DRAFT

CONSOLIDATED
ATLANTIC HIGHLY MIGRATORY SPECIES
FISHERY MANAGEMENT PLAN

VOLUME I

Including:
A Draft Environmental Impact Statement,
A Draft Regulatory Impact Review,
An Initial Regulatory Flexibility Analysis,
A Draft Social Impact Analysis, and
Framework Actions

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Highly Migratory Species Management Division
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National Marine Fisheries Service
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The Draft Consolidated Atlantic Highly Migratory Species Fishery Management Plan

Actions: Consolidate the Fishery Management Plan for Atlantic Tunas, Swordfish, and Shark and the Atlantic Billfish Fishery Management Plan; establish workshops for fishermen and dealers; consider changes to time/area closures; address rebuilding and/or overfishing of northern albacore tuna, finetooth sharks, and Atlantic billfish; modify the management process of bluefin tuna; change the fishing year; modify the authorized gears; clarify the regulations; and begin the process to update essential fish habitat

Type of Statement: Draft Environmental Impact Statement; Draft Regulatory Impact Review; Initial Regulatory Flexibility Analysis; Draft Social Impact Statement; and Draft Framework Actions

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Abstract: In 2003, the National Marine Fisheries Service (NMFS) began the process to amend the Fishery Management Plan for Atlantic Tunas, Swordfish, and Sharks and the Atlantic Billfish Fishery Management Plan. After considering comments on a scoping paper and on a predraft document, NMFS has decided to consolidate these fishery management plans, modify the fishery management plan management measures as necessary, propose framework actions, and begin the process for updating essential fish habitat. This document describes a range of alternatives that could impact fishermen and dealers for all highly migratory species fisheries. These alternatives include those to: establish mandatory workshops for fishermen and dealers; consider methods of modifying and establishing time/area closures; address rebuilding and/or overfishing of northern albacore tuna, finetooth sharks, and Atlantic billfish; simplify the management process of bluefin tuna; change the fishing year for tunas, swordfish, and billfish back to a calendar year; authorize additional gears; and clarify the regulations. Comments on the proposed rule and this draft document will be accepted for 60 days from the date of publication of the proposed rule in the Federal Register. Public hearings will be held along the Atlantic Coast, including the Caribbean, and in the Gulf of Mexico.

EXECUTIVE SUMMARY

Atlantic Highly Migratory Species (HMS) are managed under the dual authority of the Magnuson-Stevens Fishery Conservation and Management Act (Magnuson-Stevens Act) and the Atlantic Tunas Convention Act (ATCA). Under the Magnuson-Stevens Act, the National Marine Fisheries Service (NMFS) must manage fisheries to maintain optimum yield (OY) by rebuilding overfished fisheries and preventing overfishing. Under ATCA, NMFS is authorized to promulgate regulations, as may be necessary and appropriate, to implement the recommendations from the International Commission for the Conservation of Atlantic Tunas (ICCAT). Currently, tunas, swordfish, and sharks are managed under the 1999 Fishery Management Plan for Atlantic Tunas, Swordfish, and Sharks (and its 2003 amendment) and billfish under the 1988 Atlantic Billfish Fishery Management Plan (and its 1999 amendment). When finalized, this document would combine the management of all Atlantic HMS into one fishery management plan. This draft document proposes a method of combining and simplifying the objectives of the existing fishery management plans. NMFS will consider any comments on the consolidated objectives as well as comments on the alternatives themselves.

NMFS announced its intent to conduct an Environmental Impact Statement for the two current fishery management plans on July 9, 2003 (68 FR 40907). On April 30, 2004 (69 FR 23730), NMFS announced the availability of an Issues and Options Paper and nine scoping meetings. On May 26, 2004 (69 FR 29927), NMFS extended the comment period on the Issues and Options Paper to July 23, 2004, and announced an additional scoping meeting. During this time, NMFS presented the Issues and Options Paper to the New England, Mid-Atlantic, and Gulf of Mexico Fishery Management Councils and the Atlantic States Marine Fisheries Commission. A summary of the major comments received during scoping was released in December 2004 and is available on the HMS Management Division webpage at http://www.nmfs.noaa.gov/sfa/hms.

In February 2005, NMFS released the combined Predraft to the Consolidated HMS Fishery Management Plan and annual Stock Assessment and Fishery Evaluation (SAFE) Report. NMFS presented the Predraft document to all five Atlantic Fishery Management Councils, both Atlantic Fisheries Commissions, and to the HMS and Billfish Advisory Panels. Comments received from both the Issues and Options Paper and the Predraft were considered when drafting and analyzing the ecological, economic, and social impacts of the alternatives. A summary of the comments received on the Predraft was released in June 2005 and is available on the HMS Management Division webpage. The alternatives considered in this document include (preferred alternatives are in italics; all of the preferred alternatives would be implemented):

Bycatch Reduction

Workshops	
Alternative A1	Voluntary workshops for longline fishermen (No Action)
Alternative A2	*Mandatory workshops and certification for all HMS pelagic and bottom longline vessel owners – Preferred Alternative*
Alternative A3	*Mandatory workshops and certification for vessel operators actively participating in HMS pelagic and bottom longline fisheries – Preferred Alternative*
Alternative A4	Mandatory workshops and certification for all HMS longline

	vessel owners, operators, and crew
Alternative A5	*Mandatory workshops and certification for shark gillnet vessel owners and operators – Preferred Alternative*
Alternative A6	*Certification Renewal Timetable (Certification renewal every 3-years) – Preferred Alternative*
Alternative A7	No Identification Workshops (No Action)
Alternative A8	Voluntary HMS identification workshops for dealers, all commercial vessel owners and operators, and recreational fishermen
Alternative A9	*Mandatory HMS identification workshops for all shark dealers – Preferred Alternative*
Alternative A10	Mandatory HMS identification workshops for all swordfish, shark, and/or tuna dealers
Alternative A11	Mandatory HMS identification workshops for all commercial longline vessel owners
Alternative A12	Mandatory HMS identification workshops for all commercial longline vessel operators
Alternative A13	Mandatory HMS identification workshops for all commercial vessel owners (longline, CHB, General category, and handgear/ harpoon)
Alternative A14	Mandatory HMS identification workshops for all commercial vessel operators (longline, CHB, General category, and handgear /harpoon)
Alternative A15	Mandatory HMS identification workshops for all HMS Angling permit holders
Alternative A16	*Certification Renewal Timetable (Certification renewal every 3-years) – Preferred Alternative*
Time/Area Closures	
Alternative B1	Maintain existing closures; no new closures (No Action)
Alternative B2(a)	Prohibit the use of pelagic longline gear in HMS fisheries in the central portion of the Gulf of Mexico from May through November (7 months)
Alternative B2(b)	Prohibit the use of pelagic longline gear in HMS fisheries in an area of the Northeast during the month of June (1 month)
Alternative B2(c)	Prohibit the use of pelagic longline gear in HMS fisheries in the Gulf of Mexico from April through June (3 months)
Alternative B2(d)	Prohibit the use of pelagic longline gear in HMS fisheries in the Gulf of Mexico west of 86 degrees west longitude year-round
Alternative B2(e)	Prohibit the use of pelagic longline gear in HMS fisheries in an area of the Northeast to reduce sea turtle interactions
Alternative B3(a)	Modify the existing Charleston Bump time/area closure to allow the use of pelagic longline gear in all areas seaward of the axis of the Gulf Stream
Alternative B3(b)	Modify the existing Northeastern U.S. time/area closure to allow the use of pelagic longline gear in areas west of 72º 47’ west longitude during the month of June

Alternative B4	*Implement complementary HMS management measures in Madison-Swanson and Steamboat Lumps Marine Reserves from November through April (6 months) – Preferred Alternative*
Alternative B5	*Establish criteria to consider when implementing new time/area closures or making modifications to existing time/area closures – Preferred Alternative*
Alternative B6	Prohibit the use of bottom longline gear in an area southwest of Key West to protect endangered smalltooth sawfish
Alternative B7	Prohibit the use of pelagic longline gear in HMS fisheries in all areas

Rebuilding and Preventing Overfishing

Northern Albacore Tuna	
Alternative C1	Maintain compliance with the current ICCAT recommendation (No Action)
Alternative C2	Unilateral proportional reduction of United States northern albacore fishing mortality
Alternative C3	*Establish the foundation with ICCAT for developing an international rebuilding program – Preferred Alternative*
Finetooth Sharks	
Alternative D1	Maintain current regulations for recreational and commercial fisheries (No Action)
Alternative D2	Implement commercial management measures to reduce fishing mortality of finetooth sharks
Alternative D3	Implement recreational management measures to reduce fishing mortality of finetooth sharks
Alternative D4	*Identify sources of finetooth shark fishing mortality to target appropriate management actions – Preferred Alternative*
Atlantic Billfish	
Alternative E1	Retain existing regulations regarding recreational billfish fishing, including permit requirements, minimum size limits, prohibited species, landing form, allowable gear, and reporting requirements (No Action)
Alternative E2	Effective January 1, 2007, limit all participants in Atlantic HMS recreational fisheries to using only non-offset circle hooks when using natural baits or natural bait/artificial lure combinations
Alternative E3	*Effective January 1, 2007, limit all Atlantic billfish tournament participants to using only non-offset circle hooks when using natural baits or natural bait/artificial lure combinations – Preferred Alternative*
Alternative E4 (a)	Increase the minimum size limit for Atlantic white marlin to a specific size between 68 and 71’’ LJFL
Alternative E4 (b)	Increase the minimum size limit for Atlantic blue marlin to a specific size between 103 and 106’’ LJFL

Alternative E5	Implement a recreational bag limit of one Atlantic billfish per vessel per trip
Alternative E6	*Effective January 1, 2007, implement ICCAT Recommendations on Recreational Marlin Landings Limits – Preferred Alternative*
Alternative E7	*Effective January 1, 2007 - December 31, 2011, allow only catch and release fishing for Atlantic white marlin – Preferred Alternative*
Alternative E8	Effective January 1, 2007 - December 31, 2011, allow only catch and release fishing for Atlantic blue marlin

Management Program Structure

Bluefin Tuna Quota Management	
Alternative F1	Maintain the time-periods, subquota allocations, and geographic set asides for the General and Angling categories as established in the 1999 FMP (No Action)
Alternative F2	Establish General category time-periods, subquotas, and geographic set asides annually via framework actions
Alternative F3	*Amend the management procedures regarding General category time-periods, subquota, as well as geographic set-asides to allow for future adjustments to take place via a regulatory framework action – Preferred Alternative*
Alternative F3 (a)	Establish monthly General category time-periods and subquotas (June-Jan, 12.5% each)
Alternative F3 (b)	Revise General category time-periods and subquotas to allow for a formalized winter fishery (June-Aug, 54%; Sept, 26.5%; Oct-Nov, 9%; Dec, 5.2%; and Jan, 5.3%)
Alternative F3 (c)	*Revise General category time-periods and subquotas to allow for a formalized winter fishery (June-Aug, 50%; Sept, 26.5%; Oct-Nov, 13%; Dec, 5.2% and Jan, 5.3%) – Preferred Alternative*
Alternative F3 (d)	Revise General category time-periods and subquotas to allow for a formalized winter fishery (June-Aug, 38.7%; Sept, 26.6%; Oct - Nov, 13%; Dec, 10.8%; and Jan, 10.9%)
Alternative F4	*Clarify the procedures for calculating the Angling category school size-class BFT subquota allocation and remove the Angling category north/south dividing line – Preferred Alternative*
Alternative F5	Maintain the annual BFT specification process and the under/overharvest procedures within individual domestic quota categories and individual vessels in the Purse seine category (No Action)
Alternative F6	*Revise the annual BFT specification process to refer back to the supporting analytical documents of the consolidated HMS FMP and include seasonal management measures in annual framework actions – Preferred Alternative*
Alternative F7	Eliminate unharvested quota carryover provisions and return unharvested quota to the resource, while maintaining status quo overharvest provisions

Alternative F8	*Establish an individual quota category carry-over limit of 100 percent of the baseline allocation (i.e., no more than the annual baseline allocation may be carried forward), except for the Reserve category, and authorize the transfer of quota exceeding the 100 percent limit to the Reserve or another domestic quota category, while maintaining status quo overharvest provisions – Preferred Alternative*
Alternative F9	Maintain inseason action procedures (No Action)
Alternative F10	*Revise and consolidate criteria considered prior to performing inseason and some annual BFT management actions – Preferred Alternative*
Alternative F11	Eliminate BFT inseason actions
Timeframe for Annual Management of HMS Fisheries	
Alternative G1	Maintain the current fishing year for all HMS (No Action)
Alternative G2	*Shift the fishing year to January 1 – December 31 for all HMS – Preferred Alternative*
Alternative G3	Shift the fishing year to June 1-May 31 for all HMS
Authorized Gears	
Alternative H1	Maintain current authorized gears in Atlantic HMS fisheries (No Action)
Alternative H2	*Authorize speargun fishing gear as a permissible gear type in the recreational Atlantic tuna fishery - Preferred Alternative*
Alternative H3	Authorize speargun in the commercial tuna handgear and recreational tuna fisheries
Alternative H4	*Authorize green-stick for the commercial harvest of Atlantic BAYS tunas - Preferred Alternative*
Alternative H5	*Authorize buoy gear in the commercial swordfish handgear fishery, and limit vessels employing buoy gear to possessing and deploying no more than 35 individual buoys, with each having no more than two hooks or gangions attached - Preferred Alternative*
Alternative H6	Authorize buoy gear in the commercial swordfish handgear fishery, and limit vessels employing buoy gear to possessing and deploying no more than 50 individual buoys, with each buoy having no more than 15 hooks or gangions attached
Alternative H7	*Clarify the allowance of hand-held cockpit gears used at boat side for subduing HMS captured on authorized gears - Preferred Alternative*
Regulatory Housekeeping	
Alternative I1(a)	Retain current definitions for PLL and BLL gear (No Action)
Alternative I1(b)	*Establish additional restrictions on longline gear in HMS time/area closures by specifying a maximum and minimum allowable number of commercial fishing floats to qualify as a BLL and PLL vessel, respectively – Preferred Alternative*
Alternative I1(c)	*Differentiate between PLL and BLL gear based upon the species*

	composition of the catch onboard or landed – Preferred Alternative
Alternative I1(d)	Require time/depth recorders (TDRs) on all HMS longlines
Alternative I1(e)	Base HMS time/area closures on all longlines (PLL & BLL)
Alternative I2(a)	Retain current regulations regarding shark landing requirements (No Action)
Alternative I2(b)	*Require that the 2nd dorsal fin and the anal fin remain on all sharks through landing – Preferred Alternative*
Alternative I2(c)	Require that the 2nd dorsal fin and the anal fin remain on all sharks through landing, except for lemon and nurse sharks
Alternative I2(d)	Require all fins remain on all sharks through landing
Alternative I3(a)	Retain current regulations regarding retention limits, with no new prohibitions (No Action)
Alternative I3(b)	*Add new prohibition at § 635.71(a)(48) making it illegal for any person to, "Purchase any HMS that was offloaded from an individual vessel in excess of the retention limits specified in §§ 635.23 and 635.24" – Preferred Alternative*
Alternative I3(c)	*Add new prohibition at § 635.71(a)(49) making it illegal for any person to, "Sell any HMS that was offloaded from an individual vessel in excess of the retention limits specified in §§ 635.23 and 635.24" – Preferred Alternative*
Alternative I4(a)	Retain current coordinates for the East Florida Coast closed area (No Action)
Alternative I4(b)	*Amend the second coordinate of the East Florida Coast closed area so that it corresponds with the EEZ – Preferred Alternative*
Alternative I5(a)	Retain the current definition of "handline" at § 635.2 (No Action)
Alternative I5(b)	*Amend the definition of "handline" at § 635.2 by requiring that they be attached to, or in contact with, all vessels – Preferred Alternative*
Alternative I5(c)	Require that handlines remain attached to all vessels when fishing recreationally and allow unattached handlines when fishing commercially
Alternative I6(a)	Retain current regulations regarding the possession of Atlantic billfish (No Action)
Alternative I6(b)	*Prohibit vessels issued commercial permits and operating outside of a tournament from possessing, retaining, or taking Atlantic billfish from the management unit – Preferred Alternative*
Alternative I7(a)	Retain the current regulations regarding BFT dealer reporting (No Action)
Alternative I7(b)	*Amend the HMS regulations to provide an option for Atlantic tunas dealers to submit required BFT reports using the Internet – Preferred Alternative*
Alternative I7(c)	Amend the HMS BFT dealer reporting regulations to require that Atlantic tunas dealers submit BFT reports electronically, with specific exceptions
Alternative I8(a)	Maintain the existing regulations regarding submission of

	logbooks (No Action)
Alternative I8(b)	*Require submission of "No Fishing" reporting forms for selected vessels if no fishing trips occurred during the preceding month, postmarked no later than seven days after the end of the month – Preferred Alternative*
Alternative I8(c)	*Require submission of the trip "Cost-Earnings" reporting form for selected vessels 30 days after a trip and the annual "Cost-Earning" report form by January 31 of each year – Preferred Alternative*
Alternative I9(a)	Retain existing regulations at § 635.5(c)(2) requiring anglers to report non-tournament recreational landings of North Atlantic swordfish and Atlantic billfish (No Action)
Alternative I9(b)	*Require vessel owners to report non-tournament recreational landings of North Atlantic swordfish and Atlantic billfish – Preferred Alternative*
Alternative I10(a)	Retain the current regulations specifically referring to 25 mt (ww) (No Action)
Alternative I10(b)	*Modify the HMS regulations to state that "In addition, each year, 25 mt (ww) will be allocated for incidental catch by pelagic longlines" in the NED – Preferred Alternative*
Alternative I10(c)	Conduct additional discussions at ICCAT regarding quotas allocated to account for bycatch related to directed longline fisheries in the vicinity of the management area boundary
Alternative I11(a)	No permit condition for recreational trips (No Action)
Alternative I11(b)	*Require recreational vessels with a Federal permit to abide by Federal regulations, regardless of where they are fishing, unless a state has more restrictive regulations - Preferred Alternative*

NMFS believes that the suite of preferred alternatives in this draft document should, consistent with the Magnuson-Stevens Act and other domestic laws, allow overfished Atlantic HMS to rebuild, address overfishing of Atlantic HMS, balance the needs of the fishermen and communities with the needs of the resource, and maximize optimum yield for the fishery and the resource. Not all the alternatives are actions specific to the fishery management plan (FMP); some actions are framework actions taken to ensure the objectives of the FMP and the Magnuson-Stevens Act are met. Comments on this document and the associated proposed rule will be accepted for at least 60 days from publication of the proposed rule in the Federal Register. NMFS intends to finalize the regulations in early 2006.

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of FL. S. Atlantic includes: east coast of FL. GA, SC, and NC dealers reporting to Southeast Fisheries Science Center. Mid-Atlantic includes: NC dealers reporting to Northeast Fisheries Science Center, VA, MD, DE, NJ, NY, and CT. N. Atlantic includes: RI, MA, NH, and ME. For bluefin tuna, all NC landings are included in the Mid-Atlantic. 3-160

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LIST OF COMMONLY USED ABBREVIATIONS AND ACRONYMS

AA	Assistant Administrator for Fisheries
ACCSP	Atlantic Coastal Cooperative Statistics Program
ACS	Angler consumer surplus
ALWTRP	Atlantic Large Whale Take Reduction Plan
ALWTRT	Atlantic Large Whale Take Reduction Team
ANPR	Advanced Notice of Proposed Rulemaking
AOCTRP	Atlantic Offshore Cetacean Take Reduction Plan
AOCTRT	Atlantic Offshore Cetacean Take Reduction Team
AP	Advisory Panel
APA	Administrators Procedure Act
ASMFC	Atlantic States Marine Fisheries Commission
ATCA	Atlantic Tunas Convention Act
B	Biomass
BAYS	Bigeye, albacore, yellowfin, skipjack tunas
BET	Bigeye tuna
BETYP	Bigeye tuna Year Program
BFT	Bluefin tuna
BiOp	Biological Opinion
BLL	Bottom Longline
B_{MSY}	Biomass expected to yield maximum sustainable yield
B_{OY}	Biomass expected to yield optimum yield
BSD	Bluefin Tuna Statistical Document
BTF	By the fish
BUM	Blue marlin
CBP	Customs and Border Protection
CFDBS	Commercial Fisheries Database System
CFMC	Caribbean Fishery Management Council
CFL	Curved fork length
CFR	Code of Federal Regulations
CHB	Charter/Headboat
CIAT	Spanish for IATTC
CIE	Center for Independent Experts
CITES	Convention on International Trade in Endangered Species of Wild Fauna and Flora
COE	Certification of Eligibility
COFI	Committee on Fisheries
CPI	Consumer Price Index
CPUE	Catch per unit effort

CSFOP	Commercial shark fishery observer program
CSR	Center for Shark Research
CSTP	Cooperative Shark Tagging Program
CZMA	Coastal Zone Management Act
DEIS	Draft Environmental Impact Statement
DPS	Distinct population segment
DRG	Dredge
DSGFOP	Directed Shark Gillnet Fishery Observer Program
dw	Dressed weight
EA	Environmental Assessment
EEZ	Exclusive economic zone
EFH	Essential fish habitat
EFP	Exempted fishing permit
EIS	Environmental Impact Statement
EO	Executive Order
ESA	Endangered Species Act
F	Instantaneous fishing mortality
FAD	Fish aggregating device
FAO	Food and Agriculture Organization
FAS	Free Alongside Ship
FEC	Florida East Coast
FEIS	Final Environmental Impact Statement
FL	Fork Length
FMP	Fishery Management Plan
F_{MSY}	Instantaneous fishing mortality rate expected to yield maximum sustainable yield
FMU	Fishery management unit
F_{OY}	Fishing mortality rate expected to yield optimum yield
FR	Federal Register
FRFA	Final regulatory flexibility analysis
GDP	Gross Domestic Product
GIS	Geographic Information System
GOM	Gulf of Mexico
GSAFDF	Gulf and South Atlantic Fishery Development Foundation
GMFMC	Gulf of Mexico Fishery Management Council
GSMFC	Gulf States Marine Fisheries Commission
HACCP	Hazard Analysis Critical Control Point
HAPC	Habitat area of particular concern
HBS	Headboat Survey
HMS	Highly migratory species: Atlantic sharks, tunas, swordfish, and billfish

HTS	Harmonized Tariff Schedule
IATTC	Inter-America Tropical Tuna Commission
ICCAT	International Commission for the Conservation of Atlantic Tunas
IMARPE	Instituo del Mar del Peru
INP	Instituto Nacional de Pesca
IPOA	International Plan of Action
IRFA	Initial regulatory flexibility analysis
ITP	International Trade Permit
ITQ	Individual transferable quota
ITS	Incidental take statement
IUU	Illegal, Unregulated, and Unreported
LAP	Limited access permit
LCS	Large coastal sharks
LJFL	Lower jaw fork length
LOA	Letter of acknowledgment
LOF	List of Fisheries
LPS	Large Pelagic Survey
LWTRP	Large Whale Take Reduction Plan
LWTRT	Large Whale Take Reduction Team
M	Mortality
MAFMC	Mid-Atlantic Fishery Management Council
Magnuson-Stevens Act	Magnuson-Stevens Fishery Conservation and Management Act
MFMT	Maximum fishing mortality threshold
MMPA	Marine Mammal Protection Act
MMS	Minerals Management Service
MPA	Marine protected area
MRFSS	Marine Recreational Fishing Statistics Survey
MSST	Minimum stock size threshold
MSY	Maximum sustainable yield
mt	Metric tons
NCA	North Central Atlantic
NEC	Northeast Coastal Statistical Area
NED	Northeast Distant Statistical Area
NEFMC	New England Fishery Management Council
NEFSC	Northeast Fisheries Science Center
NEPA	National Environmental Policy Act
NERO	Northeast Regional Office
NFRDI	National Fisheries Research and Development Institute
NGO	Non-governmental organization

NMFS	National Marine Fisheries Service
nmi	Nautical mile
NOA	Notice of Availability
NOAA	National Oceanographic and Atmospheric Administration
NOI	Notice of Intent
NPOA	National Plan of Action
NRC	Natural Resources Consultants, Inc.
NS	National Standards
NYB	New York Bight
OSF	Office of Sustainable Fisheries
OY	Optimum yield
PAT	Pop-up archival tag
PFD	Personal flotation device
PIFSC	Pacific Islands Fisheries Science Center
PLL	Pelagic longline
POP	Pelagic observer program
PPI	Producer price index
OPR	Office of Protected Resources
PRA	Paperwork Reduction Act
PRM	Post-release mortality
PSAT	Pop-up satellite archival tag
RBS	Recreational Billfish Survey
Reg Flex Act	Regulatory Flexibility Act
RIR	Regulatory Impact Review
RFMC	Regional Fishery Management Council
RPAs	Reasonable and Prudent Alternatives
RPMs	Reasonable and Prudent Measures
SAFE report	Stock Assessment and Fishery Evaluation report
SAFMC	South Atlantic Fishery Management Council
SAB	South Atlantic Bight
SAI	Sailfish
SAR	Sargasso Sea
SBR	Spawning Stock Biomass Ratio
SCRS	Standing Committee for Research and Statistics
SCS	Small coastal sharks
SD	Statistical document
Secretary	Secretary of Commerce
SEFSC	Southeast Fisheries Science Center
SEIS	Supplemental Environmental Impact Statement

SEN	Seines
SERO	Southeast Regional Office
SEW	Stock evaluation workshop
SFA	Sustainable Fisheries Act
SFL	Straight fork length
SK Program	Saltonstall-Kennedy Program
SRP	Scientific research permit
SSB	Spawning stock biomass
SWFSC	Southwest Fisheries Science Center
TAC	Total allowable catch
TAG	Tag-A-Giant
TAL	Total allowable landings
TCs	Terms and Conditions
TL	Total length
TRP	Traps and pots
TUNS	Tuna North and Tuna South
TWL	Trawls
TXPWD	Texas Parks and Wildlife Department
UNK	Unknown
USFWS	United States Fish and Wildlife Service
VIMS	Virginia Institute of Marine Science
VMS	Vessel monitoring system
WHM	White marlin
WPRFMC	Western Pacific Regional Fishery Management Council
WTP	Willingness to pay
ww	Whole weight
WWF	World Wildlife Fund
YFT	Yellowfin tuna
YOY	Young of the year

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1.0 INTRODUCTION

Atlantic Highly Migratory Species (HMS) are managed under the dual authority of the Magnuson-Stevens Fishery Conservation and Management Act (Magnuson-Stevens Act) and the Atlantic Tunas Convention Act (ATCA). Under the Magnuson-Stevens Act, the National Marine Fisheries Service (NMFS) must, consistent with the National Standards, manage fisheries to maintain optimum yield (OY) by rebuilding overfished fisheries and preventing overfishing. Under ATCA, NMFS is authorized to promulgate regulations, as may be necessary and appropriate to implement the recommendations from the International Commission for the Conservation of Atlantic Tunas (ICCAT). Additionally, any management measures must also be consistent with other domestic laws including, but not limited to, the National Environmental Policy Act (NEPA), the Endangered Species Act (ESA), the Marine Mammal Protection Act (MMPA), and the Coastal Zone Management Act (CZMA). More detail regarding the management history of HMS is provided below (Section 1.1).

Currently, tunas, swordfish, and sharks are managed under in the 1999 Fishery Management Plan for Atlantic Tunas, Swordfish, and Sharks (and its 2003 amendment) and billfish under the 1988 Atlantic Billfish Fishery Management Plan (and its 1999 amendment). When finalized, this document would combine the management of all Atlantic HMS into one comprehensive fishery management plan (FMP) (Section 1.1.3). This draft document proposes a method of combining and simplifying the objectives of the existing FMPs (Section 1.3). NMFS will consider any comments on the consolidated objectives as well as comments on the alternatives themselves.

The National Marine Fisheries Service (NMFS) announced its intent to conduct an Environmental Impact Statement for the two current fishery management plans on July 9, 2003 (68 FR 40907). On April 30, 2004 (69 FR 23730), NMFS announced the availability of an Issues and Options Paper and its intent to hold nine scoping meetings (Gloucester, MA; Ocean City, MD; New Orleans, LA; Manteo, NC; San Juan, PR; Destin, FL; Montauk, NY; Port Aransas, TX; and Cocoa Beach, FL). On May 26, 2004 (69 FR 29927), NMFS extended the comment period to July 23, 2004, and announced an additional scoping meeting (Key West, FL). During this time, NMFS presented the Issues and Options Paper to the New England, Mid-Atlantic, and Gulf of Mexico Fishery Management Councils (69 FR 22006, April 23, 2004; 69 FR 31966, June 8, 2004; and 69 FR 36066, June 28, 2004, respectively) and the Atlantic States Marine Fisheries Commission. Council and Commission members from any Council or Commission were invited to attend any of the scoping meetings and to submit comments. A summary of the major comments received during scoping was released in December 2004 and is available on the HMS Management Division webpage at http://www.nmfs.noaa.gov/sfa/hms . Hard copies can be requested at (301) 713-2347 or via fax at (301) 713-1917.

In February 2005, NMFS released the combined Predraft to the Consolidated HMS Fishery Management Plan and annual Stock Assessment and Fishery Evaluation (SAFE) Report. NMFS presented the Predraft document to all five Atlantic Fishery Management Councils, both Atlantic Fisheries Commissions, and to the HMS and Billfish Advisory Panels. The comments received on the Predraft were summarized in a document released in June 2005. The predraft is available on the HMS webpage or hard copies can be requested at (301) 713-2347 or via fax at

(301) 713-1917. Comments received on both the Issues and Options Paper and the Predraft were considered when drafting and analyzing the ecological, economic, and social impacts of the alternatives.

Chapters 2 and 4 provide a description of the alternatives and the analyses of the potential impacts. All of the preferred alternatives would be implemented. Chapter 3 provides a description of the fishery. Chapter 5 discusses any mitigating measures regarding the alternatives. Chapter 6, 7, and 8 fully analyze the economic impacts of the alternatives and address the requirements of a Regulatory Impact Review (RIR) and Initial Regulatory Flexibility Analysis (IRFA). Chapter 9 provides the social impact analysis. Chapter 10 describes the first step in updating the descriptions of essential fish habitat. A proposed rule will be published in coordination with this document to describe further how the preferred alternatives would be implemented. Comments on both this document and the proposed rule would be accepted for 60 days from the date of publication of the proposed rule in the Federal Register. During those 60 days, NMFS will hold numerous public hearings along the Atlantic Coast, the Caribbean, and the Gulf of Mexico. NMFS will also present this draft document and proposed rule to the Fishery Management Councils and Marine Fisheries Commissions that have meetings during the 60-day comment period. Based on the comments received, NMFS intends make the necessary changes to the documents and finalize them in early 2006.

1.1 Management History

On November 28, 1990, the President of the United States signed into law the Fishery Conservation Amendments of 1990 (Pub. L. 101-627). This law amended the Magnuson Fishery Conservation and Management Act (later renamed the Magnuson-Stevens Fishery Conservation and Management Act or Magnuson-Stevens Act) and gave the Secretary of Commerce (Secretary) the authority (effective January 1, 1992) to manage HMS in the exclusive economic zone (EEZ) of the Atlantic Ocean, Gulf of Mexico, and Caribbean Sea under authority of the Magnuson-Stevens Act (16 U.S.C. §1811). This law also transferred from the Fishery Management Councils to the Secretary, effective November 28, 1990, the management authority for HMS in the Atlantic Ocean, Gulf of Mexico, and Caribbean Sea (16 U.S.C. §1854(f)(3)).[1] The Secretary then delegated authority to manage Atlantic HMS to NMFS.

Under the Magnuson-Stevens Act, NMFS must maintain OY of each fishery by preventing overfishing and rebuilding overfished stocks. To do this, NMFS must, among other things, consider the National Standards, including using the best scientific information and considering impacts on residents of different States, efficiency, costs, fishing communities, bycatch, and safety at sea (16 U.S.C. §1851 (a)(1-10)). The Magnuson-Stevens Act also has a specific section for preparing and implementing FMPs for Atlantic HMS (16 U.S.C. §1854 (g)(1)(A-G)). In summary, the section includes, but is not limited to, requirements to:

[1] The Magnuson-Stevens Act, at 16 U.S.C. 1802(14), defines the term "highly migratory species" as tuna species, marlin (*Tetrapturus* spp. and *Makaira* spp.), oceanic sharks, sailfishes (*Istiophorus* spp.), and swordfish (*Xiphias gladius*). Further, the Magnuson-Stevens Act, at 16 U.S.C. 1802(27), defines the term "tuna species" as albacore tuna (*Thunnus alalunga*), bigeye tuna (*Thunnus obesus*), bluefin tuna (*Thunnus thynnus*), skipjack tuna (*Katsuwonus pelamis*), and yellowfin tuna (*Thunnus albacares*).

- Consult with and consider the views of affected Councils, Commissions, and advisory groups;
- Evaluate the likely effects of conservation and management measures on participants and minimize, to the extent practicable, any disadvantage to U.S. fishermen in relation to foreign competitors;
- Provide fishing vessels with a reasonable opportunity to harvest any allocation or quota authorized under an international fishery agreement;
- Diligently pursue comparable international fishery management measures; and
- Ensure that conservation and management measures promote international conservation of the affected fishery, take into consideration traditional fishing patterns of fishing vessels, are fair and equitable in allocating fishing privileges among U.S. fishermen and do not have economic allocation as the sole purpose, and promote, to the extent practicable, implementation of scientific research programs that include the tagging and release of Atlantic HMS.

In addition to the Magnuson-Stevens Act, Atlantic HMS are also managed internationally by the International Commission for the Conservation of Atlantic Tunas (ICCAT). ICCAT consists of 38 contracting parties as well as other cooperating parties that fish for tunas and tuna-like species throughout the Atlantic including Canada, the European Community, Japan, and China. Since 1966, ICCAT's stated objective has been to "cooperate in maintaining the populations of these fishes at levels which will permit the maximum sustainable catch for food and other purposes." To achieve this objective, ICCAT requires countries to collect catch data. In 1966, through a resolution, ICCAT urged all countries to begin to collect and process statistics and data on Atlantic tunas fisheries. In 1972, noting data deficiencies, ICCAT again urged countries to improve the collection and efficiency of Atlantic tunas catch-effort data and to make sure data are made available to ICCAT. These types of requests continue to be made, either as resolutions or recommendations, as the management and science needs for each fishery continue to expand.

The conservation and management recommendations of ICCAT include total allowable catches, sharing arrangements for member countries, minimum size limits, effort controls, time/area closures, trade measures, compliance measures, and monitoring and inspection programs. If the United States accepts an ICCAT recommendation, the Atlantic Tunas Convention Act (ATCA) provides the Secretary with the necessary statutory authority to issue regulations as may be necessary and appropriate to implement binding ICCAT recommendations to fisheries managed by the United States (16 U.S.C. §971 *et seq*.). However, no regulation promulgated under ATCA may have the effect of increasing or decreasing any allocation or quota of fish or fishing mortality level to which the United States agreed pursuant to a recommendation of ICCAT (16 U.S.C. §971 (c)). ICCAT recommendations can be found on the internet at http://www.ICCAT.es .

The following sections give a brief history of the management of HMS. This history is organized by the current FMPs, with Atlantic tunas, swordfish, and sharks in one section and Atlantic billfish in the next section. For more detail regarding the history of management, please see the original documents. Proposed rule, final rules, and other official notices can be found in the Federal Register at http://www.gpoaccess.gov/fr/index.html. Supporting documents can be

found on the HMS Management Division's webpage at http://www.nmfs.noaa.gov/sfa/hms. Documents can also be requested by calling the HMS Management Division at (301) 713-2347.

1.1.1 History of Atlantic Tunas, Swordfish, and Shark Management

1.1.1.1 Pre-1999 Atlantic Tunas Management

Unless otherwise specified, the following history is a combination of a variety of sources including ICCAT recommendations, the 1999 FMP for Atlantic Tuna, Swordfish, and Sharks, and a 1996 document on the historic rationale and effectiveness of the regulations for U.S. Atlantic BFT fisheries (NMFS, 1996).

Bigeye, albacore, yellowfin, and skipjack (BAYS) tunas, as well as bluefin tuna have been exploited in the western Atlantic for many years. In the early 1900s, a sport fishery developed for small and medium tunas off New York and New Jersey, and for giant bluefin tuna in the Gulf of Maine. The rod and reel fishery expanded rapidly during the 1950s and 1960s, as hundreds of private, charter, and partyboats targeted tunas along the mid-Atlantic coast. This recreational fishery continues today from Cape Hatteras to the Canadian border. In addition, it is locally important in the Straits of Florida. Sport catches of BAYS, particularly yellowfin tuna, are also made in the Gulf of Mexico.

Until the late 1950s, the U.S. commercial fishery for tunas employed mostly harpoons, handlines, and traps. There was no commercial market for bluefin tuna, and giant bluefin tuna (greater than 310 pounds (lb)) were regarded as a nuisance because of the damage they caused to fishing gear. Much of the bluefin tuna catch was incidental to operations targeting other species. In 1958, commercial purse seining for Atlantic tunas began with a single vessel in Cape Cod Bay and expanded rapidly into the region between Cape Hatteras and Cape Cod during the early 1960s. The purse seine fishery between Cape Hatteras and Cape Cod was directed mainly at small and medium bluefin tuna, and at skipjack tuna, all for the canning industry. North of Cape Cod, purse seining was directed at giant bluefin tuna. A pelagic longline fishery for Atlantic tunas also developed rapidly during the 1960s, comprised mainly of Japanese vessels fishing in the Gulf of Mexico. Today U.S. pelagic longline vessels target bigeye and yellowfin tuna, and catch bluefin tuna incidentally.

The U.S. handgear fishery for Atlantic tunas is mainly a summer through early winter fishery. The recreational tuna fishery takes place mainly in the mid-Atlantic region through the Gulf of Mexico (GOM). Private vessels targeting tuna for recreational purposes only are permitted in the Angling category, while the charter/headboats targeting tunas are permitted in the Charter/Headboat category. Many fishermen who might normally consider themselves "recreational" fishermen participate in the General category in New England waters during the summer and fall and are classified as commercial fishermen. Recently, a commercial bluefin tuna fishery has developed off of some south Atlantic states, particularly the State of North Carolina, in the early winter. General category permit holders may sell tuna, and specifically bluefin tuna greater than 73 inches. A 1998 regulation prohibiting the retention of bluefin tuna less than 73 inches by fishermen in the General category clarified the distinction between the commercial and recreational fisheries. The commercial handgear fishery for bluefin tuna occurs mainly in New England, with vessels targeting fish using handline, rod and reel, and harpoon.

Bluefin Tuna

Peak yields of bluefin tuna from the western Atlantic (about 8,000 to 19,000 metric tons (mt) whole weight (ww)) occurred between 1963 and 1966 when much of the catch was taken by Asian longline vessels off Brazil. During the late 1960s and 1970s, annual yields averaged about 5,000 mt ww. High catches of juvenile bluefin tuna were sustained throughout the 1960s and into the early 1970s. During the 1960s and 1970s, a North American purse seine fishery for juveniles and the longline fishery, mostly Japanese vessels, usually took 70 to 80 percent of the yield and recreational fisheries usually took 10 percent. By 1973, the United States and other nations began to express concern about the decrease in the abundance of bluefin tuna. In response to this concern, in 1974, ICCAT recommended a minimum size limit of 6.4 kg (14 lb) and recommended that all countries limit fishing mortality to recent (at that time) levels for one year. As a result, the United States limited U.S. harvest by imposing quotas and size limits. In the late 1970s, approximately 10,000 giant bluefin tuna were taken in one year alone from the Gulf of Mexico.

After conducting a series of stock assessments, the ICCAT Standing Committee on Research and Statistics (SCRS) recommended in 1981 that catches of western Atlantic bluefin tuna be reduced to as near zero as possible to stop the decline of the stock and established a 800 mt ww total allowable catch (TAC). This recommendation also prohibited fishing effort in the western Atlantic from transferring to the eastern Atlantic (the stocks were split at 45^0 W longitude through 10^0 N latitude before moving to 25^0 W longitude at the equator). At the 1982 meeting, the TAC was increased to 2,660 mt ww, to be split proportionately between the relevant Contracting Parties. This level was maintained through 1991. Also at the 1982 meeting, ICCAT recommended that there be no directed fishery on bluefin tuna spawning stocks in the western Atlantic in spawning areas such as the Gulf of Mexico.

By the late 1980s, high ex-vessel prices and the increased importance of the Japanese market had blurred the distinction between the commercial and recreational fisheries for bluefin tuna and much of the traditionally recreational catch for medium and giant bluefin tuna was being sold for shipment to Japan. In 1992, NMFS responded by banning the sale of school, large school, and small medium bluefin tuna (27 inches to less than 73 inches curved fork length).

At the 1991 meeting, ICCAT recommended additional measures to prevent further declines in the western Atlantic bluefin tuna stock, including a ten percent reduction in the total allowable catch. In 1993, the western Atlantic bluefin tuna quota was reduced further from 2,394 mt ww to 1,995 mt ww in 1994 and 1,200 mt ww in 1995. At the 1991 meeting, the United States was allocated 693 mt ww per year for both 1993 and 1994. This 1991 recommendation also increased the minimum size to 30 kg (66 lb) or 115 cm (45 in) fork length with a tolerance level of eight percent. Fishermen who caught fish smaller than this size were encouraged to tag and release them.

In 1992, NMFS established base quotas for each permit category in the bluefin tuna fishery based upon the historical share of catch in each of these categories during the period 1983 to 1991. These quotas were used in 1992, 1993, and 1994, with overharvests and underharvests added and subtracted as required by ICCAT, as well as some inseason transfers. At the 1992 ICCAT meeting, ICCAT recommended that by September 1, 1993, all bluefin tuna imports into

a Contracting Party be accompanied by an ICCAT Bluefin Tuna Statistical Document that included, among other things, the area that the fish was harvested in, the gear, and a validation by a government official of the flag state of the vessel that harvested the tuna.

The SCRS projections in 1994 indicated that the stock could support higher quota levels and still begin to rebuild, albeit more slowly. Based on the new stock assessment, ICCAT members adopted a recommendation to increase the annual bluefin tuna total allowable catch in the western Atlantic Ocean from 1,995 to 2,200 mt ww. The share allocated to the United States was set at 1,311 mt ww. This allocation reflected trends in fleet size, effort and landings by category, as well as the ICCAT recommendation which specifies that data should be collected for the broadest range of size-classes possible, given size restrictions. At the 1996 meeting, ICCAT recommended an annual western Atlantic bluefin tuna TAC of 2,354 mt ww for 1997 and 1998. The annual quota allocated to the United States for 1997 and 1998 was 1,344 mt ww.

In 1998, the Commission adopted a 20-year Rebuilding Program for the western Atlantic bluefin management area (ICCAT Ref. 98-07) aimed at rebuilding to the stock size that will produce Maximum Sustainable Yield (MSY) by 2018 with a 50 percent or greater probability. The Program states that the TAC for the west would only be adjusted from the 2,500 mt ww level adopted for 2003-2004 if SCRS advises that (a) a catch of 2,700 mt ww or more has a 50 percent or greater probability of rebuilding or (b) a catch of 2,300 t or less is necessary to have a 50 percent or greater probability of rebuilding. According to the Program, the MSY rebuilding target can be adjusted according to advice from SCRS. In 2002, the Commission set the annual Total Allowable Catch, inclusive of dead discards, for the western Atlantic management area to 2,700 mt ww, effective beginning in 2003 (ICCAT Ref. 02-07). The current U.S. share of this quota equals 1,496 mt ww inclusive of 25 mt ww for pelagic longline incidental catch in the Northeast Distant Statistical Reporting area and an allowance for dead discards of an additional 68 mt ww. If there are dead discards in excess of this allowance, they must be counted against the following year's quota. If there are fewer dead discards, then half of the underharvest may be added to the following year's quota while the other half is conserved. The recommendation also allowed four years to balance the eight percent tolerance for bluefin tuna under 115 cm (young school and school bluefin tuna).

Bigeye Tuna

ICCAT adopted a minimum size of 3.2 kg (7 lb) with a 15 percent tolerance level for undersized bigeye tuna in 1979. In 1995, noting the large increases in longline and purse seine catches of bigeye tuna and the large number of undersized fish, ICCAT urged countries to reduce catches below MSY and reduce catches of undersized fish. ICCAT also asked countries that had equatorial fisheries catching undersized fish to place observers on the vessels and allow SCRS to study the data. In 1997, ICCAT issued two resolutions to limit the catch of larger vessels in the Atlantic and the catch of countries that caught more than an average of 200 mt ww between 1992 and 1996 and to collect information on the larger vessels in the fleet (those greater than 80 GRT).

Large numbers of undersized fish are still harvested by the surface fleets operating near the equator. SCRS estimates that approximately 70 percent by number of bigeye tuna landed are smaller than the minimum size, well in excess of the 15 percent tolerance. Total Atlantic bigeye tuna catch has increased substantially since 1990. ICCAT has not recommended Atlantic-wide

quotas for bigeye tuna. However, in 1998, ICCAT adopted two new management recommendations that are designed to limit effort in commercial fisheries for bigeye tuna throughout the Atlantic. ICCAT also adopted a resolution in 1998 that tasks SCRS with developing stock rebuilding scenarios for bigeye.

Purse seine fleets in the east Atlantic have developed a fishery that targets schools of tuna near artificial floating objects, also known as fish aggregating devices (FADs). This method of fishing has increased harvesting efficiency and contributed to excessive catch of undersized bigeye tuna. Favorable oceanographic conditions as well as the extensive use of sonar and deeper nets have also contributed to increased bigeye tuna harvest in recent years. In 1998, ICCAT established a mandatory time/area closure for purse seiners using fish aggregating devices in equatorial waters.

Albacore Tuna

Although albacore tuna harvests in the north Atlantic have declined since 1970, catch and effort in newer surface fisheries have increased since 1987. In 1997, SCRS determined that North Atlantic albacore tuna was at or near a level of full exploitation. In 1998, ICCAT adopted a recommendation to limit fishing capacity to the number of vessels in the directed albacore tuna fishery during the years of 1993 to 1995 and for countries to submit a list of vessels fishing for northern albacore. In 2003, ICCAT recommended a TAC of 34,500 mt ww for 2004, 2005, and 2006, of which the United States is allocated 607 mt ww per year.

ICCAT began managing southern Albacore when, in 1994, the SCRS found that catches of southern Albacore exceeded MSY. At this time, ICCAT recommended that countries limit the catch to 90 percent of previous levels. In 1996, ICCAT recommended a 22,000 mt ww quota for all countries fishing below 5º N latitude with the goal of achieving MSY by 2005. In 1998, this TAC was increased to 28,200 mt ww. In 2003, SCRS determined that southern albacore is not overexploited at current fishing levels. Thus, SCRS recommended that the TAC be 29,200 mt ww.

Yellowfin Tuna

Since the early 1970s, ICCAT has expressed concern over the high proportion of juvenile yellowfin tuna that are landed. In 1972, ICCAT passed a recommendation that prohibited the landing of yellowfin tuna less than 3.2 kg (7 lb). This recommendation also included an allowed 15 percent tolerance level on this minimum size. In 1995, an estimated 50 percent by number of yellowfin tuna landed were less than the minimum size. As in the bigeye tuna fisheries, these high catches of juveniles are largely a result of the use of FADs.

Atlantic yellowfin tuna landings reached a record high in 1990, primarily due to increased landings in the east Atlantic. Since 1990, catches across the Atlantic have declined somewhat and then remained stable. In 1993, ICCAT recommended that there be no increase in the level of effective fishing effort over 1992 levels.

Skipjack Tuna

The stock structure of Atlantic skipjack tuna is uncertain; separate management units are maintained in the eastern and western Atlantic. Skipjack tuna fisheries have changed significantly since 1991, with the introduction of fishing on floating objects and the expansion of the purse seine fishery towards the western Atlantic and closer to the equator. SCRS has noted that additional research on skipjack tuna is needed. At this time, there are no ICCAT recommendations or resolutions specific to skipjack tunas.

All Tunas

In April 1999, NMFS published the Final Fishery Management Plan for Atlantic Tunas, Swordfish, and Sharks (1999 FMP). This was the first FMP for Atlantic tunas. Some of the specific tunas management measures included:

- Prohibition of pelagic driftnets for tunas;
- Implementation of the BFT ICCAT Rebuilding Program;
- Establishment of category-specific percent BFT quota allocations;
- Implementation of a Cap on the Purse Seine category of 250 mt ww for BFT (later rescinded);
- Time/area closure in mid-Atlantic to reduce bluefin tuna dead discards;
- Establishment of the foundation for developing an international 10-year rebuilding program for bigeye tuna;
- Establishment of a recreational retention limit of three yellowfin tuna per person per day; and
- Establishment a fishing year of June 1 to the following May 31.

1.1.1.2 Pre-1999 Atlantic Swordfish Fishery and Management

Unless otherwise specified, the following paragraphs regarding the early history of the swordfish fishery summarize information found in the Source Document to the 1985 Atlantic Swordfish Fishery Management Plan (SAFMC, 1985a). The summary of more recent history is a combination of information from the 1999 Fishery Management Plan for Atlantic Tunas, Swordfish, and Sharks and various ICCAT recommendations.

The recreational fishery for swordfish has existed since the 1920s when the fish were taken mainly by handline trailing a baited hook or occasionally by rod and reel or harpoon. This early fishery was located from Massachusetts to New York and, because it relied on locating the fish and enticing it to strike, occurred mainly during the day. Occasionally, an angler fishing for billfish in the mid-Atlantic Bight would catch a swordfish.

In the 1970s, a recreational rod and reel fishery developed in Florida. This fishery borrowed techniques from longline fishermen and drifted the bait below the surface at night. Prior to the development of this fishery, fewer than 2,000 swordfish were estimated caught by all recreational fishermen over time in aggregate. In 1976, approximately 25-30 swordfish were taken off of Florida by rod and reel. By 1977, approximately 400 to 500 swordfish were taken. In 1978, swordfish tournaments were held in Florida, South Carolina, and New Jersey (the first

ones ever for South Carolina and New Jersey) using this new technique. Due to a loss of interest by anglers and a relatively poor fishing year in 1979, there was a decrease in recreational effort in the early 1980s. In 1981 and 1982, only 86 and 53 swordfish were reported captured.

The commercial fishery began as a harpoon fishery between New York and Canada. In the 1960s, longline gear was introduced. This new gear expanded the range of the fishery down to the Gulf of Mexico and dramatically increased the amount of fish caught from approximately 2,800 mt ww in 1960 to 8,800 mt ww in 1963. Landings stabilized in the 1970s at around 5,000 mt ww.

In 1971, the U.S. Food and Drug Administration prohibited the sale of swordfish with more than 0.5 parts per million (ppm) tissue mercury content, leading to decreased landings of swordfish worldwide. In 1978, the permissible level of mercury was raised to 1.0 ppm, which rejuvenated the commercial fishery and landings increased as a result.

In the early years, there were essentially four primary components to the commercial swordfish fleet. There were approximately 25 vessels that used harpoons and spotter aircraft to catch swordfish in northern waters during the summer months. These vessels also participated in other fisheries because of the seasonal nature of the fishery. A mobile New England pelagic longline vessel component was comprised of vessels greater than 50 feet in length, and fished the Florida Straits primarily in winter and spring. Florida longline vessels, approximately 35-50 feet in length, fished mainly between Miami and Cape Canaveral and on the west coast of Florida. There were also Cuban-American vessels, usually between 25 to 40 feet in length, which fished between Key West and Miami. The harpoon fishery usually took female swordfish greater than 200 lb. The longline fleet usually took a mixture of male and female fish weighing between 10 and 300 lb.

By the early 1980s, the early styles of longline gear had been replaced by monofilament style gear. Additionally, the components of the fishery had changed. The larger New England vessels were still highly mobile and were now fishing from the Gulf of Mexico to the Florida Keys. The smaller Florida vessels became more mobile and began expanding into the Carolinas and the mid-Atlantic area. Smaller vessels began to operate up and down the coast and even ventured into the edge of the Grand Banks. Many of these fishermen were either part-time swordfish fishermen who supplemented their income with charterboat fishing or full-time commercial fishermen who also fished for snappers, groupers, tilefish, and tunas.

From the late 1970s until the Atlantic swordfish FMP was approved in 1985, Federal management of swordfish was accomplished through the Preliminary Fishery Management Plan for Atlantic Billfishes and Sharks. This Preliminary FMP (43 FR 3818, January 27, 1978) was prepared by the Department of Commerce and established a number of requirements for foreign vessels fishing within the Atlantic fishery conservation zone (see section 1.1.2 for additional detail on the Preliminary FMP). Starting in June 1984, all vessels intending to catch swordfish by methods other than rod and reel were required to obtain a permit from NMFS Southeast Regional Office. By January 1985, 340 permit applications had been received (SAFMC, 1985b).

The Atlantic Swordfish FMP (February 1985) was prepared by the South Atlantic Fishery Management Council (SAFMC) in cooperation with the Caribbean Fishery Management Council (CFMC), the Gulf of Mexico Fishery Management Council (GMFMC), the Mid-Atlantic Fishery Management Council (MAFMC), and the New England Fishery Management Council (NEFMC). The final rule implementing the FMP published on August 22, 1985 (50 FR 33952; correction notice 50 FR 35563, September 3, 1985). This plan separated the swordfish fishery from the billfish fishery because, by this time, virtually all swordfish were taken commercially with longline or harpoon gear, while the majority of billfish were taken recreationally with rod and reel. However, it should be noted that there was a rapidly expanding market for marlin with increasing commercial landings from the late 1970s until the implementation of the Atlantic Billfish Fishery Management Plan in 1988. In the mid-1980s, Atlantic swordfish were considered to be in or near a state of growth overfishing.[2] The plan specified the following five management objectives (SAFMC, 1985b):

1. Maintain high landings in the form of the larger fish that are preferred in the market by controlling (reducing) the harvest of smaller swordfish.
2. Prevent or reduce growth overfishing to create a buffer against possible recruitment overfishing. This was to be done by maintaining a sufficient number of larger fish by controlling the harvest of smaller fish.
3. Obtain scientific information to continually monitor and refine the management of the swordfish fishery by an onboard technician program on a sample number of commercial boats.
4. Monitor and mitigate user group conflicts using the onboard technician program.
5. Minimize the impacts of foreign fishing on the domestic U.S. swordfish fishery by minimizing the swordfish bycatch of foreign longliners and squid trawls consistent with the requirement to allow opportunities to harvest tuna or catch squid under a Governing International Fisheries Agreement.

Some of the management measures implemented in the Swordfish FMP were: variable season closures to control landings of small swordfish; requiring all commercially-caught swordfish to be landed whole or as carcasses; gear restrictions for closed areas; restrictions to foreign fishing for tuna longliners and squid trawlers; commercial permit requirement; observer or technician requirements; and reporting requirements for vessels in Puerto Rico or the U.S. Virgin Islands. In September 1986, NMFS published a notice stating that the variable season closures would not be implemented (51 FR 31151, September 2, 1986). In August 1990, a final rule published requiring mandatory dealer reporting (55 FR 35643, August 31, 1990).

In November 1990, ICCAT adopted its first Atlantic swordfish recommendation. This recommendation required members to reduce fishing mortality on fish weighing more than 25 kg (55 lb) by 15 percent from 1988 fishing levels and to prohibit the landing of swordfish less than 25 kg with a 15 percent tolerance level. NMFS implemented this recommendation with an emergency rule (56 FR 26934, June 12, 1991) and later a final rule (56 FR 65007; December 13, 1991).

2 Growth overfishing occurs when excessive numbers of small fish are harvested from a stock, thereby preventing growth to the size at which the maximum yield-per-recruit would be obtained from the stock.

At its 1994 meeting, ICCAT established specific TAC levels for nations fishing for both North and South Atlantic swordfish stocks (the United States was allocated 3,970 mt ww and 3,500 mt ww for 1995 and 1996, respectively). At the 1995 meeting, ICCAT adopted recommendations that allowed nations to maintain the existing minimum size for swordfish with a 15 percent tolerance of smaller fish or alternatively to abide by a smaller minimum size (119 cm or equivalent weight) with no tolerance. ICCAT also adjusted the percentages each country received of the total allowable catch levels for North Atlantic swordfish, and established measures to account for over- and underharvests. Under the 1995 recommendation, the United States receives 29 percent of the available total allowable quota. From 1995 to 1999, NMFS modified the existing U.S. quotas for Atlantic swordfish based on these recommendations and a 1996 recommendation that established the TAC at 11,300, 11,000, and 10,700 mt ww in 1997, 1998, and 1999, respectively (the United States' allocation was 3,277, 3,190, and 3,103 mt ww in 1997, 1998, and 1999, respectively).

In 1999, NMFS implemented a number of regulations that affected swordfish fishermen, including a prohibition on the use of driftnets in the swordfish fishery, and regulations to aid in tracking swordfish trade including dealer permitting and reporting for all swordfish importers, a documentation scheme that indicated the country of origin and flag of the vessel, and a prohibition on importing swordfish less than the minimum size. These regulations were codified in the first quarter of 1999. In April 1999, NMFS published the 1999 FMP. This FMP replaced the 1985 Swordfish FMP that had been drafted by the Fishery Management Councils. The 1999 FMP maintained a number of the management measures from the previous FMP including reporting requirements, annual quotas, authorized gear, and the minimum size. However, the 1999 FMP also called for the United States to negotiate an international rebuilding plan, required that recreational landings be counted against the U.S. portion of the ICCAT-established TAC, and implemented a limited access program for commercial vessel permits.

In November 1999, ICCAT established a 10-year rebuilding program for Atlantic swordfish. This rebuilding program reduced the North Atlantic TAC (10,600, 10,500, and 10,400 mt ww for the years 2000, 2001 and 2002, respectively; 2951 mt ww for the United States in all years), established a dead discard allowance (400 , 300, and 200 mt ww in 2000, 2001, and 2002, respectively; 80 percent to the United States; phased out by 2004; the TAC minus the allowance for dead discards is the amount that could be retained) , restated the need for data reporting, and maintained the existing minimum size limits. In 2002, noting the improvement on the stock, ICCAT increased the overall TAC slightly while simultaneously reemphasizing the need to protect juvenile swordfish.

1.1.1.3 Pre-1999 Atlantic Shark Fisheries and Management

Unless otherwise specified, the main sources of the following history are the 1993 Atlantic Shark Fishery Management Plan and the 1999 FMP for Atlantic Tunas, Swordfish, and Sharks.

Recreational fishing for Atlantic sharks occurs in Federal and state waters from New England to the Gulf of Mexico and Caribbean Sea. In the past, sharks were often called "the poor man's marlin." Recreational shark fishing with rod and reel is now a popular sport at all social and economic levels, largely because of accessibility to the resource. Sharks can be

caught virtually anywhere in salt water, with even large specimens available in the nearshore area to surf anglers or small boaters. Most recreational shark fishing takes place from small to medium-size vessels. Mako, white, and large pelagic sharks are generally accessible only to those aboard ocean-going vessels. Recreational shark fisheries are exploited primarily by private vessels and charter/headboats although there are some shore-based fishermen active in the Florida Keys.

The commercial shark fishery has been sporadic in nature. In the early 1900s, a Pacific shark fishery supplied limited demands for fresh shark fillets and fish meal as well as a more substantial market for dried fins of soupfin sharks. In 1937, the price of soupfin shark liver skyrocketed when it was discovered to be the richest source of vitamin A available in commercial quantities. A shark fishery in the Caribbean Sea, off the coast of Florida, and in the Gulf of Mexico developed in response to this demand (Wagner, 1966). At this time, shark fishing gear included gillnets, hook and line, anchored bottom longlines, floating longlines, and benthic lines for deepwater fishing. These gear types are slightly different than the gears used today and are fully described in Wagner (1966). By 1950, the availability of synthetic vitamin A caused most shark fisheries to be abandoned (Wagner, 1966).

A small fishery for porbeagle existed in the early 1960s off the U.S. Atlantic coast involving Norwegian fishermen. Between the World Wars, Norwegians and Danes had pioneered fishing for porbeagles in the North Sea and in the region of the Shetland, Orkney, and the Faroe Islands. In the late 1940s, these fishermen caught from 1,360 to 2,720 mt yearly, with lesser amounts in the early 1950s (Rae, 1962). The subsequent scarcity of porbeagles in their fishing area forced the Norwegians to explore other grounds, and around 1960, they began fishing the Newfoundland Banks and the waters east of New York. Between 1961 and 1964, their catch increased from 1,800 to 9,300 mt, then declined to 200 mt (Casey *et al*., 1978).

The U.S. Atlantic shark fishery developed rapidly in the late 1970s due to increased demand for their meat, fins, and cartilage. At the time, sharks were perceived to be underutilized as a fishery resource. The high commercial value of shark fins led to the controversial practice of finning, or removing the valuable fins from sharks and discarding the carcass. Growing demand for shark products encouraged expansion of the commercial fishery throughout the late 1970s and the 1980s. Tuna and swordfish vessels began to retain a greater proportion of their shark incidental catch, and some directed fishery effort expanded as well. The Secretary of Commerce published the Preliminary Fishery Management Plan for Atlantic Billfish and Sharks in 1978, which noted, among other things, the need for international management regarding sharks. As catches accelerated through the 1980s, shark stocks suffered a precipitous decline. Peak commercial landings of large coastal and pelagic sharks were reported in 1989.

In 1989, the five Atlantic Fishery Management Councils asked the Secretary of Commerce to develop a Shark FMP. The Councils were concerned about the late maturity and low fecundity of sharks, the increase in fishing mortality, and the possibility of the resource being overfished. The Councils requested that the FMP cap commercial fishing effort, establish a recreational bag limit, prohibit "finning," and begin a data collection system.

In 1993, the Secretary of Commerce, through NMFS, implemented the FMP for Sharks of the Atlantic Ocean. The management measures in the 1993 FMP included:

- Establishing a fishery management unit (FMU) consisting of 39 frequently caught species of Atlantic sharks, separated into three groups for assessment and regulatory purposes (Large Coastal Sharks (LCS), Small Coastal Sharks (SCS), and pelagic sharks);
- Establishing calendar year commercial quotas for the LCS and pelagic sharks and dividing the annual quota into two equal half-year quotas that apply to the following two fishing periods--January 1 through June 30 and July 1 through December 31;
- Establishing a recreational trip limit of four sharks per vessel for LCS or pelagic shark species groups and a daily bag limit of five sharks per person for sharks in the SCS species group;
- Requiring that all sharks not taken as part of a commercial or recreational fishery be released uninjured;
- Establishing a framework procedure for adjusting commercial quotas, recreational bag limits, species size limits, management unit, fishing year, species groups, estimates of maximum sustainable yield, and permitting and reporting requirements;
- Prohibiting finning by requiring that the ratio between wet fins/dressed carcass weight not exceed five percent;
- Prohibiting the sale by recreational fishermen of sharks or shark products caught in the Economic Exclusive Zone (EEZ);
- Requiring annual commercial permits for fishermen who harvest and sell shark (meat products and fins);
- Establishing a permit eligibility requirement that the owner or operator (including charter vessel and headboat owners/operators who intend to sell their catch) must show proof that at least 50 percent of earned income has been derived from the sale of the fish or fish products or charter vessel and headboat operations or at least $20,000 from the sale of fish during one of three years preceding the permit request;
- Requiring trip reports by permitted fishermen and persons conducting shark tournaments and requiring fishermen to provide information to NMFS under the Trip Interview Program; and,
- Requiring NMFS observers on selected shark fishing vessels to document mortality of marine mammals and endangered species.

At that time, NMFS identified LCS as overfished and pelagic and SCS as fully fished. The quotas were 2,436 mt dressed weight (dw) for LCS and 580 mt dw for pelagic sharks. No quota was established for SCS. Under the rebuilding plan established in the 1993 FMP, the LCS quota was expected to increase every year up to the maximum sustainable yield estimated in the 1992 stock assessment, which was 3,787 mt dw.

A number of difficulties arose in the initial year of implementation of the Shark FMP that resulted in a short season and low ex-vessel prices. To address these problems, a commercial trip limit of 4,000 lb. for permitted vessels for LCS was implemented on December 28, 1993 (58 FR 68556), and a control date for the Atlantic shark fishery was established on February 22, 1994 (59 FR 8457). A final rule to implement additional measures authorized by the FMP published on October 18, 1994 (59 FR 52453), which:

- Clarified operation of vessels with a Federal commercial permit;
- Established the fishing year;
- Consolidated the regulations for drift gillnets;
- Required dealers to obtain a permit to purchase sharks;
- Required dealer reports;
- Established recreational bag limits;
- Established quotas for commercial landings; and
- Provided for commercial fishery closures when quotas were reached.

In 1994, under the rebuilding plan implemented in the 1993 Shark FMP, the LCS quota was increased to 2,570 mt dw. Additionally, a new stock assessment was completed in March 1994 that indicated rebuilding LCS could take as long as 30 years and suggested a more cautious approach for pelagic sharks and SCS. A final rule that capped quotas for LCS and pelagic sharks at the 1994 levels was published on May 2, 1995 (60 FR 21468).

In June 1996, NMFS convened another stock assessment to examine the status of LCS stocks. The 1996 stock assessment found no clear evidence that LCS stocks were rebuilding and concluded that "[a]nalyses indicate that recovery is more likely to occur with reductions in effective fishing mortality rate of 50 [percent] or more." In response to these results, in 1997, NMFS reduced the LCS commercial quota by 50 percent to 1,285 mt dw and the recreational retention limit to two LCS, SCS, and pelagic sharks combined per trip with an additional allowance of two Atlantic sharpnose sharks per person per trip (62 FR 16648, April 2, 1997). In this same rule, NMFS established an annual commercial quota for SCS of 1,760 mt dw and prohibited possession of five species. As a result of litigation, NMFS prepared additional economic analyses on the 1997 LCS quotas and was allowed to maintain those quotas during resolution of the case.

In June 1998, NMFS held another LCS stock assessment. The 1998 stock assessment found that LCS were overfished and would not rebuild under 1997 harvest levels. Based in part on the results of the 1998 stock assessment, in April 1999, NMFS published the 1999 FMP which included numerous measures to rebuild or prevent overfishing of Atlantic sharks in commercial and recreational fisheries. The 1999 FMP replaced the 1993 Atlantic Shark FMP. Management measures related to sharks that changed in the 1999 FMP included:

- Reducing commercial LCS and SCS quotas;
- Establishing ridgeback and non-ridgeback categories of LCS;
- Implementing a commercial minimum size for ridgeback LCS;
- Establishing blue shark, porbeagle shark, and other pelagic shark subgroups of the pelagic sharks and establishing a commercial quota for each subgroup;
- Reducing recreational retention limits for all sharks;
- Establishing a recreational minimum size for all sharks except Atlantic sharpnose;
- Expanding the list of prohibited shark species to 19 species;
- Implementing limited access in commercial fisheries;
- Establishing a shark public display quota;

- Establishing new procedures for counting dead discards and state landings of sharks after Federal fishing season closures against Federal quotas; and
- Establishing season-specific over- and underharvest adjustment procedures.

The implementing regulations were published on May 28, 1999 (64 FR 29090). However, in 1999, a court enjoined implementation of the 1999 regulations, as they related to the ongoing litigation on the 1997 quotas. Further history of this litigation and shark management is provided under Section 1.1.1.7 below. A year later, on June 12, 2000, the court issued an order clarifying that NMFS could proceed with implementation and enforcement of the 1999 prohibited species provisions (64 FR 29090, May 28, 1999).

1.1.1.4 1999 Fishery Management Plan for Atlantic Tunas, Swordfish, & Sharks

As described, the 1999 FMP replaced the existing Atlantic Shark and Atlantic Swordfish FMPs, and established the first FMP for Atlantic tunas. Before the 1999 FMP, Atlantic tunas were managed only under the ATCA; after the 1999 FMP, Atlantic tunas were managed under both the Magnuson-Stevens Act and ATCA.

NMFS began working on the 1999 FMP shortly after the U.S. Congress reauthorized the Magnuson-Stevens Act in 1996. The 1996 Magnuson-Stevens Act amendments added new fishery management requirements including requiring NMFS to halt overfishing; rebuild overfished fisheries; minimize bycatch and bycatch mortality, to the extent practicable; and identify and protect essential fish habitat (EFH). These provisions were coupled with the recognition that the management of HMS requires international cooperation and that rebuilding programs must reflect traditional participation in the fisheries by U.S. fishermen, relative to foreign fleets.

Development of the 1999 HMS FMP began in September 1997 with the formation of the HMS Advisory Panel (AP). The HMS AP was established under a requirement of the Magnuson-Stevens Act, and is composed of representatives of the commercial and recreational fishing communities, conservation and academic organizations, the five regional fishery management councils involved in Atlantic HMS management, the Atlantic and Gulf coastal states, and the U.S. ICCAT Advisory Committee. The HMS AP met seven times during development of the 1999 FMP, including once during the public comment period on the draft FMP, and provided extensive comment and advice to NMFS.

In October 1997, NMFS prepared and distributed a scoping document to serve as the starting point for consideration of issues for the 1999 FMP. The scoping document described major issues in the fishery, legal requirements for management, and potential management measures that could be considered for adoption in the FMP and solicited public comment on these issues. The scoping document was the subject of 21 public hearings that were held in October and November 1997 throughout the management area. The scoping meetings allowed NMFS to gather information from participants in the fisheries, and provided a mechanism by which the public could provide input to NMFS early in the FMP development process.

In October 1998, NMFS announced in the Federal Register the availability of the draft FMP. The comment period on the draft FMP lasted from October 25, 1998, to March 12, 1999. The

proposed rule that accompanied the draft FMP was published in the Federal Register on January 20, 1999. The supplemental part that related to the bluefin tuna rebuilding program published in the Federal Register on February 25, 1999. The comment period on the proposed rule and its supplement also went until March 12, 1999. Subsequent to the release of the proposed rule, NMFS held 27 public hearings in communities from Texas to Maine and the Caribbean. During the comment period, NMFS received several thousand comments from commercial and recreational fishermen, scientists, conservationists, and concerned individuals. An HMS AP meeting was held toward the end of the comment period to allow HMS AP members to view most of the comments NMFS had received on the draft FMP and accompanying proposed rule.

The 1999 FMP incorporated all existing management measures for Atlantic tuna and north Atlantic swordfish that have been issued previously under the authority of the ATCA. It also incorporated all existing management measures for north Atlantic swordfish and Atlantic sharks that had previously been issued under the authority of the Magnuson-Stevens Act. Southern Atlantic swordfish and southern Atlantic albacore tuna continue to be managed only under ATCA. In November 2004, ICCAT adopted its first recommendation for Atlantic sharks.

Some of the non-species specific management measures of the 1999 FMP included vessel monitoring systems for all pelagic longline vessels; gear and vessel marking requirements; moving pelagic longline gear after an interaction with a protected species; a requirement for charter/headboats to obtain an annual vessel permit; tournament registration for all HMS tournaments; time limits on completing a vessel logbook; and expanded observer coverage. The 1999 FMP also established the threshold levels to determine if a stock is overfished, if overfishing is occurring, or if the stock is rebuilt. Finally, the 1999 FMP identified essential fish habitat (EFH) for all Atlantic tunas, swordfish, and sharks. As part of the 1999 FMP, the regulations for all Atlantic HMS, including billfish, were consolidated into one part of the Code of Federal Regulations, 50 CFR part 635. Before then, each species had its own part. This often led to confusion and, in some cases, conflicting regulations.

1.1.1.5 Post 1999 FMP

After issuance of the 1999 FMP, a number of constituents (environmental, commercial fishermen, and recreational fishermen) sued the NMFS (the Agency) over aspects of the plan, including the BFT rebuilding program, the use of vessel monitoring systems in the pelagic longline fleet, the time/area closure for the pelagic longline fleet, the pelagic shark quotas, the shark and yellowfin tuna recreational retention limits, the large and small coastal shark quotas, and the bluefin tuna purse seine allocation. The Agency received favorable court rulings, upholding its actions, in most of these cases, and resolved some matters via settlement agreements. All of the briefings and court orders are a matter of the public record.

1.1.1.6 Regulatory Amendments Relating to the Pelagic Longline Fishery

In the 1999 FMP, NMFS committed to implement a closed area that would effectively protect small swordfish. NMFS began to work towards this goal shortly after the publication of the 1999 FMP. After the publication of the 1999 FMP, NMFS was sued by environmentalists who felt, among other things, that the Agency had not done enough to reduce bycatch in HMS fisheries. As a result, NMFS expanded the goal of the rule to reduce all bycatch and bycatch

mortality, to the extent practicable, in the HMS pelagic longline fishery. The following objectives were developed to guide agency action for this goal:

- Maximize the reduction in finfish bycatch;
- Minimize the reduction in the target catch of swordfish and other species;
- Consider impacts on the incidental catch of other species to minimize or reduce incidental catch levels; and
- Optimize survival of bycatch and incidental catch species.

NMFS published the final rule implementing the first regulatory amendment to the 1999 FMP on August 1, 2000 (65 FR 47214), which closed three large areas (DeSoto Canyon, Florida East Coast, and Charleston Bump) and prohibited the use of live bait in the Gulf of Mexico

During the course of this rulemaking, the pelagic longline fleet exceeded the incidental take statement for sea turtles established during the Endangered Species Act (ESA) Section 7 Consultation for the 1999 FMP. That, combined with new information on sea turtles and the uncertainty regarding what the closures would mean for sea turtles, resulted in a new Biological Opinion (BiOp) (June 30, 2000) that concluded that the continuation of the pelagic longline fishery would jeopardize the continued existence of leatherback and loggerhead sea turtles. As a result of the jeopardy finding, NMFS needed to implement certain measures to reduce sea turtle bycatch in the pelagic longline fishery.

Shortly after this conclusion, NMFS decided that further analyses of observer data and additional population modeling of loggerhead sea turtles were needed to determine more precisely the impact of the pelagic longline fishery on turtles. Because of this, NMFS reinitiated consultation on the HMS fisheries on September 7, 2000. In the interim, NMFS implemented emergency regulations, based on historical data on sea turtle interactions, to reduce the short-term effects of the pelagic longline fishery on sea turtles. An emergency rule that closed a portion of the Northeast Distant Statistical Area (NED) and required dipnets and line clippers to be carried and used on pelagic longline vessels to aid in the release of any captured sea turtle published on October 13, 2000 (65 FR 60889).

NMFS issued a BiOp on June 8, 2001 (revised on June 14, 2001), that again concluded that the continued operation of the Atlantic pelagic longline fishery is likely to jeopardize the continued existence of loggerhead and leatherback sea turtles. Accordingly, the BiOp provided a reasonable and prudent alternative (RPA) to avoid jeopardy. This BiOp concluded no jeopardy for other HMS fisheries, but did require additional management measures to reduce sea turtle takes in these fisheries. The RPA included the following elements: closing the NED area effective July 15, 2001, and conducting a research experiment in this area to reduce sea turtle bycatch and bycatch mortality in the PLL fishery; requiring gangions to be placed no closer than twice the average gangion length from the suspending floatlines effective August 1, 2001; requiring gangion lengths to be 110 percent of the length of the floatline in sets of 100 meters or less in depth effective August 1, 2001; and, requiring the use of corrodible hooks effective August 1, 2001. Also, the BiOp included a term and condition for the incidental take statement that required NMFS to issue a regulation requiring that all vessels permitted for HMS fisheries, commercial and recreational, post the sea turtle guidelines for safe handling and release

following longline interactions inside the wheelhouse by September 15, 2001. The requirement that all vessels permitted for HMS fisheries post sea turtle handling and release guidelines was modified to specify only bottom and pelagic longline vessels by an August 31, 2001, memorandum from the Office of Protected Resources.

On July 13, 2001, NMFS published an emergency rule (66 FR 36711) to implement several of the BiOp requirements. NMFS published an amendment to the emergency rule to incorporate the change in requirement for the handling and release guidelines that was published in the Federal Register on September 24, 2001 (66 FR 48812).

On July 9, 2002, NMFS published the final rule (67 FR 45393) implementing measures required under the June 14, 2001, BiOp on Atlantic HMS to reduce the incidental catch and post-release mortality of sea turtles and other protected species in HMS Fisheries, with the exception of the gangion placement measure. The rule implemented the NED closure, required the length of any gangion to be 10 percent longer than the length of any floatline if the total length of any gangion plus the total length of any floatline is less than 100 meters, and prohibited vessels from having hooks on board other than corrodible, non-stainless steel hooks. In the HMS shark gillnet fishery, both the observer and vessel operator must look for whales, the vessel operator must contact NMFS if a listed whale is taken and shark gillnet fishermen must conduct net checks every 0.5 to 2 hours to look for and remove any sea turtles or marine mammals from their gear. The final rule also required all HMS bottom and pelagic longline vessels to post sea turtle handling and release guidelines in the wheelhouse. NMFS did not implement the gangion placement requirement because it appeared to result in an unchanged number of interactions with loggerhead sea turtles and an apparent increase in interactions with leatherback sea turtles.

In 2001, 2002, and 2003, NMFS in conjunction with the fishing industry conducted an experiment in the NED to see if certain gear restrictions or requirements could reduce sea turtle captures and mortality. The results of this experiment indicated that certain gear types could reduce sea turtle interactions and mortality and that certain methods of handling and releasing turtles could further reduce mortality. For example, using 16/0 non-offset or 18/0 offset hooks of at least 10 degrees could reduce leatherback and loggerhead sea turtle interactions by approximately 50 and 0 percent, respectively. Using 18/0 hooks flat or offset up to 10 degrees could reduce leatherback and loggerhead sea turtle interactions by approximately 50 and 65 percent, respectively. NMFS is currently, in conjunction with the fishing industry, conducting additional experiments to verify these results throughout the fishery. Additionally, NMFS is working to export these results to other countries to reduce sea turtle interactions and mortality throughout the Atlantic and Pacific Oceans.

On November 28, 2003, based on the conclusion of this experiment and based on preliminary data that indicated that the Atlantic pelagic longline fishery may have exceeded the ITS in the June 14, 2001 BiOp, NMFS published a Notice of Intent (NOI) to prepare a Supplemental Environmental Impact Statement (SEIS) to assess the potential effects on the human environment of proposed alternatives and actions under a proposed rule to reduce sea turtle bycatch (68 FR 66783).

In January 2004, NMFS reinitiated consultation after receiving data that indicated the Atlantic pelagic longline fishery exceeded the incidental take statement for leatherback sea turtles in 2001 - 2002 and for loggerhead sea turtles in 2002. In the spring of 2004, NMFS released a proposed rule that would require fishermen to use certain hook and bait types and take other measures to reduce sea turtle takes and mortality. The resulting June 1, 2004, BiOp considered these measures and concluded that the pelagic longline fishery was not likely to jeopardize the continued existence of loggerhead sea turtles, but was still likely to jeopardize the continued existence of leatherback sea turtles. NMFS published a final rule implementing many gear and bait restrictions and requiring certain handling and release tools and methods on July 6, 2004 (69 FR 40734). NMFS also published an Advance Notice of Proposed Rulemaking to receive comments on how to further reduce sea turtle mortality (69 FR 49858, August 12, 2004), held several workshops to demonstrate sea turtle release equipment and techniques (69 FR 44513), and released revised sea turtle handling and release placards, protocols, and a video. The placards, protocols, and video are available in English, Spanish, and Vietnamese. NMFS continues to monitor the sea turtle takes in the pelagic longline fishery and may need to take further action if sea turtle takes do not remain below the levels specified in the June 2004 BiOp.

1.1.1.7 Amendment 1 to the Fishery Management Plan for Atlantic Tunas, Swordfish, and Sharks

As noted under Section 1.1.1.3, in 1999, a court enjoined the Agency from implementing many of the shark-specific regulations in the 1999 FMP. In 2000, the injunction was lifted when a settlement agreement was entered to resolve the 1997 and 1999 lawsuits. The settlement agreement required, among other things, an independent (*i.e.*, non-NMFS) review of the 1998 LCS stock assessment. The settlement agreement did not address any regulations affecting the pelagic shark, prohibited species, or recreational shark fisheries. Once the injunction was lifted, on January 1, 2001, the pelagic shark quotas adopted in the 1999 HMS FMP were implemented (66 FR 55). Additionally, on March 6, 2001, NMFS published an emergency rule implementing the settlement agreement (66 FR 13441). This emergency rule expired on September 4, 2001, and established the LCS and SCS commercial quotas at 1997 levels.

In late 2001, the Agency received the results of the peer review of the 1998 LCS stock assessment. These peer reviews found that the 1998 LCS stock assessment was not the best available science for LCS. Taking into consideration the settlement agreement, the results of the peer reviews of the 1998 LCS stock assessment, current catch rates, and the best available scientific information (not including the 1998 stock assessment projections), NMFS implemented another emergency rule for the 2002 fishing year that suspended certain measures under the 1999 regulations pending completion of new LCS and SCS stock assessments and a peer review of the new LCS stock assessment (66 FR 67118, December 28, 2001; extended 67 FR 37354, May 29, 2002). Specifically, NMFS maintained the 1997 LCS commercial quota (1,285 mt dw), maintained the 1997 SCS commercial quota (1,760 mt dw), suspended the commercial ridgeback LCS minimum size, suspended counting dead discards and state landings after a Federal closure against the quota, and replaced season-specific quota accounting methods with subsequent-season quota accounting methods. That emergency rule expired on December 30, 2002.

On May 8, 2002, NMFS announced the availability of a SCS stock assessment (67 FR 30879). The Mote Marine Laboratory and the University of Florida provided NMFS with another SCS assessment in August 2002. Both of these stock assessments indicate that overfishing is occurring on finetooth sharks while the three other species in the SCS complex (Atlantic sharpnose, bonnethead, and blacknose) are not overfished and overfishing is not occurring. On October 17, 2002, NMFS announced the availability of the 2002 LCS stock assessment and the workshop meeting report (67 FR 64098). The results of this stock assessment indicate that the LCS complex is still overfished and overfishing is occurring. Additionally, the 2002 LCS stock assessment found that sandbar sharks are no longer overfished but that overfishing is still occurring and that blacktip sharks are rebuilt and overfishing is not occurring.

Based on the results of both the 2002 SCS and LCS stock assessments, NMFS implemented an emergency rule to ensure that the commercial management measures in place for the 2003 fishing year were based on the best available science (67 FR 78990, December 27, 2002; extended 68 FR 31987, May 29, 2003). Specifically, the emergency rule implemented the LCS ridgeback/non-ridgeback split, set the LCS and SCS quotas based on the results of stock assessments, suspended the commercial ridgeback LCS minimum size, and allowed both the season-specific quota adjustments and the counting of all mortality measures to go into place.

In December 2003, NMFS implemented the regulations in Amendment 1 to the Fishery Management Plan for Atlantic Tunas, Swordfish, and Sharks (68 FR 74746). These regulations were based on the 2002 small and large coastal shark stock assessments. Some of the measures taken in Amendment 1 included revising the rebuilding timeframe for LCS; re-aggregating the LCS complex; establishing a method of changing the quota based on maximum sustainable yield (MSY); updating some shark EFH identifications; modifying the quotas, seasons, and regions; adjusting the recreational bag limit; establishing criteria to add or remove species to the prohibited shark list; establishing gear restrictions to reduce bycatch and bycatch mortality; establishing a time/area closure off of North Carolina for bottom longline fishermen; and establishing VMS requirements for bottom longline and gillnet fishermen.

1.1.1.8 Other Post-1999 FMP Regulations for Atlantic Tunas, Swordfish, and Sharks

Since the 1999 FMP, there have been a number of other regulatory actions in addition to the rules mentioned above. Below is a short list of some of these actions.

- Removal of the bluefin tuna purse seine category cap: In the 1999 FMP, NMFS finalized an alternative that would have capped the quota for vessels in the purse seine category at 250 mt ww. On November 1, 1999, NMFS published a final rule that removed the purse seine category quota cap (64 FR 58793). In that rule, the purse seine category was given 18.6 percent of the total landings quota available to the United States.
- Change to bluefin tuna incidental category catch limits: In May 2003 (68 FR 32414), NMFS modified the target catch requirements for vessels participating in the Atlantic Tunas Longline category such that pelagic longline vessels would have to land 2,000 lb. of other fish in order to land one bluefin tuna on a trip, 6,000 lb. of other fish in order to land two bluefin tuna on a trip, and 30,000 lb. of other fish to land three bluefin tuna. The rule was designed to reduce the discards of bluefin tuna. This change in the target

catch requirements applies to all fishing areas. This rule also maintained separate quotas for the seasonal fisheries, adjusted the Longline category North/South division line to $31^{0}00'$ N. latitude and adjust the Longline category subquotas to allocate 60 percent to the southern area and 40 percent to the northern area.

- Bluefin tuna amendment: On December 24 , 2003 (68 FR 74504), NMFS published a final rule that changed the opening date of the Purse seine category, established closure dates of the Harpoon and General categories, and set size tolerances of large medium BFT for the Purse seine and Harpoon categories.
- Recreational permits and reporting requirements: On December 18, 2002 (67 FR 77434), NMFS published a final rule requiring all vessel owners fishing recreationally (*i.e.*, no sale) for Atlantic HMS, including billfish, to obtain an Atlantic HMS recreational angling category permit. On January 7, 2003 (68 FR 711), a final rule establishing a mandatory reporting system for all non-tournament recreational landings of Atlantic marlins, sailfish, and swordfish was published. These requirements became effective in March 2003.
- International trade permit: On November 17, 2004, NMFS published a final rule that implements the recommendations of ICCAT and the Inter-American Tropical Tuna Commission (IATTC) for bluefin tuna, swordfish, and bigeye tuna (69 FR 67268). The rule requires all importers and exporters, regardless of ocean basin, of bluefin tuna, swordfish, and bigeye tuna to obtain an HMS International Trade Permit on an annual basis, report imports and exports on species-specific statistical documents and re-export certificates, and submit biweekly activity reports to NMFS. The rule is effective on July 1, 2005.
- Import restrictions: Due to compliance concerns, ICCAT has recommended numerous import restrictions on countries that have not shown that they are complying with ICCAT recommendations. Over the years, the countries and species that have import restrictions placed on them have changed. As of July 2, 2005, bigeye tuna from Bolivia or Georgia will not be allowed to be imported into the United States (May 17, 2005, 70 FR 28218). Additionally, ICCAT established "positive" and "negative" lists. These lists outline all the vessels that have permits and do not conduct IUU fishing (positive list) and those vessels that are not permitted and have conducted IUU fishing in the past (negative list). Fish that were caught on vessels that are not on the positive list or that are on the negative list cannot be imported into the United States (December 6, 2004, 69 FR 70396).
- Quota adjustments: Based on various ICCAT recommendations, NMFS has adjusted the quotas for North and South Atlantic swordfish (69 FR 68090, November 23, 2004) and Atlantic bluefin tuna.

Other regulatory actions that have been taken including opening and closing of fisheries and adjustments to quota allocations. All of these actions are not listed here but can be found by searching the Federal Register webpage at http://www.gpoaccess.gov/fr/index.html or by reviewing the annual HMS SAFE reports (http://www.nmfs.noaa.gov/sfa/hms).

1.1.2 History of Atlantic Billfish Fishery Management

Atlantic blue marlin (*Makaira nigricans*), white marlin (*Tetrapturus albidus*), sailfish (*Istiophorus platypterus*), and longbill spearfish *(Tetrapturus pfluegeri)* resources present a challenge for fisheries managers in the United States and international fisheries management bodies, such as ICCAT, given their distributional and behavioral patterns. Amplifying billfish management challenges is the incidental nature of most billfish interactions with commercial fishing operations throughout the Atlantic, which creates additional management complexities relative to managing a directed fishery. Atlantic billfish management strategies have been and continue to be guided by international and domestic considerations and mechanisms since the 1970s.

1.1.2.1 Preliminary Fishery Management Plan (PMP) for Atlantic Billfish & Sharks

Domestic management of Atlantic billfish resources has been developed, modified, and implemented in three primary stages and through a series of other rulemakings. In January 1978, NMFS published the Preliminary Fishery Management Plan (PMP) for Atlantic Billfish and Sharks (43 FR 3818), which was supported by an EIS (42 FR 57716). This PMP was a Secretarial effort. The management measures contained in the plan were designed to:

1. minimize conflict between domestic and foreign users of billfish and shark resources;
2. encourage development of an international management regime; and
3. maintain availability of billfishes and sharks to the expanding U.S. fisheries.

Primary management measures in the Atlantic Billfish and Shark PMP included:

- Mandatory data reporting requirements for foreign vessels;
- A prohibition on the foreign commercial retention of all billfishes caught within the Fishery Conservation Zone (FCZ) of the United States and stipulated release in a manner that will maximize the probability of survival;
- A hard cap on the catch of sharks by foreign vessels, which when achieved would prohibit further landings of sharks by foreign vessels;
- Permit requirements for foreign vessels to fish in the FCZ of the United States;
- Radio checks by foreign vessels upon entering and leaving the FCZ;
- Boarding and inspection privileges for U.S. observers; and
- Prohibition on intentional discarding of fishing gears by foreign fishing vessels within the FCZ that may pose environmental or navigational hazards.

1.1.2.2 The Fishery Management Plan for the Atlantic Billfishes

Building upon the PMP for Atlantic Billfish and Sharks was the Fishery Management Plan for the Atlantic Billfishes (53 FR 21501). This plan was jointly developed by five Atlantic regional councils (Caribbean, Gulf, South Atlantic, Mid-Atlantic, New England) and implemented in October 1988 (53 FR 37765). The 1988 FMP defined the Atlantic billfish management unit to include sailfish from the western Atlantic Ocean, white marlin and blue marlin from the North Atlantic Ocean, and longbill spearfish from the entire Atlantic Ocean;

described objectives for the Atlantic billfish fishery; and established management measures to achieve those objectives. The objectives identified in the Billfish FMP were to:

1. Maintain the highest availability of billfishes to the U.S. recreational fishery by implementing conservation measures that will reduce fishing mortality;
2. Optimize the social and economic benefits to the nation by reserving the billfish resource for its traditional use, which in the continental United States is almost entirely a recreational fishery; and
3. Increase understanding of the condition of billfish stocks and the billfish fishery.

The primary management measures adopted to achieve the stated objectives of the 1988 Billfish FMP included:

- Defining OY in qualitative terms;
- A prohibition on the sale of Atlantic billfish, with an exemption for small-scale handline (artisanal) fishery in Puerto Rico;
- Establishment of minimum sizes for Atlantic billfish;
- A prohibition on possession of Atlantic billfish by commercial longline and drift net vessels; and
- Establishment of data reporting requirements.

As previously mentioned, passage of the 1996 Magnuson-Stevens Act initiated fundamental changes in U.S. fishery management policy, shifting emphasis to precautionary management strategies. In September 1997, NMFS listed fishery resources considered to be overfished, which included Atlantic blue and white marlin. This action triggered a suite of management requirements, including development of a rebuilding plan for overfished stocks, and reduction in bycatch and bycatch mortality. Further, in 1998, western Atlantic sailfish was added to the list of overfished species. In the international arena, ICCAT made its first-ever binding recommendation for Atlantic blue and white marlin in 1997. ICCAT Recommendation 97 - 09 required landing reductions of at least 25 percent from 1996 levels by the end of 1999. Improvements in data and monitoring were also included in this recommendation.

1.1.2.3 Interim Rules

On March 24, 1998, NMFS published an interim rule (63 FR 14030) under section 305(c) of the Magnuson-Stevens Act, that increased the minimum size limits for Atlantic blue marlin and Atlantic white marlin to 96 inches lower jaw-fork length (LJFL) and 66 inches LJFL, respectively, and required tournament operators to notify NMFS of tournaments involving any Atlantic billfish at least four weeks prior to commencement. NMFS utilized the increases in size limits to immediately reduce overfishing, and to implement the 1997 ICCAT recommendation, as required by the ATCA. NMFS published an extension and amendment of the interim rule on September 29, 1998 (63 FR 51859), that:

- Further increased the minimum size for Atlantic blue marlin to 99 inches LJFL;
- Restated the minimum size for Atlantic white marlin as 66 inches LJFL;
- Established a recreational bag limit of one Atlantic marlin (blue or white marlin) per vessel per trip;

- Granted the Assistant Administrator for Fisheries (AA) the authority to adjust the bag limit, with a three-day notice, including adjustment to a zero bag limit, if necessary to meet international and domestic management objectives; and
- Continued requirements to notify NMFS of tournaments involving any Atlantic billfish at least 4 weeks prior to commencement. NMFS amended the interim rule on November 13, 1998 (63 FR 63421) by removing the adjustable bag limit provision.

Internationally, ICCAT adopted its second binding recommendation regarding billfish in November 1998. ICCAT Recommendation 98-10 built upon the previously discussed ICCAT Recommendation 97-09 by limiting landings of Atlantic blue and white marlin in the year 2000 to no more than levels required to be achieved by the end of 1999.

1.1.2.4 Amendment One to the Atlantic Billfish Fishery Management Plan

In response to Magnuson-Stevens Act requirements, and concurrent with efforts on the interim rule discussed above, NMFS prepared Amendment One to the Atlantic Billfish Fishery Management Plan and published final regulations on May 28, 1999 (64 FR 29090). Amendment One maintained the objectives of the original 1988 Billfish FMP and identified the following additional objectives:

1. Prevent and/or end overfishing of Atlantic billfish and adopt the precautionary approach to fishery management;
2. Rebuild overfished Atlantic billfish stocks, and monitor and control all components of fishing mortality, both directed and incidental, so as to ensure the long term sustainability of the stocks and promote Atlantic-wide stock recovery to the level where MSY can be supported on a continuing basis;
3. Establish a foundation for the adoption of comparable international conservation and management measures, through international entities such as ICCAT, to rebuild overfished fisheries and to promote achievement of optimum yield for these species throughout their range, both within and beyond the EEZ;
4. Minimize, to the extent practicable, release mortality in the directed billfish fishery, and minimize, to the extend practicable, bycatch and discard mortality of billfish on gears used in other fisheries;
5. Better coordinate domestic conservation and management of the fisheries for Atlantic tunas, swordfish, sharks, and billfish, considering the multispecies nature of many highly migratory species (HMS) fisheries, overlapping regional and individual participation, international management concerns, and other relevant factors;
6. Provide the data necessary for assessing the fish stocks and managing the fisheries, including addressing inadequacies in collection and ongoing collection of social, economic, and bycatch data on Atlantic billfish fisheries;
7. Coordinate domestic regulations and ICCAT conservation measures for controlling Atlantic-wide fishing mortality;
8. Consistent with other objectives of the amendment, manage Atlantic billfish fisheries for the continuing OY, so as to provide the greatest overall benefit to the Nation, particularly with respect to recreational opportunities and taking into account the protection of marine ecosystems. Optimum yield is the maximum sustainable yield from the fishery, as reduced by any relevant social, economic, or ecological factors;

9. Minimize adverse social and economic effects on recreational and commercial activities to the extent practicable, consistent with ensuring achievement of the other objectives of this plan, and with all applicable laws;
10. Maximize protection of areas identified as essential fish habitat for Atlantic billfish, particularly for critical life stages; and
11. Promote the live release of Atlantic billfish through active outreach and educational programs.

Primary management measures included:

- Adjustment of minimum size regulations for Atlantic billfish;
- A prohibition on the retention of longbill spearfish;
- Maintenance of prohibitions on commercial possession and retention;
- Allowed removal of the hook from Atlantic billfish;
- A requirement for permits and logbook reporting for charterboats targeting billfish, if selected, as part of an HMS charter/headboat system;
- Implementation of billfish tournament notification requirements;
- Implementation of a June 1 to May 31 fishing year;
- Development and implementation of outreach programs; and
- An extension of the management unit for Atlantic marlins.

1.1.2.5 ICCAT 2000

ICCAT adopted additional recommendations (00-13) regarding Atlantic billfish, including an international two-phased rebuilding plan for Atlantic blue and white marlin, in November 2000. Phase I of the plan required that countries (other than the United States) capturing marlins in commercial fisheries reduce white marlin landings from pelagic longline and purse seine fisheries by 67 percent and blue marlin landings by 50 percent from 1999 levels. ICCAT adopted the marlin rebuilding strategy based on the SCRS' most recent stock assessments that indicated that marlin stocks continued to be severely overfished. ICCAT Recommendation 00-13 also recommended that the United States restrict annual landings by U.S. recreational fishermen to 250 Atlantic blue and white marlin, combined, for 2001 and 2002 (Phase I). This recommendation was subsequently extended through 2006.

1.1.2.6 White Marlin Endangered Species Act (ESA) Listing Review

In September 2001, NMFS received a petition filed pursuant to ESA to list white marlin as endangered or threatened throughout its range and to designate critical habitat. After conducting a comprehensive review of the status of the species, NMFS determined in September 2002 that, while Atlantic white marlin abundance had declined from historical levels, the stock was not at a level that warranted listing under the ESA. The ESA determination specified that another stock status review would occur in 2007. Also, in 2001, the HMS and Billfish Advisory Panels (Billfish AP), a group of state representatives, regional Fishery Management Council members, commercial fishing representatives, recreational fishing representatives, academics, and environmental interest group representatives, indicated that it was necessary to improve the monitoring of recreational swordfish and Atlantic billfish landings.

1.1.2.7 ICCAT 2002

In 2002, Phase 1 of the ICCAT Atlantic marlin rebuilding plan was extended through the year 2005 by adoption of ICCAT Recommendation 02-13. ICCAT amended the rebuilding program by specifying that, through 2005, the annual amount of blue marlin that can be harvested and retained by pelagic longline and purse seine vessels must be no more than 50 percent of the 1996 or 1999 landing levels, whichever is greater. For white marlin, the annual amount allowed to be harvested and retained by pelagic longline and purse seine vessels must be no more than 33 percent of the 1996 or 1999 landing levels, whichever is greater. The United States had already prohibited commercial retention of billfish since the implementation of the 1988 Atlantic Billfish FMP, so it was already compliant with this recommendation. For ICCAT members other than the United States, the plan required the release of all live marlins taken as bycatch in commercial fisheries, but provided an allowance for the landing of fish unavoidably killed, provided that they were not sold. For its part of the rebuilding program, the United States agreed to continue limiting recreational landings of Atlantic blue and white marlin to 250 fish, annually, maintain its regulations prohibiting the retention of marlins by U.S. pelagic longline vessels, and continue monitoring billfish tournaments through scientific observer coverage of at least five percent initially, with the objective of 10 percent coverage by 2002. As recorded in ICCAT compliance tables, the United States remained within its 250 marlin limit in 2001 and 2003, but exceeded the 250 fish limit in 2002. At present, the United States complies with the ICCAT observer requirements by requiring that all HMS tournaments register with NMFS, selecting all billfish tournaments for reporting their results, and assigning observers to many billfish tournaments.

1.1.2.8 Recreational Permitting and Reporting Rules

A key element in complying with Phase I of the ICCAT marlin rebuilding plan and improving the monitoring of recreational billfish and swordfish landings was establishing a comprehensive monitoring program for all recreational landings of marlin, sailfish and swordfish, particularly those landed outside of fishing tournaments, which are monitored through the Recreational Billfish Survey (RBS).

In early 2002, the HMS and Billfish APs again discussed monitoring U.S. recreational billfish landings, and focused upon both a landings tag program (similar to those operating for the recreational bluefin tuna fisheries in North Carolina and Maryland) and a call-in requirement for all billfish landings.

On December 18, 2002 (67 FR 77434), NMFS published a final rule requiring all vessel owners fishing for Atlantic HMS to obtain an Atlantic HMS recreational angling category permit. On January 7, 2003 (68 FR 711), a final rule establishing a mandatory reporting system for all non-tournament recreational landings of Atlantic marlins, sailfish, and swordfish was published. These requirements became effective in March 2003. These requirements, in combination with mandatory tournament reporting, are improving the ability of the United States to accurately monitor all recreational landings of Atlantic marlins, sailfish, and swordfish, however, non-compliance by recreational anglers remains a significant issue.

1.1.2.9 Proposed Rule to Codify the 250 Marlin Landing Limit

On September 17, 2003, NMFS published a proposed rule (68 FR 54410) to codify an annual landings limit of 250 Atlantic blue and white marlin combined, and to implement a provision to carry forward over- and underharvest of the Atlantic blue and white marlin landing limit into subsequent fishing years, consistent with ICCAT recommendations. To remain in compliance with the landing limit and to maximize allowable landings, NMFS proposed to increase the legal recreational minimum size of Atlantic blue and white marlin for the remainder of a fishing year when 80 percent of the landing limit was projected to be achieved. If the landing limit was attained, NMFS proposed to allow only catch-and-release fishing for these species for the remainder of the fishing year. The proposed rule was not finalized due to a need to review the methodology of calculating recreational marlin landings. The proposed rule incorporated landings as reported by the Recreational Billfish Survey (RBS), and indicated landings levels of 129 fish for 2002. Application of a new methodology (scalar expansion) resulted in the United States reporting 279 marlin to ICCAT for compliance purposes for 2002, which exceeded the annual 250 fish landings limit by 29 fish. NMFS is continuing to review various methodologies to identify the most appropriate approach for estimating recreational marlin landings. The proposed rule for this current Draft HMS FMP will formally withdraw this 2003 proposed rule. Similar measures to those in the 2003 proposed rule are analyzed in Chapter 4 of this document.

1.1.2.10 ICCAT 2004

At the November 2004 ICCAT meeting, the United States chose not to apply the scalar expansion methodology for compliance purposes, but rather applied a methodology (RBS + Non-Tournament Reporting System + State Landing Tags) similar, but not identical to that used in the 2001 compliance report and the September 2003 Proposed Rule. Application of this methodology resulted in the United States reporting 131 marlin to ICCAT for compliance purposes in 2004. The United States is continuing to review its methodology to quantify recreationally landed marlins. Further, a new ICCAT Recommendation (as yet unnumbered) was adopted which extended Phase I of the Marlin Rebuilding Plan and delayed the planned 2005 assessment by SCRS of blue and white marlin to 2006 on the basis of inadequate data. This action resulted in an extension of the cap of 250 blue and white marlin, combined, for U.S. recreational landings through 2006.

1.1.3 Combining Management for Atlantic HMS

As previously discussed, NMFS issued two separate documents in April 1999 for the Atlantic HMS fisheries. The 1999 Fishery Management Plan for Atlantic Tunas, Swordfish, and Sharks, combined, amended, and replaced previous management plans for swordfish and sharks, and was the first FMP for tunas. Amendment One to the Billfish Management Plan updated and amended the 1988 Billfish FMP.

In 1999, based on concerns expressed by Advisory Panel (AP) members about consolidating the FMPs for billfish and the other HMS, as well as the recreational nature of the domestic billfish fishery, NMFS chose to maintain separate FMPs and APs for these species. Nevertheless, over the past six years that these two FMPs have co-existed, there has been a

growing recognition by NMFS of the interrelated nature of these fisheries and the need to consider management actions together. In addition, NMFS has identified some adverse ramifications stemming from separation of the plans, including unnecessary administrative redundancy and complexity, loss of efficiency, and public confusion over the management process. The following examples illustrate the closely intertwined nature of the fisheries and their management:

1. The Magnuson-Stevens Act defines highly migratory species as tuna species, marlin, oceanic sharks, sailfishes, and swordfish;
2. An HMS Angling or charter/headboat permit is required to fish for billfish or other HMS recreationally;
3. Recreational fishermen target billfish and other HMS in the same season and often on the same trip;
4. Recreational fishermen can use rod and reel to fish for both billfish and other HMS;
5. Many of the primary management actions for addressing overfishing and bycatch issues for billfish are already contained in the 1999 FMP for Atlantic Tunas, Swordfish, and Sharks;
6. Any potential management measures for billfish or other HMS are likely to impact the same communities;
7. The reporting requirements for billfish and other HMS fishermen are the same;
8. The regulations for Atlantic billfish and the other Atlantic HMS are all contained in 50 CFR part 635; and
9. The Billfish and HMS Advisory Panels nearly always meet in a combined session.

As such, and consistent with the fifth objective of Billfish Amendment One[3] and the ninth objective listed in the 1999 Tunas, Swordfish, and Sharks FMP[4], NMFS is consolidating these FMPs into one comprehensive FMP to improve coordination of the conservation and management of the domestic fisheries for Atlantic swordfish, tunas, sharks and billfish. The regulatory implications of consolidating the FMPs are negligible, as the regulations governing the fisheries for all Atlantic HMS have been consolidated in 50 CFR part 635 since 1999.

During the comment period on the Predraft, some HMS and Billfish AP members, some Council members, and many recreational billfish fishermen objected to the consolidation of the FMPs. For the most part, they were concerned that (1) two objectives from the 1988 Billfish FMP were identified for removal, on the basis that their core intent was thought to be adequately contained in objectives that would remain, (2) commercial fisheries aim to utilize the specific quota while recreational fisheries, particularly billfish fisheries, aim to have the highest abundance of fish available and are mostly catch-and-release fisheries, (3) in a consolidated FMP, billfish would be considered only as a bycatch species and would not be a priority, and (4) billfish would lose representation on the AP. As a result of the first comment, NMFS is now proposing to leave those two objectives as they were originally drafted in the consolidated HMS

3 To better coordinate domestic conservation and management of the fisheries for Atlantic tunas, swordfish, sharks, and billfish, considering the multispecies nature of many highly migratory species (HMS) fisheries, overlapping regional and individual participation, international management concerns, and other relevant factors.
4 To better coordinate domestic conservation and management of the fisheries for Atlantic tuna, swordfish, sharks, and billfish, considering the multispecies nature of many HMS fisheries, overlapping regional and individual participation, international management concerns, historical fishing patterns and participation, and other relevant factors.

FMP (Section 1.3). Regarding the second comment, NMFS agrees that commercial fishermen aim to fully utilize a quota and many recreational fishermen practice catch-and-release fishing. NMFS believes that this difference can be accommodated in a consolidated FMP. Further, given the interconnected nature of the billfish fishery with other HMS fisheries, both on the water and in the regulatory and policy arenas, as well as the current permitting structure, changes in any of the non-billfish fisheries are like to have impacts on the billfish fishery. Combining the FMPs would allow those changes to be analyzed more holistically with clearer links among the impacts and issues between fisheries. Regarding the third comment, NMFS believes that combining the FMPs will not change the priorities of managing HMS, which are dictated by the Magnuson-Stevens Act and other domestic law. Regarding the fourth comment, the composition of the APs in terms of representation by states and sectors (commercial, recreational, academic, or conservation) would not change as a result of combining the plans (Section 1.1.3.2).

Another group of constituents, including AP and Council members, objected to combining the FMPs because they felt that too many species and too much information had already been combined in the existing FMPs. If anything, these parties felt that the species and management measures in the existing FMPs should be separated and that NMFS should manage on a more species-specific basis. NMFS believes that combining the FMPs for tunas, swordfish, and sharks, and the actual regulations for all HMS, while a challenge at first, has led to a more holistic view of the fishery. This view has allowed the impacts of management measures on all sectors of HMS fisheries to be fully analyzed whereas before, the links may not have been seen or analyzed so readily. By combining the FMPs, NMFS is moving toward an ecosystem-based approach to the management of HMS. Such an approach could ultimately benefit the resource and the people involved. As an example, at several of the meetings on the Predraft, fishermen have noted that using circle hooks while trolling for blue marlin is impracticable. At those same meetings, tuna fishermen have been asking for the use of circle hooks on rod and reel. In many cases, the same fishermen fish for tunas and billfish. While NMFS could implement different regulations for tunas and billfish, more effective and appropriate management can only be done by considering the implications on both fisheries.

NMFS also received comments that other interested parties, including some recreational fishermen and AP members, feel the plan to consolidate the FMPs makes sense and is only logical, particularly given the overlapping nature of the fisheries. Some people, who supported the consolidation, noted that the customary joint meetings of the HMS and Billfish APs have resulted in an imbalance of representation favoring the recreational fishing sector. NMFS does not believe that combining the FMPs will change the composition of the APs.

1.1.3.1 Implications for Management Measures

The 1999 Tunas, Swordfish, and Sharks FMP integrated and replaced preexisting management measures for Atlantic tuna, swordfish, and shark fisheries. Amendment One to the Billfish FMP (1999) was developed in coordination with the Tunas, Swordfish, and Sharks FMP, but augmented rather than replaced the preexisting Billfish FMP, which had been finalized in 1988. The consolidated HMS FMP is intended to augment and combine the 1999 Atlantic Tunas, Swordfish, and Sharks FMP, Amendment One to the 1999 Atlantic Tunas, Swordfish, and Sharks FMP, the 1988 Billfish FMP, and Amendment One to the Billfish FMP into a single fishery management plan. To reiterate, upon issuance of the final rule implementing the

consolidated HMS FMP, there will be a single management plan for Atlantic tunas, swordfish, sharks, and billfish. Under the consolidated HMS FMP, the "HMS" would include billfish in all references except where noted otherwise.

The consolidation itself would not change any existing management measures for Atlantic tunas, swordfish, sharks, and billfish that have been issued previously under the authority of ATCA and the Magnuson-Stevens Act. Should NMFS determine that further changes are necessary, they will be made through the FMP amendment process or through rulemaking as described in the framework provisions. Please see section 1.3 for a discussion of the implications of combining the plans on the plan objectives.

As discussed in Section 1.1.2.2, the 1988 Fishery Management Plan for Atlantic Billfish prohibited the sale or purchase of Atlantic billfish. Recognizing the existence of a traditional artisanal handline fishery in Puerto Rico that occasionally landed billfishes, primarily blue marlin, the 1988 Billfish FMP also included a limited exemption from the "no sale" provision to accommodate this fishery. The exemption to the "no sale" provision was subject to a number of conditions and restrictions, including:

- only fish caught on handlines having fewer than six hooks could be retained for sale;
- vessels retaining billfish for sale could not have a rod and reel onboard;
- fish could be sold only in Puerto Rico;
- a maximum of 100 billfish per year could be landed and sold;
- if more than 100 billfish per year were landed under the exemption, the Councils would consider removing the exemption;
- all existing fishermen wishing to sell billfish would be required to obtain a permit;
- the Caribbean Fishery Management Council, in cooperation with the Government of the Commonwealth of Puerto Rico, would develop and implement a system for tracking billfish landings under the exemption; and
- the exemption would not be in effect until the permitting and tracking systems were operative, pending approval by the five involved Councils at that time.

The exemption from the "no sale" provision for the Puerto Rican handline artisanal fishery has never been implemented under Federal Regulations, because the aforementioned conditions have never been met, either prior to or following transfer of the FMP to Secretarial authority. Given the overfished and overfishing status of Atlantic billfish and non-fulfillment of conditions necessary to implement the exemption over nearly two decades, NMFS sought comment on the potential removal of the "no sale" exemption from the FMP during the scoping process for the Consolidated HMS Amendment. Further, as the provision was developed and approved by the five Atlantic Councils prior to transfer of the FMP to Secretarial authority, NMFS specifically sought comment from the Councils on this issue in November 2004.

Public comment on elimination of the exemption to the no sale provision as discussed in the Pre-draft document was mixed, with support for its elimination as well as limited support for maintaining the exemption. In response to direct outreach efforts to the Councils on this issue, NMFS received formal responses from the New England Council, the Mid-Atlantic Council, and the Caribbean Council. The New England Council responded with a formal "no comment" on

the issue, as it had not been directly involved in HMS management issues since the inception of Secretarial Authority. The Mid-Atlantic Council indicated that removal of the exemption was an appropriate action, and the Caribbean Council adopted a formal motion at its May 2005 meeting in St. Thomas, USVI, in support of removing the provision.

Based on the overfished and overfishing status of Atlantic billfish; non-fulfillment of the conditions necessary to implement the exemption to the no sale provision and resultant non-implementation of the provision over a period of 18 years; public comment; and support of the involved fishery management councils, specifically the Caribbean Council which would be most directly impacted by the potential elimination of the exemption provision, NMFS is not carrying forward the exemption to the no sale provision for the artisanal handline fishery in Puerto Rico into the consolidated HMS FMP.

1.1.3.2 Implications for Highly Migratory Species and Billfish Advisory Panels

The HMS and Billfish Advisory Panels (AP) were established in September 1997, pursuant to Magnuson-Stevens Act requirements (16 U.S.C. 1801 et. seq., as amended by the Sustainable Fisheries Act PL 104-297), to assist NMFS in the collection and evaluation of information relevant to the development of the 1999 Tunas, Swordfish, and Sharks FMP and Amendment 1 of the Billfish FMP. Nominations for initial membership on the APs were solicited in March and August of 1997 for the Billfish and HMS APs, respectively, and the first meeting of the APs was held in October 1997.

Membership for both panels is composed of representatives of the commercial and recreational fishing communities, as well as conservation and academic interests. When finalizing the members on each panel, NMFS attempts to achieve a balance among sectors, regions, and species. The five Regional Fishery Management Councils involved in Atlantic HMS management, the Atlantic and Gulf Coastal States, the U.S. Coast Guard, and the U.S. ICCAT Advisory Committee have *ex-officio* seats. In keeping with operating practices for appointments to Regional Fishery Management Councils, appointments to the 23-member HMS AP have been selected on a staggered, three-year cycle with eight members appointed for a three-year term. For the Billfish AP, which consists of nine appointed members, terms are on a two-year cycle with four members appointed for each two-year term. Staggered terms were implemented to ensure that there is some institutional memory on the APs at all times. The terms of *ex-officio* seats do not expire and assignment and substitution of these AP representatives are at their discretion of the respective agencies. Current AP Members, excluding *ex-officio* seats, are identified in Table 1.1and Table 1.2.

Table 1.1 Highly Migratory Species Advisory Panel Membership as of May 2005.

Commercial		
Nelson Beideman, New Jersey Term Exp. 12/31/05	William Gerencer, Maine Term Exp. 12/31/07	Dewey Hemilright, North Carolina Term Exp. 12/31/07
Russell Hudson, Florida Term Exp. 12/31/06	Gail Johnson, Maine Term Exp. 12/31/05	Don Nehls, Florida Term Exp. 12/31/06

Vacant, US Virgin Islands Term Exp. 12/31/07	Richard Ruais, New Hampshire Term Exp. 12/31/05	Peter Weiss, Massachusetts Term Exp. 12/31/06
Recreational		
James Donofrio, New Jersey Term Exp. 12/31/06	Michael Leech, Florida Term Exp. 12/ 31/06	Joseph Mc Bride, New York Term Exp. 12/ 31/06
Russell Nelson, Florida Term Exp. 12/31/07	Mark Sampson, Maryland Term Exp. 12/31/05	William Utley, Maine Term Exp. 12/31/07
Rom Whitaker, North Carolina Term Exp. 12/31/05	Richard Stone, North Carolina Term Exp. 12/31/07	
Conservation		
Shana Miller, New York Term Exp. 12/31/07	Roman Bonfil, New York Term Exp. 12/31/07	Sonja Fordham, District of Columbia Term Exp. 12/31/05
Merry Camhi, New York Term Exp. 12/31/06		
Academic		**ICCAT Advisory Committee Chair**
Dr Phil Goodyear, Florida Term Exp. 12/31/05	Dr. Robert Hueter, Florida Term Exp. 12/31/06	Dr. John Graves, Virginia

Table 1.2 Billfish Advisory Panel Membership as of May 2005.

Commercial		
Jack Devnew, Virginia Term Exp. 12/31/06	William Etheridge, North Carolina Term Exp. 12/31/05	
Recreational		
Pamela Basco, Texas Term Exp. 12/31/05	Ellen Peel, Florida Term Exp. 12/31/05	
Rick Weber, New Jersey Term Exp. 12/31/06	Robert F. Zales II, Florida Term Exp. 12/31/06	
Conservation	**Academic**	**ICCAT Advisory Committee Chair**
Ken Hinman, Virginia Term Exp. 12/31/05	Dr. Robert Ditton, Texas Term Exp. 12/31/06	Dr. John Graves, Virginia
	Dr. Alvarado Bremer, Texas Term Exp. 12/31/06	

Composition of the existing HMS and Billfish APs, in terms of the number of seats and the percentage of seat allocation, is detailed in Table 1.3. During the FMP consolidation process, the memberships of the two panels will be combined into a single consolidated HMS AP that will advise NMFS on all HMS issues, including billfish. Once the consolidated HMS FMP is finalized, NMFS will continue to balance representation based on species, sector, and regions.

Table 1.3 Current Advisory Panel Seat Allocation.

	Current HMS AP		Current Billfish AP		Combined AP	
	# of Seats	% Representation	# of Seats	% Representation	# of Seats	% Representation
Commercial	9	39	2	22	11	34
Recreational	8	35	4	44	12	37
Conservation	4	17	1	11	5	16
Academic	2	9	2	22	4	13
Totals	23	100	9	99	32	100

1.2 Need for Action

Since the 1999 FMP and Amendment were implemented, a number of management issues have arisen that either require addressing through an FMP amendment, or that could be implemented more effectively if the action is considered in conjunction with other actions. This section provides a succinct summary of some of the driving forces behind the management measures being considered in this rulemaking. More detail on the individual issues can be found later in the document.

This section also describes which actions are actually amending the FMP and which actions are considered regulatory framework adjustments or actions under the FMP (Table 1.4). A framework action includes notice and comment rulemaking and amends implementing regulations but not the FMP itself. Both the 1999 FMP and the 1999 Billfish Amendment outlined certain management measures that could be taken by framework adjustments to meet the objectives of the FMP and the Magnuson-Stevens Act and that would not necessarily require amending the FMP (50 CFR §635.34). These actions were modified with Amendment 1 to the 1999 FMP. The actions proposed to be taken in this document span a range of framework actions and amendments to the FMP.

Table 1.4 Table indicating whether actions in this document are amending the FMP or are being taken as framework actions

Major Issue	Framework or FMP Amendment
Reducing Bycatch: Workshops	FMP Amendment
Reducing Bycatch: Time/area closures	FMP Amendment and framework action
Rebuilding: Northern albacore tuna	FMP Amendment
Overfishing: Finetooth sharks	FMP Amendment
Rebuilding: Billfish	Framework action
Management Program: Bluefin tuna	FMP Amendment and framework action
Management Program: Timeframe	Framework action
Management Program: Authorized gears	Framework action
Management Program: Regulatory housekeeping	Framework action

The June 2004 BiOp requires the Agency to conduct training workshops regarding the release of sea turtles from pelagic longline gear and to certify that fishermen have attended these workshops. Additionally, in Amendment 1 to the Tunas, Swordfish, and Shark FMP, NMFS stated that if shark fishermen can show that they can correctly identify shark species and fish for specific species, then the Agency might consider using species-specific shark quotas in the future. In public comments during the scoping period and on the Predraft, NMFS heard that some fishermen feel the data collection problem is not with the fishermen but with the dealers. These comments were considered when analyzing alternatives for workshops. Many of the needs for workshops and certifying that people are trained are beyond what was considered in the 1999 FMPs. Thus, in this FMP, NMFS examines different types of workshops to meet these needs.

Since 1999, NMFS has implemented a number of time/area closures in order to reduce bycatch, to the extent practicable, consistent with National Standard 9. While preliminary analyses have been done in annual SAFE reports that examine the efficacy of these closures, a comprehensive analysis of the impact of the closures on bycatch rates, the fishermen, and the communities has been done for the first time in this document. Based on the results of this comprehensive analysis, in this rulemaking, NMFS examines the current time/area closures to determine if these closures are accomplishing the original goals of the closures or if changes are needed. NMFS also examines the need for additional closures to reduce bycatch in HMS fisheries of certain species including sea turtles, white marlin, and bluefin tuna. The 1999 FMP considered and allowed for the implementation of time/area closures as framework actions. However, NMFS is considering a comprehensive mechanism regarding how to analyze the need for establishing, modifying, or removing time/area closures. Because this alternative is beyond the scope of the 1999 FMP, NMFS is considering the possible implementation of that alternative in this FMP.

Since the 1999 FMPs, the Agency has determined that overfishing is occurring on finetooth sharks and that northern albacore tuna are overfished. NMFS intends to address rebuilding and overfishing for these species in this action. For northern albacore tuna, because its rebuilding plan is not yet outlined in the FMP, any actions would be incorporated into this FMP. For finetooth sharks, actions being considered would be regulatory framework actions.

Despite the implementation of domestic and international management measures, the status of Atlantic blue and white marlin has continued to decline. Currently, the status of sailfish and spearfish is uncertain. Atlantic white marlin has been identified as one of the most severely overfished species of any stock under ICCAT's purview for the past four years, but nevertheless continues to be subjected to high and unsustainable levels of fishing mortality throughout the Atlantic. In 2002, the United States undertook a status review of white marlin pursuant to the ESA. While the status review team determined that white marlin stock status did not warrant a listing at that time, it concluded that "unless fishing mortality is reduced significantly and relatively quickly, the stock could decline to a level that would warrant ESA protection" (White Marlin Status Review Team 2002). NOAA is committed to conducting another ESA listing review in 2007. Ultimately, the declines in the status of blue and white marlin have diminished the likelihood of achieving domestic rebuilding goals and objectives outlined in the 1999 Billfish Amendment.

The United States has led billfish conservation efforts internationally over the past decade. The effects of these efforts, while serving to move conservation forward in the policy arena, are as yet uncertain from a biological perspective. Additional information on this issue should be available in late 2006 when the next ICCAT stock assessment for Atlantic marlin is scheduled. While the United States cannot unilaterally reverse stock declines for these species given the international nature of the fishery, additional domestic management actions are possible and necessary to augment steps that have thus far been unable to stem long-term downward population trends and/or increasing fishing mortality rates for Atlantic marlins. Failure of the United States to continue leading international efforts to rebuild marlin will likely result in this issue losing visibility and priority among international fishery managers, as marlin are generally taken incidentally to directed fishing activities for more commercially valuable species. The rulemaking process and the management measures analyzed are a critical component of demonstrating such leadership. Reinforcing the need for action are new data suggesting that post-release mortality for white marlin from recreational catch-and-release fishing with traditional J-hooks may be considerably higher than previous estimates. As such, in this document, NMFS reviews the current data and examines methods of reducing billfish mortality in both the commercial (*e.g.*, time/area closures) and recreational fisheries (*e.g.*, minimum sizes). Because the management measures being considered are within the scope of those allowed for framework actions, these measures would be taken as regulatory framework actions.

Over the years, BFT management has become increasingly complicated and difficult for the public to understand, and may no longer accurately reflect the needs of the fishery and goals of the FMP. These issues are evident on a daily basis from the number of constituent inquiries addressed by NMFS and the number of inseason management actions necessary throughout the season. In addition, NMFS has received a petition from the State of North Carolina for rulemaking to adjust the quota allocations to provide for a General category fishery off of North Carolina in the winter. NMFS is considering these requests and is also considering ways of clarifying BFT management. Some of the changes considered are within the scope of those that the 1999 FMP stated could be accomplished by framework actions. However, other alternatives are beyond the scope and need to be accomplished by FMP amendment. Thus, this issue encompasses both framework actions and amendments to the FMP.

In the 1999 FMP and Billfish Amendment, NMFS established a fishing year for tunas, billfish, and swordfish that began on June 1 and went through the following May 31. This fishing year was established to allow NMFS time to implement recommendations from ICCAT before the fishing year began. The change to the fishing year, however, has been problematic given that many of the data infrastructures and reporting requirements both within the Agency and ICCAT are based on calendar year rather than fishing years. Thus, NMFS revisits this issue during this rulemaking. Changes to the fishing year are within the scope allowed in the 1999 FMP and the 1999 Billfish Amendment. Thus, this issue is being taken as a framework action.

In 1999, NMFS published a list of authorized gears for all fisheries across the nation. Occasionally, NMFS receives requests to modify the list of authorized gears. Sometimes, these requests include gear that fishermen use in other oceans or elsewhere in the Atlantic to catch the

same species; other times, the requests are due to additional groups requesting to use a gear that is approved for one permit, but not another. NMFS considers some of these requests pertaining to HMS in this rulemaking. The use and restriction of gears is within the scope of management measures that can be modified through framework actions; thus, NMFS is proposing to modify the authorized gears via a framework action.

This rulemaking also considers a number of corrections and additions to the Atlantic HMS regulations at 50 CFR part 635 and other relevant sections in the CFR (*e.g.*, 50 CFR part 300 contains information regarding international trade) in order to clarify their intent, remove incorrect cross-references, remove dated regulations, as appropriate, and aid enforcement. These actions are all being taken as framework actions.

In addition, this consolidated HMS FMP continues to conduct a five-year review of EFH consistent with the EFH guidelines. The Magnuson-Stevens Act requires the Secretary, through NMFS, to establish guidelines to assist in the description and identification of EFH in FMPs, among other things. The Agency set forth a schedule for the review and update of such EFH identifications based on new scientific evidence or other relevant information. The EFH guidelines articulate processes for determining the extent of EFH that encompasses each species and life-stage in a managed fishery. In addition, the EFH guidelines call for periodic review and revision of EFH identified areas based on available information, as well as a complete review of all EFH information at least once every five years. NMFS originally described and identified EFH for all HMS, including Atlantic billfish, in 1999, and recently updated the EFH for five shark species (blacktip, dusky, finetooth, nurse, and sandbar) in Amendment 1 to the FMP for Atlantic Tunas, Swordfish, and Sharks, which was finalized in 2003. In this document, NMFS includes the information available for all HMS, including billfish, in order to aid in the determination of which species need updates to their EFH identifications. Any updates or resulting changes in management will be done in a future document.

In the proposed rule, NMFS is also taking two additional actions: (1) a formal withdrawal of the 2003 proposed rule to implement the ICCAT 250 fish limit; and (2) a formal decision not to implement the exemption to the no sale provision for the artisanal handline fishery in Puerto Rico as outlined in the 1988 Billfish FMP.

1.3 Objectives

Amendment and consolidation of the 1999 Tunas, Swordfish, and Shark and the Billfish FMPs and their amendments provides an opportunity to review the suitability and relevance of the HMS and Billfish FMP objectives. Both plans contain a detailed set of objectives, of which many overlap, complement, or otherwise reinforce each other. At the same time, a small number of objectives are unique to each plan, and may not logically apply to the other plan. NMFS has identified potential changes to the objectives of the existing FMPs that will remove redundancy and update some objectives. In some cases, NMFS is proposing to combine similar objectives, carry unique objectives into the combined HMS FMP unchanged, or modify objectives. Table 1.5 identifies the objectives of the existing HMS and Billfish FMPs as well as the proposed list of objectives for the consolidated HMS FMP.

Table 1.5 Existing and Proposed Objectives of the Atlantic Tunas, Swordfish, and Shark, Billfish, and Consolidated HMS FMPs. Highlighted text indicates the differences in objectives between the two existing FMPs.

Obj. #	Tunas, Swordfish, and Shark FMP	Billfish FMP and Billfish Amendment	Proposed Consolidated FMP
1	To prevent or end overfishing of Atlantic tuna, swordfish, and sharks and adopt the precautionary approach to fishery management	Prevent and/or end overfishing of Atlantic billfish and adopt the precautionary approach to fishery management	Prevent or end overfishing of Atlantic tuna, swordfish, billfish, and sharks and adopt the precautionary approach to fishery management
2	To rebuild overfished fisheries in as short a time as possible and control all components of fishing mortality, both directed and incidental, so as to ensure the long-term sustainability of the stocks and promote stock recovery of the management unit to the level at which the maximum sustainable yield can be supported on a continuing basis	Rebuild overfished Atlantic billfish stocks, and monitor and control all components of fishing mortality, both directed and incidental, so as to ensure the long-term sustainability of the stocks and promote Atlantic-wide stock recovery to the level where MSY can be supported on a continuing basis	Rebuild overfished Atlantic HMS stocks, and monitor and control all components of fishing mortality, both directed and incidental, so as to ensure the long-term sustainability of the stocks and promote Atlantic-wide stock recovery to the level where MSY can be supported on a continuing basis
3	To minimize, to the extent practicable, bycatch of living marine resources and the mortality of such bycatch that cannot be avoided in the fisheries for Atlantic tuna, swordfish, and sharks	Minimize, to the extent practicable, release mortality in the directed billfish fishery, and minimize, to the extent practicable, bycatch and discard mortality of billfish on gears used in other fisheries	Minimize, to the extent practicable, bycatch of living marine resources and the mortality of such bycatch that cannot be avoided in the fisheries for Atlantic HMS or other species, as well as release mortality in the directed billfish fishery
4	To establish a foundation for international negotiation on conservation and management measures to rebuild overfished fisheries and to promote achievement of optimum yield for these species throughout their range, both within and beyond the exclusive economic zone. Optimum yield is the maximum sustainable yield from the fishery, reduced by any relevant social, economic, or ecological factors	Establish a foundation for the adoption of comparable international conservation and management measures, through international entities such as ICCAT, to rebuild overfished fisheries and to promote achievement of optimum yield for these species throughout their range, both within and beyond the EEZ	Establish a foundation for international negotiation on conservation and management measures to rebuild overfished fisheries and to promote achievement of optimum yield for these species throughout their range, both within and beyond the exclusive economic zone.

Obj. #	Tunas, Swordfish, and Shark FMP	Billfish FMP and Billfish Amendment	Proposed Consolidated FMP
5	To minimize, to the extent practicable, economic displacement and other adverse impacts on fishing communities during the transition from overfished fisheries to healthy ones	Minimize adverse social and economic effects on recreational and commercial activities to the extent practicable, consistent with ensuring achievement of the other objectives of this plan, and with all applicable laws	Minimize, to the extent practicable, adverse social and economic impacts on fishing communities and recreational and commercial activities during the transition from overfished fisheries to healthy ones, consistent with ensuring achievement of the other objectives of this plan and with all applicable laws
6	To provide the data necessary for assessing the fish stocks and managing the fisheries, including addressing inadequacies in current collection and ongoing collection of social, economic, and bycatch data about HMS fisheries	Provide the data necessary for assessing the fish stocks and managing the fisheries, including addressing inadequacies in collection and ongoing collection of social, economic, and bycatch data on Atlantic billfish fisheries	Provide the data necessary for assessing the fish stocks and managing the fisheries, including addressing inadequacies in current collection and ongoing collection of social, economic, and bycatch data on Atlantic HMS fisheries
7	Consistent with other objectives of this FMP, to manage Atlantic HMS fisheries for continuing optimum yield so as to provide the greatest overall benefit to the Nation, particularly with respect to food production, providing recreational opportunities, preserving traditional fisheries, and taking into account the protection of marine ecosystems	Consistent with other objectives of this amendment, manage Atlantic billfish fisheries for the continuing optimum yield so as to provide the greatest overall benefit to the Nation, particularly with respect to recreational opportunities and taking into account the protection of marine ecosystems. Optimum yield is the maximum sustainable yield from the fishery, as reduced by any relevant social, economic, or ecological factors.	Consistent with other objectives of this FMP, manage Atlantic HMS fisheries for continuing optimum yield so as to provide the greatest overall benefit to the Nation, particularly with respect to food production, providing recreational opportunities, preserving traditional fisheries to the extent practicable, and taking into account the protection of marine ecosystems
8	To better coordinate domestic conservation and management of the fisheries for Atlantic tuna, swordfish, sharks, and billfish, considering the multispecies nature of many HMS fisheries, overlapping regional and individual participation, international management concerns, historical fishing patterns and participation, and other relevant factors	Better coordinate domestic conservation and management of the fisheries for Atlantic tunas, swordfish, sharks, and billfish, considering the multispecies nature of many highly migratory species (HMS) fisheries, overlapping regional and individual participation, international management concerns, and other relevant factors	Better coordinate domestic conservation and management of the fisheries for Atlantic tuna, swordfish, sharks, and billfish, considering the multispecies nature of many HMS fisheries, overlapping regional and individual participation, international management concerns, historical fishing patterns and participation, and other relevant factors

Obj. #	Tunas, Swordfish, and Shark FMP	Billfish FMP and Billfish Amendment	Proposed Consolidated FMP
9	To provide a framework, consistent with other applicable law, to take necessary action under ICCAT compliance recommendation	Coordinate domestic regulations and ICCAT conservation measures for controlling Atlantic-wide fishing mortality	Provide a framework, consistent with other applicable law, to take necessary action under ICCAT compliance and/or conservation recommendations, including controlling Atlantic-wide fishing mortality
10	To promote protection of areas identified as essential fish habitat for tuna, swordfish, and sharks	Maximize protection of areas identified as essential fish habitat for Atlantic billfish, particularly for critical life stages	Promote conservation and enhancement of areas identified as essential fish habitat for Atlantic HMS, particularly for critical life stages
11	To simplify and streamline HMS management while actively seeking input from affected constituencies, the general public, and the HMS AP		Simplify and streamline HMS management while actively seeking input from affected constituencies, the general public, and the HMS AP
12		Promote the live release of Atlantic billfish through active outreach and educational programs	Promote the live release and tagging of Atlantic HMS through active outreach and educational programs
13		Maintain the highest availability of billfishes to the U.S. recreational fishery by implementing conservation measures that will reduce fishing mortality	Maintain the highest availability of billfishes to the U.S. recreational fishery by implementing conservation measures that will reduce fishing mortality
14		Optimize the social and economic benefits to the nation by reserving the billfish resource for its traditional use, which in the continental United States is almost entirely a recreational fishery	Optimize the social and economic benefits to the nation by reserving the billfish resource for its traditional use, which in the continental United States is almost entirely a recreational fishery
15		Increase understanding of the condition of billfish stocks and the billfish fishery	Increase understanding of the condition of HMS stocks and HMS fisheries

Obj. #	Tunas, Swordfish, and Shark FMP	Billfish FMP and Billfish Amendment	Proposed Consolidated FMP
16	To reduce latent effort and overcapitalization in HMS commercial fisheries		Create a management system to make fleet capacity commensurate with resource status so as to achieve the dual goals of economic efficiency and biological conservation, for both commercial and recreational fisheries, while reducing latent effort and overcapitalization, as needed, and providing access for traditional gears and fishermen to participate fully as the stock recovers
17	To create a management system to make fleet capacity commensurate with resource status so as to achieve the dual goals of economic efficiency and biological conservation		Combine with objective 16.
18	To develop eligibility criteria for participation in the commercial shark and swordfish fisheries based on historical participation, including access for traditional swordfish handgear fishermen to participate fully as the stock recovers		Combine with objective 16.

In addition to the proposed consolidated FMP objectives identified in table 1.5, additional objectives of this rulemaking, particularly for the framework actions, consistent with but not part of the objectives for the FMP, are to:

- Better coordinate domestic conservation and management of the fisheries for Atlantic tunas, swordfish, sharks, and billfish, considering the multi-species nature of many HMS fisheries;
- Reduce bycatch and bycatch mortality, to the extent practicable while also minimizing the economic and social impacts on related fisheries;
- Reduce mortality, including landings and post-release mortality, of Atlantic billfish in directed and non-directed fisheries;
- Improve data collections or data collection programs;
- Implement, to the extent practicable, the bycatch reduction strategy using the standardized bycatch reduction methodology;
- Begin the review process for updating EFH identifications for Atlantic HMS, as needed; and,
- Simplify management of Atlantic HMS, to the extent practicable.

1.4 Issues for Future Consideration and Outlook

Beyond the issues identified in the need for action, as discussed in Section 1.2, other new and unresolved matters have been identified by NMFS as important to rebuilding and maintaining fisheries that are economically and biologically sustainable. To this end, the issues identified below were generated by input from the general public during the scoping process for this rulemaking, the HMS and Billfish Advisory Panels, NMFS staff, and other fora. Further consideration of these and other issues in the future may be helpful in improving management. In many cases, the scoping, description of fisheries, and analyses for this EIS, once finalized, would be basis for taking action.

While NMFS was unable to include all the issues in this rulemaking due to time requirements and complexities for some of the issues in this rulemaking (*e.g.*, those that need to be addressed in 2005 and early 2006) and those in this list (*e.g.*, revising the limited access system could take a number of years to complete), NMFS may consider the issues in this list during future rulemakings, possibly through framework actions. This list is not comprehensive in nature, but rather identifies only a portion of the issues brought to the attention of NMFS that may need to be addressed in the future. The order in which these issues are listed is not in order of priority.

- Bluefin Tuna Size Limits and Tolerances

Current regulations limit Purse Seine vessel landings of large medium bluefin tuna (73 inches to less than 81 inches) to no more than 15 percent, by weight, of the total amount of giant bluefin tuna landed during a fishing year. Purse seine fishery participants commented that these restrictions may no longer be appropriate as schools of bluefin appear to be comprised of mixed size classes to a greater degree than in the past, thereby preventing the harvest of the available quota without exceeding bluefin tuna size limit tolerances. Purse seine fishery participants have also commented that it is not possible to predict the total amount of giant bluefin tuna that will be landed during a fishing year, which affects their ability to comply with the percent requirement of large medium bluefin tuna landed by fishing year.

- Filleting of Tunas At-Sea

Under current regulations at 50 CFR 635.30(a), "persons who own or operate a fishing vessel that possesses an Atlantic tuna in the Atlantic Ocean or that lands an Atlantic tuna in an Atlantic coastal port must maintain such Atlantic tuna through offloading either in round form or eviscerated with the head and fins removed, provided that one pectoral fin and the tail remain attached." Eviscerated is defined as a fish that has only the alimentary organs removed. The regulations are intended to aid in enforcing the minimum size limit, retention limits, and species identification.

Over the past several years, the HMS Charter/Headboat industry, more specifically the headboat sector, has requested that it be exempt from the current regulations and allowed to fillet Atlantic tunas at sea. Industry representatives claim that headboats are adversely impacted by the current regulations in a number of ways. Specifically, because headboats can carry upwards

of 40 passengers and because hold capacity on a headboat is limited, the inability to fillet at sea can adversely impact the quality of the fish that are retained (because it cannot be stored properly). Additionally, once a headboat returns to port, crew members may be working under tight timeframes to leave port and embark on another trip and may not have time to fillet tuna for paying passengers. Allowing processing of the catch while the vessel is steaming back to port may allow crew to leave the vessel, passengers to go home, or the vessel to conduct a subsequent trip immediately upon returning to port. Nevertheless, while authorizing filleting at sea may have several economic and social advantages for the industry as set forth above, waiving the current regulations could render enforcement of size limits, retention limits, and species identification difficult. NMFS received a few comments on the Predraft of this consolidated HMS FMP that suggested NMFS could remove the requirement to keep the tails on the fish. The commentors indicated that the tails are not needed for species identification and that removing them could result in higher quality fish and remove an unnecessary and costly burden to fishermen.

- Shark Quotas

Pelagic sharks are subject to exploitation by many different nations and exhibit trans-oceanic migration patterns. Currently, the 1999 Tunas, Swordfish, and Sharks FMP has established species-specific quotas for pelagic sharks, including porbeagle (92 mt dw), blue (273 mt dw), and all other pelagic sharks (488 mt dw), in order to limit expansion in the fishery, pending additional scientific assessment. Given the transboundary/international nature of pelagic shark populations and the fisheries that interact with them, the ICCAT SCRS agreed to conducted a stock assessment in June 2004 for some species of pelagic sharks, with an emphasis on blue and shortfin mako sharks. For assessment purposes, the stocks were divided into North and South Atlantic populations. With noticeable caveats pertaining to substantial levels of uncertainty, the assessment concluded that overfishing of blue shark populations in the North and South Atlantic is not occurring. The assessment also stated that based on historical CPUE trends and model outputs, North Atlantic shortfin mako populations are likely to have experienced some level of stock depletion and that overfishing may possibly be occurring. For the South Atlantic stock, current stock biomass may have decreased since 1971, but the magnitude of decline appears to be less than in the North Atlantic (SCRS, 2004). A conclusion as to the stock status relative to MSY for the South Atlantic population could not be made. A range of comments were received on the issue of pelagic shark quotas during the scoping process including, but not limited to, calls to increase quotas, reduce quotas, and to eliminate the pelagic shark quota sub categories.

Similarly, Canada has recently completed a stock assessment on porbeagle sharks. The assessment indicated that reductions in quota may be needed. Currently, few U.S. fishermen land porbeagle sharks. During the Predraft, NMFS received comments from both conservationists and commercial fishermen that action should be taken to reduce the commercial quota and allow only incidental harvest of porbeagle sharks.

Currently, NMFS is conducting a species-specific stock assessment for dusky sharks. The results of that stock assessment are expected in 2005. Additionally, NMFS intends to conduct a new stock assessment for all large coastal sharks starting in the fall of 2005. The new stock assessment would be conducted in a manner similar to that of the South Atlantic, Gulf of

Mexico, and Caribbean Fishery Management Councils and would not be completed (including the peer review) until early 2006. NMFS also expects to conduct a new stock assessment for all small coastal sharks in 2006/2007.

Based on these many stock assessments, NMFS realizes there might be a need to adjust current quotas for certain species. NMFS intends to combine the necessary rulemakings into one rule that would not occur until at least the large coastal shark stock assessment is complete. This future rule may also consider other modifications to shark management measures including, but not limited to, modifications to the mid-Atlantic time/area closure, as needed.

- Large coastal shark trip limits

In 1994, in order to lengthen the fishing season for large coastal sharks and to reduce the derby fishery, NMFS implemented a 4,000 lb trip limit on LCS. This trip limit was maintained for directed shark permit holders after implementation of the limited access program in 1999. Incidental shark permit holders have a lower trip limit, as this permit is intended to allow limited numbers of sharks taken incidentally to directed fishing activities for other species to be landed, thereby reducing waste and allowing limited economic benefit from what would otherwise be bycatch. Fishermen have commented that the directed trip limit is unnecessary because upgrading restrictions prevent large vessels from re-entering the fleet and that, because fishermen do not weigh sharks until they reach the docks, some latitude of the trip limit is needed. Additionally, some fishermen note that they often exceed the trip limit on one set and need to cut their gear and return to it later, which can reduce safety at sea and increase bycatch and bycatch mortality. NMFS examined the LCS trip limit issue during scoping for Amendment 1 to the 1999 Tunas, Swordfish, and Sharks FMP. In this process, a number of suggestions were made by the public, including, but not limited to, increasing the trip limit, decreasing the trip limit, eliminating the trip limit, providing a tolerance, and others. However, to address shark issues in a comprehensive rather than piecemeal fashion, the Agency has decided to wait until the issue could be examined with possible adjustments to the limited access program, including upgrading restrictions and the incidental trip limits.

- Limited Access Permit Reform

The HMS limited access permit program was established in the 1999 Tunas, Swordfish, and Sharks FMP in order to reduce latent effort and begin the process of rationalizing catch capacity with the available quota, while simultaneously avoiding negative impacts to the livelihood of those who were substantially dependent upon these fisheries. Since its inception, a number of issues pertaining to the program have been identified by constituents, advisory panel members, NMFS staff, and others. These have included, but are not limited to, further rationalizing some segments of the HMS fisheries, streamlining or simplifying the permitting process, altering existing upgrading restrictions, restructuring the permit process to a gear-based permit system from the current species-based permit system, reopening some segments of the limited access system to allow for the issuance of additional permits, modifying when permits are renewed, and modifying the incidental trip limit. Additionally, some commentors have noted a need to re-open the swordfish handgear fishery and to encourage inactive swordfish permit holders to fish in order to catch fully the swordfish quota allocated to the United States.

Addressing these issues in the future will be important to the successful long-term stewardship of HMS fisheries.

- Observers

Observers provide a baseline of data and biological samples used to estimate the accuracy of data from other data collection programs, including industry-based programs such as logbooks or vessel trip reports. Observer data are generally considered to have a high standard of quality; however, observer programs are expensive to operate. Current HMS regulations allow NMFS to select any vessel that has an Atlantic HMS, tunas, shark, or swordfish permit for observer coverage. Vessels permitted in the HMS Charter/Headboat and Angling categories can be requested to take observers on a voluntary basis. Recent Biological Opinions pertaining to HMS fisheries require NMFS to collect observer information specific to sea turtles and marine mammals on pelagic longline vessels and commercial vessels participating in the Atlantic shark fisheries. NMFS continues to explore ways to enhance and improve observer coverage programs.

- Recordkeeping and Reporting

Recreational fisheries are a major component of Atlantic HMS fisheries. Because recreational landings of Atlantic HMS are not marketed through commercial channels, it is not possible to monitor anglers' catches through ex-vessel transactions as in the commercial fishery. Instead, NMFS collects data through other means including the two primary statistical sampling surveys of the recreational fisheries: the Marine Recreational Fishery Statistics Survey (MRFSS) and the Large Pelagics Survey (LPS). Both surveys consist of a telephone survey to estimate effort and a dockside intercept program to collect CPUE data or landings. The utility and accuracy of both surveys has been questioned in recent years. To improve recreational data collection, NMFS began a pilot program in the Gulf of Mexico to collect data from the for-hire sector as part of the MRFSS in 1999. A similar modification was made to the MRFSS on the Atlantic coast in 2003. NMFS also uses other programs to collect information on recreational fisheries for Atlantic HMS, including tournament registration and reporting and angler self-reporting systems. Mandatory call-in systems were implemented in 1997 for bluefin tuna, and in 2003 for Atlantic billfish and swordfish. NMFS is also working cooperatively with individual states to develop more effective monitoring of Atlantic HMS recreational fisheries, such as the North Carolina and Maryland catch card and body tag systems. Despite these data collection systems, NMFS seeks to further enhance its recreational data collection efforts.

Dealers and fishermen provide fishery dependent information that is essential to the management of HMS fisheries. Data on landings and sales provided by dealers and information on catch, landings, location, and effort provided by fishermen are used for biological, social, and economic analyses necessary for fisheries management. Data collection requirements and needs frequently vary from fishery to fishery even within HMS. As a result, dealers and fishermen may be required to report data about different species on different NMFS forms to more than one NMFS office. Different types of information may be collected using different methodologies such as vessel trip reports or vessel logbooks. Most are submitted in hard copies, but some fisheries have instituted electronic reporting. Currently in HMS fisheries, all commercial fishing vessels and charter/headboat vessels are required to submit logbooks for all HMS trips, if they

are selected for reporting. Permit holders selected for reporting include all shark and swordfish fishermen and Atlantic tunas longline category vessels. These permit holders are required to submit logbooks to the Southeast Fisheries Science Center of NMFS. NMFS believes that better administration and coordination of reporting programs and requirements for dealers and fishermen of HMS species can ultimately streamline reporting requirements and procedures, thereby ensuring that information necessary for the management of HMS species is collected more efficiently and with less burden on fishermen.

- Billfish COE

Currently, a Billfish Certificate of Eligibility (COE) is required for all first receivers of Pacific billfish for the domestic trade of fresh or frozen billfish shipments. The purpose of the collection of this information is to maintain the nature of the Atlantic billfish fishery as a recreational resource with no commercial trade, as designated in the Atlantic Billfish FMP. The COE augments NMFS' ability to quantify all billfish that enter into the commerce of the United States and to establish that these fish were not harvested in or from the Atlantic billfish management unit. The required COE document provides information on the vessel that caught the billfish and contains a declaration from the dealer or processor that the accompanying billfish was not harvested from the Atlantic Ocean management unit. A dealer or processor who subsequently receives or possesses billfish covered by an original document is only required to complete the Dealer's/Processor's Declaration, and retain a copy of the COE while processing the billfish. Currently, dealers and processors do not have to provide the required Billfish COE information on a specific form, although NMFS provides, on the Internet or upon request, a standard form to facilitate the data collection. Also, NMFS does not collect the information upon final disposition of the billfish. In the scoping process and in comments on the Predraft, commentors expressed support for strengthening the Billfish COE program and potentially requiring the use of a standard form and/or submission of the form to NMFS upon final disposition of the billfish. Such action would standardize reporting requirements that may improve compliance, facilitate enforcement, and improve the quality and quantity of information on Pacific billfish shipments.

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2.0 SUMMARY OF THE ALTERNATIVES

2.1 Bycatch Reduction

2.1.1 Workshops

2.1.1.1 Protected Species Release and Disentanglement and Identification Workshops for Pelagic Longline, Bottom Longline, and Gillnet Fishermen

These workshops are intended to reduce the mortality of sea turtles and other protected resources captured incidentally in the HMS pelagic longline (PLL) fishery, and to reduce the mortality of sea turtles, smalltooth sawfish, and other protected resources captured incidentally in the HMS bottom longline (BLL) and gillnet fisheries. These workshops would relay information and demonstrate techniques specific to sea turtle release and disentanglement protocols as per the current NMFS standards. Through these workshops, participants would be trained to safely disentangle, resuscitate, and release captured sea turtles as well as identify and release other protected resource species and non-target species captured incidentally to HMS fishing activities. During these workshops, participants would be given a comprehensive hands-on examination, which, upon successful completion, would result in a multi-year certification. These workshops would likely be held at several regional locations, during non-peak fishing times. After the initial series of workshops, the Agency would continue to provide certification opportunities for permitted HMS fishery participants. Certification would be renewed in person on a specified timetable (*i.e*., 2, 3, or 5-year timetable) to ensure that the latest techniques to disentangle, release, and identify protected species are used. New certification requirements may be warranted based upon reinitiation of consultation with the NMFS Office of Protected Resources or the receipt of significant new information related to handling and release protocols. While the workshop alternatives listed below may list specific mandatory requirements for certain individuals only, anyone may attend the workshop on a voluntary basis and receive the workshop certificate.

Alternative A1 Voluntary workshops for longline fishermen (No Action)

Under Alternative A1, the No Action alternative, NMFS would continue to provide voluntary workshops for PLL fishermen and continue to distribute wheelhouse placards, the safe release protocols, and educational videos, as well as disseminate additional information through the activities of the NMFS PLL Point of Contact (POC). No mandatory requirements would be implemented under this alternative.

Alternative A2 *Mandatory workshops and certification for all HMS pelagic and bottom longline vessel owners – Preferred Alternative*

Alternative A2 would require mandatory workshops and certification for all vessel owners that have pelagic and bottom longline on their vessel and that have been issued or are required to be issued limited access permits (LAPs). Attendance and successful completion of a workshop would be linked to an owner's ability to renew an HMS fishing permit, if logbooks have been submitted indicating that longline has been used on at least one trip in the past year or since permit was issued, whichever is more recent. Without a certificate indicating successful

completion of the workshop, an HMS permit would not be issued to the vessel. Certification would be renewed on a 2, 3, or 5-year timetable (See alternative A6).

Alternative A3 *Mandatory workshops and certification for vessel operators actively participating in HMS pelagic and bottom longline fisheries – Preferred Alternative*

Alternative A3 would require mandatory workshops and certification for vessel operators actively participating in HMS pelagic and bottom longline fisheries. Alternative A3 would allow the Agency to certify one individual associated with the fishing activities, ensuring that at least one trained person is available during gear retrieval. At least one trained person would be required to be onboard during fishing activities in order to provide proof of certification. Vessels without a certified operator would be unable to operate. Certification would be renewed on a 2, 3, or 5-year timetable (See alternative A6).

Alternative A4 Mandatory workshops and certification for all HMS longline vessel owners, operators, and crew

Alternative A4 would require mandatory workshops and certification for all HMS longline vessel owners, operators, and crewmembers. Attendance and successful completion of a workshop would be linked to an owner's ability to renew an HMS fishing permit. This alternative would allow the Agency to certify at least two individuals per vessel that would be associated with fishing activities on board the vessel. Without the owners, operators, and crew attendance and successful completion of the workshop, an HMS permit would not be issued to the vessel. At least one trained person must be onboard during fishing activities to provide proof of certification. Certification would be renewed on a 2, 3, or 5-year timetable (See alternative A6).

Alternative A5 *Mandatory workshops and certification for shark gillnet vessel owners and operators – Preferred Alternative*

Alternative A5 would require mandatory workshops and certification for all shark gillnet vessel owners that have been issued a shark permit and operators of the vessel, where logbooks indicate that gillnet gear has been used on at least one trip in the past year or since the permit was issued, whichever is more recent. The workshops would certify vessel owners and operators in the safe handling and release of protected resources, including sea turtles, smalltooth sawfish, and marine mammals. Attendance and successful completion of a workshop would be linked to an owner's ability to renew an HMS fishing permit. Without a certificate indicating successful completion of the workshop, an HMS permit would not be issued to the vessel and the vessel would be unable to operate. Certification would be renewed on a 2, 3, or 5-year timetable (See alternative A6).

Alternative A6 *Certification Renewal Timetable (Certification renewal every 3-years) – Preferred Alternative*

Alternative A6 would require renewal of mandatory workshop certifications on a specific timetable (*i.e*., every 2, 3, or 5-years). Certification renewal may be conducted in person, via the internet, or by mailing and distribution of additional material (*i.e.*, DVDs, Videos, *etc.*). This alternative would be combined with any of the mandatory workshop alternatives listed above.

2.1.1.2 HMS Identification Workshops

Proper identification of HMS, both targeted species and bycatch, and threatened and endangered species that fishermen may interact with while pursuing HMS, is paramount to the efficacy of HMS regulations and management. Permitted fish dealers and fishermen are responsible for accurately identifying HMS on the dealer reports and logbooks submitted to NMFS. These reports form the basis of quota monitoring activities and stock assessments; misidentification of certain HMS can negatively impact stock assessments, calculation of season lengths, and the criteria used to designate certain species as prohibited. Identification workshops involving the HMS Management Division, the regional Fishery Science Centers, the Office of Protected Resources, academics, aquarium staff, and NGO representatives may educate/train those involved with HMS (fishermen, dealers, and law enforcement officials) to improve identification skills. These workshops may be most effective if held at venues where live and/or freshly dead specimens can be displayed. After the initial series of workshops, the Agency would continue to provide certification opportunities for permitted HMS fishery participants. Certification would be renewed on a specified timetable (*i.e*., 2, 3, or 5-year timetable) to ensure that the latest techniques to properly identify commonly caught HMS and protected species are used. While the workshop alternatives listed below may be specifically required for certain individuals, anyone could attend the workshop on a voluntary basis.

Alternative A7 No Identification Workshops (No Action)

Under alternative A7, the No Action alternative, NMFS would continue to support dissemination of information, such as how to buy the Guide to Sharks, Tunas, & Billfishes of U.S. Atlantic & Gulf of Mexico, to enhance fishery participant's ability to accurately identify species commonly caught in HMS fisheries. No mandatory requirements would be implemented under this alternative.

Alternative A8 Voluntary HMS identification workshops for dealers, all commercial vessel owners and operators, and recreational fishermen

Under Alternative A8, NMFS would hold voluntary HMS identification workshops for dealers, commercial vessel owners and operators, and recreational fishermen. These workshops would be held in addition to the items listed under the No Action alternative (*i.e.*, A7) above. No mandatory requirements would be implemented under this alternative.

Alternative A9 *Mandatory HMS identification workshops for all shark dealers – Preferred Alternative*

Alternative A9 would require mandatory HMS identification workshops, in which the focus would be on shark identification, for all federally permitted shark dealers. Attendance and successful completion of a workshop would be linked to a dealer's ability to renew a Federal

dealer permit. If the permitted dealer was unable to attend or is not directly involved in dealer activities then a proxy could be sent to meet mandatory attendance requirements. If a dealer opts to send a proxy, then the dealer must designate a proxy from each place of business covered by the dealer's permit. A proxy must be a person who is employed by a place of business, covered by a dealer's permit, a primary participant in identification, weighing, or first receipt of fish as they are offloaded from a vessel, and involved in filling out dealer reports. NMFS specifically requests comments on proxy designation (*i.e.*, who should be allowed to act as a proxy). Without a certificate indicating successful completion of the workshop, no permit would be issued. Certification would be renewed on a 2, 3, or 5-year timetable (See alternative A16).

Alternative A10 Mandatory HMS identification workshops for all swordfish, shark, and or/tuna dealers

Alternative A10 would require mandatory HMS identification workshops for all swordfish, shark, and or/tuna dealers. Attendance and successful completion of a workshop would be linked to a dealer's ability to renew a Federal dealer permit. If the permitted dealer was unable to attend or is not directly involved in dealer activities, then a proxy could be sent to meet mandatory attendance requirements. If a dealer opts to send a proxy, then the dealer must designate a proxy from each place of business covered by the dealer's permit. A proxy must be a person who is employed by a place of business, covered by a dealer's permit, a primary participant in identification, weighing, or first receipt of fish as they are offloaded from a vessel, and involved in filling out dealer reports. NMFS specifically requests comments on proxy designation (*i.e.*, who should be allowed to act as a proxy). Without a certificate indicating successful completion of the workshop, no permit would be issued. Certification would be renewed on a 2, 3, or 5-year timetable (See alternative A16).

Alternative A11 Mandatory HMS identification workshops for all commercial longline vessel owners

Alternative A11 would require mandatory HMS identification workshops for all vessel owners issued LAPs and using longline gear. Attendance and successful completion of a workshop would be linked to an owner's ability to renew an HMS fishing permit. Without a certificate indicating successful completion of the workshop, an HMS permit would not be issued to a vessel that has logbook reports indicating longline use. Certification would be renewed on a 2, 3, or 5-year timetable (See alternative A16).

Alternative A12 Mandatory HMS identification workshops for all commercial longline vessel operators

Alternative A12 would require mandatory HMS identification workshops for all commercial longline vessel operators. Certification would be renewed on a 2, 3, or 5-year timetable (See alternative A16).

Alternative A13 Mandatory HMS identification workshops for all commercial vessel owners (longline, CHB, General category, and handgear/harpoon)

Alternative A13 would require mandatory HMS identification workshops for all commercial vessel owners. Attendance and successful completion of a workshop would be linked to an owner's ability to renew an HMS fishing permit. Without a certificate indicating successful completion of the workshop, an HMS permit would not be issued to the vessel. Certification would be renewed on a 2, 3, or 5-year timetable (See alternative A16).

Alternative A14 Mandatory HMS identification workshops for all commercial vessel operators (longline, CHB, General category, and handgear/harpoon)

Alternative A14 would require mandatory HMS identification workshops for all commercial vessel operators. Certification would be renewed on a 2, 3, or 5-year timetable (See alternative A16).

Alternative A15 Mandatory HMS identification workshops for all HMS Angling permit holders

Alternative A15 would require mandatory HMS identification workshops for all HMS Angling permit holders, the largest category of HMS permit holders. Attendance and successful completion of a workshop would be linked to an angler's ability to renew an HMS Angling fishing permit. Without a certificate indicating successful completion of the workshop, no HMS Angling permit would be issued. Certification would be renewed on a 2, 3, or 5-year timetable (See alternative A16).

Alternative A16 *Certification Renewal Timetable (Certification renewal every 3-years) – Preferred Alternative*

Alternative A16 would require renewal of mandatory workshop certifications on a specific timetable (*i.e.*, every 2, 3, or 5-years). Certification renewal may be conducted in person, via the internet, or by mailing and distribution of additional material (*e.g.*, DVDs, Videos, *etc.*). This alternative would be combined with any of the mandatory workshop alternatives listed above.

Other workshop alternatives considered but not further analyzed at this time

Alternative A17 Compliance With, and Understanding of, HMS Regulations

Constituents have expressed concern over the complexity of HMS regulations. Workshops providing a thorough explanation of HMS regulations and management history would likely be beneficial and may result in improved public relations on the behalf of the Agency, improved compliance with regulations, and understanding of the HMS regulatory process.

During the scoping process for the Issues and Options Paper and Pre-draft for this document, NMFS received comments noting that workshops held by the agency should be prioritized. Furthermore, comments received were supportive of continuing to disseminate information pertaining to HMS regulations (*i.e.*, Annual HMS Compliance Guide) rather than spending Federal dollars to hold workshops on regulations at this time. Advisory Panel members

were supportive of focusing on mandatory requirements (*i.e.*, workshops required under Biological Opinions and other mandates) first and then following up with additional hard copy outreach material to meet regulatory informational needs. Since NMFS already disseminates this type of information on an annual basis and given that this information can be distributed to participants attending either the handling/release and/or identification workshops, this alternative is not being further analyzed at this time. NMFS may reconsider this alternative in the future, if appropriate.

2.1.2 Time/Area Closures

Time-area closures, first implemented for Atlantic HMS beginning in 1999, have proven to be effective at reducing bycatch, to the extent practiable (Chapter 4). Despite these closures, several non-target HMS such as blue and white marlin, sailfish, and bluefin tuna are overfished and overfishing is still occurring, and protected species, such as leatherback and loggerhead sea turtles, continue to interact with HMS gears. As a result, NMFS is considering additional closures or modifications to existing closures to further reduce these interactions. The first time/area closure for HMS was implemented in the 1999 FMP with the Northeastern U.S. closure off New Jersey in June 1999 to reduce bluefin tuna discards. Since then, additional closures have been implemented in the DeSoto Canyon (2000), Florida East Coast (2001), Charleston Bump, and Northeast Distant (2001), and the Mid-Atlantic shark closed area (2005) (Figure 2.1). The goal of all of the HMS time/area closures is to: (1) maximize the reduction in bycatch; (2) minimize the reduction in the target catch of other species; (3) consider impacts on the incidental catch of other species to minimize or reduce incidental catch levels; and 4) optimize survival of bycatch and incidental catch species.

NMFS considered the following alternatives, ranging from the no action alternative of maintaining existing closures to a complete prohibition of certain HMS gear types. Some of the alternatives are grouped according to the specific objectives of the closed areas. Thus, alternatives B2(a) through B2(k) consider new closure areas for HMS to address primarily white marlin, bluefin tuna, and sea turtle bycatch, whereas alternatives B3(a) through B3(d) consider alternatives for modifying existing closures. For details on the methods used to consider alternatives and select alternatives for further analysis see Section 4.1.2 and Appendix A.

Alternative B1 Maintain existing time/area closures; no new time/area closures (No Action)

This alternative would maintain the existing time/area closures, and would not implement any new time/area closures. The current time/area closures are shown in Figure 2.1.

Alternative B2(a) Prohibit the use of pelagic longline gear in HMS fisheries in the central portion of the Gulf of Mexico from May through November (7 months)

This alternative would prohibit the use of pelagic longline gear by all U.S. flagged-vessels permitted to fish for HMS in the central portion of the Gulf of Mexico where blue and white marlin, sailfish, spearfish, bluefin tuna, and leatherback and loggerhead sea turtles have been observed and reported caught year-round, but with highest concentrations from May through November. This closure would encompass approximately 11,991 square nautical miles (nm^2)

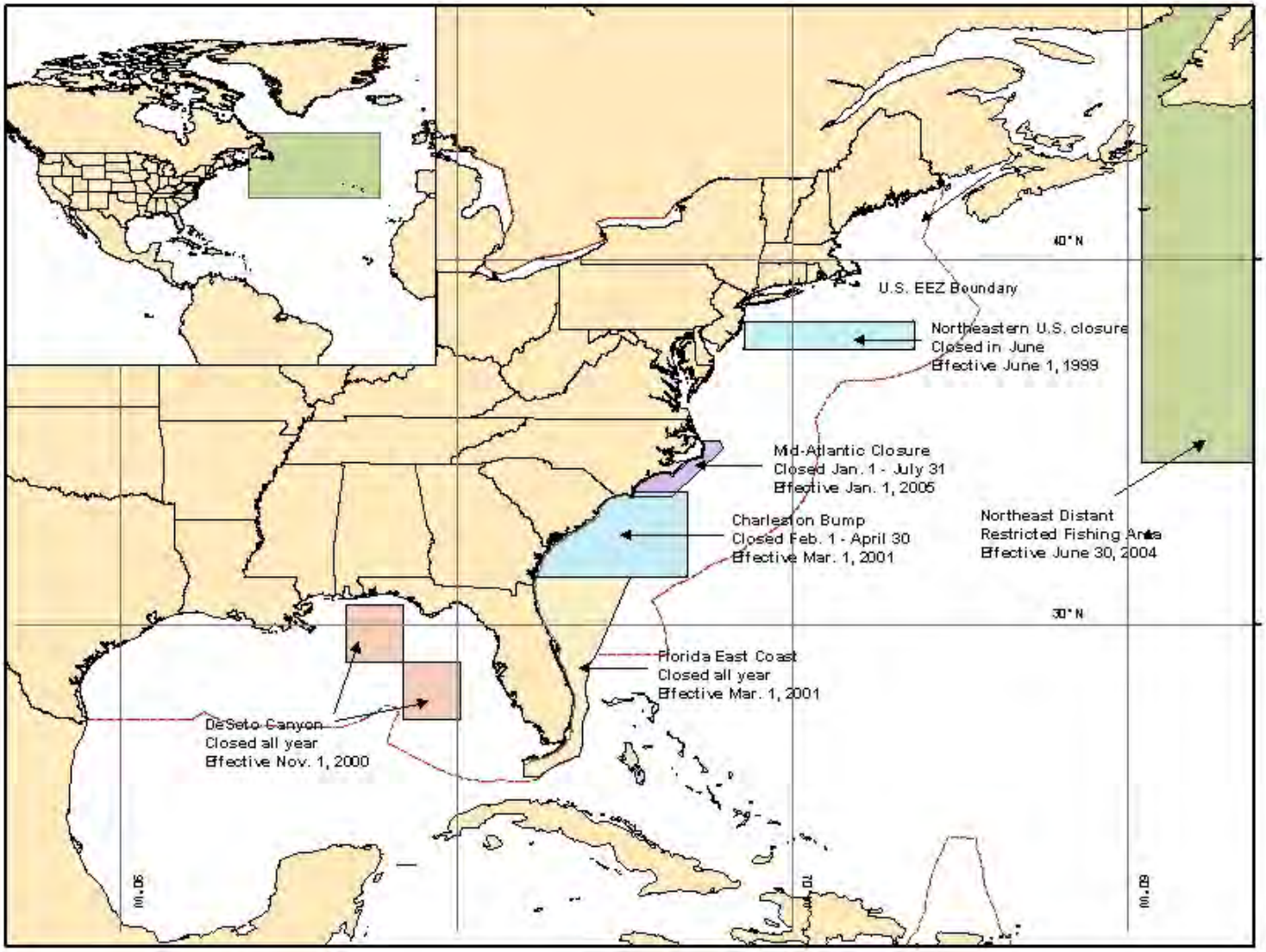

Figure 2.1 **Existing time/area closures in HMS fisheries. Inset shows extent of the Northeast Distant restricted fishing area. All closures except the Mid-Atlantic are applicable to pelagic longline gear only. The Mid-Atlantic Closure is applicable to bottom longline gear only**

and would be defined as the area within the following coordinates, beginning with the northeastern corner and proceeding clockwise: 27º 10’ N. latitude (Lat.), 90º 29’ W. longitude (Long.); 25º 47’ N. Lat., 90º 29’ W. Long.; 25º 47’ N. Lat., 93º 10’ W. Long.; 27º 10’ N. Lat., 93º 10’ W. Long (Figure 4.7 in Chapter 4).

Alternative B2(b) Prohibit the use of pelagic longline gear in HMS fisheries in and area of the Northeast during the month of June (1 month)

This alternative would prohibit the use of pelagic longline gear by all U.S. flagged-vessels permitted to fish for HMS in a portion of the Northeast where large numbers of bluefin tuna are discarded during the month of June. This closure would encompass approximately 2,251 nm^2 and would be defined as the area within the following coordinates, beginning with the northern-most corner and proceeding clockwise: 41º 15’ N. Lat., 66º 41’ W. Long.; 40º 48’ N. Lat., 66º 14’ W. Long.; 39º 50’ N. Lat., 67º 22’ W. Long.; 40º 17’ N. Lat., 67º 49’ W. Long (Figure 4.7 in Chapter 4).

Alternative B2(c) Prohibit the use of pelagic longline gear in HMS fisheries in the Gulf of Mexico from April through June (3 months)

This alternative would prohibit the use of pelagic longline gear by all U.S. flagged-vessels permitted to fish for HMS in a central portion of the Gulf of Mexico from April through June (three months). The area was mainly considered to protect bluefin tuna that spawn in the Gulf of Mexico. NMFS took into account information received in a petition for rulemaking to consider a closure to reduce bluefin tuna discards in a reported spawning area in the Gulf of Mexico (Blue Ocean Institute *et al*., 2005; Block *et al*., 2005). This closure would encompass approximately 101,670 nm^2 and would be defined as the area within the following coordinates, beginning with the northwest corner and proceeding clockwise: 28° 00’ N. Lat., 96° 00’ W. Long.; 28° 00’ N. Lat., 92° 00’ W. Long.; 29° 00’ N. Lat., 92° 00’ W. Long.; 29° 00’ N. Lat., 86° 00’ W. Long.; 28° 00’ N. Lat., 86° 00’ W. Long.; 28° 00’ N. Lat., 85° 00’ W. Long.; 27° 00’N. Lat., 85° 00’ W. Long.; 27° 00’ N. Lat., 86° 00’ W. Long.; 26° 00’ N. Lat., 86° 00’ W. Long.; 26° 02’ N. Lat., 86° 17’ W. Long.; following the EEZ until 26° 00’ N. Lat., 96° 00’ W. Long (Figure 4.7 in Chapter 4).

Alternative B2(d) Prohibit the use of pelagic longline gear in HMS fisheries in the Gulf of Mexico west of 86 degrees W. Longitude year-round

This alternative would prohibit the use of pelagic longline gear by all U.S. flagged-vessels permitted to fish for HMS in the Gulf of Mexico west of 86 degrees W. Longitude year-round, thus eliminating an area where approximately 50 percent of all effort (Atlantic, Gulf of Mexico, and Caribbean) and 90 percent of all effort in the Gulf of Mexico has been reported in recent years (2001 – 2003). This area was mainly considered to help reduce the number of interactions with leatherback sea turtles. This closure would encompass an area 162,181 nm^2 west of 86° 00’ W. Long., 25° 00’ N. Lat. between the State Territorial Sea and the EEZ boundary (Figure 4.7 in Chapter 4).

Alternative B2(e) Prohibit the use of pelagic longline gear in HMS fisheries in an area of the Northeast to reduce sea turtle interactions

This alternative would prohibit the use of pelagic longline gear by all U.S. flagged-vessels permitted to fish for HMS in the Northeast year-round. The area was considered primarily to reduce loggerhead sea turtle interactions which occur with greater frequency there than in nearly all other areas. This closure would encompass a 46,956 nm^2 area and would be defined as the area within the following coordinates, beginning with the western-most corner and proceeding clockwise: 39° 59' N. Lat., 71° 50' W. Long.; 41° 18' N. Lat., 66° 26' W. Long.; 40° 27' N. Lat., 66° 42' W. Long.; 37° 53' N. Lat., 70° 28' W. Long (Figure 4.7 in Chapter 4).

Alternative B3(a) Modify the existing Charleston Bump time/area closure to allow the use of pelagic longline gear in all areas seaward of the axis of the Gulf Stream

This alternative would modify the existing Charleston Bump time/area closure by moving the eastern boundary at 76º W. Long. to the west following the axis of the Gulf Stream from the existing northeast corner of the closure southwest to 31º N. Lat., 79º 16' Long. This alternative would reopen areas seaward of the axis of the Gulf Stream previously closed to pelagic longline gear from February 1 through April 30, and help offset reduction of targeted species created by any new closures. In particular, this alternative would provide additional opportunity to harvest North Atlantic swordfish, which are no longer experiencing overfishing, and for which the quota has not been harvested in recent years (Figure 4.9).

Alternative B3(b) Modify the existing Northeastern U.S. time/area closure to allow the use of pelagic longline gear in areas west of 72º 47' W. Long. during the month of June

This alternative would modify the existing Northeastern U.S. time/area closure boundary to allow pelagic longline gear in areas west of 72º 47' W. Long. during the month of June. This alternative would reopen an area in which there were historically low numbers of bluefin tuna discards, and where recent data indicates limited or no discards of bluefin tuna during much of the year. This alternative would help offset reduction of targeted species created by any new closures. This alternative would also provide additional opportunity to harvest North Atlantic swordfish and other targeted HMS such as yellowfin tuna (Figure 4.9).

Alternative B4 *Implement complementary HMS management measures in Madison-Swanson and Steamboat Lumps Marine Reserves from November through April (6 months) – Preferred alternative*

This alternative would implement complementary HMS management measures in the Madison-Swanson and Steamboat Lumps Marine Reserves, consistent with Gulf of Mexico Fishery Management Council (GOMFMC) recommendations. These reserves would prohibit all HMS fishing from November through April and allow surface trolling only from May through October. If implemented, the HMS management measures would expire on June 16, 2010, consistent with GOMFMC recommendations. Both of these reserves are located just shoreward of the Desoto Canyon Closed Area. The Madison-Swanson Marine Reserve is 115 nm^2 in size,

rectangular-shaped, and is positioned southwest of Apalachicola, FL (29° 17' N. Lat., 85° 50' W. Long. to 29° 17' N. Lat., 85° 38' W. Long. to 29° 06' N. Lat., 85° 38' W. Long. to 29° 06' N. Lat., 85° 50' W. Long.). The Steamboat Lumps marine reserve is 104 nm^2 in size, rectangular-shaped, and is positioned due west of Clearwater, FL (28° 14' N. Lat., 84° 48' W. Long. to 28° 14' N. Lat., 84° 37' W. Long. to 28° 03' N. Lat., 84° 37' W. Long. to 28° 03' N. Lat., 84° 48' W. Long. (Figure 4.13)

Alternative B5 *Establish criteria to consider when implementing new time/area closures or making modifications to existing time/area closures – Preferred alternative*

This alternative would establish criteria for regulatory framework adjustments for implementing new time/area closures or making modifications to existing time/area closures. These criteria would provide greater transparency in the decision making process, and allow fishermen more ability to plan for future changes. Criteria that would be considered, consistent with the FMP, the Magnuson-Stevens Act, and other applicable law, may include the following: any ESA-related issues, concerns, or requirements, including applicable Biological Opinions; bycatch rates of protected species, prohibited HMS, or non-target species both within the specified or potential closure area(s) and throughout the fishery; bycatch rates and post-release mortality rates of bycatch species associated with different gear types; new or updated landings, bycatch and fishing effort data; evidence or research indicating that changes to fishing gear and/or fishing practices can significantly reduce bycatch; social and economic impacts; and the practicability of implementing new or modified closures compared to other bycatch reduction options. If the species is an ICCAT managed species, NMFS would need to determine the overall effect of the United States' catch on that species before implementing time/area closures.

Currently, NMFS is also considering modifying current closed areas using these same criteria and GIS mapping techniques to better pinpoint areas of low bycatch within closed areas (based on catch data from pelagic logbooks collected before an area was closed) (see Section 4.1.2). The current time/area closures were not intended to be permanent. Rather, NMFS intended to modify existing closures, as necessary, to allow utilization of a given fishery once the objective of the time/area closure had been met. Additionally, because fisheries, fishing gear, fishing practices, and stock status change over time, occasionally NMFS must examine the continued need for existing time/area closures. One method of doing this would be for NMFS to conduct, fund, or support research, such as testing methods for reducing bycatch of protected, prohibited, and non-target species. Such research would need to be part of a scientifically-justified research plan, identifying the rationale, objectives, methodology and experimental design of the research, and it would be limited in scope and magnitude in terms of ecological and socio-economic impact. Research in both open and closed areas would be warranted to collect data on the spatial and temporal relationship between target and bycatch species and to provide data for use in considering the criteria listed above. Such research could be cooperative in nature to include different stakeholders in the process.

Alternative B6 Prohibit the use of bottom longline gear in an area southwest of Key West to protect endangered smalltooth sawfish

This alternative would prohibit the use of bottom longline gear by all U.S. flagged vessels permitted to fish for HMS in an area southwest of Key West where smalltooth sawfish have been observed and caught year-round. This area would encompass approximately 49 nm^2 and would be defined as the area on the southwest tip of Key West, bordering the State Territorial Sea with the following coordinates, beginning with the northwest corner and proceeding clockwise: 24° 29' N. Lat., 82° 06' W. Long.; 24° 29' N. Lat., 82° 02' W. Long.; 24° 24' N. Lat., 81° 58'W. Long.; 24° 23' N. Lat., 81° 58' W. Long.; 24° 23'N. Lat., 82° 06' W. Long (Figure 4.15)

Alternative B7 Prohibit the use of pelagic longline gear in HMS fisheries in all areas

This alternative would prohibit the use of pelagic longlines in HMS fisheries in all areas to enhance the rebuilding of overfished stocks and reduce bycatch and bycatch mortality.

Other time/area closure alternatives considered but not further analyzed at this time

Below are a number of closure alternatives that, for one reason or another, were considered and then eliminated before being fully analyzed. The descriptions below include the reasons why the alternatives were not further analyzed at this time. More detail can be found in Appendix A. These alternatives may be considered in the future as needed.

Alternative B2(f)	Prohibit the use of pelagic longline gear in HMS fisheries in the central portion of the Gulf of Mexico in an area similar to, but larger than the area considered in alternative B2(a), from May through November (7 months)
Alternative B2(g)	Prohibit the use of pelagic longline gear in an area off the Northeast Atlantic coast from the 200 meter contour to the 2000 meter contour between the eastern tip of Georges Bank (66º 10' W Long.) to Cape Hatteras (35º N Lat.) from June through October
Alternative B2(h)	Prohibit the use of pelagic longline gear in an area off the Southeast Atlantic coast from the 200 meter contour to the 2000 meter contour between Cape Hatteras (35º N Lat.) and Cape Canaveral (29º N Lat.) from March through November
Alternative B2(i)	Prohibit the use of pelagic longline gear in an area adjacent to the eastern boundary of the existing Florida East Coast closure from 29º N to 28º 25' N and seaward to the 2000 meter contour year-round
Alternative B2(j)	Prohibit the use of pelagic longline gear in HMS fisheries in the Gulf of Mexico from the 200 meter contour to the 2000 meter contour from the Straits of Florida (82º W Long.) to the border between the United States and Mexico (26º N Lat.) year-round
Alternative B2(k)	Prohibit the use of pelagic longline gear in HMS fisheries in the Caribbean from the 200 meter contour to the 2000 meter contour on the west coast of Puerto Rico during certain times of the year
Alternative B3(c)	Modify the Florida East Coast time/area closure to allow the use of pelagic longline gear in the northeast and southwest corners of the existing closure
Alternative B3(d)	Modify the existing DeSoto Canyon time/area closure to allow the use of pelagic longline gear in all areas seaward of the 2000 meter contour

Alternative B2(f) would prohibit the use of pelagic longline gear by all U.S. flagged-vessels permitted to fish for HMS in a portion of the central Gulf of Mexico. This is similar to, but larger than the area described in alternative B2(a), where blue and white marlin, sailfish, spearfish, bluefin tuna, and sea turtles have been observed and caught year-round, but with highest concentrations occurring from May through November. Without redistribution of fishing effort, this closure would result in a large decrease in leatherback sea turtle discards for a year-round closure (Table A.9 in Appendix A), and could still potentially result in a relatively large decrease in the number of discards for blue and white marlin when only a seasonal closure is considered (Tables A.1 and A.2 in Appendix A). This closure would encompass approximately 17,219 nm^2 and would be defined as the area within the following coordinates, beginning with the northeastern corner and proceeding clockwise: 27º 10' N latitude (Lat.), 89º 11' W. longitude (Long.); 25º 44' N. Lat., 89º 11' W. Long.; and following the EEZ boundary to 26º 10' N. Lat., 93º 10' W. Long.; 27º 10' N. Lat., 93º 10' W. Long.

When redistribution of fishing effort was considered, a seven-month closure for alternative B2(f) was predicted to result in slightly fewer discards of all species considered compared to the year-round closure, with the exception of leatherback sea turtles and bluefin tuna (Table A.2 versus Table A.9 in Appendix A). However, in general, even a seasonal closure in this area could have resulted in an increase in the number of swordfish, bluefin tuna, and bigeye tuna discards (2,081, 219 and 150 discards over three years for the seven-month closure, respectively; Table A.5 in Appendix A). Thus, this closure could have resulted in negative ecological impacts and was not further analyzed.

Alternatives B2(g) – (k) were considered due to their overlap with existing EFH areas for white marlin and information indicating bycatch of non-target HMS species as well as sea turtles. NMFS specifically took into account five suggested white marlin time/area closures in the U.S. EEZ described on page 10 in a February 14, 2002, letter from the Biodiversity Legal Foundation, re: Atlantic White Marlin Critical Habitat Designation. NMFS agreed to take these five areas into account, among other things, as part of a settlement agreement in Center for Biological Diversity v. NMFS, Civ. Action No. 04-0063 (D.D.C.), which is awaiting approval from the court. Data from the pelagic longline (PLL) logbook and pelagic observer program (POP) were analyzed for these specific areas to determine the percent reduction in discards with and without redistribution of fishing effort (described in detail in Chapter 4and Appendix A). The analyses indicated that, while there may be some benefit from closures without the redistribution of fishing effort, in nearly all cases, bycatch increased with the redistribution of fishing effort in one or more of these areas, or other areas had higher rates of bycatch and produced better results in the redistribution of fishing effort analyses. Additionally, because these alternatives follow contour lines, they would be difficult to enforce and difficult for fishermen to know if they were fishing inside a closed area or not. Therefore, while NMFS presents some analyses here and in Appendix A, alternatives B2(g) – (k) were not further analyzed in Chapter 4.

Alternative B2(g) would prohibit the use of pelagic longline gear by all U.S. flagged-vessels permitted to fish for HMS in portions of the Northeast in areas where white marlin are concentrated during certain times of the year and have been observed and reported caught from June through October. This time period also corresponds to higher catches of all other species

considered (blue marlin, sailfish, spearfish, leatherback and loggerhead sea turtles and bluefin tuna; Table A.10 in Appendix A). Without considering redistribution of fishing effort, closing B2(g) could result in a reduction in the number of discards for all species considered (Tables A.1 and A.2 in Appendix A). However, when redistribution of fishing effort was considered, there was a predicted increase in the number of discards for white marlin, blue marlin, sailfish, spearfish, leatherback and other sea turtles, with the largest increase in discards expected for blue marlin, sailfish, and spearfish (20.2, 23.2, and 14. 5 percent, respectively; Table A.2 in Appendix A). Loggerhead sea turtles were the only species with an expected decrease in discards under the redistribution model. Therefore, this alternative was not further analyzed.

Alternative B2(h) would prohibit the use of pelagic longline gear and/or other HMS gears, by all U.S. flagged-vessels permitted to fish for HMS in portions of the Southeast where white marlin are concentrated during certain times of the year and have been observed and caught year-round. Without considering redistribution of fishing effort, the model predicted a small decrease in the number of discards, with the exception of sailfish (Tables A.1 and A.2 in Appendix A). When redistribution of fishing effort was considered, the ecological impacts of B2(h) would likely be minor (the predicted decreases in the number of discards were small and typically less than six percent (Table A.2 in Appendix A) there would be almost no decrease in the number of discards for blue marlin, a slight increase in the number of discards for white marlin, and a moderate increase in the number of discards of both leatherback and loggerhead sea turtles (Tables A.1 and A.2 in Appendix A). Thus, given the minimal ecological benefits for some species, the negative ecological impact for white marlin and sea turtles, and potential negative economic impact of this closure, this alternative was not further analyzed.

Alternative B2(i) would prohibit the use of pelagic longline gear by all U.S. flagged-vessels permitted to fish for HMS in portions of the Florida East Coast where white marlin are concentrated during certain times of the year and have been observed and caught year-round. Without considering redistribution of fishing effort, B2(i) could have decreased discards for all species considered, most notably blue marlin (12.9 percent; Table A.2 in Appendix A). When redistribution of fishing effort was considered, the model predicted only slight decreases in discards of white and blue marlin, sailfish and loggerhead sea turtles, with all decreases less than ten percent (Table A.2 in Appendix A). However, there were predicted increases in spearfish, leatherback sea turtle, and bluefin tuna discards (Tables A.1 and A.2 in Appendix A). Thus, given the potential negative ecological impacts of this closure, this alternative was not further analyzed.

Alternative B2(j) would prohibit the use of pelagic longline gear and/or other HMS gears, by all U.S. flagged-vessels permitted to fish for HMS in portions of the Gulf of Mexico where white marlin are concentrated during portions of the year and have been observed and reported caught year-round. Without considering redistribution of fishing effort, B2(j) could have decreased discards of all species considered, especially blue marlin, sailfish and spearfish (21.6, 43.1, 25.5 percent, respectively; Table A.2 in Appendix A). However, when redistribution of fishing effort was considered, the model predicted an increase in the number of discards, especially for loggerhead sea turtles (22.1 percent; Table A.2 in Appendix A). While there were predicted decreases in discards of sailfish and spearfish (Tables A.1 and A.2 in Appendix A), the net effect could be a negative ecological impact, so this alternative was not further analyzed.

Alternative B2(k) would prohibit the use of pelagic longline gear by all U.S. flagged-vessels permitted to fish for HMS in portions of the Caribbean where white marlin are concentrated and have been observed and caught during certain times of the year. Bycatch occurs primarily from January through April, and December. While there are some reported discards for white and blue marlin, even without considering redistribution of fishing effort, the predicted percent reduction in the number of hooks and discards associated with B2(k) was extremely low (Tables A.1 and A.2 in Appendix A). When redistribution of fishing effort was considered, there was only a slight decrease in the number of discards for white and blue marlin, whereas there were slight increases in the number of discards for all other species considered (less than two percent; Table A.2 in Appendix A.2). Thus, the overall ecological impact due to this time/area closure would probably be relatively minor, resulting in no net decrease in discards of the species considered. Therefore, this alternative was not further analyzed.

In terms of modifications to existing time/area closures (alternatives B3(c) – (d)), the proportion of discarded swordfish versus the number of swordfish kept (Table A.25 in Appendix A) varied among the modifications. Both alternatives B3(c) and B3(d) resulted in a larger proportion of discarded swordfish than alternatives B3(a) or B3(b) (Table A.25 in Appendix A). Minimizing the number of swordfish caught in B3(d) is important because the average swordfish size was significantly smaller ($P = 0.03$) in the modified area (i.e., "outside") compared to the closed areas (i.e., "inside" area; Figures A.3 in Appendix A). In addition, the average swordfish size in this area was smaller than the minimum size limit of 117 cm LJFL (Table A.21 in Appendix A). There were also a lower proportion of bluefin tuna discards in the B3(a) and B3(b) modifications compared to B3(c) and B3(d). However, B3(c) and B3(d) could potentially result in higher catches of yellowfin, bigeye, and BAYS tuna than either B3(a) or B3(b) (Table A.25 in Appendix A).

In terms of bycatch, B3(c) or B3(d) could result in the highest bycatch levels of white and blue marlin, and sailfish; almost 2.5 times as many white marlin, at least four times as many blue marlin, and at least ten times as many sailfish could be discarded in the B3(c) and B3(d) modifications compared to the B3(a) or B3(b) modification (Table A.24 in Appendix A). Such high levels of bycatch associated with B3(c) or B3(d) may have a larger negative ecological impact compared to B3(a) or B3(b); thus, NMFS only analyzed alternatives B3(a) and B3(b) in Chapter 4.

Alternative B3(c) would modify the Florida East Coast time/area closure by moving the eastern boundary at 27º N Lat., 30' W Long. west to the axis of the Gulf Stream, and then following the axis of the Gulf Stream north to 31º N Lat., 79º 20' W Long. B3(c) would also move the southernmost boundary of the Florida East Coast closure north from 24º 00' N Lat. to 24º 10' N Lat. between 81º 47' and 81º 00'W Long. This alternative would reopen these areas to pelagic longline gear year-round and help offset reduction of targeted species created by any new closures. However, compared to the alternatives further analyzed (B3(a) and B3(b)), this modification would have resulted in higher bycatch, especially for blue marlin (Table A.24). Although B3(c) could have resulted in an increase in the number of swordfish, yellowfin tuna, and bigeye tuna landed, it could have also increased the number of swordfish, bluefin, yellowfin and bigeye tuna discards (Table A.25). Thus, given the potential negative ecological impact of

this modification, especially compared to the other modifications considered, this alternative was not further analyzed.

Alternative B3(d) would modify the existing DeSoto Canyon time/area closure boundary to allow pelagic longline gear in areas seaward of the 2000 meter contour from 26º N Lat., 85º 00' W Long., to 29º N Lat., 88º 00' W Long. B3(d) would reopen this area to pelagic longline gear year-round and help offset reduction of targeted species created by any new closures. However, of the four modifications to current time/area closures that have been considered, this modification had the highest potential number of total discards of all the species considered, especially for sailfish (Table A.24 in Appendix A). In addition, B3(d) could result in a higher percentage of swordfish discards (Table A.25 in Appendix A). Minimizing discards in this area would be particularly important because the average size swordfish that was caught in this area previous to the year 2000 was smaller than the minimum size limit of 117 cm LJFL (Table A.21 in Appendix A). Thus, given the potential negative ecological impact of this modification, especially when compared to the other considered modifications, this alternative was not further analyzed.

2.2 Rebuilding and Preventing Overfishing

2.2.1 Northern Albacore Tuna

In the October 1999 Report to Congress on the Status of U.S. Fisheries, NMFS identified the northern albacore tuna stock as overfished. Alternatives for developing a rebuilding plan for northern albacore tuna were presented and discussed in a proposed rule issued on May 24, 2000 (65 FR 33519), and in the supporting EA/RIR/IRFA. The alternatives considered included no action, a unilateral U.S. action plan, and a ten-year international rebuilding program negotiated through ICCAT. NMFS requested comment on those rebuilding alternatives and commenters noted that a rebuilding program for northern albacore tuna must reflect the magnitude of current landings and consider year-to-year variability in the U.S. commercial and recreational fisheries. In the final rule, NMFS indicated that, in establishing the foundation for an international rebuilding program, it would work through ICCAT to adopt a target stock size together with a time frame for rebuilding that included flexibility (65 FR 77523, December 12, 2000).

Since the final rule, the U.S delegation to ICCAT has advocated a total allowable catch (TAC) for northern albacore tuna set at a level less than the current estimate of replacement yield (34,500 mt ww). Other ICCAT members have not shared the U.S. position that immediate catch reductions were needed to rebuild the spawning stock biomass to levels that would support MSY. Consequently, ICCAT has responded by adopting a series of recommendations (annually for 2000 - 2003) to set a TAC at the replacement yield level of 34,500 mt ww through 2006, together with country specific allocations in order to control compliance. In addition, the 1998 recommendation on limiting vessel capacity for northern albacore has remained in force. Irrespective of the established TAC, reported catches have been significantly below the replacement yield level in recent years. Major harvesters (European Union countries) have attributed the decline in catches to gear changes (shifting from banned gillnets to trolling) and to availability (fish concentrations further offshore under prevailing oceanographic conditions) rather than further declines in abundance. If true, the low catches in recent years may have allowed some rebuilding to occur. Depending on the results of the scheduled 2007 stock

assessment, the United States will continue to seek an international northern albacore tuna rebuilding program with a target stock level, a time table, and reference points. In order to rebuild the stock, if the 2007 assessment indicates a similar level of stock abundance below $B_{MSY,}$ ICCAT would likely have to set the TAC at replacement level or below. The U.S. landings alone, at around two percent, would likely not provide enough harvest reduction to rebuild the stock. This measure would incorporate the northern albacore rebuilding program through ICCAT into this consolidated HMS FMP. As noted above, NMFS previously took comment on the following northern albacore rebuilding alternatives but welcomes further public comment at this time.

Alternative C1 Maintain compliance with the current ICCAT recommendation (No Action)

Under Alternative C1, NMFS would continue to monitor U.S. northern albacore tuna fisheries to stay in compliance with the ICCAT-recommended annual U.S. TAC of 607 mt ww.

Alternative C2 Unilateral proportional reduction of United States northern albacore tuna fishing mortality

Alternative C2 would establish a reduction in fishing mortality of northern albacore tuna in U.S. fisheries. This would be a unilateral action setting a proportional reduction below the current TAC in an effort to begin rebuilding the northern albacore stock. A variety of measures designed to reduce mortality would be examined, including but not limited to: seasonal closures, closed areas, quota restrictions, size limits, and retention limits. Those measures found to be appropriate would be implemented as domestic regulation through separate rulemaking.

Alternative C3 *Establish the foundation with ICCAT for developing an international rebuilding program – Preferred Alternative*

Under alternative C3, the United States would continue to work through ICCAT to establish a stock size and rebuilding plan time frame consistent with the Magnuson-Stevens Act. Such an international rebuilding program should ensure rebuilding to a level capable of producing MSY with a target stock level, a timetable, and reference points. Once a plan was established, the United States would comply with ICCAT recommendation(s), with domestic regulatory action taken as necessary. Alternative C3 would not require any immediate domestic regulatory action.

2.2.2 Finetooth Sharks

The following alternatives explore a range of management options available to address overfishing of finetooth sharks. The 2002 stock assessment for Small Coastal Sharks (SCS) found that overfishing was occurring on finetooth sharks. A more detailed description of the 2002 SCS assessment can be found in Section 3.2.5.

Alternative D1 Maintain current regulations for recreational and commercial fisheries (No Action)

This alternative would maintain fishing mortality at current levels. Finetooth sharks are managed for recreational and commercial fisheries within the SCS species complex. Commercial fisheries are managed under a limited access permitting system where new entrants to the fishery must get a previously held permit transferred to their vessel, subject to upgrading restrictions. There are approximately five vessels that target SCS with gillnet gear and these vessels are subject to extensive observer coverage. There is no SCS trip limit for directed permit holders; however, incidental permit holders are limited to 16 SCS and pelagic sharks combined per vessel per day. Between 1999 and 2003, commercial landings of SCS ranged from 249 - 330 mt dw, well below the quota established for SCS. Most finetooth sharks are landed by vessels not targeting sharks, with gillnet gear, in the South Atlantic region. Recreational anglers must possess an HMS Angling permit and are subject to a bag limit of one shark (including finetooth shark) greater than 54 inches FL (137 cm) per vessel per day. Between 2000 and 2003, 6,732 and 5,742 finetooth sharks were reported to the Marine Recreational Fisheries Statistics Survey (MRFSS) in the South Atlantic and Gulf of Mexico, respectively.

Alternative D2 Implement commercial management measures to reduce fishing mortality of finetooth sharks

This alternative would implement management measures to reduce finetooth shark fishing mortality in commercial fisheries targeting sharks. These measures would affect all vessels in possession of a Federal limited access shark permit and targeting sharks. These actions may include any combination of the following measures, including: a directed trip limit for SCS, gillnet gear restrictions, prohibiting the use of gillnet gear for landing sharks, reduced soak time for gillnets, and reducing the overall SCS quota.

Alternative D3 Implement recreational management measures to reduce fishing mortality of finetooth sharks

This alternative would implement measures aimed at reducing fishing mortality of finetooth sharks in HMS recreational fisheries. This alternative may require the use of circle hooks when targeting SCS, and/or increase the minimum size for retention of finetooth sharks. Currently, anglers may retain one shark over 137 cm (54 inches) per vessel per trip and are permitted to use circle and J hooks. This alternative would not affect the minimum size for possession of other sharks.

Alternative D4 *Identify sources of finetooth shark fishing mortality to target appropriate management actions – Preferred Alternative*

Landings data from dealer reports, compared to observer data from the Directed Shark Gillnet Fishery Observer Program (DSGFOP) indicate that the five vessels currently targeting sharks with gillnets are not landing a significant portion of the total catch of finetooth sharks (Tables 4.41 and 4.42). This alternative would identify sources of finetooth shark fishing mortality in commercial fisheries that are not targeting sharks, but landing them incidentally to other species. Table 2.1 describes activities, anticipated results, and a timeline associated with alternative D4. Vessels that possess Federal shark limited access permits, but are targeting other fish such as king and Spanish mackerel, croaker, southern kingfish, and bluefish, may not be

reporting all their catches in logbooks and have not been selected for observer coverage comparable to HMS vessels targeting sharks with gillnets. Furthermore, there may be landings in state waters by state fishermen that the Agency has not yet quantified.

Continuation of a pilot program initiated in the spring of 2005 that places observers from the Directed Shark Gillnet Fishery Observer Program (DSGFOP) on commercial gillnet vessels that possess either directed or incidental shark permits will provide NMFS with more accurate estimates as to the contribution of these fisheries to the overall fishing mortality of finetooth sharks. Furthermore, there may be significant bycatch of finetooth sharks in the Gulf of Mexico shrimp trawl fishery as this fishery targets coastal areas less than 20 m water depth. Including finetooth sharks as a select species in this fisheries' observer program may improve estimates of fishing mortality and result in additional catch series data for the upcoming stock assessment. Furthermore, the United States Coast Guard (USCG) and Texas Parks and Wildlife Department (TXPWD) have informed NMFS that another source of undocumented finetooth shark fishing mortality occurs as a result of illegal fishing by Mexican gillnet vessels in the U.S. EEZ in the Gulf of Mexico. Seized catches have included finetooth sharks and NMFS would like to increase collaborative efforts to reduce this mortality as it may be impacting other species as well. Finetooth sharks are difficult to properly identify; therefore, workshops proposed in this rulemaking (alternative A9) for shark dealers on species identification may facilitate improved quota monitoring and ensure that data received from shark dealers are more accurate.

Table 2.1 Summary of activities, anticipated results, and associated timelines for preventing overfishing of finetooth sharks.

Activity	Anticipated Result	Timeline
Send letters to state and Federal management agencies to determine sources of finetooth mortality and follow-up with designees	Expand information on fisheries that are landing finetooth sharks within the purview of Councils, Commissions, and state agencies; expand available data for SCS assessment	06/2005 (*letters completed, follow up on-going*)
Expand DSGFOP to include all vessels with directed or incidental shark permits and gillnet gear on board	Increase landings information on finetooth sharks landed with gillnet gear in Federal waters of the South Atlantic, expand available data for SCS assessment	2005 (pilot program, expansion of DSGFOP, *in progress*) 2006 (official inclusion of additional vessels in selection for coverage under DSGFOP)
Include finetooth sharks as a select species in the Shrimp Trawl Fishery Observer Program in the Gulf of Mexico	Increase bycatch landings information in the GOM shrimp trawl fishery, expand bycatch data for SCS assessment	2006
Implement identification workshops for shark dealers (alternative A9)	Improve species identification skills; improve General Canvass (dealer) data reports	2007
SCS stock assessment	Updated information on the status of finetooth sharks in the Atlantic Ocean	2007

Activity	Anticipated Result	Timeline
Propose additional management measures as necessary	Based on stock assessment and investigating other sources of mortality, implement commercial and/or recreational management measures as necessary to prevent overfishing	2008

Other finetooth shark alternatives considered but not further analyzed at this time

Alternative D5 Prohibit landings of finetooth sharks in commercial and recreational fisheries.

This alternative would add finetooth sharks to the prohibited species list for commercial and recreational fisheries. Commercial and recreational fishermen would not be able to land and/or possess finetooth sharks under this alternative. Presently, finetooth sharks do not meet at least two of the four criteria defined under 50 CFR Part 635 for inclusion of species to the prohibited species list for Atlantic sharks. The existing criteria are: 1) there is sufficient biological information to indicate the stock warrants protection, such as indications of depletion or low reproductive potential or the species is on the ESA candidate list; 2) the species is rarely encountered or observed caught in HMS fisheries, 3) the species is not commonly encountered or observed caught as bycatch in fishing operations, or 4) the species is difficult to distinguish from other prohibited species (*i.e.*, look alike issue).

During the development of Amendment 1 to the Fishery Management Plan for Atlantic Tunas, Swordfish, and Sharks, the agency considered the addition of finetooth to the list of prohibited species and concluded:

> "This alternative would have limited ecological impacts as finetooth sharks are common bycatch in non-HMS fisheries and prohibiting them will not prevent their capture. A reduction in finetooth shark landings in HMS fisheries may not significantly reduce mortality because they are only a small component of total landings. This alternative may help to reduce mortality of this species but could also increase waste and discards...In regard to alternative I6 [prohibited species listing criteria], finetooth sharks are not depleted and are commonly caught in HMS and non-HMS fisheries. Therefore, this species does not appear to meet the criteria selected under alternative I6, at this time" (NMFS, 2003).

The Agency does not have any new information at this time that would alter this conclusion. Thus, this alternative was not further analyzed at this time. As more information is collected NMFS may re-consider if necessary.

2.2.3 Atlantic Billfish

Atlantic blue and white marlin have been identified as overfished with overfishing continuing. West Atlantic sailfish are considered overfished. The status of blue and white marlin is characterized by reduced or severely reduced biomass levels and high fishing mortality rates. In 2002, NMFS conducted an Endangered Species Act (ESA) status listing review for

Atlantic white marlin and determined that a listing was not warranted at that time. Another ESA status listing review for Atlantic white marlin is anticipated in 2007, and additional conservation steps taken in advance of that review would be relevant to status review deliberations. Domestically, directed billfish fishing effort has been reserved for the recreational fishing sector since 1988, when possession by pelagic longline vessels and sales of Atlantic billfish species were prohibited. Based on ICCAT data, the United States' landings (landings and dead discards) of Atlantic blue and white marlin averaged 2.29 percent and 4.31 percent (respectively) of aggregate Atlantic-wide landings for these species, as reported to ICCAT for the period 1999-2003. United States landings of West Atlantic sailfish averaged 9.56 percent of aggregate West Atlantic-wide sailfish landings, as reported to ICCAT for the period 1999-2003.

The following alternatives represent the range of options that NMFS is considering to reduce the recreational fishery's contribution to overfishing and to improve data collection. The alternatives include gear restrictions, landings restrictions, and data collection requirements.

Alternative E1 Retain existing regulations regarding recreational billfish fishing, including permit requirements, minimum size limits, prohibited species, landing form, allowable gear, and reporting requirements (No Action)

Alternative E1 would maintain the *status quo* in the domestic Atlantic recreational billfish fishery. As such, this alternative retains all existing regulations regarding recreational billfish fishing in the Atlantic Ocean, including permit requirements, minimum size limits, prohibited species, catch and release fishery management program, landing form, allowable gear, and reporting requirements, unless specifically modified during this rulemaking.

Alternative E2 Effective January 1, 2007, limit all participants in Atlantic HMS recreational fisheries to using only non-offset circle hooks when using natural baits or natural bait/artificial lure combinations

Alternative E2 would require the use of non-offset circle hooks in all segments of HMS recreational fisheries, for all species, whenever natural baits or natural bait/artificial lure combinations are used, beginning on January 1, 2007. This includes HMS Angling category permitted vessels, Charter/Headboat permitted vessels on for-hire trips, and all General category permitted vessels participating in HMS tournaments. Circle hooks are defined in 50 CFR §635.2 as "a fishing hook originally designed and manufactured so that the point is turned perpendicularly back to the shank to form a generally circular, or oval, shape." Natural bait/artificial lure combinations would include, but are not limited to, rigs such as natural baits used in combination with artificial hoods, heads, and or skirts. This alternative would allow the use of J-hooks with artificial lures.

Alternative E3 *Effective January 1, 2007, limit all Atlantic billfish tournament participants to using only non-offset circle hooks when using natural baits or natural bait/artificial lure combinations – Preferred Alternative*

Alternative E3 would require the use of non-offset circle hooks by all Atlantic billfish tournament participants whenever natural baits or natural bait/artificial lure combinations are

used, effective January 1, 2007. Any tournament that has an award category, or awards points or prizes for Atlantic billfish is considered a billfish tournament. Circle hooks are defined in 50 CFR §635.2 as "a fishing hook originally designed and manufactured so that the point is turned perpendicularly back to the shank to form a generally circular, or oval, shape." Natural bait/artificial lure combinations would include, but are not limited to, rigs such as natural baits used in combination with artificial hoods, heads, and or skirts. This alternative would allow the use of J-hooks with artificial lures in tournaments.

Alternative E4(a) Increase the minimum legal size for Atlantic white marlin to a specific size between 68 and 71 inches LJFL (172 - 180 cm)

Alternative E4(a) would increase the minimum legal size for Atlantic white marlin to a specific size between 68 and 71 inches LJFL (172 - 180 cm) to reduce United States' landings and or mortalities, as appropriate. The sizes presented represent the upper and lower bounds of the sizes analyzed and available for selection, and as such, do not represent consideration of a "slot limit."

Alternative E4(b) Increase the minimum size for blue marlin to a specific size between 103 and 106 inches LJFL (261 – 269 cm)

Alternative E4(b) would increase the minimum size for blue marlin to a specific size between 103 and 106 inches LJFL (261 – 269 cm) to reduce United States' landings and or mortalities, as appropriate. The sizes presented represent the upper and lower bounds of the sizes analyzed and available for selection, and as such, do not represent consideration of a "slot limit."

Alternative E5 Implement a recreational bag limit of one Atlantic billfish per vessel per trip

Alternative E5 would implement a recreational bag limit of one Atlantic billfish per vessel per trip. No more than one Atlantic billfish would allowed to be possessed, retained, or landed on, or by, a vessel regardless of the length of the trip.

Alternative E6 *Effective January 1, 2007, Implement ICCAT Recommendations on Recreational Marlin Landings Limits – Preferred Alternative*

Alternative E6 would allow NMFS to implement ICCAT Recommendations pertaining to recreational marlin landing limits. Current ICCAT recommendations in need of domestic implementation currently include, 00-13, 02-13, and an unnumbered 2004 billfish recommendation. The specific provisions of these recommendation that need to be domestically implemented are consistent between each other (the same provision is carried through each recommendation) and impose upon the United States an annual landing limit of 250 recreationally caught Atlantic blue and white marlin, combined.

To provide for maximum utilization of the United States' recreational Atlantic marlin landing limit without exceeding it, this alternative would allow NMFS to increase the legal

minimum size of blue and or white marlin, as appropriate. The anticipated effect of an in-season minimum size increase would be to slow landings, if necessary, and thereby prevent a shift to catch and release fishing only. Under this alternative, the proposed size range that would be made available to NMFS for in-season management actions is from 117 to 138 inches for Atlantic blue marlin and 70 to 79 inches for Atlantic white marlin. The need for action and the specific minimum size temporarily implemented would be based upon a review of observed landings, time remaining until conclusion of the current fishing year, current and historical landings trends, and any other relevant factors. As a backstop to ensure that the United States' actions remain consistent with the ICCAT landing limit, the fishery would become catch and release only for the remainder of a fishing year if the landing limit were achieved. If marlin minimum sizes are increased to slow landings during a given fishing year, they would revert back to the previous minimum size at the start of the next fishing season. Consistent with ICCAT recommendations, NMFS would subtract any overharvest from the subsequent fishing year's landing limit, and could carryforward any underharvest to the subsequent fishing year.

Alternative E7 *Effective January 1, 2007 – December 31, 2011, allow only catch and release fishing for Atlantic white marlin – Preferred Alternative*

Alternative E7 would allow only catch and release fishing for Atlantic white marlin. Possession, retention, and landings of Atlantic white marlin would be prohibited at all times and under all circumstances. This provision would expire five years from the effective date unless specifically extended by NMFS.

Alternative E8 Effective January 1, 2007 – December 31, 2011, allow only catch and release fishing for Atlantic blue marlin

Alternative E8 would allow only catch and release fishing for Atlantic blue marlin. Possession, retention, and landings of Atlantic white marlin would be prohibited at all times and under all circumstances. This provision would expire five years from the effective date unless specifically extended by NMFS

Other billfish alternatives considered but not further analyzed at this time

Alternative E9 Implement a mandatory Atlantic HMS tournament permit

Alternative E9 would replace the current tournament registration system with a mandatory tournament permit. A separate permit would be required for each tournament on an annual basis. Tournament permit applications would be required to be received 45 days in advance of the tournament to allow NMFS time to process the permit and select tournaments for reporting, if appropriate. This alternative would not alter reporting requirements. NMFS has determined that improvements to tournament registration, data collection, and enforcabilitity that could be achieved under this alternative can be achieved with significantly less burden to the public and government through implementation of regulatory clarifications contained elsewhere in this document. Please see the Section 2.3.4 Regulatory Housekeeping for addition details. Therefore, this alternative is not further analyzed in this rulemaking, but maybe considered, if appropriate and necessary, in a future rulemaking.

2.3 Management Program Structure

2.3.1 Atlantic BFT Domestic Management Measures

Atlantic tunas, and more specifically BFT, are managed under the dual authority of the Magnuson-Stevens Act and ATCA. ATCA authorizes the Secretary of Commerce (Secretary) to implement binding recommendations of ICCAT. The authority to issue regulations under the Magnuson-Stevens Act and ATCA has been delegated from the Secretary to the Assistant Administrator for Fisheries, NOAA (AA).

2.3.1.1 BFT Quota Management in the General and Angling Categories

The following alternatives considered explore different possibilities for amending/clarifying the annual BFT quota allocation schemes in both the General and Angling categories. Currently, ICCAT recommends an annual Total Allowable Catch (TAC) of BFT for the United States in the western Atlantic management area. NMFS implements these ICCAT recommendations, as required by ATCA, by dividing the annual U.S. BFT TAC among several domestic quota categories based on allocation percentages established in the 1999 FMP. In some categories, the General and Angling being two of them, NMFS further subdivides these domestic category allocations into subquotas (*i.e.*, on a temporal, geographic, and/or BFT size class basis) to further meet the objectives of the Magnuson-Stevens Act, ATCA, and the 1999 FMP. Not all of the alternatives are mutually exclusive.

Alternative F1 Maintain the time-periods, subquota allocations, and geographic set-asides for the General and Angling categories as established in the 1999 FMP (No Action)

This alternative would maintain the current General category time-period subquota allocation scheme, as stated in the 1999 FMP, and would require an FMP amendment to adjust the time-period subquota allocation percentages in the future. This sub-allocation scheme divides the annual General category quota in three distinct time-periods and one geographic set-aside. The New York Bight geographic set-aside (Figure 2.2) is allocated ten metric tons (mt) on an annual basis. Once this amount is deducted from the overall General category quota, the remaining quota is divided among three time-periods and is allocated to each time-period as follows: 60 percent to June through August, 30 percent to September, and 10 percent to October through January (Figure 2.3).

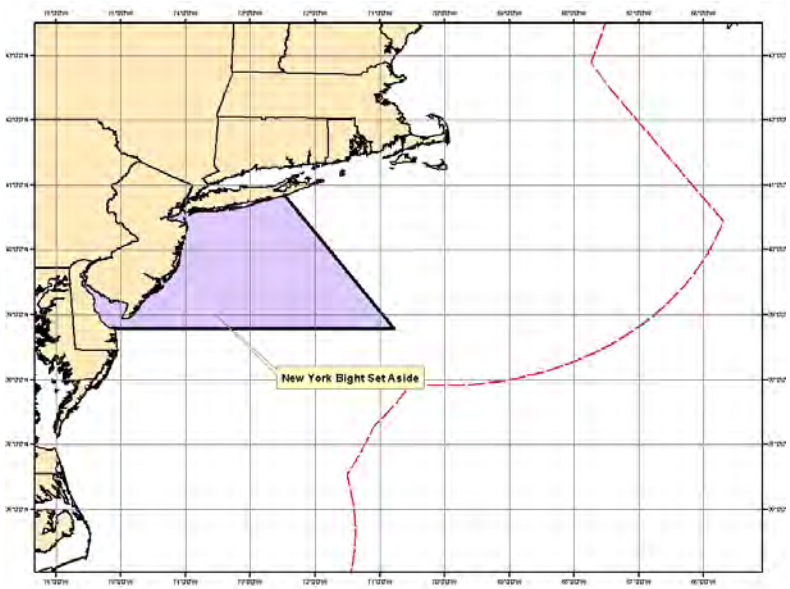

Figure 2.2 **The New York Bight set-aside is defined as an area comprising the waters South and West of a straight line originating at a point on the southern shore of Long Island, NY, at 72 degrees 27 minutes W. longitude (Shinnecock Inlet) and running South southeast 150 degrees true, and north of 38 degrees 47 minutes N. latitude**

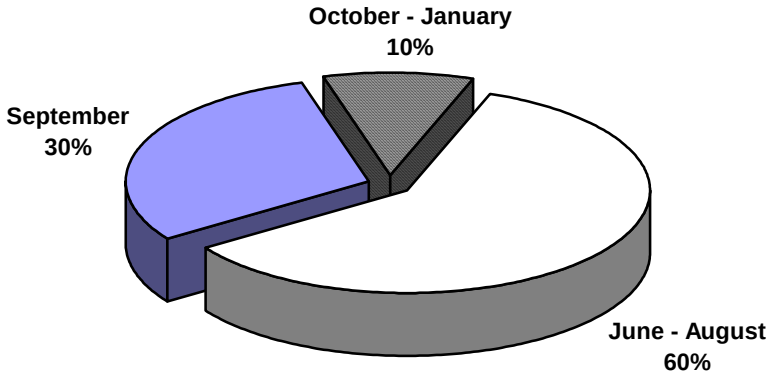

Figure 2.3 **Alternative F1: No Action. Suballocation of the BFT General Category Quota among the current three time-periods. New York Bight set-aside is subtracted from the General Category quota and then the time-period allocations are determined.**

This alternative would also maintain and implement the current process NMFS uses to account for the ICCAT recommendations regarding the tolerance limit of school BFT and the NED Statistical Area set-aside. The ICCAT recommendation regarding school BFT states that contracting parties, non-contracting parties, entities and fishing entities may grant tolerances to capture western Atlantic BFT either weighing less that 30 kg, or in the alternative having a fork length less than 115 cm; provided they limit the take of these fish so that the average over each four-consecutive-year quota balancing period is no more than eight percent by weight of the total BFT quota on a national basis, and institute measures to deny economic gain to the fishermen form such fish. ICCAT has issued an additional recommendation stating that the United States

shall receive a quota (of catch that can be retained) of 25 mt to account for bycatch related to their directed longline fisheries in the vicinity of the management area boundary. NMFS defined "in the vicinity of the management area boundary." as the Northeast Distant statistical area (NED) (68 FR 56783, October 2, 2003).

As the NED Statistical Area recommendation is more recent than the school BFT tolerance limit, NMFS has not accounted for this additional allocation in the calculations used to formulate the school tolerance BFT, denoted in mt. Therefore under this alternative, the United States would continue to calculate the school size-class BFT tolerance limit by applying the eight percent to the U.S. overall quota after the quota attributed to the NED Statistical Area recommendation has been deducted from the U.S. quota versus applying the eight percent to the total BFT quota on a national basis.

This alternative would also maintain the North/South Angling category dividing line (Figure 2.4). This dividing line was intended to provide a more equitable geographic and temporal distribution of recreational fishing opportunities by separating each BFT size-class subquota into two geographical regions, the northern area (allocated 47.2 percent of the size-class subquotas) and the southern area (52.8 percent of the size-class subquotas). The effectiveness of this management tool is dependent on NMFS gathering recreational BFT landings information in a real-time fashion.

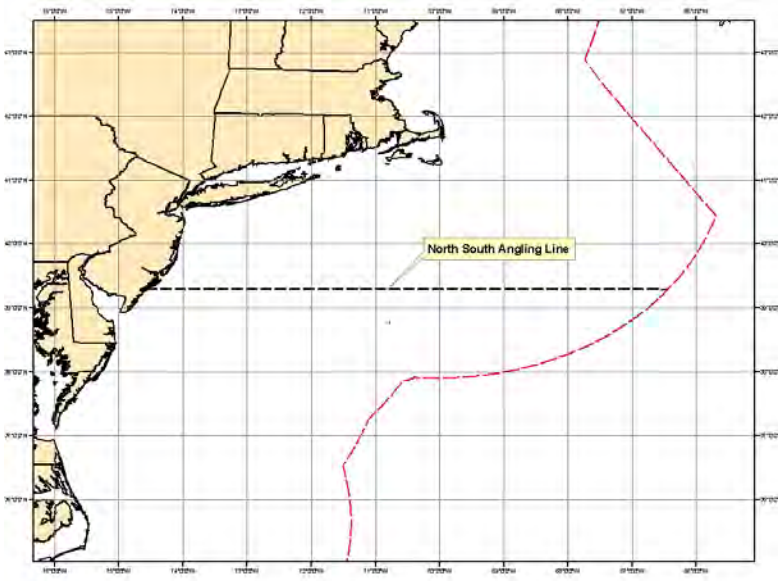

Figure 2.4 The Angling category North/South dividing line, located at 39 degrees 18 minutes North latitude (Great Egg Inlet, NJ).

Alternative F2 Establish General category time-periods, subquotas, and geographic set-asides annually via framework actions

This alternative would amend the process that establishes the General category time-periods and associated subquotas. Under this alternative, General category time-periods and/or the subquota allocated to each time-period, as well as any geographic set-asides, would be

established annually via a regulatory framework action (versus an FMP amendment as currently described under Alternative F1). This alternative would revise the detailed language regarding General category time-periods, subquota allocations, and geographic set-asides contained in the 1999 FMP to be more general, as opposed to the other two alternatives. The specific details pertaining to management of the General category would then be established each year in the annual regulatory framework action. This alternative attempts to address the inherent variability in the General category BFT fishery from one year to the next, and would require the regulatory framework action be finalized prior to the start of the season, thereby establishing General category time-periods and associated subquotas before the fishery commences.

Factors that would be considered prior to establishing the annual General category time-periods, associated subquotas, and/or geographic set-asides may include, but are not limited to, protected species interactions and bycatch rates, historic landings, total landings reported at the end of the season, weather conditions, levels of effort, the amount of unharvested quota rolling over from the previous fishing year, and the projected ability of the vessels to harvest the subquotas.

Alternative F3 *Amend the management procedures regarding General category time-periods, subquota, as well as geographic set-asides to allow for future adjustments to take place via a regulatory framework action – Preferred Alternative*

This alternative would amend the management procedures as they pertain to establishing, and adjusting the General category time-periods, subquotas, as well as geographic set-asides. More specifically, this alternative would revise the detailed language regarding General category time-periods, subquota allocations, and geographic set-asides contained in the 1999 FMP to be more general, similar to Alternative F2. However, under this alternative the specific details pertaining to management of the General category would be established in the regulatory text implementing the consolidated FMP, versus established annually (as in Alternative F2), thereby providing a level of consistency from one year to the next. By moving the specific language from the FMP to the implementing regulations, NMFS would gain the ability to provide consistent time-periods and subquotas while also gaining the ability to amend these General category time-periods, subquota allocation percentages, and geographic set-asides, if deemed necessary, via a regulatory framework action, versus an FMP amendment.

Additionally, because the baseline quota, time-periods, and associated subquotas would be contained in the implementing regulations, notice and comment rulemaking would not be necessary prior to the start of the fishing year for the fishery to operate. Factors that may warrant future adjustments may include, but are not limited to, revisions to ICCAT recommendations regarding the U.S. BFT quota, shifts in protected species interactions and bycatch rates, consideration of historic allocations and landings, stability and predictability of quotas, total landings reported, weather conditions, levels of effort, the amount of unharvested quota rolling from one year to the next, and the projected ability of the vessels to harvest the subquotas. If the specific management measures contained in the regulatory text need to be changed, than an appropriate analytical document (*i.e.*, EA or EIS, RIR, IRFA, etc.) would accompany the proposed and final rule in the regulatory amendment, however, as long as the ICCAT

recommended annual U.S. BFT quota remains consistent, and the established General category time-period subquota allocation percentages are being specified in whole weight, the regulatory, environmental, social and economic analyses conducted for the consolidated FMP would be referred back to and used as supporting documentation for the annual regulatory framework action.

This alternative would also amend the actual General category time-periods as well as the corresponding subquota allocation percentages for each time-period. The status quo General category time-periods and subquotas are described in Alterative F1. The range of sub-alternatives analyzed here are intended to further meet the objectives of the Magnuson-Stevens Act, ATCA, as well as the consolidated HMS FMP, and are drafted in accordance with the preferred CY/FY alternatives contained in Section 2.3.2. These alternatives specifically address public comments received during the scoping period of this action as will as the North Carolina Department of Marine Fisheries' (NCDMF) Petition for Rulemaking (see Notice of Receipt of Petition, 67 FR 69502, November 18, 2002). The sub-alternatives are as follows:

Alternative F3(a) Establish monthly General category time-periods and subquotas (June-Jan; 12.5 percent each)

This sub-alternative would remove the current New York Bight set-aside allocation and divide the coastwide General category season into eight distinct time-periods that correspond to each month from June through January. The coastwide General category quota would be allocated in equal amounts among all eight time periods, specifically 12.5 percent to each time-period (Figure 2.5). This alternative was designed to provide an opportunity to harvest an equal amount of quota during all eight months of the General category BFT season.

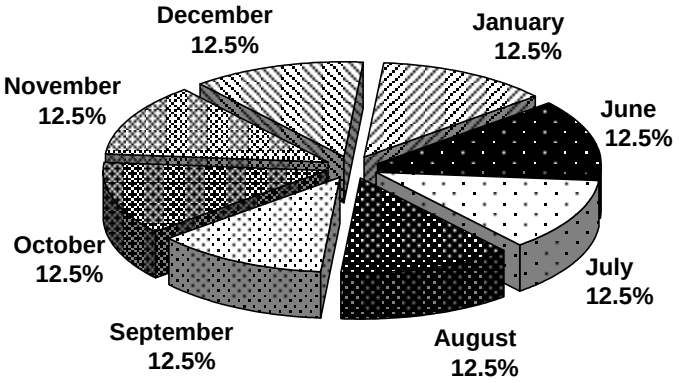

Figure 2.5 Alternative F3a: Equal General category subquota allocation percentages for each month of the BFT fishing season.

Alternative F3(b) Revise General category time-periods and subquotas to allow for a formalized winter fishery (June-Aug, 54 percent; Sept, 26.5 percent; Oct-Nov, 9 percent; Dec, 5.2 percent; and Jan, 5.3 percent)

This sub-alternative would remove the New York Bight set-aside allocation and divide the coastwide General category season into five distinct time-periods that correspond with traditional fishing patterns in the New England region, yet are slightly modified to reflect recent trends in the fishery and provide for a formal winter fishery in the South Atlantic region. Historically the coastwide General category BFT fishery was prosecuted in the waters off of New England during the summer and early fall months. However, recent trends in this coastwide fishery reflect a shift in the availability of commercial size BFT, both geographically and temporally, to the South Atlantic area. This alternative is intended to achieve optimum yield from the General category quota while providing fair and equitable fishing opportunities to General category participants regardless of geographical location. The time-periods would consist of June through August, September, October through November, December, and January. This alternative would also establish time-period subquota allocation percentages as follows: 54 percent (June through August), 26.5 percent (September), 9 percent (October through November), 5.2 percent (December) and 5.3 percent (January) (Figure 2.6).

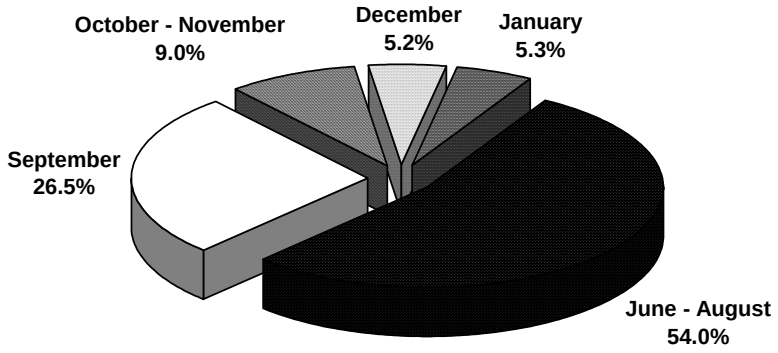

Figure 2.6 Alternative F3b: Proposed General category time-period subquota allocation percentages.

Alternative F3(c) *Revise General category time-periods and subquotas to allow for a formalized winter fishery (June-Aug, 50 percent; Sept, 26.5 percent; Oct-Nov, 13 percent; Dec, 5.2 percent; and Jan, 5.3 percent) – Preferred Alternative*

This sub-alternative would also remove the New York Bight set-aside allocation and divide the coastwide General category season into the same five distinct time-periods, as described in sub-alternative F3(b). The intent of this alternative is to shift slightly more quota (relative to Alternative F3(b)) from the start of the season to the October through November fishery where demand has been increasing in recent years, and to the December and January time-periods (relative to Alternative F1) to provide for a formal winter BFT fishery in the South Atlantic region. As described in Alternative F3(b), the historical General category BFT fishery was primarily prosecuted in the waters off of New England during the summer and early fall months. This resulted in a General category time-period and subquota allocation scheme heavily weighted to the New England fishery (*i.e.*, See Alternative F1 for the status quo). The time-periods, and associated subquotas of this alternative are intended to allocate fish privileges to further achieve optimum yield without excluding traditional participants in the fishery. Thus,

this alternative would establish time-period subquota allocation percentages as follows: 50 percent (June through August), 26.5 percent (September), 13 percent (October through November), 5.2 percent (December), and 5.3 percent (January) (Figure 2.7).

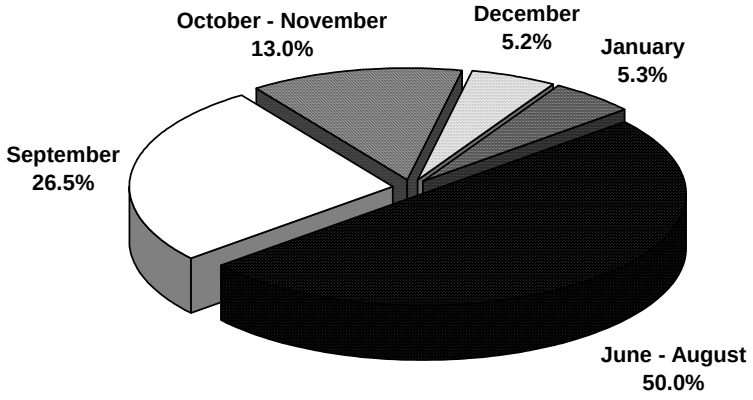

Figure 2.7 Alternative F3c: Proposed General category time-period subquota allocation percentages.

Alternative F3(d) Revise General category time-periods and subquotas to allow for a formalized winter fishery (June-Aug, 38.7 percent; Sept , 26.6 percent; Oct-Nov, 13 percent; Dec, 10.8 percent; and Jan, 10.9 percent)

This sub-alternative would also remove the New York Bight set-asides allocation and divide the coastwide General category season into the same five distinct time-periods referred to in sub-alternatives F3(b) and F3(c). However, this alternative's time-period subquota allocation percentages are intended to provide the greatest opportunity for the winter BFT fishery and specifically embody the subquota allocation requested in the NCDMF Petition for Rulemaking. This alternative would establish time-period subquota allocation percentages as follows: 38.7 percent (June through August), 26.6 percent (September), 13 percent (October), 10.8 percent (December), and 10.9 percent (January) (Figure 2.8).

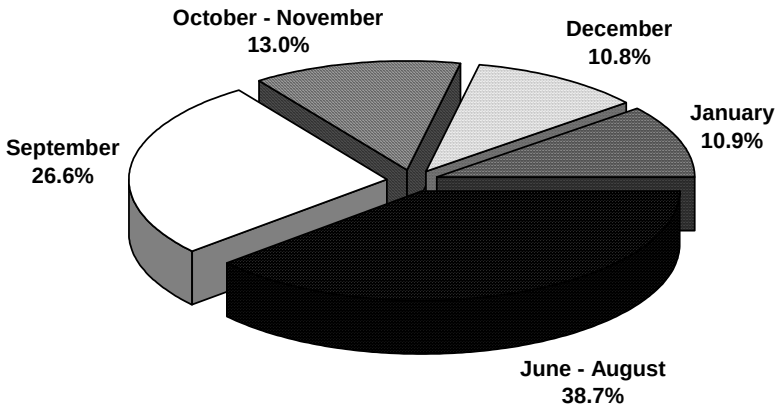

Figure 2.8 Alternative F3d: Proposed General category time-period subquota allocation percentages embodying the NCDMF Petition for Rulemaking.

Alternative F4 *Clarify the procedures for calculating the Angling category school size-class BFT subquota allocation and remove the Angling category North/South dividing line – Preferred Alternative*

This alternative would clarify the procedure for calculating the ICCAT-recommended school size-class BFT tolerance for the Angling category quota. The eight percent tolerance limit would be deducted from the U.S. BFT quota to determine the school size-class allowance for the Angling category. Then, the NED Statistical set-aside allocation would be deducted from the remaining U.S. BFT quota. This proposed clarification would implement the eight percent tolerance limit more consistently with the actual language contained in the ICCAT recommendation and would result in a slight increase of the school size class BFT quota by approximately 0.02 percent.

This alternative would also remove the North/South Angling category dividing line, located at 39 degrees 18 minutes N. latitude (Great Egg Inlet, NJ) (Figure 2.4). Since the implementation of the Angling category North/South line, the methodology used to account for the recreational harvest of BFT has changed. Current recreational BFT monitoring programs, and the timeliness of the data they provide, limit the effectiveness of this North/South line as a fisheries management tool. This alternative is intended to address public expectations that the North/South line is used to allocate Angling category subquotas when, in fact, Angling category fishing opportunities currently are provided via temporal inseason management versus geographic management.

2.3.1.2 Annual BFT Quota Adjustments

In 1992, ICCAT recommended that if the catch of one of the Contracting Parties exceeds its annual or biannual scientific monitoring quota, then in the biannual period or year following reporting of that catch to ICCAT, that Contracting Party will reduce its catch to compensate in total for that overage. Such a reduction will be applied to the domestic catch category of the

applicable Contracting Party of the overage. This recommendation was revised in 1998 to state that unused quota or overage from the previous year shall be added or subtracted, as appropriate, to the current year's catch that can be retained. The intent of the following alternatives is to streamline the annual BFT quota adjustment process, including the allocation of baseline quotas as well as adjusting those quotas based on the previous years under/overharvests.

Alternative F5 Maintain the annual BFT quota specification process and the under/overharvest procedures within individual domestic quota categories and individual vessels in the Purse seine category (No Action)

This alternative would maintain the annual BFT quota specification process established in the 1999 FMP which allocates the ICCAT-recommended U.S. BFT quota annually to domestic user groups. The U.S. BFT quota is allocated to specific domestic quota categories via allocation percentages contained in the 1999 FMP. The annual BFT specifications quantify the baseline allocation for each domestic quota category, measured in whole weight (metric tons), by calculating the allocation percentages against the recommended U.S. BFT quota.

These percentage shares were based on allocations that had been developed by NMFS over several years. Under this alternative, as well as all subsequent alternatives, the allocation of the U.S. BFT quota would remain consistent with those baseline percentages established in the 1999 FMP. Those percentages are as follows: General - 47.1 percent; Angling - 19.7 percent; Harpoon - 3.9 percent; Purse Seine - 18.6 percent; Longline - 8.1 percent; and Trap - 0.1 percent. The remaining 2.5 percent of the BFT landings quota would be held in the Reserve category (Figure 2.8). Under this alternative, as well as all subsequent alternatives, these domestic quota category percentages would remain unchanged as codified in the consolidated HMS FMP and would require an FMP amendment to change them in the future. However, revisions to the General category time-period subquota allocation scheme are being considered in Section 2.3.1.1.

This alternative would require NMFS to draft proposed annual BFT quota specifications and appropriate supporting analytical documents, collect public comment on those proposed specifications, and then, after responding to comments received, finalize the initial BFT quota specifications via a final rule published in the Federal Register. This process would establish the domestic quota categories annual baseline allocations in weight, as well as applicable subquota allocations in weight, while accounting for any under/overharvests for the previous year.

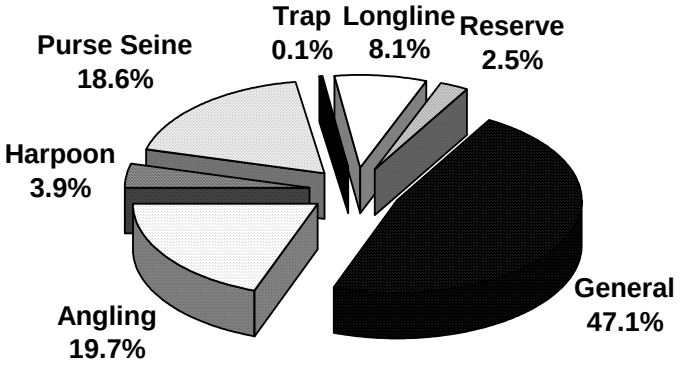

Figure 2.9 Alternative F5: No Action. U.S. BFT Domestic Quota Category Allocation Percentages.

This alternative maintains and implements annual adjustment procedures, which include accounting for unused quota or overage from the previous year, within individual domestic quota categories, via the current annual specification process. These annual adjustments would be based on landings statistics and other available information, and consideration of which BFT quota in any category or, as appropriate, subcategory has been exceeded or has not been reached, with the exception of the Purse seine category, due to the IFQ nature of this category. Any overharvest would be subtracted from, or the underharvest added to, that same quota category for the following fishing year, provided that the total of the adjusted category quotas and the Reserve is consistent with ICCAT recommendations regarding country quotas, the tolerance of school BFT, and the allowance for dead discards. For the Purse seine category, annual adjustments would be based on landings statistics and other available information for that specific purse seine vessel's allocation. Adjustments would then be considered based on calculations of whether a purse seine vessel's allocation, as adjusted, has been exceeded or has not been reached, in which case the overharvest will be subtracted from, or underharvest added to, that vessel's allocation for the following fishing year. Under this alternative all domestic quota categories do not have a limitation on the amount of quota that can be carried forward from on year to the next.

This alternative would also implement annual adjustment procedures that provide the authority to allocate any quota remaining in the Reserve category at the end of a fishing year to account for overharvest in any fishing category, provided such allocation was consistent with the criteria specified in Section 2.3.1.3. This alternative would also maintain the authority to perform inseason actions within a fishing year, such as adjusting daily retention limits and the applicable duration, quota transfers among categories or, as appropriate, subcategories, and performing interim closures. These inseason actions would be determined based on the consideration of the criteria stipulated in Section 2.3.1.3.

This alternative would maintain the default General and Angling category BFT retention limits as articulated in the regulations implementing the 1999 FMP. The default coastwide General category BFT retention limit is one large medium or giant BFT, measuring 73 inches curved fork length (CFL) or greater, per vessel per day/trip. The default Angling category BFT retention limit is one school, large school, or small medium BFT, measuring 27 inches to less than 73 inches CFL per vessel per day/trip. NMFS does have the ability to alter the default

retention limits via an inseason action. For further details regarding inseason actions, please see Section 2.3.1.3.

This alternative would also maintain the procedure for establishing Restricted Fishing Days (RFDs) in the General category BFT fishery, by proposing them in the annual BFT quota specifications. An RFD means a day beginning at 0000 hours and ending 2400 hours local time, during which a person aboard a vessel for which a General category permit for Atlantic tunas has been issued may not fish for, possess, or retain BFT. RFDs are intended to lengthen the General category BFT season, reduce market gluts, and further achieve optimum yield. A designated RFD, may be waived if it is determined that it would impede the attainment of a time-period subquota or an RFD may be introduced if it is determined that it is needed to avert a premature time-period closure. NMFS has the ability to alter the RFD schedule via an inseason action. For further details regarding inseason actions, please see Section 2.3.1.3.

Alternative F6 *Revise the annual BFT quota specification process to refer back to the supporting analytical documents of the consolidated HMS FMP and include seasonal management measures in annual framework actions – Preferred Alternative*

This alternative is similar to Alternative F5, in the sense that BFT quota specifications would still be conducted on an annual basis, however, the range of impacts associated with annual BFT specifications would be analyzed in the appropriate analytical documents of the consolidated HMS FMP, as opposed to a separate EA or EIS. The consolidated HMS FMP analyses would then be referred to and used in subsequent quota specifications as the supporting analytical documents for regulatory, environmental, social and economic impact analyses. A stand alone analytical documents would accompany the annual BFT quota specifications only if the analyses associated with the consolidated HMS FMP no longer applied, (for instance, if ICCAT were to amend its recommendation regarding the total U.S. BFT TAC). Currently, ICCAT recommendations regarding BFT TACs last for multiple year timeframes, and usually coincide with the most recent BFT stock assessment. The ICCAT-recommended U.S. BFT TAC would be allocated to the domestic quota categories per the allocation percentages listed in the consolidated HMS FMP (see Alternative F5) and the equivalent quota tonnage associated with these percentages would be specified in the regulatory text implementing the consolidated HMS FMP, therefore formally establishing annual baseline quotas, in whole weight, for each of the quota categories and removing the need to analyze them on an annual basis.

The baseline quota percentages, for each domestic quota category, would remain in the consolidated HMS FMP, while the corresponding quota allocation for each quota category, denoted in metric tons, would be specified in the regulatory text implementing the consolidated HMS FMP. These baseline quota allocations may be adjusted on an annual basis to account for under/overharvests that occur in the previous year, per ICCAT recommendations. The range of these quota adjustments would also be analyzed in the supporting analytical documents of the consolidated HMS FMP and would be referred to in the annual BFT specifications (see Section 4.3.1.1, Alternative F8). This alternative would also maintain and implement annual adjustment procedures that would provide the authority to allocate any quota remaining in the Reserve category at the end of a fishing year to any fishing category, provided such allocation is

consistent with the applicable determination criteria currently listed in the regulations. Section 2.3.1.3 addresses the multiple set of determination criteria listed in the current regulations and the preferred alternative of this section is to consolidate the multiple lists into one, for consistency purposes. As any annual quota transfers from the Reserve category would be similar to an inseason quota transfer, the determination criteria discussed in Section 2.3.1.3 would also be addressed prior to conducting an annual transfer from the Reserve category.

This alternative would also include seasonal management measures in the annual framework rulemaking. Under the No Action alternative (*i.e.*, in comparison to Alternative F5), inseason management is conducted separately from the annual rulemaking. These seasonal management measures may include, but are not limited to, establishing recreational daily BFT retention limits and their duration and General category effort controls, such as RFDs and daily BFT retention limits. The intent of including seasonal management measures in the annual BFT specifications would provide prior notice of, and an opportunity for the public to comment on these sort of actions. Subsequent inseason actions likely would still be necessary to close fisheries, alter seasons, and/or alter retention limits as changing fishery conditions warrant them. This alternative would also maintain the inseason action authority as discussed under Section 2.3.1.3.

Alternative F7 Eliminate unharvested quota carryover provisions and return unharvested quota to the resource, while maintaining status quo overharvest provisions

This alternative would implement an annual adjustment provision that would not carry unharvested quota forward from one fishing year to the next, but would start each fishing year with the baseline domestic quota category allocations. This alternative would maintain the overharvest provision and annual adjustment procedures as described in Alternative F5.

Alternative F8 *Establish an individual quota category carryover limit of 100 percent of the baseline allocation (i.e., no more than the annual baseline allocation may be carried forward), except for the Reserve category, and authorize the transfer of quota exceeding the 100 percent limit to the Reserve or another domestic quota category, while maintaining status quo overharvest provisions – Preferred Alternative*

This alternative would implement similar carryover provisions described in Alternative F5, but would apply a limit on the amount of quota each domestic quota category could carry forward from one fishing year to the next. This limit would apply to all domestic quota categories, except for the Reserve category. The intent of this alternative would be to prevent "stockpiling" of unharvested quota in a particular domestic quota category due to multiple successive years of underharvest. This alternative would implement a carryover cap of 100 percent of the baseline allocation for each domestic quota category, except for the Reserve category, such that no more than two years worth of quota allocation could be held by a particular domestic quota category at the start of the fishing year. For example, the Harpoon category is allocated 3.9 percent of the U.S. BFT quota. Using the current ICCAT BFT quota recommendation, this equates to an annual baseline allocation of approximately 57.1 mt. Under this alternative, the Harpoon category would only be allowed to carry forward 57.1 mt of

unharvested quota from on year to the next. Combining the Harpoon category annual baseline allocation of 57.1 mt with the maximum amount of unharvested quota that can be carried forward, 57.1 mt, the Harpoon category quota would be capped at 114.2 mt. Any quota that exceeds the 100 percent carryover limit would then be transferred to either the Reserve category or to another domestic quota category. Section 2.3.1.3 addresses the multiple sets of determination criteria listed in the current regulations and the preferred alternative of this section is to consolidate these multiple lists into one, for consistency purposes. As any quota transfers associated with exceeding the 100 percent rollover limit would be similar to an inseason quota transfer, the determination criteria discussed in Section 2.3.1.3 would also need to be addressed prior to transferring the excess to the Reserve or another category. This alternative would maintain the overharvest provisions as stipulated in Alternative F5.

2.3.1.3 Inseason Actions

The following alternatives set forth the basis for NMFS' management of BFT inseason actions, including, but not limited to adjusting daily retention limits, inseason quota transfers, and fishery closures/reopenings.

Alternative F9 Maintain inseason action procedures (No Action)

This alternative would maintain and implement the existing regulatory authority to provide for maximum utilization of the BFT quota by authorizing increases or decreases to the General category daily retention limit of large medium and giant BFT over a range from zero to a maximum of three per vessel via the use of inseason management actions that are published in the final rule section of the Federal Register. These actions are based on a review of dealer reports, daily landing trends, availability of the species on the fishing grounds, and any other relevant factors. General category retention limit adjustments are not effective until at least three calendar days after a notification is filed with the Office of the Federal Register for publication. The one exception corresponds to previously designated RFDs. RFDs may be waived effective upon closure of the General category fishery so that persons aboard vessels permitted in the General category may conduct catch-and-release or tag-and-release fishing for BFT under § 635.26.

This alternative would also maintain and implement the existing regulatory authority to provide for maximum utilization of the Angling category BFT quota, by authorizing adjustments that may increase or decrease the recreational retention limit for any size-class BFT or change a vessel trip limit to an angler limit and vice versa. Such adjustments would be based on a review of daily landing trends, availability of the species on the fishing grounds, and any other relevant factors. Also, such adjustments to the retention limits may be applied separately for persons aboard a specific vessel type, such as private vessels, headboats or charterboats. Recreational retention limit adjustments are not effective until at least three calendar days after a notification is filed with the Office of the Federal Register for publication.

This alternative would maintain and implement regulations that authorize quota transfers, within a fishing year, among categories or, as appropriate subcategories, after considering the following factors:

(A) The usefulness of information obtained from catches in the particular quota category for biological sampling and monitoring of the status of the stock;
(B) The catches of the particular category quota to date and the likelihood of closure of that segment of the fishery if no allocation is made;
(C) The projected ability of the vessels fishing under the particular category quota to harvest the additional amount of BFT before the end of the fishing year;
(D) The estimated amounts by which quotas for other gear categories of the fishery might be exceeded;
(E) Effects of the transfer on BFT rebuilding and overfishing;
(F) Effects of the transfer on accomplishing the objectives of the Fishery Management Plan for Atlantic Tunas, Swordfish, and Sharks.

If it is determined, based on these criteria and the probability of exceeding the total quota, that vessels fishing under any category or subcategory quota are not likely to take that quota, NMFS may conduct an inseason transfer of any portion of the remaining quota of that fishing category to any other fishing category or to the Reserve.

This alternative would maintain and implement regulations to close a domestic quota category, other than the Purse seine category quota due to the IFQ nature of this category, based on when that quota is reached, or is projected to be reached. The closure would be effective for the remainder of the fishing year or for a specified period as indicated in the closure notice published as an inseason action in the final rule section of the Federal Register.

This alternative would also maintain and implement the regulations to close and reopen the Angling category BFT fishery by accounting for variations in seasonal distribution, abundance, or migration patterns of BFT, or catch rate in one area, that may preclude anglers in another area from a reasonable opportunity to harvest a portion of the Angling category quota. The Angling category BFT fishery or part of the fishery may be reopened at a later date if it is determined that BFT have migrated into the other area. In determining the need for any such interim closure, the following criteria would be considered:

(A) The usefulness of information obtained from catches of a particular geographic area of the fishery for biological sampling and for monitoring the status of the stock;
(B) The current year catches from the particular geographic area relative to the catches recorded for that area during the preceding four years;
(C) The catches from the particular geographic area to date relative to the entire category and the likelihood of closure of that entire category of the fishery if no interim closure or area closure is effected; and
(D) The projected ability of the entire category to harvest the remaining amount of BFT before the anticipated end of the fishing season.

Alternative F10 *Revise and consolidate criteria considered prior to performing inseason and certain annual BFT management actions – Preferred Alternative*

This alternative would consolidate and enhance the sets of criteria that NMFS considers for any and all inseason management actions, as well as certain annual management actions,

including, but not limited to adjustments in daily retention limits, annual quota adjustments, inseason quota transfers, fishery closures, and interim fishery closure/reopenings. The intent of this alternative is to enhance the flexibility and consistency regarding the determination criteria analyzed prior to conducting inseason management actions and/or some annual management actions as discussed in the previous alternatives.

This alternative would also move the determination criteria from § 635.27(a)(7) into a stand-alone section. Thus, for example, this alternative would propose the following consolidated criteria a stand-alone section:

(A) The usefulness of information obtained from catches in the particular category for biological sampling and monitoring of the status of the stock;
(B) The catches of the particular category quota, and/or subquota, to date and the likelihood of closure of that segment of the fishery if no interim closure or quota allocation is made;
(C) The projected ability of the vessels fishing under the particular category quota and/or subcategory quota to harvest the remaining and/or additional amount of BFT before the end of the fishing year;
(D) The estimated amounts by which quotas for other gear categories of the fishery might be exceeded;
(E) Effects of the action on BFT rebuilding and overfishing;
(F) Effects of the action on accomplishing the objectives of the consolidated HMS FMP;
(G) Review of variations in seasonal distribution, abundance, or migration patterns of BFT;
(H) Effects of catch rates in one area, precluding participants in another area from having a reasonable opportunity to harvest a portion of the category quota; and
(I) Review of dealer reports, daily landing trends, availability of the species on the fishing grounds.

This alternative would also implement regulations, identical to Alternative F9, to close any domestic quota category, other than the Purse seine category quota, based on when that quota is reached, or is projected to be reached. The closure would be effective for the remainder of the fishing year or for a specified period as indicated in the closure notice.

Alternative F11 Eliminate BFT inseason actions

This alternative would eliminate NMFS authority to perform inseason actions such as daily retention limit adjustments, inseason quota transfers, or interim closures. Domestic BFT quotas would be established as outlined in Section 2.3.1.1, and would be amended annually due to carryover provisions as outlined in Section 2.3.1.2. This alternative is designed to provide BFT fishery participants certainty in the rules and regulations throughout the BFT season for the purpose of consistency and at the expense of flexibility.

2.3.2 Timeframe for Annual Management of HMS Fisheries

Many aspects of HMS fisheries are managed on an annual cycle, including, but not limited to, quota distribution, permit issuance, and fishery specifications. Currently, sharks are managed on a calendar year cycle (January 1 to December 31) while tunas, swordfish, and billfish are managed on a fishing year cycle (June 1 to May 31). For example, the 2005 annual quotas recommended by ICCAT for the U.S. tuna and swordfish fisheries are implemented for the fishing year from June 1, 2005 to May 31, 2006, and the annual 2005 domestic shark fishery quotas are based on a fishing year from January 1, 2005 through December 31, 2005 (ICCAT does not currently make recommendations for annual shark quotas.) The following alternatives present options for shifting the management cycle timeframe in order to simplify the management program for HMS fisheries and improve the United States' basis for negotiations at international forums.

Alternative G1 Maintain the current management cycle for all HMS (No Action)

This alternative would maintain the current management timeframe for all managed HMS. Atlantic tunas, swordfish, and billfish would continue to be managed on a fishing year from June 1 to May 31, whereas, Atlantic sharks would continue to be managed on a calendar year. This alternative would not require any re-allocation of the sub-quotas used to manage BFT, sharks, or swordfish.

Alternative G2 *Shift the fishing year to January 1 to December 31 for all HMS – Preferred Alternative*

Under this alternative, all of the HMS management programs would be implemented on a calendar year cycle. The Atlantic shark management timeframe would maintain the status quo, whereas tunas, swordfish, and billfish would shift from a fishing year to a calendar year. To transition from a fishing year to a calendar year, an abbreviated fishing year would be established via a separate action for BFT and swordfish to cover the months between the end of the fishing year (May 31, 2006) and the start of the new calendar year (January 1, 2007). The shift in the management timeframe would require some alteration to the BFT seasonal allocations because a domestic BFT subquota and time-period currently spans two calendar years. Section 2.3.1 discusses management alternatives for BFT, including an alternative addressing this issue.

Alternative G3 Shift the fishing year to June 1 to May 31 for all HMS

This alternative would move all HMS to a June 1 to May 31 fishing year management cycle. The management timeframe for Atlantic tunas, swordfish, and billfish would maintain status quo, whereas shark management would shift from the calendar year to a fishing year. The shark management program's trimesters and sub-quotas would be modified to fit within a fishing year management regime, and a bridge period would be required to cover the months between the end of the calendar year (December 31, 2006) and beginning of the fishing year (June 1, 2007).

2.3.3 Authorized Fishing Gear

Innovative fishing gears and techniques are essential to increasing efficiency and reducing bycatch in fisheries for Atlantic HMS. As current or traditional gears are modified and new gears are developed, NMFS needs to be cognizant of these advances to gauge their potential impacts on target catch rates, bycatch rates, and protected species interactions, all of which can have important management implications. New gears and techniques need to be evaluated by NMFS for qualification as authorized gear types. In this document, NMFS is considering the definition and authorization of speargun gear, green-stick gear, and buoy gear, as well as clarifying the allowable use of handheld cockpit gears.

Alternative H1 Maintain current authorized gears in Atlantic HMS fisheries (No Action)

The revised list of authorized fisheries (LOF) and fishing gear used in those fisheries became effective December 1, 1999 (64 FR 67511). The rule applies to all U.S. marine fisheries, including Atlantic HMS. As stated in the rule, "no person or vessel may employ fishing gear or participate in a fishery in the exclusive economic zone (EEZ) not included in this LOF without giving 90 days' advance notice to the appropriate Fishery Management Council (Council) or, with respect to Atlantic HMS, the Secretary of Commerce (Secretary)." The LOF is updated periodically and can be found at 50 CFR § 600.725. Acceptable HMS fisheries and authorized gear types for Atlantic tunas, swordfish, and sharks include: swordfish handgear fishery - rod and reel, harpoon, handline, bandit gear; pelagic longline fishery - longline; shark drift gillnet fishery - gillnet; shark bottom longline fishery - longline; shark recreational fishery - rod and reel, handline; tuna purse seine fishery - purse seine; tuna recreational fishery - rod and reel, handline; and tuna handgear fishery - rod and reel, harpoon, handline, bandit gear. For Atlantic billfish, the only acceptable fishery and authorized gear type is recreational fishery - rod and reel. This alternative would maintain the status quo for authorized gear in all Atlantic HMS fisheries.

Alternative H2 *Authorize speargun fishing gear as a permissible gear type in the recreational Atlantic tuna fishery - Preferred Alternative*

Alternative H2 would define and authorize speargun fishing gear in the recreational Atlantic tuna fishery. Recreational spearfishermen would only be allowed to fish from vessels with HMS Angling or CHB category permits, and would be subject to all recreational requirements for BFT and other federally managed tunas. Speargun landings would be deducted from the Angling category quota. Under this alternative, all regulated Atlantic tunas taken with speargun fishing gear would be ineligible for sale by HMS Angling category vessels. However, for consistency purposes, vessels that possess an Atlantic HMS CHB permit would be allowed to sell their recreational Atlantic tunas, except for BFT, while on a for-hire trip, provided they do not exceed the daily recreational retention limits for any BAYS tunas and abide by sale restrictions as outlined in 50 CFR § 635.31. Regardless of whether CHB fishermen are operating in a for-hire or non-for-hire manor, BFT harvested by speargun fishing gear could not be sold. Fishermen using speargun fishing gear would be allowed to freedive, use SCUBA or other underwater breathing devices, and would be required to be physically in the water when they fire their speargun. Only free-swimming fish, not those restricted by fishing lines or other means, could be taken. The use of powerheads, or any other explosive devices, would not be allowed to

be used to harvest or subdue tunas with this gear type. Under this alternative, no HMS would be allowed to be taken by speargun fishing gear, other than Atlantic tunas.

Under alternative H2, speargun fishing gear would be defined as a muscle-powered speargun equipped with a trigger mechanism, a spear with a tip designed to penetrate and retain fish, and terminal gear. Terminal gear may include but is not limited to trailing lines, reels, and floats. Muscle-powered spearguns store potential energy provided from the operator's muscles. Muscle-powered spearguns may only release that amount of energy that the operator has provided to it from his/her own muscles. Common energy storing methods for muscle-powered spearguns include compressing air and springs, and the stretching of rubber bands (IBSRC, 2005) (Figure 2.10). Powerheads, or any other explosive devices, would not be allowed to harvest or subdue tunas with this gear type.

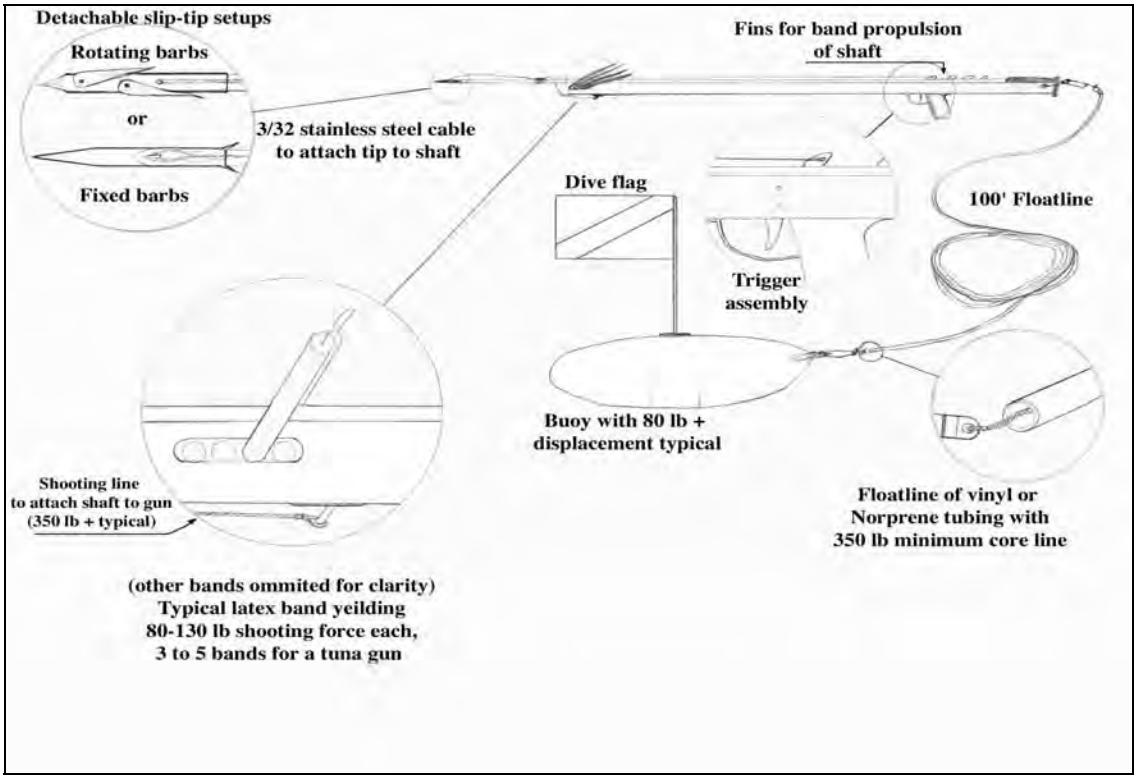

Figure 2.10 **A Diagram of a Typical Speargun Fishing Gear Configuration** (courtesy of Matthew Richards).

Alternative H3 Authorize speargun fishing gear as a permissible gear-type in the commercial tuna handgear and recreational Atlantic tuna fisheries

Alternative H3 would authorize the use of speargun fishing gear, as define above, in the commercial tuna handgear and recreational Atlantic tunas fisheries. Recreational speargun landings would be deducted from the Angling category quota, and commercial speargun landings would subtracted from the General category quota. As discussed in alternative H2, fishermen using speargun fishing gear would be allowed to freedive, use SCUBA or other underwater

breathing devices, and would be required to be physically in the water when they fire their speargun. Only free-swimming fish, not those restricted by fishing lines or any other devices, could be taken. The use of powerheads, or any other explosive devices, would not be allowed to harvest or subdue tunas with this gear type. Under this alternative, no HMS would be allowed to be taken by speargun fishing gear, other than Atlantic tunas.

Alternative H4 *Authorize green-stick fishing gear for the commercial harvest of Atlantic BAYS tunas - Preferred Alternative*

Alternative H4 would define green-stick fishing gear and add this gear to the list of authorized fishing gears for the commercial tuna handgear fishery. This alternative would also prohibit commercial vessels using or possessing green-stick fishing gear from retaining or possessing BFT on board. Currently, there are two distinct configurations of green-stick fishing gear, recreational and commercial. The recreational configuration, as described by Wescott, 1996, is currently allowed due to its consistency with the current list of authorized gears for Atlantic tunas. The commercial green-stick configuration, however, does not cleanly fall under the current list of authorized gears. Alternative H4 would define green-stick gear and authorize its use in the commercial tuna handgear fishery.

In the recreational configuration, a fiberglass pole, or "green-stick", serves as a vertical outrigger, elevating a line above the waters' surface, allowing multiple anglers to fish individually tended lines suspended by the green-stick's single line. At the end of the green-stick line, a floating decoy is attached. This decoy provides drag as the vessel moves forward and puts tension on the green-stick line. The individual fishing lines are connected to the green-stick line by rubber bands, outrigger clips, or other breakaway connections, and are allowed to hang down and brush across the surface of the water while trolled. When a fish takes one of the baits, the breakaway connection releases, and the angler tending that line fights and lands the fish (Figure 2.11). Some recreational fishermen have further modified the gear and suspend baits from a "high-line" attached to a flying bridge or tuna tower, and do not actually use the green-stick pole (Wescott, 1996).

The commercial configuration of green-stick gear generally consists of a 10.7 - 13.7 m (35 - 45 feet) fiberglass pole mounted to the vessel. A heavy mainline (800-1,000-pound test line) housed in a spool is hoisted by a tether-rope mounted to the top of the pole. The mainline is connected to the tether-rope with a cotton breakaway cord. At the end of the mainline, a floating decoy is attached. This decoy provides drag as the vessel moves forward and puts tension on the mainline. Several leaders hang down from the mainline at regularly spaced intervals and suspend baits so that they brush across the top of the water (Figure 2.12). As this gear is towed, the baits attached to the mainline skip across the water's surface and flex in the fiberglass pole produces a "jigging" action that attracts fish. This gear was designed so that the mainline breaks away from the tether rope when one or more fish are hooked. The mainline and all the fish are then retrieved together using the spool (Wescott, 1996). In practice, the commercial configuration of green-stick gear is primarily used on vessels targeting yellowfin tuna. Please see Wescott, 1996, for more information on the configuration, rigging, and use of green-stick gear.

Under this alternative, tuna General category (commercial handgear) participants would continue to be subject to all current General category regulations (such as size limits), and vessels with PLL gear onboard would continue to be subject to all current PLL regulations, including gear restrictions (such as circle hooks) and closed areas. Commercial vessels utilizing green-stick gear, or possessing green-stick gear onboard, would be prohibited from retaining or possessing BFT.

Under alternative H4, green-stick gear would be defined as a line that is elevated, or suspended, above the waters' surface from which no more than 10 hooks or gangions may be hung. The gear must be actively trolled and configured so that the baits are fished on or above the surface of the water. The suspended line, attached gangions, and catch may be retrieved collectively by hand or mechanical means.

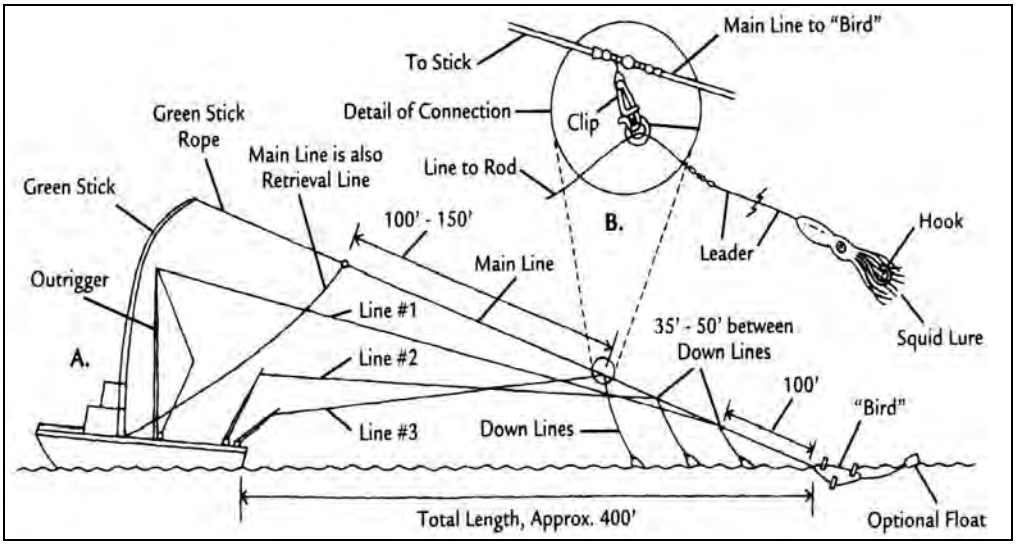

Figure 2.11 **A Diagram of the Recreational Configuration of Green-stick Fishing Gear.** Source: Wescott, 1996

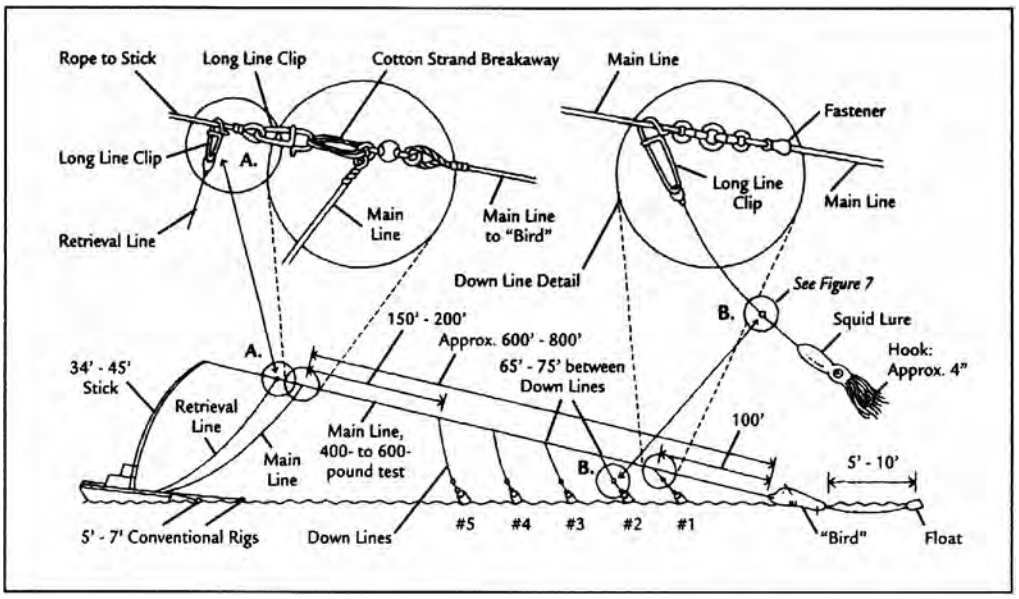

Figure 2.12 **A Diagram of the Commercial Configuration of Green-stick Fishing Gear.** Source: Wescott, 1996

Alternative H5 *Authorize buoy gear as a permissible gear type in the commercial swordfish handgear fishery; limit vessels employing buoy gear to possessing and deploying no more than 35 individual buoys, with each having no more than two hooks or gangions attached – Preferred Alternative*

Alternative H5 would define and authorize buoy gear in the commercial swordfish handgear fishery. The swordfish handgear fishery may currently utilize individual handlines attached to free-floating buoys, however, a preferred alternative in this document (I5(b)) would require that handlines used in HMS fisheries be attached to a vessel. Alternative H5 would change the definition of individual free-floating buoyed lines, that are currently considered to be handlines, to "buoy gear," allowing the commercial swordfish handgear fishery to continue utilizing this gear type. This fishery has been operating under the current regulations, which require that handlines be restricted to no more than two hooks and be released and retrieved by hand. The current regulations do not limit the number of individual handlines/buoys that may be possessed or deployed. Alternative H5 would maintain current limits of no more than two hooks per line and requirements that the gear be released and retrieved by hand, however, it would limit the number of individual buoys possessed or deployed to no more than 35 per vessel. Fishermen using buoy gear would be required to mark each buoy with the vessel's name, registration number, or HMS permit number, as per current regulations at 50 CFR § 635.6 (c). Additionally, under this alternative, fishermen using this gear type would be required to affix gear monitoring equipment to each buoy to aid in recovery. Gear monitoring equipment may include, but is not limited to, radar reflectors, beeper devices, lights, or reflective tape. If only reflective tape is used, the vessel deploying the buoy gear must possess an operable spotlight capable of illuminating deployed buoys.

Under alternative H5, buoy gear would be defined as a fishing gear consisting of a single buoy supporting a single mainline to which no more than two hooks or gangions are attached. Buoy gear must be constructed and deployed so that the mainline remains vertical in the water column. This gear must be released and retrieved by hand. Fishermen using buoy gear must affix gear monitoring equipment to each buoy. Gear monitoring equipment may include, but is not limited to, radar reflectors, beeper devices, lights, or reflective tape. If only reflective tape is used, the vessel deploying the buoy gear must possess an operable spotlight capable of illuminating deployed buoys.

Alternative H6 Authorize buoy gear as a permissible gear type in the commercial swordfish handgear fishery; limit vessels employing buoy gear to possessing and deploying no more than 50 individual buoys, with each buoy having no more than 15 hooks or gangions attached

Alternative H6 would authorize the use of buoy gear, as defined above, in the commercial swordfish handgear fishery. This alternative is similar to H5, however, it would limit vessels to possessing and deploying no more than 50 individual buoys, with each buoy having no more than 15 hooks or gangions attached.

Alternative H7 *Clarify the allowance of hand-held cockpit gears used at boat side for subduing HMS captured on authorized gears - Preferred Alternative*

In recent years, NMFS has become aware of some confusion regarding the allowable use of hand-held cockpit gears. This confusion stems from the Atlantic HMS regulations regarding authorized gears located at 50 CFR § 635.21(e). In this section, NMFS lists the authorized primary gear types that Atlantic HMS permit holders are allowed to use. The gear types are based on the species being targeted and the permit category of the particular vessel. It is NMFS' intent to only authorize the primary gear types used to harvest HMS, meaning the gears used to bring an HMS to the vessel. This issue is being addressed to clarify the allowable use of secondary gears to subdue HMS after they are brought to the vessel using a primary gear type.

Alternative H7 would clarify the allowance of secondary hand-held cockpit gears, which may include, but are not limited to, dart harpoons, gaffs, flying gaffs, tail ropes, etc., used at boat side for subduing HMS captured on authorized primary gears. This alternative would acknowledge and account for the current regulations located at 50 CFR § 635.21(a), which state that an Atlantic HMS harvested from its management unit that is not retained must be released in a manner that will ensure maximum probability of survival, but without removing the fish from the water. Under this alternative, cockpit gears would not be allowed to be used in any way to capture undersized or free-swimming HMS, but to only gain control of legal-sized HMS brought to the vessel via an authorized primary gear type, with the intent of retaining that HMS.

2.3.4 Regulatory Housekeeping

This section addresses several items in the HMS regulations that need to be “cleaned up,” including minor corrections, clarifications, the removal or modification of obsolete cross-references, and minor changes to definitions and prohibitions that will improve the administration and enforcement of HMS regulations. Several of these items have been identified

by constituents over the past few years or were raised during scoping hearings. Most of the corrections, clarifications, changes in definitions, and modifications to remove obsolete cross-references are consistent with the intent of previously analyzed and approved management measures. These proposed changes would have no effect either individually or cumulatively upon the human environment. Under NOAA Administrative Order 216-6, actions that modify previously analyzed actions and that do not affect the human environment, minor technical additions, corrections, or changes to existing regulations are categorically excluded from the requirements of an EA or EIS. Proposed changes that meet these criteria, and that are therefore exempt from the NEPA requirements, are described in Section 2.3.4.1, with the current regulation in the left column and the proposed amendment in the right column. Other, more substantive, changes for which alternatives have been analyzed pursuant to NEPA, the Regulatory Flexibility Act, or other applicable laws are discussed in Section 2.3.4.2.

2.3.4.1 Proposed Regulatory Changes That Do Not Need Alternatives

Table 2.2 presents a list of most of the current regulations and the proposed amendments to those regulations that NMFS is considering. A description of why the change is being considered is included in the last column. Similar additional changes may be contained in the proposed rule that are not listed here.

Table 2.2 List of Many Proposed Regulatory Changes.

Item Number	Current Regulation	Proposed Amendment	Rationale for Proposed Amendment
1	**§ 635.2 Definitions.** *ILAP* means an initial limited access permit issued pursuant to §635.4.	**§ 635.2 Definitions.** Remove the definition for ILAP.	Removes the definition of Initial Limited Access Permits (ILAPs), which are no longer issued.
2	**§ 635.2 Definitions.** *Management unit* means in this part: * * * (5) For sharks, means all fish of these species in the western north Atlantic Ocean, including the Gulf of Mexico and the Caribbean Sea, excluding those species listed in Table 2 of Appendix A.	**§ 635.2 Definitions** *Management unit* means in this part: * * * (5) For sharks, means all fish of the species listed in Table 1 of Appendix A to this part, in the western north Atlantic Ocean, including the Gulf of Mexico and the Caribbean Sea.	Specifies the species that are part of the management unit, rather than those that are not part of the management unit.
3	**§ 635.2 Definitions.** *Northeast Distant closed area* *** * ***	**§ 635.2 Definitions.** *Northeast Distant gear restricted area* *** * ***	Amends title of the Northeast Distant closed area to reflect recent amendments to the regulations governing this area.
4	**§ 635.2 Definitions.** *Shark* means one of the oceanic species, or a part thereof, listed in tables 1 and 2 in Appendix A to this part.	**§ 635.2 Definitions.** *Shark* means one of the oceanic species, or a part thereof, listed in Table 1 in Appendix A to this part.	Links the definition of "shark" to the definition of "management unit."

Item Number	Current Regulation	Proposed Amendment	Rationale for Proposed Amendment
5	**Table 2 in Appendix A - List of Deepwater and other sharks**	Remove **Table 2 in Appendix A**.	Removes the table of species that were previously removed from the management unit. NMFS will continue to collect data on these species and may add them to the management unit in the future.
6	**§ 635.4(c)(2)** A vessel issued an Atlantic Tunas General category permit under paragraph (d) of this section may fish in a recreational HMS fishing tournament if the vessel has registered for, paid an entry fee to, and is fishing under the rules of a tournament that has notified NMFS as required under § 635.5(d). When a vessel issued an Atlantic Tunas General category permit is fishing in such a tournament, such vessel must comply with HMS Angling category regulations, except as provided in 635.4(c)(3).	**§ 635.4(c)(2)** A vessel issued an Atlantic Tunas General category permit under paragraph (d) of this section may fish in a recreational HMS fishing tournament if the vessel has registered for, paid an entry fee to, and is fishing under the rules of a tournament that has registered with NMFS as required under § 635.5(d). When a vessel issued an Atlantic Tunas General category permit is fishing in such a tournament, such vessel must comply with HMS Angling category regulations, except as provided in 635.4(c)(3).	Clarifies the requirement that tournaments must be registered with NMFS, consistent with proposed revisions to § 635.5(d).
7	**§ 635.4(d)(4)** A person can obtain an Atlantic Tunas Longline category permit for a vessel only if the vessel has been issued both a limited access permit for shark and a limited access permit for swordfish. NMFS will issue Atlantic Tunas Longline category permits to qualifying vessels in calendar year 1999. Thereafter, such permits may be obtained through transfer from current owners consistent with the provisions under paragraph (l)(2) of this section.	**§ 635.4(d)(4)** A person can obtain an Atlantic Tunas Longline category permit for a vessel only if the vessel has been issued both a limited access permit for shark and a limited access permit other than handgear for swordfish. Atlantic Tunas Longline category permits may be obtained through transfer from current owners consistent with the provisions under paragraph (l)(2) of this section.	Removes a reference to a date that has passed. Also, clarifies that handgear permit holders cannot have an Atlantic Tunas Longline category permit because they cannot use longline gear to catch swordfish.
8	**§ 635.4(e)(1)** As of July 1, 1999, the only valid Federal commercial vessel permits for sharks are those that have been issued under the limited access criteria specified in §635.16.	**§ 635.4(e)(1)** The only valid Federal commercial vessel permits for sharks are those that have been issued under the limited access program consistent with §635.4(l) and (m).	Removes a date that has passed, and a cross-reference that has been removed.

Item Number	Current Regulation	Proposed Amendment	Rationale for Proposed Amendment
9	**§ 635.4(e)(2)** The owner of each vessel used to fish for or take Atlantic sharks or on which Atlantic sharks are retained, possessed with an intention to sell, or sold must obtain, in addition to any other required permits, only one of two types of commercial limited access shark permits: Shark directed limited access permit or shark incidental limited access permit. See §635.16 regarding the initial issuance of these two types of permits. It is a rebuttable presumption that the owner or operator of a vessel on which sharks are possessed in excess of the recreational retention limits intends to sell the sharks.	**§ 635.4(e)(2)** The owner of each vessel used to fish for or take Atlantic sharks or on which Atlantic sharks are retained, possessed with an intention to sell, or sold must obtain, in addition to any other required permits, only one of two types of commercial limited access shark permits: Shark directed limited access permit or shark incidental limited access permit. It is a rebuttable presumption that the owner or operator of a vessel on which sharks are possessed in excess of the recreational retention limits intends to sell the sharks.	Removes a cross-reference that has been removed.
10	**§ 635.4(f)(1)** The owner of each vessel used to fish for or take Atlantic swordfish or on which Atlantic swordfish are retained, possessed with an intention to sell, or sold must obtain, in addition to any other required permits, only one of three types of commercial limited access swordfish permits: swordfish directed limited access permit, swordfish incidental limited access permit, or swordfish handgear limited access permit. See §635.16 regarding the initial issuance of these three types of permits.	**§ 635.4(f)(1)** The owner of each vessel used to fish for or take Atlantic swordfish or on which Atlantic swordfish are retained, possessed with an intention to sell, or sold must obtain, in addition to any other required permits, only one of three types of commercial limited access swordfish permits: swordfish directed limited access permit, swordfish incidental limited access permit, or swordfish handgear limited access permit.	Removes a cross-reference that has been previously removed.
11	**§ 635.4(f)(2)** As of July 1, 1999, the only valid Federal vessel permits for swordfish are those that have been issued under the limited access criteria specified in §635.16.	**§ 635.4(f)(2)** The only valid Federal vessel permits for swordfish are those that have been issued under the limited access program consistent with §635.4(l) and (m).	Removes a date that has passed, and a cross-reference that has been previously removed.
12	**§ 635.4(h)(2)** *Limited access permits for swordfish and shark.* See §635.16 for the issuance of ILAPs for shark and swordfish. See paragraph (l) of this section for transfers of ILAPs and LAPs for shark and swordfish. See paragraph (m) of this section for renewals of LAPs for shark and swordfish.	**§ 635.4(h)(2)** *Limited access permits for swordfish and shark.* See paragraph (l) of this section for transfers of LAPs for shark and swordfish. See paragraph (m) of this section for renewals of LAPs for shark and swordfish.	Removes references to Initial Limited Access Permits (ILAPs), which are no longer issued. Also, removes a cross-reference that has been previously removed.

Item Number	Current Regulation	Proposed Amendment	Rationale for Proposed Amendment
13	**§ 635.4(l)(2)(i)** Subject to the restrictions on upgrading the harvesting capacity of permitted vessels in paragraph (l)(2)(ii) of this section and to the limitations on ownership of permitted vessels in paragraph (l)(2)(iii) of this section, an owner may transfer a shark or swordfish ILAP or LAP or an Atlantic Tunas Longline category permit to another vessel that he or she owns or to another person. Directed handgear ILAPs and LAPs for swordfish may be transferred to another vessel but only for use with handgear and subject to the upgrading restrictions in paragraph (l)(2)(ii) of this section and the limitations on ownership of permitted vessels in paragraph (l)(2)(iii) of this section. Incidental catch ILAPs and LAPs are not subject to the requirements specified in paragraphs (l)(2)(ii) and (l)(2)(iii) of this section.	**§ 635.4(l)(2)(i)** Subject to the restrictions on upgrading the harvesting capacity of permitted vessels in paragraph (l)(2)(ii) of this section and to the limitations on ownership of permitted vessels in paragraph (l)(2)(iii) of this section, an owner may transfer a shark or swordfish LAP or an Atlantic Tunas Longline category permit to another vessel that he or she owns or to another person. Directed handgear LAPs for swordfish may be transferred to another vessel but only for use with handgear and subject to the upgrading restrictions in paragraph (l)(2)(ii) of this section and the limitations on ownership of permitted vessels in paragraph (l)(2)(iii) of this section. Incidental catch LAPs are not subject to the requirements specified in paragraphs (l)(2)(ii) and (l)(2)(iii) of this section.	Removes references to Initial Limited Access Permits (ILAPs), which are no longer issued.
14	**§ 635.4(l)(2)(ii)(B)** The vessel's horsepower may be increased only once subsequent to the issuance of a limited access permit, whether through refitting, replacement, or transfer. * * *	**§ 635.4(l)(2)(ii)(B)** Subsequent to the issuance of a limited access permit, the vessel's horsepower may be increased only once, relative to the baseline specifications of the vessel originally issued the LAP, whether through refitting, replacement, or transfer. * * *	Clarifies that the one allowable horsepower upgrade for vessels with limited access permits is relative to the baseline specifications of the vessel originally issued the LAP.
15	**§ 635.4(l)(2)(ii)(C)** The vessel's length overall, gross registered tonnage, and net tonnage may be increased only once subsequent to the issuance of a limited access permit, whether through refitting, replacement, or transfer. * * *	**§ 635.4(l)(2)(ii)(C))** Subsequent to the issuance of a limited access permit, the vessel's length overall, gross registered tonnage, and net tonnage may be increased only once, relative to the baseline specifications of the vessel originally issued the LAP, whether through refitting, replacement, or transfer. * * *	Clarifies that the one allowable vessel size upgrade for vessels with limited access permits is relative to the baseline specifications of the vessel originally issued the LAP.

Item Number	Current Regulation	Proposed Amendment	Rationale for Proposed Amendment
16	**§ 635.4(l)(2)(viii)** As specified in paragraph (f)(4) of this section, a directed or incidental ILAP or LAP for swordfish, a directed or an incidental catch ILAP or LAP for shark, and an Atlantic Tunas commercial category permit are required to retain swordfish. Accordingly, a LAP for swordfish obtained by transfer without either a directed or incidental catch shark LAP or an Atlantic tunas commercial category permit will not entitle an owner or operator to use a vessel to fish in the swordfish fishery.	**§ 635.4(l)(2)(viii)** As specified in paragraph (f)(4) of this section, a directed or incidental LAP for swordfish, a directed or an incidental catch LAP for shark, and an Atlantic Tunas longline category permit are required to retain swordfish. Accordingly, a LAP for swordfish obtained by transfer without either a directed or incidental catch shark LAP or an Atlantic Tunas longline category permit will not entitle an owner or operator to use a vessel to fish in the swordfish fishery.	Removes references to Initial Limited Access Permits (ILAPs), which are no longer issued. Changes general term "commercial" to "longline" to be consistent with the cross- reference to paragraph (f)(4).
17	**§ 635.4(l)(2)(ix)** As specified in paragraph (d)(4) of this section, a directed or incidental ILAP or LAP for swordfish, a directed or an incidental catch ILAP or LAP for shark, and an Atlantic Tunas Longline category permit are required to retain Atlantic tunas taken by pelagic longline gear. Accordingly, an Atlantic Tunas Longline category permit obtained by transfer without either a directed or incidental catch swordfish or shark LAP will not entitle an owner or operator to use the permitted vessel to fish in the Atlantic tunas fishery with pelagic longline gear.	**§ 635.4(l)(2)(ix)** As specified in paragraph (d)(4) of this section, a directed or incidental LAP for swordfish, a directed or an incidental catch LAP for shark, and an Atlantic Tunas Longline category permit are required to retain Atlantic tunas taken by pelagic longline gear. Accordingly, an Atlantic Tunas Longline category permit obtained by transfer without either a directed or incidental catch swordfish or shark LAP will not entitle an owner or operator to use the permitted vessel to fish in the Atlantic tunas fishery with pelagic longline gear.	Removes references to Initial Limited Access Permits (ILAPs), which are no longer issued.

Item Number	Current Regulation	Proposed Amendment	Rationale for Proposed Amendment
18	**§ 635.4(m)(2)** *Shark, swordfish, and tuna longline LAPs*. As of June 1, 2000, the owner of a vessel of the United States that fishes for, possesses, lands or sells shark or swordfish from the management unit, or takes or possesses such shark or swordfish as incidental catch or that fishes for Atlantic tunas with longline gear must have the applicable limited access permit(s) issued pursuant to the requirements in §635.4, paragraphs (e) and (f). However, any ILAP that expires on June 30, 2000, is valid through that date. Only valid limited access permit holders in the preceding year are eligible for renewal of a limited access permit(s). Limited access permits that have been transferred according to the procedures of paragraph (l) of this section are not eligible for renewal by the transferor.	**§ 635.4(m)(2)** *Shark, swordfish, and tuna longline LAPs*. The owner of a vessel of the United States that fishes for, possesses, lands or sells shark or swordfish from the management unit, or takes or possesses such shark or swordfish as incidental catch or that fishes for Atlantic tunas with longline gear must have the applicable limited access permit(s) issued pursuant to the requirements in §635.4, paragraphs (e) and (f). Only persons holding a non-expired limited access permit(s) in the preceding year are eligible for renewal of a limited access permit(s). Limited access permits that have been transferred according to the procedures of paragraph (l) of this section are not eligible for renewal by the transferor.	Removes a date that has passed, and references to Initial Limited Access Permits (ILAPs), which are no longer issued. Also, replaces the word "valid" with "non-expired" to better clarify the intent of the paragraph.
19	**§ 635.5(a)(4)** *Pelagic longline sea turtle reporting*. The operators of vessels that have pelagic longline gear on board and that have been issued, or are required to have, a limited access swordfish, shark, and tuna longline category permit for use in the Atlantic Ocean including the Caribbean Sea and the Gulf of Mexico are required to report any sea turtles that are dead when they are captured or that die during capture to the NOAA Fisheries Southeast Fisheries Science Center Observer Program, at a number designated by NOAA Fisheries, within 48 hours of returning to port, in addition to submitting all other reporting forms required by this part and 50 CFR parts 223 and 224.	Remove **§ 635.5(a)(4),** and redesignate subsequent sections as needed.	Removes a duplicative reporting requirement. Captured sea turtles would still be required to be reported in PLL logbooks, so no information is lost.

Item Number	Current Regulation	Proposed Amendment	Rationale for Proposed Amendment
20	**§ 635.5(d)** *Tournament operators.* A tournament operator must notify NMFS of the purpose, dates, and location of the tournament conducted from a port in an Atlantic coastal state, including the U.S. Virgin Islands and Puerto Rico, at least 4 weeks prior to commencement of the tournament. NMFS will notify a tournament operator in writing, when his or her tournament has been selected for reporting. The tournament operator that is selected must maintain and submit to NMFS a record of catch and effort on forms available from NMFS. Tournament operators must submit completed forms to NMFS, at an address designated by NMFS, postmarked no later than the 7th day after the conclusion of the tournament and must attach a copy of the tournament rules.	**§ 635.5(d)** *Tournament operators.* A tournament operator must register with the NMFS' HMS Management Division all HMS tournaments that are conducted from a port in an Atlantic coastal state, including the U.S. Virgin Islands and Puerto Rico, at least 4 weeks prior to commencement of the tournament by indicating the purpose, dates, and location of the tournament. Tournament registration is not considered complete unless the operator has received a confirmation number from the NMFS' HMS Management Division. NMFS will notify a tournament operator in writing when his or her tournament has been selected for reporting. Tournament operators that are selected for reporting must maintain and submit to NMFS a record of catch and effort on forms available from NMFS. Tournament operators must submit the completed forms to NMFS, at an address designated by NMFS, postmarked no later than the 7th day after the conclusion of the tournament, and must attach a copy of the tournament rules.	Clarifies the specific line office that HMS tournament operators must notify and register with. Indicates that a confirmation number is necessary to complete the registration process.
21	**§ 635.21(a)(2)** If a billfish is caught by a hook, the fish must be released by cutting the line near the hook or by using a dehooking device, in either case without removing the fish from the water.	**§ 635.21(a)(2)** If a billfish is caught by a hook and not retained, the fish must be released by cutting the line near the hook or by using a dehooking device, in either case without removing the fish from the water.	Clarifies that billfish caught by a hook *and not retained* must be released using specified protocols. Without clarification, the implication may be that billfish caught by hook must always be released.
22	**§ 635.21(c)(1)** From August 1, 1999, through November 30, 2000, no person may deploy a pelagic longline that is more than 24 nautical mile (44.5 km) in length in the Mid-Atlantic Bight.	**§ 635.21(c)(1)** [Reserved] or Remove and replace paragraph.	Removes a requirement that has expired.
23	**§ 635.21(c)(2)(ii)** In the Charleston Bump closed area from March 1 through April 30, 2001, and from February 1 through April 30 each calendar year thereafter;	**§ 635.21(c)(2)(ii)** In the Charleston Bump closed area from February 1 through April 30 each calendar year;	Removes dates that have passed.

Item Number	Current Regulation	Proposed Amendment	Rationale for Proposed Amendment
24	**§ 635.21(c)(2)(iii)** In the East Florida Coast closed area at any time beginning at 12:01 a.m. on March 1, 2001;	**§ 635.21(c)(2)(iii)** In the East Florida Coast closed area at any time;	Removes dates that have passed.
25	**§ 635.21(c)(2)(iv)** In the Desoto Canyon closed area at any time beginning at 12:01 a.m. on November 1, 2000;	**§ 635.21(c)(2)(iv)** In the Desoto Canyon closed area at any time;	Removes dates that have passed.
26	**§ 635.21(c)(2)(v)** In the Northeast Distant closed area at any time, unless persons onboard the vessel comply with the following: * * *	**§ 635.21(c)(2)(v)** In the Northeast Distant gear restricted area at any time, unless persons onboard the vessel comply with the following: * * *	Amends title of the Northeast Distant closed area to reflect recent amendments to the regulations governing the area.
27	Second sentence of **§ 635.21(e)(1)** currently reads, "When fishing for Atlantic tunas other than BFT, fishing gear authorized for any Atlantic Tunas permit category may be used, except that purse seine gear may only be used on board vessels permitted in the Purse Seine category and pelagic longline gear may be used only on board vessels issued an Atlantic Tunas Longline category tuna permit as well as ILAPs or LAPs for both swordfish and sharks."	Second sentence of **§ 635.21(e)(1)** proposed to be amended as, "When fishing for Atlantic tunas other than BFT, fishing gear authorized for any Atlantic Tunas permit category may be used, except that purse seine gear may only be used on board vessels permitted in the Purse Seine category and pelagic longline gear may be used only on board vessels issued an Atlantic Tunas Longline category tuna permit and a LAP other than handgear for swordfish, and a LAP for sharks."	Removes references to Initial Limited Access Permits (ILAPs), which are no longer issued. Consistent with existing regulations, reiterates that vessels issued swordfish handgear permits cannot be issued an Atlantic Tunas Longline category permit because the vessel cannot use longline gear to catch swordfish.
28	**§ 635.21(e)(4)(iii)** A person aboard a vessel issued a directed handgear ILAP or LAP for Atlantic swordfish may not fish for swordfish with any gear other than handgear. * * *	**§ 635.21(e)(4)(iii)** A person aboard a vessel issued a directed handgear LAP for Atlantic swordfish may not fish for swordfish with any gear other than handgear. * * *	Removes references to Initial Limited Access Permits (ILAPs), which are no longer issued.
29	The third sentence of **§635.22(c)** currently reads, "No prohibited sharks from the management unit, which are listed in table 1(d) of Appendix A to this part, may be retained."	The third sentence of **§635.22(c)** is proposed to be amended as, "No prohibited sharks, including parts or pieces of prohibited sharks, which are listed in table 1(d) of Appendix A to this part, may be retained."	Clarifies that parts and pieces of prohibited sharks may not be retained.

Item Number	Current Regulation	Proposed Amendment	Rationale for Proposed Amendment
30	**§ 635.23(f)(3) –** For pelagic longline vessels fishing in the Northeast Distant closed area, as defined under §635.2, under the exemption specified at §635.21(c)(2)(v), all BFT taken incidental to fishing for other species while in the Northeast Distant closed area may be retained up to a maximum of 25 mt for all vessels so authorized, notwithstanding the retention limits and target catch requirements specified in paragraph (f)(1) of this section.	**§ 635.23(f)(3) –** For pelagic longline vessels fishing in the Northeast Distant gear restricted area, as defined under §635.2, under the exemption specified at §635.21(c)(2)(v), all BFT taken incidental to fishing for other species while in the Northeast Distant gear restricted area may be retained up to a maximum of 25 mt for all vessels so authorized, notwithstanding the retention limits and target catch requirements specified in paragraph (f)(1) of this section.	Changes the title of the NED closed area to reflect recent amendments to the regulations governing the area.
31	**§ 635.24(a)(1)** Persons who own or operate a vessel that has been issued a directed ILAP or LAP for shark may retain, possess or land no more than 4,000 lb (1,814 kg), dw, of LCS per trip.	**§ 635.24(a)(1)** Persons who own or operate a vessel that has been issued a directed LAP for shark may retain, possess or land no more than 4,000 lb (1,814 kg), dw, of LCS per trip.	Removes references to Initial Limited Access Permits (ILAPs), which are no longer issued.
32	**§ 635.24(a)(2)** Persons who own or operate a vessel that has been issued an incidental catch ILAP or LAP for sharks may retain, possess or land no more than 5 LCS and 16 SCS and pelagic sharks, combined per trip.	**§ 635.24(a)(2)** Persons who own or operate a vessel that has been issued an incidental catch LAP for sharks may retain, possess or land no more than 5 LCS and 16 SCS and pelagic sharks, combined per trip.	Removes references to Initial Limited Access Permits (ILAPs), which are no longer issued.
33		Add a new paragraph at **§635.24(a)(3)** to read as follows, "Persons who own or operate a vessel that has been issued an incidental or directed LAP for sharks may not retain, possess, sell, or purchase a prohibited shark, including parts or pieces of prohibited sharks, which are listed in Table 1 of Appendix A to this part under prohibited sharks."	Clarifies existing regulations regarding the retention, possession, sale and purchase of prohibited sharks by also including parts and pieces of prohibited sharks.
34	**§ 635.24(b)(1)** Persons aboard a vessel that has been issued an incidental ILAP or LAP for swordfish may retain, possess, or land no more than two swordfish per trip in or from the Atlantic Ocean north of 5° N. lat.	**§ 635.24(b)(1)** Persons aboard a vessel that has been issued an incidental LAP for swordfish may retain, possess, or land no more than two swordfish per trip in or from the Atlantic Ocean north of 5° N. lat.	Removes references to Initial Limited Access Permits (ILAPs), which are no longer issued.

Item Number	Current Regulation	Proposed Amendment	Rationale for Proposed Amendment
35	**§ 635.24(b)(2)** Persons aboard a vessel in the squid trawl fishery that has been issued an incidental ILAP or LAP for swordfish may retain, possess, or land no more than five swordfish per trip in or from the Atlantic Ocean north of 5° N. lat. * * *	**§ 635.24(b)(2)** Persons aboard a vessel in the squid trawl fishery that has been issued an incidental LAP for swordfish may retain, possess, or land no more than five swordfish per trip in or from the Atlantic Ocean north of 5° N. lat. * * *	Removes references to Initial Limited Access Permits (ILAPs), which are no longer issued.
36	**§ 635.27(a)(3)** * * * In addition, 25 mt shall be allocated for incidental catch by pelagic longline vessels fishing in the Northeast Distant closed area, as defined under §635.2, under the exemption specified at §635.21(c)(2)(v).	**§ 635.27(a)(3)** * * * In addition, 25 mt shall be allocated for incidental catch by pelagic longline vessels fishing in the Northeast Distant gear restricted area, as defined under §635.2, under the exemption specified at §635.21(c)(2)(v).	Changes title of the NED closed area to reflect recent regulatory changes to the area.
37	**§ 635.71(a)(7)** Fail to allow an authorized agent of NMFS to inspect and copy reports and records, as specified in § 635.5(e) or § 635.32.	**§ 635.71(a)(7)** Fail to allow an authorized agent of NMFS to inspect and copy reports and records, as specified in § 635.5(e), § 635.5(f), or § 635.32.	Adds an additional reference in this prohibition to § 635.5(f) – *Additional data and inspection.*
38	**§ 635.71(a)(8)** Fail to make available for inspection an Atlantic HMS or its area of custody, as specified in § 635.5(g).	**§ 635.71(a)(8)** Fail to make available for inspection an Atlantic HMS or its area of custody, as specified in § 635.5(f).	Corrects an obsolete reference to § 635.5(g) and replaces with § 635.5(f).
39	**§ 635.71(a)(37)** Fail to report to NMFS, at the number designated by NMFS, the incidental capture of listed whales with shark gillnet gear and sea turtle mortalities associated with pelagic longline gear as required by § 635.5.	**§ 635.71(a)(37)** Fail to report to NMFS, at the number designated by NMFS, the incidental capture of listed whales with shark gillnet gear as required by § 635.5.	Removes a duplicative reporting requirement. Captured sea turtles would still be required to be reported in PLL logbooks, so no information is lost.
40	**§ 635.71(b)(22)** As the owner or operator of a purse seine vessel, fail to comply with the requirements for weighing, measuring, and information collection specified in § 635.30(a)(2).	**§ 635.71(b)(22)** Remove paragraph. Replace with new paragraph or redesignate successive prohibitions, as appropriate.	Removes language referencing a paragraph that has been removed.
41	**§ 635.71(d)(10)** Retain, possess, sell, or purchase a prohibited shark, as specified under § 635.22(c) and § 635.27(b)(1) or fail to disengage any hooked or entangled prohibited shark with the least harm possible to the animal as specified at § 635.21(d)(3).	**§ 635.71(d)(10)** Retain, possess, sell, or purchase a prohibited shark, including parts or pieces of prohibited sharks, as specified under § 635.22(c), § 635.24(a)(3), and § 635.27(b)(1) or fail to disengage any hooked or entangled prohibited shark with the least harm possible to the animal as specified at §635.21(d)(3).	Adds a reference to a new paragraph at § 635.24(a)(3), which includes parts and pieces of prohibited sharks.

Item Number	Current Regulation	Proposed Amendment	Rationale for Proposed Amendment
42	**§ 635.71(d)(11)** Falsify information submitted under § 635.16(d)(2) or (d)(4) in support of an application for an ILAP or an appeal of NMFS's denial of an ILAP for shark.	Remove **§ 635.71(d)(11)** and redesignate §§ 635.71(d)(12) and 635.71(d)(13) as §§ 635.71(d)(11) and 635.71(d)(12), respectively.	Removes a cross-reference that has been removed. ILAPs are no longer being issued, and appeals are complete.
43	**§ 635.71(e)(11)** Falsify information submitted under §635.16(d)(2) or (d)(4) in support of an application for an ILAP or an appeal of NMFS's denial of an initial limited access permit for swordfish.	Remove **§ 635.71(e)(11)** and redesignate §§ 635.71(e)(12), (e)(13), (e)(14), and (e)(15) as §§ 635.71(e)(11), (e)(12), (e)(13), and (e)(14), respectively.	Removes a cross-reference that has been removed. ILAPs are no longer being issued, and appeals are complete.
44	**§ 300.182(d)** *Duration.* Any permit issued under this section is valid until December 31 of the year for which it is issued, unless suspended or revoked.	**§ 300.182(d)** *Duration.* Any permit issued under this section is valid for the period specified on it, unless suspended or revoked.	Modifies the expiration date of the HMS International Trade Permit.

2.3.4.2 Alternatives

The issues being addressed in this section include changes in definitions, clarifications, and amendments for which alternatives have been developed and analyzed. A description of each issue is provided, followed by a description of the alternatives being considered.

Issue 1: Definitions of Pelagic and Bottom Longline

The HMS time/area closures that are currently in effect apply specifically to either pelagic or bottom longline gear (*i.e.*, the Desoto Canyon, East Florida Coast, Charleston Bump, Mid-Atlantic Shark, and Northeastern United States Closed Areas). Therefore, to determine compliance with the closed area restrictions, it is optimal for the two gear types to be clearly differentiable. In the current regulations, the difference is articulated by general reference to the presence of weights/floats capable of anchoring/supporting the mainline on/in the seafloor/water column. Problems have arisen because bottom longline vessel operators sometimes possess and utilize floats on bottom longline gear, and pelagic longline vessel operators sometimes possess and utilize weights on pelagic longline gear. In these situations, it may be difficult to determine if the weights are capable of anchoring the mainline on the seafloor, or if the floats are capable of supporting the mainline in the water column. NMFS is considering amending the definitions for pelagic and bottom longlines at §§ 635.2; 635.21(c); and 635.21(d), or establishing additional restrictions on these gears when fishing in the time/area closures. Any revisions to the definitions or additional restrictions would also have to take into consideration the implementation of any new or revised time/area closures, as discussed in Section 4.1.2.

Alternative I1(a) Retain current definitions for pelagic and bottom longline gears (No Action)

This alternative would retain the current definitions for pelagic and bottom longlines at §§ 635.2; 635.21(c); and 635.21(d). A pelagic longline is defined as a longline that is suspended by floats in the water column and that is not fixed to or in contact with the ocean bottom. For purposes of § 635.21(c), a vessel is considered to have pelagic longline gear onboard when a power-operated longline hauler, a mainline, floats capable of supporting the mainline, and leaders (gangions) with hooks are onboard. A bottom longline is defined as a longline that is deployed with enough weights and/or anchors to maintain contact with the ocean bottom. For purposes of § 635.21(d), a vessel is considered to have bottom longline gear on board when a power-operated longline hauler, a mainline, weights and/or anchors capable of maintaining contact between the mainline and the ocean bottom, and leaders (gangions) with hooks are on board.

Alternative I1(b) *Establish additional restrictions on longline gear in HMS time/area closures by specifying a maximum and minimum allowable number of commercial fishing floats in order to qualify as a bottom or pelagic longline vessel, respectively – Preferred Alternative*

This alternative would retain the current definitions for pelagic and bottom longlines at §§ 635.2; 635.21(c); and 635.21(d). However, in addition, this alternative would establish limits on the number of commercial fishing floats that longline fishing vessels must possess onboard to qualify as either a bottom or pelagic longline vessel within the closed areas. Specifically, to be considered a bottom longline vessel in a PLL closed area, the vessel must possess no more than 70 commercial fishing floats onboard or deployed, combined. To be considered a pelagic longline vessel in a BLL closed area, the vessel must possess at least 71 commercial fishing floats onboard or deployed, combined. Examples of commercial fishing floats include bullet floats, poly balls, high flyers, and lobster pot buoys. NMFS is specifically seeking comments on this list to determine if it is complete and/or accurate. Also, NMFS is considering whether to include a definition of "fishing floats" in the final rule for this action. Comments are requested on potential language to define "fishing floats."

Alternative I1(c) *Differentiate between pelagic and bottom longline gear based upon the species composition of the catch onboard or landed – Preferred Alternative*

This alternative would retain the current definitions for pelagic and bottom longlines at §§ 635.2; 635.21(c); and 635.21(d). However, in addition, this alternative would establish a 5-percent limit (by weight) on the allowable amount of “indicator” pelagic species that bottom longline vessels may possess or land from PLL closed areas, and establish a 5-percent limit (by weight) on the allowable amount of “indicator” demersal species that pelagic longline vessels may possess or land from BLL closed areas. Specifically, to qualify as a bottom longline vessel when fishing in a PLL closed area, no more than 5 percent (by weight) of the species possessed or landed may be “indicator” pelagic species relative to “indicator” demersal species. To be considered a pelagic longline vessel when fishing in a BLL closed area, no more than 5 percent (by weight**)** of the species possessed or landed may be “indicator” demersal species relative to “indicator” pelagic species. NMFS is specifically seeking comments on the list of pelagic and demersal “indicator” species.

Alternative I1(d) Require time/depth recorders (TDRs) on all HMS longlines

This alternative would require TDRs (data loggers) at pre-specified intervals on all HMS longline fishing gear that is deployed. The TDRs must be operational, and able to accurately record the maximum and minimum fishing depths of HMS longline gear using an onboard TDR reader. Pelagic longline gear would be required to remain within the upper two-thirds of the water column while fishing, and bottom longline gear would be required to remain within the bottom third of the water column while fishing.

Alternative I1(e) Base HMS time/area closures on all longlines (PLL and BLL)

This alternative would not differentiate between pelagic and bottom longline gear in the establishment and enforcement of HMS longline closed areas. Specifically, if this alternative were adopted, all longline gear would be prohibited from all HMS longline closed areas.

Issue 2: Shark Identification

Species identification of sharks can be enhanced by the presence of fins. NMFS is considering amending the regulations governing commercial shark landings, possibly at § 635.30(c)(2) and at § 635.71(d)(6), to facilitate shark identification for enforcement and data collection purposes.

Alternative I2(a) Retain current commercial regulations regarding shark landing requirements (No Action)

By retaining the *status quo*, this alternative would allow for the removal of all shark fins prior to landing. Other regulations governing the landing of sharks and shark fins would remain unchanged, as well. As such, Federal commercial shark limited access permit holders would be allowed to eviscerate sharks and remove their heads and fins at sea as long as the ratio between the weight of fins and the weight of carcass does not exceed five percent.

Alternative I2(b) *Require that the 2nd dorsal fin and the anal fin remain on all sharks through landing – Preferred Alternative*

This alternative would mandate the retention of the 2nd dorsal fin and anal fin on all shark species through landing. Specifically, Federal commercial shark limited access permit holders would be required to have these fins attached to all sharks during offloading. Removal of these fins would only be permissible after the shark is offloaded.

Alternative I2(c) Require that the 2nd dorsal fin and the anal fin remain on all sharks through landing, except for lemon and nurse sharks

This alternative would mandate the retention of the 2nd dorsal fin and anal fin an all shark species, except for lemon and nurse sharks, through landing. Specifically, Federal commercial shark limited access permit holders would be required to have these fins attached to all sharks, except nurse and lemon sharks, during offloading. Removal of these fins would only be

permissible after the shark is offloaded. Nurse and lemon sharks would be exempt because identification is more readily accomplished with these species, even without the two fins.

Alternative I2(d) Require that all fins remain on all sharks through landing

This alternative would mandate the retention of all fins on all shark species through landing. Federal commercial shark limited access permit holders would be required to have all fins attached to all sharks during offloading. Removal of the fins would only be permissible after the shark is offloaded.

Issue 3: HMS Retention Limits

Currently, HMS retention limits are specific to "persons aboard a vessel" (*i.e.*, vessel owners and operators). NMFS is considering adding new prohibitions at § 635.71(a)(48) and § 635.71(a)(49) that would address the purchase and sale of HMS by dealers in excess of the retention limits specified in §§ 635.23 and 635.24. The intent of these prohibitions would be to improve compliance with HMS retention limits by extending the regulations to both of the parties involved in a transaction.

Alternative I3(a) Retain current regulations regarding retention limits, with no new prohibitions (No Action)

This alternative would not implement new prohibitions regarding the purchase and sale of HMS by dealers in excess of the retention limits specified in §§ 635.23 and 635.24. As such, compliance with many of the HMS retention limits would remain solely incumbent upon "persons aboard a vessel" (*i.e.*, vessel owners and operators). Persons who purchase HMS in excess of the retention limits would remain unaffected.

Alternative I3(b) *Add new prohibition at § 635.71(a)(48) making it illegal for any person to, "Purchase any HMS that was offloaded from an individual vessel in excess of the retention limits specified in §§ 635.23 and 635.24" – Preferred Alternative*

This alternative would implement a new prohibition at § 635.71(a)(48) making it illegal for any person to, "Purchase any HMS from an individual vessel in excess of the retention limits specified in §§ 635.23 and 635.24." As such, dealers and buyers would be held responsible for purchases in excess of HMS retention limits, as would vessel owners and operators. This prohibition is intended to improve compliance with HMS retention limits by extending the regulations to both of the parties involved in a transaction. It would reinforce and clarify other existing regulations regarding landings of HMS in excess of commercial retention limits.

Alternative I3(c) *Add new prohibition at § 635.71(a)(49) making it illegal for any person to, "Sell any HMS that was offloaded from an individual vessel in excess of the retention limits specified in §§ 635.23 and 635.24" – Preferred Alternative*

This alternative would implement a new prohibition at § 635.71(a)(49) making it illegal for any person to, "Sell any HMS from an individual vessel in excess of the retention limits specified in §§ 635.23 and 635.24". This prohibition would reinforce and clarify other regulations regarding landings of HMS in excess of commercial retention limits.

Issue 4: Definition of East Florida Coast Closed Area

NMFS is considering amending the definition of the East Florida Coast closed area at § 635.2 by replacing the second coordinate (28° 17' N. lat., 79° 12' W. long.) with 28° 17' 10" N. lat., 79° 11' 24" W. long., so that the outer boundary of the closed area corresponds with the outer boundary of the EEZ, as originally intended. This area was initially described in the FSEIS (NMFS June 14, 2000) and the final rule prepared pursuant to implementation of the closed area (65 FR 47214, August 1, 2000). However, one of the current outer coordinates does not correspond exactly with the EEZ boundary, thus leaving a small area open between the closed area and the EEZ. The outer coordinate being considered is approximately 1.02 km (0.55 nm) seaward (eastward) of the current coordinate. This modification would effect the intent of the closed area to extend out to the EEZ.

Alternative I4(a) Retain current coordinates for the East Florida Coast closed area (No Action)

This alternative would retain the *status quo* coordinates for the East Florida Coast closed area. One of the outer coordinates does not correspond exactly with the EEZ boundary, thus leaving a small area open between the closed area and the EEZ. Pelagic longline vessels would continue to be allowed to fish in this small area between the closed area and the EEZ.

Alternative I4(b) *Amend the second coordinate of the East Florida Coast closed area to 28° 17' 10" N. lat., 79° 11' 24" W. long., so that it corresponds with the EEZ – Preferred Alternative*

This alternative would amend a coordinate of the East Florida Coast closed area. If this alternative were selected, pelagic longline vessels would not be able to fish in a small area that is currently open between the closed area and the EEZ.

Issue 5: Definition of Handline

Currently, a "handline" is defined as fishing gear consisting of a mainline to which no more than two leaders (gangions) with hooks are attached, and that is released and retrieved by hand, rather than by mechanical means. It has been brought to the Agency's attention that some vessel operators, both commercial and recreational, may be deploying numerous handlines that are not attached to their vessel, effectively fishing with miniature, hand-operated longlines, in areas that are closed to pelagic longlines and elsewhere. While these vessel operators are technically compliant with current regulations, this practice may circumvent the original "concept" of handline gear, and could potentially diminish the conservation benefits associated with the PLL closed areas. Therefore, NMFS is considering amending the definition of "handline," possibly at §§ 635.2 and 635.2l.

Alternative I5(a) Retain the current definition of "handline" at § 635.2 (No Action)

The "No Action" alternative would retain the current definition of "handline," as described above. As such, the practice of fishing with an unlimited number of unattached handlines would continue to be allowed.

Alternative I5(b) *Amend the definition of "handline" at § 635.2 by requiring that they be attached to, or in contact with, all vessels – Preferred Alternative*

Alternative I5(b) would define a handline as fishing gear that is attached to, or in direct contact with, a fishing vessel and consists of a mainline to which no more than two leaders (gangions) with hooks are attached, and that is released and retrieved by hand, rather than by mechanical means. As such, the practice of fishing with unattached handlines would be disallowed for all HMS commercial and recreational fishing activities. Please see Section 2.3.3 of this document regarding an alternative that would add "buoy gear" to the list of authorized gears for the swordfish handgear fishery.

Alternative I5(c) Require that handlines remain attached to all vessels when fishing recreationally and allow unattached handlines when fishing commercially

Alternative I5(c) would require that handlines remain attached to, or in direct contact with, a fishing vessel for all vessels possessing either an HMS Angling category permit; an HMS Charter/headboat permit when fishing on a for-hire trip; or, an Atlantic Tunas General category permit when fishing in a registered HMS tournament. As such, the practice of fishing with unattached handlines would be disallowed when conducting recreational fishing activities, but the practice would be allowed when fishing commercially.

Issue 6: Possession of Billfish on Vessels Issued Commercial Permits

The Atlantic billfish fishery is a recreational fishery and the sale of Atlantic billfish is prohibited. Furthermore, Atlantic billfish may only be harvested by rod and reel, and persons may not currently possess, take, or retain billfish if pelagic longline gear is onboard the vessel. NMFS is considering amendments that would reinforce the recreational nature of the Atlantic billfish fishery by eliminating a minor loophole that exists, whereby the possession or retention of billfish is not prohibited if commercial gears other than pelagic longline are onboard a vessel. As such, persons may potentially fish for and possess Atlantic billfish for non-commercial purposes when conditions favor their availability using rod and reel when other commercial gear is onboard. Also, vessel operators might incidentally capture and possess billfish caught on other commercial gears and illegally retain the fish by indicating that it was caught using rod and reel. Therefore, NMFS is considering amendments to prohibit the possession or retention of billfish on all vessels with bottom longline, gillnet, purse seine, harpoon, bandit gear, commercial rod and reel, commercial handline, and other commercial gear onboard. If this alternative were selected, the regulations for these other commercial gears would be consistent with current regulations in effect for pelagic longline gear. This issue would clarify that only vessel owners possessing either an HMS Angling, HMS Charter/headboat, or Atlantic Tunas General category (when fishing in a registered HMS tournament) permit may possess or retain an Atlantic billfish taken from its management unit with rod and reel.

Alternative I6(a) Retain current regulations regarding the possession of Atlantic billfish (No Action)

The "No Action" alternative would not prohibit the possession or retention of billfish if commercial gears other than pelagic longlines were onboard the vessel. As such, persons may potentially fish for and possess Atlantic billfish for non-commercial purposes when conditions favor their availability using rod and reel, when other commercial gear is onboard. The "No Action" alternative does not specify which permit holders may possess or retain an Atlantic billfish taken from its management unit.

Alternative I6(b) *Prohibit vessels issued commercial permits and operating outside of a tournament from possessing, retaining, or taking Atlantic billfish from the management unit – Preferred Alternative*

Alternative I6(b) would prohibit the possession or retention of billfish on all vessels with bottom longline, gillnet, purse seine, harpoon , bandit gear, commercial rod and reel, commercial handline, and other commercial onboard. Only vessel owners possessing either an HMS Angling, HMS Charter/headboat permit, or an Atlantic Tunas General category (when fishing in a registered HMS tournament) permit would be allowed to possess or retain an Atlantic billfish taken from its management unit with rod and reel. If this alternative were selected, the regulations for these commercial gears would be consistent with current regulations in effect for pelagic longline gear. This alternative would further reinforce and clarify the recreational nature of the Atlantic billfish fishery.

Issue 7: Bluefin Tuna Dealer Reporting

NMFS is investigating alternative methods of BFT dealer reporting. Currently, BFT dealers are required to manually complete and submit potentially three individual BFT reports (BFT landing reports, bi-weekly BFT reports, and BFT statistical documents for international trade). These reports are then re-entered into databases by NMFS personnel. Recent advances in software technology and web-based applications provide opportunities for dealers to enter and report data with greater efficiency, and with potential reductions in administrative costs for both dealers and NMFS. For example, NMFS' Northeast Regional Office has transitioned to an electronic web-based dealer reporting system and continues to work with dealers to improve the system. Electronic capabilities could also be developed for an HMS BFT system to increase quality control and assurance capabilities, using cross-checks with other databases, data fields, and flags that would facilitate accurate data entry. However, current regulations regarding BFT dealer reporting and recordkeeping only provide requirements that dealers submit written reports, either in the mail or via FAX transmittal. To provide additional electronic reporting flexibility, as described above, it is necessary to amend the HMS regulations to specify that BFT dealers may also submit these reports electronically over the Internet if they choose to do so.

Alternative I7(a) Retain the current regulations regarding bluefin tuna dealer reporting (No Action)

Under this alternative the regulations regarding BFT dealer reporting would remain unchanged. Potentially, dealers that have the capacity and interest to report electronically would not be able to do so because the current requirements specifically state that reports must be written and mailed or faxed (*i.e*. fax for landing reports; fax or standard mail for bi-weekly reports; fax or standard mail for statistical documents accompanying imported BFT; standard mail for statistical documents accompanying exported BFT).

Alternative I7(b) *Amend the HMS regulations to provide an option for Atlantic tunas dealers to submit required BFT reports using the Internet – Preferred Alternative*

Under this alternative, the regulations would be slightly modified to add text under each BFT dealer reporting requirement so that dealers may also electronically submit the required report if they choose to do so. All *status quo* methods of providing hand-written reports and documentation via mail or fax would remain available and permissible. Electronic submission would be provided as an option, and would not be mandatory. Investigations are still underway regarding the feasibility and design of an electronic system and no dates for implementation have yet been set. However, when such a system has been designed, it would be useful to provide interested dealers with the opportunity to test the system and provide feedback for future enhancements. The preferred alternative would provide dealers with the flexibility to not only test the system, but to continue to use it should they choose to do so.

Alternative I7(c) Amend the HMS BFT dealer reporting regulations to require that Atlantic tunas dealers submit BFT reports electronically, with specific exceptions.

This alternative would propose to adjust the regulations to require all BFT dealers, with some exceptions, to submit all BFT reports electronically either using a web-based application or software on a private computer with data transmitted over the Internet. The intent of this alternative would be to standardize reporting, reduce administrative burdens, and ensure the new system is used. All options to submit written reports via mail or fax would be eliminated except in certain specific cases, such as for dealers below an established economic size or when a dealer reports minimal numbers of fish infrequently.

Issue 8: "No-Fishing" and "Cost-Earnings" Reporting Forms

Presently, if commercial HMS permit holders (*i.e*., HMS Charter/headboat, Atlantic Tunas, and commercial shark and swordfish permit holders) are selected for reporting, they are required to submit logbooks to NMFS postmarked within seven days of offloading all Atlantic HMS. NMFS supplies logbook forms to all selected vessels. These forms consist of a fishing report (catch, discards, effort and fishing area data), a "no-fishing" reporting form if no fishing took place during the preceding month, and trip and annual "cost-earnings" reporting forms. The reported information is used to conduct stock assessments, monitor quotas, prevent overfishing, and estimate the economic impacts of different management measures. There has been some confusion as to whether the "no-fishing" reporting form and the "cost-earnings" reporting forms are a required component of the logbook, and exactly when they must be submitted. Therefore, NMFS is considering amendments to require the submission of a "no- fishing" reporting form,

and to specify that the report must be postmarked no later than seven days after the end of the month. Similarly, the "cost-earnings" reporting forms would need to be submitted within 30 days of a trip and by January 31 of each year. The Paperwork Reduction Act (PRA) reporting burden for these information collections is currently approved under the PRA submission for Atlantic HMS vessel logbooks (OMB Control Number 0648-0371). A requirement to submit the "no-fishing" reporting form and the "cost-earnings" reporting form within a certain timeframe would be new, however it is consistent with current HMS requirements and with other NMFS' Southeast' Regional regulations. These modifications are being considered to better clarify HMS logbook reporting requirements.

Alternative I8(a) Maintain the existing regulations regarding submission of logbooks. (No Action)

The "No Action" alternative would retain the existing regulations regarding the submission of HMS vessel logbooks at § 635.5(a)(1). There are currently no specific requirements to submit "no-fishing" and "cost-earnings" reporting forms to NMFS within a certain timeframe.

Alternative I8(b) *Require submission of "no-fishing" reporting forms for selected vessels if no fishing trips occurred during the preceding month, postmarked no later than seven days after the end of the month – Preferred Alternative*

Alternative I8(b) would amend the HMS regulations at § 635.5(a)(1) to require the submission of "no-fishing" reporting forms for selected vessels if no fishing trips occurred during the preceding month, postmarked no later than seven days after the end of the month. This alternative would better clarify HMS logbook reporting requirements and provide important information to conduct stock assessments, monitor quotas, and prevent overfishing.

Alternative I8(c) *Require submission of the trip "cost-earnings" reporting form for selected vessels 30 days after a trip, and the annual "Cost-Earning" report form by January 31st of each year – Preferred Alternative*

Alternative I8(c) would amend the HMS regulations to require the submission of trip "cost-earnings" reporting forms for selected vessels 30 days after a trip, and the annual "cost-earnings" report form by January 31st of each year. This alternative would better clarify HMS reporting requirement and provide important information to estimate the economic impacts of different management measures.

Issue 9: Non-Tournament Recreational Landings Reporting

HMS regulations currently specify that anglers are required to report non-tournament recreational landings of Atlantic billfish and swordfish, whereas other HMS regulations specify that vessel owners are required to report recreational landings of bluefin tuna under the Angling category. NMFS is considering clarifying that owners of vessels permitted, or required to be permitted, in the Atlantic HMS Angling or Atlantic HMS Charter/headboat category must report all non-tournament recreational landings of billfish and swordfish. This action is being considered to remove inconsistencies in reporting requirements and to clarify NMFS' intent that

the vessel owner, rather than the angler, is responsible for reporting non-tournament recreational landings of Atlantic billfish and swordfish.

Alternative I9(a) Retain existing regulations at § 635.5(c)(2) requiring anglers to report non-tournament recreational landings of North Atlantic swordfish and Atlantic billfish (No Action)

Alternative I9(a) would retain existing HMS regulations which specify that anglers are required to report non-tournament recreational landings of Atlantic billfish and swordfish. These regulations are inconsistent with other HMS regulations specifying that vessel owners are required to report recreational landings of bluefin tuna under the Angling category.

Alternative I9(b) *Require vessel owners to report non-tournament recreational landings of North Atlantic swordfish and Atlantic billfish – Preferred Alternative*

Alternative I9(b) would amend the HMS regulations to specify that vessel owners are required to report non-tournament recreational landings of Atlantic billfish and swordfish. This alternative, if selected, would be consistent with other HMS regulations that specify that vessel owners are required to report recreational landings of bluefin tuna under the Angling category.

Issue 10: Pelagic Longline 25 mt (ww) NED Incidental BFT Allocation

In November 2002, ICCAT recommended an annual Total Allowable Catch (TAC) of BFT for the United States in the western Atlantic management area of 1,489.6 mt (ww), and allocated 25 mt (ww) to account for the incidental catch of BFT by longline fisheries directed on other species "in the vicinity of the management boundary area" for the eastern and western BFT stocks. This area was defined as the NMFS Northeast Distant (NED) statistical reporting area (approximately the Grand Banks fishing grounds) in the 2003 BFT annual specifications (68 FR 56783, October 2, 2003). The regulatory text at 50 CFR 635.27(a)(3) was revised to include this additional allocation and specifically states that "25 mt shall be allocated for incidental catch by pelagic longlines". Each year, the United States is allocated by ICCAT an additional 25 mt (ww) for this incidental catch. However, because previous year's longline activity has not resulted in full quota attainment, un-utilized quota has been carried forward and added to the subsequent fishing year's annual 25 mt (ww) allocation. This has resulted in revised totals that exceed 25 mt (ww) and are, therefore, contrary to the specific language contained in the regulatory text. Several alternatives are presented below to clarify the amount of available incidental BFT quota for pelagic longline activity in the vicinity of the NED statistical reporting area.

Alternative I10(a): Retain the current regulations specifically referring to 25 mt (ww) (No Action)

Under this alternative, the regulations would remain unchanged and specifically indicate that only 25 mt (ww) are available for incidentally-caught BFT landed by pelagic longline vessels from the NED.

Alternative I10(b): *Modify the HMS regulations to state that "In addition, each year, 25 mt (ww) will be allocated for incidental catch by pelagic longlines" in the NED – Preferred Alternative*

Under Alternative I10(b), the regulatory text would be slightly modified to include "each year" to clarify that the annual baseline allocation equals 25 mt (ww), but the total available quota for a given year is not limited and may be modified to account for under/overharvests from prior year's activity.

Alternative I10(c): Conduct additional discussions at ICCAT regarding quotas allocated to account for bycatch related to directed longline fisheries in the vicinity of the management area boundary

Under this alternative, the United States would conduct additional discussions at the annual ICCAT meeting regarding the long-term allocation to account for bycatch related to directed longline fisheries in the vicinity of the management area boundary. Subsequent action by ICCAT and implementation by the United States might include changes to the allocation including a cap on the total amount of unharvested quota that could be carried from one year to the next, and/or provide the United States with the ability to redistribute some portion of the quota.

Issue 11: Permit Condition for Recreational Trips

As a condition of their permits, vessels that have a commercial shark or swordfish permit must comply with Federal regulations regardless of where vessels are fishing, unless a state has more restrictive regulations (50 CFR § 635.4(a)(10)). However, vessels fishing recreationally for sharks, swordfish, billfish, and tunas in a few states are currently able to fish under state regulations while in state waters, and under Federal regulations when in Federal waters. This has generated confusion due to the differences between state and Federal regulations and the inability to verify whether or not a particular fish onboard a vessel was caught in state waters or Federal waters. The alternatives below consider modifying the *status quo* to remove this ambiguity.

Alternative I11 (a) No permit condition for recreational trips (No Action)

Under this alternative, the regulations would remain as they currently are. Thus, vessels issued an HMS Angling permit, or an Atlantic Tunas General Category permit that is participating in a registered tournament, or an HMS Charter/headboat permit that is on a for-hire trip would fish under Federal requirements in Federal waters and state requirements in state waters.

Alternative I11(b) *Require recreational vessels with a Federal permit to abide by Federal regulations, regardless of where they are fishing, unless a state has more restrictive regulations - Preferred Alternative*

Under this alternative, vessels that have been issued an HMS Angling permit, an Atlantic Tunas General category permit that is participating in a registered tournament, or an HMS

Charter/headboat permit on a for-hire trip would be required to fish for, retain, or possess Atlantic HMS in accordance with Federal regulations regardless of fishing location unless the state where the fish is caught has more restrictive regulations. For example, if the Federal bag limit is three fish per vessel, and the state bag limit is two fish per vessel, a vessel with a Federal permit fishing in state waters would be limited to two fish per vessel. However, if the state bag limit were four fish per vessel, a vessel with a Federal permit fishing in state waters would be limited to three fish per vessel. Vessels that have not been issued a Federal permit that allows for recreational fishing of Atlantic HMS would need to abide by state regulations when fishing for HMS in state waters. A vessel without a Federal permit cannot legally fish in Federal waters for Atlantic HMS.

CHAPTER 2 REFERENCES

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3.0 DESCRIPTION OF AFFECTED ENVIRONMENT

3.1 Introduction

Atlantic HMS fisheries are primarily managed by the HMS Management Division in NMFS. Because of their migratory nature, HMS fishery management necessitates management at the international, national, and state levels. NMFS primarily coordinates that management of HMS fisheries in Federal waters (domestic) and the high seas (international) while individual States establish regulations for HMS in their own waters. There are exceptions to this generalization. For example, Federal bluefin tuna regulations apply in most state waters, and Federal shark and swordfish fishermen, as a condition of their permit, are required to follow Federal regulations in all waters unless that state has more restrictive regulations (see Sections 2.3.4 and 4.3.4 for a proposed alternative that would apply the permit condition to recreationally caught HMS).

On the international level, NMFS participates in the stock assessments conducted by ICCAT's SCRS and in the annual ICCAT meetings. The stock assessments and management recommendations or resolutions are all listed on ICCAT's website at http://www.iccat.es/. NMFS also actively participates in other international groups that could affect U.S. fishermen and the fishing industry including CITES and FAO.

On the domestic level, the HMS Management Division implements international agreements, as appropriate, and implements management measures that are required under domestic laws such as the Magnuson-Stevens Act and ESA. While NMFS does not generally manage HMS fisheries in state waters, states are invited to AP meetings and to participate in stock assessments, public hearings, or other fora. The HMS Management Division intends to continue improving its communication and coordination with State agencies. Table 3.1 outlines the existing state regulations as of February 16, 2004, with regard to HMS species. The HMS Management Division updates this table periodically throughout the year.

Table 3.1 State Rules and Regulations Pertaining to Highly Migratory Species as of February 16, 2004. State regulations are subject to change; contact the appropriate state personnel to ensure that the regulations listed below remain current. Y = Regulation in effect; * = Regulation in development; X = Regulation repealed; FL = Fork Length; CL = Carcass Length; TL = Total Length; LJFL = Lower Jaw Fork Length; CFL = Curved Fork Length; DW = Dressed Weight; SCS = Small Coastal Sharks; LCS = Large Coastal Sharks.

State	Regulations by Species				Cite Reference	Regulatory Details	Contact Information
	Tuna	Swordfish	Billfish	Sharks			
ME	✓			✓	Tuna -ME Rev. Stat. Ann. tit. 12, §§ 6001, 6502, and 6551 Sharks - Code ME R. 13-188 § 50.02	**Tuna** - Retention limit - 1 tuna/year - non resident special tuna permit holder; Unlawful to fish for tuna with gear other than harpoon or hook and line or possess tuna taken in unlawful manner. No minimum size limits. **Sharks** - Regulations apply to Spiny dogfish only	ME Department of Marine Resources George Lapointe Phone: 207/624-6553 Fax: 207/624-6024
NH	X		✓	✓	Tuna - FIS 603.10 (REPEALED) Billfish - FIS 603.13 Sharks - FIS 603.19	**Billfish** - Possession limit - 1 billfish/trip; Minimum size - Blue marlin - 99"; White marlin - 66"; Sailfish - 57"; May be taken by hook and line only; Unlawful to sell billfish **Sharks** - Regulations apply to Spiny dogfish only	NH Fish and Game Clare McBane Phone: 603/868-1095 Fax: 603/868-3305
MA	✓		✓	✓ * prohibition on attempt to harvest certain coastal shark species; complements	Tuna - MA Regs. Code tit. 322 § 6.04 Billfish - MA Regs. Code tit. 322, § 6.11 Sharks – www.mass.gov/dfwele/dmf/commercialfishing/regssummary_012005.pdf; MA Marine Fisheries Regulation Summaries 2005	Tuna - Reference to ATCA and Federal regulations Billfish - Possession limit - 1fish/trip; Recreational minimum size - Blue marlin - 86"; Sailfish - 57"; White marlin - 62"; Billfish may be taken by hook and line only; spearing, netting, snagging are prohibited; Sale of billfish is prohibited Sharks - Regulations apply to Spiny dogfish only	MA Division of Marine Fisheries David Pierce Phone: 617/626-1530 Fax: 617/626-1509
RI				✓	Sharks - RIMFC Regulations § 7.15	**Sharks** - Regulations apply to spiny dogfish only	RI Department of Environment Management Brian Murphy Phone: 401/783-2304

State	Regulations by Species				Cite Reference	Regulatory Details	Contact Information
	Tuna	Swordfish	Billfish	Sharks			
CT				✓	Dogfish – Regulations of Connecticut State Agencies § 26-159a-19	**Sharks** - Regulations apply to spiny dogfish only	CT Department of Environmental Protection Eric Smith Phone: 860/434-6043 Fax: 860/434-6150
NY			✓	✓	Billfish -NY Environmental Conservation § 13-0339 (5) Sharks - NY Environmental Conservation § 13-0338; State of New York Codes, Rules and Regulations (Section 40.1)	**Billfish** - Blue marlin, White marlin, Sailfish, and Longbill spearfish shall not be bought, sold or offered for sale; Striped marlin, Black marlin, Shortbill spearfish shall not be bought, sold or offered for sale **Sharks** - Shark finning prohibited; Reference to the Federal regulations 50 CFR part 635; Prohibited sharks listed	NY Department of Environmental Conservation Byron Young Phone: 631/444-0435 Fax: 631/444-0449
NJ				✓	Sharks -NJ Administrative Code tit. 7, §§ 25-18.1 - 25- 18.2	**Sharks** - Commercial/Recreational possession limit - 2 fish/vessel; Finning prohibited; May be eviscerated; Dorsal fin to pre-caudal pit must be at least 23" in length; Total length must be 48" in length	NJ Fish, Game and Wildlife Bruce Freeman Phone: 609/292-2083
DE			✓	✓	Billfish - DE Code Ann. tit. 7, § 1310 Sharks - DE Code Regulations 3541	**Billfish/Sharks** - Reference to Federal regulations for sharks; Prohibition on sale of Atlantic Sailfish and Blue/White/Striped marlin **Sharks** - Creel limit on regulated sharks 1fish/vessel/day; Creel limit for sharpnose is 2/day; Minimum size on regulated sharks - 54 in FL. Prohibition against possessing fins without them being attached naturally to the body.	DE Division of Fish and Wildlife Roy Miller Phone: 302/739-3441

State	Regulations by Species				Cite Reference	Regulatory Details	Contact Information
	Tuna	Swordfish	Billfish	Sharks			
MD	✓	✓	✓	✓	Tuna - Code of Maryland Regulations tit. 8, § 02.12.01 and tit. 8, § 02.05.23 Swordfish - Code of Maryland Regulations tit. 8, § 02.12.01 and tit. 8, § 02.05.27 Billfish - Code of Maryland Regulations tit. 8, § 02.12.01 and tit. 8, § 02.05.26 Sharks - Code of Maryland Regulations tit 8, § 02.05.17	**Tuna** - Reference to listing Bluefin Tuna as "in need of conservation"; Federal regulations used to control size and seasons and recreational catch required to be tagged **Swordfish** - Reference to listing Swordfish as "in need of conservation"; Federal regulations used to control size and seasons and recreational catch required to be tagged **Billfish** (blue and white marlin and sailfish) - Reference to listing Billfish as "in need of conservation"; Federal regulations control size and seasons and recreational catch required to be tagged **Sharks** - Minimum size - 54" FL; 31" carcass; Finning prohibition; Recreational catch limit - 1 fish/person/day; Commercial catch limit - 4,000 lb/day; Reference to 50 CFR 635	MD Department of Natural Resources Harley Speir Phone: 410/260-8303
VA			✓	✓	Billfish - 4 VA Administrative Code 20-350 Sharks - 4 VA Administrative Code 20-490	**Billfish** - Prohibition on sale of billfish **Sharks** - Possession limit - 1 fish/person; 1 fish for each person on board boat with common hold; Minimum size - 58" FL (Commercial Only); 31" CL (Commercial Only); 7500 lb/vessel/day limit; 200 lb limit on shark carcasses less than 31" minimum CL taken within VA state waters; Finning prohibited; Spiny dogfish regulations as well.	VA Marine Resources Commission Jack Travelstead Phone: 757/247-2247 Fax: 757/247-2020
NC			✓	✓ * Modify closed area off NC to allow fishing outside 15 fathoms during 1st trimester (Jan 1 - Feb 15)	Billfish -NC Administrative Code tit. 15A, r.3M.0507 Sharks -NC Administrative Code tit. 15A, r.3M.0505; Proclamation FF-24-2004	**Billfish** - Recreational possession limit - 1 Blue or White marlin/vessel/trip; 1 Sailfish/person/day; Minimum size - Blue marlin - 99"; White marlin - 66"; Sailfish - 63"; unlawful to sell or offer for sale Blue or White marlin and Sailfish **Sharks** - Director may impose restrictions for size, seasons, areas, quantity, etc.; Proclamations consistent with closures for LCS, SCS, and Pelagics; Closure to directed shark harvest since 1997; proclamation smooth dogfish may be dressed at sea	NC Division of Marine Fisheries Preston Pate Phone: 252/726-7021 Fax: 252/726-0254

State	Regulations by Species				Cite Reference	Regulatory Details	Contact Information
	Tuna	Swordfish	Billfish	Sharks			
SC	✓		✓	✓	Tuna -SC Code Ann. § 50-5-2730 Billfish - SC Code Ann. § 50-5-1700 Sharks -SC Code Ann. § 50-5-2725	**Tuna** - Reference to ATCA and MSA regulations for Tuna **Billfish** - Unlawful to sell billfish; hook and line gear only; unlawful to possess while transporting gillnets, seines, or other commercial gear **Sharks** - Retention limit - 2 Atlantic sharpnose/per/day and 1 Bonnethead/person/day; No minimum size for recreationally caught bonnethead sharks; No need for Federal recreational angler permit to fish for shark in state waters; Reference to Federal commercial regulations and closures	SC Department of Natural Resources David Cupka Phone: 843/953-9050 Fax: 912/262-2318
GA			✓	✓	Gear Restrictions/Prohibitions - GA Code Ann. § 27-4-7; Billfish - GA Code Ann. § 27-4-130.2; GA Comp. R. & Regs. § 391-2-4-.04 Sharks - GA Code Ann. § 27-4-130.1; OCGA § 27-4-7(b); GA Comp. R. & Regs. § 391-2-4-.04	Gear Restrictions/Prohibitions - Use of gillnets is prohibited in state waters. **Billfish** - Possession prohibited in state waters, except for catch-and-release. **Sharks** - Daily limit 2; Possession limit 2 person/vessel (whichever less); Minimum size 48"; Limit 1 shark less than 84"; Sand tiger sharks – all harvest is prohibited; SCS (including Atlantic sharpnose and bonnethead) - 2/day/person; Minimum size 30"TL; All species must be landed head and fins intact. Sharks may not be landed in Georgia if harvested using gill nets.	GA Department of Natural Resources Henry Ansley Phone: 912/264-7218 Fax: 912/262-3143

State	Regulations by Species				Cite Reference	Regulatory Details	Contact Information
	Tuna	Swordfish	Billfish	Sharks			
FL		✓	✓	✓	Sharks -FL Administrative Code Ann. r.68B-44, F.A.C Swordfish/ Billfish - FL Administrative Cod Ann. r. 68B-33 F.A.C	**Billfish** – Longbill/Mediterranean/roundscale spearfish – harvest/possession/landing/purchase/sale/exchange prohibited. **Blue/White Marlin and Sailfish** – Sale prohibited; Aggregate possession of 1 fish/person; Gear restriction (hook and line only); Minimum size limit (Blue Marlin – 99" LJFL; White Marlin – 66" LJFL; Sailfish – 63" LJFL); Recreational catch reporting requirement (all non-tournament landings must be reported NOAA within 24 hours); Must land in whole condition (gutting allowed) **Swordfish** - Minimum size - 47 in LJFL/29" cleithrum to keel/33 lb. dw; Possession limit 1 fish/person/day or 3 fish/vessel/day (with 3 or more persons onboard); Commercial harvest and sale allowed only with Florida saltwater products license and a Federal LAP for swordfish; Recreational catch reporting requirement (all non-tournament landings must be reported NOAA within 24 hours) **Sharks** – No size limit; Retention limit (rec and com) - 1 shark/person/day; Maximum of 2 sharks/vessel (with two or more persons on board); Reference to Federal regulations regarding commercial season, closures, and prohibition on sale; Federal regulatory permits for sale of sharks and swordfish; Finning & Filleting prohibited	FL Fish and Wildlife Conservation Commission Phone: 850/488-6058 Fax: 850/488-7152
AL	✓	✓	✓	✓	Sharks - AL Administrative Code r. 220-2-.46, r.220-3-.30, r.220-3-.37	**Tuna/Swordfish/Billfish/Sharks** - Reference to Federal regulations **Sharks** - Recreational daily bag limit - 2 sharpnose/person/day; all other species - 1fish/person/day; Recreational minimum size all sharks (except sharpnose) - 54" FL; Reference to shark commercial season and bycatch provisions	AL Department of Conservation and Natural Resources Major Jenkins jjenkins@dcnr.state.al.us Phone: 251 861 2882

State	Regulations by Species				Cite Reference	Regulatory Details	Contact Information
	Tuna	Swordfish	Billfish	Sharks			
LA	✓	✓	✓	✓	Tuna -LA Administrative Code tit. 76, § 361 Swords/Billfish - LA Administrative Code tit. 76, § 355 Sharks - LA Administrative Code tit. 76, § 357	**Tuna** - Recreational bag and possession limit Yellowfin (3 fish/person); Rec/Commercial minimum size -Yellowfin, Bigeye and Bluefin (27 in CFL) Billfish/Swordfish - Minimum size - Blue marlin (99 in LJFL), White marlin (66" LJFL), Sailfish (63 in LJFL), Swordfish (29 in carcass length or 33 lb dw); Recreational creel limit - 5 swordfish/vessel/trip **Sharks** - Minimum size - 54" except sharpnose; Possession limit - 1 fish/vessel/trip; Trip limit 4,000 lb dw LCS; Reference to Federal regulations; State waters closed to rec/commercial April 1 through June 30	LA Department of Wildlife and Fisheries Harry Blanchet 225 765-2889 fax (225) 765-2489 hblanchet@wlf.louisiana.gov
MS	✓		✓	✓	Tuna/Billfish/Sharks - MS Code R. 43 000 040, Ord. 7.025	**Tuna** - Minimum size - Bigeye (27 in CFL); Yellowfin (27 in CFL); Bag limit none in commercial; Bag limit of 3 yellowfin tuna/person in recreational **Billfish** - No take provisions for commercially harvested Blue and White marlin and Sailfish; Recreational minimum size - Blue marlin (99 in LJFL); White marlin (66 in LJFL); Sailfish (63 in LJFL) **Sharks** - Recreational minimum size - LCS/Pelagics (37 in TL); SCS (25 in TL); Recreational bag limit - LCS/Pelagics (1/person up to 3/vessel); SCS (4/person); Commercial - Reference to Federal regulations.	MS Department of Marine Resources Kerwin Cuevas Phone: 228/374-5000

State	Regulations by Species				Cite Reference	Regulatory Details	Contact Information
	Tuna	Swordfish	Billfish	Sharks			
TX		✓	✓	✓	Billfish/Swordfish/Sharks - TX Administrative Code Title 31, Part 2, Parks and Wildlife Code Title 5, Parks and Wildlife Proclamations 65.3 and 65.72	**Blue Marlin, White Marlin, Sailfish, Sharks, Longbill spearfish, and Broadbill swordfish** are gamefish and may only be taken with pole and line (including rod and reel); **Blue Marlin, White Marlin, Sailfish, and Longbill spearfish** may not be sold for any purpose; **Billfish** - Bag limit none; Minimum size (Blue Marlin - 131 in TL; White Marlin - 86 in TL; Sailfish - 84 in TL); **Sharks** - Commercial/Recreational retention limit 1 fish/person/day; Commercial/Recreational possession limit is twice the daily bag limit (*i.e.*, 1 fish/person/day); Commercial/Recreational minimum size 24 in TL.	TX Parks & Wildlife Randy Blankinship Phone: 956/350-4490 Fax: 956/350-3470
Puerto Rico	✓	✓	✓	✓	Regulation #6768 Article 8 – General Fishing Limits Article 13 – Limitations Article 17 – Permits for Rec Fishing (March 2004)	Sell, offer for sale, or traffic in any billfish or swordfish, either whole or processed, captured in jurisdictional waters of Puerto Rico. **Swordfish or billfish, tuna and shark** are covered under the Federal regulation known as Highly Migratory Species of the U.S. Department of Commerce (50 CFR, Part 635). Fishers who capture these species shall comply with said regulation. Billfish captured incidentally with long line must be released by cutting the line close to the fishhook, avoiding the removal of the fish from the water. In the case tuna and swordfish fishers shall obtain a permit according to the requirements of the Federal government.	Puerto Rico Department of Natural and Environmental Resources Craig Lileystrom Phone: 787-724-8774 x4042 craig@caribe.net
U.S. Virgin Islands	✓	✓	✓	✓	US VI Commercial and Recreational Fisher's Information Booklet Revised June 2004	Federal regulations and Federal permit requirements apply in territorial waters.	www.caribbeanfmc.com http://www.caribbeanfmc.com/usvi%20booklet/fisher%20booklet%20final.pdf

3.2 Status of the Stocks

The methods used to determine the status of Atlantic HMS are fully described in Chapter 3 of the 1999 Tunas, Swordfish, and Shark FMP and Amendment 1 to the Billfish FMP and in a paper describing the technical guidance for implementing National Standard 1 of the Magnuson-Stevens Act (Restrepo *et al*., 1998). These methods will not change as a result of combining the FMPs.

In summary, a species is considered overfished when the current biomass (B) is less than the minimum stock size threshold ($B < B_{MSST}$). The minimum stock size threshold (MSST) is determined based on the natural mortality of the stock and the biomass at Maximum Sustainable Yield (B_{MSY}). The MSY is the maximum long-term average yield that can be produced by a stock on a continuing basis. The biomass can be lower than B_{MSY}, and the stock not be declared overfished as long as the biomass is above B_{MSST}.

Overfishing may be occurring on a species if the current fishing mortality (F) is greater than the fishing mortality at MSY (F_{MSY}) ($F > F_{MSY}$). In the case of F, the maximum fishing mortality threshold is F_{MSY}. Thus, if F exceeds F_{MSY}, the stock is experiencing overfishing.

If a species is declared overfished or has overfishing occurring, action to rebuild the stock and/or prevent further overfishing is needed. A species is considered rebuilt when B is greater than B_{MSY} and F is less than F_{MSY}. A species is considered healthy when B is greater than or equal to the biomass at optimum yield (B_{OY}) and F is less than or equal to the fishing mortality at optimum yield (F_{OY}).

3.2.1 Atlantic Swordfish

3.2.1.1 Life History/Species Biology

Swordfish are members of the family *Xiphiidae*, in the suborder *Scombroidei*. Atlantic swordfish (*Xiphias gladius*) are one of the largest and fastest predators in the Atlantic Ocean, reaching a maximum size of 530 kg (1165 lb). Like other highly migratory species, they have developed a number of specialized anatomical, physiological, and behavioral adaptations (Helfman *et al*., 1997). Swordfish are distinguished by a long bill that grows forward from the upper jaw. This bill differs from that of marlins (family *Istiophoridae*) in that it is flattened rather than round in cross section, and smooth rather than rough. Swordfish capture prey by slashing this bill back and forth in schools of smaller fish or squid, stunning or injuring their prey in the process. They may also use the bill to spear prey, or as a defense during territorial encounters. Broken swordfish bills have been found embedded in vessel hulls and other objects (Helfman *et al.*, 1997).

Atlantic swordfish are usually found in surface waters but occasionally dive as deep as 650 meters. These large pelagic fishes feed throughout the water column on a wide variety of prey including groundfish, pelagics, deep-water fish, and invertebrate. Swordfish show extensive diel migrations and are typically caught on pelagic longlines at night when they feed in surface waters (SCRS, 2004). They are capable of migrating long distances to maximize prey

availability and, as noted above, can prey upon various trophic levels during their daily vertical migrations (NMFS, 1999). As adults and juveniles, swordfish feed at the highest levels of the trophic food chain, implying that their prey species occur at low densities. The foraging behavior of swordfish reflects the broad distribution and scarcity of appropriate prey; they often aggregate in places where they are likely to encounter high densities of prey, including areas near current boundaries, convergence zones, and upwellings (Helfman *et al*., 1997).

Swordfish move thousands of kilometers annually and are distributed globally in tropical and subtropical marine waters. Their broad distribution, large spawning area, and prolific nature have contributed to the resilience of the species in spite of the heavy fishing pressure being exerted on it by many nations. During their annual migration, north Atlantic swordfish follow the major currents which circle the North Atlantic Ocean (including the Gulf Stream, Canary and North Equatorial Currents) and the currents of the Caribbean Sea and Gulf of Mexico. The primary habitat in the western north Atlantic is the Gulf Stream, which flows northeasterly along the U.S. coast, then turns eastward across the Grand Banks. North-south movement along the eastern seaboard of the United States and Canada is significant (NMFS, 2003). They are found in the colder waters during summer months and all year in the subtropical and tropical area (SCRS, 2003). Additional information on life history relating to habitat can be found in Section 3.3, Essential Fish Habitat, as well as the 1999 FMP for Atlantic Tunas, Swordfish, and Sharks.

Like most large pelagic species, swordfish have adapted body contours that enable them to swim at high speeds. Their streamlined bodies are round or slightly compressed in cross section (fusiform), and their stiff, deeply forked tails minimize drag. This streamlined physical form is enhanced by depressions or grooves on the body surface into which the fins can fit during swimming. The extremely small second dorsal and anal fins of the swordfish may function like the finlets of tuna, reducing turbulence and enhancing swimming performance. Their method of respiration, known as ram gill ventilation, requires continuous swimming with the mouth open to keep water flowing across the gill surfaces, thereby maintaining an oxygen supply. This respiratory process is believed to conserve energy compared to the more common mechanism whereby water is actively pumped across the gills (Helfman *et al*., 1997). In addition to the benefits of speed and efficiency, their search for prey is aided by coloring that provides camouflage in pelagic waters. This shading is darker along the dorsal side and lighter underneath, enhanced by silvery tones.

Swordfish exhibit other physiological characteristics that enable them to extend their hunting range. For example, swordfish can maintain elevated body temperatures, conserving the heat generated by active swimming muscles. Swordfish have developed a heat exchange system that allows them to swim into colder, deep water in pursuit of prey. Because warm muscles contract faster than cool ones, heat conservation is believed to enable these predatory fishes to channel more energy into swimming speed. The internal temperatures of these fishes remains fairly stable even as they move from surface waters to deep waters. Swordfish have also adapted specialized eye muscles for deep water hunting. Because their eye muscles do not have the ability to contract, they produce heat when stimulated by the nervous system, locally warming both the brain and eye tissues (Helfman *et al*., 1997). With this modification, swordfish are able to hunt in the frigid temperatures of deep-water ocean environments without experiencing a decrease in brain and visual function that might be expected under such harsh conditions.

Juvenile swordfish are characterized as having exceptionally fast growth during the first year (NMFS, 1999). Swordfish exhibit dimorphic growth, where females show faster growth rates and attain larger sizes than males. Young swordfish grow very rapidly, reaching about 130 cm lower jaw-fork length (LJFL) by age two. Swordfish are difficult to age, but 53percent of females are considered mature by age 5, at a length of about 130 cm LJFL (SCRS, 2003; SCRS, 2004). Approximately 50 percent of males attain maturity by 112 cm LJFL (Arocha, 1997). All males are mature by 145 to 160 cm LJFL (37 to 50 kg ww), approximately age five, and all females are mature by 195 to 220 cm LJFL (93 to 136 kg ww), approximately age nine. In general, swordfish reach 140 cm LJFL (33 kg ww) by age three and are considered mature by age five. Individual females may spawn numerous times throughout the year (NMFS, 1999). Swordfish stocks consist of several age classes, a condition that may serve as a buffer against adverse environmental conditions and confer some degree of stability on the stocks. Swordfish are also at a high trophic level, which may make the species less vulnerable to short-term fluctuations in environmental conditions (NMFS, 1999).

When ICCAT's Standing Committee on Research and Statistics (SCRS) scientists assess the status of Atlantic swordfish, the stock is split between the North Atlantic, South Atlantic, and Mediterranean Sea. The SCRS continues to examine existing information, including spawning data, tagging information, genetic studies, and abundance indices to better define stock structure. For the purposes of domestic management, the swordfish population is considered to consist of two discrete stocks divided at 5° North.

3.2.1.2 Effect of ICCAT Regulations

ICCAT Catch limits (all weights in this section are given in whole weight)

The total allowable catch in the North Atlantic in 2002 was 10,400 mt (10,200 mt retained and 200 mt discarded). The reported landings were about 9,000 mt and the estimated discards were about 600 mt. The total allowable catch in the North Atlantic in 2003 was 14,000 mt (13,900 mt retained and 100 mt discarded). The reported landings in 2003 were about 10,600 mt and the estimated discards were about 460 mt. Reports for year 2003 are considered provisional and subject to change. The total allowable catch in the South Atlantic in 2002 was 14,620 mt. The reported landings for 2002 were about 13,660 mt and reported discards were 1 mt. The total allowable catch in the South Atlantic in 2003 was 15,631 mt. The reported landings for 2003 were about 10,900 mt and reported discards were <1 mt. Reports for year 2003 are considered provisional and subject to change (SCRS, 2004).

ICCAT Minimum size limits (all weights in this section are given in whole weight)

There are two minimum size options that are applied to the entire Atlantic: 125 cm LJFL with a 15 percent tolerance for undersized fish, or 119 cm LJFL with zero tolerance and evaluation of the discards. In the absence of size data, these calculations could not be updated or examined for 2003. In 2000, the percentage of swordfish reported landed (throughout the Atlantic) less than 125 cm LJFL was about 21 percent (in number) overall for all nations fishing in the Atlantic. If this calculation is made using reported landings plus estimated discards, then the percentage less than 125 cm LJFL would be about 25 percent. The SCRS noted that this

proportion of small fish did not increase very much even though recruitment in the North has been at a high level in recent years (SCRS, 2004).

3.2.1.3 Stock Status and SCRS Outlook

No new assessment was conducted in 2003 or 2004; the most recent assessment of North and South Atlantic swordfish stocks was conducted in 2002. In that assessment, updated CPUE and catch data through 2001 were examined. Sex and age-specific (North Atlantic) and biomass standardized catch rates (North and South Atlantic) from the various fleets were updated. The updated North Atlantic CPUE data showed similar trends to previous years, and also showed signs of improvement in stock status since 1998. In particular, the recruitment index (1997 - 2001) and the catch-at-age used in the 2002 North Atlantic assessment showed signs of substantially improved recruitment (age one), which has manifested in several age classes and the biomass index of some fisheries, and have allowed for increases in spawning biomass and a more optimistic outlook. The strong recruitments of the late 1990s promoted improvement in spawning stock biomass and should result in further improvement, if these year classes are not heavily harvested. The CPUE patterns in the South Atlantic by fleet showed contradictory patterns. Lack of important CPUE information from some fleets fishing in the South Atlantic prevented the SCRS from reconciling these conflicts (SCRS, 2004).

North Atlantic Swordfish (all weights are given in whole weight)

An updated estimate of maximum sustainable yield from production model analyses is 14,340 mt (range 11,500 to 15,500 mt). Since 1997, North Atlantic swordfish catches have been below 14,340 mt; preliminary estimates (reported plus carried over) of catches in 2001, 2002, and 2003 were about 9,980, 9,550, and 11,020 mt, but the most recent years are provisional and probably underestimated. The biomass at the beginning of 2002 was estimated to be 94 percent (range: 75 to 124percent) of the biomass needed to produce MSY. This estimate is up from an estimate of 65 percent of MSY in the 1998 assessment. The 2001 fishing mortality rate was estimated to be 0.75 times the fishing mortality rate at MSY (range: 0.54 to 1.06). The replacement yield for the year 2003 was estimated to be about the MSY level. As the TAC for North Atlantic swordfish for 2002 was 10,400 mt, it was considered likely that biomass would increase further under those catch levels. The TAC set for 2003 - 2005 is 14,000 mt (ICCAT Recommendation 02 - 02). Given recent fishing mortality patterns, the spawning biomass likely will increase largely owing to the very large recruitments estimated for 1997 - 2000. Further, given that recent (2002 - 2003) reported catch has been below estimated replacement yield, the North Atlantic swordfish biomass may have already achieved the B_{MSY} level. However, noting the uncertainties inherent in the assessment, the SCRS warned against large increases over the current TAC (SCRS, 2004). The next assessment is scheduled for 2006.

South Atlantic Swordfish

The SCRS noted that reported total catches have been reduced since 1995, as was recommended by the SCRS. SCRS had previously expressed serious concern about the trends in stock biomass of South Atlantic swordfish based on the pattern of rapid increases in catch before 1995 that could result in rapid stock depletion, and in declining CPUE trends of some bycatch fisheries. Standardized CPUE series were available for three fleets, the targeted fishery of

European Community (EC)-Spain, and the bycatch fisheries of Chinese Taipei and Japan. There was considerable conflict in trends among the three CPUE series and it is unclear which, if any, of the series tracks total biomass. It was noted that there was little overlap in fishing area among the three fleets, and that the three CPUE trends could track different components (or cohorts) of the population. To address this possibility, an age-structured production model was run as a sensitivity test. For the base case production model, the Committee selected the bycatch CPUE series combined using a simple unweighted mean and the targeted CPUE series. Due to some inconsistencies in the available CPUE trends reliable stock assessment results could not be obtained (SCRS, 2004).

Reported catches of Atlantic swordfish, including discards for the period 1950 – 2003 can be found in Figure 3.1. Estimated fishing mortality rate relative to the F_{MSY} for the period 1959 – 2001 can be found in Figure 3.2. Annual yield for North Atlantic swordfish relative to the estimated MSY can be found in Figure 3.3. A summary of Atlantic swordfish stock status can be found in Table 3.2

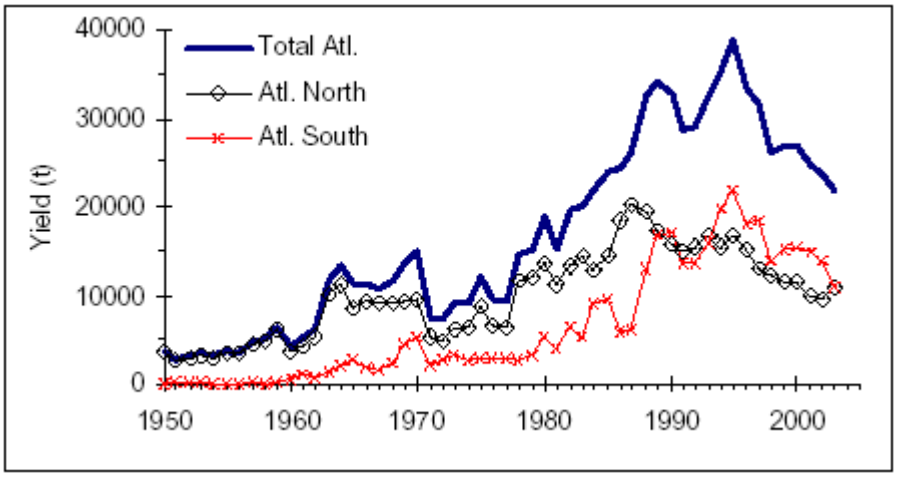


Figure 3.1 **Reported catches (mt whole weight) of Atlantic Swordfish, including discards for 1950 – 2003.** Source: SCRS, 2004.

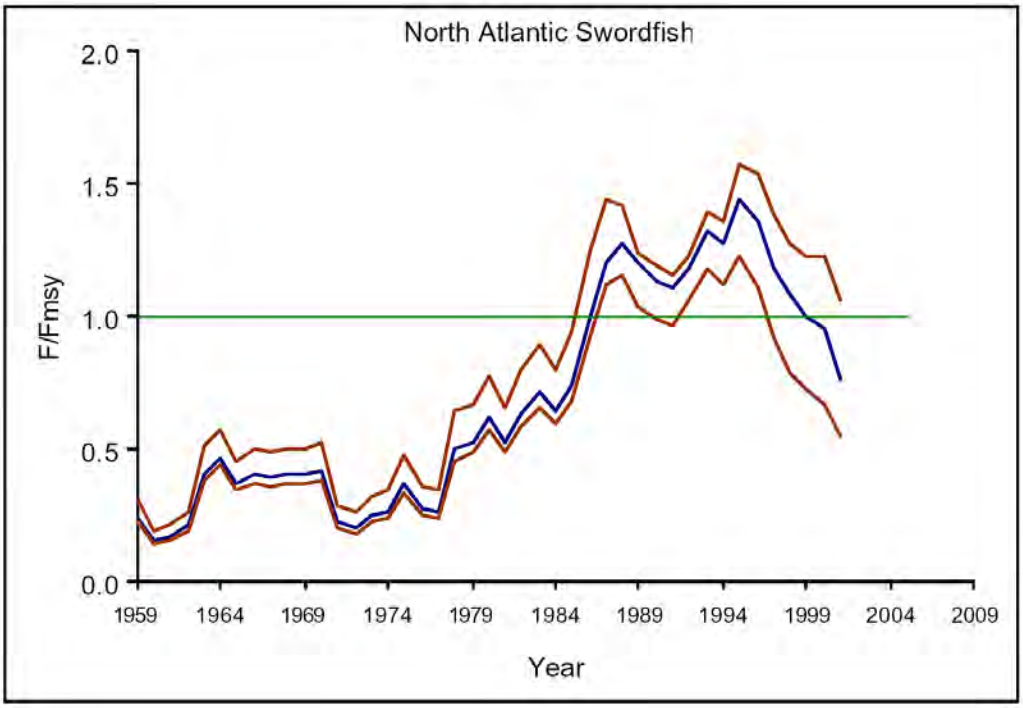


Figure 3.2 **Estimated fishing mortality rate relative to FMSY (F/FMSY) for the period 1959-2001 (median with 80percent confidence bounds based on bootstrapping are shown).** Source: SCRS 2004.

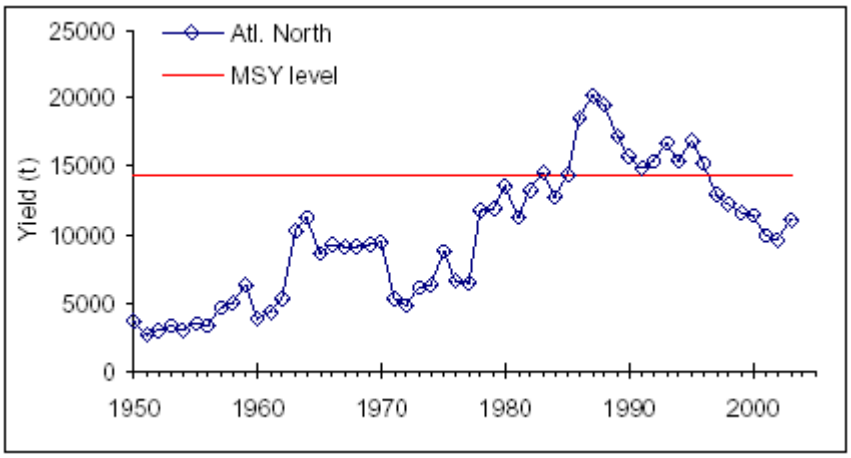


Figure 3.3 **Annual yield (mt) (whole weight) for North Atlantic swordfish relative to the estimated MSY level.** Source: SCRS 2004

Table 3.2 Atlantic Swordfish Stock Summary (weights given in mt ww). Source: SCRS, 2004.

ATLANTIC SWORDFISH SUMMARY		
	North Atlantic	**South Atlantic**
Maximum Sustainable Yield[1]	14,340 t (11,580-15,530)[4]	Not estimated
Current (2003) Yield[2]	11,028 t	10,919 t
Current (2002) Replacement Yield[3]	about MSY	Not estimated
Relative Biomass (B_{2002}/B_{MSY})	0.94 (0.75 - 1.24)	Not estimated
Relative Fishing Mortality		
F_{2001}/F_{MSY}[1]	0.75 (0.54 - 1.06)	Not estimated
F_{2000}/F_{max}	1.08	Not estimated
$F_{2000}/F_{0.1}$	2.05	Not estimated
$F_{2000}/F_{30\%SPR}$	2.01	Not estimated
Management Measures in Effect	Country-specific TACs [Ref. 02-02]; 125/119 cm LJFL minimum size [Ref. 99-02].	TAC target [Ref. 01-02]; 125/119 cm LJFL minimum size [Refs. 90-2 & 95-10].

[1] Base Case production model results based on catch data 1950-2001.
[2] Provisional and subject to revision, see footnote on SWO-ATL-Table 1.
[3] For next fishing year.
[4] 80% confidence intervals are shown.

Table 3.3 Stock Assessment Summary Table. Source: SCRS, 2004.

Species	Current Relative Biomass Level	Minimum Stock Size Threshold	Current Fishing Mortality Rate	Maximum Fishing Mortality Threshold	Outlook**
West Atlantic Bluefin Tuna	SSB_{01}/SSB_{MSY} = 0.31 (low recruitment); 0.06 (high recruitment) SSB_{01}/SSB_{75} = 0.13 (low recruitment); 0.13 (high recruitment)	*$0.86SSB_{MSY}$*	F_{01}/F_{MSY} = 2.35 (low recruitment scenario) F_{01}/F_{MSY} = 4.64 (high recruitment scenario)	F_{year}/F_{MSY} = 1.00	Overfished; overfishing is occurring.
East Atlantic Bluefin Tuna	SSB_{00}/SSB_{70} = 0.80	*Not estimated*	F_{00}/F_{max} = 2.4	*Not estimated*	Overfished; overfishing is occurring.*
Atlantic Bigeye Tuna	B_{03}/B_{MSY} = 0.85-1.07	*$0.6B_{MSY}$ (age 2+)*	F_{02}/F_{MSY} = 0.73-1.01	F_{year}/F_{MSY} = 1.00	Overfished; overfishing is occurring.
Atlantic Yellowfin Tuna	B_{01}/B_{MSY} = 0.73 - 1.10	*$0.5B_{MSY}$ (age 2+)*	F_{01}/F_{MSY} = 0.87-1.46	F_{year}/F_{MSY} = 1.00	Approaching an overfished condition.
North Atlantic Albacore Tuna	B_{00}/B_{MSY} = 0.68 (0.52-0.86)	*$0.7B_{MSY}$*	F_{00}/F_{MSY} = 1.10 (0.99 - 1.30)	F_{year}/F_{MSY} = 1.00	Overfished; overfishing is occurring.
South Atlantic Albacore Tuna	B_{02}/B_{MSY} = 1.66 (0.74-1.81)	*Not estimated*	F_{02}/F_{MSY} = 0.62 (0.46-1.48)	*Not estimated*	Not overfished; overfishing not occurring.*
West Atlantic Skipjack Tuna	*Unknown*	*Unknown*	*Unknown*	F_{year}/F_{MSY} = 1.00	Unknown

* South Atlantic albacore and East Atlantic bluefin tuna are not found in the U.S. EEZ.

**** Based on "Sustaining and Rebuilding", National Marine Fisheries Service, 2003, - Report to Congress - The Status of U.S. Fisheries, May 2004.**

3.2.2 Atlantic Bluefin Tuna

All text, figures and tables for this Section are from the SCRS 2004 Report and the U.S. National Report to ICCAT, 2004. Recent information from Block *et al.* (2005) is also incorporated under the subsection on 'Recent Updates on U.S. Bluefin Tuna Research'. All weights are reported as whole weights unless indicated as otherwise.

Life History/Species Biology

Atlantic bluefin tuna are distributed from the Gulf of Mexico to Newfoundland in the West Atlantic, from roughly the Canary Islands to south of Iceland in the East Atlantic, and throughout the Mediterranean Sea. Historically, catches of bluefin were made from a broad geographic range in the Atlantic and Mediterranean.

Atlantic bluefin tuna can grow to over 300 cm and reach more than 650 kg. The oldest age considered reliable is 20 years, based on an estimated age at tagging of two years and about 18 years at liberty, although it is believed that bluefin tuna may live to older ages. Bluefin tuna are, thus, characterized by a late age at maturity (thus, a large number of juvenile classes) and a long life span. These factors contribute to make Bluefin tuna well adapted to variations in recruitment success, but more vulnerable to fishing pressure than rapid growth species such as tropical tuna species. Bluefin tuna in the West Atlantic generally reach a larger maximum size compared to bluefin caught in the East Atlantic.

Bluefin in the West Atlantic are assumed to first spawn at age eight compared to ages four to five in the east Atlantic. Distribution expands with age; large bluefin are adapted for migration to colder waters. Bluefin tuna are opportunistic feeders, with fish, squid, and crustaceans common in their diet. In the West Atlantic, bluefin tuna are thought to spawn from mid-April into June in the Gulf of Mexico and in the Florida Straits. Juveniles are thought to occur in the summer over the continental shelf, primarily from about 35°N to 41°N and offshore of that area in the winter. In the East Atlantic, bluefin tuna generally spawn from late May to July depending on the spawning area, primarily in the Mediterranean, with highest concentrations of larvae around the Balearic Islands, Tyrrhenian Sea, and central and eastern Mediterranean where the sea-surface temperature of the water is about 24°C. Sexually mature fishes have also been recently observed in May and June in the eastern Mediterranean (between Cyprus and Turkey).

<u>Distribution and Migration</u>

In 1982, ICCAT established a line for separating the eastern and western Atlantic management units based on discontinuities in the distribution of catches at that time in the Atlantic and supported by limited biological knowledge. The United States is allocated quota from the western Atlantic management unit where the U.S. fisheries primarily occur. However, the overall distribution of the catch in the 1990s is much more continuous across the North Atlantic than was seen in previous decades. Tagging evidence indicates that movement of bluefin across the current east/west management boundary in the Atlantic does occur, that movements can be extensive (including transatlantic) and complex, that there are areas of concentration of electronically tagged fish (released in the west) in the central North Atlantic just east of the management boundary, and that fisheries for bluefin tuna have developed in this area in the last decade. At least some of these fish have moved from west of the current boundary (see below for a brief summary of highlights of U.S. research).

Complementary studies, which might show east to west movement, are less advanced. The composition, and natal origin of these fish in the central North Atlantic area are not known. The SCRS emphasizes that "it is clear that the current boundary does not depict our present

understanding of the biological distribution and biological stock structure of Atlantic bluefin tuna." The SCRS also notes that "the current boundary is a *management* boundary and its effectiveness for management is a different issue."

There has been an accumulation of evidence on bluefin tuna mixing in the last few years through the collection of tagging data and its examination through the modeling of mixing scenarios for evaluating their effect on management. However, the origin of fish older than one year still remains unknown. Mixing results were reviewed in 2001 by the Workshop on Bluefin Tuna Mixing. This research led to a long-term plan for modeling finer scale spatial mixing and to short-term strategies for assessment to assist the advice for management. The data and research were reviewed again in 2002.

ICCAT, at its 2002 Meeting in Bilbao, called for a *Working Group to Develop Integrated and Coordinated Atlantic Bluefin Tuna Management Strategies*, which met in 2003 and again in 2004. In response to the recommendations from these meetings, the SCRS is developing a revised proposal for initiating a coordinated Bluefin Tuna Research Program; to address priority research and data needs for providing scientific advice to ICCAT related to revised management procedures for Bluefin tuna. Uncertainty exists regarding the importance and impacts of mixing on western stocks. The most important uncertainty regarding management advice by the SCRS for the eastern stock is the uncertainty in the catch data that are being taken.

Recent Updates on U.S. Bluefin Tuna Research

As part of its commitment to the Bluefin Program, research supported by the United States has concentrated on ichthyoplankton sampling, reproductive biology, methods to evaluate hypotheses about movement patterns, spawning area fidelity, stock structure investigations, and population modeling analyses.

Ichthyoplankton surveys in the Gulf of Mexico during the bluefin spawning season were continued in 2003 and 2004. Data resulting from these surveys, which began in 1977, are used to develop a fishery-independent abundance index of spawning western Atlantic bluefin tuna. This index has continued to provide one measure of bluefin abundance that is used in SCRS assessments of the status of the resource. During 2003, a U.S. scientist participated in the Spanish TUNIBAL project studying the relationships between bluefin larval and adult distributions and hydrography in waters near the Balaeric Islands in the Mediterranean Sea. During the 2004 U.S. ichthyoplankton survey, a plankton net of a type used in the Spanish surveys was fished in addition to the nets normally used to determine the impact of using a wider net mouth and larger mesh on the size and catch rates of bluefin in the Gulf of Mexico.

Scientists at Virginia Institute of Marine Science and Texas A&M University have used nuclear and mitochondrial DNA to investigate the population structure of bluefin tuna in the Mediterranean Sea (SCRS/2004/165). Young of the year bluefin were studied to reduce possible migratory effects. Their results indicate homogeneity within the western Mediterranean basin (Balaeric Islands and Tyrrhenian Sea) and differences between the eastern (Ionian Sea) and western basins. Samples collected for these studies were obtained by, or in cooperation with,

European scientists from multiple locations including Spain and several locations in Italy; financial and logistical assistance was also provided by the ICCAT bluefin year program.

Since 1998, researchers from Texas A & M University and the University of Maryland with assistance of researchers from Canada, Europe, and Japan have studied the feasibility of using otolith chemical composition (microcontituents and isotopes) to distinguish bluefin stocks. Recent research has investigated the value of using additional microconstituent elements (transitional metals) to enhance classification success. By themselves the transitional metals provided little discriminatory power, but when combined with the other trace elements (for 13 elements in all), the classification success was improved to about 80 - 90 percent. Studies of classification success using oxygen isotopes continue.

Scientists at University of Maryland, Virginia Institute of Marine Science, and Texas A&M University have continued to sample specimens for genetic and otolith chemistry studies of stock structure. Roughly 10 - 20 young-of-the-year were collected in 2003. In addition, limited sampling of ages one and older continues. Efforts are also continuing to obtain samples from juveniles and mature bluefin from the Mediterranean Sea and adjacent waters.

In response to ICCAT's request for alternative approaches for managing mixed populations of Atlantic bluefin tuna, SCRS/2003/108 examined approaches to developing more complex models of bluefin population dynamics including detailed spatial information and methods for assessing the resources and examining management procedures. SCRS/2003/105 proposed the evaluation of possible age structured assessment using more complex geographic stratification and movement scenarios than have been used in recent assessments. Document SCRS/2004/166 further extends that work and shows that, under the proposed model structure, western Atlantic bluefin population trends from the conventional ICCAT assessments can be replicated while the most recent east Atlantic assessment trends cannot. It also corroborated earlier results that showed that estimated western Atlantic population trends are influenced by assumptions about movement rates and patterns.

In May 2004, scientists from (1) Stanford University and the Monterey Bay Aquarium and (2) the New England Aquarium and the University of New Hampshire made presentations on their research findings to the SCRS meeting on bluefin tuna management strategies held in France. Researchers at the Imperial College, London are working with the University of Miami, the University of New Hampshire, and NOAA/NMFS to develop methods to estimate bluefin movement and fishing mortality rate patterns (SCRS/2004/164). An operational model is being developed which will use conventional and electronic tagging data and fishing effort by management area. The operational model will be used to examine possible harvest control rules and the evaluation of possible management procedures.

A thorough review of recreational catch estimation procedures for HMS species, including but not limited to BFT, was conducted during 2004, focusing on a survey program covering the rod and reel fishery along the Atlantic Coast of the United States from Virginia northward. U.S. scientists also worked cooperatively with scientists in Brazil, instructing a course on CPUE standardization methods and applications to stock assessment (Recife, Brazil, June 7 - 12 2004).

A recent publication in Nature by Block *et al*. provided data on electronic tagging and a discussion on the population structure of Atlantic bluefin tuna (April 2005). The abstract reads as follows: "Electronic tags that archive or transmit stored data to satellites have advanced the mapping of habitats used by highly migratory fish in pelagic ecosystems. Here we report on the electronic tagging of 772 Atlantic bluefin tuna in the western Atlantic Ocean in an effort to identify population structure. Reporting electronic tags provided accurate location data that show the extensive migrations of individual fish (n = 330). Geoposition data delineate two populations, one using spawning grounds in the Gulf of Mexico and another from the Mediterranean Sea. Transatlantic movements of western-tagged bluefin tuna reveal site fidelity to known spawning areas in the Mediterranean Sea. Bluefin tuna that occupy western spawning grounds move to central and eastern Atlantic foraging grounds. Our results are consistent with two populations of bluefin tuna with distinct spawning areas that overlap on North Atlantic foraging grounds. Electronic tagging locations, when combined with US pelagic longline observer and logbook catch data, identify hot spots for spawning bluefin tuna in the northern slope waters of the Gulf of Mexico. Restrictions on the time and area where longlining occurs would reduce incidental catch mortalities on western spawning grounds."

SCRS Recent Stock Assessment Results

The last full stock assessments for western Atlantic Bluefin tuna were conducted in 2002 with the next scheduled for 2006. The assessment results are similar to those from previous assessments (see Table 3.4). They indicate that the spawning stock biomass (SSB) declined steadily from 1970 (the first year in the assessment time series) through the late 1980s, before leveling off at about 20 percent of the level in 1975 (which has been a reference year used in previous assessments). A steady decline in SSB since 1997 is estimated and leaves SSB in 2001 at 13 percent of the 1975 level. The assessment also indicates that the fishing mortality rate during 2001 on the spawning stock biomass (SSB) is the highest level in the series.

Estimates of recruitment of age one fish have been generally lower since 1976. However, recruitment of age one fish in 1995 and 1998 is estimated to be comparable in size to some of the year classes produced in the first half of the 1970s. While the large decline in SSB since the early 1970s is clear from the assessment, the potential for rebuilding is less clear. Key issues are the reasons for relatively poor recruitment since 1976, and the outlook for recruitment in the future. One school of thought is that recruitment has been poor because the SSB has been low. If so, recruitment should improve to historical levels if SSB is rebuilt. Another school of thought is that the ecosystem changed such that it is less favorable for recruitment and thus recruitment may not improve even if SSB increases. To address both schools of thought, the SCRS considered two recruitment scenarios as described below and summarized in Table 3.4. (East Atlantic Bluefin tuna summary data are also provided for comparison purposes). For both scenarios, the assessment indicates that the fishing mortality on the western Atlantic bluefin resource exceeds F_{MSY} and the SSB is below B_{MSY} (thus overfished according to ICCAT's objective of maintaining stocks at the MSY-biomass level and as indicated in the NMFS, 2003).

Table 3.4 Summary Table for the Status of West Atlantic Bluefin Tuna. Source: ICCAT, 2004.

Age/size at Maturity	Age 8/~ 200 cm fork length
Spawning Sites	Primarily Gulf of Mexico and Florida Straits
Current Relative Biomass Level *Minimum Stock Size Threshold*	SSB_{01}/SSB_{75} (low recruitment) = .13 (.07-.20) SSB_{01}/SSB_{75} (high recruitment) = .13 (.07-.20) SSB_{01}/SSB_{msy} (low recruitment) = .31 (.20-.47) SSB_{01}/SSB_{msy} (high recruitment) = .06 (.03-.10) $0.86B_{MSY}$
Current Relative Fishing Mortality Rate *Maximum Fishing Mortality Threshold*	F_{01}/F_{MSY} (low recruitment) = 2.35 (1.72-3.24) F_{01}/F_{MSY} (high recruitment) = 4.64 (3.63-6.00) F/F_{MSY} = 1.00
Maximum Sustainable Yield	Low recruitment scenario: 3,500 mt (3,300-3,700) High recruitment scenario: 7,200 mt (5,900-9,500)
Catch (2003) including discards	2,146 mt
Short Term Sustainable Yield	Probably > 3,000 mt
Outlook	Overfished; overfishing continues to occur

Table 3.5 Summary Table for the Status of East Atlantic Bluefin Tuna. Source: ICCAT, 2004.

Age/size at Maturity	Age 4-5
Spawning Sites	Mediterranean Sea
Current Relative Biomass Level	SSB_{00}/SSB_{1970} = .80
Current Relative Fishing Mortality Rate	F_{00}/F_{MAX} = 2.4
Maximum Sustainable Yield	Not estimated
Current (2001) Yield	34,557 mt
Yield (long term)	23,543 to 24,649 mt
Outlook	Overfished; overfishing continues to occur.

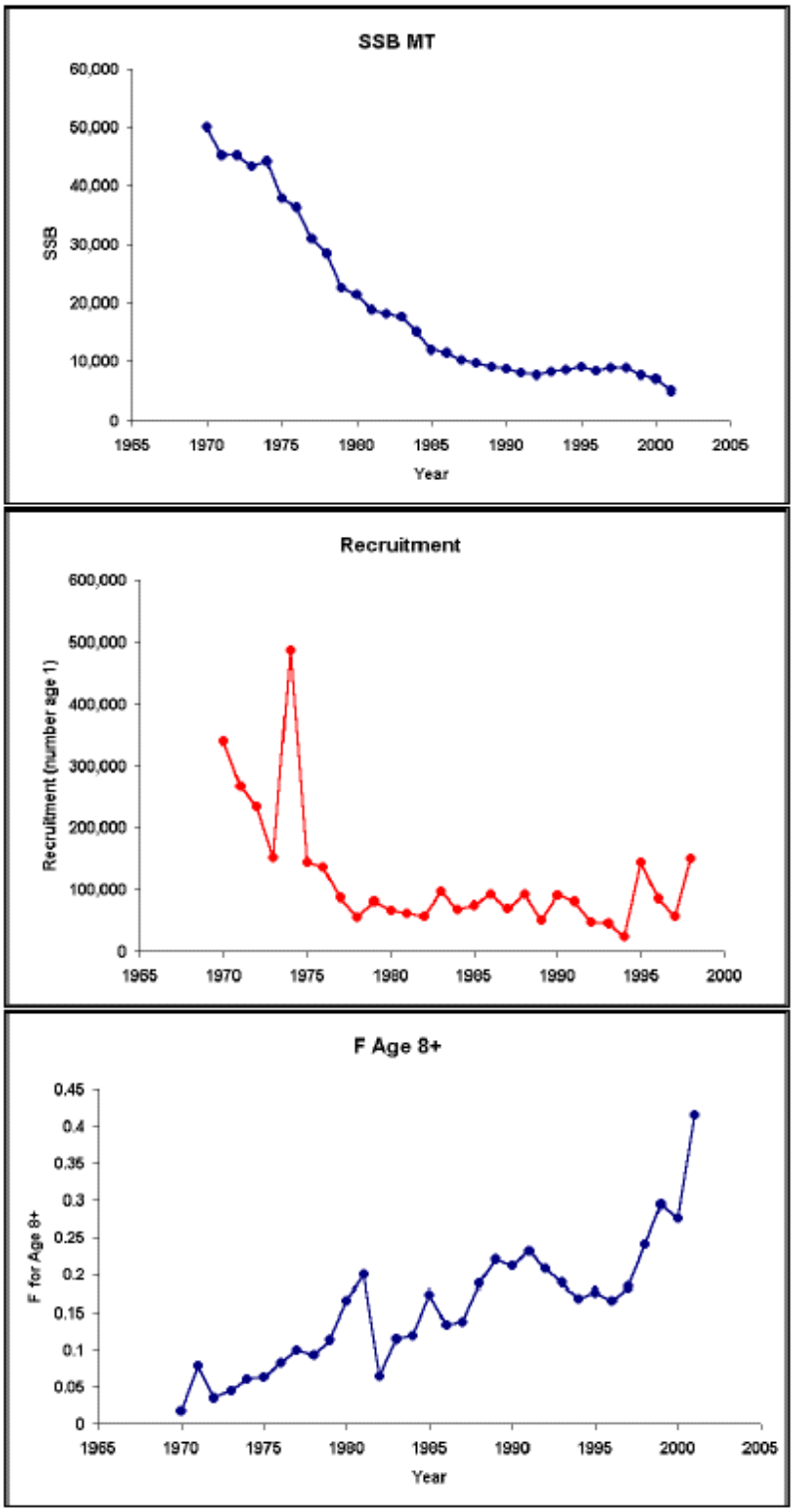


Figure 3.4 **Western Atlantic bluefin tuna spawning biomass (t), recruitment (numbers) and fishing mortality rates for fish of age 8+, estimated by the Base Case VPA run.** Source: ICCAT, 2004.

SCRS Advice and Management Actions

The SCRS's management recommendation for the western Atlantic bluefin tuna management area is directed at the Rebuilding Program adopted by ICCAT in 1998. According to the Program, the MSY rebuilding target can be adjusted according to advice from SCRS. In 2002, ICCAT set the annual Total Allowable Catch (TAC), inclusive of dead discards, for the western Atlantic management area to 2,700 mt, effective beginning in 2003. The Program states that the TAC for the west would only be adjusted from the 2,500 mt level adopted for 2003 - 2004 if SCRS advises that (a) a catch of 2,700 mt or more has a 50 percent or greater probability of rebuilding or (b) a catch of 2,300 mt or less is necessary to have a 50 percent or greater probability of rebuilding.

The Program is designed with the intent to rebuild with 50 percent probability by 2018 to the spawning biomass level associated with MSY. In light of the uncertainty in the assessment, the choice between recruitment scenarios and rebuilding targets, and assumptions about mixing, the weight of scientific opinion within the SCRS favored no change from the current TAC of 2,500 mt per year. Projections based on the low recruitment scenario indicate that the TAC could be increased without violating the Rebuilding Program, assuming that relatively large recruitment estimates for some recent year classes are realistic. The high levels of recruitment estimated for some recent year classes are consistent with a higher biomass level as a rebuilding target. In previous assessment sessions, the spawning biomass level in 1975 was considered a useful rebuilding target. The 1975 biomass is more than twice the MSY spawning biomass level associated with the low recruitment scenario. The projections indicate a 35 - 60 percent probability of rebuilding to the 1975 spawning biomass level for a catch of 2,500 mt per year, depending on the recruitment scenario assumed. It seems likely that a recruitment scenario corresponding to a SSB_{MSY} equal to the level in 1975 would indicate a probability of rebuilding by 2018 for a catch of 2,500 mt per year within the range of 35 - 60 percent.

The MSY spawning biomass associated with the high recruitment scenario, which is nearly twice the 1975 level, is unlikely to be reached by 2018 if the recent level of catch (and TAC) is maintained. However, the SCRS does not recommend the sharp reduction in TAC that would be necessary to comply with the rebuilding Program based on the high recruitment scenario because of:

- Uncertainty about the most appropriate recruitment scenario;
- Recognition that for the high recruitment scenario, the spawning biomass associated with MSY is not well determined (because estimation leads to extrapolation beyond biomass levels included within the current assessment); and
- The generally positive outlook for the resource according to the current assessment regardless of the recruitment scenario assumed.

As emphasized in previous assessments, mixing across management unit boundaries of fish of western and eastern origin could be important for management of the resource in both areas. In particular, the condition of the eastern Atlantic stock and fishery could adversely affect recovery in the west Atlantic, which was also noted in the SCRS's 1998, 2000, and 2001 reports.

Therefore, the SCRS stressed the importance of continuing efforts to manage the fisheries in both the east and west Atlantic according to ICCAT's objectives.

SCRS Evaluation of Management Measures

The first regulatory measure for a scientific monitoring level was adopted for western Atlantic bluefin catches in 1981. Since then, monitoring levels have been changed in various years. Until 1987, both estimated catches and landings were below or equal to the level of the catch limits. However, from 1988 to 1997, estimated landings were very close to the level of the limits and, for some years, exceeded the limit by a maximum of 100 mt. Estimated catches (including discards) were higher than the limits every year during this period (by about 200 to 300 mt) with the exceptions of 1992 and 1997. The estimated catches exceeded the 2,500 mt limit in 2000 by 165 mt, by 218 mt in 2001, and by 715 mt in 2002. It should be pointed out that for compliance purposes, some countries (including the United States) are using fishing years that do not correspond to calendar years. Also, according to the ICCAT regulatory measure, the amount of catch that exceeded quota or was left over from the quota can be carried over to succeeding years. Hence, the catch limit set for each year could have been adjusted accordingly. The SCRS notes that the excess of the catch limits in most recent years is due to some new fisheries that operated without a quota.

For the west Atlantic, a size limit of 6.4 kg with 15 percent allowance, in number of fish, has been in effect since 1975. In addition, a prohibition on the taking and landing bluefin tuna less than 30 kg (or 115 cm) with an eight percent tolerance, by weight on a national basis, became effective in 1992. The SCRS notes that, since 1992, the proportion of undersized fish for all catches combined has been below the allowance level (*e.g.*, one percent and three percent <115cm in 2000 and 2001, respectively). In 2002, ICCAT set the annual TAC, inclusive of dead discards, for the western Atlantic management area to 2,700 mt, effective beginning in 2003. The reported 2003 catches were 2,146 mt.

SCRS Outlook

In general, the outlook for bluefin tuna in the West Atlantic is similar to the outlook reported based on the 2000 western Atlantic bluefin tuna assessment session. The assessment and projection results for the present assessment are somewhat less optimistic than in 2000 but the confidence in the strength of the 1994 year class has increased. Therefore, the increases associated with different levels of future catch projected for the short-term are smaller but are estimated more confidently. It should be noted that the 1995 year class was estimated to be strong in 2000, but it is now estimated to be only of average strength.

As noted by the previous assessment session, western Atlantic bluefin tuna catches have not varied very much since 1983 (the range over this period is 2,106 to 3,011 mt), and the estimated spawning stock size (Spawning Stock Biomass (SSB) measured as the biomass of fish age 8+) has been relatively stable, notwithstanding the indication of a decline in the most recent years. Thus, over an extended period of time, catches around recent levels have maintained stock size at about the same level, in spite of several past assessments that predicted the stock would either decline or grow if the current catch was maintained. This observation highlights the challenge of predicting the outlook for this stock.

In order to provide advice relative to rebuilding the western Atlantic bluefin resource, the SCRS conducted projections for two scenarios about future recruitment. One scenario assumed that future average recruitment will approximate the average estimated recruitment (at age one) since 1976, unless spawning stock size declines to low levels (such as the current level estimated in the assessment, but generally lower than estimates during most of the assessment history). The second scenario allowed average recruitment to increase with spawning stock size up to a maximum level no greater than the average estimated recruitment for 1970 to 1974. These scenarios are referred to as the low recruitment and high recruitment scenarios, respectively. The low and high recruitment scenarios implied that the B_{MSY} (expressed in SSB) is 42 percent and 183 percent of the biomass in 1975, respectively. With the current information the SCRS could not determine which recruitment scenario is more likely, but both are plausible, and recommended that management strategies should be chosen to be reasonably robust to this uncertainty.

Table 3.6 below summarizes the results of projections of both scenarios at different catch levels. The projections for the low recruitment scenario estimated that a constant catch of 3,000 mt per year has an 83 percent probability of allowing rebuilding to the associated SSB_{MSY} by 2018. A constant catch of 2,500 mt per year has a 35 percent probability of allowing rebuilding to the 1975 SSB by 2018.

The results of projections based on the high recruitment scenario estimated that a constant catch of 2,500 mt per year has a 60 percent probability of allowing rebuilding to the 1975 level of SSB, and there is a 20 percent chance of rebuilding SSB to SSB_{MSY} by 2018. If the low recruitment scenario is valid, the TAC could be increased to at least 3,000 mt without violating ICCAT's rebuilding plan. If the high recruitment scenario is valid, the TAC should be decreased to less than 1,500 mt to comply with the plan.

The estimate of SSB_{MSY} for the high recruitment scenario is critical to inferences regarding the probability of achieving rebuilding under different future levels of catch, and also less well determined by the data than SSB_{MSY} for the low recruitment scenario. In particular, the estimates of SSB_{MSY} based on the high recruitment scenario are substantially larger than the largest spawning stock size included in the assessment. This extrapolation considerably increases the uncertainty associated with these estimates of SSB_{MSY}. Previous meetings have used SSB_{1975} as a rebuilding target in the context of interpreting projections. Arguably SSB_{1975} is appropriate as a target level for interpreting the implications of projections based on the high recruitment scenario. Under such a target level for the high recruitment scenario, a TAC of 2,700 mt has an estimated probability of reaching the rebuilding level of about 50 percent.

The SCRS cautioned that these conclusions do not capture the full degree of uncertainty in the assessments and projections. An important factor contributing to uncertainty is mixing between fish of eastern and western origin. Furthermore, the projected increases in stock size are strongly dependent on estimates of recent recruitment, which are a particularly uncertain part of the assessment. A sensitivity test in which the estimates of the below average 1996 and the strong 1997 year classes were excluded from the analysis gave somewhat less optimistic results in terms of the estimated probabilities of recovery by 2018. However, these projections still

predicted increases in spawning biomass for both recruitment scenarios, except for extreme increases in catch.

Table 3.6 **Probability of western Atlantic bluefin tuna achieving rebuilding target by 2018.** Source: ICCAT, 2004.

Catch	Low Recruitment Scenario		High Recruitment Scenario	
(MT)	SSB_{1975}	SSB_{MSY}	SSB_{1975}	SSB_{MSY}
500	95 %	100 %	98 %	73 %
1,000	89 %	100 %	96 %	62 %
1,500	77 %	100 %	87 %	47 %
2,000	60 %	99 %	75 %	30 %
2,300	45 %	98 %	66 %	24 %
2,500	35 %	97 %	60 %	20 %
2,700	26 %	95 %	52 %	17 %
3,000	14 %	83 %	38 %	11 %
5,000	0 %	1 %	2 %	0 %

3.2.3 Atlantic Bays Tuna

All text, figures and tables for this Section are from the SCRS 2004 Report and the U.S. National Report to ICCAT, 2004. All weights are reported as whole weights unless indicated as otherwise.

3.2.3.1 Atlantic Bigeye Tuna

Biology/Life History

The geographical distribution of bigeye tuna is very wide and covers almost the entire Atlantic Ocean between 50°N and 45°S. This species is able to dive deeper than other tuna species and exhibits extensive vertical movements. Similar to the results obtained in other oceans, pop-up tagging and sonic tracking studies conducted on adult fish in the Atlantic has revealed that they exhibit clear diurnal patterns being much deeper in the daytime than at night. Spawning takes place in tropical waters when the environment is favorable. From the nursery areas in tropical waters, juvenile fish tend to diffuse into temperate waters as they grow larger. Catch information from the surface gears indicate that the Gulf of Guinea is a major nursery ground for this species.

Dietary habits of bigeye tuna are varied such that prey organisms like fish, mollusks, and crustaceans are found in stomach contents. A growth study based on otolith and tagging data resulted in the adoption by the SCRS of a new growth curve. The curve shows bigeye tuna

exhibit relatively fast growth: about 105 cm in fork length at age three, 140 cm at age five and 163 cm at age seven. Bigeye tuna become mature at about age three and a half. Young fish form schools mostly mixed with other tunas such as yellowfin and skipjack. These schools are often associated with drifting objects, whale sharks and sea mounts. This association appears to weaken as bigeye tuna grow larger. An estimate of natural mortality (M) for juvenile fish was provided based on the results of a tagging program. According to this study, mortality for juvenile fish only is at a similar level of M as that currently used for the entire Atlantic stock as well as the level of M used for all other oceans. Various evidence including; a genetic study, the time-area distribution of fish, and movements of tagged fish, suggest an Atlantic-wide single stock for this species, which is currently accepted by the SCRS. However, the possibility of other scenarios, such as north and south stocks, should not be disregarded.

Recent Updates on U.S. Bigeye Tuna Research

During 2004, U.S. scientists participated in both the Bigeye Tuna Year Program (BETYP) Symposium (Madrid, Spain, March 8 – 9, 2004) and the Second World Bigeye Tuna Meeting (Madrid, Spain, March 10 - 13, 2004). Contributed papers included SCRS/2004/038, describing the simulated aggregation of bigeye tuna in free schools versus those associated with fish aggregating devices, and SCRS/2004/059, which reviewed published work on yellowfin tuna growth and compared parameter estimates in the context of potential impact on the catch-at-age matrices used for stock assessment. U.S. scientists took part in the 2004 ICCAT Bigeye Tuna Stock Assessment (Madrid, Spain, June 28 - July 3, 2004). For this meeting, relative abundance patterns based on U.S. pelagic longline data from 1982 to 2003 were presented in SCRS/2004/133.

SCRS Recent Stock Assessment Results

A new stock assessment was conducted for bigeye tuna in July 2004. Due to the early date of the meeting, the catch information for 2003 was incomplete and could not be incorporated in the assessment. The 2004 stock assessment was conducted using various types of models. However, there were considerable sources of uncertainty arising from the lack of information regarding (a) reliable indices of abundance for small bigeye from surface fisheries, (b) the species composition of Ghanaian fisheries that target tropical tunas, and (c) details on the historical catch and fishing activities of Illegal, Unregulated, Unreported (IUU) fleets (*e.g.*, size, location and total catch).

Three indices of relative abundance were available to assess the status of the stock (Figure 3.5). All were from longline fisheries conducted by Japan, Chinese Taipei and United States. While the Japanese indices have the longest duration since 1961 and represent roughly 20 - 40 percent of the total catch, the other two indices are shorter and generally account for a smaller fraction of the catch than the Japanese fishery. These three indices primarily relate to medium and large-size fish.

Various types of production models were applied to the available data and the SCRS notes that the current year's model fits to the data were better than in past assessments, although they required similar assumptions regarding stock productivity. The point estimates of MSY obtained from different production models ranged from 93,000 mt to 113,000 mt. The lower

limit of this range is higher than the one estimated in the 2002 assessment, probably due to the revised indices and the addition of a new index. An estimate obtained from another age-aggregated model was 114,000 mt. The inclusion of estimation uncertainty would broaden this range considerably.

These analyses estimate that the total catch was larger than the upper limit of MSY estimates for most years between 1993 and 1999, causing the stock to decline considerably, and leveling off thereafter as total catches decreased. These results also indicate that the current biomass is slightly below or above (85 – 107 percent) the biomass at MSY (Figure 3.6), and that current fishing mortality is also in the range of 73 percent to 101 percent of the level that would allow production of MSY (Table 3.7). However, indications from the most targeted and wide-ranging fishery are of a more pessimistic status than implied by these model results. Several types of age-structured analyses were conducted using the above-mentioned longline indices from the central fishing grounds and catch-at-age data converted from the available catch-at-size data. In general, the trajectories of biomass and fishing mortality rates are in accordance with the production model analyses. Model fits appeared improved over those of past assessments, apparently as a result of using a new growth curve for the calculation of catch at age.

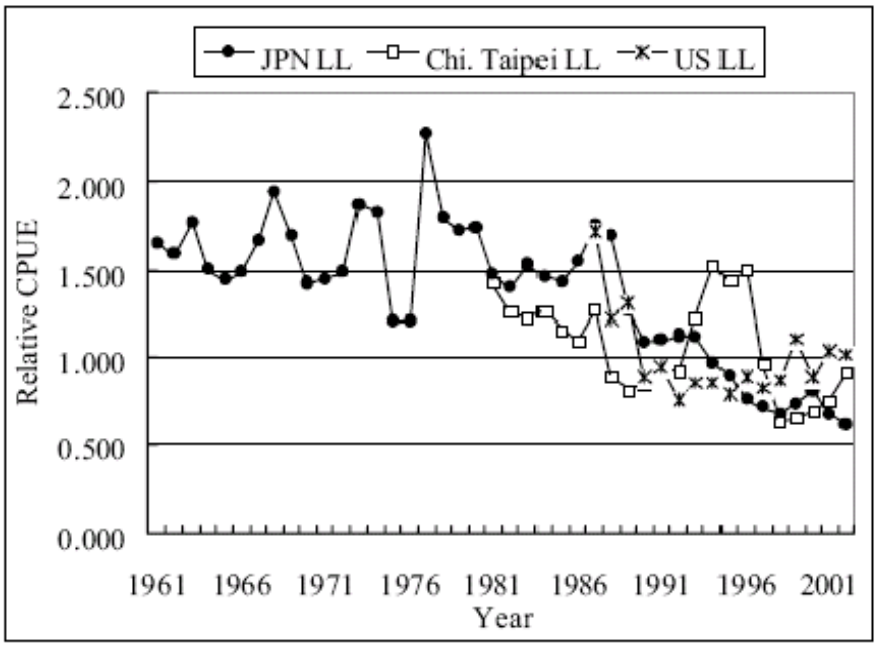


Figure 3.5 **Abundance indices in numbers of BET. All ages are aggregated.** Source: ICCAT, 2004.

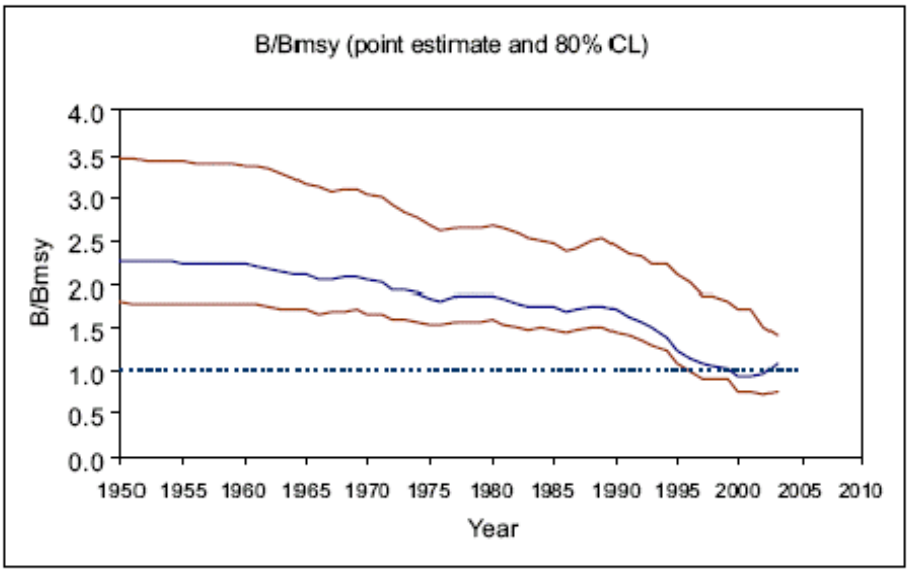


Figure 3.6 **Trajectory of the BET biomass modeled in production model analysis (middle line) bounded by upper and lower lines denoting 80 percent confidence intervals.** Source: ICCAT, 2004.

Table 3.7 **Summary Table for the Status of Atlantic Bigeye Tuna.** Source: ICCAT, 2004.

Age/size at Maturity	Age 3/~100 cm curved fork length
Spawning Sites	Tropical waters
Current Relative Biomass Level *Minimum Stock Size Threshold*	B_{03}/B_{MSY} = 0.85 - 1.07 $0.6B_{MSY}$ (age 2+)
Current Relative Fishing Mortality Rate *Maximum Fishing Mortality Threshold*	F_{02}/F_{MSY} = 0.73-1.01 F_{year}/F_{MSY} = 1.00
Maximum Sustainable Yield	93,000 - 114,000 mt
Current (2003) Yield	85,000 mt
Current (2003) Replacement Yield	89,000 - 103,000 mt
Outlook	Overfished; overfishing is occurring

SCRS Advice and Management Actions

Previous yield-per-recruit and spawner-per-recruit analyses highlighted the potential importance of reducing fishing mortality on small fish. However, the percentage of fish caught less than this minimum size (3.2 kg) is very high (46 - 62 percent of the total fish caught) since 1989. The SCRS, therefore, recommends the full implementation of the moratorium on Fish Aggregation Device (FAD) fishing by all surface fisheries in the Gulf of Guinea. This assessment indicated that the stock has declined due to the large catches made since the mid-

1990s to around or below the level that produces the MSY, and that fishing mortality exceeded F_{MSY} for several years during that time period. Projections indicate that catches of more than 100,000 mt will result in continued stock decline. ICCAT should be aware that if major countries were to take the entire catch limit set under the ICCAT Recommendations and other countries were to maintain recent catch levels, then the total catch could exceed 100,000 mt. The SCRS highly recommended that catch levels of around 90,000 mt or lower be maintained at least for the near future for ICCAT to rebuild the stock.

The SCRS noted its appreciation for the effort made by ICCAT in establishing the Statistical Document Program for bigeye tuna and expressed hope that the data to be submitted to the Secretariat will be useful to improve estimates of unreported catches. The SCRS also stated its appreciation regarding the initiatives to reduce the IUU activities taken by several fishing authorities. These efforts are helpful in identifying and reducing the unreported catches in the Atlantic and will make the catch limit regulation more effective, and thus will contribute to reduce uncertainties in the bigeye stock assessment. As far as the IUU catches of BET are concerned, they are almost disappearing according to the available estimates. Nevertheless, the SCRS expressed concern that unreported catches may have been underestimated.

SCRS evaluation of current regulations

ICCAT recommended a bigeye tuna minimum size regulation of 3.2 kg in 1980 to reinforce the same regulation for yellowfin tuna. It is clear that a large quantity of juvenile bigeye tuna smaller than 3.2 kg continues to be captured mostly from the equatorial surface fleets (baitboat and purse seine). The percentage and total number of fish smaller than the minimum size has increased since 1989 and was more than 45 percent of the total fish caught or more than six million fish thereafter, although the absolute number of undersized fish might have been reduced in some fisheries. According to previous yield-per-recruit analyses, a full implementation of this regulation could result in an increase in yield-per-recruit by almost 20 percent at F_{max}.

The moratorium on FAD fishing by surface gears in the Gulf of Guinea has been implemented by ICCAT since 1999. The full evaluation of this program is somewhat hindered by the multi-species nature of surface fisheries and the existence of other types of fisheries. The updated analysis indicated that this regulation appeared effective in reducing mortality for juvenile bigeye and increasing the spawning biomass per recruit. The full compliance with this regulation by all surface fisheries will greatly increase the effectiveness of this regulation. The SCRS was pleased to note that Ghana implemented this moratorium in the 2003/2004 season (SCRS/2004/027).

Limiting the annual catch to the average catch in two years of 1991 and 1992 entered into force for the major fishing countries whose 1999 catch reported to the 2000 SCRS was larger than 2,100 mt. The 2003 total reported catch for the major countries and fishing entities to which the catch limit applies (EC-Spain, EC-France, EC-Portugal, Japan, Ghana, China and Chinese Taipei) was 67,700 mt and 18,800 mt lower than the total catch limit (86,500 mt). As a whole, the total catch in 2003 for all countries is about 11,300 mt lower than the average total catch of 1991 and 1992.

SCRS Outlook

Stock projections were conducted based on the production model results, assuming a catch of 75,480 mt in 2003 and varying levels of constant catch thereafter. The projection results suggest that the biomass of the stock will likely decline further with constant catches of 100,000 mt or more. On average, increases in biomass are expected with catches of 90,000 mt or less. However, due to uncertainty, there is a non-negligible probability of further decline of the stock with a constant future catch of 100,000 mt or more.

3.2.3.2 Atlantic Yellowfin Tuna

Life History/Biology

Yellowfin tuna is a cosmopolitan species distributed mainly in the tropical and subtropical oceanic waters of the three oceans, where they form large schools. The sizes exploited range from 30 cm to 170 cm fork length (FL). Smaller fish (juveniles) form mixed schools with skipjack and juvenile bigeye, and are mainly limited to surface waters, while larger fish are found in surface and sub-surface waters. The majority of the long-term recoveries of tagged fish have been tagged in the western Atlantic and recovered in the eastern Atlantic, where several recaptures are recorded each year.

Sexual maturity occurs at about 100 cm FL. Reproductive output among females has been shown to be highly variable, although the extent of this is unknown. The main spawning ground is the equatorial zone of the Gulf of Guinea, with spawning occurring from January to April. Juveniles are generally found in coastal waters off Africa. In addition, spawning occurs in the Gulf of Mexico, in the southeastern Caribbean Sea, and off Cape Verde, although the relative importance of these spawning grounds is unknown.

Although such separate spawning areas might imply separate stocks or substantial heterogeneity in the distribution of yellowfin tuna, a single stock for the entire Atlantic is assumed as a working hypothesis (Atlantic Yellowfin Working Group, Tenerife, 1993), taking into account the transatlantic migration (from west to east) indicated by tagging, a 40-year time series of longline catch data that indicates yellowfin are distributed continuously throughout the entire tropical Atlantic Ocean, and other information (*e.g.*, time-area size frequency distributions and locations of fishing grounds).

Growth patterns are variable with size, being relatively slow initially, and increasing by the time the fish leave the nursery grounds. Males are predominant in the catches of larger sized fish. Natural mortality is assumed to be higher for juveniles than for adults. Tagging studies for Pacific yellowfin supports this assumption. New data on biology and catches obtained from the Brazilian longline fishery were presented in 2004.

<u>Recent Updates on U.S. Yellowfin Tuna Research</u>

During 2003, U.S. scientists in cooperation with scientists from other countries conducted several collaborative studies. Cooperative research by the United States and Mexico continued and resulted in a joint analysis of United States and Mexican longline catch-per-unit-effort

(CPUE) of yellowfin in the Gulf of Mexico (SCRS/2003/061). Cooperative research plans include further development of abundance indices for sharks and other tunas, as well as the refinement of the yellowfin tuna indices as additional data become available. Cooperative research on yellowfin tuna abundance indices, catch-at-age, and life-history studies is also continuing with Venezuelan scientists. One document on Venezuelan longline catch rate patterns resulted from this collaboration in 2003 (SCRS/2003/054) and additional working papers based on this collaboration are expected in future years.

U.S. scientists participated in the 2003 ICCAT Yellowfin Tuna Stock Assessment (Merida, Mexico, July 21 - 26, 2003), and submitted several other working papers. Two relative abundance patterns (one for the Gulf of Mexico and another for the Atlantic regions fished by U.S. longline vessels) based on U.S. pelagic longline data from 1981 to 2002 were presented in SCRS/2003/060. Additionally, a relative abundance index based on data collected through the Large Pelagic Survey from the Virginia-Massachusetts rod and reel fishery (1986 - 2002) was presented in SCRS/2003/062.

New information from a genetic study was presented in SCRS/2003/063. The phylogenetic analysis conducted on samples from the Gulf of Mexico and Gulf of Guinea by researchers at Texas A&M, Galveston, revealed the presence of siblings in several sampling tows for juvenile tuna. Given the high level of genetic diversity at both the mitochondrial and microsatellite loci, the probability of such sampling is extremely low and can best be explained by the unequal reproductive output of certain females. Increases in vulnerability of juvenile yellowfin tuna could be of concern in terms of genetic integrity of the population if levels of reproductive variance are confirmed to be large.

U.S. scientists also worked in cooperation with outside experts to study alternatives for improving the collection of catch statistics in the U.S. recreational yellowfin tuna fishery. A U.S. scientist attended the Tuna Statistics Meeting (Tema, Ghana, February 2 - 5, 2003) and collaborated with scientists from other nations (including Ghana) in the design of a pilot study to develop a sampling scheme for Ghana's tropical tuna fishery.

SCRS Recent Stock Assessment Results

A full assessment was conducted for yellowfin tuna in 2003 applying various age-structured and production models to the available catch data through 2001. Unfortunately, at the time of the assessment meeting, only 19 percent of the 2002 catch had been reported (calculated relative to the catch reports available at the time of the SCRS Plenary). The results from all models were considered in the formulation of the SCRS's advice.

The variability in overall catch-at-age is primarily due to variability in catches of ages zero and one (note that the catches in numbers of ages zero and especially one were particularly high during the period 1998 - 2001). Both equilibrium and non-equilibrium production models were examined in 2003 and the results are summarized in Table 3.8. The estimate of MSY based upon the equilibrium models ranged from 151,300 to 161,300 mt; the estimates of F_{2001}/F_{MSY} ranged from 0.87 to 1.29. The point estimate of MSY based upon the non-equilibrium models ranged from 147,200 - 148,300 mt. The point estimates for F_{2001}/F_{MSY} ranged from 1.02 to 1.46. The main differences in the results were related to the assumptions of each model. The SCRS

was unable to estimate the level of uncertainty associated with these point estimates. An age-structured virtual population analysis (VPA) was made using eight indices of abundance. The results from this model were more comparable to production model results than in previous assessments, owing in part to a greater consistency between several of the indices used. The VPA results compare well to the trends in fishing mortality and biomass estimated from production models. The VPA estimates that the spawning biomass (Table 3.6) and the levels of fishing mortality (Table 3.7) in recent years have been very close to MSY levels. The estimate of MSY derived from these analyses was 148,200 mt.

In summary, the age-structured and production model analyses implied that although the 2001 catches of 159,000 mt were slightly higher than MSY levels, effective effort may have been either slightly below or above (up to 46 percent) the MSY level, depending on the assumptions. Consistent with these model results, yield-per-recruit analyses also indicated that 2001 fishing mortality rates could have been either above or about the level which could produce MSY. Yield-per-recruit analyses further indicated that an increase in effort is likely to decrease the yield-per-recruit, while reductions in fishing mortality on fish less than 3.2 kg could result in substantial gains in yield-per-recruit and modest gains in spawning biomass-per-recruit.

Table 3.8 Summary Table for the Status of Atlantic Yellowfin Tuna. Source: ICCAT, 2004.

Age/size at Maturity	Age 3/~110 cm curved fork length
Spawning Sites	Tropical waters
Relative Biomass Level *Minimum Stock Size Threshold*	B_{01}/B_{MSY} = 0.73 - 1.10 $0.5B_{MSY}$ (age 2+)
Relative Fishing Mortality Rate *Maximum Fishing Mortality Threshold*	F_{01}/F_{MSY} = 0.87 - 1.46 F_{year}/F_{MSY} = 1.00
Maximum Sustainable Yield	147,200 - 161,300 mt
Current (2003) Yield	124,000 mt
Replacement Yield (2001)	May be somewhat below the 2001 yield (159,000 mt)
Outlook	Approaching an overfished condition

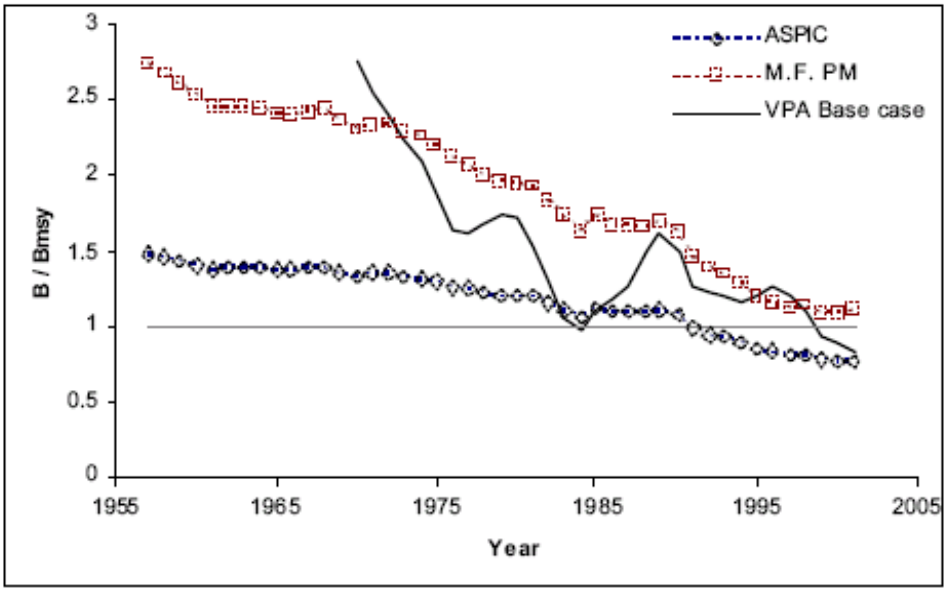


Figure 3.7 **Comparison of relative biomass trends calculated using VPA and non-equilibrium production models.** Source: ICCAT, 2004.

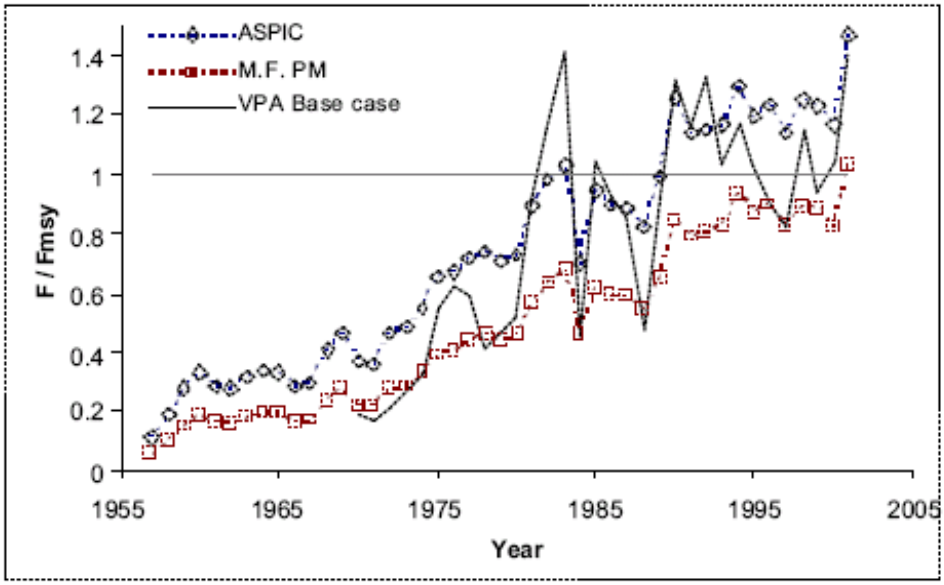


Figure 3.8 **Comparison of relative fishing mortality trends calculated using VPA and non-equilibrium production models.** Source: ICCAT, 2004.

SCRS Advice and Management Recommendations

Estimated catches of yellowfin tuna have averaged 141,000 mt over the past three years. This average falls near the lower estimate of the range of MSY from the age-structured and production model analyses conducted during the 2003 assessment. The SCRS considers that the yield of 159,000 mt in 2001 is likely somewhat above the replacement yield, and that levels of fishing effort and fishing mortality may have been near MSY. Total catches since 2001 have been declining, but without a new assessment it is not clear whether or not this reflects decreases in fishing effort and fishing mortality. Therefore, the SCRS reaffirms its support for ICCAT's 1993 recommendation "that there be no increase in the level of effective fishing effort exerted on Atlantic yellowfin tuna, over the level observed in 1992." During the 2003 assessment, the SCRS's estimates of effective fishing effort for recent years fell near the estimate for 1992.

A number of management measures have been implemented in the United States, consistent with this advice, to prevent overfishing. In 1999, NMFS implemented limited access in the pelagic longline fishery for Atlantic tunas, as well as a recreational retention limit for yellowfin tuna. The United States has also implemented a larger minimum size than that required by ICCAT. This species is listed as approaching an overfished condition by the United States.

The SCRS also continues to recommend that effective measures be found to reduce fishing mortality of small yellowfin, based on previous results of yield-per-recruit analysis. In 2003, the SCRS evaluated the effects of the moratorium on fishing on floating objects (and other measures to reduce catches of small fish) begun in late 1997, but there were insufficient data to fully evaluate the impact on yellowfin tuna. In general, the approach was intended to benefit bigeye tuna and is not expected to reduce the mortality of juvenile yellowfin tuna. In fact, the fishing mortality on juvenile yellowfin tuna appears to have increased substantially during the moratorium years, although it is unclear that this is related to the moratorium.

SCRS Evaluation of Management Measures

In 1973, ICCAT adopted a regulation that imposed a minimum size of 3.2 kg for yellowfin tuna, with a 15 percent tolerance in the number of undersized fish per landing. This regulation has not been adhered to internationally, as the proportion of landings of yellowfin tuna less than 3.2 kg has been far in excess of 15 percent per year for the purse seine and baitboat fisheries. Based on the catch species composition and catch-at-size data available during the 2003 assessment, yearly catches in number ranged between 54 percent and 72 percent undersized yellowfin tuna by purse seiners, from 63 percent to 82 percent undersized fish for baitboats over the period 1997-2001. Landings of undersized fish occur primarily in the equatorial fisheries. Unfortunately, it is difficult to realize substantial reductions in catches of undersized fish in these fisheries because small yellowfin tuna are mostly associated with skipjack tuna, especially when fishing occurs on floating objects; thus it is difficult to avoid catching small yellowfin when catching skipjack, the latter being an important component of eastern Atlantic (equatorial) purse seine fleet catches. The SCRS plans further investigations of the utility of minimum size regulations and alternative measures to reduce juvenile mortality in this multi-species fishery.

In 1993, ICCAT recommended "that there be no increase in the level of effective fishing effort exerted on Atlantic yellowfin tuna, over the level observed in 1992." As measured by fishing mortality estimates from the 2003 assessment, effective effort in 2001 appeared to be approaching or exceeding the 1992 levels.

SCRS Outlook

Since reported yellowfin tuna landings in 2001 appeared to be somewhat above the MSY level estimated during the 2003 assessment and fishing effort and fishing mortality may have been in excess of the levels associated with MSY, it is important to ensure that effective effort does not increase beyond the 2001 level. Projections indicate that stock biomass is likely to decrease if fishing mortality increases to the level estimated for 1992, which is currently being approached or exceeded. Thus the possibility that the fishing power of the purse seiners and other fleets may further increase, even if the total capacity of the fleet were to remain constant, is also cause for concern. It should be noted that the current estimates of total yellowfin landings in 2002 and 2003, which were not available at the time of the assessment, are 139,000 mt and 124,000 mt, respectively.

3.2.3.3 Atlantic Albacore Tuna

Life History / Species Biology

Albacore is a temperate tuna widely distributed throughout the Atlantic Ocean and Mediterranean Sea. For assessment purposes, the existence of three stocks is assumed based on available biological information: northern and southern Atlantic stocks (separated at 5ºN), and a Mediterranean stock. Albacore spawning areas in the Atlantic are found in subtropical western areas of both hemispheres and throughout the Mediterranean Sea. Spawning takes place during austral and boreal spring-summer. Sexual maturity is considered to occur at about 90 cm FL (age five) in the Atlantic, and at smaller size (62 cm, age two) in the Mediterranean. Until this age they are mainly found in surface waters, where they are targeted by surface gears. Some adult albacore are also caught using surface gears but, as a result of their deeper distribution, they are mainly caught using longlines. Young albacore tuna are also caught by longline in temperate waters.

<u>Recent Updates on U.S. Albacore Tuna Research</u>

In 2003, an analysis of U.S. longline CPUE (SCRS/03/086) was prepared in support of the ICCAT assessment of northern and southern Atlantic albacore tuna.

SCRS Stock Assessment Results

The last assessment of the northern stock was conducted in 2000, using data from 1975 to 1999, and that of the southern stock in 2003; no assessment of the Mediterranean stock has ever been carried out. To coordinate the timing of the assessments of northern and southern albacore tuna, the stock assessment for northern albacore was postponed at the 2004 ICCAT meeting from 2006 to 2007 (note the management measures for northern albacore expire at the end of 2006). The SCRS noted the considerable uncertainty that continues to remain in the catch-at-size data

for the northern and southern stocks, and the profound impact this has had on attempts to complete a satisfactory assessment of northern albacore tuna.

North Atlantic

The SCRS carried out an initial analysis of the state of the northern stock using a model essentially the same as that used in previous assessments. However, revisions to catch-at-size data, provided to the Secretariat during and shortly before the assessment, altered the historical data series. The impacts of these revisions are such that the SCRS concluded that it was not appropriate to proceed with an assessment based on the 2003 catch-at-age. Consequently, the SCRS's opinion of the current state of the northern albacore tuna stock is based primarily on the last assessment conducted in 2000 together with observations of CPUE and catch data provided to the SCRS since then. The results, obtained in 2000, showed consistency with those from previous assessments (Table 3.9).

The SCRS noted that CPUE trends have varied since the last assessment in 2000, and in particular differed between those representative of the surface fleets (Spain Troll age two and Spain Troll age three) and those of the longline fleets of Japan, Chinese Taipei and the United States. The Spanish age two troll series, while displaying an upward trend since the last assessment, nonetheless declines over the last ten years. For the Spanish age three troll series the trend in the years since the last assessment is down, however, the trend for the remainder of the last decade is generally unchanged. For the longline fleets, the trend in CPUE indices is either upwards (Chinese Taipei and United States) or unchanged (Japan) in the period since the last assessment. However, variability associated with all of these catch rate estimates prevented definitive conclusions about recent trends of albacore catch rates.

Equilibrium yield analyses, carried out in 2000 and made on the basis of an estimated relationship between stock size and recruitment, indicate that spawning stock biomass was about 30 percent below that associated with MSY. However, the SCRS noted considerable uncertainties in these estimates of current biomass relative to the biomass associated with MSY (B_{MSY}), owing to the difficulty of estimating how recruitment might decline below historical levels of stock biomass. Thus, the SCRS concluded that the northern stock is probably below B_{MSY}, but the possibility that it is above it should not be dismissed (Figure 3.9). However, equilibrium yield-per-recruit analyses made by the SCRS in 2000 indicate that the northern stock is not being growth overfished ($F < Fmax$).

South Atlantic

In 2003, an age-structured production model, using the same specifications as in 2000, was used to provide a base case assessment for soouthern Atlantic albacore. Results were similar to those obtained in 2000, but the confidence intervals were substantially narrower in 2003 than in 2000 (Table 3.10). In part, this may be a consequence of additional data now available, but the underlying causes need to be investigated further. The estimated MSY and replacement yield from the 2003 base case (30,915 mt and 29,256 mt, respectively) were similar to those estimated in 2000 (30,274 mt and 29,165 mt). In both 2003 and 2000, the fishing mortality rate was estimated to be about 60 percent of F_{MSY}. Spawning stock biomass has declined substantially

relative to the late 1980s, but the decline appears to have leveled off in recent years and the estimate for 2002 remains well above the spawning stock biomass corresponding to MSY.

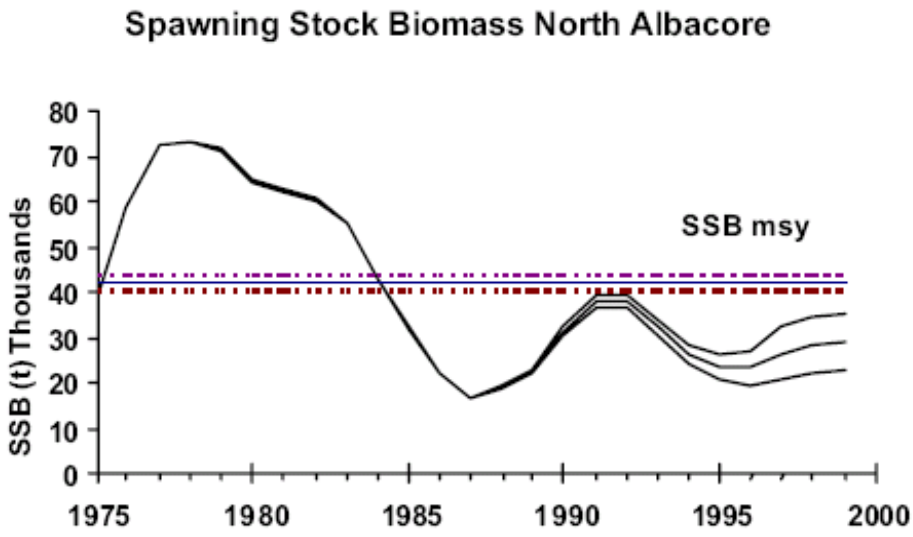


Figure 3.9 **North Atlantic albacore spawning stock biomass and recruits with 80 percent confidence limits.** Source: ICCAT, 2004.

Table 3.9 **Summary Table for the Status of North Atlantic Albacore Tuna.** Source: ICCAT, 2004.

Age/size at Maturity	Age 5/~90 cm curved fork length
Spawning Sites	Subtropical western waters of the northern Hemisphere
Current Relative Biomass Level *Minimum Stock Size Threshold*	B_{99}/B_{MSY} = 0.68 (0.52 - 0.86) $0.7B_{MSY}$
Current Relative Fishing Mortality Rate *Maximum Fishing Mortality Threshold*	F_{99}/F_{MSY} = 1.10 (0.99 - 1.30) F_{year}/F_{MSY} = 1.00
Maximum Sustainable Yield	32,600 mt [32,400 - 33,100 mt]
Current (2003) Yield	25,516 mt
Current (2003) Replacement Yield	not estimated
Outlook	Overfished; overfishing is occurring

Table 3.10 Summary Table for the Status of South Atlantic Albacore Tuna. Source: ICCAT, 2004.

Age/size at Maturity	Age 5/~90 cm curved fork length
Spawning Sites	Subtropical western waters of the southern Hemisphere
Current Relative Biomass Level	B_{02}/B_{MSY} = 1.66 (0.74 - 1.81)
Current Relative Fishing Mortality Rate	F_{02}/F_{MSY} = 0.62 (0.46 - 1.48)
Maximum Sustainable Yield	30,915 mt (26,333 - 30,915)
Current (2003) Yield	27,811 mt
Current (2003) Replacement Yield	29,256 mt (24,530 - 32,277)
Outlook	Not overfished; overfishing is not occurring

SCRS Advice and Management Recommendations

North Atlantic

No assessment of the North Atlantic albacore stock was possible in 2003 because of uncertainties associated with the catch-at-age. In 2000, the SCRS recommended that in order to maintain a stable Spawning Stock Biomass in the near future the catch should not exceed 34,500 mt (the 1999 catch level) in the period 2001-2002. The SCRS further noted that should ICCAT wish the Spawning Stock Biomass to begin increasing towards the level estimated to support MSY, then catches in 2001 and 2002 should not exceed 31,000 mt. In 2003, the SCRS reiterated its previous advice and extended it until the next assessment.

South Atlantic

Recent catches of albacore tuna in the South Atlantic are in the vicinity of the current and recent estimates of MSY (30,915 mt). Both the 2000 and the 2003 albacore assessments estimated that the stock is above B_{MSY} (2003 estimates $B_{current}/B_{MSY}$ = 1.66, $F_{current}/F_{MSY}$ = 0.62). The SCRS recommends that in order to maintain SSB in the near future the catch should not exceed 31,000 mt for the next three to five years.

Mediterranean

There are no ICCAT management recommendations for the Mediterranean stock. However, the SCRS recommended to ICCAT that reliable data be provided on catch, effort and size for Mediterranean albacore tuna. The SCRS also recommended that an effort be made to recover historical data. Improvements to these basic inputs are essential before a stock assessment of Mediterranean albacore tuna can be attempted.

SCRS Evaluation of Management Recommendations

North Atlantic

Since 2001, ICCAT established a TAC of 34,500 mt for this stock. In 2003, ICCAT extended this TAC up to 2006. The SCRS noted that reported catches for 2001, 2002, and 2003 have been below the TAC. A 1998 recommendation that limits fishing capacity to the average of 1993 - 1995 also remains in force. The SCRS is unable to assess whether or not these recommendations have had a direct effect on the stock.

South Atlantic

Since 1999, ICCAT established the TAC for this stock (in 2001-2003 the TAC has been set to 29,200 mt). In 2003, ICCAT extended this TAC to 2004. The SCRS noted that reported catches have not exceeded the TAC in 2003. Also the total catch by Chinese Taipei, South Africa, Brazil, and Namibia (26,620 mt) did not exceed the 27,500 mt catch limit of parties actively fishing for southern albacore, as stipulated by resolution 02-06. It should be noted that sufficient capacity exists within the fisheries to exceed the TAC as was done in 2000, 2001, and 2002. Japan adhered to its bycatch limit of four percent of the total catch of bigeye tuna in the Atlantic Ocean. However, the SCRS is unable to assess whether or not these catch limits have had a direct effect on the stock.

SCRS Outlook

North Atlantic

In terms of yield per recruit, the assessment carried out in 2000 indicates that the fishing intensity is at, or below, the fully exploited level. Concerning MSY-related quantities, the SCRS recalls that they are highly dependent on the specific choice of stock-recruitment relationship. The SCRS believed that using a particular form of stock-recruitment relationship that allows recruitment to increase with spawning stock size provided a reasonable view of reality. This hypothesis together with the results of the assessment conducted in 2000 indicate that the spawning stock biomass (B_{1999}) for the northern stock (29,000 mt) was about 30 percent below the biomass associated with MSY (42,300 mt) and that current F (2000) was about 10 percent above F_{MSY}. However, an alternative model allowing for more stable recruitment values in the range of observed SSB values would provide a lower estimate of SSB at MSY, below the current value.

South Atlantic

Catches of albacore in the South Atlantic in 2001 and 2002 were above replacement yield, and were below estimates of MSY in 2003. Nevertheless, both the 2000 and 2003 albacore assessments estimated that the stock is above B_{MSY}. There is now greater confidence in these estimates of MSY and therefore there is justification to base a TAC recommendation on MSY instead of replacement yield estimates from the model as in 2000. This results from the SCRS's view that current stock status is somewhat above B_{MSY} and catch of this level, on average, would be expected to reduce the stock further towards B_{MSY}. Recent estimates of high

recruitment could allow for some temporary increase in adult stock abundance under a 31,000 mt catch, but this result is uncertain.

Mediterranean

Given the lack of an assessment, the implications of the rapid increase in landings in unknown.

3.2.3.4 Atlantic Skipjack Tuna

Life History / Species Biology

Skipjack tuna is a cosmopolitan species forming schools in the tropical and subtropical waters of the three oceans. Skipjack spawn opportunistically throughout the year in vast areas of the Atlantic Ocean. The size at first maturity is about 45 cm for males and about 42 cm for females in the East Atlantic, while in the West Atlantic sexual maturity is reached at around 51 cm for females and 52 cm for males. Skipjack growth is seasonal, with substantial differences according to the latitude. There remains considerable uncertainty about the variability of the growth parameters between areas. It is, therefore, a priority to gain more knowledge on the growth schemes of this species.

Skipjack is a species that is often associated with floating objects, both natural objects or fish aggregating devices (FADs) that have been used extensively since the early 1990s by purse seiners and baitboats (during the 1991 to 2003 period, about 55 percent of skipjack were caught with FADs). The concept of viscosity (low interchange between areas) could be appropriate for the skipjack stocks. A stock qualified as "viscous" can have the following characteristics:

- It may be possible to observe a decline in abundance for a local segment of the stock;
- Overfishing of that component may have little, if any, repercussion on the abundance of the stock in other areas; and,
- Only a minor proportion of fish may make large-scale migrations.

The increasing use of FADs could have changed the behavior of the schools and the migrations of this species. It is noted that, in effect, the free schools of mixed species were much more common prior to the introduction of FADs than now. These possible behavioral changes ("ecological trap" concept) may lead to changes in the biological parameters of this species as a result of the changes in the availability of food, predation and fishing mortality. Skipjack caught with FADs are usually found associated with other species. The typical catch with floating objects is comprised of about 63 percent skipjack, 20 percent small yellowfin, and 17 percent juvenile bigeye and other small tunas. A comparison of size distributions of skipjack between periods prior to and after the introduction of FADs show that, in the eastern Atlantic, there has been an increase in the proportion of small fish in the catches, as well as a decline in the total catch in recent years in some areas.

The SCRS reviewed the current stock structure hypothesis that consists of two separate management units, one in the east Atlantic and another in the west Atlantic, separated at 30°W. The boundary of 30° West was established when the fisheries were coastal, whereas in recent

years the East Atlantic fisheries have extended towards the west, surpassing this longitude, and showing the presence of juvenile skipjack tuna along the Equator, west of 30°W, following the drift of the FADs. This implies the potential existence of a certain degree of mixing. Nevertheless, taking into account the large distances between the east and west areas of the ocean, various environmental constraints, the existence of a spawning area in the east Atlantic as well as in the northern zone of the Brazilian fishery, and the lack of additional evidence (*e.g.* transatlantic migrations in the tagging data), the hypothesis of separate east and west Atlantic stock is maintained as the most plausible alternative. On the other hand, in taking into account the biological characteristics of the species and the different fishing areas, smaller management units could be considered.

SCRS Recent Stock Assessment Results

The last assessment on Atlantic skipjack tuna was carried out in 1999 (Table 3.11). The state of the Atlantic skipjack stock(s), as well as the stocks of this species in other oceans, show a series of characteristics that make it extremely difficult to conduct an assessment using current models. Among these characteristics, the most noteworthy are:

- The continuous recruitment throughout the year, but heterogeneous in time and area, making it impossible to identify and monitor the individual cohorts;
- Apparent variable growth between areas, which makes it difficult to interpret the size distributions and their conversion to ages; and,
- Exploitation by many and diverse fishing fleets (baitboat and purse seine), having distinct and changing catchabilities, which makes it difficult to estimate the effective effort exerted on the stock in the east Atlantic.

For these reasons, no standardized assessments have been able to be carried out on the Atlantic skipjack stocks. Notwithstanding, some estimates were made, by means of different indices of the fishery and some exploratory runs were conducted using a new development of the generalized production model.

<u>Eastern stock</u>

Standardized catch rates are not available. However, an analysis was made, for the 1969-2002 period, of the different indices of the purse seine fishery that could provide valuable information on the state of the stock. For the majority of the indices, the trends were divergent, depending on the area, which may indicate the viscosity of the skipjack stock, with limited mixing rates between areas. Because of the difficulties in assigning ages to the skipjack catches, the estimates of the values of natural mortality by age and obtaining indices of abundance (especially for the eastern stock), no catch-by-age matrices were developed and, consequently, no analytical assessment methods were applied.

<u>Wetern stock</u>

Standardized abundance indices up to 1998 were available from the Brazilian baitboat fishery and the Venezuelan purse seine fishery, and in both cases the indices seem to show a stable stock status. Uncertainties in the underlying assumptions for the analyses prevent the

extracting of definitive conclusions regarding the state of the stock. However, the results suggest that there may be over-exploitation within the FAD fisheries, although it was not clear to what extent this applies to the entire stock. The SCRS could not determine if the effect of the FADs on the resource is only at the local level or if it had a broader impact, affecting the biology and behavior of the species. Under this supposition, maintaining high concentrations of FADs would reduce the productivity of the overall stock. However, since 1997, and due to the implementation of a voluntary Protection Plan for Atlantic tunas, agreed upon by the Spanish and French boat owners in the usual areas of fishing with objects, which later resulted in a Commission regulation on the surface fleets that practice this type of fishing, there has been a reduction in the skipjack tuna catches associated with FADs. Maintaining this closure could have a positive effect on the resource.

Table 3.11 Summary Table for the Status of West Atlantic Skipjack Tuna. Source: ICCAT, 2004.

Age/size at Maturity	Age 1 to 2/~50 cm curved fork length
Spawning Sites	Opportunistically in tropical and subtropical waters
Current Relative Biomass Level *Minimum Stock Size Threshold*	*Unknown* *Unknown*
Current Relative Fishing Mortality Rate F_{2003}/F_{MSY} *Maximum Fishing Mortality Threshold*	*Unknown* $F_{year}/F_{MSY} = 1.00$
Maximum Sustainable Yield	*Not Estimated*
Current (2003) Yield	24,053 mt
Current Replacement Yield	*Not Estimated*
Outlook	*Unknown*

SCRS Advice and Management Recommendations

There is currently no specific regulation in effect for skipjack tuna. However, the French and Spanish boat owners voluntarily applied a moratorium for the period of November 1997 through January 1998, and November 1998 through January 1999. The moratorium, which was implemented in order to protect juvenile bigeye tuna, has had an influence on the skipjack catches made with FADs. Since 1999, a similar moratorium was applied, recommended by ICCAT, and is still in force. The average purse seine skipjack catches during the months from November to January by the fleets that applied the moratoria were reduced by 64 percent compared to the average catches between the 1993 - 1996 period (before the moratoria) and those corresponding to the 1998 - 2002 period. For the entire period in which the moratoria have been in effect (1998 - 2002), the average annual skipjack catches by the purse seine fleets that applied the moratoria decreased by 41 percent, which is equivalent to 42,000 mt per year. However, this decrease is likely a combined result of the decrease in effort and the moratorium impact; this is supported by the observation that the mean annual catch by boats has decreased only 18 percent between the two periods.

3.2.4 Atlantic Billfish

3.2.4.1 Blue Marlin

Life History/Species Biology

Blue marlin (*Makaira nigricans*) range from Canada to Argentina in the western Atlantic, and from the Azores to South Africa in the eastern Atlantic. Blue marlin are large apex predators with an average weight of 100-175 kg (220-385 lb). Female blue marlin grow faster and reach a larger maximum size than males. Young blue marlin are one of the fastest growing teleosts, reaching 30-45 kg (66-99 lb) after the first year. The maximum growth rate of these fish is 1.66 cm/day (0.65 inches/day) which occurs at 39 cm LJFL (15.3 inches) (NMFS, 1999). Life expectancy for blue marlin is between 20-30 years based on analysis of dorsal spines.

Estimates of natural mortality rates for billfish would be expected to be relatively low, generally in the range of 0.15 to 0.30, based on body size, behavior and physiology (NMFS, 1999). Sagitta otolith weight is suggested to be proportional to age, indicating that both sexes are equally long-lived, based on the maximum otolith weight observed for each sex. Additionally, predicting age from length or weight is imprecise due to many age classes in the fishery.

Blue marlin have an extensive geographical range, migratory patterns that include trans-Atlantic as well as trans-equatorial movements, and are generally considered to be a rare and solitary species relative to the schooling Scombrids (tunas). Graves *et al*. (2002) captured eight blue marlin with recreational fishing gear and then implanted fish with satellite pop-up tags. These fish moved 74-248 km (40-134 nautical miles (nm)) over five days, with a mean displacement of 166 km (90 nm). Fish spent the vast majority of their time in waters with temperatures between 22 and 26 °C (71–78 °F) and at depths less than 10 m. The maximum time at liberty recorded of a tagged individual was 4,024 days (about 11 years) for a blue marlin that was estimated to weigh 29.5 kg (65 lb) at the time of release. Junior *et al*., (2004) found the depth of capture for blue marlin, with pelagic longline gear ranged from 50-190 m (164-623 feet), with most individuals captured at 90 m (295 feet).

The Cooperative Tagging Center (CTC) program has tagged and recaptured over 147 blue marlin and found that these fish moved an average of 903 km (488 nm) (NMFS, 1999). Some individuals have exhibited extended movement patterns, and strong seasonal patterns of movement of individuals between the United States and Venezuela are evident. A blue marlin released off Delaware and recovered off the island of Mauritius in the Indian Ocean represents the only documented inter-ocean movement of a highly migratory species in the history of the CTC. The minimum straight-line distance traveled for this fish was 16,853 km (9,100 nm) in 1,108 days-at-large (roughly three years).

Adults are found primarily in the tropics within the 24°C (75 °F) isotherm, and make seasonal movements related to changes in sea surface temperatures. In the northern Gulf of Mexico they are associated with the Loop Current, and are found in blue waters of low productivity rather than in more productive green waters. Off Puerto Rico, the largest numbers of blue marlin are caught during August, September, and October. Equal numbers of both sexes

occur off northwest Puerto Rico in July and August, with larger males found there in May and smaller males in September. Very large individuals, probably females, are found off the southern coast of Jamaica in the summer and off the northern coast in winter, where males are caught in December and January.

There has not been an Atlantic wide survey of spawning activity for blue marlin, however, these fish generally reproduce between the ages of two and four, at 220-230 cm (86-90 inches) in length, and weigh approximately 120 kg (264 lb). Female blue marlin begin to mature at approximately 47-60 kg (104-134 lb), while males mature at smaller weights, generally from 35-44 kg (77-97 lb). There are likely two separate spawning events that occur at different times in the North and South Atlantic. South Atlantic spawning takes place between February and March (NMFS, 1999). Peak spawning activity in the North Atlantic Ocean occurs between July and October, with females capable of spawning up to four times per reproductive season (de Sylva and Breder, 1997).

During the spawning season, blue marlin release between one and eleven million small (1-2 mm), transparent pelagic planktonic eggs. The number of eggs has been correlated to interspecific sizes among billfish and the size of individuals within the same species. Ovaries from a 147 kg (324 lb) female blue marlin from the northwest Atlantic Ocean were estimated to contain 10.9 million eggs, while ovaries of a 125 kg (275 lb) female were estimated to contain seven million eggs. Males are capable of spawning at any time.

Blue marlin are generalist predators feeding primarily on epipelagic fish and cephalopods in coastal and oceanic waters, however, mesopelagic fish and crustaceans associated with rocky, sandy, and reef bottoms are also important components of the diet. Feeding in mesopelagic areas probably takes place at night (Rosas-Alayola *et al*., 2002). Diet studies of blue marlin off the northeastern coast of Brazil indicate that oceanic pomfret (*Brama brama*) and squid (*Ornithoteuthis antillarum*) were the main prey items and present in at least 50 percent of stomachs. Other important prey species vary by location and include dolphin fishes, bullet tuna (*Auxis. spp*) around the Bahamas, Puerto Rico, and Jamaica, and dolphin fishes and scombrids in the Gulf of Mexico. Stomach contents have also included deep-sea fishes such as chiasmodontids.

Constant ingestion of small quantities of food is necessary. Blue marlin have relatively small stomachs, reducing the proportion of the body allocated for visceral mass, and allocating more volume to musculature for swimming speed and endurance (Junior *et al*., 2004). In the Pacific Ocean, changes in the diet observed are related more with abundance and distribution of prey than preferences in food items, with *Auxis spp*. (bullet and frigate tunas) well represented in all locations. Predators of blue marlin are relatively unknown. Sharks will attack hooked blue marlin, but it is not known if they attach free-swimming, healthy individuals.

Effect of ICCAT Management Regulations

Since 1995, blue marlin have been managed under a single stock hypothesis because of tagging data and mitochondrial DNA evidence that are consistent with one Atlantic-wide stock. The participants in this fishery are varied. Most landings of blue marlin are incidental to offshore longline fisheries targeting tuna and/or swordfish near the surface. However, significant

bycatch landings are also made using gear intended to fish deeper in the water column. The United States, Brazil, Venezuela, and Bahamas have significant, directed recreational fisheries for blue marlin (SCRS, 2004). Purse-seiners incidentally catch blue marlin. These harvests are more significant in the tropics where nets are set on floating Fish Aggregation Devices (FADs), than in the European Union (EU) where blue marlin comprise only 0.021percent of the total tuna catches, and less than 10 percent of the total billfish catches reported. The temporary ban on FADs adopted by the EU produced a 300-400 mt ww (661,386 – 881,849 lb) decrease in incidental catches of marlins (Gaertner *et al*., 2002).

ICCAT Recommendation 97-09 required Contracting Parties to reduce, starting in 1998, blue marlin and white marlin landings by at least 25 percent for each species from 1996 landings, by the end of 1999. Recommendations 00-13, 01-10, and 02-13 imposed or extended additional catch restrictions for blue marlin. These included limiting the annual amount of blue marlin that can be harvested by pelagic longline and purse seine vessels and retained for landing to no more than 50 percent of the 1996 or 1999 landing levels, whichever is greater, as well as requiring that all blue marlin and white marlin brought to pelagic longline and purse seine vessels alive be released in a manner that maximizes their survival. The live release provision does not apply to marlins that are dead when brought along the side of the vessel or that are not sold or entered into commerce (SCRS, 2004). In addition, these recommendations limited recreational landings in the United States to 250 blue and white marlin combined, on an annual basis. Also in 2000, ICCAT recommended that a blue marlin minimum size be established for recreational fisheries (251 cm (98.8 inches) LJFL). In November 2004, ICCAT extended phase one of the ICCAT mortality reduction plan, as established and modified by recommendations 00-13, 01-10, 02-13, through 2006 and postponed the next scheduled assessment of Atlantic blue marlin until 2006. The SCRS noted that it does not expect to have enough new information to provide an assessment of these recent regulations until 2006.

In the United States, blue marlin are managed exclusively for recreational fisheries. This fishery is subject to the ICCAT imposed 250-fish limit for both blue and white marlin combined, annually. There is also a domestic minimum size of 251 cm (99 inches) and 167 cm (66 inches) inches for blue and white marlin, respectively. In 2003, 131 blue and white marlin were reported landed in tournaments (108 blue marlin).

Status of the Stock and SCRS Outlook

The last stock assessment for blue marlin was in 2000 using similar methods to the previous assessment (1996), however, data were revised in response to concerns raised since the 1996 assessment. The assessment might reflect a retrospective pattern wherein improvement in estimated biomass ratios result in estimated lower productivity. The 2000 assessment was slightly more optimistic than the 1996 assessment. Atlantic blue marlin are at approximately 40 percent of B_{MSY} and overfishing has taken place for the last 10-15 years. B_{MSY} is estimated at 2,000 mt (4,409,245 lb) and current fishing mortality is approximately four times higher than F_{MSY} (Table 3.12) (SCRS, 2004). There is uncertainty in the assessment because the historical data are not well quantified. The 2000 assessment estimated that overfishing was still occurring and that productivity (MSY and a stock's capacity to replenish) was lower than previously estimated, it is expected that landings in excess of estimated replacement yield would result in further stock decline (SCRS, 2004).

No additional assessment information became available in 2004 to modify recommendations currently in force. The current assessment indicates that the stock is unlikely to recover if the landings contemplated by the 1996 ICCAT recommendation continue into the future. While there is additional uncertainty in stock status and replacement yield estimates do not reflected in bootstrap results, these uncertainties can only be addressed through substantial investment in research into habitat requirements of blue marlin and further verification of historical data. The SCRS recommended that the ICCAT take steps to reduce the catch of blue marlin as much as possible, including: reductions in fleet-wide effort, a better estimation of dead discards, establishment of time area closures, and scientific observer sampling for verification of logbook data. The SCRS noted that future evaluation of management measures relative to the recovery of the blue marlin stock are unlikely to be productive unless new quantitative information on the biology and catch statistics of blue marlin, and additional years of data are available (SCRS, 2004).

A summary of Atlantic blue marlin stock assessment data can be found in Table 3.12. Estimated catches of Atlantic blue marlin by region for the period 1956 – 2001 can be found in Figure 3.10. A composite CPUE series for blue marlin for the period 1955 – 2000 can be found in Figure 3.11. The estimated median relative fishing mortality trajectory for Atlantic blue marlin can be found in Figure 3.12.

Table 3.12 Summary of Atlantic Blue Marlin Stock Assessment data. Weights are in metric tons, whole weight.

ATLANTIC BLUE MARLIN SUMMARY[1]	
	Total Atlantic
Maximum Sustainable Yield (MSY)	~ 2,000 t (~ 1,000 ~ 2,400 t)[2]
2002 Yield	2,494 t
2003 Yield[4]	1,951 t
1999 Replacement Yield	~ 1,200 t (~ 840 - 1,600 t)[2]
Relative Biomass (B_{2000}/B_{MSY})	~ 0.4 (~ 0.25 - 0.6)[2]
Relative Fishing Mortality (F_{1999}/F_{MSY})	4.0 (~ 2.5 - 6.0)[2]
Management Measures in Effect	- Reduced pelagic longline and purse seine landings to 50% of 1996 or 1999 levels, whichever is greater [Refs. 00-13[3], 01-10[3] and 02-13].

[1] Assessment results are uncertain. Uncertainty in these estimates is not fully quantified by bootstrapping.
[2] Approximate 80% CI from bootstrap for ASPIC model.
[3] These measures did not take effect until mid-2001.
[4] Reported Task I value, which is likely to be a substantial underestimate of the total catch.

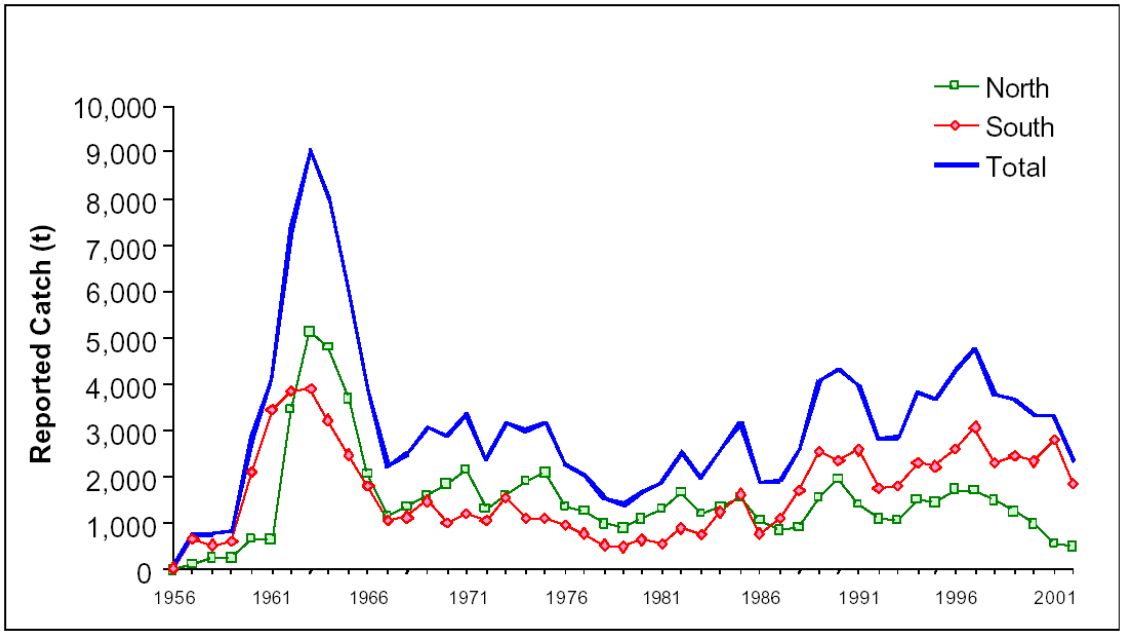


Figure 3.10 **Estimated catches (including landings and dead discards in mt) of blue marlin in the Atlantic by region. The 2003 catch reported to ICCAT is preliminary and is not included in this figure. Weights are in metric tones, whole weight.**

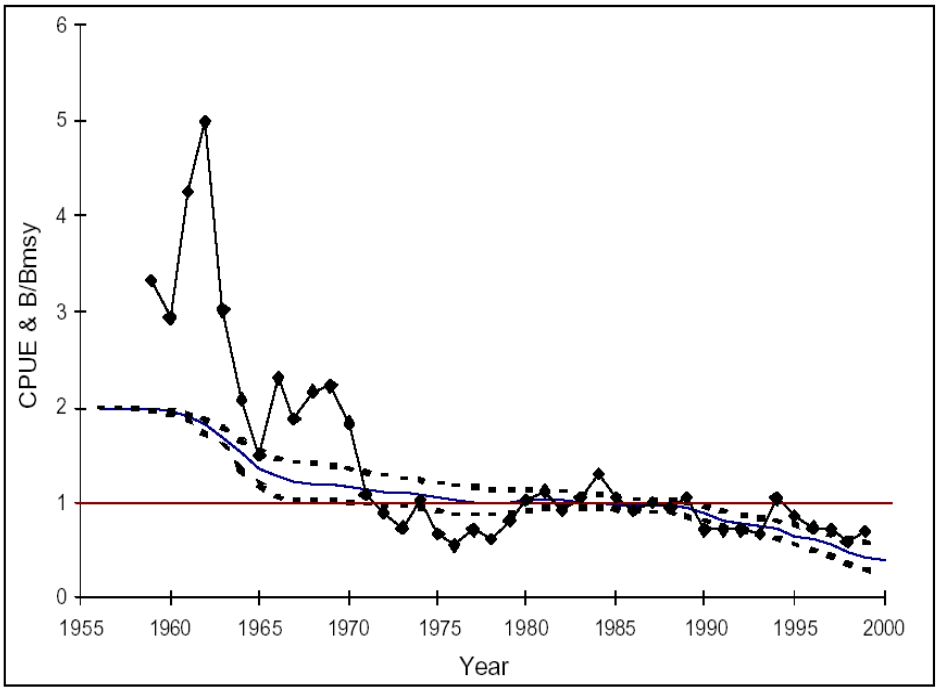


Figure 3.11 **Composite CPUE series (symbols) used in the blue marlin assessment compared to model estimated median relative biomass (solid lines) from bootstrap results (80 percent confidence bounds shown by dotted lines)**

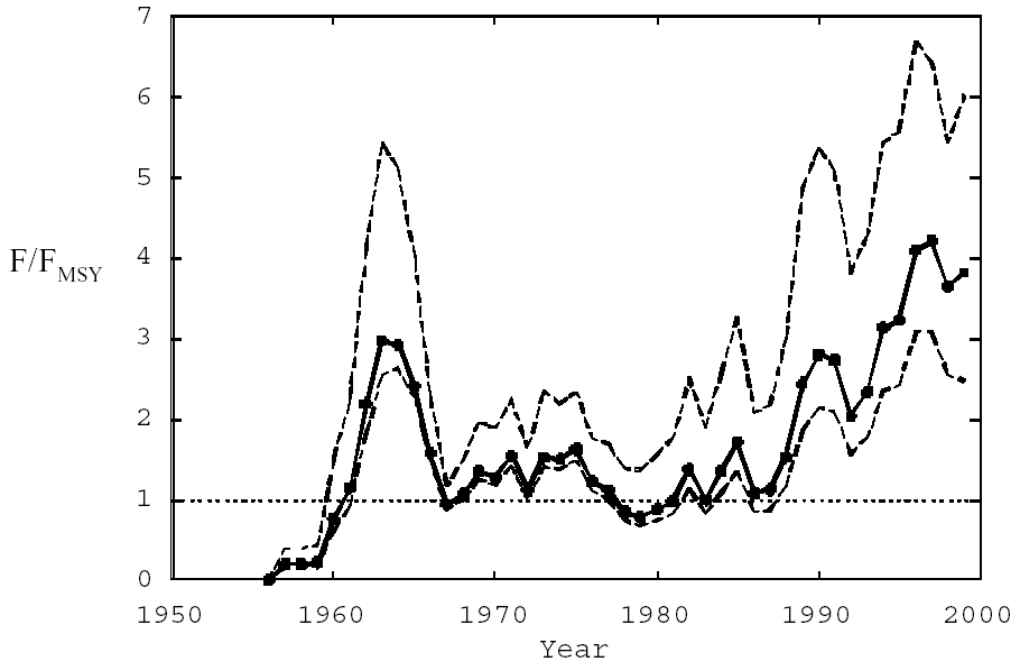


Figure 3.12 Estimated median relative fishing mortality trajectory for Atlantic blue marlin (center, dark line) with approximate 80 percent confidence range (light lines) obtained from bootstrapping.

3.2.4.2 White Marlin

Life History/Species Biology

White marlin (*Tetrapturus albidus*) are found exclusively in tropical and temperate waters of the Atlantic Ocean and adjacent seas, unlike sailfish and blue marlin, which are also found in the Pacific Ocean. White marlin are found at the higher latitudes of their range only in the warmer months. Junior *et al*., (2004) captured white marlin with pelagic longline gear off northeastern Brazil in depths ranging from 50-230 m (164-754 feet), with no obvious depth layer preference. White marlin generally prefer water temperatures above 22°C (71° F) with salinities between 35-37 ppt (NMFS, 1999). They may occur in small, same-age schools, however, are generally solitary compared to the Scombrids (tunas). Catches in some areas may include a rare species (*Tetrapturus georgei*) which is superficially similar to white marlin. The so-called "hatchet marlin" may also represent (*T. georgei)*, and has been caught occasionally in the Gulf of Mexico (NMFS, 1999).

White marlin are generally 20-30 kg (44-66 lb) at harvest. These fish grow quickly, with females attaining a larger maximum size than males, and have a life span of 18 years (SCRS 2004). Adult white marlin grow to over 280 cm (110 inches) TL and 82 kg (180 lb). White marlin exhibit sexually dimorphic growth patterns; females grow larger than males, but the dimorphic growth differences are not as extreme as noted for blue marlin. The longest time at liberty for a tagged white marlin, 4,305 days (11.8 years).

This species undergoes extensive movements, although not as extreme as those of the bluefin tuna and albacore. Trans-equatorial movements have not been documented for the species. There have been 29,751 white marlin tagged and released by the CTC program, with 540 reported recaptures (1.8 percent of all releases). The majority of releases took place in the months of July through September, in the western Atlantic off the east coast of the United States. Releases of tagged white marlin also occurred off Venezuela, in the Gulf of Mexico, and in the central west Atlantic. The mean straight line distance of recaptured white marlin is 842 km (455 nm). A substantial number of individuals moved between the mid-Atlantic coast of the United States and the northeast coast of South America. Overall, 1.1 percent of documented white marlin recaptures have made trans-Atlantic movements. The longest movement was for a white marlin tagged during July 1995 off the east coast near Cape May, NJ and recaptured off Sierra Leone, West Africa, in November, 1996. The fish traveled a distance of at least 6,517 km (3,519 nm) over 476 days (NMFS, 1999).

White marlin spawn in the spring (March through June) in the northwestern Atlantic Ocean and females are generally 20 kg (44 lb) in mass and 130 cm (51.2 inches) in length at sexual maturity. White marlin spawn in tropical and sub-tropical waters with relatively high surface temperatures and salinities (20 to 29°C (68-84°F) and over 35 ppt) and move to higher latitudes during the summer. There has not been an Atlantic-wide study of the spawning behavior of white marlin. Spawning seems to take place in more offshore areas than for sailfish, although larvae are not found as far offshore as blue marlin. Females may spawn up to four times per spawning season (de Sylva and Breder, 1997). It is believed there are at least three spawning areas in the western north Atlantic: northeast of Little Bahama Bank off the Abaco Islands, northwest of Grand Bahama Island, and southwest of Bermuda. Larvae have also been collected from November to April, but these may have been sailfish larvae (*Istiophorus platypterus*), as the two cannot readily be distinguished (NMFS, 1999). Spawning concentrations occur off the Bahamas, Cuba, and the Greater Antilles, probably beyond the U.S. EEZ, although the locations are unconfirmed. Concentrations of white marlin in the northern Gulf of Mexico and from Cape Hatteras, NC to Cape Cod, MA are probably related to feeding rather than spawning (NMFS, 1999).

White marlin are primarily piscivorous. Oceanic pomfret and squid were the most important food items in a study that sampled sailfish stomachs collected off the coast of Brazil in the southwestern Atlantic Ocean (Junior *et al*., 2004). The number of food items per stomach ranged from 1-12 individuals. The largest prey observed in white marlin stomachs were snake mackerel (*Gempylus serpens*), that were 40-73 cm (15.7-28.7 inches) in length (Junior *et al*., 2004). Squid, dolphin, hardtail jack, flying fish, bonitos, mackerels, barracuda, and puffer fish are the most important prey items in the Gulf of Mexico.

The world's largest sport fishery for white marlin occurs in the summer from Cape Hatteras, NC to Cape Cod, MA especially between Oregon Inlet, NC and Atlantic City, NJ. Successful fishing occurs up to 148 km (80 nm) offshore at submarine canyons, extending from Norfolk Canyon in the mid-Atlantic to Block Canyon off eastern Long Island. Concentrations are associated with rip currents and weed lines (fronts), and with bottom features such as steep drop-offs, submarine canyons, and shoals. The spring peak season for white marlin sport fishing occurs in the Straits of Florida, southeast Florida, the Bahamas, and off the north coasts of Puerto

Rico and the Virgin Islands. In the Gulf of Mexico summer concentrations are found off the Mississippi River Delta, at DeSoto Canyon, at the edge of the continental shelf off Port Aransas, TX, with a peak off the Delta in July, and in the vicinity of DeSoto Canyon in August. In the Gulf of Mexico, adults appear to be associated with blue waters of low productivity, being found with less frequency in more productive green waters. While this is also true of the blue marlin, there appears to be a contrast between the factors controlling blue and white marlin abundance, as higher numbers of blue marlin are generally caught when catches of white marlin are low, and vice versa. It is believed that white marlin prefer slightly cooler temperatures than blue marlin.

Effect of ICCAT Management Regulations

Recommendation 97-09 required ICCAT Contracting Parties to reduce, starting in 1998, blue marlin and white marlin landings by at least 25 percent for each species from 1996 landings, such reduction to be accomplished by the end of 1999. ICCAT Recommendations 00-13, 01-10, and 02-13 imposed or extended additional catch restrictions for white marlin. These included reductions of 33 percent from the 1996 or 1999 landing levels, whichever is greater, in the annual amount of white marlin that can be harvested by pelagic longline and purse seine vessels and retained for landing. Further, all blue marlin and white marlin brought to pelagic longline and purse seine vessels alive are required to be released in a manner that maximizes their survival (SCRS, 2004). The live release provision does not apply to marlins that are dead when brought along the side of the vessel or that are not sold or entered into commerce. While the stock status evaluations are uncertain, projections indicated that the apparent intent of the ICCAT Billfish recommendations has, in the short term, some potential for stabilizing the stock biomass near current levels.

In the United States, white marlin are managed exclusively for recreational fisheries. The sport fishery for the species is concentrated between Cape Hatteras, NC and Cape Cod, MA during the summer months (NMFS, 1999). This fishery is subject to an ICCAT imposed, 250-fish limit, annually for both blue and white marlin combined. In 2001, time area closures were established in the United States to reduce interactions between longline fisheries and white marlin. In 2003, 131 blue and white marlin were reported landed in tournaments (23 white marlin). Purse seine fisheries have incidental catches of white marlin, especially those that set on FADs. A temporary ban on FADs implemented by the EU resulted in a 300 - 400 mt (661,386 – 881,849 lb) decrease in incidental purse seine catches of all marlins (Gaertner *et al*., 2002).

Status of the Stock and SCRS Outlook

White marlin have been managed under a single stock hypothesis by ICCAT since 2000. The most recent stock assessments for white marlin (1996, 2000, and 2002) all indicated that biomass of white marlin has been below B_{MSY} for more than two decades and the stock is overfished. In 2004, the SCRS indicated that in spite of significant improvements in the relative abundance estimates made available during the last three assessments, they are still not informative enough to provide an accurate estimate of stock status (SCRS, 2004). The 2002 assessment indicated that the relative fishing mortality is 8.28 times that permissible at F_{MSY} (Table 3.13). Given that the stock is severely depressed, the SCRS concluded that ICCAT should take steps to reduce the catch of white marlin by as much as possible, first by increasing observer coverage to improve estimates of catch and dead discards of white marlin.

Furthermore, SCRS recommended that Contracting Parties conduct research into habitat requirements and post-release survival of white marlin and take steps to verify historical fishery data.

The SCRS suggested that ICCAT take steps to make sure that the intended reductions in catch are complied with, and monitored, so that proper evaluation can be carried out in the future. The SCRS recommended improving observer programs so that better estimates of catch and dead discards of white marlin are obtained. The SCRS further recommended that, in the absence of observing a change in population status resulting from the most recent management measures, the potential for increasing stock size of white marlin may require future catches to be reduced beyond the level apparently intended by its most recent recommendations. However, the SCRS also stated that more definitive advice should be available after several years of data become available. The SCRS also noted that future evaluation of management measures relative to the recovery of the white marlin stock are unlikely to be productive unless new quantitative information on the biology and catch statistics of white marlin, and additional years of data, are available (SCRS, 2004). As such, ICCAT postponed the next white marlin assessment until 2006 or later. A summary of Atlantic white marlin stock assessment data can be found Table 3.13 and Figure 3.13.

Table 3.13 Summary of Atlantic White Marlin Stock Assessment data. Weights are in metric tons, whole weight. Source: SCRS, 2004.

ATLANTIC WHITE MARLIN SUMMARY[1]				
	Likely value	*Continuity case [2] estimate (80% conf. limit)*	*Retrospective adjusted estimate [3]*	*Range of sensitivity [4] estimates*
Maximum Sustainable Yield	Below 2000 Yield	964 t (849-1070)		323-1,320 t
2002 Yield	822 t	--		--
2003 Yield[5]	571 t	--		--
2001 Replacement Yield	Below 2000 Yield	222 t (101-416)	371 t	102-602 t
Relative Biomass (B_{2001}/B_{MSY})	<1 (Over-fished)	0.12 (0.06-0.25)	0.22	0.12-1.76
Relative Fishing Mortality (F_{2000}/F_{MSY})	>1 (Over-fishing)	8.28 (4.5-15.8)	5.05	0.80-10.30
Management Measures in Effect:	- In 2001 and 2002, PS and LL fisheries limit landings to 33% of max (1996, 1999) level. [Ref. 00-13], [Ref. 01-10] and [Ref. 02-13].			

[1] Assessment results are highly uncertain.
[2] The data used are not sufficiently informative to choose a "best case". For consistency, the continuity case presented here is based on data and assumptions that closely resemble the analyses made in 2000. Confidence limits from bootstrapping are conditional on this model-data set and thus may underestimate the real uncertainty.
[3] These results are for the continuity case except that they were adjusted for retrospective biases.
[4] The sensitivity analyses made were not chosen in a systematic way; the range is presented only for qualitative guidance.
[5] Reported Task I value for 2003, which is likely an underestimate of total catch.

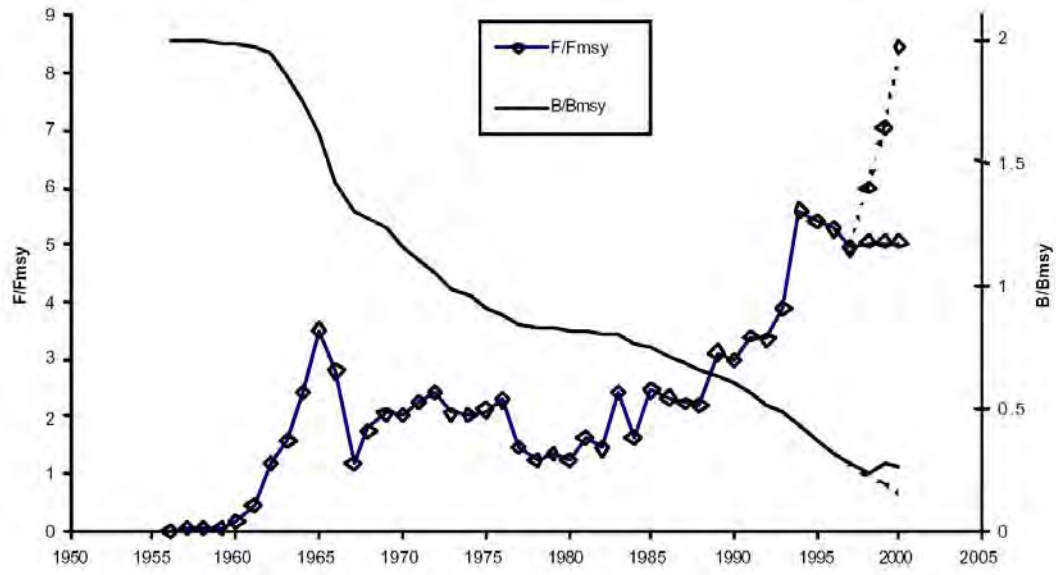


Figure 3.13 **Estimated biomass ratio B_{2000}/ B_{MSY} (solid line, no symbols) and fishing mortality ratio F2000/FMSY (solid line with symbols) from the production model fitted to the continuity case for white marlin. Ratios of last three years have been adjusted for retrospective pattern. Broken lines show unadjusted ratios. Note that scales are different for each ratio. Source: SCRS, 2004.**

3.2.4.3 Sailfish

Life History/Species Biology

Sailfish have a pan-tropical distribution and prefer water temperatures between 21 and 28°C (69-82°F). Although sailfish are the least oceanic of the Atlantic billfish and have higher concentrations in coastal waters (more than any other Istiophorid), they are also found in offshore waters. They range from 40°N to 40°S in the western Atlantic and 50°N to 32°S in the eastern Atlantic. No trans-Atlantic movements have been recorded, suggesting a lack of mixing between east and west. Although sailfish are generally considered to be rare and solitary species relative to the schooling Scombrids, sailfish are known to occur along tropical coastal waters in small groups consisting of at least a dozen individuals. Junior *et al*., (2004) captured sailfish in the southwestern Atlantic Ocean with pelagic longline gear at depths between 50 - 210 m (164 - 688 feet), with most individuals captured at 50 m. Sailfish are the most common representative of the Atlantic Istiophorids in U.S. waters (SCRS, 2004). Female sailfish grow faster, and attain a larger maximum size, than males while both sexes have a life expectancy of 15 years (NMFS, 1999).

In the winter, sailfish are found in schools around the Florida Keys and eastern Florida, in the Caribbean, and in offshore waters throughout the Gulf of Mexico. In the summer they appear to diffuse northward along the U.S. coast as far north as the coast of Maine, although there is a population off the east coast of Florida all year long. During the summer, some of these fish move north along the inside edge of the Gulf Stream. After the arrival of northerlies in the winter, they regroup off the east coast of Florida. Sailfish appear to spend most of their time

above the thermocline, which occurs at depths of 10 - 20 m (32.8 – 65.6 feet) and 200 - 250 m (656 – 820 feet), depending on location. The 28°C (82°F) isotherm appears to be the optimal temperature for this species. Sailfish are mainly oceanic but migrate into shallow coastal waters. Larvae are associated with the warm waters of the Gulf Stream (NMFS, 1999).
A total of 62,740 sailfish have been tagged and released through the efforts of the CTC program, with reported recapture of 1,090 sailfish (1.7 percent of all releases). Most releases occurred off southeast Florida, from north Florida to the Carolinas, the Gulf of Mexico, Venezuela, Mexico, the northern Bahamas and the U.S. Virgin Islands. One tagged and recaptured specimen traveled from Juno, FL to the mid-Atlantic, a distance of 2,972 km (1,745 miles). The longest movement tracked by tagging was 3,509 km (2,193 miles), with this specimen at-large for 1.4 years. During the winter sailfish are restricted to the warmer parts of their range and move farther from the tropics during the summer. The summer distribution of sailfish does not extend as far north as for marlins. Tag-and-recapture efforts have recovered specimens only as far north as Cape Hatteras, NC. Few trans-Atlantic or trans-equatorial movements have been documented using tag-recapture methods (NMFS, 1999).

Most sailfish examined that have been caught off Florida are under three years of age. Mortality is estimated to be high in this area, as most of the population consists of only two year classes. The longest period a recaptured-tagged animal was found to be at-large was 16.1 years. Unfortunately, the size at release is not available for this fish. Growth rate in older individuals is very slow (0.59 kg/yr (1.3 lb/year). Sailfish are probably the slowest growing of the Atlantic istiophorids. Sexual dimorphic growth is found in sailfish, but it is not as extreme as with blue marlin (NMFS, 1999).

Female sailfish spawn at age three and are generally 13 - 18 kg and 157 cm (28.6 - 39.6 lb and 61.8 inches), whereas males generally mature earlier at 10 kg and 140 cm (22 lb and 55.1 inches). Spawning takes place between April and October (de Sylva and Breder, 1997). Spawning has been reported to occur in shallow waters 9 – 12 m (30 - 40 ft) around Florida, from the Florida Keys to the region off Palm Beach on the east coast. Spawning is also assumed to occur, based on presence of larvae, offshore beyond the 100 m (328 feet) isobath from Cuba to the Carolinas, from April to September. However, these spawning activities have not been observed. Sailfish can spawn multiple times in one year, with spawning activity-moving northward in the western Atlantic as the summer progresses. Larvae are found in Gulf Stream waters in the western Atlantic, and in offshore waters throughout the Gulf of Mexico from March to October (NMFS, 1999). In the Pacific Ocean, sailfish spawn in waters between 27 - 30°C (Hernandez-H and Ramirez-H, 1998).

Sailfish are generally piscivorous, but also consume squid. Larvae eat copepods early in life then switch to fish at 6.0 mm (0.2 inches) in length (NMFS, 1999). The diet of adult sailfish caught around Florida consists mainly of pelagic fishes such as little tunny (*Euthynnus alletteratus*), halfbeaks (*Hemiramphus* spp.), cutlassfish (*Trichiurus lepturus*), rudderfish (*Strongylura notatus*), jacks (*Caranx spp.*), pinfish (*Lagodon rhomboides*), and squids (*Argonauta argo* and *Ommastrephes bartrami).* Sailfish are opportunistic feeders and there is evidence that they may feed on demersal species such as sea robin (*Triglidae*), cephalopods and gastropods found in deep water.

Sailfish collected in the western Gulf of Mexico contained a large proportion of shrimp in their stomachs in addition to little tunny, bullet tuna (*Auxis* sp.), squid, and Atlantic moonfish (*Vomer setapinnis*). Adult sailfish are probably not preyed upon often, but predators include killer whales (*Orcinus orca*), bottlenose dolphin (*Tursiops turncatus*), and sharks. Junior *et al*., (2004) determined that squid were actually the second most important food item in the southwestern Atlantic off the coast of Brazil. Number of food items per stomach ranged from 1-14, and 6 percent of the stomachs were empty upon collection (Junior *et al*., 2004). Participants from many nations characterize fisheries in both the western and eastern Atlantic Ocean. Sailfish are found predominantly in the upper reaches of the water column and are caught in directed sport fisheries (recreational) and as bycatch in the offshore longline fisheries for swordfish and tunas and as a directed catch in coastal fisheries. The reported catches of sailfish/spearfish (Task I) for 2003 were 1,310 and 416 mt (2,888,055 and 917,123 lb) for the west and east Atlantic, respectively. In coastal waters, artisanal fisheries use many types of shallow water gear to target sailfish (NMFS, 2003).

Effect of ICCAT Management Regulations

There are currently no specific ICCAT regulations for sailfish. Sailfish are managed as distinct eastern and western Atlantic stocks. This separation into two management units is based on life history information.

Status of the Stock and SCRS Outlook

Sailfish and Longbill spearfish landings have historically been reported together in annual ICCAT landing statistics. An assessment was conducted in 2001 for the western Atlantic sailfish stock based on sailfish/spearfish composite catches and sailfish "only" catches. The assessment tried to address shortcomings of previous assessments by improving abundance indices and separating the catch of sailfish from that of spearfish in the offshore longline fleets. The 2001 assessment looked at catches reported between 1956-2000 and all the quantitative assessment models used produced unsatisfactory fits, therefore the SCRS recommended applying population models that better accounted for these dynamics in order to provide improved assessment advice. For the western Atlantic stock, annual sailfish catches have averaged about 700 mt ww (1,543,235 lb) over the past two decades and the abundance indices have remained relatively stable. The 2000 yield was 506 mt ww (1,115,539 lb) (Table 3.14). Recent analyses did not provide any information on the MSY or other stock benchmarks for the 'sailfish only' stock. In the eastern Atlantic, abundance indices based on coastal/inshore fisheries for sailfish have decreased in recent years, while those attained from the Japanese longline fishery indicate constant estimates of abundance since the mid-1970s (SCRS, 2004).

Based on the 2001 assessment, it is unknown if the western or eastern sailfish stocks are undergoing overfishing or if the stocks are currently overfished. Therefore SCRS recommended that Contracting Parties consider methods to reduce fishing mortality rates, overall, and that western Atlantic catches should not be increased above current levels. Furthermore, the SCRS expressed concerned about the incomplete reporting of catches, particularly in recent years. Management recommendations made by the SCRS in 2004 were the same as those made in 2003. These management recommendations indicated that ICCAT should consider methods for reducing fishing mortality rates. The current western Atlantic assessment led the SCRS to

recommend that the West Atlantic sailfish "only" catches should not exceed current levels. For the East Atlantic, the SCRS recommended that sailfish "only" catches should not exceed current levels and that ICCAT should consider practical and alternative methods to reduce fishing mortality and assure data collection systems. SCRS expressed concern about the incomplete reporting of catches, particularly for the most recent years, the lack of sufficient reports by species, and evaluations of the new methods used to split the sailfish and spearfish catch and to index abundance. The SCRS recommended all countries landing sailfish/spearfish or having dead discards, report these data to the ICCAT Secretariat and that the SCRS should consider the possibility of a spearfish "only" assessment in the future (SCRS, 2004).

A summary of Atlantic sailfish stock assessment data is given in Table 3.14. The evolution of estimated sailfish/spearfish catches in the Atlantic during the period 1956–2002 for both east and west stocks in Figure 3.14. Available CPUE for western Atlantic sailfish/spearfish for the period 1967-2000 is shown in Figure 3.15. Estimated sailfish only catches from 1956-2000 is shown in Figure 3.16.

Table 3.14 **Summary of Atlantic Sailfish Stock Assessment data. Weights are in metric tons, whole weight.** Source: SCRS, 2004.

ATLANTIC SAILFISH "ONLY" SUMMARY		
	West Atlantic	**East Atlantic**
Maximum Sustainable Yield (MSY)	Not estimated	Not estimated
Recent Yield (2000)[1]	506 t[2]	969 t[2]
2000 Replacement Yield	~ 600 t	Not estimated
Management Measures in Effect	None	None

[1] Estimated yield includes that carried over from previous years.
[2] Recent yield (2000) was estimated during the 2001 sailfish assessment. To estimate the 2001, 2002 and 2003 yield, catches of sailfish and spearfish would have to be separated. A separation similar to the one conducted in the 2001 assessment has not yet been conducted.

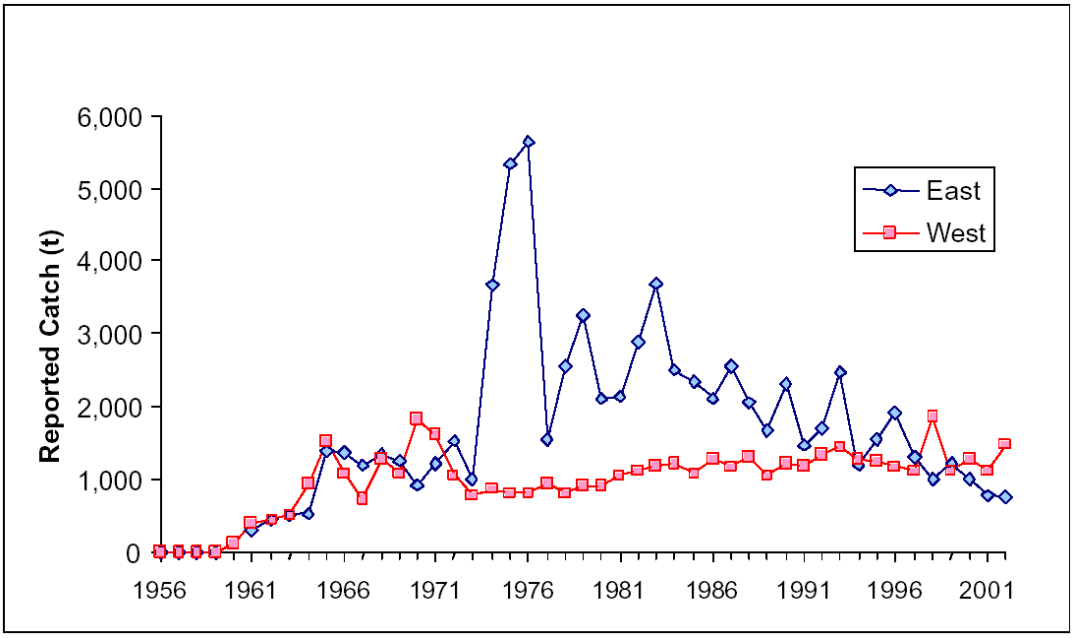


Figure 3.14 **Evolution of estimated sailfish/spearfish catches in the Atlantic (landings and dead discards, reported and carried over) in the ICCAT Task I database during 1956-2002 for the east and west stocks. The 2003 catch reported to ICCAT is preliminary and is not included in this figure. Weights are in metric tons, whole weight.**

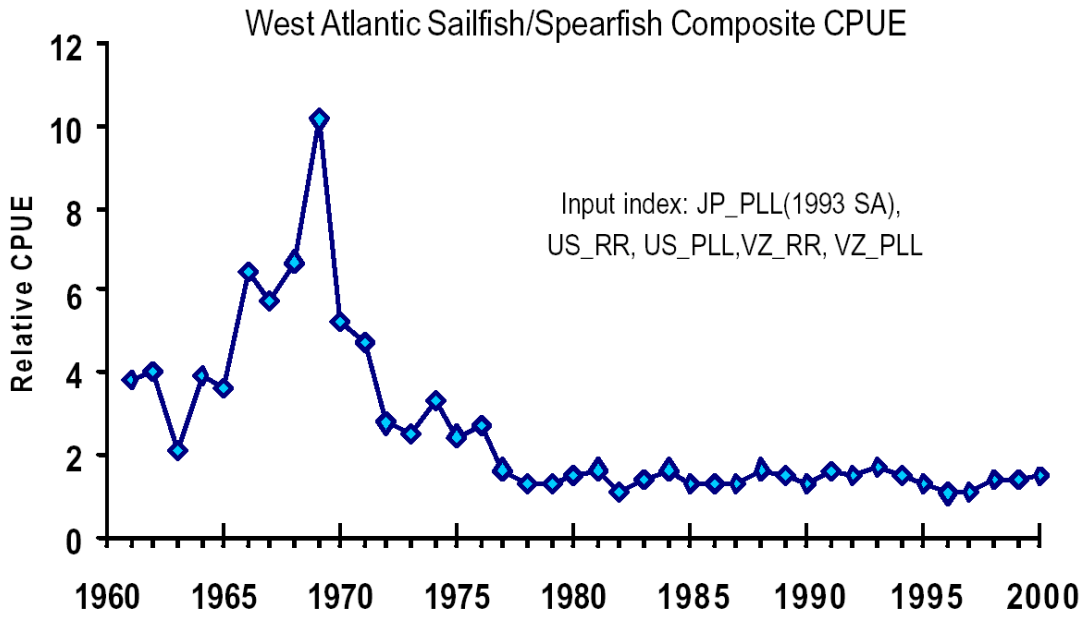


Figure 3.15 **Available standardized CPUE for western Atlantic sailfish/spearfish for the period 1967-2000, including Japanese, U.S., and Venezuelan time series data.**

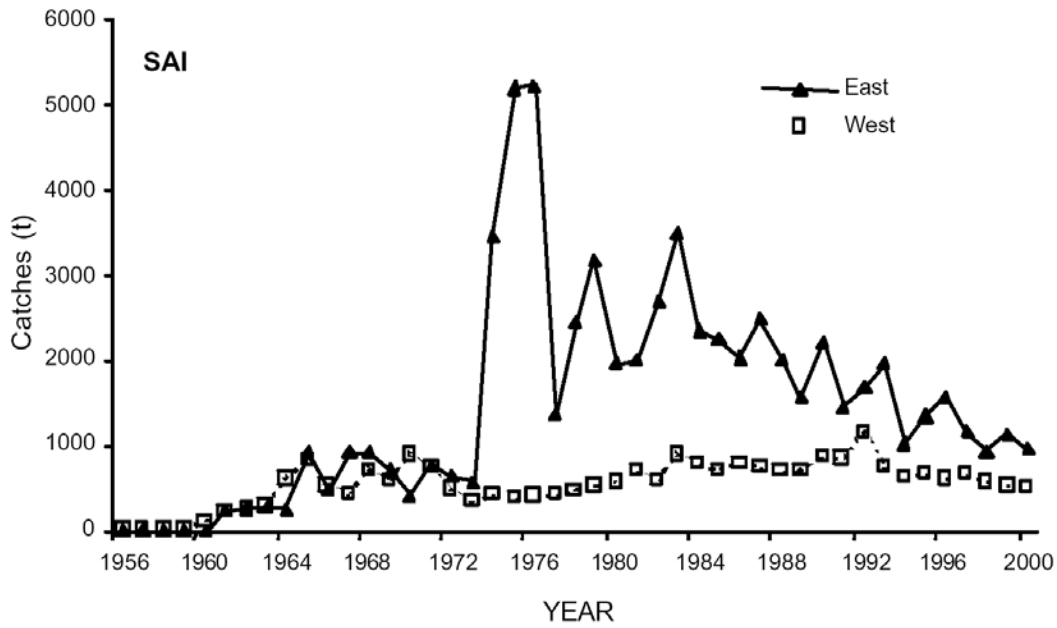


Figure 3.16 Estimated sailfish "only" catches based on the new procedure for splitting combined sailfish and longbill spearfish catches from 1956-2000. Weights are in metric tons, whole weight.

3.2.4.4 Longbill Spearfish

The longbill spearfish (*Tetrapturus pfluegeri*) are the most rare of the Atlantic istiophorids, and were identified as a distinct species in 1963. There is relatively little information available on spearfish life history. A related istiophorid, the Mediterranean spearfish (*Tetrapturus belone*), is the most common representative of this family in the Mediterranean Sea. Longbill spearfish are known to occur in epipelagic waters above the thermocline, off the east coast of Florida, the Bahamas, the Gulf of Mexico, and from Georges Bank to Puerto Rico. Junior *et al*., (2004) captured spearfish off the coast of Brazil at depths ranging from 50-190 m (164 – 623 feet). The geographic range for this species is from 40° North to 35° South.

Spearfish spawn from November to May and females are generally 17-19 kg (37.4-41.8 lb) and 160-170 cm (63-66 inches) at first maturity. These fish are unique among istiophorids in that they are winter spawners. Larval spearfish have been identified from the vicinity of the mid-Atlantic ridge from December to February, indicating that this species spawns in offshore waters (de Sylva and Breder, 1997).

Common prey items include fish and squid. Specifically, Junior *et al*., (2004) observed 37 stomachs and found that oceanic pomfret and squid comprised 63 percent of the items identified in stomachs. Most prey items were between 1 - 10 cm (0.39-3.9 inches) in length, with a mean length of 6.7 cm (2.63 inches). The maximum number of prey items found in any individual stomach was 33.

Similar to sailfish, spearfish are caught incidentally or as bycatch, in offshore longline fisheries by many nations. There are also artisanal fisheries that take place in the Caribbean Sea and in the Gulf of Guinea. Directed recreational fisheries for spearfish are limited due to the fact that the fish are generally located further offshore than other istiophorids. The reported catches of sailfish/spearfish (Task I) for 2003 are 1,310 and 416 mt ww (2,888,055 and 917,123 lb) for the west and east Atlantic, respectively. The 2001-2003 reported catch of unclassified billfish was 12 percent of the reported catch for all billfish and for some fisheries this proportion is much greater. This is a problem for species like spearfish for which there is already a paucity of data (SCRS, 2004).

Effect of ICCAT Management Regulations

There are currently no specific ICCAT regulations for longbill spearfish in effect.

State of the Stock and SCRS Outlook

Initial stock assessments conducted on spearfish aggregated these landings with sailfish. As mentioned in the Sailfish section, the 2001 assessment included a 'sailfish only' in addition to an aggregate sailfish/spearfish assessment. West Atlantic catch levels for sailfish/spearfish combined seem sustainable because over the past two decades CPUE and catch levels have remained constant, however, MSY is unknown. As a result, it is unknown whether or not spearfish are experiencing overfishing or are overfished. Spearfish catch levels are shown in Figure 3.17.. The SCRS recommends implementing measures to reduce, or keep fishing mortality levels constant and evaluations of new methods to split sailfish and spearfish indices of abundance (SCRS, 2004).

Management recommendations are similar to those listed for sailfish, including: consider methods for Contracting Parties to reduce mortality rates, encourage Contracting Parties to provide complete reporting of spearfish catches, evaluate new methods to split the sailfish and spearfish catch/index abundance, and assess sailfish independently of spearfish.

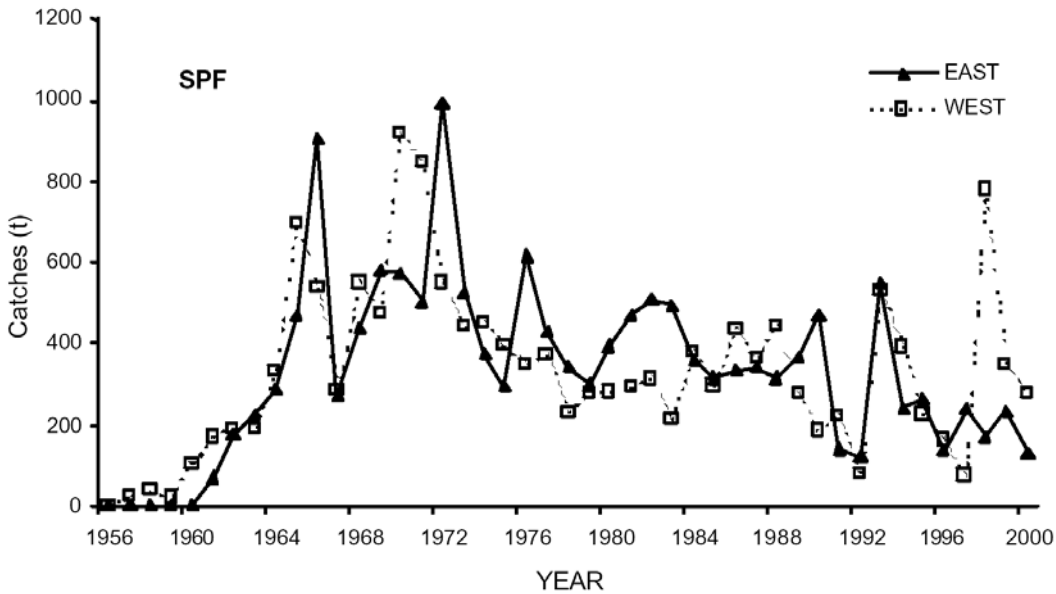


Figure 3.17 Estimated spearfish "only" catches in the Atlantic based on the new procedure for splitting combined sailfish and spearfish catches from 1956-2000. Weights are in metric tons, whole weight.

3.2.5 Atlantic Sharks

3.2.5.1 Life History/Species Biology

Sharks belong to the class Chondrichthyes (cartilaginous fishes) that also includes rays, skates, and deepwater chimaeras (ratfishes). From an evolutionary perspective, sharks are an old group of fishes characterized by skeletons lacking true bones. The earliest known sharks have been identified from fossils from the Devonian period, over 400 million years ago. These primitive sharks were small creatures, about 60 to 100 cm long, that were preyed upon by larger armored fishes that dominated the seas. Sharks have survived competition for eons, evolving into the large and aggressive predators that dominate the seas today. The life span of sharks in the wild is not known, but it is believed that many species may live 30 to 40 years or longer.

Relative to other marine fish, sharks have a very low reproductive potential. Several important commercial species, including large coastal carcharhinids, such as sandbar (*Carcharhinus plumbeus)* (Casey and Hoey, 1985; Sminkey and Musick, 1995; Heist *et al*., 1995), lemon (*Negaprion brevirostris)* (Brown and Gruber, 1988), and bull sharks (Branstetter and Stiles, 1987), do not reach maturity until 12 to 18 years of age. Various factors determine this low reproductive rate: slow growth, late sexual maturity, one- to two-year reproductive cycles, a small number of young per brood, and specific requirements for nursery areas. These biological factors leave many species of sharks vulnerable to overfishing.

There is extreme diversity among the 350 species of sharks, ranging from tiny pygmy sharks of only 20 cm in length to the giant whale sharks, over 12 meters in length. There are fast

moving, streamlined species such as mako (*Isurus spp.)* and thresher sharks (*Alopias spp*.), and sharks with flattened, ray-like bodies, such as angel sharks (*Squatina dumerili)*. The most commonly known sharks are large apex predators including the white (*Carchardodn carcharias*), mako, tiger (*Galeocerdo cuvier*), bull (*Carcharhinus leucas)*, and great hammerhead (*Sphyrna modarran*). Some shark species reproduce by laying eggs, others nourish their embryos through a placenta. Despite their diversity in size, feeding habits, behavior and reproduction, many of these adaptations has contributed greatly to the evolutionary success of sharks.

The most significant reproductive adaptations of sharks are internal fertilization and the production of fully developed young or "pups." These pups are large at birth, effectively reducing the number of potential predators and enhancing their chances of survival. During mating, the male shark inseminates the female with copulatory organs, known as claspers that develop on the pelvic fins. In most species, the embryos spend their entire developmental period protected within their mother's body, although some species lay eggs. The number of young produced by most shark species in each litter is small, usually ranging from two to 25, although large females of some species can produce litters of 100 or more pups. The production of fully developed pups requires great amounts of nutrients to nourish the developing embryo. Traditionally, these adaptations have been grouped into three modes of reproduction: oviparity (eggs hatch outside body), ovoviviparity (eggs hatch inside body), and viviparity (live birth).

Adults usually congregate in specific areas to mate and females travel to specific nursery areas to pup. These nurseries are discrete geographic areas, usually in waters shallower than those inhabited by the adults. Frequently, the nursery areas are in highly productive coastal or estuarine waters where abundant small fishes and crustaceans provide food for the growing pups. These areas also may have fewer large predators, thus enhancing the chances of survival of the young sharks. In temperate zones, the young leave the nursery with the onset of winter; in tropical areas, young sharks may stay in the nursery area for a few years.

Shark habitat can be described in four broad categories: (1) coastal, (2) pelagic, (3) coastal - pelagic, and (4) deep-dwelling. Coastal species inhabit estuaries, the nearshore and waters of the continental shelves, *e.g*., blacktip (*Carcharhinus limbatus*), finetooth, bull, lemon, and sharpnose sharks (*Rhizoprinondon terraenaovae*). Pelagic species, on the other hand, range widely in the upper zones of the oceans, often traveling over entire ocean basins. Examples include shortfin mako (*Isurus oxyrinchus*), blue (*Prionace glauca*), and oceanic whitetip (*Carcharhinus longimanus*) sharks. Coastal-pelagic species are intermediate in that they occur both inshore and beyond the continental shelves, but have not demonstrated mid-ocean or transoceanic movements. Sandbar, scalloped hammerhead (*Sphyrna lewini*), and dusky sharks (*Carcharhinus obscurus*) are examples of coastal-pelagic species. Deep-dwelling species, *e.g*., most cat sharks (*Apristurus spp*.) and gulper sharks (*Centrophorus spp*.), inhabit the dark, cold waters of the continental slopes and deeper waters of the ocean basins.

Seventy-three species of sharks are known to inhabit the waters along the U.S. Atlantic coast, including the Gulf of Mexico and the waters around Puerto Rico and the U.S. Virgin Islands. HMS manages seventy-two species; spiny dogfish also occur along the U.S. coast, however management for this species is under the authority of the Atlantic States Marine Fisheries Commission as well as the New England and Mid-Atlantic Fishery Management

Councils. Based on a combination of ecology and fishery dynamics the sharks in the management unit have been divided into four species groups for management: (1) large coastal species, (2) small coastal species, (3) pelagic species, and (4) prohibited species (Table 3.15).

Table 3.15 Common names of shark species included within the four species management units under the purview of the HMS management division.

Management Unit	Shark Species Included
Large Coastal Sharks (11)	Sandbar, silky, tiger, blacktip, bull, spinner, lemon, nurse, smooth hammerhead, scalloped hammerhead, and great hammerhead sharks
Small Coastal Sharks (4)	Atlantic sharpnose, blacknose, finetooth, and bonnethead sharks
Pelagic Sharks (5)	Shortfin mako, thresher, oceanic whitetip, porbeagle, and blue sharks
Prohibited Species (19)	Whale, basking, sandtiger, bigeye sandtiger, white, dusky, night, bignose, Galapagos, Caribbean reef, narrowtooth, longfin mako, bigeye thresher, sevengill, sixgill, bigeye sixgill, Caribbean sharpnose, smalltail, and Atlantic angel sharks

3.2.5.2 Status of the Stocks

NMFS is responsible for conducting stock assessments for the Large and Small Coastal Shark complexes (LCS and SCS) (Cortes, 2002; Cortes *et al*., 2002). ICCAT and the Committee on the Status of Endangered Wildlife in Canada (COSEWIC) have recently conducted assessments of three pelagic shark species. Stock assessments were conducted for the Large and Small Coastal Shark complexes (LCS and SCS) in 2002. Species-specific assessments for blacktip and sandbar sharks within the LCS complex and finetooth sharks, Atlantic sharpnose sharks, blacknose sharks (*Carcharhinus acronotus*), and bonnethead sharks (*Sphyrna tiburo*) within the SCS complex, were also conducted in 2002. The conclusions of these assessments are summarized in Table 3.16 and Table 3.17 and are fully described in Amendment 1 to the 1999 Atlantic Tunas, Swordfish, and Sharks FMP. Summaries of recent stock assessments and reports on several species of pelagic sharks (blue sharks, shortfin mako sharks, and porbeagle sharks (*Lamna nasus*) by COSEWIC and ICCAT are also included in this section.

3.2.5.3 Finetooth Sharks

Finetooth sharks inhabit shallow coastal waters to depths of 10 m (32.8 feet) near river mouths in the Gulf of Mexico and South Atlantic Ocean between Texas and North Carolina. These fish often form large schools and migrate to warmer waters when water temperatures drop below 20°C (68°F). Finetooth sharks are relatively productive compared to other sharks as fish are sexually mature at 3.9 (TL = 118 cm (46 inches)) and 4.3 (TL = 123 cm (48 inches)) years for males and females, respectively (Carlson *et al*., 2003). Reproduction in finetooth sharks is viviparous with yolk sac placenta and embryos nourished through a placental connection. Females move into the nursery areas in late May and gestation is approximately 12 months. Each litter can have 1-6 pups with individuals measuring 51 - 64 cm (20 - 25 inches) in length.

The finetooth shark feeds primarily on mullet, Spanish mackerel, spot, Atlantic menhaden, cephalopods, and crustacean (Bester and Burgess, 2004).

In 2002, NMFS conducted a stock assessment for all SCS, including finetooth sharks. Five catch rate series were used, including fishery-independent and -dependent data. The fishery-independent data sources included the NMFS Pascagoula and Panama City Laboratory longline surveys (NMFS SE LL and NMFS LL PC), and the NMFS Panama City Laboratory Gillnet Survey (NMFS GN). Fishery–dependent catch series data were included from the combined recreational series and the Directed Shark Gillnet Fishery Observer Program (DSGFOP). This catch rate series data were combined with life history information for finetooth sharks and evaluated with several stock assessment models. There were four models utilized for the assessment and numerous scenarios within each model, producing a range of point estimates for fishing mortality, relative fishing mortality, biomass, relative stock biomass, maximum fishing mortality threshold, minimum stock size threshold, and other parameters.

Of the catch series data used in the analysis, three of the five showed a positive trend (*i.e.*, had positive slopes) in catch over time, suggesting an increase in finetooth shark abundance. The catch series data showing positive trends were DSGFOP (0.03), NMFS SE LL (0.34), and NMFS LL PC (0.04); however only the slope for the DSGFOP catch series data was statistically significant different from zero ($P = 0.03$). However, it should be noted that data were missing from some years in the NMFS SE LL and the DSGFOP catch series data; therefore, one cannot necessarily assume that finetooth sharks are increasing in abundance. The other two datasets, NMFS LL PC and NMFS GN PC, had negative trends in catch over time as indicated by their negative slopes (-0.24 and -0.11, respectively) but neither trend was statistically significant from zero. Overall, the slopes for the small coastal shark (SCS) complex as a whole and other individual species were relatively flat, indicating that the relative abundance of the stocks remained fairly stable during the exploitation phase (Cortés, 2002).

Four different stock assessment models were used to evaluate the status of SCS using Bayesian statistical techniques. Results of both surplus production models and the Lagged Recruitment Survival and Growth State Space model (LRSG) (using several different scenarios) indicate that the current level of removals is sustainable for the SCS aggregate and the individual species within the complex. Relative stock biomass and fishing mortality trajectories obtained with the Bayesian state-space Schaefer surplus production model (SPM) for the small coastal aggregate and the Atlantic sharpnose sharks followed similar trends, since the catches were dominated by these species. The model predicted that the stock biomass for the small coastal shark complex in any given year from 1972 - 2000 exceeded the biomass producing MSY. Relative fishing mortality (F/F_{MSY}) was generally below one for the SCS complex, but for finetooth sharks, the final five values of F in the series (1996 - 2002) estimated by the model were above the level of F corresponding to MSY.

Results for finetooth sharks were directly influenced by the catch series used, which did not include any bycatch estimates, and this, in turn, influenced certain parameters of the Bayesian models (specifically, the priors chosen for K, which describes uncertainty in assessment models) (Cortés, 2002). The lack of bycatch data in the catch series data lead to low values of MSY predicted for finetooth sharks in the SCS stock assessment (especially those

obtained through the SPM models). This lack of bycatch data and shorter catch and catch per unit effort (CPUE) series, coupled with no catches reported in some years, led to some uncertainty in the stock assessment for finetooth sharks. In the case of finetooth sharks, model estimates of recent F levels are above F_{MSY}, indicating that recent levels of effort directed at this species, if continued, could result in an overfished status in the relatively near future. The various stock assessments models used and sensitivity analyses run support these general conclusions (Cortés, 2002). Future work should continue to monitor the status of this individual species (Cortés, 2002).

Currently, there are a number of issues that make the management of finetooth problematic. First, in order to reduce fishing mortality on finetooth sharks, NMFS needs to identify a target fishing mortality. However, the large ranges for F_{2000} (0.13 - 1.50) and F_{MSY} (0.03 - 0.44) make it difficult to discern to what extent fishing mortality (*i.e.*, F_{2000}) needs to be reduced (*i.e.*, it is difficult to identify the fishing mortality target). The large ranges in the stock assessment output for finetooth sharks are due to the fact that for finetooth sharks there were shorter catch and CPUE series, lack of bycatch estimates, and no catches reported in some years (Cortes, 2002). Since bycatch mortality was not included in the 2002 stock assessment for finetooth sharks, NMFS does not currently have an accurate estimate of bycatch fishing mortality. Furthermore, the majority of fishing mortality may be occurring in fisheries that may not be targeting finetooth sharks and/or are not reporting their landings. For instance, finetooth sharks are generally a coastal species that occur in shallow, inshore waters under states' jurisdiction (Bester and Burgess, 2004). NMFS is currently investigating recreational and commercial landings in state waters.

Management efforts are further complicated by the fact that the DSGFOP catch series data included landings data from only five vessels with directed shark permits, targeting sharks with gillnet gear. These vessels account for less than 10 percent of the landings depending on the year. These landings equate to approximately one percent of finetooth landings reported to the General Canvass during the same time period. While observer coverage is extensive (100 percent from November 15 – April 1), it does not include all finetooth shark landings in this fishery outside the right whale calving season (April 2 – November 14) when observer coverage is reduced to approximately 30 percent. The majority of the commercial landings reported via the general canvass (dealer) logbooks are being caught by other gillnet fisheries in the South Atlantic managed by states, fishery management councils, or fisheries that are not currently managed. These vessels are not currently included in the DSGFOP because they are not "targeting" sharks, however, since they possess shark permits they are able to keep the finetooth sharks they harvest. Finetooth sharks are susceptible to any type of gillnet gear, even those with a slightly different mesh size than the driftnets or strikenets employed by vessels in the observer program.

Landings of finetooth sharks in other fisheries are extensive; however, catch series data from these fisheries are currently unavailable. The inclusion of such data in future stock assessments will provide better information on both fishing effort and estimates of MSY. Thus, it may be prudent to continue to investigate other sources of fishing mortality before initiating a particular set of management actions. In order to capture additional catch series data on fisheries contributing to finetooth fishing mortality, NMFS is expanding observer programs to include

DSGFOP observers on all boats that have directed or incidental shark permits to determine if these gillnet vessels in the South Atlantic are contributing to the majority of fishing mortality. A continuation of a pilot program initiated in the spring of 2005 that placed observers on board additional gillnet vessels targeting other fish species will improve data collection efforts. Furthermore, contacting regional Fishery Management Councils and Interstate Marine Fisheries Commissions to determine sources of mortality occurring under other fishery management plans, and having finetooth sharks included as a select species for sub-sampling of bycatch in the Gulf of Mexico Shrimp Trawl Observer Program will provide additional landings data necessary for appropriate management and conservation actions in the future.

Table 3.16 Summary Table of Biomass and Fishing Mortality for Small Coastal Sharks (SCS) Source: Cortes, 2002.

Species/Complex	MSY	2001 Relative Biomass Level (B_{2001}/B_{MSY})	Minimum Stock Size Threshold MSST = (0.5)B_{MSY} if M>=0.5 MSST = (1-M)Bmsy if M<0.5	Fishing Mortality Rate (F_{2000})	Maximum Fishing Mortality Threshold (F_{MSY})	Outlook
Small Coastal Sharks (SCS)	7.0-2.2 mill lb dw	1.38-2.39	16.2-50.2	0.03-0.24	0.04-0.28	Not overfished; No overfishing occuring
Finetooth Sharks	0.26-0.05 mill lb dw	1.39-2.37	0.4-1.4	0.13-1.50	0.03-0.44	Not overfished; Overfishing is occuring
Bonnethead Sharks	1.8-0.5 mill lb dw	1.46-2.78	2.3-7.3	0.03-0.18	0.05-0.53	Not overfished; No overfishing occuring
Atlantic Sharpnose Sharks	7.8-1.9 mill lb dw	1.69-3.16	11.5-33.4	0.02-0.06	0.04-0.42	Not overfished; No overfishing occuring
Blacknose Sharks	0.8-0.2 mill lb dw	1.92-3.15	1.6-4.5	0.02-0.19	0.03-0.32	Not overfished; No overfishing occuring

Table 3.17 Summary Table of Biomass and Fishing Mortality for Large Coastal Sharks (LCS). Source: Cortes *et al*., 2002

Species/Complex	2001 Biomass (N_{2001})	2001 Relative Biomass (N_{2001}/N_{MSY})	Fishing Mortality Rate (F_{2001})	Maximum Fishing Mortality Threshold (F_{MSY})	Outlook
Large Coastal Complex	2,940-10,156	0.46-1.18	0.07-0.21	0.05-0.10	Overfished; Overfishing is occurring
Sandbar Sharks	1,027-4.86 E-8	3.25E4-2.22	0.0001-0.70	0.05-0.46	Not overfished; Overfishing is occurring
Blacktip Sharks	5,587-3.16 E7	0.79-1.66	0.01-0.21	0.06-0.18	Not overfished; No overfishing occurring

ICCAT Stock Assessment on Blue and Shortfin Mako Sharks

At the 2004 ICCAT annual meeting in New Orleans the commission adopted a recommendation concerning the conservation of sharks caught in association with fisheries managed by ICCAT. This is the first binding measure passed by ICCAT dealing specifically with sharks. This recommendation includes, among other measures: reporting of shark catch data by Contracting Parties, a ban on shark finning, a request for Contracting Parties to live-release sharks that are caught incidentally, a review of management alternatives from the 2004 assessment on blue and shortfin mako sharks, and a commitment to conduct another stock assessment of selected pelagic shark species no later than 2007.

At the 2004 Inter-Sessional Meeting of the ICCAT Subcommittee on bycatch, stock assessments for Atlantic blue shark (*Prionace glauca*) and shortfin mako (*Isurus oxyrinchus*) were conducted. This work included a review of their biology, a description of the fisheries, analyses of the state of the stocks and outlook, analyses of the effects of current regulations, and recommendations for statistics and research. The assessment indicated that the current biomass of North and South Atlantic blue shark seems to be above MSY ($B>B_{MSY}$), however, these results are conditional and based on assumptions that were made by the committee. These assumptions indicate that blue sharks are not currently overfished, again, this conclusion is conditional and based on limited landings data. The committee estimates that between 82,000 and 114,000 mt ww (180,779,054 - 251,326,978 lb) of blue shark are harvested from the Atlantic Ocean each year.

The North Atlantic shortfin mako population has experienced some level of stock depletion as suggested by the historical CPUE trend and model outputs. The current stock may be below MSY ($B<B_{MSY}$), suggesting that the species may be overfished. Overfishing may also be occurring as between 13,000 and 18,000 mt ww (28,660,094 – 39,683,207 lb) of shortfin mako are harvested in the Atlantic Ocean annually. South Atlantic stocks of shortfin mako shark are likely fully exploited as well, but depletion rates are less severe than in the North Atlantic.

The results of both of these assessments should be considered preliminary in nature due to limitations on quality and quantity of catch data available (SCRS, 2004). The subcommittee stated that catch data currently being reported to ICCAT does not represent the total catch actually landed, and are very limited with regard to size, age, and sex of shark harvested or caught incidentally. In order to attain a more accurate estimate of total landings, and improve future stock assessments, the committee made several recommendations, including: increase the infrastructure investment for monitoring the overall catch composition of sharks, standardize catch per unit effort (CPUE) from major fishing fleets, expand use of trade statitistics (fins) to extend historical time series, and include scientists from all Contracting Parties with significant blue and shortfin mako catches in future assessments (SCRS, 2004).

COSEWIC Stock Assessment on Porbeagle

The Committee on the Status of Endangered Wildlife in Canada (COSEWIC) conducted a species report and assessment for porbeagle in 2004. They suggest that significant declines in porbeagle abundance have occurred as a result of overexploitation in fisheries. In 2001, porbeagle biomass was estimated at 4,409 mt ww (9,720,181 lb), a decline of 89 percent from

the pre-fishing biomass in 1961 (COSEWIC, 2004). The model employed predicts that populations declined precipitously after the fishery was developed in 1961, recovered slightly in the 1980s, and then declined again to the current level. Porbeagle quotas have been reduced significantly for Canadian fisheries. NMFS is interested in working with the Canadian government to address concerns raised by the COSEWIC report. Currently, NMFS has a species-specific quota of 92 mt dw (202,823 lb) for porbeagle. These fish are generally harvested incidentally in the pelagic longline fisheries. Between 2000 and 2003, landings of porbeagle were approximately 3.4 mt dw for the four fishing years combined.

3.2.5.4 Ongoing Research

Northeast Fisheries Science Center

Fishery Independent Survey for Coastal Sharks

The biannual fishery independent survey of Atlantic large and small coastal sharks in US waters from Florida to Delaware was conducted from April 19 to June 1, 2004. The goals of this survey are to: 1) monitor the species composition, distribution, and abundance of sharks in the coastal Atlantic; 2) tag sharks for migration and age validation studies; 3) collect biological samples for age and growth, feeding ecology, and reproductive studies; and 4) collect morphometric data for other studies. Results from this 2004 survey included 557 sharks representing eight species caught on 69 longline sets. The time series of abundance indices from this survey are critical to the evaluation of coastal Atlantic shark species.

Age and Growth of Coastal and Pelagic Sharks

A comprehensive aging and validation study for the shortfin mako (*Isurus oxyrinchus)*, continued in conjunction with scientists at Moss Landing Marine Laboratories, California using bomb carbon techniques. Additional validation studies have begun on the sandbar shark, (*Carcharhinus plumbeus)*, dusky shark, (*Carcharhinus obscurus)*, tiger shark, (*Galeocerdo cuvieri)*, and white shark, (*Carcharodon carcharias)*. Age and growth studies on the tiger shark (with scientists at the University of New Hampshire), thresher shark, (*Alopias vulpinus)* (with scientists at the University of Rhode Island), night shark, (*Carcharhinus signatus)* (with NMFS scientists at the SEFSC Panama City Laboratory), and the bull shark, (*Carcharhinus leucas)* (with scientists with the Florida Division of Natural Resources) are underway. Collection, processing, photographing, and reading of samples are in various stages for these species including intercalibration of techniques, criteria, and band readings. This intercalibration process involves sharing samples and comparing counts between researchers including a researcher from the Natal Sharks Board, South Africa for joint work on shortfin mako, blue, and basking shark band periodicity. Collections of vertebra took place at tournaments and on the biannual research cruise with 285 sharks injected with OTC for validation. Night and dusky sharks were prepared with gross sectioning to determine the best method for reading and all processing was initiated using histology. Readings were completed on the thresher and tiger sharks towards intercalibration to generate bias graphs. Vertebrae, length-frequency data, and tag/recapture data collected from 1962 to present are being analyzed on each of these species to obtain growth parameters.

Biology of the Thresher Shark

Life history studies of the thresher shark continued. Data collection was augmented to include reproductive and food habits, in addition to age and growth information.

Biology of the Porbeagle Shark

A cooperative U.S./Canada research program continued on the life history of the porbeagle shark, (*Lamna nasus)* with preliminary analysis of porbeagle tagging and recapture data using information from U.S., Canadian, and Norwegian sources.

Collection of Recreational Shark Fishing Data and Samples

Biological samples for age and growth, feeding ecology, and reproductive studies and catch data for pelagic sharks were collected at recreational fishing tournaments in the Northeast. Analysis of these tournament landings data was initiated by creating a database of historic information (1961 - 2004) and producing preliminary summaries of one long term tournament. The collection and analysis of these data are critical for input into species and age specific population and demographic models for shark management

Cooperative Shark Tagging Program (CSTP)

The Cooperative Shark Tagging Program involving over 6,500 volunteer recreational and commercial fishermen, scientists, and fisheries observers conducted since 1962, continued to tag large coastal and pelagic sharks and provide information to define essential fish habitat for shark species in U.S. Atlantic and Gulf of Mexico waters. Since its inception, the CSTP has tagged over 128,000 sharks representing 40 species.

Atlantic Blue Shark Life History and Assessment Studies

A collaborative program to examine the biology and population dynamics of the blue shark, *Prionace glauca*, in the North Atlantic is ongoing. Research on the food and feeding ecology of the blue shark is being conducted cooperatively with University of Rhode Island staff with additional samples collected and a manuscript under revision. A detailed reexamination of the reproductive parameters of the blue shark continued with collection of additional biological samples to determine if any changes have occurred since the 1970s. A manuscript on blue shark stock structure based on tagging data was completed detailing size composition and movements between Atlantic regions. Additionally, a research focus on the population dynamics in the North Atlantic with the objectives of constructing a time series of blue shark catch rates (CPUE) from research surveys, estimation of blue shark migration and survival rates, and the development of an integrated tagging and population dynamics model for the North Atlantic for use in stock assessment continued in collaboration between NEFSC scientists and scientists at the School of Aquatic and Fishery Sciences, University of Washington. Progress to date includes the preliminary recovery of historical research survey catch data, size composition, and biological sampling data on pelagic sharks and preliminary analysis of survival and movement rates for blue sharks based on tag and release data from the NMFS CSTP. Preparation of standardized catch rate and size composition data compatible with pelagic longline observer data continued with a resulting ICCAT submission. As part of this comprehensive program,

cooperative research continued with the Irish Marine Institute and Central Fisheries Board on mark-recapture databases including coordination of formats and programs with the NMFS CSTP for joint data analyses.

Atlantic Shortfin Mako Life History and Assessment Studies

A collaborative program with students and scientists at the University of Rhode Island to examine the biology and population dynamics of the shortfin mako in the North Atlantic was continued. Ongoing research included an update on age and growth and reproductive parameters and an examination of the predator-prey relationships between the shortfin mako and its primary prey, bluefish (*Pomatomus saltatrix).* A manuscript was completed comparing contemporary and historic levels of bluefish predation. Future research includes the estimation of shortfin mako migration rates and patterns and survival rates using CSTP mark/recapture data and satellite tags with movements correlated with Advanced Very High Resolution Radiometer (AVHRR) sea surface temperature data. Toward these goals, two shortfin mako sharks were tagged with pop-up archival transmitting tags.

Blacktip Shark Migrations

Analysis of movements of the blacktip shark (*Carcharhinus limbatus)* in the western North Atlantic and Gulf of Mexico based on release and recapture data is ongoing with the examination of general migration patterns and exchange between and within regions of U.S. and Mexican waters. Release and recapture data were analyzed for evidence of Atlantic and Gulf primary and secondary blacktip nursery grounds.

Cooperative Atlantic States Shark Pupping and Nursery Survey (COASTSPAN)

NEFSC Apex Predators Program staff manage and coordinate this project that uses researchers in major coastal Atlantic states from Florida to Delaware to conduct a cooperative, comprehensive, and standardized investigation of valuable shark nursery areas. This research identifies which shark species utilize coastal zones as pupping and nursery grounds, gauges the relative importance of these areas, and determines migration and distribution patterns of neonate and juvenile sharks. This program is described in further detail in Section 3.3 of this document.

Juvenile Shark Survey for Monitoring and Assessing Delaware Bay Sandbar Sharks

NEFSC staff conduct this part of the COASTSPAN monitor and assessment project for the juvenile sandbar shark population in the Delaware Bay nursery grounds using monthly longline surveys from June to September each year. A random stratified sampling plan based on depth and geographic location is ongoing to assess and monitor the juvenile sandbar shark population during the nursery season. In addition, the tagging and recapture data from this project are being used to examine the temporal and spatial relative abundance and distribution of sandbar sharks in Delaware Bay.

Habitat Utilization, Food Habits, and Essential Fish Habitat of Delaware Bay Sandbar and Smooth Dogfish Sharks

The food habits portion of the study characterizes the diet, feeding periodicity, and foraging habits of the sandbar shark as well as examine the overlap in diet and distribution with the smooth dogfish shark (*Mustelus canis)*. Stomachs from over 800 sandbar sharks and over 200 smooth dogfish sharks have been sampled for contents through a non-lethal lavage method. Acquired data will be coupled with environmental data, providing information on preferred habitat. This information is an important contribution towards understanding essential fish habitat and provides information necessary for nursery ground management and rebuilding of depleted shark populations.

Ecosystems Modeling

Ecosystem modeling, focusing on the role of sharks as top predators, will be conducted using ECOPATH - ECOSIM models, using the sandbar shark as a model species and examining the ecological interactions between sandbar and smooth dogfish sharks in Delaware Bay.

Overview of Gulf and Atlantic Shark Nurseries

Due to the requirement for a better understanding of shark nursery habitat in U.S. coastal waters, NEFSC staff are editors for an American Fisheries Society symposium proceedings volume on U.S. Atlantic and Gulf of Mexico coastal shark nursery ground and habitat studies.

Post-Release Recovery and Survivorship Studies in Sharks -- Physiological Effects of Capture Stress

This ongoing research is directed towards the sandbar shark (*Carcharhinus plumbeus)*, and is being conducted cooperatively with Massachusetts Division of Marine Fisheries biologists. The study utilizes blood and muscle sampling methods in addition to acoustic tracking to obtain physiological profiles of individual sharks to characterize stamina and to determine ultimate post release survival. These analyses are requisite in view of the extensive current and proposed catch-and-release management strategies for coastal and pelagic shark species.

Southeast Fisheries Science Center

Stock Assessments of Pelagic, Large Coastal, and Prohibited Sharks

The ICCAT Subcommittee on Bycatches conducted a stock assessment of blue sharks and shortfin makos in Tokyo, Japan, in June 2004. All information available on biology, fisheries, stock identity, catch, CPUE, and size of these species was reviewed and an evaluation of the status of stocks conducted using surplus production, age-structured, and catch-free stock assessment models. U.S. scientists contributed eight working documents for this meeting on various aspects of shark biology and methods to assess stock status; SEFSC scientists participated in the assessment process and authored or co-authored six of those documents. A stock assessment of dusky shark, a prohibited species under the shark FMP and candidate for listing under the ESA, is under way with expected completion in summer of 2005. Biological

and fishery information available for this species is being synthesized and stock status will be evaluated using multiple stock assessment methodologies. The next assessment of large coastal sharks is planned for FY06, but data collection, synthesis, analysis, and preliminary stock evaluations will begin in late FY05.

Update on Catches of Atlantic Sharks:

An update on catches of large and small coastal and pelagic sharks in U.S. Atlantic, Gulf of Mexico, and Caribbean waters was generated in FY04 for inclusion in the 2004 SAFE Annual Report and future shark stock assessments. Time series of commercial and recreational landings and discard estimates from several sources were compiled for the large coastal shark complex and sandbar and blacktip sharks. Additionally, recent species-specific commercial and recreational landings were provided for sharks in the large coastal, small coastal, and pelagic groups. Species-specific information on the geographical distribution of commercial landings by gear type and geographical distribution of the recreational catches was also provided. Trends in length-frequency distributions and average weights and lengths of selected species reported from three separate recreational surveys and in the directed shark bottom-longline observer program were also included. Another update on catches of Atlantic sharks will be generated in FY05.

Ecosystem Modeling

A dynamic mass-balance ecosystem model was used to investigate how relative changes in fishing mortality on sharks can affect the structure and function of Apalachicola Bay, Florida, a coastal marine ecosystem. Simulations were run for 25 years wherein fishing mortality rates from recreational and trawl fisheries were doubled for 10 years and then decreased to initial levels. Effect of time/area closures on ecosystem components were also tested by eliminating recreational fishing mortality on juvenile blacktip sharks. Simulations indicated biomass of sharks declined up to 57 percent when recreational fishing mortality was doubled. Simulating a time/area closure for juvenile blacktip sharks caused increases in their biomass but decreases in juvenile coastal shark biomass, a competing multispecies assemblage that is the apparent competitor. In general, reduction of targeted sharks did not cause strong top-down cascades. Another update on catches of Atlantic sharks was generated in FY05

Elasmobranch Feeding Ecology and Shark Diet Database

The 1999 Fishery Management Plan for Atlantic Tunas, Swordfish, and Sharks gives little consideration to ecosystem function because there is little quantitative species-specific data on diet, competition, predator-prey interactions, and habitat requirements of sharks. Given this, several studies are currently underway describing the diet and foraging ecology, habitat use, and predator-prey interactions of elasmobranchs in various communities. In 2004, the diet of Atlantic sharpnose sharks (*Rhizoprionodon terraenovae*) was compared in two marine embayments of the northeast Gulf of Mexico. Results indicate that variations in diet composition between areas and ontogenetic diet shifts within each location are likely due to differences in overall habitat structure and availability of potential prey species. A manuscript is currently in review. A database containing information on quantitative food and feeding studies of sharks conducted around the world has been in development for several years and presently

includes over 200 studies. This fully searchable database will continue to be updated and fine-tuned in FY05. The goal is to make this tool available to researchers in the relatively near future.

Cooperative Gulf of Mexico States Shark Pupping and Nursery Survey (GULFSPAN)

The SEFSC Panama City Shark Population Assessment Group manages and coordinates a survey of coastal bays and estuaries between the Panhandle of Florida and Texas. Surveys identify the presence/absence of neonate and juvenile sharks and attempt to quantify the relative importance of each area as it pertains to essential fish habitat requirements for sharks. The SEFSC Panama City Shark Population Assessment Group also initiated a juvenile shark abundance index survey in 1996. The index is based on random, depth-stratified gillnet sets conducted throughout coastal bays and estuaries in northwest Florida monthly from April to October. The species targeted for the index of abundance are juvenile sharks in the large and small coastal management groups. More information on this program can be found in Section 3.3 of this document.

Angel Shark Life History

The Atlantic Angel Shark is a benthic species inhabiting deep waters of the Gulf of Mexico and the Atlantic Ocean. This species is listed as prohibited by the 1999 Fisheries Management Plan for Atlantic Tunas, Swordfish, and Sharks due to the lack of biological data and a precautionary approach for species thought to be highly susceptible to exploitation. Life history studies began in 2003. Samples are obtained from commercial fishers and fishery-independent surveys. Preliminary reproductive parameters were determined in 2004 and results presented at the annual American Elasmobranch Society meeting held in Norman, Oklahoma, in May 2004.

Life History Studies of Elasmobranchs

Biological samples are obtained through research surveys and cruises, recreational fishers, and through collection by onboard observers on commercial fishing vessels. Age and growth rates and other life history aspects of selected species are processed and data analyzed following standard methodology. This information is vital as input to population models incorporating variation and uncertainty in estimates of life-history traits to predict the productivity of the stocks and ensure that they are harvested at sustainable levels. The age and growth parameters of bull shark (*Carcharhinus leucas*) and spinner shark (*C. brevipinna*) were completed and submitted for publication in 2004.

Cooperative Research-Definition of Winter Habitats for Blacktip Sharks in the Eastern Gulf of Mexico

A collaborative effort between SEFSC Panama City Shark Population Assessment Group and Mote Marine Laboratory is underway to define essential winter habitats for blacktip sharks (*Carcharhinus limbatus*). Deployment of archival Pop-up Archival Transmitting (PAT) tags on sharks during January - February of FY05 in the Florida Keys and north Florida will be executed with the cooperation of the charterboat industry. PAT tags will be programmed to detach from individuals during late spring and early summer when sharks have recruited to coastal areas.

Cooperative Research-Habitat Utilization among Coastal Sharks

Through a collaborative effort between SEFSC Panama City Shark Population Assessment Group and Mote Marine Laboratory, the utilization of coastal habitats by neonate and young-of-the-year blacktip and Atlantic sharpnose sharks will be monitored through an array of underwater acoustic receivers (VR2, Vemco Ltd.) placed throughout each study site. Movement patterns, home ranges, activity space, survival, and length of residence of individuals will be compared by species and area to provide information to better manage critical species and essential fish habitats.

Cooperative Research-Characterization of Bycatch in the Gulf Butterfish, (*Peprilus burti*), Trawl Fishery, with an Emphasis on Identification of Life History Parameters for several Potentially High-Risk Species

A proposal with the SEFSC Panama City Shark Population Assessment Group and the University of Florida was submitted to MARFIN to quantify and qualify the elasmobranch bycatch in the butterfish, (*Peprilus triacanthus)*, trawl fishery in the Gulf of Mexico. Determination of life history parameters for the roundel skate, (*R. texana)*, the clearnose skate, (*R. eglanteria)*, the spreadfin skate (*Dipturus olseni)*, and the Atlantic angel shark, (*Squatina dumerili)* will be developed ultimately for the estimation of vital rates. Vital rate information will be used to determine the productivity of the stocks and ensure that they are harvested at sustainable levels.

Coastal Shark Assessment Research Surveys

The SEFSC Mississippi Laboratories in Pascagoula have been operating annual research cruises aboard NOAA vessels since 1995. The objectives of this program are to conduct bottom longline surveys to assess the distribution and relative abundance of coastal sharks along U.S. and Mexican waters of the Gulf of Mexico and the U.S. eastern seaboard. This is the only long-term, nearly stock-wide, fishery-independent survey of Atlantic sharks conducted in U.S. and neighboring waters. Ancillary objectives are to collect biological and environmental data, and to tag-and-release sharks. Starting in 2001 and under the auspices of the Mex-US-Gulf Program, the Pascagoula Laboratories have provided logistical and technical support to Mexico's Instituto Nacional de la Pesca to conduct a cooperative research cruise aboard the Mexican research vessel Onjuku in Mexican waters of the Gulf of Mexico. The cruise also took place in 2002, but was suspended in 2003 and 2004 because of mechanical problems with the research vessel and other issues.

Cooperative Research--The capture depth, time, and hooked survival rate for bottom longline-caught large coastal sharks

A collaborative effort between SEFSC Panama City Shark Population Assessment Group and the University of Florida to examine alternative measures in the shark bottom longline fishery to reduce mortality on prohibited sharks such as reduced soak time, restrictions on the length of gear, and fishing depth restrictions will be tested using hook timers. Funding is being sought through the NMFS Cooperative Research Program.

3.3 Habitat

3.3.1 Regulatory Requirements

Section 303(a)(7) of the Magnuson-Stevens Act, 16 U.S.C. §§ 1801 *et seq*., as amended by the Sustainable Fisheries Act in 1996, requires FMPs to describe and identify essential fish habitat (EFH), minimize to the extent practicable adverse effects on such habitat caused by fishing, and identify other actions to encourage the conservation and enhancement of such habitat. The Magnuson-Stevens Act defines EFH as "those waters and substrate necessary to fish for spawning, breeding, feeding or growth to maturity." (16 U.S.C. § 1802 (10)). The EFH regulations (at 50 C.F.R. 600 Subpart J) provide additional interpretation of the definition of essential fish habitat: "'Waters' include aquatic areas and their associated physical, chemical, and biological properties that are used by fish, and may include aquatic areas historically used by fish where appropriate; 'substrate' includes sediment, hard bottom, structures underlying the waters, and associated biological communities; 'necessary' means the habitat required to support a sustainable fishery and the managed species' contribution to a healthy ecosystem; and 'spawning, breeding, feeding, or growth to maturity' covers a species' full life cycle."

The EFH regulations require that EFH be described and identified within the U.S. Exclusive Economic Zone (EEZ) for all life stages of each species in a fishery management unit. FMPs must describe EFH in text, tables, and figures, as appropriate, that provide information on the biological requirements for each life history stage of the species. According to the EFH regulations, an initial inventory of available environmental and fisheries data sources should be undertaken to compile information necessary to describe and identify EFH and to identify major species-specific habitat data gaps. Habitats that satisfy the criteria in the Magnuson-Stevens Act have been identified and described as EFH in the 1999 FMPs and in Amendment 1 to the 1999 Tunas, Swordfish, and Shark FMP.

NMFS originally described and identified EFH and related EFH regulatory elements for all HMS in the management unit in the 1999 FMPs, and more recently updated EFH for five shark species (blacktip, sandbar, dusky, nurse, and finetooth sharks) in Amendment 1 to the 1999 Tunas, Swordfish, and Shark FMP, which was implemented in 2003. The EFH regulations further require NMFS to conduct a comprehensive review of all EFH related information at least once every five years and revise or amend the EFH provisions if warranted. This includes modifying the boundaries of areas considered to be EFH. To that effect, NMFS is currently undertaking the comprehensive five-year review of information pertaining to EFH for all HMS in the management unit in this draft FMP. Based on the findings of this review, NMFS may recommend that certain EFH boundaries may need to be modified in a subsequent rulemaking. At that time, alternatives for boundary modifications would be proposed. For a complete description of the comprehensive five-year review of all new EFH information see Chapter 10 and Appendix B.

3.3.1.1 Habitat Areas of Particular Concern

To further the conservation and enhancement of EFH, the EFH guidelines encourage FMPs to identify Habitat Areas of Particular Concern (HAPCs). HAPCs are areas within EFH

that meet one or more of the following criteria: they are ecologically important, particularly vulnerable to degradation, undergoing stress from development, or they are a rare habitat type. HAPCs can be used to focus conservation efforts on specific habitat types that are particularly important to the managed species. Currently, only one area, for sandbar sharks off of North Carolina, Chesapeake Bay, MD, and Great Bay, NJ, has been identified as a HAPC for HMS (1999 FMP). Although no new HAPCs have been identified since the 1999 FMP, and no new HAPCs are proposed in this draft FMP, the information being compiled during this review may be used to identify HAPC areas in a future rulemaking.

3.3.2 Habitat Types and Distributions

HMS traverse large expanses of the world's oceans, straddling jurisdictional boundaries. Although many of the species frequent other oceans of the world, the Magnuson-Stevens Act only authorizes the description and identification of EFH in Federal, state or territorial waters, including areas of the U.S. Caribbean, the Gulf of Mexico and the Atlantic coast of the United States to the seaward limit of the U.S. EEZ. These areas are connected by currents and water patterns that influence the occurrence of HMS at particular times of the year. On the largest scale, the North and South Equatorial currents bathe the U.S. Caribbean islands. The North Equatorial Current continues through the Caribbean Basin to enter the Gulf of Mexico through the Yucatan Straits. The current continues through the Florida Straits to join the other water masses (including the Antilles Current) to form the Gulf Stream along the eastern coast of the United States. Variations in flow capacities of the Florida Straits and the Yucatan Straits produce the Loop Current, the major hydrographic feature of the Gulf of Mexico. These water movements in large part influence the distributions of the pelagic life stages of HMS.

Tuna, swordfish, and billfish distributions are most frequently associated with hydrographic features such as density fronts between different water masses. The scales of these features vary. For example, the river plume of the Mississippi River extends for miles into the Gulf of Mexico and is a fairly predictable feature, depending on the season. Fronts that set up over the De Soto Canyon in the Gulf of Mexico, or over the Charleston Bump or the Baltimore Canyon in the Mid-Atlantic, may be of a much smaller scale. The locations of many fronts or frontal features are statistically consistent within broad geographic boundaries. These locations are influenced by riverine inputs, movement of water masses, and the presence of topographic structures underlying the water column, thereby influencing the habitat of HMS. Those areas that are known spawning grounds, or areas of aggregation for feeding or other reasons, are considered to be EFH for those species.

Sharks are found in a wide variety of coastal and ocean habitats including estuaries, nearshore areas, the continental shelf, continental slope, and open ocean. Many species are migratory and, like all other marine species, are affected by the condition of the habitat. Atlantic sharks are broadly distributed as adults but have been found to utilize specific estuaries as pupping and nursery areas during pupping season and throughout their neonate (newborn) life stages which may vary from a few to many months. Since coastal and coastal pelagic species frequently appear near shore and have pupping and nursery areas near shore, much more is known about their habitat requirements, particularly for early life history stages. Much less is known about the habitat requirements, pupping areas, and other details of pelagic and deep dwelling species.

The following sections are intended to provide a general overview of the various habitats with which HMS are most frequently associated. A more detailed description is contained in the 1999 Tunas, Swordfish, and Shark FMP.

3.3.2.1 Atlantic Ocean

(Material in this section is largely a summary of information in MMS, 1992; 1996. Original sources of information are referenced in those documents)

The region of the Atlantic Ocean within which EFH for Federally managed HMS is identified spans the area between the Canadian border in the north and the Dry Tortugas in the south. It includes a diverse spectrum of aquatic species of commercial, recreational, and ecological importance. The distribution of marine species along the Atlantic seaboard is strongly affected by the cold Labrador Current in the northern part, the warm Gulf Stream in the middle and southern portions of the region, and generally by the combination of high summer and low winter temperatures. For many species Cape Hatteras forms a strong zoogeographic boundary between the Mid- and South Atlantic areas, while the Cape Cod/Nantucket Island area is a somewhat weaker zoogeographic boundary in the north.

Coastal and Estuarine Habitat

Although HMS move primarily through open ocean waters, they do periodically utilize inshore habitats. This is especially true for several species of sharks that move inshore, often into shallow coastal waters and estuaries, to give birth; these areas then become nursery areas as the young develop. Examples include Great Bay, New Jersey, Chesapeake Bay, Maryland and Delaware Bay, Delaware which provide important nursery habitat for sandbar sharks, and Bull's Bay, South Carolina, and Terrebone Bay, Louisiana which are important blacktip shark nursery areas. Typically, the pups (neonates) remain in these same areas throughout their early life stages, which may vary from a few to many months. Recent tagging studies have shown that some sharks return to summer nursery areas in subsequent years. Although billfish move primarily throughout open-ocean waters, two species, the white marlin and the sailfish can be found inshore. Sailfish are also known to move inshore to spawn off the east coast of Florida and in the Florida Keys.

Coastal habitats that may be encountered by HMS are described in this section. Those areas that are known nursery or spawning grounds, or areas of HMS aggregation for feeding or other reasons, are considered to be EFH for those species. It should be noted that characteristics of coastal and offshore habitats may be affected by activities and conditions occurring outside of those areas (farther up-current) due to water flow or current patterns that may transport materials that could cause negative impacts.

Estuaries are highly productive, yet fragile, environments that support a great diversity of fish and wildlife species, including sharks. Many commercially valuable fish and shellfish stocks are dependent on these areas during some stage of their development. In the vicinity of North Carolina, Virginia, and Maryland, approximately 90 percent of the commercially valuable fish species are dependent on estuaries for at least part of their life cycle.

Along the Atlantic seaboard coastal wetlands are located predominantly south of New York because these coastal areas have not been glaciated. Nearly 75 percent of the Atlantic coast salt marshes are found in the states of North Carolina, South Carolina, and Georgia. These three states contain approximately nine million acres of salt marsh. Wetland vegetation plays an important role in nutrient cycling, and provides stability to coastal habitats by preventing the erosion of sediments and by absorbing the energy of storms.

There are 13,900 square miles (sq mi) (36,000 square kilometers (sq km)) of estuarine habitat along the Atlantic coast, of which approximately 68 percent (9,400 sq mi) occurs north of the Virginia/ North Carolina border, with Chesapeake Bay contributing significantly to the total. South of the Gulf of Maine, where there is a wider coastal plain and greater agricultural activity, estuaries carry higher sediment and nutrient loads. The increased fertility and generally higher water temperatures resulting from these nutrient loads allow these estuaries to support greater numbers of fish and other aquatic organisms.

South of the Virginia/North Carolina border, there are approximately 4,500 sq mi (11,655 sq km) of estuarine habitat. The Currituck, Albemarle, and Pamlico Sounds, which together constitute the largest estuarine system along the entire Atlantic coast, make up a large portion of these southern estuaries. A unique feature of these sounds is that they are partially enclosed and protected by a chain of fringing islands, the Outer Banks, located 32 to 48 km (20 to 30 mi) from the mainland.

Because of their low tidal flushing rates, estuaries are generally more susceptible to pollution than other coastal water bodies. The severity of the problem varies depending on the extent of tidal flushing. In Maryland and Virginia, the primary problems reported are excessive nutrients (nitrates and phosphates), particularly in the Chesapeake Bay and adjoining estuarine areas. Other problems included elevated bacterial and suspended sediment levels. Non-point sources of pollution are considered one of the main causes of pollution. Elevated bacterial levels were also listed as a local coastal pollution problem in Maryland.

In North Carolina, the primary problems listed for estuarine areas were enrichment in organics and nutrients, fecal coliform bacteria, and low dissolved oxygen. Insufficient sewage treatment, wide-spread use of septic systems in coastal areas, as well as agricultural runoff are considered to be major causes of these pollution problems. Oil spills from vessel collisions and groundings, as well as illegal dumping of waste oil, are a common cause of local, short-term water quality problems, especially in estuaries along the North and Mid-Atlantic coasts. These sources of pollution and habitat degradation may have a negative impact on coastal shark populations, particularly during vulnerable early life stages.

Many of the coastal bays and estuaries along the Atlantic East Coast and Gulf of Mexico are described in greater detail in the 1999 Tunas, Swordfish, and Shark FMP, including the distribution, size, depth, freshwater inflow, habitat types, tidal range and salinity for each of the major estuaries and bays on the East coast and Gulf coast, and are not repeated here.

Continental Shelf and Slope Areas

Moving seaward away from the coast, the next major geologic features encountered are the continental shelf and slope areas. The continental shelf is characterized by depths ranging from a few meters to approximately 60 meters (198 ft), with a variety of bottom habitat types. Far less research has been done in this area than on the coasts and estuaries, and consequently much less is known about the specific habitat requirements of HMS within these regions.

The shelf area of the Mid-Atlantic Bight averages about 100 km (60 mi) in width, reaching a maximum of 150 km (90 mi) near Georges Bank, off New England, and a minimum of 50 km (30 mi) offshore Cape Hatteras, NC. Current speeds are strongest at the narrowest part of the shelf where wind-driven current variability is highest. The distribution of marine species, including HMS, along the Atlantic seaboard may be strongly influenced by currents, the warm Gulf Stream in the middle and south portions of the region, and generally by the combination of high summer and low winter temperatures.

The continental shelf in the South Atlantic Bight varies in width from 50 km (32 mi) off Cape Canaveral, FL to a maximum of 120 km (75 mi) off Savannah, GA, and a minimum of 30 km (19 mi) off Cape Hatteras. The shelf is divided into three cross-shelf zones. Waters on the inner shelf (0 to 20 m (0 to 66 ft)) interact extensively with rivers, coastal sounds, and estuaries. This interaction tends to form a band of low-salinity, stratified water near the coast that responds quickly to local wind-forcing and seasonal atmospheric changes. Mid-shelf (20 to 40 m (66 to 132 ft)) current flow is strongly influenced by local wind events with frequencies of two days to two weeks. In this region, vertically well mixed conditions in fall and winter contrast with vertically stratified conditions in the spring and summer. Gulf Stream frontal disturbances (*e.g.*, meanders and cyclonic cold core rings) that occur on time scales of two days to two weeks dominate currents on the outer shelf (40 to 60 m (132 to 197 ft)).

The Mid-Atlantic area from Cape Cod, MA to Cape Hatteras, NC represents a transition zone between northern cold-temperate waters of the north and the warm-temperate waters to the south. Water temperatures in the Mid-Atlantic vary greatly by season. Consequently, many of the fish species of importance in the Mid-Atlantic area migrate seasonally, whereas the major species in the other three areas are typically resident throughout the year (MMS, 1992; 1996). The shelf-edge habitat may range in water depth between 40 and 100 m (131 and 328 ft). The bottom topography varies from smooth sand to mud to areas of high relief with associated corals and sponges. The fish species found in this area include parrotfish (*Scaridae*) and the deepwater species of the snapper-grouper assemblage.

The continental slope generally has smooth mud bottoms in water depths of 100 to 200 m (328 to 656 ft). Many of the species in this zone are representatives of cold-water northern species exhibiting tropical submergence (*i.e.*, being located in deeper, cooler water as latitude decreases).

A topographic irregularity southeast of Charleston, SC, known as the Charleston Bump, is an area of productive sea floor, which rises abruptly from 700 to 300 m (2,300 to 980 ft) within a distance of about 20 km (12 mi), and at an angle which is approximately transverse to both the general isobath pattern and the Gulf Stream currents. The Charleston Gyre is a

persistent oceanographic feature that forms in the lee of the Charleston Bump. It is a location in which larval swordfish have been commonly found and may serve as nursery habitat.

Pelagic Environmnet

Many HMS spend their entire lives in the pelagic, or open ocean environment. These species are highly mobile and physiologically adapted to traveling great distances with minimal effort. Much of what is known about the association between HMS and their migrations across vast open ocean habitat comes from tagging studies.

While the open ocean may appear featureless, there are major oceanographic features such as currents, temperature gradients, eddies, and fronts that occur on a large scale and may influence the distribution patterns of many oceanic species, including HMS. For instance, the Gulf Stream produces meanders, filaments, and warm and cold core rings that significantly affect the physical oceanography of the continental shelf and slope. These features tend to aggregate both predators and prey, and are frequently targeted by commercial fishing vessels. This western boundary current has its origins in the tropical Atlantic Ocean (*i.e.*, the Caribbean Sea). The Gulf Stream system is made up of the Yucatan Current that enters the Gulf of Mexico through the Yucatan Straits; the Loop Current which is the Yucatan Current after it separates from Campeche Bank and penetrates the Gulf of Mexico in a clockwise flowing loop; the Florida Current, as it travels through the Straits of Florida and along the continental slope into the South Atlantic Bight; and the Antilles Current as it follows the continental slope (Bahamian Bank) northeast to Cape Hatteras. From Cape Hatteras it leaves the slope environment and flows into the deeper waters of the Atlantic Ocean.

The flow of the Gulf Stream as it leaves the Straits of Florida reaches maximum speeds of about 200 cm/s. During strong events, maximum current speeds greater than 250 cm/s have been recorded offshore of Cape Hatteras. The width of the Gulf Stream at the ocean surface ranges from 80 to 100 km (50 to 63 mi) and extends to depths of between 800 and 1,200 m (2,624 to 3,937 ft).

As a meander passes, the Gulf Stream boundary oscillates sequentially onshore (crest) and offshore (trough). A meander can cause the Gulf Stream to shift slightly shoreward or well offshore into deeper waters. The Gulf Stream behaves in two distinct meander modes (small and large), with the size of the meanders decreasing as they move northward along the coast. During the large meander mode the Gulf Stream front is seaward of the shelf break, with its meanders having large amplitudes. Additionally, frontal eddies and accompanying warm-water filaments are larger and closer to shore. During the small meander mode the Gulf Stream front is at the shelf break. Frontal eddies and warm-water filaments associated with small amplitude meanders are smaller and farther from shore. Since HMS tend to follow the edge of the Gulf Stream, their distance from shore can be greatly influenced by the patterns of meanders and eddies.

Meanders have definite circulation patterns and conditions superimposed on the statistical mean (average) condition. As a meander trough migrates in the direction of the Gulf Stream's flow, it upwells cool nutrient-rich water, which at times may move onto the shelf and may evolve into an eddy. These boundary features move south-southwest. As warm-water filaments, they transfer momentum, mass, heat, and nutrients to the waters of the shelf break.

Gulf Stream filaments are mesoscale events, which occur regularly offshore the southeast United States. The filament is a tongue of water extending from the Gulf Stream pointing to the south. These form when meanders cause the extrusion of a warm surface filament of Gulf Stream water onto the outer shelf. The cul-de-sac formed by this extrusion contains a cold core that consists of a mix of outer-shelf water and nutrient-rich water. This water mix is a result of upwelling as the filament/meander passes along the slope. The period from genesis to decay typically is about two to three weeks.

The Charleston Gyre is a permanent oceanographic feature of the South Atlantic Bight, caused by the interaction of the Gulf Stream waters with the topographically irregular Charleston Bump. The gyre produces an upwelling of nutrients, which contributes significantly to primary and secondary productivity of the Bight. The degree of upwelling varies with the seasonal position and velocity of the Gulf Stream currents.

In the warm waters between the west edge of the Florida Current/Gulf Stream and 20° N and 40° N, pelagic brown algae, *Sargassum natans* and *S. fluitans*, form a dynamic structural habitat. The greatest concentrations are found within the North Atlantic Central Gyre in the Sargasso Sea. Large quantities of *Sargassum* frequently occur on the continental shelf off the southeastern United States. Depending on prevailing surface currents, this material may remain on the shelf for extended periods, be entrained into the Gulf Stream, or be cast ashore. During calm conditions *Sargassum* may form irregular mats or simply be scattered in small clumps. Oceanographic features such as internal waves and convergence zones along fronts aggregate the algae along with other flotsam into long linear or meandering rows collectively termed "windrows."

Pelagic *Sargassum* supports a diverse assemblage of marine organisms including fungi, micro- and macro-epiphytes, sea turtles, numerous marine birds, at least 145 species of invertebrates, and over 100 species of fishes. The fishes associated with pelagic *Sargassum* include juveniles as well as adults, including large pelagic adult fishes. Swordfish and billfish are among the fishes that can be found associated with *Sargassum*. The *Sargassum* community, consisting of the floating *Sargassum* (associated with other algae, sessile and free-moving invertebrates, and finfish) is important to some epipelagic predators such as wahoo and dolphin. The *Sargassum* community provides food and shelter from predation for juvenile and adult fish, including HMS, and may have other functions such as habitat for fish eggs and larvae.

Offshore water quality in the Atlantic is controlled by oceanic circulation, which, in the Mid-Atlantic is dominated by the Gulf Stream and by oceanic gyres. A shoreward, tidal and wind-driven circulation dominates as the primary means of pollutant transport between estuaries and the nearshore. Water quality in nearshore water masses adjacent to estuarine plumes and in water masses within estuaries is also influenced by density-driven circulation. Suspended sediment concentration can also be used as an indication of water quality. For the Atlantic coastal areas, suspended sediment concentration varies with respect to depth and distance from shore, the variability being greatest in the mid-Atlantic and South Atlantic. Re-suspended bottom sediment is the principal source of suspended sediments in offshore waters.

3.3.2.2 Gulf of Mexico

(Material in this section is largely a summary of information in MMS, 1996; Field *et al.*, 1991; and NOAA 1997. Original sources of information are referenced in those documents.)

The Gulf of Mexico supports a great diversity of fish resources that are related to a variety of ecological factors, such as salinity, primary productivity, and bottom type. These factors differ widely across the Gulf of Mexico and between inshore and offshore waters. Characteristic fish resources are not randomly distributed; high densities of fish resources are associated with particular habitat types (*e.g.*, east Mississippi Delta area, Florida Big Bend sea grass beds, Florida Middle Grounds, mid-outer shelf, and the De Soto Canyon area). The highest values of surface primary production are found in the upwelling area north of the Yucatan Channel and in the De Soto Canyon region. In terms of general biological productivity, the western Gulf is considered to be more productive in the oceanic region than is the eastern Gulf. Productivity of areas where HMS are known to occur varies between the eastern and western Gulf, depending on the influence of the Loop Current.

Coastal and Estuarine Habitats

There are 5.62 million hectares (ha) (13.88 million acres) of estuarine habitat among the five states bordering the Gulf. This includes 3.2 million ha (8 million acres) of open water, 2.43 million ha (6 million acres) of emergent tidal vegetation (including about 162,000 ha (400,318 acres) of mangroves), and 324,000 ha (800, 636 acres) of submerged vegetation. Estuaries are found from east Texas through Louisiana, Mississippi, Alabama, and northwest Florida and encompass more than 62,000 sq km (23,938 sq mi) of water surface area. Estuaries of the Gulf of Mexico export considerable quantities of organic material, thereby enriching the adjacent continental shelf areas, and many of these estuaries provide important habitat as pupping and nursery grounds for juvenile stages of many important invertebrate and fish species including many species of Atlantic sharks.

Coastal wetland habitat types that occur along the Gulf Coast include mangroves, non-forested wetlands (fresh, brackish, and saline marshes), and forested wetlands. Marshes and mangroves form an interface between marine and terrestrial habitats, while forested wetlands occur inland from marsh areas. Wetland habitats may occupy narrow bands or vast expanses, and can consist of sharply delineated zones of different species, monospecific stands of a single species, or mixed plant species communities.

Continental Shelf and Slope Areas

The Gulf of Mexico is a semi-enclosed, subtropical sea with a surface area of approximately 1.6 million sq km (0.6 million sq mi). The main physiographic regions of the Gulf basin are the continental shelf, continental slope and associated canyons, the Yucatan and Florida Straits, and the abyssal plains. The U.S. continental shelf is narrowest, only 16 km (9.9 mi) wide, off the Mississippi River. The continental shelf width varies significantly from about 350 km (217 mi) offshore western Florida, 156 km (97 mi) off Galveston, TX, and decreasing to 88 km (55 mi) off Port Isabel near the Mexican border. The depth of the central abyss ranges to 4,000 m (13,000 ft). The Gulf is unique because it has two entrances: the Yucatan Strait and the

Straits of Florida. The Loop Current dominates the Gulf's general circulation and its associated eddies. The Loop current is caused by differences between the sill depths of the two straits. Coastal and shelf circulation, on the other hand, is driven by several forcing mechanisms: wind stress, freshwater input, buoyancy and mass fluxes, and transfer of momentum and energy through the seaward boundary.

In the Gulf, the continental shelf extends seaward from the shoreline to about the 200-m water depth (660 ft), and is characterized by a gentle slope of less than one degree. The continental slope extends from the shelf edge to the continental rise, usually at about the 2,000-m (6,500 ft) water depth. The topography of the slope in the Gulf is uneven and is broken by canyons, troughs, and escarpments. The gradient on the slope is characteristically one to six degrees, but may exceed 20 degrees in some places, particularly along escarpments. The continental rise is the apron of sediment accumulated at the base of the slope. The incline is gentle with slopes of less than one degree. The abyssal plain is the basin floor at the base of the continental rise.

Physical Oceanography

The Gulf receives large amounts of freshwater runoff from the Mississippi River as well as from a host of other drainage systems. In recent years, large amount of nutrient laden runoff from the Mississippi River have resulted in large hypoxic or low oxygen areas in the Gulf. This "dead zone" may affect up to 16,500 sq km (6,371 sq mi) during the summer, resulting in unfavorable habitat conditions for a wide variety of species.

Sea-surface temperatures in the Gulf range from nearly constant throughout (isothermal) (29° to 30°C (84° to 86°F)) in August to a sharp horizontal gradient in January, (25°C (77°F) in the Loop Current core to 14° to 15° C (57° to 59°F) along the northern shelf). The vertical distribution of temperature reveals that in January, the thermocline depth is about 30 to 61 m (98 to 200 ft) in the northeast Gulf and 91 to 107 m (298 to 350 ft) in the northwest Gulf. In May, the thermocline depth is about 46 m (150 ft) throughout the entire Gulf.

Sea surface salinities along the north Gulf vary seasonally. During months of low freshwater input, salinities near the coastline range between 29 to 32 ppt. High freshwater input conditions during the spring and summer months result in strong horizontal gradients and inner shelf salinities less than 20 ppt. The mixed layer in the open Gulf, from the surface to a depth of approximately 100 to 150 m (330 to 495 ft), is characterized by salinities between 36.0 and 36.5 ppt.

Sharp discontinuities of temperature and/or salinity at the sea surface, such as the Loop Current front or fronts associated with eddies or river plumes, are dynamic features that may act to concentrate buoyant material such as detritus, plankton, or eggs and larvae. These materials are transported, not by the front's movements or motion across the front, but mainly by lateral movement along the front. In addition to open ocean fronts, a coastal front, which separates turbid, lower salinity water from the open-shelf regime, is probably a permanent feature of the north Gulf shelf. This front lies about 30 to 50 km (19 to 31 mi) offshore. In the Gulf, these fronts are the most commonly utilized habitat of the pelagic HMS species.

The Loop Current is a highly variable current entering the Gulf through the Yucatan Straits and exiting through the Straits of Florida (as a component of the Gulf Stream) after tracing an arc that may intrude as far north as the Mississippi-Alabama shelf. This current has been detected down to about 1,000 m (3,300 ft) below the surface. Below that level there is evidence of a countercurrent. When the Loop Current extends into or near shelf areas, instabilities, such as eddies, may develop that can push warm water onto the shelf or entrain cold water from the shelf. These eddies consist of warm water rotating in a clockwise fashion. Major Loop Current eddies have diameters on the order of 300 to 400 km (186 to 249 miles), and may extend to a depth of about 1,000 m. Once these eddies are free from the Loop Current, they travel into the western Gulf along various paths to a region between 25° N to 28° N and 93° W to 96° W. As eddies travel westward a decrease in size occurs due to mixing with resident waters and friction with the slope and shelf bottoms. The life of an individual eddy, until its eventual assimilation by regional circulation in the western Gulf, is about one year. Along the Louisiana/Texas slope, eddies are frequently observed to affect local current patterns, hydrographic properties, and possibly the biota of fixed oil and gas platforms or hard bottoms. Once an eddy is shed, the Loop Current undergoes major dimensional adjustments and reorganization.

3.3.2.3 U.S. Caribbean

(Material in this section is largely a summary of information in Appeldoorn and Meyers, 1993. Original sources of information are referenced in that document.)

The waters of the Caribbean region include the coastal waters surrounding the U.S. Virgin Islands and Puerto Rico. All of these Caribbean islands, with the exception of St. Croix, are part of a volcanic chain of islands formed by the subduction of one tectonic plate beneath another. Tremendously diverse habitats (rocky shores, sandy beaches, mangroves, seagrasses, algal plains, and coral reefs) and the consistent light and temperature regimes characteristic of the tropics are conducive to high species diversity.

The waters of the Florida Keys and southeast Florida are intrinsically linked with the waters of the Gulf of Mexico and the waters of the Caribbean to the west, south, and east, and to the waters of the South Atlantic Bight to the north. These waters represent a transition from insular to continental regimes and from tropical to temperate regimes. This zone, therefore, contains one of the richest floral and faunal complexes.

Coastal and Estuarine Habitats

Although the U.S. waters of the Caribbean are relatively nutrient poor, and therefore have low rates of primary and secondary productivity, they display some of the greatest diversity of any part of the South Atlantic region. High and diverse concentrations of biota are found where habitat is abundant. Coral reefs, sea grass beds, and mangrove ecosystems are the most productive of the habitat types found in the Caribbean, but other areas such as soft-bottom lagoons, algal hard grounds, mud flats, salt ponds, sandy beaches, and rocky shores are also important in overall productivity. These diverse habitats allow for a variety of floral and faunal populations.

Offshore, between the sea grass beds and the coral reefs and in deeper waters, sandy bottoms and algal plains dominate. These areas may be sparsely or densely vegetated with a canopy of up to one meter of red and brown algae. Algal plains are not areas of active sand transport. These are algae-dominated sandy bottoms, often covered with carbonate nodules. They occur primarily in deep water (> 15 m, or 50 ft), and account for roughly 70 percent of the area of the insular shelf of the U.S. Virgin Islands. Algal plains support a variety of organisms including algae, sponges, gorgonians, solitary corals, mollusks, fish, and worms, and may serve as critical juvenile habitat for commercially important (and diminishing) species such as queen triggerfish and spiny lobsters.

Coral reefs and other coral communities are some of the most important ecological (and economic) coastal resources in the Caribbean. They act as barriers to storm waves and provide habitat for a wide variety of marine organisms, including most of the economically important species of fish and shellfish. They are the primary source for carbonate sand, and serve as the basis for much of the tourism. Coral communities are made by the build up of calcium carbonate produced by living animals, coral polyps, in symbiosis with a dinoflagellate, known as zooxanthellae. During summer and early fall, most of the coral building organisms are at or near the upper temperature limit for survival and so are living under natural conditions of stress. Further increase in local or global temperature could prove devastating.

Sea grass beds are highly productive ecosystems that are quite extensive in the Caribbean; some of the largest sea grass beds in the world lie beyond the shore on both sides of the Keys. Sea grass beds often occur in close association with shallow-water coral reefs. Seagrasses are flowering plants that spread through the growth of roots and rhizomes. These act to trap and stabilize sediments, reduce shoreline erosion, and buffer coral reefs; they provide food for fish, sea turtles (heavy grazers), conch, and urchins; they provide shelter and habitat for many adult species and numerous juvenile species who rely on the sea grass beds as nursery areas; and they provide attachment surfaces for calcareous algae.

Mangrove habitats are very productive coastal systems that support a wide variety of organisms. The mangrove food web is based largely on the release of nutrients from the decomposition of mangrove leaves, and in part on the trapping of terrestrial material. Red mangroves (*Rhizophora mangle*), with their distinctive aerial prop roots, grow along the shoreline, often in mono-specific stands. The roots of the red mangroves help to trap sediments and pollutants associated with terrestrial runoff and help to buffer the shore from storm waves. Red mangrove forests support a diverse community of sponges, tunicates, algae, larvae, and corals, as well as juvenile and adult fish and shellfish. Black mangroves (*Aveicennia germinans*) and white mangroves (*Laguncularia racemosa*) grow landward of the red mangroves. They also act as important sediment traps. Exposed and sheltered mangrove shorelines are common throughout the U.S. Caribbean.

Throughout the U.S. Caribbean, both rocky shores and sandy beaches are common. While many of these beaches are high-energy and extremely dynamic, buffering by reefs and seagrasses allows some salt-tolerant plants to colonize the beach periphery. Birds, sea turtles, crabs, clams, worms, and urchins use the intertidal areas.

Salt ponds, common in the U.S. Virgin Islands, are formed when mangroves or fringing coral reefs grow or storm debris is deposited, effectively isolating a portion of a bay. The resulting "pond" undergoes significant fluctuations of salinity with changes in relative evaporation and runoff. The biota associated with salt ponds are, therefore, very specialized, and usually somewhat limited. Salt ponds are extremely important in trapping terrestrial sediments before they reach the coastal waters.

Insular Shelf and Slope Areas

Puerto Rico and the U.S. Virgin Islands contain a wide variety of coastal marine habitats, including coral and rock reefs, sea grass beds, mangrove lagoons, sand and algal plains, soft bottom areas, and sandy beaches. These habitats are, however, very patchily distributed. Nearshore waters range from zero to 20 m (66 ft) in depth, and outer shelf waters range from 20 to 30 m (66 to 99 ft) in depth, the depth of the shelf break. Along the north coast the insular shelf is very narrow (two to three km wide), seas are generally rough, and few good harbors are present. The coast is a mixture of coral and rock reefs, and sandy beaches. The east coast has an extensive shelf that extends to the British Virgin Islands. Depth ranges from 18 to 30 m (59 to 99 ft). Much of the bottom is sandy, commonly with algal and sponge communities. The southeast coast has a narrow shelf (eight km wide). About 25 km (15.5 mi) to the southeast is Grappler Bank, a small seamount with its summit at a depth of 70 m (231 ft). The central south coast broadens slightly to 15 km (99 mi) and an extensive sea grass bed extends nine kilometers offshore to Caja de Muertos Island. Further westward, the shelf narrows again to just two km (1.2 mi) before widening at the southwest corner to over 10 km (6 mi). The entirety of the southern shelf is characterized by hard or sand-algal bottoms with emergent coral reefs, grass beds, and shelf edge. Along the southern portion of the west coast the expanse of shelf continues to widen, reaching 25 km (15.5 mi) at its maximum. A broad expanse of the shelf is found between 14 and 27 m (46 and 99 ft), where habitats are similar to those of the south coast. To the north, along the west coast, the shelf rapidly narrows to two to three kilometers.

Physical Oceanography

U.S. Caribbean waters are primarily influenced by the westward flowing North Equatorial Current, the predominant hydrological driving force in the Caribbean region. It flows from east to west along the northern boundary of the Caribbean plateau and splits at the Lesser Antilles, flowing westward along the north coasts of the islands.

The north branch of the Caribbean Current flows west into the Caribbean Basin at roughly 0.5 m (1.7 ft) per second. It is located about 100 km (62 mi) south of the islands, but its position varies seasonally. During the winter it is found further to the south than in summer. Flow along the south coast of Puerto Rico is generally westerly, but this is offset by gyres formed between the Caribbean Current and the island. The Antilles Current flows to the west along the northern edge of the Bahamas Bank and links the waters of the Caribbean to those of southeast Florida.

Coastal surface water temperatures remain fairly constant throughout the year and average between 26° and 30°C (79° and 86°F). Salinity of coastal waters is purely oceanic and

therefore is usually around 36 ppt. However, in the enclosed or semi-enclosed embayments salinity may vary widely depending on fluvial and evaporational influences.

It is believed that no upwelling occurs in the waters of the U.S. Caribbean (except perhaps during storm events) and, since the waters are relatively stratified, they are severely nutrient-limited. In tropical waters nitrogen is the principal limiting nutrient.

3.4 Fishery Data Update

In this section, HMS fishery data, with the exception of some data on Atlantic sharks, are analyzed by gear type; Section 3.4.6 provides a summary of landings by species. While HMS fishermen generally target particular species, the non-selective nature of most fishing gears promote effective analysis and management on a gear-by-gear basis. In addition, issues such as bycatch, and safety are generally better addressed by gear type. A summary of catch statistics can be found in Section 3.4.6 of this document.

The revised list of authorized fisheries (LOF) and fishing gear used in those fisheries became effective December 1, 1999 (64 FR 67511). The rule applies to all U.S. marine fisheries, including Atlantic HMS. As stated in the rule, "no person or vessel may employ fishing gear or participate in a fishery in the exclusive economic zone (EEZ) not included in this LOF without giving 90 days' advance notice to the appropriate Fishery Management Council (Council) or, with respect to Atlantic HMS, the Secretary of Commerce (Secretary)." Acceptable HMS fisheries and authorized gear types for Atlantic tunas, swordfish, and sharks include: swordfish handgear fishery - rod and reel, harpoon, handline, bandit gear; pelagic longline fishery - longline; shark drift gillnet fishery - gillnet; shark bottom longline fishery - longline; shark recreational fishery - rod and reel, handline; tuna purse seine fishery - purse seine; tuna recreational fishery- rod and reel, handline; and tuna handgear fishery - rod and reel, harpoon, handline, bandit gear. For Atlantic billfish, the only acceptable fishery and authorized gear type is recreational fishery - rod and reel. Species whose life history characteristics may lead to their eventual categorization as highly migratory, but which are not currently under the Secretary or Regional Council management authority, are covered in two broad categories: Recreational Fisheries (Non-FMP) and Commercial Fisheries (Non-FMP). Species that fit this description may be harvested with the gears listed for these catchall categories.

Due to the nature of SCRS data collection, Table 3.18 depicts a summary of U.S. and international HMS catches by species rather than gear type. International catch levels are taken from the 2004 Standing Report of the SCRS, while U.S. reported catches, other than sharks, are taken from the U.S. National Report. The U.S. percentage of regional and total catches for HMS species are presented (Table 3.18) to provide a basis for comparison of the U.S.' catches relative to other nations/entities. Catch of billfish includes both recreational landings and dead discards from commercial fisheries; catch for bluefin tuna includes commercial landings and discards and recreational landings; and swordfish include commercial landings and discards. Historical catch levels dating back to 1950 can be found in the SCRS Report and a discussion of typical species-specific U.S. catch levels can be found in the 1999 FMP. International catch and landings tables are included for the longline and purse seine fisheries in Sections 3.4.1 and 3.4.2 of this report. At this point, data necessary to assess the U.S. regional and total percentage of international catch levels for Atlantic shark species are unavailable.

Table 3.18 **Calendar Year 2003 U.S. vs International Catch of HMS (mt ww) other than sharks.** Source: SCRS, 2004.

Species	Total International Reported Catch	Region of U.S. Involvement	Total Regional Catch	U.S. Catch	U.S. Percentage of Regional Catch	U.S. Percentage of Total Atlantic Catch
Atlantic Swordfish	21,946* (includes N. & S. Atlantic)	North Atlantic	11,028*	2,524	22.88%	11.59%
		South Atlantic	10,919*	20	0.18%	
Atlantic Bluefin Tuna	30,513**	West Atlantic	2,144	1,428 (52 mt discards)	66.60%	4.68%
Atlantic Bigeye Tuna	85,088	Total Atlantic	85,088	484	0.57%	0.57%
Atlantic Yellowfin Tuna	123,929	West Atlantic	24,978	7,702	30.84%	6.21%
Atlantic Albacore Tuna	60,742 (includes N. & S. Atlantic and Mediterranean)	North Atlantic	25,516	448	1.76%	0.74%
		South Atlantic	27,811	2	0.007%	
Atlantic Skipjack Tuna	147,478	West Atlantic	24,053	78	0.32%	0.05%
Atlantic Blue Marlin	1,951	North Atlantic	640	19	2.96%	0.97%
Atlantic White Marlin	571	North Atlantic	191	1	0.52%	0.18%
Atlantic Sailfish	1,835	West Atlantic	1,310	53	4.04%	2.88%

* Actual catches are likely higher given significant non-compliance with ICCAT reporting requirements.
** Significant non-compliance with ICCAT reporting requirements affects SCRS from estimating aggregate 2003 eastern Atlantic bluefin tuna catches accurately.

3.4.1 Pelagic Longline Fishery

3.4.1.1 Domestic Aspects of the Atlantic Pelagic Longline Fishery

The U.S. pelagic longline fishery for Atlantic HMS primarily targets swordfish, yellowfin tuna, and bigeye tuna in various areas and seasons. Secondary target species include dolphin,

albacore tuna, pelagic sharks (including mako, thresher, and porbeagle sharks), as well as several species of large coastal sharks. Although this gear can be modified (*e.g.*, depth of set, hook type, etc.) to target swordfish, tunas, or sharks, it is generally a multi-species fishery. These vessel operators are opportunistic, switching gear style and making subtle changes to target the best available economic opportunity of each individual trip. Pelagic longline gear sometimes attracts and hooks non-target finfish with no commercial value, as well as species that cannot be retained by commercial fishermen due to regulations, such as billfish. Pelagic longlines may also interact with protected species such as marine mammals, sea turtles, and seabirds. Thus, this gear has been classified as a Category I fishery with respect to the Marine Mammal Protection Act. Any species (or undersized catch of permitted species) that cannot be landed due to fishery regulations is required to be released, whether dead or alive. Pelagic longline gear is composed of several parts (see Figure 3.18[1]) (NMFS, 1999).

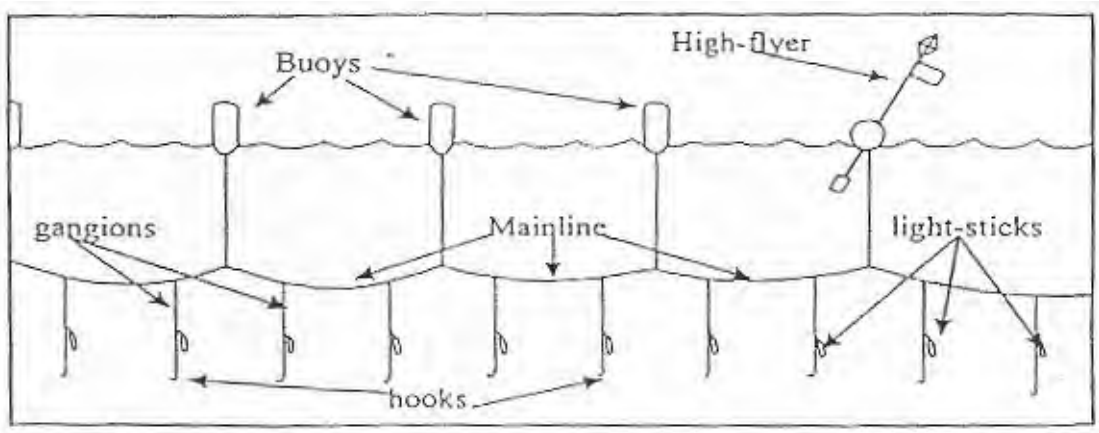


Figure 3.18 Typical U.S. Pelagic Longline Gear. Source: Arocha, 1996

The primary fishing line, or mainline of the longline system, can vary from five to 40 miles in length, with approximately 20 to 30 hooks per mile. The depth of the mainline is determined by ocean currents and the length of the floatline, which connects the mainline to several buoys and periodic markers which can have radar reflectors or radio beacons attached. Each individual hook is connected by a leader to the mainline. Lightsticks, which contain chemicals that emit a glowing light are often used, particularly when targeting swordfish. When attached to the hook and suspended at a certain depth, lightsticks attract baitfish, which may, in turn, attract pelagic predators (NMFS, 1999).

When targeting swordfish, the lines generally are deployed at sunset and hauled at sunrise to take advantage of swordfish nocturnal near-surface feeding habits (NMFS, 1999). In general, longlines targeting tunas are set in the morning, deeper in the water column, and hauled in the evening. Except for vessels of the distant water fleet, which undertake extended trips, fishing vessels preferentially target swordfish during periods when the moon is full to take advantage of increased densities of pelagic species near the surface. The number of hooks per set varies with line configuration and target species (Table 3.19) (NMFS, 1999).

[1] As of April 1, 2001, (66 FR 17370) a vessel is considered to have pelagic longline gear on board when a power-operated longline hauler, a mainline, floats capable of supporting the mainline, and leaders (gangions) with hooks are on board.

Table 3.19 Average Number of Hooks per Pelagic Longline Set, 1999 - 2003. Source: Data reported in pelagic longline logbook.

Target Species	1999	2000	2001	2002	2003
Swordfish	521	550	625	695	712
Bigeye Tuna	768	454	671	755	967
Yellowfin Tuna	741	772	731	715	723
Mix of tuna species	NA	638	719	767	764
Shark	613	621	571	640	970
Dolphin	NA	943	447	542	692
Other species	781	504	318	300	865
Mix of species	738	694	754	756	750

Figure 3.19 illustrates basic differences between swordfish (shallow) sets and tuna (deep) longline sets. Swordfish sets are buoyed to the surface, have few hooks between floats, and are relatively shallow. This same type of gear arrangement is used for mixed target sets. Tuna sets use a different type of float placed much further apart. Compared with swordfish sets, tuna sets have more hooks between the floats and the hooks are set much deeper in the water column. It is believed that because of the difference in fishing depth, tuna sets hook fewer turtles than the swordfish sets. In addition, tuna sets use bait only, while swordfish fishing uses a combination of bait and lightsticks. Compared with vessels targeting swordfish or mixed species, vessels specifically targeting tuna are typically smaller and fish different grounds.

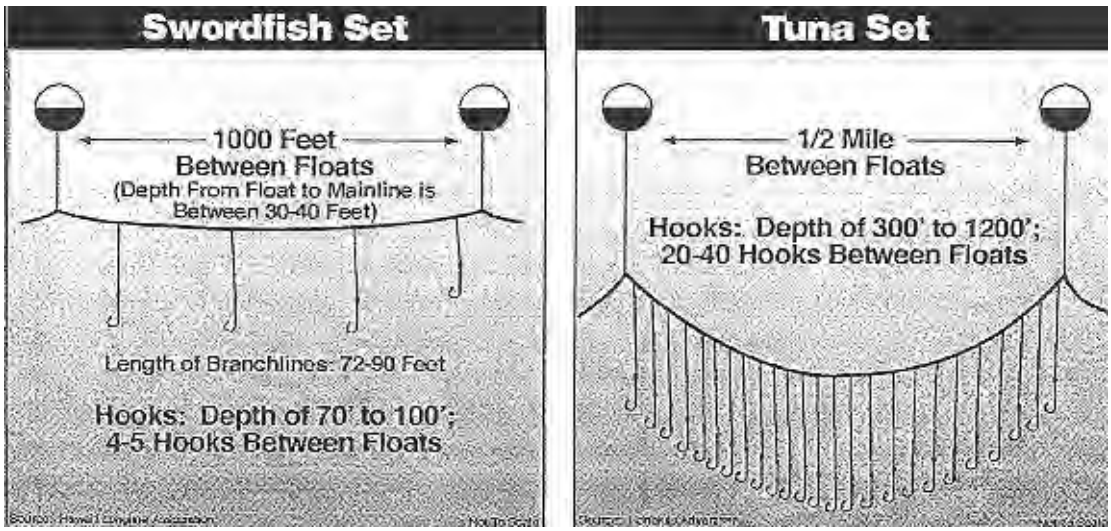


Figure 3.19 Different Pelagic Longline Gear Deployment Techniques. Source: Hawaii Longline Association and Honolulu Advertiser.

Regional U.S. Pelagic Longline Fisheries Description

The U.S. pelagic longline fishery sector is comprised of five relatively distinct segments with different fishing practices and strategies, including the Gulf of Mexico yellowfin tuna fishery, the South Atlantic-Florida east coast to Cape Hatteras swordfish fishery, the mid-Atlantic and New England swordfish and bigeye tuna fishery, the U.S. distant water swordfish fishery, and the Caribbean Islands tuna and swordfish fishery. Each vessel type has different range capabilities due to fuel capacity, hold capacity, size, and construction. In addition to geographical area, segments differ by percentage of various target and non-target species, gear characteristics, and deployment techniques. Some vessels fish in more than one fishery segment during the course of the year (NMFS, 1999).

The Gulf of Mexico Yellowfin Tuna Fishery

Gulf of Mexico vessels primarily target yellowfin tuna year-round; however, each port has one to three vessels that directly target swordfish, either seasonally or year-round. Longline fishing vessels that target yellowfin tuna in the Gulf of Mexico also catch and sell dolphin, swordfish, other tunas, and sharks. During yellowfin tuna fishing, few swordfish are captured incidentally. Many of these vessels participate in other Gulf of Mexico fisheries (targeting shrimp, shark, and snapper/grouper) during allowed seasons. Home ports for this fishery include Madiera Beach, Florida; Panama City, Florida; Dulac, Louisiana; and Venice, Louisiana (NMFS, 1999).

For catching tuna, the longline gear is configured similar to swordfish longline gear but is deployed differently. The gear is typically set out at dawn (between two a.m. and noon) and retrieved at sunset (4 p.m. to midnight). The water temperature varies based on the location of fishing. However, yellowfin tuna are targeted in the western Gulf of Mexico during the summer when water temperatures are high. In the past, fishermen have used live bait, however, NMFS prohibited the use of live bait in an effort to decrease bycatch and bycatch mortality of billfish (65 FR 47214, August 1, 2000). In this, and all other areas, except the NED, specific circle hooks (16/0 or larger non-offset and 18/0 or larger with an offset not to exceed 10 degrees) are currently required, as are whole finfish and squid baits.

The South Atlantic ~ Florida East Coast to Cape Hatteras Swordfish Fishery

South Atlantic pelagic longline vessels previously targeted swordfish year-round, although yellowfin tuna and dolphin fish were other important marketable components of the catch. In 2001 (65 FR 47214, August 1, 2000), the Florida East Coast closed area (year-round closure) and the Charleston Bump closed area (February through April closure) became effective. NMFS analyzed logbook data to determine the effectiveness of these closed areas (Sections 2.1.2 and 4.1.2).

Prior to these closures, smaller vessels used to fish short trips from the Florida Straits north to the bend in the Gulf Stream off Charleston, South Carolina (Charleston Bump). Mid-sized and larger vessels migrate seasonally on longer trips from the Yucatan Peninsula throughout the West Indies and Caribbean Sea, and some trips range as far north as the mid-Atlantic coast of the United States to target bigeye tuna and swordfish during the late summer

and fall. Fishing trips in this fishery average nine sets over 12 days. Home ports (including seasonal ports) for this fishery include Georgetown, South Carolina; Charleston, South Carolina; Fort Pierce, Florida; Pompano Beach, Florida; and Key West, Florida. This sector of the fishery consists of small to mid-size vessels, which typically sell fresh swordfish to local high-quality markets (NMFS, 1999).

The Mid-Atlantic and New England Swordfish and Bigeye Tuna Fishery

Fishing in this area has evolved during recent years to focus almost year-round on directed tuna trips, with substantial numbers of swordfish trips as well. Some vessels participate in directed bigeye/yellowfin tuna fishing during the summer and fall months and then switch to bottom longline and/or shark fishing during the winter when the large coastal shark season is open. Fishing trips in this fishery sector average 12 sets over 18 days. During the season, vessels primarily offload in the ports of New Bedford, Massachusetts; Barnegat Light, New Jersey; Ocean City, Maryland; and Wanchese, North Carolina (NMFS, 1999).

The U.S. Atlantic Distant Water Swordfish Fishery

This fishing ground covers virtually the entire span of the western north Atlantic to as far east as the Azores and the mid-Atlantic Ridge. Approximately 12 large fishing vessels operate out of mid-Atlantic and New England ports during the summer and fall months targeting swordfish and tunas, and then move to Caribbean ports during the winter and spring months. Many of the current distant water operations were among the early participants in the U.S. directed Atlantic commercial swordfish fishery. These larger vessels, with greater ranges and capacities than the coastal fishing vessels, enabled the United States to become a significant player in the north Atlantic fishery. They also fish for swordfish in the south Atlantic. The distant water vessels traditionally have been larger than their southeast counterparts because of the distances required to travel to the fishing grounds. Fishing trips in this fishery tend to be longer than in other fisheries, averaging 30 days and 16 sets. Ports for this fishery range from San Juan, Puerto Rico through Portland, Maine, and include New Bedford, Massachusetts, and Barnegat Light, New Jersey (NMFS, 1999). This segment of the fleet was directly affected by the L-shaped closure in 2000 and the NED closure in 2001. A number of vessels have recently returned to this fishery with the issuance of the July 6, 2004, rule (69 FR 40734) to reduce sea turtle bycatch and bycatch mortality. Unlike in other areas, vessels fishing in the NED are required to use 18/0 or larger circle hooks with an offset not to exceed 10 degrees and whole mackerel or squid baits.

The Caribbean Tuna and Swordfish Fishery

This fleet is similar to the southeast coastal fishing fleet in that both are comprised primarily of smaller vessels that make short trips relatively near-shore, producing high quality fresh product. Both fleets also encounter relatively high numbers of undersized swordfish at certain times of the year. Longline vessels targeting HMS in the Caribbean use fewer hooks per set, on average, fishing deeper in the water column than the distant water fleet off New England, the northeast coastal fleet, and the Gulf of Mexico yellowfin tuna fleet. This fishery is typical of most pelagic fisheries, being truly a multi-species fishery, with swordfish as a substantial portion of the total catch. Yellowfin tuna, dolphin and, to a lesser extent, bigeye tuna, are other

important components of the landed catch. Ports for this fishery include St. Croix, U.S. Virgin Islands; and San Juan, Puerto Rico. Many of these high quality fresh fish are sold to local markets to support the tourist trade in the Caribbean (NMFS, 1999).

U.S Pelagic Longline Catch, Landings, and Bycatch

U.S. pelagic longline catch (including bycatch, incidental catch, and target catch) is largely related to these vessel and gear characteristics, but is summarized for the whole fishery in Table 3.20. U.S. pelagic longline landings of Atlantic tunas and swordfish for 1999 – 2003 are summarized in Table 3.21. Additional information related to landings can be seen in Section 3.4.6.

Table 3.20 Reported Catch of Species Caught by U.S. Atlantic Pelagic Longlines, in Number of Fish, for 1999 - 2003. Source: Pelagic Longline Logbook Data.

Species	1999	2000	2001	2002	2003
Swordfish Kept	67,120	62,978	47,560	49,320	51,835
Swordfish Discarded	20,558	17,074	13,993	13,035	11,829
Blue Marlin Discarded	1,253	1,443	635	1,175	595
White Marlin Discarded	1,969	1,261	848	1,438	809
Sailfish Discarded	1,407	1,091	356	379	277
Spearfish Discarded	151	78	137	148	108
Bluefin Tuna Kept	263	235	177	178	273
Bluefin Tuna Discarded	604	737	348	585	881
Bigeye, Albacore, Yellowfin, Skipjack Tunas Kept	114,438	94,136	80,466	79,917	63,321
Pelagic Sharks Kept	2,894	3,065	3,460	2,987	3,037
Pelagic Sharks Discarded	28,967	28,046	23,813	22,828	21,705
Large Coastal Sharks Kept	6,382	7,896	6,478	4,077	5,326
Large Coastal Sharks Discarded	5,442	6,973	4,836	3,815	4,813
Dolphin Kept	31,536	29,125	27,586	30,384	29,372
Wahoo Kept	5,136	4,193	3,068	4,188	3,919
Turtles Discarded	631	271	424	465	399
Number of Hooks (X 1,000)	*7,902*	*7,976*	*7,564*	*7,150*	*7,008*

Table 3.21 Reported Landings in the U.S. Atlantic Pelagic Fishery (in mt ww) for 1999 - 2003. Source: U.S. National Report to ICCAT, 2004 (NMFS, 2004a).

Species	1999	2000	2001	2002	2003
Yellowfin Tuna	3,374	2,901	2,201	2,573	2,154
Skipjack Tuna	2.0	1.8	4.3	2.5	4.2
Bigeye Tuna	929.1	531.9	682.4	535.8	284.9
Bluefin Tuna	73.5	66.1	37.5	49.9	81.4
Albacore Tuna	194.5	147.3	193.8	155	110.9
Swordfish N.*	3,362.4	3,315.8	2,483	2,598.8	2,772.1
Swordfish S.*	185.2	143.8	43.2	199.9	20.9

* Includes landings and estimated discards from scientific observer and logbook sampling programs.

Marine Mammals

Of the marine mammals that are hooked by U.S. pelagic longline fishermen, many are released alive, although some animals suffer serious injuries and may die after being released. Marine mammals are caught primarily during the third and fourth quarters in the Mid-Atlantic Bight (MAB) and Northeast Coastal (NEC) areas (Figure 3.20). In 2004, the incidental catch was highest in the fourth quarter in the MAB area (Garrison, 2005a).

In 2000, there were 14 observed takes of marine mammals by pelagic longlines. This number has been extrapolated based on reported fishing effort to an estimated 403 mammals fleet-wide (32 common dolphin, 93 Risso's dolphin, 231 pilot whales, 19 whales, 29 pygmy sperm whales) (Yeung, 2001). Incidental catch of pilot whales on pelagic longlines is thought to result from pilot whales preying on tuna that have been caught on the gear.

In 2001 and 2002, there were 16 and 24 observed takes of marine mammals, respectively. The majority of these interactions were observed in the MAB, followed by the NED research experiment. In 2001, a total of 84 Risso's dolphin and 93 pilot whales are estimated to have been interacted with in the pelagic longline fishery. In 2002, the pelagic longline fishery is estimated to have interacted with 87 Risso's dolphin and 114 pilot whales. In the NED research experiment, an additional four Risso's dolphin and one northern bottlenose whale were recorded with serious injuries during 2001, as well as three Risso's dolphin, one unidentified dolphin, and one unidentified marine mammal in 2002. One striped dolphin was recorded as released alive during the NED experiment in 2001, as well as one Risso's dolphin, one common dolphin, one pilot whale, and one unidentified dolphin in 2002 (Garrison, 2003).

In 2003, there were 28 observed takes of marine mammals in the pelagic longline fishery. The majority of these interactions were observed in the MAB, followed by the NED experimental fishery, and the NEC area. This number has been extrapolated based on reported fishing effort to an estimated 300 mammals fleet wide (49 beaked whales, 16 dolphin, 30 Atlantic spotted dolphin, 46 common dolphin, 105 Risso's dolphin, 32 pilot whales, 22 minke whales). In addition, five Risso's dolphin, one striped dolphin, and one baleen whale were

observed captured in the 2003 NED research experiment, with one Risso's dolphin recorded as dead (Garrison and Richards, 2004).

There were a total of 12 observed interactions with marine mammals in the pelagic longline fishery in 2004. The majority of these interactions was with pilot whales and was observed in the MAB area. During 2004, the pelagic longline fishery was estimated to have interacted with 108 pilot whales, 49 Risso's dolphins, and seven common dolphins (Garrison, 2005a). Between January 1, 2005, and March 31, 2005 (Quarter 1, 2005), a total of 178 pelagic longline sets (132,480 hooks) were observed. There were two marine mammal interactions observed (1 bottlenose dolphin and 1 Risso's dolphin), with both marine mammals being released uninjured. These interactions were observed in the South Atlantic Bight (SAB) and Gulf of Mexico (GOM) areas (Garrison, 2005b). NMFS monitors observed interactions with sea turtles and marine mammals on a quarterly basis and reviews data for appropriate action, if any, as necessary.

Sea Turtles

Currently, many sea turtles are taken in the GOM and NEC areas (Figure 3.20) and most are released alive. In the past, the bycatch rate was highest in the third and fourth quarters. Loggerhead and leatherback turtles dominate the catch of sea turtles. In general, sea turtle captures are rare, but takes appear to be clustered (Hoey and Moore, 1999).

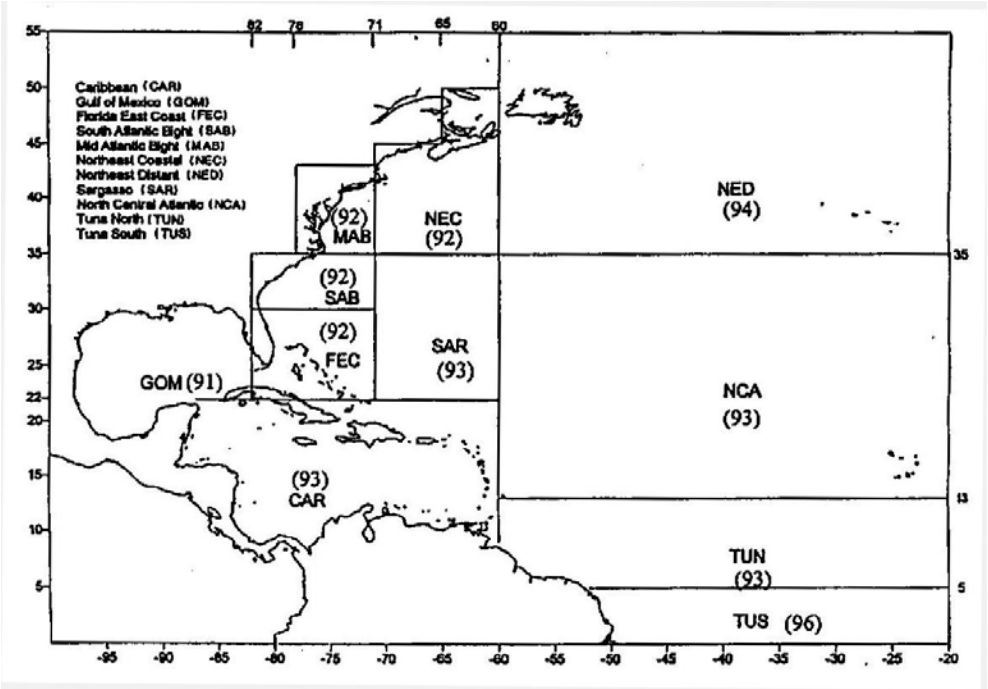


Figure 3.20 Geographic Areas Used in Summaries of Pelagic Logbook Data. Source: Cramer and Adams, 2000

The estimated take levels for 2000 were 1,256 loggerhead and 769 leatherback sea turtles (Yeung, 2001). For 2001, the estimated take levels outside of the NED closed area were 312 loggerhead and 1,208 leatherback sea turtles. For 2002, the estimated take levels outside of the

NED closed area were 575 loggerhead and 962 leatherback sea turtles (Garrison, 2003). In 2003, the estimated take levels outside the NED closed area were 727 loggerhead and 1,112 leatherback sea turtles, with greatest number of takes occurring in the GOM (Garrison and Richards, 2004). In 2004, the pelagic longline fishery interacted with an estimated 1,359 leatherback sea turtles, with the greatest number of interactions occurring in the GOM. Additionally, there were an estimated 734 interactions with loggerhead sea turtles, with the majority of these interactions occurring in the SAB, NEC, Florida East Coast (FEC), and MAB areas (Garrison, 2005a). During Quarter 1, 2005, there were nine observed interactions with leatherback sea turtles and seven interactions with loggerhead sea turtles. The sea turtles observed during this period were each listed as released alive and injured. The majority of interactions with both sea turtle species were observed in the GOM area (Garrison, 2005b). NMFS monitors observed interactions with sea turtles and marine mammals on a quarterly basis and reviews data for appropriate action, if any, as necessary.

As a result of the increased sea turtle interactions in 2001 and 2002, NMFS reinitiated consultation for the pelagic longline fishery and completed a new BiOp on June 1, 2004. The June 2004 BiOp concluded that long-term continued operation of the Atlantic pelagic longline fishery is not likely to jeopardize the continued existence of loggerhead, green, hawksbill, Kemp's ridley, or olive ridley sea turtles, but is likely to jeopardize the continued existence of leatherback sea turtles. The BiOp included a reasonable and prudent alternative (RPA) and an incidental take statement (ITS) for the combined years 2004 – 2006, and for each subsequent three-year period (NMFS, 2004b).

A final rule published in July 2004 (69 FR 40734) prohibited the possession of "J"-style hooks in the pelagic longline fishery and required the possession and use of specific sea turtle release and disentanglement gears, handling and release protocols, as well as requiring the use of specific circle hooks and baits.

NED Research Experiment

Consistent with the conservation recommendation of an earlier, 2001 BiOp, NMFS initiated a research experiment in the NED area in consultation and cooperation with the domestic pelagic longline fleet. The goal was to develop and evaluate the efficacy of new technologies and changes in fishing practices to reduce sea turtle interactions. In 2001, the experiment attempted to evaluate the effect of gangions placed two gangion lengths from floatlines, the effect of blue-dyed bait on target catch and sea turtle interactions, and the effectiveness of dipnets, line clippers, and dehooking devices. Eight vessels participated, making 186 sets, between August and November. During the course of the research experiment, 142 loggerhead and 77 leatherback sea turtles were incidentally captured and no turtles were released dead.

The data gathered during the 2001 experiment were analyzed to determine if the tested measures reduced the incidental capture of sea turtles by a statistically significant amount. The blue-dyed bait parameter decreased the catch of loggerheads by 9.5 percent and increased the catch of leatherbacks by 45 percent. Neither value is statistically significant. In examining the gangion placement provision, the treatment sections of the gear (with gangions placed 20 fathoms from floatlines) did not display a statistically significant reduction in the number of

loggerhead and leatherback sea turtle interactions than the control sections of the gear (with a gangion located under a floatline). The treatment section of the gear recorded an insignificant increase in the number of leatherback interactions. Following an examination of the data, NMFS discovered that the measures had no significant effect upon the catch of sea turtles (Watson *et al.*, 2003).

Dipnets and line clippers were examined for general effectiveness. The dipnets were found to be adequate in boating loggerhead sea turtles. Several line clippers were tested, with the La Force line clipper having the best performance. Several types of dehooking devices were tested, with the work on these devices continuing in the 2002 and 2003 NED research experiment.

In the summer and fall of 2002, NMFS conducted the second year of the research experiment. The use of circle and "J"-hooks, whole mackerel bait, squid bait, and shortened daylight soak time were tested to examine their effectiveness in reducing the capture of sea turtles. The data indicate there were 501 sets made by 13 vessels with 100 percent observer coverage. During the course of the experiment, 100 loggerhead and 158 leatherback sea turtles were captured and 11 were tagged with satellite tags. In addition to the sea turtles, the vessels interacted with one unidentified marine mammal, one unidentified dolphin, one common dolphin, one longfin pilot whale, and four Risso's dolphins; all were released alive (Watson *et al.*, 2003).

In 2003, the research experiment tested a number of treatments to verify the results of the 2002 experiment in addition to testing additional treatments. Data indicate that there were 539 sets made by 11 vessels with 100 percent observer coverage. During the course of the experiment, one olive ridley, 92 loggerhead, and 79 leatherback sea turtles were captured; all were released alive (Foster *et al.*, 2004; Watson *et al.*, 2004). In addition to the sea turtles, the vessels interacted with one striped dolphin, one baleen whale, and five Risso's dolphin resulting in one mortality (Garrison and Richards, 2004).

From 2001 through 2003, NMFS worked with the commercial fishing industry to develop new pelagic longline fishing technology to reduce interaction rates and bycatch mortality of threatened and endangered sea turtles. The cooperative gear technology research investigated line configurations, setting and retrieving procedures, hook types, hook sizes, bait types, and release and disentanglement gears. Ultimately, specific hook designs and bait types were found to be the most effective measures for reducing sea turtle interactions. Large circle hooks and mackerel baits were found to substantially reduce sea turtle interactions over the use of the industry standard "J"-hooks and squid baits. The gears developed to remove hooks and line from hooked and entangled sea turtles are anticipated to reduce post-hooking mortality associated with those interactions not avoided. Since the conclusion of the NED research experiment, NMFS has continued to investigate pelagic longline bycatch mitigation techniques in the Gulf of Mexico, Atlantic Ocean, and the Caribbean Sea. Additionally, NMFS held a series of voluntary workshops for U.S. pelagic longline fishermen providing outreach and training in sea turtle handling and release techniques.

NMFS believes that the transfer of this information to other fishing countries will result in significant reductions in interaction rates and post-release mortalities of threatened and endangered sea turtles throughout their ranges.

Seabirds

Gannets, gulls, greater shearwaters, and storm petrels are occasionally hooked by Atlantic pelagic longlines. These species and all other seabirds are protected under the Migratory Bird Treaty Act. Seabird populations are often slow to recover from excess mortality as a consequence of their low reproductive potential (one egg per year and late sexual maturation). According to NMFS observer data from 2003, three unidentified seabirds were observed hooked between January and September. The majority of longline interactions with seabirds occur as the gear is being set. The birds eat the bait and become hooked on the line. The line then sinks and the birds are subsequently drowned.

The United States has developed a National Plan of Action in response to the Food and Agriculture Organization of the United Nations (FAO) International Plan of Action to reduce the incidental take of seabirds (www.nmfs.gov.gov/NPOA-S.html). Although Atlantic pelagic longline interactions will be considered in the plan, NMFS has not identified a need to implement gear modifications to reduce seabird takes by Atlantic pelagic longlines. Takes of seabirds have been minimal in the fishery, most likely due to the setting of longlines at night and/or fishing in areas where birds are largely absent. Observed seabird bycatch in the Atlantic pelagic longline fishery from 1999 - 2003 can be seen in Section 3.8.

Finfish

In the U.S. pelagic longline fishery, fish are discarded for a variety reasons. Swordfish, yellowfin tuna, and bigeye tuna may be discarded because they are undersized or unmarketable (*e.g.*, shark bitten). Blue sharks, as well as other species, are discarded because of a limited markets (resulting in low prices) and perishability of the product. Large coastal sharks are discarded during times when the shark season is closed. Bluefin tuna may be discarded because target catch requirements for other species have not been met. Also, all billfish are required to be released. In the past, swordfish have been discarded when the swordfish season was closed. Reported catch from 1999 – 2003 for the U.S. pelagic longline fishery (including reported bycatch, incidental catch, and target catch) is summarized in Table 3.20. Additional U.S. landings and discard data are available in the 2004 U.S. National Report to ICCAT (NMFS, 2004a).

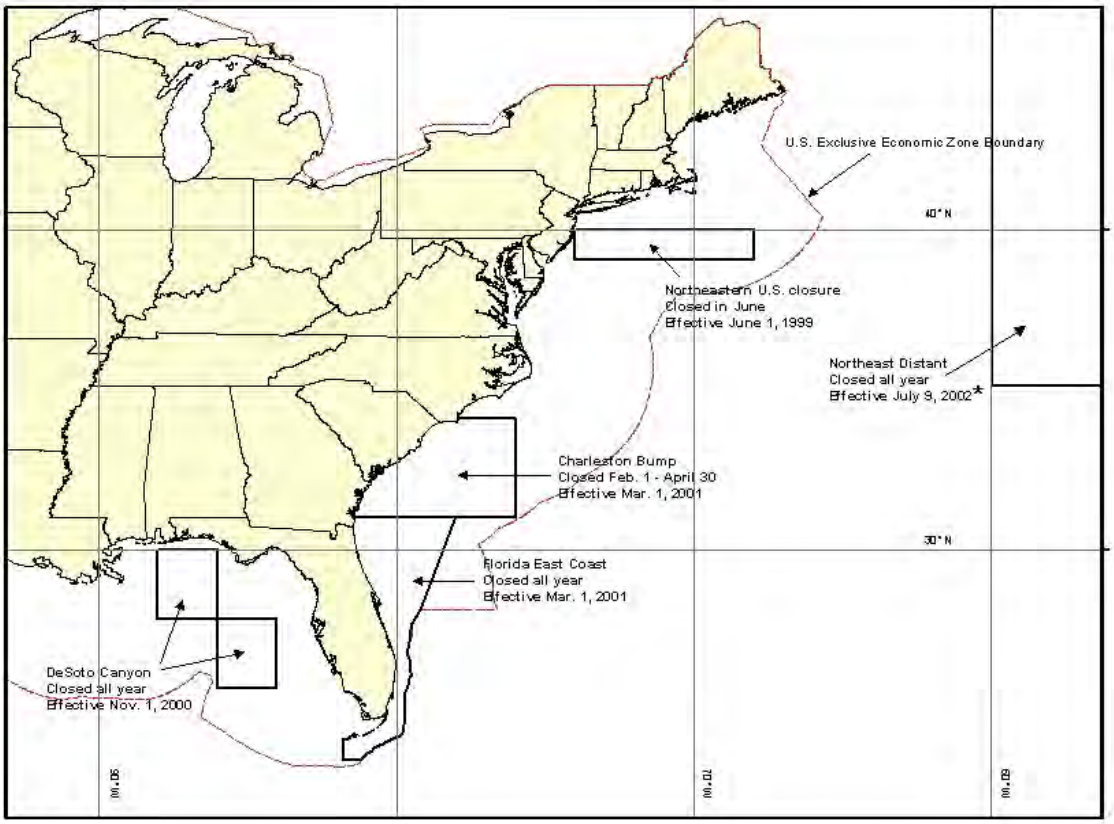
At this time, direct use of observer data with pooling for estimating dead discards in this fishery represents the best scientific information available for use in stock assessments. Direct use of observer data has been employed for a number of years to estimate dead discards in Atlantic and Pacific longline fisheries, including billfish, sharks, and undersized swordfish. Furthermore, the data have been used for scientific analyses by both ICCAT and the Inter-American Tropical Tuna Commission (IATTC) for a number of years.

Bycatch mortality of marlins, swordfish, and bluefin tuna from all fishing nations may significantly reduce the ability of these populations to rebuild, and it remains an important

management issue. In order to minimize bycatch and bycatch mortality in the domestic pelagic longline fishery, NMFS implemented regulations to close areas to longline (Figure 3.21) and has banned the use of live bait by longline vessels in the Gulf of Mexico.

As part of the BFT rebuilding program, ICCAT recommends an allowance for dead discards. The U.S. annual dead discard allowance is 68 mt ww. The estimate for the 2003 calendar year was used as a proxy to calculate the amount to be added to, or subtracted from, the U.S. BFT landings quota for 2004. The 2003 calendar year preliminary estimate of U.S. dead discards, as reported per the longline discards calculated from logbook tallies, adjusted as warranted when observer counts in quarterly/geographic stratum exceeded logbook reports, totaled 52.4 mt ww. Estimates of dead discards from other gear types and fishing sectors that do not use the pelagic longline vessel logbook are unavailable at this time, and thus, are not included in this calculation. As U.S. fishing activity is estimated to have resulted in fewer dead discards than its allowance, the ICCAT recommendation and U.S. regulations state that the United States may add one half of the difference between the amount of dead discards and the allowance (*e.g.*, 68.0 mt – 52.4 mt = 15.6 mt, 15.6 mt/2 = 7.8 mt ww) to its total allowed landings for the following fishing year, to individual fishing categories, or to the Reserve category. NMFS proposes to allocate the 7.8 mt ww to the Reserve category quota to assist in covering potential overharvests from the previous fishing years.

The 2002 calendar year preliminary dead discard estimate, as reported in pelagic longline vessel logbooks and published in 2003 Final Initial Quota Specifications (68 FR 56783, October 2, 2003), totaled 38.0 mt ww. This preliminary estimate has been revised using the longline discards calculated from logbook tallies, adjusted as warranted when observer counts in stratum exceeded logbook reports. The revised 2002 calendar year dead discard estimate is 41.6 mt ww.



* Closed except to vessels complying with specific conditions (see 50 CFR 635 for details).

Figure 3.21 Areas Closed to Pelagic Longline Fishing by U.S. Flagged Vessels

3.4.1.2 International Aspects of the Atlantic Pelagic Longline Fishery

Pelagic longline fisheries for Atlantic HMS primarily target swordfish and tunas. Directed pelagic longline fisheries in the Atlantic have been operated by Spain, the United States, and Canada since the late 1950s or early 1960s. The Japanese pelagic longline tuna fishery started in 1956 and has operated throughout the Atlantic since then (NMFS, 1999). Most of the 35 other ICCAT nations now also operate pelagic longline vessels.

ICCAT generally establishes management recommendations on a species (*e.g.* swordfish) or issue basis (*e.g.* data collection) rather than by gear type. For example, ICCAT typically establishes quotas or landing limits by species, not gear type. In terms of data collection, ICCAT may require use of specific collection protocols or specific observer coverage levels in certain fisheries or on vessels of a certain size, but these are usually applicable to all gears, and not specific to any one gear type. However, there are a handful of management recommendations that are specifically applicable to the international pelagic longline fishery. These include, a prohibition on longlining in the Mediterranean Sea in June and July by vessels over 24 meters in length, a prohibition on pelagic longline fishing for bluefin tuna in the Gulf of Mexico, and mandated reductions in Atlantic white and blue marlin landings for pelagic longline and purse seine vessels from specified levels, among others.

Because most ICCAT management recommendations pertain to individual species or issues, as discussed above, it is often difficult to obtain information specific to the international pelagic longline fishery. For example, a discussion of authorized total allowable catches (TAC) for specific species in this section of the document would be of limited utility because it is not possible to identify what percentage of quotas are allocated to pelagic longline. Division of quota, by gear type, is typically done by individual countries.

Nevertheless, ICCAT does report landings by gear type. Available data indicate that longline effort produces the second highest volume of catch and effort, and is the most broadly distributed (longitudinally and latitudinally) of the gears used to target ICCAT managed species (Figure 3.22) (SCRS, 2004). Purse seines produce the highest volume of catch of ICCAT managed species from the Atlantic (SCRS, 2004). From 1999 through 2002 (inclusive) there was a declining trend in estimated international landings of HMS for fisheries in which the United States participated. In 2003, international landings of HMS for fisheries in which the U.S. participated totaled 113,826 mt, which represented a modest increase over 2002 (SCRS, 2004). Detailed information on international Atlantic pelagic longline catches can be found in Table 3.23.

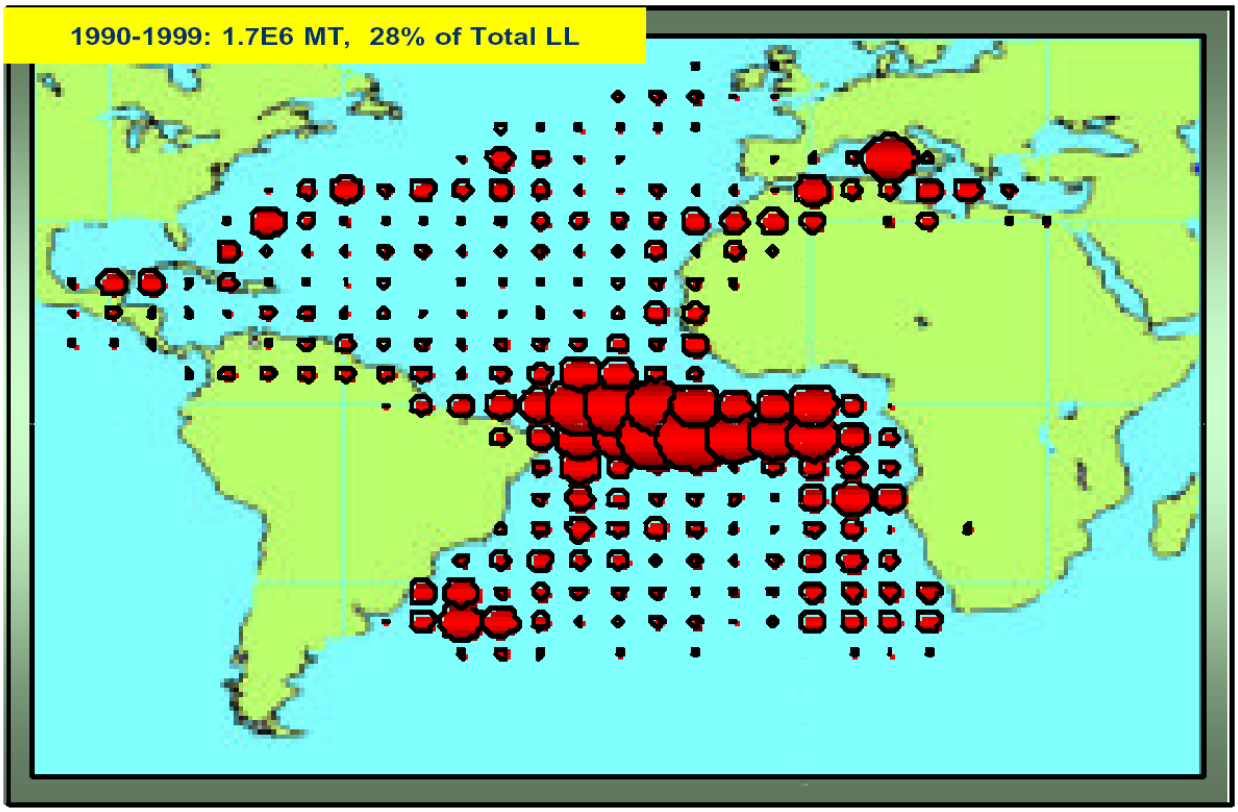


Figure 3.22 Distribution of Atlantic Longline Catches for all Countries 1990-1999. Source: SCRS, 2004

Scientific observer data are being collected on a range of pelagic longline fleets in the Atlantic and will be increasingly useful in better quantifying total catch, catch composition, and disposition of catch as these observer programs mature. Previous ICCAT observer coverage requirements of five percent for non-purse seine vessels that participated in the bigeye and yellowfin tuna fishery, including pelagic longline (per ICCAT Recommendation 96-01), are no longer in force. There is currently no ICCAT required minimum level of observer coverage specific to pelagic longline fishing. Japan is required to have eight percent observer coverage of its vessels fishing for swordfish in the North Atlantic, which are primarily pelagic longline vessels, however, the recommendation is not specific to vessel or gear type. ICCAT recommendation 04-01, a conservation and management recommendation for the bigeye tuna fishery, will enter into force in mid-2005 and requires at least five percent observer coverage of pelagic longline vessels over 24 meters fishing for bigeye.

ICCAT has also developed a running tabulation of the diversity of species caught by the various gears used to target tunas and tuna like species in the Atlantic and Mediterranean (Table 3.22). For all fish species, longline gear shows the highest documented diversity of catch, followed by gillnets and purse seine. For seabirds, longline gear again shows the highest diversity of catch, while for sea turtles and marine mammals, purse seine and gillnet have a higher documented diversity of species for Atlantic tuna fleets (SCRS, 2004).

Table 3.22 ICCAT Bycatch Table (LL, longline; GILL, gillnets; PS, purse-seine; BB, baitboat; HARP, harpoon; Trap, traps). Source: SCRS 2004.

ICCAT Bycatch Table (www.iccat.es)

Count	Group	LL	GILL	PS	BB	HARP	TRAP	OTHER
214	*All Groups*	149	110	78	12	33	20	43
		69.6%	51.4%	36.4%	5.6%	15.4%	9.3%	20.1%
12	*Skates and Rays*	10	6	6	0	2	0	1
		83.3%	50.0%	50.0%	0.0%	16.7%	0.0%	8.3%
46	*Coastal Sharks*	45	19	6	1	7	2	9
		97.8%	41.3%	13.0%	2.2%	15.2%	4.3%	19.6%
11	*Pelagic Sharks*	10	7	5	0	5	2	4
		90.9%	63.6%	45.5%	0.0%	45.5%	18.2%	36.4%
23	*Teleosts (ICCAT Species)*	23	18	16	9	6	7	11
		100.0%	78.3%	69.6%	39.1%	26.1%	30.4%	47.8%
82	*Teleosts (excluding Scombridae and billfishes)*	44	37	25	2	5	4	17
		53.7%	45.1%	30.5%	2.4%	6.1%	4.9%	20.7%
5	*Sea Turtles*	3	4	5	0	2	1	1
		60.0%	80.0%	100.0%	0.0%	40.0%	20.0%	20.0%
9	*Sea Birds*	8	2	0	0	0	0	0
		88.9%	22.2%	0.0%	0.0%	0.0%	0.0%	0.0%
26	*Marine Mammals*	6	17	15	0	6	4	0
		23.1%	65.4%	57.7%	0.0%	23.1%	15.4%	0.0%

3.4.1.3 U.S. Pelagic Longline Catch in Relation to International Catch

Highly Migratory Species

The U.S. fleet is a small part of the international fleet that competes on the high seas for catches of tunas and swordfish (Table 3.23). Although the U.S. fleet landed as much as 35 percent of the swordfish from the North Atlantic, north of 5° N. latitude in 1990, this proportion decreased to 24.3 percent by 2001. For tunas, the U.S. proportion of landings was 23 percent in 1990, decreasing to 9.4 percent of total Atlantic tuna catches by 2001 (NMFS, 2003a). In 2002, the U.S fleet landed 27.6 percent of the swordfish from the North Atlantic, and 11.5 percent of total Atlantic tuna catches (NMFS, 2004c). In recent years, the proportion of U.S. pelagic longline landings of HMS, for the fisheries in which the United States participates, has remained relatively stable in proportion to international landings (Table 3.23). The U.S. fleet accounts for less than 0.5 percent of the landings of swordfish and tuna from the Atlantic Ocean south of 5° N. latitude, and does not operate at all in the Mediterranean Sea. Tuna and swordfish landings by foreign fleets operating in the tropical Atlantic and Mediterranean are greater than the catches from the north Atlantic area where the U.S. fleet operates. Even within the area where the U.S. fleet operates, the U.S. portion of fishing effort (in numbers of hooks fished) is less than 10 percent of the entire international fleet's effort, and likely less than that due to differences in reporting effort between ICCAT countries (NMFS, 2001b).

Table 3.23 Estimated International Longline Landings of HMS, Other than Sharks, for All Countries in the Atlantic: 1999 - 2003 (mt ww)[1]. Source: SCRS, 2004.

	1999	2000	2001	2002	2003
Swordfish (N. Atl + S. Atl)	25,201	24,990	22,562	22,127	20,788
Yellowfin Tuna (W. Atl)[2]	11,596	11,465	12,684	11,578	10,178
Bigeye Tuna	76,513	70,976	55,162	46,509	51,606
Bluefin Tuna (W. Atl.)[2]	914	859	610	727	188
Albacore Tuna (N. Atl + S. Atl)	27,209	28,881	29,667	27,779	27,879
Skipjack Tuna (N. Atl + S. Atl)	51	60	70	109	106
Blue Marlin (N. Atl. + S. Atl.)[3]	2,359	2,187	1,638	1,337	1,671
White Marlin (N. Atl. + S. Atl.)[3]	981	893	593	730	557
Sailfish (W. Atl.)[3]	524	811	812	1,271	853
Total	**145,348**	**141,122**	**123,798**	**112,167**	**113,826**
U.S. Longline Landings (from 2003 and 2004 U.S. Natl. Report)[4]	**8,331.1**	**7,253.5**	**5,695.3**	**6,203.9**	**5,468.4**
U.S. Longline Landings as a Percent of Total Longline Landings	**5.7**	**5.1**	**4.6**	**5.5**	**4.8**

[1]Landings include those classified by the SCRS as longline landings for all areas

[2]Note that the United States has not reported participation in the E. Atl yellowfin tuna fishery since 1983 and has not participated in the E. Atl bluefin tuna fishery since 1982.
[3]Includes U.S. *dead discards.*
[4]Includes swordfish, blue marlin, white marlin, and sailfish longline discards.

Sea Turtles

From 1999 to 2003, the U.S. pelagic longline fleet targeting HMS captured an average of 772 loggerhead and 1,013 leatherback sea turtles per year, based on observed takes and total reported effort. In 2004, the U.S. pelagic longline fleet was estimated to have captured 734 loggerhead and 1,359 leatherback sea turtles (Garrison, 2005a). Since other ICCAT nations do not monitor incidental catches of sea turtles, an exact assessment of their impact is not possible. However, high absolute numbers of sea turtle catches in the foreign fleets have been reported from other sources (NMFS, 2001b). Throughout the Atlantic basin, including the Mediterranean Sea, a total of 210,000 – 280,000 loggerhead and 30,250 – 70,000 leatherback sea turtles are estimated to be captured by pelagic longline fisheries each year (Lewiston *et al*., 2004).

Mortality in the domestic and foreign pelagic longline fisheries is just one of numerous factors affecting sea turtle populations in the Atlantic (National Research Council, 1990). Many sources of anthropogenic mortality are outside of U.S. jurisdiction and control. If the U.S. swordfish quota was relinquished to other fishing nations, the effort now expended by the U.S. fleet would likely be replaced by foreign effort. This could significantly alter the U.S. position at ICCAT and make the implementation of international conservation efforts more difficult. This would also eliminate the option of gear or other experimentation with the U.S. longline fleet, thus making it difficult to find take reduction solutions which could be transferred to other longlining nations to effect a greater global reduction in sea turtle takes in pelagic longline fisheries. The United States has, and will continue to make efforts at ICCAT, Inter-American Tropical Tuna Commission (IATTC), and other international forums, to encourage adoption of sea turtle conservation measures by international fishing fleets.

The first international agreement devoted solely to the protection of sea turtles – the Inter-American Convention for the Protection and Conservation of Sea Turtles - was concluded on September 5, 1996, in Salvador, Brazil, and entered into force in May 2001. The Inter-American Convention called for the Parties to establish national sea turtle conservation programs. In addition to domestic rulemaking in various fisheries, NMFS has been active at the international level in promoting sea turtle conservation efforts. A summery of some of these efforts is provided below.

In February 2003, the United States supported a workshop consisting of technical experts on sea turtle biology and longline fishery operations from interested nations in order to share information and discuss possible solutions to reduce incidental capture of marine turtles in these fisheries. The United States introduced the NED sea turtle bycatch mitigation research at the November 2003, ICCAT meeting in Dublin, Ireland, and co-sponsored ICCAT Resolution 03-11 which encouraged other nations to improve data collection and reporting on sea turtle bycatch and promote the safe handling and release of incidentally captured sea turtles. A poster and video describing the NED research experiment and preliminary results were displayed, as well as many of the experimentally tested release gears.

In January 2004, the Northeast Distant Waters Longline Research ad hoc advisory group met in Miami, Florida. The purpose of this meeting was to present a summary of the 2001 and 2002 NED pelagic longline sea turtle bycatch mitigation research and the preliminary results for the 2003 research, and to discuss future research needs. Also in January 2004, the IATTC - CIAT Bycatch Working Group met in Kobe, Japan. The purpose of U.S. attendance at this meeting was to present results of sea turtle mitigation research by the U.S, to hear research results on bycatch mitigation from other countries, to encourage IATTC countries to evaluate or adopt sea turtle mitigation technology in their fisheries, and to address other bycatch issues in longline fisheries. A Workshop was held in conjunction with the Sea Turtle Symposium in San Jose, Costa Rica in February 2004. The focus of this workshop was on providing information on the safe release of sea turtles to participants from nations with longline fleets. In June 2004, NMFS SEFSC staff conducted longline mitigation training and workshops in Peru, in cooperation with the IATTC. In August 2004, a workshop was held in Panama on conducting circle hook experiments similar to those undertaken in Ecuador (see description below) and on the use of dehooking devices and safe handling and release techniques. Also in August 2004, a workshop was held in Guatemala on conducting circle hook experiments similar to Ecuador and on the use of dehooking devices, safe handling and release techniques. In October 2004, Southwest Fisheries Science Center (SWFSC) staff followed up on a training workshop held in 2003 in cooperation with the Instituo del Mar del Peru (IMARPE) for fisheries observers, by working with Peruvian researchers to initiate circle hook implementation and experiments in the artisanal dolphin and shark fisheries.

At the Annual ICCAT meeting in New Orleans in November 2004, NMFS staff conducted a workshop discussing experimental results and the use of circle hooks, the use of dehooking devices, and safe handling and release techniques. Also in November, a workshop was conducted at the meeting of the Gulf and Caribbean Fisheries Institute in Saint Petersburg, Florida.

In collaboration with the World Wildlife Fund (WWF), IATTC, and the Western Pacific Regional Fishery Management Council (WPRFMC), NMFS provided hooks, dehooking devices, and technical assistance to Ecuador for the testing of non-offset 14/0 and 15/0 circle hooks in the dolphin fishery and 10 degree offset 16/0 and 18/0 circle hooks in the tuna/shark fisheries. Work began in March 2004 and initial results indicate that the majority of the bycatch is entangled, not hooked. Pacific Islands Fisheries Science Center (PIFSC) staff has been consulting with WPRFMC, Blue Ocean Institute, and Japan on a cooperative research design to test the efficiency of circle hooks in the Japanese tuna fishery. A draft research plan was reviewed in May 2004, and a meeting to refine the draft was held in Honolulu in Sept 2004. In June 2004, NMFS staff gave a presentation promoting cooperative research and the use of circle hooks at a Symposium on Bycatch Reduction hosted by the National Fisheries Research and Development Institute (NFRDI) in Korea.

The first Technical Assistance Workshop on Sea Turtle Bycatch Reduction Experiments in Longline Fisheries was held in April 2005, in Honolulu. This workshop was held to provide technical assistance for participants from the FAO Technical Consultation to design programs for the development and testing of turtle bycatch reducing technology appropriate to the longline

fisheries of participating nations. The Third International Fishers Forum was held in Yokahama, Japan in July 2005, and United States and regional research results on sea turtle bycatch avoidance methods were presented.

3.4.1.4 Management of the U.S. Pelagic Longline Fishery

The U.S. Atlantic pelagic longline fishery is restricted by a limited swordfish quota, divided between the North and South Atlantic (separated at 5° N. lat.). Other regulations include minimum sizes for swordfish, yellowfin, bigeye, and bluefin tuna, limited access permitting, bluefin tuna catch requirements, shark quotas, protected species incidental take limits, reporting requirements (including logbooks), and gear and bait requirements. Current billfish regulations prohibit the retention of billfish by commercial vessels, or the sale of billfish from the Atlantic Ocean. As a result, all billfish hooked on longlines must be discarded, and are considered bycatch. This is a heavily managed gear type and, as such, is strictly monitored. Because it is difficult for pelagic longline fishermen to avoid undersized fish in some areas, NMFS has closed areas in the Gulf of Mexico and along the east coast. The intent of these closures is to relocate some of the fishing effort into areas where bycatch is expected to be lower. There are also time/area closures for pelagic longline fishermen designed to reduce the incidental catch of bluefin tuna and sea turtles. In order to enforce time/area closures and to monitor the fishery, NMFS requires all pelagic longline vessels to report positions on an approved vessel monitoring system (VMS).

In June 2004, NMFS conditionally re-opened the NED to pelagic longline fishing. NMFS limited vessels with pelagic longline gear onboard in that area, at all times, to possessing onboard and/or using only 18/0 or larger circle hooks with an offset not to exceed 10 degrees. Only whole mackerel and squid baits may be possessed and or utilized with allowable hooks. In August of 2004, NMFS limited vessels with pelagic longline gear onboard, at all times, in all areas open to pelagic longline fishing, excluding the NED, to possessing onboard and/or using only 16/0 or larger non-offset circle hooks and/or 18/0 or larger circle hooks with an offset not to exceed 10 degrees. Only whole finfish and squid baits may be possessed and/or utilized with allowable hooks. All pelagic longline vessels must possess and use sea turtle handling and release gear in compliance with NMFS careful release protocols.

Permits

The 1999 FMP established six different limited access permit types: 1) directed swordfish, 2) incidental swordfish, 3) swordfish handgear, 4) directed shark, 5) incidental shark, and 6) tuna longline. To reduce bycatch concerns in the pelagic longline fishery, these permits were designed so that the swordfish directed and incidental permits are valid only if the permit holder also holds both a tuna longline and a shark permit. Similarly, the tuna longline permit is valid only if the permit holder also holds both a swordfish (directed or incidental, not handgear) and a shark permit.

As of April 2005, approximately 222 tuna longline limited access permits had been issued. In addition, approximately 189 directed swordfish limited access permits, 90 incidental swordfish limited access permits, 229 directed shark limited access permits, and 321 incidental shark limited access permits had been issued. Vessels with limited access swordfish and shark

permits do not necessarily use pelagic longline gear, but these are the only permits that allow for the use of pelagic longline gear.

Monitoring and Reporting

Pelagic longline fishermen and the dealers who purchase HMS from them are subject to reporting requirements. NMFS has extended dealer reporting requirements to all swordfish importers as well as dealers who buy domestic swordfish from the Atlantic. These data are used to evaluate the impacts of harvesting on the stock and the impacts of regulations on affected entities.

Commercial HMS fisheries are monitored through a combination of vessel logbooks, dealer reports, port sampling, cooperative agreements with states, and scientific observer coverage. Logbooks contain information on fishing vessel activity, including dates of trips, number of sets, area fished, number of fish, and other marine species caught, released and retained. In some cases, social and economic data such as volume and cost of fishing inputs are also required.

Pelagic Longline Observer Program

In 2004, NMFS observers recorded 702 pelagic longline sets for an overall coverage of 7.3 percent. During the first and second quarters of 2004, 60 experimental sets employing circle hooks were made in the Gulf of Mexico (GME). These sets had 100 percent observer coverage (Garrison, 2005a). One thousand eighty-eight pelagic longline sets were observed and recorded by NMFS observers in 2003 (11.5 percent overall coverage – 100 percent coverage in the NED; and 6.2percent coverage in remaining areas) (Garrison and Richard, 2004). Table 3.24 details the amount of observer coverage in past years for this fleet. Generally, due to logistical problems, it has not always been possible to place observers on all selected trips. NMFS is working towards improving compliance with observer requirements and facilitating communication between vessel operators and observer program coordinators. In addition, fishermen are reminded of the safety requirements for the placement of observers specified at 50 CFR 600.746, and the need to have all safety equipment on board required by the U.S. Coast Guard.

Table 3.24 Observer Coverage of the Pelagic Longline Fishery. Source: Yeung, 2001; Garrison, 2003; Garrison and Richards, 2004; Garrison, 2005a.

Year	**Number of Sets Observed**			**Percentage of Total Number of Sets**		
1999	420			3.8		
2000	464			4.2		
	Total	Non-NED	NED	Total	Non-NED	NED
2001*	584	398	186	5.4	3.8	100.0
2002*	856	353	503	8.9	3.7	100.0
2003*	1088	552	536	11.5	6.2	100.0
	Total	Non-GME	GME	Total	Non-GME	GME
2004**	702	642	60	7.3	6.7	100.0

*In 2001, 2002, and 2003, 100 percent observer coverage was required in the NED research experiment.
** In 2004 there was 100 percent observer coverage in the GME.

Safety Issues Associated with the Fishery

Like all offshore fisheries, pelagic longlining can be dangerous. Trips are often long, the work is arduous, and the nature of setting and hauling longline gear may result in injury or death. Like all other HMS fisheries, longline fishermen are exposed to unpredictable weather. NMFS does not wish to exacerbate unsafe conditions through the implementation of regulations. Therefore, NMFS considers safety factors when implementing management measures on pelagic longline fishermen. For example, all time/area closures are expected to be closed to fishing, not transiting, in order to allow fishermen to make a direct route to and from fishing grounds. NMFS seeks comments from fishermen on any safety concerns they may have. Fishermen have pointed out that, due to decreasing profit margins, they may fish with less crew or less experienced crew or may not have the time or money to complete necessary maintenance tasks. NMFS encourages fishermen to be responsible in fishing and maintenance activities.

3.4.2 Purse Seine

3.4.2.1 Overview of History and Current Management

Purse seine gear consists of a floated and weighted encircling net that is closed by means of a drawstring threaded through rings attached to the bottom of the net. The efficiency of this gear is enhanced by the assistance of spotter planes used to locate schools of tuna. Once a school is spotted, the vessel intercepts and uses the large net to encircle it, with the aid of a smaller skiff. Once encircled, the drawstring is pulled, closing the bottom of the net and preventing escape. The net is then lifted next to the vessel where the tunas are removed and placed onboard the larger vessel. Domestic aspects of the Atlantic tunas purse seine fisheries are described in Section 2.2.3 of the 1999 FMP. Economic and social aspects of the fisheries are described in Sections 3.5and 3.6 of this document, respectively.

Vessels using purse seine nets have participated in the U.S. fishery for BFT continuously since the 1950s, although a number of purse seine vessels did target and land BFT off the coast of Gloucester, MA as early as the 1930s. A limited entry system with non-transferable individual vessel quotas (IVQs) for purse seining was established in 1982, effectively excluding any new entrants to this category. Equal baseline quotas are assigned to individual vessels by regulation; the IVQ system is possible given the small pool of ownership in this sector of the fishery. Currently, only five vessels comprise the BFT purse seine fleet and the quotas were made transferable among the five vessels in 1996. Over the last few years, the Purse seine category has not fully harvested its allocated quota. This can be attributed to a number of different reasons outside of the industry's or NMFS' control. NMFS has issued several EFPs to address this issue and will continue to assess current regulations and their impact on providing reasonable opportunities to harvest available quota. In late December 2004, NMFS transferred 100 mt from the Purse seine category to the Reserve category (70 FR 302, January 3, 2005).

3.4.2.2 Most Recent Catch and Landings Data

Table 3.25shows purse seine landings of Atlantic tunas from 1999 through 2003. Purse seine landings make up approximately 20 percent of the total annual U.S. landings of BFT (about 25 percent of total commercial landings), but account for only a small percentage, if any, of the landings of other HMS. In the 1980s and early 1990s, purse seine landings of yellowfin tuna were often over several hundred metric tons. Over 4,000 mt ww of yellowfin were recorded landed in 1985. In recent years, via informal gentlemen's agreements with other sectors of the tuna industry, the purse seine fleet has opted not to direct any effort on HMS other than BFT.

Table 3.25 Domestic Atlantic Tuna Landings for the Purse Seine Fishery: 1999-2003 (mt ww). Northwest Atlantic Fishing Area. Source: U.S. National Report to ICCAT: 2004.

Species	1999	2000	2001	2002	2003
Bluefin Tuna	247.9	275.2	195.9	207.7	265.4
Yellowfin Tuna	0	0	0	0	0
Skipjack Tuna	0	0	0	0	0

3.4.2.3 U.S. vs. International Purse Seine Catch

The U.S. purse seine fleet has historically accounted for a small percentage of total Atlantic landings. Over the past five years, the U.S. purse seine fishery has contributed to less than 0.15 percent of the total purse seine landings reported to ICCAT.

Table 3.26 Estimated International Purse Seine Atlantic Tuna Landings in the Atlantic and Mediterranean: 1999-2003 (mt ww). Source: SCRS, 2004

Species	1999	2000	2001	2002	2003
Bluefin Tuna	15,884	17,616	17,520	18,548	15,525
Yellowfin Tuna	83,445	80,253	102,641	95,435	79,908
Skipjack Tuna	95,367	80,762	77,995	70,750	92,805
Bigeye Tuna	20,923	17,909	22,060	16,192	22,237
Total	**215,619**	**196,540**	**220,216**	**200,925**	**210,475**
U.S. Total	**248**	**275**	**196**	**208**	**265**
U.S. Percentage	**0.12%**	**0.14%**	**0.09%**	**0.10%**	**0.13%**

Since the 1999 ICCAT meeting, ICCAT has continued to implement a FADs closed area in the Gulf of Guinea. The closure (which became mandatory in mid-1999) was in response to concern over catches of juvenile and undersize tunas by non-U.S. internationally flagged purse seiners relying on FADs. The full evaluation of this program is somewhat hindered by the multi-

species nature of surface fisheries and the existence of other types of fisheries. The updated analysis indicated that this regulation appeared effective at reducing mortality for juvenile bigeye. Full compliance with this regulation by all surface fisheries will greatly increase the effectiveness of this regulation.

3.4.2.4 Bycatch Issues and Data Associated with the Fishery

The Atlantic BFT Purse seine category fishery is currently listed as a Category III fishery under the Marine Mammal Protection Act. After a school of fish is located, a purse seine net is set by paying out the net in a circle around the school. This affords considerable control over what is encircled by the net and the net does not remain in the water for any considerable amount of time. Therefore, this gear-type is not likely to result in mortality or serious injury of marine mammals or sea turtles. As a result, the 2001 BiOp concluded that the continued operation of the purse seine fishery may adversely affect, but is not likely to jeopardize, the continued existence of any endangered or threatened species under NMFS jurisdiction.

This fishery was observed in 1996, with near-100 percent coverage. Six pilot whales, one humpback whale, and one minke whale were observed as encircled by the nets during the fishery. All were released alive or dove under the nets and escaped before being pursed.

About mid-way through the 2000 BFT purse seine fishing season, large concentrations of BFT were located in one of the areas of Georges Bank that has been closed to all fishing gears in order to provide protection and rebuilding of northeast multispecies stocks, particularly for cod, haddock, and yellowtail flounder. As tuna purse seine gear was not permitted to be used in the closed areas, the purse seine fleet could not access these fish, which were behaving in a manner conducive to purse seine operations (spending time very close to the surface). Purse seine vessels have traditionally fished in or near the closed area, most often to the west, near the “BB” buoy. The 1996 observer data showed minimal interaction with demersal species. In an effort to gather information on the interaction of tuna purse seines with demersal species and avoid conflicts with other gear types, NMFS issued EFPs to the purse seine fleet, and placed observers on the vessels. This allowed the purse seine vessels to fish in the closed area during 2000 and successfully prosecute the tuna fishery, while providing NMFS with additional data on purse seine operations and gear interactions.

Only five observed purse seine sets were made in the closed areas during the 2000 fishing season, and there was no bycatch of groundfish reported on these sets. In order to gather additional information on the impacts of this fishery in the closed areas, and to allow the purse seine fleet to utilize their allocated quota of BFT for 2001 and avoid conflicts with other gear types, NMFS issued EFPs to the purse seine fleet again in 2001, and placed observers on the vessels. The New England Fisheries Management Council revised the list of exempted gear in May 2004, to allow the tuna purse seiners access to the closed areas under Amendment 13 to Northeast Multispecies FMP.

3.4.2.5 Safety Issues Associated with the Fishery

There are no new safety issues associated with the U.S. Atlantic tunas purse seine fishery since the publication of the 1999 FMP.

3.4.3 Commercial Handgear

Handgear, including handline, harpoon, rod and reel, and bandit gear are used for Atlantic HMS by fishermen on private vessels, charter vessels, and headboat vessels. Operations, frequency and duration of trips, and distance ventured offshore vary widely. An overview of the history of the HMS handgear fishery (commercial and recreational) can be found in Section 2.5.8 of the 1999 FMP.

The proportion of domestic HMS landings harvested with handgear varies by species, with Atlantic tunas comprising the majority of commercial landings. Commercial handgear landings of all Atlantic HMS (other than sharks) in the United States are shown in Table 3.27. The fishery is most active during the summer and fall, although in the South Atlantic and Gulf of Mexico fishing occurs during the winter months. For BFT, commercial handgear landings accounted for approximately 45 percent of total U.S. landings, and almost 65 percent of commercial BFT landings. The commercial handgear fishery for BFT occurs mainly in New England, and more recently off the coast of North Carolina, with vessels targeting large medium and giant BFT using rod and reel, handline, harpoon, and bandit gear. Beyond these general patterns, the availability of BFT at a specific location and time is highly dependent on environmental variables that fluctuate from year to year. Fishing usually takes place between eight and 200 km from shore using bait including mackerel, whiting, mullet, ballyhoo, herring, and squid.

The majority of U.S. commercial handgear fishing activities for bigeye, albacore, yellowfin, and skipjack tunas take place in the northwest Atlantic. Rod and reel gear is also used by recreational fishermen, which is addressed in Section 3.4.4. In 2003, three percent of the total yellowfin catch, or nine percent of the commercial yellowfin catch, was attributable to commercial handgear. The majority of these landings occurred in the northwest Atlantic Ocean. Commercial handgear landings of skipjack tuna accounted for approximately 12 percent of total skipjack landings, or about 55 percent of commercial skipjack landings. For albacore, commercial handgear landings accounted for less than one percent of total albacore landings, or about three percent of commercial albacore landings. Commercial handgear landings of bigeye tuna accounted for approximately one percent of total bigeye landings and two percent of total commercial bigeye landings.

3.4.3.1 Overview of History and Current Management Measures

A thorough description of the commercial handgear fisheries for Atlantic tunas can be found in Section 2.2.3 of the 1999 FMP. The domestic swordfish fisheries are discussed in Section 2.3.3 of the 1999 FMP. The domestic shark fisheries are discussed is Section 2.4.3 of the 1999 FMP. Economic and social aspects of all the domestic handgear fisheries are described later in this document (Section 3.5 and 3.6 respectively).

3.4.3.2 Most Recent Catch and Landing Data

Updated tables of landings for the commercial handgear fisheries by gear and by area for 1999 - 2003 are presented in the following tables.

Table 3.27 Domestic Landings for the Commercial Handgear Fishery, by Species and Gear, for 1999-2003 (mt ww). Source: U.S. National Report to ICCAT: 2004

Species	Gear	1999	2000	2001	2002	2003
Bluefin Tuna	Rod and Reel	643.6	579.3	889.7	878.8	595.1
	Handline	15.5	3.2	9.0	4.5	2.5
	Harpoon	115.8	184.2	101.9	55.5	53.2
	TOTAL	**774.9**	**766.7**	**1,000.6**	**983.8**	**650.8**
Bigeye Tuna	Troll	0.0	0.0	0.0	0.0	0.0
	Handline	12.3	5.7	33.7	14.4	6.3
	TOTAL	**12.3**	**5.7**	**33.7**	**14.4**	**6.3**
Albacore Tuna	Troll	0.0	0.0	0.0	0.0	0.0
	Handline	4.4	7.9	3.9	6.6	3.4
	TOTAL	**4.4**	**7.9**	**3.9**	**6.6**	**3.4**
Yellowfin Tuna	Troll	0.0	0.0	0.0	0.0	0.0
	Handline	220.0	284.0	300.0	244.0	216.0
	TOTAL	**220.0**	**284.0**	**300.0**	**244.0**	**216.0**
Skipjack Tuna	Troll	0.0	0.0	0.0	0.0	0.0
	Handline	6.4	9.7	10.5	12.4	9.4
	TOTAL	**6.4**	**9.7**	**10.5**	**12.4**	**9.4**
Swordfish	Handline	5.0	8.9	8.9	11.7	11.7
	Harpoon	0.0	0.6	7.4	2.8	0.0
	TOTAL	**5.0**	**9.5**	**16.3**	**14.5**	**11.7**

Table 3.28 **Domestic Landings for the Commercial Handgear Fishery by Species and Region for 1999-2003 (mt ww).** Source: U.S. National Report to ICCAT: 2004

Species	Region	1999	2000	2001	2002	2003
Bluefin Tuna	NW Atl	774.4	766.7	1,000.6	938.3	650.8
Bigeye Tuna	NW Atl	11.9	4.1	33.2	13.8	6.0
	GOM	0.2	0.1	0.5	0.6	0.3
	Caribbean	0.2	1.5	0.0	0.0	0.0
Albacore Tuna	NW Atl	0.6	2.9	1.7	3.9	1.4
	GOM	≤ .05	0.0	0.0	0.0	≤ .05
	Caribbean	3.8	5.0	2.2	2.7	2.0
Yellowfin Tuna	NW Atl	192.0	235.7	242.5	137.0	148.0
	GOM	12.7	28.6	43.4	100.0	59.0
	Caribbean	14.5	19.4	14.3	7.0	9.0
Skipjack Tuna	NW Atl	0.2	0.2	0.2	0.2	0.2
	GOM	0.4	0.7	0.0	0.0	0.0
	Caribbean	5.8	8.8	10.3	12.5	9.2
Swordfish	NW Atl	5.0	8.9	8.9	11.6	10.2
	GOM	≤ .05	1.2	0.3	2.9	1.5

Handgear Trip Estimates

Table 3.29 displays the estimated number of rod and reel and handline trips targeting large pelagic species in 2001 through 2003. The trips include commercial and recreational trips, and are not specific to any particular species. It should be noted that these estimates are still preliminary and subject to change.

Table 3.29 **Estimated number of vessel trips targeting large pelagic species, 2001-2003.** Source: Large Pelagics Survey database

Year	AREA							Total
	NH/ME	MA	CT/RI	NY	NJ (north)	NJ (south) + MD/DE	VA	
Private Vessels								
2001	1,944	3,641	497	2,039	3,040	2,675	910	14,746
2002	5,090	15,180	2,558	7,692	2,762	22,757	6,524	62,563
2003	4,501	13,411	2,869	12,466	3,214	21,619	5,067	63,147
Charter Vessels								
2001	133	567	203	280	660	655	307	2,805
2002	1,132	3,357	937	1,686	1,331	6,300	1,510	16,253
2003	221	2,561	1,246	2,035	1,331	5,201	546	13,141

3.4.3.3 U.S. vs. International Handgear Catch

SCRS data do not lend themselves to organize international landings into a commercial handgear category. While some countries report rod and reel landings, these numbers may include both commercial and recreational landings. International catches of all Atlantic HMS for 2003 are summarized in Table 3.18.

3.4.3.4 Bycatch Issues and Data Associated with the Fishery

As compared with other commercial gear types, commercial handgear produces relatively lower levels of bycatch. However, bycatch in the yellowfin tuna commercial handgear fishery is unmonitored in those areas where commercial activities occur after the Large Pelagic Survey (LPS) sampling season. Rod and reel discards of HMS, as assessed from LPS data, are discussed in the Recreational Section 3.4.4 as are new efforts in documenting catch-and-release survival rates. At this time, however, there is little information regarding important interactions and new data relating to commercial handgear bycatch. Anecdotal reports suggest that there may be low levels of BFT, yellowfin, and bigeye tuna discards, but there is no supporting documentation at this point. Some regulatory discards occur because fishermen must comply with minimum size restrictions.

3.4.3.5 Safety Issues Associated with the Fishery

Section 3.9 of the 1999 Atlantic Tunas, Swordfish, and Shark FMP describes safety of human life at sea as it pertains to the fisheries for Atlantic HMS. Additional safety information regarding the commercial handgear fisheries for Atlantic HMS is presented below.

The U.S. Coast Guard (USCG) conducts routine vessel safety inspections at sea on a variety of vessels throughout the year, and during the busy General category BFT season the USCG concentrates patrol activities on General category BFT boats. Boarding officers indicate that the majority of the commercial handgear vessels have the necessary safety equipment; however, many part-time fishermen operating smaller vessels do not meet the necessary safety standards. There have been several cases of vessels participating in this fishery that have capsized due to weight while attempting to boat commercial-sized BFT (measuring 73 inches or greater and weighing several hundred pounds).

Currently, NMFS does not require proof of proper safety equipment as a condition to obtain a commercial handgear permit. Instead, NMFS informs permit applicants that commercial vessels are subject to the Fishing Vessel Safety Act of 1988 and advises them to contact their local USCG office for further information. The USCG District Boston office reports receiving 50 to 75 calls a week during the peak fishing season; officers speak with all callers to answer vessel questions.

Since NMFS regulations do not require USCG inspection or safety equipment in order to obtain a commercial handgear permit, NMFS cannot be certain that all participants in the commercial BFT handgear fishery are adequately prepared for the conditions they may

encounter. NMFS is concerned about the safety of all vessels participating in the BFT fishery and is working with the USCG to improve communication of vessel safety requirements to commercial handgear vessel operators.

It is unlawful for Atlantic tuna vessels to engage in fishing unless the vessel travels to and from the area where it will be fishing under its own power and the person operating that vessel brings any BFT under control (secured to the catching vessel or on board) with no assistance from another vessel, except when shown by the operator that the safety of the vessel or its crew was jeopardized or other circumstances existed that were beyond the control of the operator. NMFS Enforcement and USCG boarding officers have recently encountered vessels participating in the BFT fishery that are unable to transit to and from the fishing grounds due to their limited fuel capacity. Occasionally these smaller vessels will work in cooperation with a larger documented vessel to catch a BFT; others have been observed to leave lifesaving equipment at the dock to make room for extra fuel, bait, and staples. NMFS is concerned that use of such inadequately equipped vessels jeopardizes crew in that the vessel may not be able to safely return to shore without assistance of the larger vessel due to insufficient fuel or to adverse weather conditions.

Over the last couple of years, NMFS has received a number of vessel permit applications from kayak owner/operators. In addition to the requirement mentioned above, NMFS only issues permits to vessels that possess either a USCG Documentation number, a state registration number, or a foreign registration number (recreational permit only). As kayaks typically do not require such documentation NMFS has denied all applications for a kayak to date.

Over the last few years, the USCG focused boardings on small vessels, especially those owned by “part-time” commercial BFT fishermen, and terminated several dozen trips due to the lack of safety equipment on board. If a vessel is boarded at sea and found to be lacking major survival equipment, the USCG will terminate the trip and escort the vessels back to the dock.

NMFS has concerns regarding individuals embarking on HMS trips by themselves. Recently there have been a few incidents of fishermen either severely injuring themselves or dying while pursing HMS by themselves. Certain hazardous situations could be mitigated by having an additional person onboard the vessel while conducting a trip targeting large pelagics. NMFS encourages vessel owner/operators to practice safe fishing techniques.

NMFS will consider all safety comments and information, including those from the USCG and NMFS Enforcement, when planning future General category effort control schedules and will discuss these issues in future meetings with the AP.

3.4.4 Recreational Handgear

The following section describes the recreational portion of the handgear fishery, and is primarily focused upon rod and reel fishing. The HMS Handgear (rod and reel, handline, and harpoon) fishery includes both commercial and recreational fisheries and is described fully in Section 2.5.8 of the 1999 FMP. The recreational billfish fishery is described fully in Section 2.1.3 of the 1999 Billfish Amendment. The commercial sale, barter or trade of Atlantic billfish by U.S. commercial interests is prohibited, only recreational landings are authorized.

3.4.4.1 Overview of History and Current Management

Atlantic tunas, swordfish, and sharks are managed under the 1999 FMP and Amendment 1 to the 1999 FMP, while Atlantic billfish are managed separately under the Billfish FMP, as amended. Summaries of the domestic aspects of the Atlantic tuna fishery, the Atlantic swordfish fishery, and the Atlantic shark fishery are found in Sections 2.2.3, 2.3.3, and 2.4.3, respectively, of the 1999 FMP. A history of Atlantic billfish management is provided in Section 1.1.1 of the Billfish Amendment.

Atlantic tunas, sharks, swordfish, and billfish are all targeted by domestic recreational fishermen using rod and reel gear. The recreational swordfish fishery had declined dramatically over the past twenty years, but recent information indicates that the recreational swordfish fishery is rebuilding in the Mid-Atlantic Bight, and off the east coast of Florida. Effective March 1, 2003, an HMS Angling category permit has been required to fish recreationally for any HMS-managed species (Atlantic tunas, sharks, swordfish, and billfish) (67 FR 77434, December 18, 2002). Prior to March 1, 2003, the regulations only required vessels fishing recreationally for Atlantic tunas to possess an Atlantic Tunas Angling category permit.

Recreational fishing for Atlantic HMS is managed primarily through the use of minimum size limits and bag limits. Recreational tuna fishing regulations are the most complex and include a combination of minimum sizes, bag limits, limited season-based quota allotment for bluefin tuna, and reporting requirements (depending upon the particular species and vessel type).

The recreational swordfish fishery has been managed through the use of a minimum size requirement and landings requirement (swordfish may be gutted and beheaded but may not be cut into smaller pieces). However, regulations published on January 7, 2003 (68 FR 711) established a recreational retention limit of one swordfish per person up to three per vessel per day, effective March 2003. Regardless of the length of a trip, no more than the daily limit of North Atlantic swordfish can be possessed onboard a vessel.

The recreational shark fishery is managed using bag limits, minimum size requirements, and landing requirements (sharks must be landed with heads and fins attached). Additionally, the possession of 19 species of sharks is prohibited.

Atlantic blue and white marlin have a combined landings cap (*i.e.*, a maximum amount of fish (250) that can be landed per year); however, the overall management strategy for the recreational billfish fishery is through the use of minimum size limits. There are no recreational retention limits for Atlantic sailfish, blue marlin, and white marlin. Recreational anglers may not land longbill spearfish.

ICCAT has made several recommendations to recover billfish resources throughout the Atlantic Ocean that are discussed in detail in Section 3.2.4.

3.4.4.2 Most Recent Catch and Landings Data

The recreational landings database for HMS consists of information obtained through surveys including the Marine Recreational Fishery Statistics Survey (MRFSS), Large Pelagic

Survey (LPS), Southeast Headboat Survey (HBS), Texas Headboat Survey, and Recreational Billfish Survey Tournament Data (RBS). Descriptions of these surveys, the geographic areas they include, and their limitations, are discussed in Section 2.6.2 of the 1999 FMP and Section 2.3.2 of the 1999 Billfish Amendment.

Reported domestic landings of Atlantic bluefin tuna (1983 through 1998) and BAYS tuna (1995 through 1997) were presented in Section 2.2.3 of the 1999 FMP. As landings figures for 1997 and 1998 were preliminary in the 1999 FMP, updated landings for recreational rod and reel fisheries are presented in Table 3.30 through 2003. Recreational landings of swordfish are monitored by the LPS and the MRFSS. However, because swordfish landings are considered rare events, it is difficult to extrapolate the total recreational landings from dockside intercepts.

An ad hoc committee of NMFS scientists reviewed the methodology and data used to estimate recreational landings of Atlantic HMS during 2004. The Committee was charged with reviewing the 2002 estimates of U.S. recreational landings of bluefin tuna, white marlin and blue marlin reported by NMFS to ICCAT. The committee was also charged with recommending methods to be used for the estimation of 2003 recreational fishery landings of bluefin tuna and marlin. Although the Committee discovered and corrected a few problems with the raw data from the LPS and the estimation program used to produce the estimates, the Committee concluded that the estimation methods for producing the 2002 estimates were consistent with methods used in previous years. The report of the Committee is available at: http://www.nmfs.noaa.gov/sfa/hms/RecReports/2002-2003%20Bluefin-Marlin%20Report-120304.pdf .

Table 3.30 Updated Domestic Landings for the Atlantic Tunas, Swordfish and Billfish Recreational Rod and Reel Fishery: Calendar years 1996-2003 (mt ww)*. Sources: NMFS, 2004; Large Pelagic Survey; SEFSC Recreational Billfish Survey. (Recreational shark landings are provided in **Table 3.33** through **Table 3.36**).

Species	Region	1996	1997	1998	1999	2000	2001	2002	2003
Bluefin tuna**	NW Atlantic	362	299	184	103.0	49.5	242.9	519.4	314.6
	GOM	0	0	0	0.4	0.9	1.7	1.5	0
	Total	**362**	**299**	**184**	**103.4**	**50.4**	**244.6**	**520.9**	**314.6**
Bigeye tuna	NW Atlantic	108.2	333.5	228.0	316.1	34.4	366.2	49.6	188.5
	GOM	0	0	0	1.8	0	0	0	0
	Caribbean						0	0	4.0
	Total	**108.2**	**333.5**	**228.0**	**317.9**	**34.4**	**366.2**	**49.6**	**192.5**
Albacore	NW Atlantic	277.8	269.5	601.1	90.1	250.75	122.3	323.0	333.8
	GOM	61.7	65.2	0	0	0	0	0	0
	Total	**339.5**	**334.7**	**601.1**	**90.1**	**250.75**	**122.3**	**323.0**	**333.8**
Yellowfin tuna	NW Atlantic	4,484.8	3,560.9	2,845.7	3,818.2	3,809.5	3,690.5	2,624	4,672
	GOM	13.2	7.7	80.9	149.4	52.3	494.2	200	640
	Caribbean				0	0	0.1	7.2	16
	Total	**4,498**	**3,569**	**2,927**	**3,967.6**	**3,861.8**	**4184.7**	**2,831.2**	**5,328**
Skipjack tuna	NW Atlantic	48.1	42.0	49.5	63.6	13.1	32.9	23.3	34.0
	GOM	36.4	21.7	37.0	34.8	16.7	16.1	13.2	11.0
	Caribbean				0	0	0	13.2	15.7
	Total	**84.5**	**63.7**	**86.5**	**98.4**	**29.8**	**49.0**	**49.7**	**60.7**
Blue marlin***	NW Atlantic	17.0	25.0	34.1	24.8	13.8	9.0		
	GOM	8.3	11.5	4.5	7.5	4.7	5.1		
	Caribbean	9.6	8.6	10.6	4.6	5.7	2.3		
	Total	**34.9**	**45.1**	**49.2**	**36.9**	**24.2**	**16.4**	**5.6**	**19**
White marlin ***	NW Atlantic	2.7	0.9	2.4	1.5	0.23	2.8		
	GOM	0.6	0.9	0.2	0.1	0	0.3		
	Caribbean	0.0	0.0	0.02	0	0	0		
	Total	**3.3**	**1.8**	**2.6**	**1.6**	**0.23**	**3.1**	**5.6**	**0.6**
Sailfish***	NW Atlantic	0.2	0	0.1	0.07	1.75	61.2		
	GOM	0.8	0.4	1.0	0.6	0.24	0.6		

Species	Region	1996	1997	1998	1999	2000	2001	2002	2003
	Caribbean	0.2	0.2	0.05	0	0.06	0		
	Total	**1.2**	**0.6**	**1.5**	**0.67**	**2.05**	**61.8**	**103**	
Swordfish	**Total**	**5.9**	**10.9**	**4.7**	**21.3**	**15.6**	**1.5**	**21.5**	**5.1**

* Rod and reel catches and landings for Atlantic tunas represent estimates of landings and dead discards based on statistical surveys of the U.S. recreational harvesting sector.
** Rod and reel catch estimates for bluefin tuna in the U.S. National Report to ICCAT include both recreational and commercial landings. Rod and reel catch of bluefin less than 73" curved fork length (CFL) are recreational, and rod and reel catch of bluefin 73 inches CFL or greater are commercial. Rod and reel catch of bluefin > 73" CFL also includes a few metric tons of "trophy" bluefin (recreational bluefin 73").
*** Blue marlin, white marlin, and sailfish landings are based on the U.S. National Report to ICCAT and consist primarily of reported tournament landings.

Atlantic Billfish Recreational Fishery

Due to the rare nature of billfish encounters and the difficulty of monitoring landings outside of tournament events, reports of recreational billfish landings are sparse. However, the RBS provides a preliminary source for analyzing recreational billfish landings. Table 3.31 documents the number of billfish landed in 2000-2003, as reported by the RBS.

Table 3.31 Preliminary RBS Recreational Billfish Landings (calendar year). Source: NMFS Recreational Billfish Survey (RBS).

Species	1999	2000	2001	2002	2003
Blue Marlin	172	117	75	84	96
White Marlin	36	8	22	33	20
Sailfish	30	18	11	14	24
Swordfish	-	-	0	16	48

In support of the sailfish assessment conducted at the 2001 SCRS billfish species group meeting, document SCRS/01/106 developed indices of abundance of sailfish from the U.S. recreational billfish tournament fishery for the period 1973-2000. The index of weight per 100 hours fishing was estimated from numbers of sailfish caught and reported in the logbooks submitted by tournament coordinators and NMFS observers under the RBS, as well as available size information. Document SCRS/01/138 estimated U.S. sailfish catch estimates from various recreational fishery surveys.

All recreational, non-tournament landings of billfish, including swordfish, must be reported within 24 hours of landing to NMFS by the permitted owner of the vessel landing the fish. This requirement is applicable to all permit holders, both private and charter/headboat vessels, not fishing in a tournament. In Maryland and North Carolina, vessel owners should report their billfish landings at state-operated landings stations. A landed fish means a fish that is kept and brought to shore. Due to large-scale non-compliance with the call-in requirement, the landings in Table 3.32 are considered a minimum estimate of the non-tournament landings of billfish.

Table 3.32 Number of billfish reported to NMFS via call-in system by fishing year, 2002-2004. Source: G. Fairclough, pers. comm.

Species	2002*	2003	2004**
Blue Marlin	0	7	2
White Marlin	0	1	0
Sailfish	3	16	34
Swordfish	28	188	194

Based on a fishing year of June 1 – May 31.

* Reporting requirement did not go into effect until March 1, 2003

** 2004 landings as of January 28, 2005

Swordfish Recreational Fishery

The recreational swordfish fishery in the North Atlantic Ocean has been steadily expanding in recent years, probably due to increased availability of small swordfish and an increased interest in the sport. Fishermen typically fish off the east coast of Florida and off the coasts of New Jersey and New York. Fish have also been occasionally encountered on trips off Maryland and Virginia. In the past, the New York swordfish fishery occurred incidental to overnight yellowfin tuna trips. During the day, fishermen targeted tunas, while at night they fished deeper for swordfish. This appears to have evolved into a year-round directed fishery off Florida and a summer fishery off of New Jersey. The Florida fishery occurs at night with fishermen targeting swordfish using live or dead bait and additional attractants such as lightsticks, LED lights, and light bars suspended under the boat.

Historically, fishery survey strategies have not captured all landings of recreational handgear-caught swordfish. Although some handgear swordfish fishermen have commercial permits[1], many others land swordfish strictly for personal consumption. Therefore, NMFS published regulations to improve recreational swordfish monitoring and conservation. A final rule was published on January 7, 2003 (68 FR 711), that included a trip limit of one swordfish per person, up to three per vessel, and mandatory reporting of all recreationally-landed swordfish and billfish via a toll-free call-in system. These regulations became effective on March 2, 2003. Accordingly, all reported recreational swordfish landings will be counted against the Incidental swordfish quota.

Recreational fishing tournaments allow for the collection of a large volume of fishery-dependent data in a relatively short time period. Tournaments also provide a "snapshot" of the recreational fishery at a particular time and location. Analysis of tournament data collected over a period of years could provide valuable information regarding trends in the recreational swordfish fishery. A recent study documented recreational handgear-caught swordfish in three south Florida tournaments (J. Levesque, pers. comm.). The tournaments occurred from July though September 2002, two in Lighthouse Point and the other in Ft. Lauderdale. Data was obtained through direct at-sea observation, dockside interviews with anglers landing swordfish, and a telephone interview with a tournament organizer. A total of 156 vessels and between 468 - 624 individuals participated in the three tournaments.

2 Access to the commercial swordfish fishery is limited; hand gear fishermen however may purchase permits from other permitted fishermen because the permits are transferable.

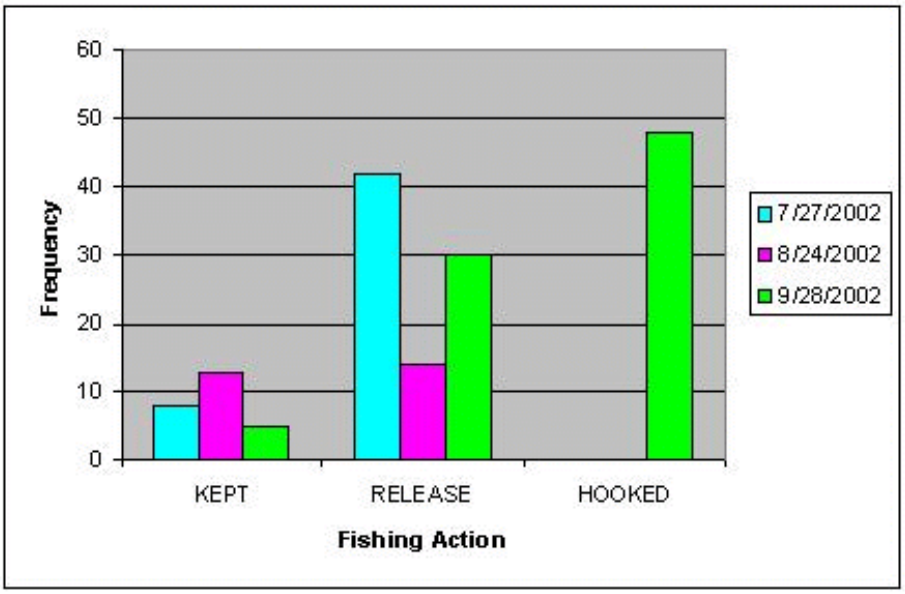


Figure 3.23 **Total Number of Swordfish Caught, Kept and Released in Three Sampled Recreational Swordfish Tournaments off Southeast Florida during 2002.** Source: J. Levesque, pers. comm.

Figure 3.23 indicates that 112 swordfish were caught during the three monitored tournaments. Of these, 26 swordfish were retained and 86 swordfish were released alive. Additional data from the September 28, 2002, tournament indicated that, in that tournament, 48 swordfish were hooked, 30 were released, and four were kept. The definition of hooked, for these purposes, was a swordfish that was on the line for any given amount of time. All hooked fish were assumed to be swordfish. The three fishing tournaments implemented a 55-inch, or 140 cm LJFL minimum size requirement for landed swordfish, although current federal regulations are 119 cm (46.9 in) LJFL.

Sizes for landed swordfish ranged from 130 - 230 cm (51.2 – 90.6 in) fork length. The mean size for landed swordfish was 160 cm (63 in) fork length. Weights for landed swordfish ranged from 36 - 144 kg (79.3 – 317.2 lb). The mean weight for the landed swordfish was 62.6 kg (137.9 lb). Estimated weights for the released swordfish ranged from 13 - 32 kg (28.6 – 70.5 lb). The mean estimated weight for released swordfish was 19.5 kg (43 lb).

The overall number of swordfish hooked per-unit-effort was .0615-swordfish/hr. or 6.15 swordfish per 100-hrs. drifting. The catch per-unit-effort was .0143-swordfish landed/hr. or 1.43 fish per 100-hrs. drifting.

Shark Recreational Fishery

Recreational landings of sharks are an important component of HMS fisheries. Recreational shark fishing with rod and reel is a popular sport at all social and economic levels, largely because the resource is accessible. Sharks can be caught virtually anywhere in salt water, depending upon the species. Recreational shark fisheries are oftentimes exploited in nearshore

waters by private vessels and charter/headboats. However, there is also some shore-based fishing and some offshore fishing. The following tables provide a summary of landings for each of the three species groups. Amendment 1 to the 1999 Atlantic Tunas, Swordfish, and Shark FMP limited the recreational fishery to rod and reel and handline gear only.

Table 3.33 Estimates of Total Recreational Harvest of Atlantic Sharks: 1998-2003 (numbers of fish in thousands). Source: 1998-2000 (Cortés, pers. comm..); 2001-2003 (Cortés, 2005). Estimates for 2001-2003 do not include prohibited species.

Species Group	1998	1999	2000	2001	2002	2003
LCS	169.6	92.3	131.5	127.9	77.9	81.4
Pelagic	11.8	11.1	13.3	3.8	4.7	4.3
SCS	175.1	125.7	197.8	211.6	153.8	134.7
Unclassified	8.0	6.9	11.0	22.2	2.4	16.2

Table 3.34 Recreational Harvest of Atlantic Large Coastal Sharks (LCS) by Species, in number of fish: 1998-2003. Sources: 1998-2000 (Cortés, pers. comm.); 2001-2003 (Cortés, 2005). Estimates for 2001-2003 do not include prohibited species.

LCS Species	1998	1999	2000	2001	2002	2003
Basking**	0	0	0	0	0	0
Bignose*	0	0	0	0	0	0
Bigeye sand tiger**	0	0	0	0	0	0
Blacktip	83,045	35,585	69,668	48,757	42,290	38,753
Bull	1,663	3,150	6,116	4,151	1,910	3,345
Caribbean Reef*	74	3	122	0	0	0
Dusky*	4,499	5,570	2,501	5,583	1,047	2,731
Galapagos*	0	0	0	0	0	0
Hammerhead, Great	476	388	925	3,382	4	68
Hammerhead, Scalloped	2,052	1,367	3,433	1,183	1,061	2,320
Hammerhead, Smooth	375	1	2	703	2	1
Hammerhead, Unclassified	390	75	3,675	0	5,293	0
Lemon	2,161	173	2,785	5,488	1,683	4,002
Night*	133	50	24	0	0	0
Nurse	2,455	1,503	2,233	3,672	2,173	647
Sandbar	35,766	20,602	10,878	36,094	8,341	5,185
Sand tiger**	0	0	0	604	0	0
Silky	5,376	3,863	5,120	3,808	1,785	444
Spinner	10,805	6,361	5,402	3,651	4,134	4,460
Tiger	1,380	153	1,480	758	170	110
Whale**	0	0	0	0	0	0

LCS Species	1998	1999	2000	2001	2002	2003
White**	0	0	0	0	0	0
Large Coastal Unclassified	18,979	13,444	17,102	16,211	9,098	22,086
Total:	169,629	92,288	131,466	134,045	78,991	84,152

*indicates species that were prohibited in the recreational fishery as of July 1, 1999.
** indicates species that were prohibited as of April 1997.

Table 3.35 **Recreational Harvest of Atlantic Pelagic Sharks by Species, in number of fish: 1998-2003.** Sources: 1998-2000 (Cortés, pers. comm.); 2001-2003 (Cortés, 2005). Estimates for 2001-2003 do not include prohibited species.

Pelagic Shark Species	1998	1999	2000	2001	2002	2003
Bigeye thresher*	0	0	0	0	65	0
Bigeye sixgill*	0	0	0	0	0	0
Blue Shark	6,085	5,218	7,010	950	0	376
Mako, Longfin*	0	0	0	0	0	0
Mako, Shortfin	5,633	1,383	5,813	2,871	3,206	3,957
Mako, Unclassified	8	9	0	0	0	0
Oceanic whitetip	0	0	0	0	0	0
Porbeagle	0	0	0	0	0	0
Sevengill*	0	0	0	0	0	0
Sixgill*	0	0	0	0	0	0
Thresher	36	4,512	528	0	1,467	0
Total:	11,762	11,122	13,351	3,821	4,673	4,333

* indicates species that were prohibited in the recreational fishery as of July 1, 1999.

Table 3.36 **Recreational Harvest of Atlantic SCS by Species, in number of fish: 1998-2003.** Source: 1998-2000 (Cortés, pers. comm.); 2001-2003 (Cortés, 2005). Estimates for 2001-2003 do not include prohibited species.

SCS Species	1998	1999	2000	2001	2002	2003
Atlantic Angel*	110	0	0	0	0	0
Blacknose	10,523	6,049	9,795	15,179	11,416	6,705
Bonnethead	29,147	38,835	56,142	58,511	50,894	39,863
Finetooth	139	78	1,438	6,701	2,952	1,774
Sharpnose, Atlantic	135,137	80,694	130,371	131,165	88,523	86,361
Sharpnose, Caribbean*	0	0	0	0	0	0
Smalltail*	0	4	26	26	0	0
Total:	175,056	125,660	197,772	211,582	153,785	134,703

*indicates species that were prohibited in the recreational fishery as of July 1, 1999.

3.4.4.3 U.S. vs. International Catch

Important directed recreational fisheries for HMS occur in the United States, Venezuela, the Bahamas, and Brazil. Many other countries and entities in the Caribbean and the west coast of Africa are also responsible for significant HMS recreational landings. Directed recreational fisheries for sailfish occur in the Western Atlantic and include the United States, Venezuela, the Bahamas, Brazil, Dominican Republic, Mexico, and other Caribbean nations. However, of these countries, the United States is the only country that currently reports recreational landings to ICCAT. Therefore, a comparison of the percentage of U.S. landings relative to recreational fisheries in other countries is not possible. Further, total landings data are incomplete because many countries that reported landings in 1996 failed to report their 1998 and 1999 landings, which hampered the 2000 Atlantic marlin stock assessments, as well.

As part of a 1997 SCRS survey, 12 ICCAT member countries as well as Chinese Taipei and Senegal provided information on the existence of, and level of data collection for, recreational and artisinal fisheries. The survey results indicated that Brazil, Canada, France, Italy, Morocco, UK, Bermuda, and the United States have recreational fisheries in the ICCAT area of concern. Levels of data collection varied widely from country to country, making any comparison of catch levels difficult and potentially inaccurate. The wide range of recreational catches across nations and species warrants further exploration of potential data sources and the feasibility of increased recreational monitoring.

At the 1999 ICCAT meeting in Rio de Janeiro, Brazil, the Commission adopted a resolution to improve the quantity and quality of recreational data collection. Recreational fisheries were to be discussed and assessed in each country's National Report beginning in the year 2000. In addition, the SCRS was called upon to examine the impact of recreational fishing on tuna and tuna-like species. At this time additional information is not available regarding international HMS recreational catches.

At the 2004 ICCAT meeting in New Orleans, U.S., the Commission adopted a recommendation concerning prohibited gear in the sport and recreational fisheries in the Mediterranean Sea. Prohibited gear includes towed and encircling nets, seine sliding, dredgers, gill nets, trammel net and longline to fish for tuna and tuna-like species. The recommendation also prohibits the sale of sport and recreational tuna and tuna-like species and stipulates that data on these fisheries be collected and transmitted to the SCRS.

3.4.4.4 Bycatch Issues and Data Associated with the Fishery

Bycatch in the recreational rod and reel fishery is difficult to quantify because many fishermen value the experience of fishing and may not be targeting a particular pelagic species. Recreational "marlin" or "tuna" trips may yield dolphin, tunas, wahoo, and other species, both undersized and legal sized. Bluefin tuna trips may yield undersized bluefin, or a seasonal closure may prevent landing of a bluefin tuna above the minimum size. In some cases, therefore, rod and reel catch may be discarded. The Magnuson-Stevens Act (16 USC 1802 (2)) stipulates that bycatch does not include fish under recreational catch-and-release.

The 1999 Billfish Amendment established a catch-and-release fishery management program for the recreational Atlantic billfish fishery. As a result of this program, all Atlantic billfish that are released alive, regardless of size, are not considered bycatch. NMFS believes that establishing a catch-and-release fishery in this situation will further solidify the existing catch-and-release ethic of recreational billfish fishermen, and thereby increase release rates of billfish caught in this fishery. The recreational white shark fishery is by regulation a catch-and-release fishery only and white sharks are not considered bycatch.

Bycatch can result in death or injury to discarded fish. Therefore, bycatch mortality should be incorporated into fish stock assessments, and into the evaluation of management measures. Rod and reel discard estimates from Virginia to Maine during June - October could be monitored through the expansion of survey data derived from the LPS (dockside and telephone surveys). However, the actual numbers of fish discarded for many species are so low that presenting the data by area could be misleading, particularly if the estimates are expanded for unreported effort in the future. The number of kept and released fish reported or observed through the LPS dockside intercepts for 1997-2003 is presented in Table 3.37.

Outreach programs to address bycatch were included in the 1999 FMP and the Billfish Amendment. These programs have not yet been implemented, but the preparation of program designs is currently in progress. One of the key elements in the outreach program will be to provide information that leads to an improvement in post-release survival from both commercial and recreational gear. Additionally, an outreach program to encourage the use of circle hooks to increase post-release survival within HMS fisheries was introduced in a proposed rule published in 2001 (66 FR 66386, December 26, 2001). The final rule to promote the voluntary use of circle hooks published in 2003 (68 FR 711, January 7, 2003). Initial implementation of the outreach program began in 2004 with workshops conducted on the proper handling and release of sea turtles.

A study by Graves *et al.* (2002), investigated short-term (5 days) post-release mortality of Atlantic blue marlin using pop-up satellite tag technology. A total of nine recreationally caught blue marlin were tagged and released during July and August of 1999. All hooks employed in the study were “J” hooks. The attached tags were programmed to detach from the fish after five days and to record direct temperature and inclination of the buoyant tag to determine if the fish were actively swimming after being released. After detachment, the tags floated to the surface and began transmitting recorded position, temperature and inclination data to satellites of the Argos™ system. Three different lines of evidence provided by the tags (movement, water temperature, and tag inclination) suggested that at least eight of the nine blue marlin survived for five days after being tagged and released. One of the tags did not transmit any data, which precluded the derivation of a conclusion regarding the tagged marlin’s survival.

This study was continued in 2003 for white marlin to evaluate post release survival and habitat use (NMFS, 2004). Pop-up satellite archival tags (PSATs) were used to estimate survival of white marlin released from four locations in the western North Atlantic recreational fishery. Forty-one tags were attached to white marlin caught using dead baits rigged on straight-shank (“J”) hooks (n=21) or circle hooks (n=20) offshore of the U.S. Mid-Atlantic, the Dominican Republic, Mexico, and Venezuela. Survival was significantly higher ($p<0.01$) for white marlin

caught on circle hooks (100 percent) relative to those caught on straight-shank ("J") hooks (65 percent). These results, along with previous studies on circle hook performance, suggest that a simple change in hook type can significantly increase the survival of white marlin released from recreational fishing gear. Data from these short term deployments also suggest that white marlin strongly associated with warm, near surface waters. However, based on the frequency, persistence, and patterns of vertical movements, white marlin appear to direct a considerable proportion of foraging effort well below surface waters, a behavior that may account for relatively high catch rates of white marlin on some pelagic longline sets.

Table 3.37 Observed or reported number of HMS kept* and released in the rod and reel fishery, Maine through Virginia. Source: Large Pelagic Survey (LPS) Preliminary Data.

	Number of Fish Kept							Number of Fish Released Alive						
Species	**1997**	**1998**	**1999**	**2000**	**2001**	**2002**	**2003**	**1997**	**1998**	**1999**	**2000**	**2001**	**2002**	**2003**
White Marlin**	7	11	6	2	5	8	12	203	465	156	59	118	215	160
Blue Marlin**	3	3	3	0	1	0	4	30	27	28	17	14	30	39
Sailfish**	0	1	0	6	0	0	0	2	2	3	0	2	6	6
Swordfish	5	1	3	14	1	5	9	6	5	1	5	10	6	21
Giant Bluefin Tuna	51	69	56	34	20	176	58	6	11	6	0	0	8	0
Large Medium Bluefin Tuna	6	26	13	3	7	11	11	3	8	5	3	6	2	0
Small Medium Bluefin Tuna	28	19	8	30	87	62	83	34	26	44	37	5	8	13
Large School Bluefin Tuna	60	134	106	95	457	391	287	158	67	42	22	128	47	40
School Bluefin	1,000	392	212	151	338	556	509	840	412	136	159	58	200	174
Young School Bluefin	5	13	1	4	0	7	4	139	581	94	23	40	182	10
Bigeye Tuna	26	17	27	16	9	32	21	6	9	0	0	8	1	3
Yellowfin Tuna	2,472	2,646	2,501	2,366	2,423	2,595	3,216	222	645	682	97	74	328	200
Skipjack Tuna	296	261	146	32	100	117	681	468	267	88	69	130	250	526
Albacore	146	558	133	513	302	534	546	43	92	52	17	52	95	31
Thresher Shark	7	7	3	2	5	20	24	2	2	2	1	0	5	8
Mako Shark	74	78	49	49	27	72	141	94	92	49	114	65	120	208
Sandbar Shark	5	2	2	1	2	0	9	30	56	6	4	10	17	26
Dusky Shark	6	6	1	0	0	1	0	50	54	7	32	8	9	0
Tiger Shark	0	2	0	0	1	1	0	5	5	0	3	2	3	12
Porbeagle	0	1	0	0	0	1	0	5	6	0	0	0	14	3
Blacktip Shark	2	1	0	0	1	0	1	0	2	5	0	0	6	0
Atl. Sharpnose	0	1	0	0	0	0	0	0	3	0	0	0	0	0

	Number of Fish Kept							Number of Fish Released Alive						
Species	**1997**	**1998**	**1999**	**2000**	**2001**	**2002**	**2003**	**1997**	**1998**	**1999**	**2000**	**2001**	**2002**	**2003**
Shark														
Blue Shark	27	26	11	12	2	36	65	1,897	780	572	374	141	505	2,061
Hammerhead Shark	2	1	1	1	2	0	0	4	4	5	0	1	6	38
Wahoo	10	71	45	41	34	49	68	1	2	0	0	13	6	3
Dolphin (Mahi)	1,022	7,263	2,139	955	1,294	2,509	4,209	61	194	73	48	108	111	677
King Mackerel	171	198	141	289	19	36	66	1	10	8	24	10	5	5
Atlantic Bonito	384	328	254	194	77	704	315	203	300	166	27	49	176	282
Little Tunny	428	1,231	97	139	48	240	121	1,015	1,507	133	118	118	585	443
Amberjack	3	6	9	6	19	7	44	18	40	24	20	14	57	111
Spanish Mackerel	0	2	1	13	3	5	35	1	1	0	0	0	0	1

*NMFS typically expands these "raw" data to report discards of bluefin tuna by the rod and reel fishery to ICCAT. If sample sizes are large enough to make reasonable estimates for other species, NMFS may produce estimates for other species in future SAFE reports.
**Amendment One to the Atlantic Billfish FMP established billfish released in the recreational fishery as a "catch-and-release" program, thereby exempting these fish from bycatch considerations.

3.4.4.5 Safety Issues Associated with the Fishery

The USCG does not maintain statistics on boating accidents, rescue, or casualty data specifically pertaining to recreational fishing as it does for the commercial industry. As a result, the 1999 FMP and the Billfish Amendment contain only minimal safety information regarding recreational HMS fisheries. Safety issues associated with handline fisheries for tunas are discussed in Section 3.4.3. The USCG compiles statistics on the total number of recreational boating accidents and casualties, independent of the activity or fishery in which they are engaged Table 3.38). Two common situations often place recreational boaters in potential danger. Individuals in small vessels often venture out farther than their vessels are designed to travel without proper navigational equipment, and may encounter rougher water than their boats are designed to withstand. Since fishermen targeting HMS species, particularly marlin, often travel at least 75 to 100 miles offshore, having a properly equipped vessel of adequate size is very important for the safety of recreational HMS constituents. Additionally, as the recreational swordfish fishery off the southeastern coast of Florida occurs at night and usually in small boats ranging from 23 to 40 feet in length, it presents other unique risks. Shipping traffic regularly runs through the recreational swordfish fleet, which could lead to incidents if someone is not on watch at all times. Another frequent safety concern of the Coast Guard is when someone is up in the flying bridge. Both of these situations can lead to people falling overboard. In 2003, approximately 70 percent of all boating casualties were due to drowning and in approximately 86 percent of all the drowning deaths, the victim was not wearing a personal floatation device (PFD) (Table 3.39).

Table 3.38 Overall 2003 Reported Boating Accident Types. Source: USCG Boating Statistics, 2003.

Accident Type	# Accidents	# of Injuries	# of Fatalities	Total Property Damage
Capsizing	514	330	206	$3,167,989
Carbon Monoxide	20	30	7	$0
Collision with Fixed Object	558	491	50	$4,751,034
Collision with Floating Object	152	104	3	$1,123,884
Vessel Collision	1,469	1,063	70	$7,474,678
Departed Vessel	45	6	39	$0
Ejected from Vessel	7	4	5	$0
Falls within Boat	233	253	6	$183,400
Falls on PWC	15	14	1	$0
Fall Overboard	509	354	201	$141,018
Fire/Explosion (fuel)	142	68	7	$2,921,295
Fire/Explosion (other than fuel)	68	10	2	$9,189,282
Flooding or Swamping	274	61	41	$2,383,566

Accident Type	# Accidents	# of Injuries	# of Fatalities	Total Property Damage
Grounding	291	193	8	$4,282,148
Not Reported	158	126	20	$1,028,992
Other Casualty	80	58	4	$177,900
Sinking	128	23	8	$2,021,308
Skier Mishap	451	466	6	$13,001
Struck by Boat	89	82	9	$116,350
Struck by Motor	107	103	6	$350
Struck Submerged Object	128	49	4	$1,446,179
Total	**5,438**	**3,888**	703	**$40,422,374**

Table 3.39 Overall 2003 Reported Boating Accident Cause-of-Death Statistics. Source: USCG Boating Statistics, 2003.

Cause of Death	# Fatalities	PFD Worn	
		Yes	No
Carbon Monoxide Poisoning	7	0	7
Burns	3	0	3
Drowning	481	65	416
Electrocution	3	0	3
Hypothermia	32	8	24
Other	12	5	7
Trauma	135	46	89
Not Reported	30	3	27
Total	**703**	**127**	**576**

3.4.5 Commercial Atlantic Shark Fishery

3.4.5.1 Overview of History and Current Management

In 1993, NMFS implemented the Fishery Management Plan (FMP) for Sharks of the Atlantic Ocean, which established three management units: large coastal sharks (LCS), small coastal sharks (SCS), and pelagic sharks. At that time NMFS identified LCS as overfished, and therefore implemented commercial quotas for LCS and established recreational harvest limits for all sharks. In 2003, NMFS amended the measures enacted in the 1999 FMP based on the 2002 LCS and SCS stock assessments, litigation, and public comments. Implementing regulations for Amendment 1 to the 1999 FMP were published on December 24, 2003 (68 FR 74746). Management measures enacted in the amendment included: re-aggregating the large coastal shark complex, using maximum sustainable yield (MSY) as a basis for setting commercial quotas, eliminating the commercial minimum size restrictions, establishing three regional commercial quotas (Gulf of Mexico, South Atlantic, and North Atlantic) for LCS and SCS

management units, implementing trimester commercial fishing seasons effective January 1, 2005, imposing gear restrictions to reduce bycatch, and a time/area closure off the coast of North Carolina effective January 1, 2005. As a result of using MSY to establish quotas, and implementing a new rebuilding plan, the overall annual landings quota for LCS in 2004 was established at 1,017 metric tons (mt) dressed weight (dw). The overall annual landings quota for SCS was established at 454 mt dw and the pelagic, blue, and porbeagle shark quotas were established at 488 mt dw, 273 mt dw, and 92 mt dw, respectively.

The regional quotas which were established in Amendment 1 to the 1999 HMS FMP for LCS and SCS were intended to improve overall management of the stocks by tailoring quotas to specific regions based on landings information. These quotas were based upon average historical landings (1999 - 2001) from the canvass and quota monitoring databases. The canvass database provides a near-census of the landings at major dealers in the southeast United States (including state landings) and the quota monitoring database collects information from dealers in the South Atlantic and Gulf of Mexico.

On November 30, 2004, NMFS issued a final rule (69 FR 69537), which established, among other things, new regional quotas based on updated landings information from 1999 - 2003. This final rule did not change the overall quotas for LCS, SCS, and pelagic sharks established in Amendment 1 to the 1999 HMS FMP, only the percentages allocated to each of the regions. The updated information was based on several different databases, including the canvass and quota monitoring databases, the Northeast Commercial Fisheries Database (CFDBS), and the snapper grouper logbook. The new regional quotas and trimester seasons for the commercial Atlantic shark fishery became effective January 1, 2005.

3.4.5.2 Most Recent Catch and Landings Data

Commercial shark fishing effort is generally concentrated in the southeastern United States and Gulf of Mexico (Cortes and Neer, 2002). During 1997 - 2003, 92 - 98 percent of LCS, 38 – 49 percent of pelagic sharks, and nearly all SCS (80 – 100 percent) came from the southeast region (Cortes, pers. comm.). McHugh and Murray (1997) found in a survey of shark fishery participants that the largest concentration of bottom longline fishing vessels is found along the central Gulf coast of Florida, with the John's Pass - Madeira Beach area considered the center of directed shark fishing activities. Consistent with other HMS fisheries, some shark fishery participant's move from their homeports to other fishing areas as the seasons change and fish stocks move.

Landings data from 1999 - 2003 indicate that overall LCS landings (including protected species) in the Atlantic commercial shark fishery increased from 1,753 mt dw in 1999 to 2,017 mt dw in 2003 (data from 2003 are still preliminary) (Table 3.40). For SCS, landings ranged from a low of 249 mt dw in 2003 to a high of 330 mt dw in 1999 (Table 3.41). For pelagic sharks, landings ranged from a low of 159 mt dw in 2000 to a high of 281 mt dw in 2003 (Table 3.42). There are a number of other sources of mortality on LCS including discards, recreational catches, catches by other countries, and bycatch of sharks in other fisheries are listed in Table 3.43. All of these sources of mortality are taken into account when developing stock assessments for the Atlantic commercial shark fishery.

Species-specific landings estimates from 1999 - 2003 for LCS indicate that sandbar and blacktip sharks were the two predominant species landed in recent years. In 1999, 2001, and 2002, sandbar sharks were the most abundant species landed in the LCS complex and accounted for 34 - 43 percent of total LCS landings respectively, whereas blacktip sharks in 2000 and 2003 were the most abundant species landed with 33 - 44 percent of total LCS landings (Table 3.40). Hammerhead sharks (all species combined) were the third most abundant species landed, ranging from two to three percent of total LCS landings in 2001 and 2003. Finetooth and sharpnose sharks were the most abundant species landed in the SCS complex. In 2001, finetooth sharks represented 42 percent of total SCS landings, and in 1999 sharpnose sharks represented 39 percent of total SCS landings. Shortfin mako were the most abundant among pelagic shark landings, accounting for 48 percent of that category in 2001 (Table 3.42).

Regional quotas for LCS and SCS were implemented for the first time in 2004. At that time, data indicated that the Gulf of Mexico, South Atlantic, and North Atlantic regions accounted for 42, 54, and four percent of the total LCS landings and four, 83, and 13 percent of the total SCS landings, respectively. Based on a review of updated landings, new regional quotas were established in 2005 (69 FR 69537) for the Gulf of Mexico, South Atlantic and North Atlantic regions at 52, 41, and 7 percent of the total LCS landings (Table 3.44) and 10, 88, and two percent of the total SCS landings, respectively (Table 3.45). The quota for pelagic sharks was not divided among regions.

Recreational catches account for a significant portion of LCS and SCS landings. For the two most recent years for which data are available (2002 - 2003), 78,991 and 84,152 LCS respectively, were estimated to have been caught by recreational fishermen. For SCS, 153,785 sharks were caught recreationally in 2002 and 134,703 in 2003. For pelagic sharks 4,673 were caught recreationally in 2002 and 4,333 were caught in 2003.

Table 3.40 Commercial landings of large coastal sharks in lb dw: 1999-2003. Sources: Data from 1999-2001, Cortés pers. Comm.; data from 2002-2003, Cortés, 2005.

Large Coastal Sharks	1999	2000	2001	2002	2003
Basking**	0	0	0	0	0
Bignose*	9,050	672	1,442	0	318
Bigeye sand tiger**	0	0	0	0	0
Blacktip	1,259,016	1,633,919	1,135,199	1,099,194	1,487,604
Bull	28,603	24,980	27,037	40,463	93,816
Caribbean Reef*	0	0	1	0	0
Dusky*	110,942	205,746	1,973	8,779	23,288
Galapagos*	0	0	0	0	0
Hammerhead, Great	0	0	0	0	0
Hammerhead, Scalloped	0	0	0	0	0
Hammerhead, Smooth	0	0	0	0	0
Hammerhead, Unclassified	53,393	35,060	69,356	108,160	153,548
Large Coastal, Unclassified	67,197	16,575	172,494	147,359	51,433

Lemon	25,298	45,269	24,453	56,921	80,688
Narrowtooth*	0	0	0	0	0
Night*	4,287	0	0	0	20
Nurse	1,176	429	387	69	70
Sandbar	1,320,239	1,491,908	1,407,550	1,863,420	1,436,838
Sand Tiger**	6,401	6,554	1,248	409	975
Silky	9,961	31,959	14,197	30,731	51,588
Spinner	629	14,473	6,970	8,447	12,133
Tiger	30,779	24,443	26,973	16,115	18,536
Whale**	0	0	0	0	0
White**	82	1,201	26	0	1,454
Unclassified, assigned to large coastal	821,648	92,117	525,661	771,450	853,564
Unclassified, fins	116,570	87,820	23,988	142,565	181,431
Total	**3,865,271 (1,753 mt dw)**	**3,713,125 (1,684 mt dw)**	**3,438,955 (1,560 mt dw)**	**4,294,082 (1,948 mt dw)**	**4,447,304 (2,017 mt dw)**

* indicates species that were prohibited in the commercial fishery as of June 21, 2000.
** indicates species that were prohibited as of April 1997.
*** Preliminary data, species not yet available.

Table 3.41 Commercial landings of small coastal sharks in lb dw: 1999-2003. Source: Cortés and Neer, 2002; Cortés, 2003.

Small coastal sharks	1999	2000	2001	2002	2003
Atlantic Angel*	0	97	0	495	0
Blacknose	137,619	178,083	160,990	144,615	131,511
Bonnethead	58,150	69,411	63,461	36,553	38,614
Finetooth	285,230	202,572	303,184	185,120	163,407
Sharpnose, Atlantic	244,356	142,511	196,650	213,301	190,960
Sharpnose, Atlantic, fins	0	0	209	10	0
Sharpnose, Caribbean*	2,039	353	205	0	0
Unclassified Small Coastal	336	0	51	35,831	25,307
Total:	**727,730 (330 mt dw)**	**593,027 (269 mt dw)**	**724,541 (329 mt dw)**	**615,915 (279 mt dw)**	**549,799 (249 mt dw)**

* indicates species that were prohibited in the commercial fishery as of June 21, 2000.

Table 3.42 Commercial landings of pelagic sharks in lb dw: 1999-2003 Source: Data from 1999-2001, Cortés pers. comm.; and data from 2002-2003, Cortés, 2005.

Pelagic Sharks	1999	2000	2001	2002	2003
Bigeye thresher*	18,683	4,376	330	0	0
Bigeye sixgill*	0	0	0	0	0
Blue shark	886	3,508	65	137	6,324
Mako, longfin*	3,394	6,560	9,453	3,008	1,831

Pelagic Sharks	1999	2000	2001	2002	2003
Mako, shortfin	150,073	129,088	171,888	159,840	150,076
Mako, Unclassified	56,625	74,690	73,556	58,392	33,203
Oceanic whitetip	1,480	657	922	1,590	2,559
Porbeagle	5,650	5,272	1,152	2,690	1,738
Sevengill*	0	0	0	0	0
Sixgill*	0	0	0	0	0
Thresher	96,266	81,624	56,893	53,077	46,502
Unclassified, pelagic	0	233	0	5,965	79,439
Unclassified, assigned to pelagic	41,006	40,951	31,636	182,983	297,126
Unclassified, pelagic, fins	2,408	3,746	12,239	0	0
Total:	**376,471 (171 mt dw)**	**350,705 (159 mt dw)**	**358,134 (162 mt dw)**	**467,682 (212 mt dw)**	**618,798 (281 mt dw)**

* indicates species that were prohibited in the commercial fishery as of June 21, 2000.

Table 3.43 Estimates of total landings and dead discards for large coastal sharks: 1981 - 2003 (numbers of fish in thousands). Source: Table 1 in Cortes, 2005, except for bottom longline discards for 1981-1992 and Mexican catches, which came from Cortes *et al*., 2002.

Year	Commercial Landings	Pelagic Longline Discards	Recreational Catches	Unreported	Bottom Longline Discards	Mexican Catches	Menhaden Fishery bycatch	Total
1981	16.2	0.9	265.0	N/A	0.9	120.0	25.1	428.1
1982	16.2	0.9	413.9	N/A	0.9	81.9	25.1	538.9
1983	17.5	0.9	746.6	N/A	1.0	85.4	25.1	876.5
1984	23.9	1.3	254.6	N/A	1.4	120.7	25.1	426.9
1985	22.2	1.2	365.6	N/A	1.3	87.7	25.1	503.1
1986	54.0	2.9	426.1	24.9	3.1	81.8	25.1	617.9
1987	104.7	9.7	314.4	70.3	5.9	80.2	25.1	610.3
1988	274.6	11.4	300.6	113.3	15.5	89.3	25.1	829.8
1989	351.0	10.5	221.1	96.3	19.9	105.6	25.1	829.4
1990	267.5	8.0	213.2	52.1	15.1	122.2	25.1	703.3
1991	200.2	7.5	293.4	11.3	11.3	95.7	25.1	644.5
1992	215.2	20.9	304.9	N/A	12.2	103.4	25.1	681.6
1993	169.4	7.3	249.0	N/A	11.3	119.8	25.1	581.9
1994	228.0	8.8	160.9	N/A	16.3	110.7	26.2	550.9
1995	222.4	5.2	180.8	N/A	13.9	96.0	24.0	537.8
1996	160.6	5.7	191.5	N/A	7.6	106.1	25.1	493.6
1997	130.6	5.6	168.1	N/A	8.3	83.1	25.1	417.8
1998	174.9	4.3	169.6	N/A	9.9	74.1	25.1	458.1
1999	111.5	9.0	92.3	N/A	3.8	57.1	25.1	297.5
2000	111.2	9.4	131.5	N/A	4.8	52.1	25.1	343.0
2001	95.7	5.6	127.9	N/A	6.1	52.1	25.1	334.1
2002	123.4	2.4	77.9	N/A	4.9	N/A	25.1	233.7
2003	126.5	3.5	81.4	N/A	7.0	N/A	25.1	243.5

Table 3.44 Commercial landings of LCS (including unclassified sharks) in the Atlantic and Gulf of Mexico by region and year (mt dw) from 1999-2003.

Year	South Atlantic			Gulf of Mexico			North Atlantic		Total		
	Canvass	QMS	Logbook	Canvass	QMS	Logbook	CFDBS*	Logbook	Canvass	QMS	Logbook
1999	1246.9	474.5	789.2	1342.7	739.8	803.9	135.5	75.6	258.9	1415	1668.7
2000	1107	503.8	662.1	1255.3	912.1	760	168.7	167.6	2362.3	1591.3	1589.7
2001	1078.4	488.1	632.6	1270.4	639.4	898.8	254.4	98.9	2348.8	1390.1	1630.3
2002	1542	678.8	680.4	1406.5	614.7	1034.6	191.2	104	2948.5	1492.3	1819
2003	1226.7	674.9	635.7	1829.7	934.3	1168.4	178.3	64.6	3056.4	1804.9	1868.7
Total	6201	2820.1	3400	7104.6	3840.3	4665.7	928.1	510.7	13305.6	7693.6	8576.4
Average	1240.2	564.0	680	1420.9	768.1	933.1	185.6	102.1	2661.1	1538.7	1715.3
Total Combined	12526.2			15610.6			1438.8		29575.6		
Average Combined	835.1			1040.7			143.9		2019.7		
Percent	41% (416.9 mt dw)			52% (528.8 mt dw)			7% (71.2 mt dw)		100%		

*Northeast Commercial Fisheries Database System (CFDBS). There is no canvass data available for the North Atlantic.

Table 3.45 Commercial landings of SCS in the Atlantic and Gulf of Mexico by region and year (mt dw) from 1999 - 2003.

Year	South Atlantic			Gulf of Mexico			North Atlantic		Total		
	Canvass	QMS	Logbook	Canvass	QMS	Logbook	CFDBS*	Logbook	Canvass	QMS	Logbook
1999	391.3	317.3	198.4	11.8	14.5	26.5	3.7	2.07	403.1	335.7	226.97
2000	357.5	229.9	74.5	11.6	24.1	13	12.6	9.3	369.1	266.6	96.8
2001	446.3	309	143.9	8.8	18.9	34.5	0.1	7.8	455.1	328	186.2
2002	311.1	248.9	156.7	36.9	11.4	42.4	15.4	5.4	348	275.7	204.5
2003	168.3	197.4	147.1	47.9	46.1	73.6	0	7.4	216.2	243.5	228.1
Total	1674.5	1302.5	720.6	117.0	115.0	190.0	31.8	31.97	1791.5	1449.5	942.57
Average	334.9	260.5	144.12	23.4	23.0	38.0	6.4	6.394	358.3	289.9	188.514
Total Combined	3697.6			422			63.8		4183.4		
Average Combined	246.5			28.1			6.4		281.0		
Percent	88% (398.2 mt dw)			10% (45.4 mt dw)			2% (10.3 mt dw)		100%		

*Northeast Commercial Fisheries Database System (CFDBS). There is no canvass data available for the North Atlantic.

3.4.5.3 Bottom Longline Fishery

The Atlantic bottom longline fishery targets both LCS and SCS. Bottom longline is the primary commercial gear employed in the LCS and SCS fisheries in all regions. Gear characteristics vary by region, but in general, an approximately ten-mile long bottom longline, containing about 600 hooks, is fished overnight. Skates, sharks, or various finfishes are used as bait. The gear typically consists of a heavy monofilament mainline with lighter weight monofilament gangions. Some fishermen may occasionally use a flexible 1/16 inch wire rope as gangion material or as a short leader above the hook.

In January 2002, the observer coverage requirements in the shark bottom longline fishery changed from voluntary to mandatory participation if selected. NMFS selects approximately 40 - 50 vessels for observer coverage during each season. Vessels are randomly selected if they have a directed shark limited access permit, have reported landings from sharks during the previous year, and have not been selected for observer coverage during each of the three previous seasons.

NMFS currently manages the commercial shark observer program through a contract with the University of Florida and Florida Museum of Natural History, Commercial Shark Fishery Observer Program (CSFOP). The CSFOP trains and places observers aboard vessels in the directed shark bottom longline fishery in the Atlantic and Gulf of Mexico to collect data on the commercial shark fishery and thus improve overall management strategies for the fishery. Observers provide baseline characterization information, by region, on catch rates, species composition, catch disposition, relative abundance, and size composition within species for the large coastal and small coastal shark bottom longline fisheries.

During 2003, six observers logged 263 sea days on shark fishing trips aboard 20 vessels in the Atlantic from North Carolina to Florida and in the eastern Gulf of Mexico off Florida. The number of trips taken on each vessel ranged from one to five and the number of sea days each observer logged ranged from nine to 35. Observers documented the catches and fishing effort on approximately 150 longline sets that fished 103,351 hooks. During 2004, five observers logged 196 sea days on 56 shark fishing trips aboard 11 vessels. Observers documented the catches and fishing effort during 120 longline sets that fished 90,980 hooks.

Data from the CSFOP between 2000 and 2002 show that LCS comprised 66.2 percent of the total catch (Burgess and Morgan, 2002). During 2003, LCS comprised 68.4 percent of the total catch. Sandbar sharks dominated the observed catches with 30.6 percent of total LCS catch (Table 3.46). The overall catch and disposition of species is listed in Table 3.47. Regional differences in sandbar shark abundance were evident. For example, in the Carolina region, sandbar sharks comprised 67.4 percent of the total catch and 77.2 percent of the large coastal shark catch. In the Florida Gulf region, sandbar sharks comprised 62.0 percent of the total catch and 66.5 percent of the large coastal catch, whereas in the Florida East Coast region, sandbar sharks comprised only 17.2 percent of the total observed catch, and 37.1 percent of the large coastal shark catch (Burgess and Morgan, 2003). Blacktip sharks comprised 13.9 percent of total observed catch and 20.3 percent of the large coastal catch (Burgess and Morgan, 2002). Tiger sharks comprised 7.5 percent of the total observed catch and 11.0 percent of the large coastal

shark catch. A majority of tiger sharks (71.7 percent) and nurse sharks (98.8 percent) were tagged and released.

During 2003, CSFOP data indicate that SCS comprised 28.0 percent of the total observed catch (Burgess and Morgan, 2003; Burgess and Morgan 2004). Atlantic sharpnose shark dominated the SCS catch (80.3 percent). The remainder of the small coastal catch consisted of blacknose sharks (5.5 percent), bonnethead (0.03 percent), and finetooth (0.02 percent)(Table 3.46). In previous seasons, the Atlantic sharpnose shark was the most frequently caught shark in the Florida East Coast region and accounted for 51.6 percent of the total observed catch, and 96.0 percent of the small coastal catch in that region (Burgess and Morgan, 2002).

Bottom longlining for sharks has relatively low observed bycatch rates. Historically, finfish bycatch has averaged approximately five percent in the bottom longline fishery. Finfish bycatch for the bottom longline fishery includes, but is not limited to, skates, rays, cobia, redfish, bluefish, and great barracuda. During the second semi-annual season of 2003, observer data indicate that approximately 4,320 sharks were caught compared to 432 other fish, four invertebrates, and three sea turtles (Burgess and Johns, 1999). In terms of bycatch rates, observed shark catches constitute 91 percent of the 4,759 total animals caught, with other fish comprising 10 percent, invertebrates less than .01 percent, and sea turtles less than .01 percent. For more information on bycatch see Section 3.8.

Table 3.46 **Species composition of observed bottom longline catch during 2003.** Source: Burgess and Morgan, 2004.

Species	Total Number Caught	% Total Catch	% Management Category
LCS			
Sandbar shark	2719	30.63	44.78
Blacktip shark	1232	13.88	20.29
Tiger shark	665	7.49	10.95
Spinner shark	309	3.48	5.09
Scalloped hammerhead	259	2.92	4.27
Bull shark	257	2.90	4.23
Nurse shark	175	1.97	2.88
Sand tiger	108	1.22	1.78
Dusky shark	108	1.22	1.78
Silky shark	105	1.18	1.73
Lemon shark	60	0.68	0.99
Great hammerhead	55	0.62	0.91
Bignose shark	8	0.09	0.13
Night shark	8	0.09	0.13
White shark	3	0.03	0.05

Species	Total Number Caught	% Total Catch	% Management Category
Caribbean shark	1	0.01	0.02
Total	6072	68.41	100
SCS			
Sharpnose shark	1996	22.49	80.32
Blacknose shark	484	5.45	19.48
Bonnethead	3	0.03	0.12
Finetooth	2	0.02	0.08
Total	2485	28.00	100.00
Pelagics			
Sevengill	5	0.06	45.45
Shortfin mako	2	0.02	18.18
Bigeye sixgill	2	0.02	18.18
Bigeye thresher shark	1	0.01	9.09
Sixgill shark	1	0.01	9.09
Total	11	0.12	100.00
Other			
Smooth dogfish	298	3.36	
Unidentified sharks	10	0.113	

Table 3.47 Directed bottom longline shark observed catch and disposition, 2003. Source: Burgess and Morgan, 2004.

	Number caught	Percent total mortality	Number Carcassed*	Percent Carcassed	Other mortality**	Percent other mortality	Number Tagged released	Percent Released
Small Coastal	2,485	94.85	295	11.87	2,062	82.98	127	5.11
Large Coastal	6,072	86.68	4,677	77.03	586	9.65	809	13.32
Pelagic	11	90.91	2	18.18	8	72.73	1	9.09
Large coastal sharks:								
Sandbar	2,719	97.35	2,597	95.51	50	1.84	72	2.65
Blacktip	1,232	99.51	1,207	97.97	19	1.54	6	0.49
Tiger	665	40.60	41	6.17	229	34.44	395	59.40
Spinner	309	100.00	302	97.73	7	2.27		0.00
Scalloped hammerhead	259	98.84	86	33.20	170	65.64	3	1.16
Bull	257	96.89	248	96.50	1	0.39	8	3.11
Nurse	175	0.57	0	0.00	1	0.57	174	99.43
Dusky	108	76.85	38	35.19	45	41.67	25	23.15
Sand tiger	108	0.00	0	0.00	0	0.00	108	100.00
Silky	105	97.14	78	74.29	24	22.86	3	2.86
Lemon	60	86.67	52	86.67	0	0.00	8	13.33
Great hammerhead	55	96.36	25	45.45	28	50.91	2	3.64
Bignose	8	75.00	3	37.50	3	37.50	2	25.00
Night	8	100.00	0	0.00	8	100.00		0.00
White	3	33.33	0	0.00	1	33.33	2	66.67
Caribbean	1	0.00	0	0.00	0	0.00	1	100.00
Small coastal sharks:								
Sharpnose	1,996	96.24	14	0.70	1,907	95.54	74	3.71
Blacknose	484	89.05	276	57.02	155	32.02	53	10.95
Bonnethead	3	100.00	3	100.00	0	0.00	0	0.00
Finetooth	2	100.00	2	100.00	0	0.00	0	0.00
Pelagic sharks:								
Bigeye thresher	5	100.00	0	0.00	5	100.00	0	0.00
Sevengill	2	0.00	0	0.00	2	100.00	0	0.00
Shortfin mako	2	0.00	2	100.00	0	0.00	0	0.00
Sixgill	1	0.00	0	0.00	0	0.00	1	100.00
Bigeye sixgill	1	0.00	0	0.00	1	100.00	0	0.00

* carcassed means sharks that are retained

** other mortality refers to sharks brought to the vessel dead, but not retained

3.4.5.4 Gillnet Fishery

In the southeast shark gillnet fishery, NMFS modified the requirement to have 100 percent observer coverage at all times on March 30, 2001 (66 FR 17370), by reducing the level required to a statistically significant level outside of right whale calving season (100 percent observer coverage is still required during the right whale calving season from November 15 through April 1). This modification of observer coverage reduced administrative costs while maintaining statistically significant and adequate levels of coverage to provide reasonable estimates of sea turtle and marine mammal takes outside the right whale calving season. The level of observer coverage necessary to maintain statistical significance will be reevaluated annually and adjusted accordingly. Additionally, in 2001, NMFS established a requirement to conduct net checks every two hours to look for and remove any protected species.

The southeast shark gillnet fishery is comprised of several vessels based primarily out of ports in northern Florida (South Atlantic Region) that use nets typically 456 to 2,280 meters long and 6.1 to 15.2 meters deep, with stretched mesh from 12.7 to 22.9 cm. This fishery is currently prohibited in the state waters off South Carolina, Georgia, and Florida, thereby forcing some of these vessels to operate in deeper waters under Federal jurisdiction, where gillnets are less effective. The entire process (set to haulback) takes approximately 9 hours (Carlson and Baremore, 2002a). A total of 41 strikenet sets, in which a smaller second vessel actively sets the net around a school of sharks, were observed on three vessels from January through September 2003. However, 51 additional trips were made when the observer departed with the vessel but no strike was made. Reasons for not striking for sharks included the inability to locate the school, sharks located in state waters, and poor weather conditions (Carlson and Baremore, 2003).

On September 23, 2002, NMFS implemented a restricted area to reduce bycatch of right whales from November 15 through March 31 (67 FR 59471). In this area, only gillnets used in a strikenet fashion can operate during times when right whales are present. Operation in this area at that time requires 100 percent observer coverage. Vessels fishing in a strikenet fashion used nets 364.8 meters long, 30.4 meters deep, and with mesh size 22.9 cm. Observed catch in the strikenet fishery consisted of 6 species of sharks (96.7 percent of total number caught) and seven species of teleosts and rays (3.3 percent of total number caught). No marine mammals or sea turtles were observed caught. The blacktip shark made up 97.5 percent of the number of sharks caught, and 86 percent of the overall catch. Bycatch included crevalle jack, red drum, and great barracuda (Table 3.48).

A total of 24 driftnet sets were observed on five vessels from February through September, 2004. Driftnet vessels carried nets ranging in length from 547.2 - 2736 m; depths from 7.6 - 13.7 m and stretched mesh sizes from 12.7 - 22.9 cm. The most frequently used mesh size was 12.7 cm. For all observed driftnet sets, set duration averaged 0.4 hrs. Sets were made in seawater averaging 15.4 m deep. Haulback and processing of the catch averaged 3.4 hrs. Average soak time for the driftnet (time net was first set minus time haulback began) was 10.8 hrs.

The observed driftnet catch consisted of nine species of sharks. Three species of sharks made up 92.9 percent (by number) of the observed shark catch (Table 3.49). These species were

the Atlantic sharpnose shark, blacknose shark, and finetooth shark. By weight, the shark catch was made up of Atlantic sharpnose shark, (55.3 percent), blacknose shark (17.1 percent), blacktip shark (10.7 percent), and finetooth shark (10.3 percent). Total observed catch composition (percent of numbers caught) was 79.0 percent sharks, 20.7 percent teleosts, 0.3 percent rays, and 0.03 percent protected species (*i.e.*, marine mammals, sea turtles, sawfish).

There were 23 species of teleosts, two species of rays, and one species of marine mammal observed caught during the driftnet season (Table 3.50). Four species of teleosts and rays made up 90.8 percent by number of the overall non-shark species in observed strikenet catches. These species were little tunny (45.6 percent); king mackerel (23.3 percent); great barracuda (11.8 percent); and red drum (10.2 percent). For incidental driftnet catch species, the highest proportion discarded dead (with observed catch greater than 10 specimens) was Atlantic sailfish, (100.0 percent), king mackerel (78.3 percent), and cobia (28.7 percent). Red drum had the highest discard proportion alive (98.1 percent) (Carlson and Baremore, 2003). Observed driftnet sets caught 23 species of teleosts and rays and no sea turtles or marine mammals. Only the great barracuda were retained, with all remaining bycatch discarded alive (Carlson, 2002).

Outside of right whale calving season, observed drift gillnet catch consisted of 26 species of teleosts and rays and one species of marine mammal, which was discarded dead. Five species of teleosts and one species of ray made up 90.6 percent by number of the overall non-shark catch. Little tunny (44.1 percent), king mackerel (20.8 percent), great barracuda (12.5 percent), Atlantic moonfish (9.4 percent), and cobia (3.8 percent) dominated the bycatch (Carlson and Baremore, 2002). During drift gillnet fishing, the highest proportion of species discarded dead (for species with greater than 10 individuals) was for tarpon, crevalle jack, king mackerel, and red drum. Cownose rays and red drum had the highest proportion of discarded alive with 78.1 percent and 50.0 percent, respectively (Carlson and Baremore, 2002).

Table 3.48 Total Strikenet Shark Catch and Bycatch by Species in order of Decreasing Abundance for all Observed Trips, 2003. Source: Carlson and Baremore, 2003.

Species	Total Number Caught	Kept (%)	Discarded Alive (%)	Discarded Dead (%)
Blacktip shark	6,401	97.5	.6	1.9
Blacknose shark	343	100.0	0	0
Crevalle jack	215	96.2	3.3	.5
Red Drum	18	0	100	0
Great barracuda	13	92.3	0	7.7
Manta ray	10	0	100	0
Bull shark	8	75	12.5	12.5
Permit	8	50	37.5	12.5
Nurse shark	1	0	100	0
Spinner shark	1	100	0	0
Finetooth shark	1	100	0	0
Cobia	1	100	0	0
Atlantic bonito	1	0	0	100
Total	**7,021**			

Table 3.49 Total Shark Catch by Species and Species Disposition in Order of Decreasing Abundance for all Observed Driftnet Sets, 2003. Source: Carlson and Baremore, 2003.

Species	Total Number Caught	Kept (%)	Discarded Alive (%)	Discarded Dead (%)
Atlantic sharpnose	6,917	99.8	0	.2
Blacknose	799	100	0	0
Finetooth	620	100	0	0
Blacktip	375	45	24	31
Bonnethead	168	100	0	0
Scalloped Hammerhead	62	3.2	0	96.8
Spinner	20	5	0	95
Great Hammerhead	6	100	0	0
Lemon	1	0	100	0
Total	**8,968**			

Table 3.50 Total bycatch in NMFS observed drift gillnet sets in order of decreasing abundance and species disposition for all observed trips, 2003. Source: Carlson, 2003.

Species	Total Number Caught	Kept (%)	Discard Alive (%)	Discard Dead (%)
Little tunny	1169	92.6	0	7.4
King mackerel	596	21.5	.2	78.3
Barracuda	300	100	0	0
Red drum	262	0	98.1	1.9
Cobia	80	70	1.3	28.7
Blackfin tuna	36	100	0	0
Atlantic sailfish	30	0	0	100
Cownose ray	22	0	59.1	40.9
Spanish mackerel	11	100	0	0
Remora	9	0	33.4	66.6
Crevalle jack	8	0	0	100
Blue runner	8	87.5	0	12.5
Tarpon	5	0	0	100
Manta ray	5	0	100	0
Dolphin	5	100	0	0
Tripletail	4	100	0	0
Spotted eagle ray	2	0	100	0
Blue marlin	2	0	0	100
Balloonfish	2	0	0	100
Wahoo	1	100	0	0
Pompano	1	100	0	0
Rainbow runner	1	100	0	0
Black drum	1	0	100	0
Bluefish	1	0	0	100

3.4.5.5 Pelagic Longline Fishery

The U.S. pelagic longline (PLL) fishery for Atlantic HMS primarily targets swordfish, yellowfin tuna, or bigeye tuna in various areas and seasons and catches sharks incidentally. Although this gear can be modified (*i.e*., depth of set, hook type, etc.) to target swordfish, tuna, or sharks, like other hook and line fisheries, it is a multi-species fishery. For more information on the PLL fishery, see Section 3.4.1. Longline gear sometimes attracts and hooks non-target finfish with no commercial value, as well as species that cannot be retained by commercial fishermen, such as billfish or some species of sharks. Pelagic longlines may also interact with protected species such as marine mammals, sea turtles, and sea birds.

From May 1992 through December 2000, the Pelagic Observer Program (POP) recorded a total of 4,612 elasmobranchs (15 percent of the total catch) caught off the southeastern U.S. coast in fisheries targeting tunas and swordfish (Beerkircher *et al.*, 2004). Of the 22 elasmobranch species observed, silky sharks were numerically dominant (31.4 percent of the elasmobranch catch), with silky, dusky, night, blue, tiger, scalloped hammerhead, and unidentified sharks making up the majority (84.6 percent) (Beerkircher *et al.*, 2004).

3.4.5.6 Protected Resources

Under the Marine Mammal Protection Act (MMPA) (16 U.S.C. 1361 et seq.) the Atlantic shark gillnet fishery is classified as Category II (occasional serious injuries and mortalities), and the shark bottom longline as Category III (remote likelihood or no known serious injuries or mortalities) (July 20, 2004, 69 FR 43338). On October 29, 2003, NMFS issued a biological opinion (BiOp) pursuant to the Endangered Species Act (ESA) regarding Atlantic shark fisheries. This BiOp concluded that the level of anticipated take in the Atlantic shark fishery resulting from measures implemented in Amendment 1 to the 1999 FMP (68 FR 74746), were not likely to jeopardize the continued existence of endangered green, leatherback, and Kemp's ridley sea turtles, the endangered smalltooth sawfish, or the threatened loggerhead sea turtle. Furthermore, it concluded that the actions in the rule were not likely to adversely affect marine mammals. As a result of this conclusion, NMFS (NMFS, 2003) anticipates that the continued operation of the shark bottom longline program will result in a five year total incidental take of the following numbers of sea turtles: Leatherback - 172; loggerhead – 1,370; a total of 30 in any combination of hawksbill, green, and Kemp's ridley sea turtles. NMFS also anticipates a five year take of 261 smalltooth sawfish, of which no lethal takes are expected. If the actual calculated incidental captures or mortalities exceed the incidental take statement, a formal consultation for that gear type must be re-initiated immediately. More information is available in Amendment 1 to the 1999 FMP and the October 2003 BiOp and is not repeated here.

Loggerhead Sea Turtles

In the bottom longline fishery, a total of 55 sea turtles were observed caught from 1994 through 2004 (Table 3.51 and Figure 3.24). Seasonal variation indicates that most of the sea turtles were caught early in the year. Of the 55 observed sea turtles, 43 were loggerhead sea turtles, of which 26 were released alive. Another nine loggerheads were released in an unknown condition and eight were released dead. Based on extrapolation of observer data in Amendment 1 to the 1999 FMP, it was estimated that a total of 2,003 loggerhead sea turtles were taken in the

shark bottom longline fishery from 1994 through 2002 (NMFS, 2003a). An additional 503 unidentified sea turtles were estimated to have been taken. On average, 222 loggerhead sea turtles and 56 unidentified sea turtles were estimated to have been taken annually during this time period in the shark bottom longline fishery.

In the shark gillnet fishery, loggerhead sea turtles are rarely caught. During the 1999 right whale calving season no loggerhead sea turtles were caught in this fishery (Carlson and Lee, 1999). No loggerhead sea turtles were observed caught with strikenets during the 2000-2002 right whale calving seasons (Carlson 2000; Carlson and Baremore, 2001; Carlson and Baremore, 2002a). However, three loggerhead sea turtles have been observed caught with drift gillnets during right whale calving season, one each year from 2000 to 2002 (Carlson, 2000; Carlson and Baremore, 2001; Carlson and Baremore, 2002a; Garrison, 2003). In 2004 there were no observed sea turtle interactions in either the strikenet or drift gillnet fisheries.

No loggerhead sea turtles were caught outside of the right whale calving season in 2002 (Carlson and Baremore, 2002b), and no loggerhead turtles were observed caught during or after the right whale calving season in 2003 or 2004 in the directed shark gillnet fishery (Carlson and Baremore 2003; Carlson, pers. comm). One loggerhead sea turtle mortality was reported in abandoned fishing gear in January 2004, and was not considered part of normal fishing operations.

Leatherback Sea Turtles

Of the 55 observed sea turtle interactions in the bottom longline fishery from 1994 - 2004, four were leatherback sea turtles of which one was dead and three were released with their condition unknown (Figure 3.24). Based on extrapolation of observer data, it was estimated that 269 leatherback sea turtles were taken in the shark bottom longline fishery from 1994 through 2002 (NMFS, 2003a). On average, 30 leatherback sea turtles each year were taken in the shark bottom longline fishery during 1994 through 2002. This analysis only estimates takes without discriminating between live and dead releases. Of the observed leatherback takes, 25 percent were lethal. Applying the observed mortality rate of 25 percent to the total leatherback takes and an additional 42 percent post-release mortality estimate due to hook ingestion to the remaining, results in an estimated total number of leatherbacks killed as a result of the selected action at 17 per year. The leatherback mortality is very conservative because it is known that leatherbacks rarely ingest or bite hooks, but are usually foul hooked on their flippers or carapaces, reducing the likelihood of post-hooking release mortality. However, leatherback-specific data for this fishery is not available and therefore the most conservative estimate is used.

In the shark gillnet fishery, leatherback sea turtles are sporadically caught. During the 1999 right whale calving season, two leatherback sea turtles were caught in this fishery, and both were released alive (Carlson and Lee, 1999). No leatherback sea turtles were observed caught with strikenets during the 2000-2002 right whale calving seasons (Carlson, 2000; Carlson and Baremore, 2001; Carlson and Baremore, 2002a). Leatherback sea turtles have been observed caught in shark drift gillnets including 14 in 2001 and two in 2002 (Carlson, 2000; Carlson and Baremore, 2001; Carlson and Baremore, 2002a; Garrison, 2003). NMFS temporarily closed the shark gillnet fishery (strikenetting was allowed) from March 9 to April 9, 2001, due to the increased number of leatherback interactions that year (66 FR 15045, March 15, 2001).

From 2003 - 2004, no leatherback sea turtles were observed caught in gillnets fished in strikenet or driftnet methods (Carlson and Baremore 2003; Carlson, pers. comm.).

Smalltooth Sawfish

As of April 1, 2003, NMFS listed smalltooth sawfish as an endangered species (68 FR 15674) under the ESA. After reviewing the best scientific and commercial information, the status review team determined that the continued existence of the U.S. Distinct Population Segment of smalltooth sawfish was in danger of extinction throughout all or a significant portion of its range from a combination of the following four listing factors: the present or threatened destruction, modification, or curtailment of habitat or range; overutilization for commercial, recreational, scientific, or educational purposes; inadequacy of existing regulatory mechanisms; and other natural or manmade factors affecting its continued existence.

To date there has been only one observed catch of a smalltooth sawfish in shark gillnet fisheries (Table 3.52). The sawfish was taken on June 25, 2003, in a gillnet off southeast Florida and was released alive (Carlson and Baremore, 2003). The set was characteristic of a typical drift gillnet set, with gear extending 30 to 40 feet deep in 50 to 60 feet of water. Prior to this event it was speculated that the depth at which drift gillnets are set above the sea floor may preclude smalltooth sawfish from being caught. Although sometimes described as a lethargic demersal species, smalltooth sawfish feed mostly on schooling fishing, thus they would occur higher in the water column during feeding activity. In fact, smalltooth sawfish and Atlantic sharks may be attracted to the same schools of fish, potentially making smalltooth sawfish quite vulnerable if present in the area fished. The previous absence of smalltooth sawfish incidental capture records is more likely attributed to the relatively low effort in this fishery and the rarity of smalltooth sawfish, especially in Federal waters. These factors may result in little overlap of the species with the gear. The sawfish was cut from the net and released alive with no visible injuries. This indicates that smalltooth sawfish can be removed safely if entangled gear is sacrificed.

Given the high rate of observer coverage in the shark gillnet fishery, NMFS believes that smalltooth sawfish takes in this fishery are very rare. The fact that there were no smalltooth sawfish caught during 2001 when 100 percent of the fishing effort was observed, indicates that smalltooth sawfish takes (observed or total) most likely do not occur on an annual basis. Based on this information, the 2003 BiOp estimated that one incidental capture of a sawfish (released alive) over the next five years, will occur as a result of the use of gillnets in this fishery (NMFS, 2003a).

However, sawfish have been observed caught (eight known interactions, seven released alive, one released in unknown condition) in shark bottom longline fisheries from 1994 through 2004 (Morgan pers. comm., Burgess and Morgan, 2004) (Figure 3.25). Based on these observations, expanded sawfish take estimates for 1994 - 2002 were developed for the shark bottom longline fishery (NMFS, 2003a). A total of 466 sawfish were estimated to have been taken in this fishery from 1994 - 2002, resulting in an average of 52 per year. All but one of the observed sawfish was released alive.

Four delphinids have been observed caught and released alive between 1994 and 2004 (G. Burgess, pers. comm.). One pelican was observed caught and killed off the Florida Gulf Coast in January 1995 (G. Burgess, pers. comm.). Bycatch estimates for the shark bottom longline fishery have not been extrapolated for marine mammals. Observed takes of marine mammals in the Southeast Atlantic shark gillnet fishery during 1999 - 2004, totaled 12 bottlenose dolphins and four spotted dolphins. Extrapolated observations from these data suggest serious injury and mortality of 25 bottlenose dolphin and one Atlantic spotted dolphin in the shark gillnet fishery from 1999 through 2002 (Garrison, 2003).

Table 3.51 Observed Sea Turtle Interactions by Month for Years 1994-2004 in the Shark Bottom Longline Fishery. Source: A. Morgan pers. comm.

Month	Number of Sea Turtle Interactions
January	13
February	17
March	5
April	4
May	1
June	0
July	9
August	3
September	3
October	0
November	0
December	0
TOTAL	55

Table 3.52 Protected Species Interactions in Drift Gillnet Sets During the Directed Shark Gillnet Fishery for All Observed Trips, 2003. Source: Carlson, 2003.

Species	Total Number Caught	Released Alive	Discarded Dead	Released Condition Unknown or Comatose
Bottlenose dolphin	2	0	1	1
Smalltooth sawfish	1	1	0	0

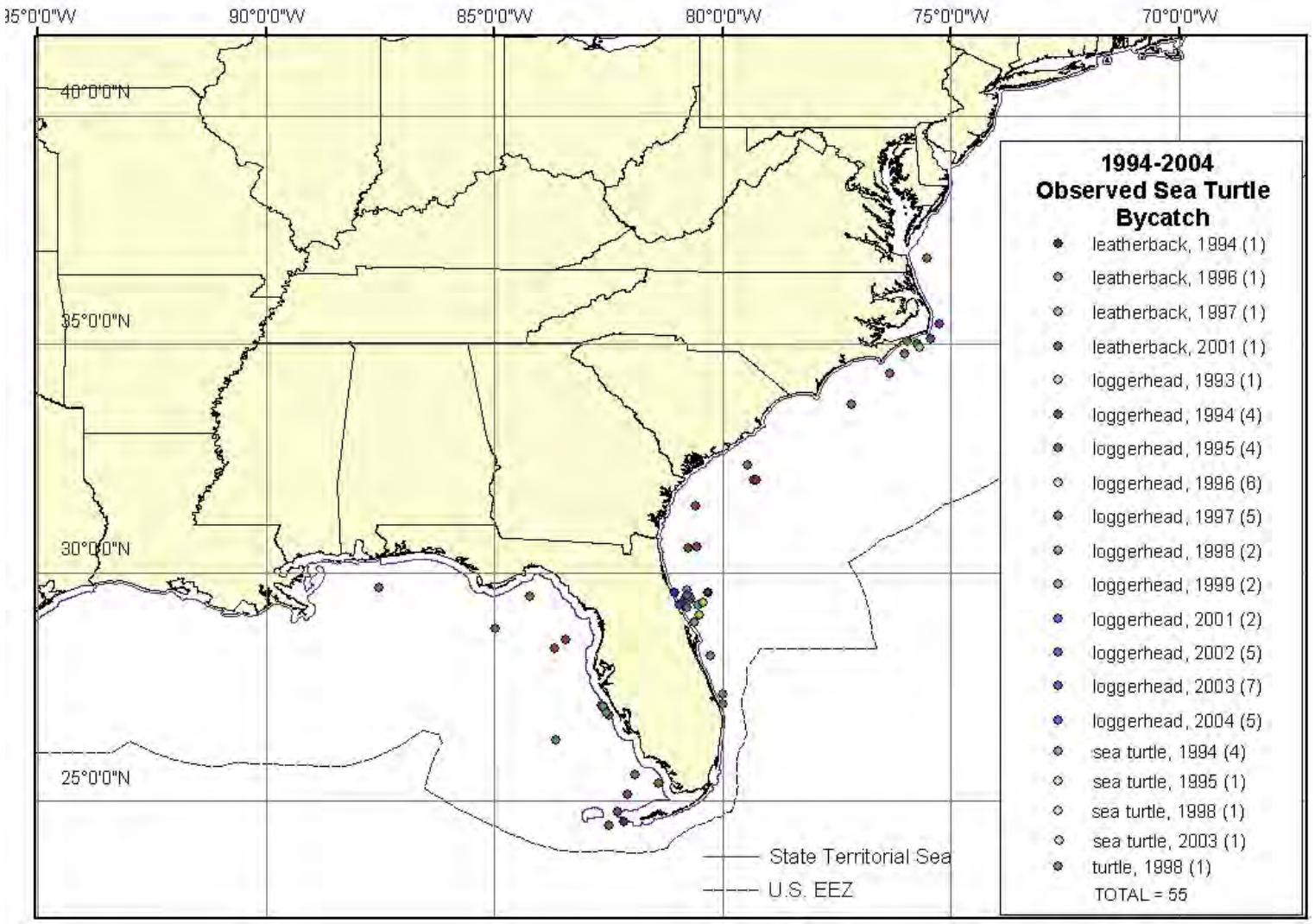


Figure 3.24 Observed sea turtle interactions in the shark bottom longline fishery from 1994-2004. Source: Burgess and Morgan, 2004.

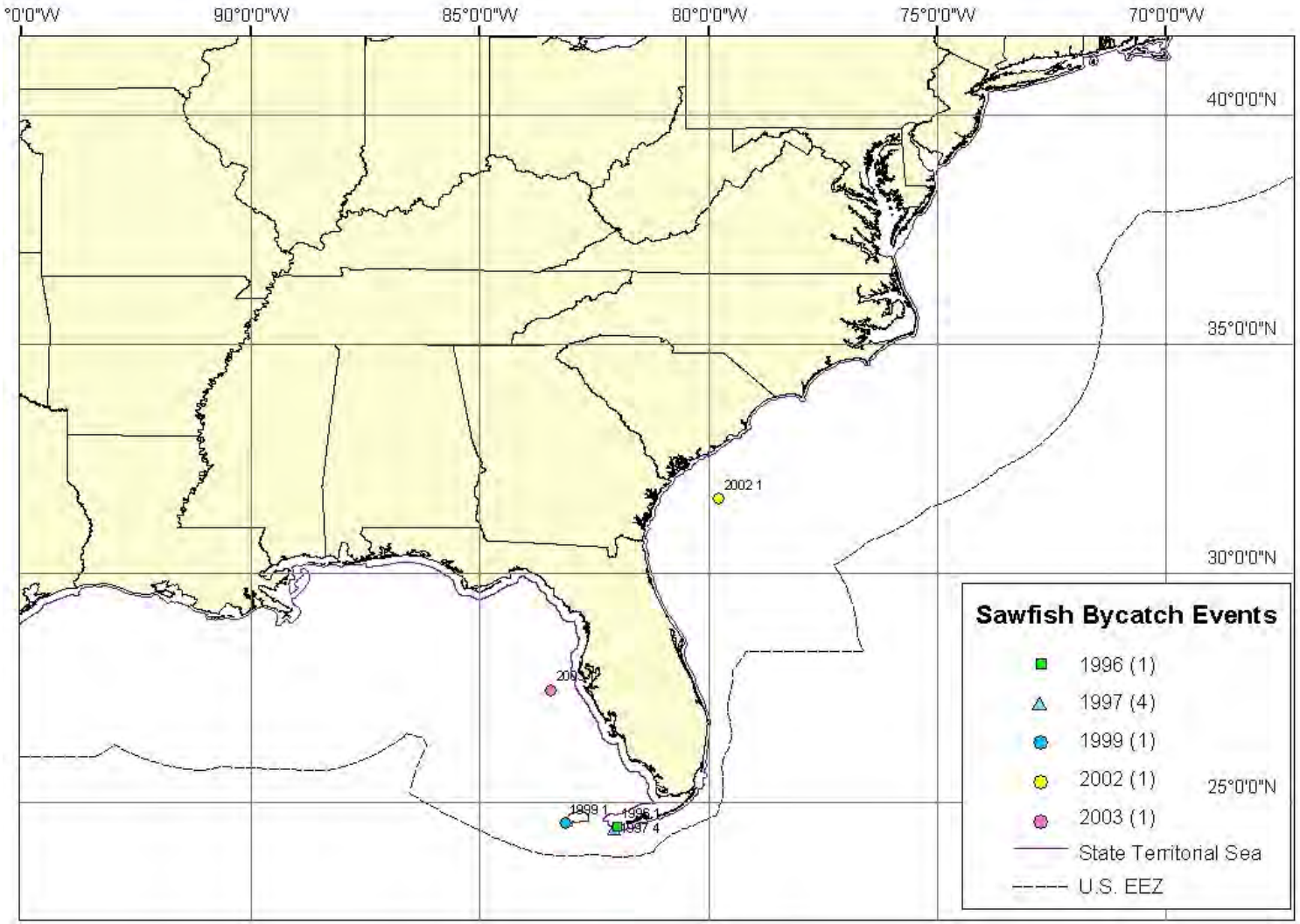


Figure 3.25 **Observed sawfish interactions in the shark bottom longline fishery from 1994-2004.** Source: Burgess and Morgan, 2004.

National Plan of Action for the Conservation and Management Of Sharks

On February 15, 2001, NMFS released the final National Plan of Action (NPOA) for the Conservation and Management of Sharks (66 FR 10484). The NPOA was developed pursuant to the endorsement of the International Plan of Action (IPOA) by the United Nations' Food and Agriculture Organization Committee on Fisheries Ministerial Meeting in February 1999. The overall objective of the IPOA is to ensure conservation and management of sharks and their long-term sustainable use. The final NPOA, consistent with the Magnuson-Stevens Act, requires NMFS and the Regional Fishery Management Councils to undertake extensive data collection, analysis, and management measures in order to ensure the long-term sustainability of U.S. shark fisheries. The NPOA also encourages Interstate Marine Fisheries Commissions and State agencies to initiate or expand current data collection, analysis, and management measures and to implement regulations consistent with federal regulations, as needed. For additional information on the U.S. NPOA and its implementation, see http://www.nmfs.noaa.gov .

Shark Finning Prohibition Act

On December 21, 2000, President Clinton signed the Shark Finning Prohibition Act into law (Public Law 106-557). This amended the Magnuson-Stevens Fishery Conservation and Management Act to prohibit any person under U.S. jurisdiction from (i) engaging in the finning of sharks; (ii) possessing shark fins aboard a fishing vessel without the corresponding carcass; and (iii) landing shark fins without the corresponding carcass. NMFS published final regulations on February 11, 2002 (67 FR 6194). These regulations prohibit the finning of sharks, possession of sharks without the corresponding carcasses, and landings of shark carcasses without the corresponding carcasses in U.S. fisheries in the exclusive economic zone and on the high seas.

3.4.5.7 U.S. vs. International Breakdown of Landings

There is currently no comprehensive international reporting system for Atlantic shark catches and landings. While there are some international data, not all countries report shark catches and landings and those that do use varying reporting methods. The most recent landings reports for blue and shortfin mako sharks are presented in Table 3.53 and Table 3.54, respectively. In 2001, ICCAT passed a resolution on Atlantic sharks to determine needed improvements in data collection for Atlantic shortfin mako and blue sharks, and to conduct an interim meeting in 2003 to discuss the issue. In addition, the resolution called upon contracting parties and non-contracting parties to: (1) submit catch and effort data on Atlantic shortfin mako, porbeagle, and blue sharks; (2) encourage the release of live sharks that are caught incidentally; (3) minimize waste and discards from shark catches; and (4) voluntarily agree not to increase fishing effort targeting Atlantic porbeagle, shortfin mako and blue sharks until sustainable levels of harvest can be determined through stock assessments.

At its annual meeting in New Orleans in 2004, ICCAT adopted a recommendation to, among other things, ban shark finning, require vessels to fully utilize their entire catches of sharks, encourage the release of live sharks that are caught incidentally and are not used for food, and review the assessment of shortfin mako sharks in 2005, and reassess blue sharks and shortfin mako no later than 2007. The ICCAT recommendation also encouraged countries to engage in research to identify shark nursery areas, and collect data on shark catches.

Table 3.53 **Nominal catches of blue shark reported to ICCAT (landings and discards in t) by major gear and flag between 1990 and 2002.** Source: ICCAT Report 2004-2005(I).

		1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002
Atlantic Total		2348	3533	2343	7879	8310	8422	9036	36895	33211	34208	33462	34301	31357
LANDINGS	longline	1387	2265	1667	5749	7366	7501	7767	36279	32578	33790	32616	33415	31146
	others	220	496	491	994	372	300	558	431	422	309	709	780	143
DISCARDS	longline	741	772	184	1136	572	618	609	185	189	105	137	105	68
	others	0	0	0	0	0	3	102	0	22	4	0	0	0
LANDINGS	BENIN	0	0	0	0	0	0	0	6	4	27	0	0	0
	BRASIL	0	0	0	0	0	0	743	1103	0	179	1689	2173	1971
	CANADA	0	0	0	0	0	276	12	11	5	54	18	0	5
	CAP-VERT	0	0	0	0	0	0	0	0	0	0	0	0	0
	CHINA.PR	0	0	0	0	0	0	0	0	0	0	0	750	420
	EC-CYPRUS	0	0	0	0	0	0	0	0	0	0	9	0	0
	EC-DENMARK	2	1	1	0	1	2	3	1	1	0	2	1	13
	EC-ESPANA	0	0	0	0	0	0	0	29917	28137	29005	26046	25110	21037
	EC-FRANCE	130	187	276	322	350	266	278	213	163	0	395	207	109
	EC-IRELAND	0	0	0	0	0	0	0	0	0	66	9	66	11
	EC-PORTUGAL	1387	2257	1583	5726	4669	5569	5710	3966	3318	3337	4220	4713	4602
	EC-U.K	1	0	0	0	0	12	0	0	1	0	12	9	6
	JAPAN	0	0	0	0	2596	1589	1044	996	850	893	492	518	675
	MEXICO	0	0	0	0	0	0	0	0	0	0	0	6	0
	NAMIBIA	0	0	0	0	0	0	0	0	0	0	0	0	2213
	PANAMA	0	0	0	0	0	0	0	0	0	177	22	0	0
	SENEGAL	0	0	0	0	0	0	0	0	0	0	0	456	0
	SOUTHAFRICA	0	0	0	0	0	0	0	0	23	21	0	83	63
	TRINIDAD&TOBAG	0	0	0	0	0	0	0	0	0	0	0	0	6
	U.S.A	87	308	215	680	29	23	283	211	255	217	291	42	0
	UK-BERMUDA	0	0	0	0	0	0	0	1	2	0	0	0	0
	URUGUAY	0	8	84	15	93	64	252	286	242	126	119	59	159
DISCARDS	CANADA	0	0	0	0	0	0	0	0	16	0	0	0	0
	U.S.A	741	772	184	1136	572	618	710	185	195	101	137	106	68
	UK-BERMUDA	0	0	0	0	0	3	1	0	0	8	0	0	0

Table 3.54 **Nominal catches of shortfin mako shark reported to ICCAT (landings and discards in t) by major gear and flag between 1990 and 2002.** Source: ICCAT Report 2004-2005(I).

		1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002
Atlantic Total		*486*	*538*	*511*	*1824*	*1352*	*2646*	*1680*	*5300*	*4105*	*3731*	*4366*	*4522*	*4792*
LANDINGS	longline	218	328	235	1137	1017	1177	1421	5125	3941	3630	4044	4278	4527
	others	268	210	250	667	317	1440	259	175	165	100	322	244	266
DISCARDS	longline	0	0	26	20	18	29	0	0	0	2	0	0	0
LANDINGS	BRASIL	0	0	0	0	0	0	83	190	0	27	219	409	226
	CANADA	0	0	0	0	0	111	67	110	69	70	78	69	78
	CHINA.PR	0	0	0	34	45	23	27	19	74	126	306	22	208
	COTE D'IVOIRE	0	0	0	0	0	0	15	0	0	10	9	15	0
	EC-ESPANA	0	0	0	0	0	0	0	3777	3347	2895	2679	2921	2859
	EC-PORTUGAL	193	314	220	796	649	749	785	519	425	446	706	523	471
	EC-U.K	0	0	0	0	0	0	0	0	0	2	3	2	1
	JAPAN	0	0	0	0	0	0	213	248	0	0	0	0	0
	MEXICO	0	0	0	0	0	10	0	0	0	0	10	16	0
	NAMIBIA	0	0	0	0	0	0	0	0	0	1	0	0	459
	PANAMA	0	0	0	0	0	0	0	0	0	25	1	0	0
	SOUTH AFRICA	0	0	0	0	0	0	0	0	19	13	0	79	19
	ST.VINCENT	0	0	0	0	0	0	0	0	0	3	0	0	0
	TRINIDAD&TOBAGO	0	0	0	0	0	0	0	0	0	0	0	0	1
	U.S.A	268	210	250	945	628	1703	465	408	148	69	292	395	413
	UK-BERMUDA	0	0	0	0	0	0	1	1	2	0	0	0	0
	URUGUAY	25	14	15	29	12	21	24	28	21	43	63	70	58
DISCARDS	MEXICO	0	0	0	0	0	1	0	0	0	0	0	0	0
	U.S.A	0	0	26	20	18	28	0	0	0	0	0	0	0
	UK-BERMUDA	0	0	0	0	0	0	0	0	0	2	0	0	0

3.4.6 Fishery Data: LANDINGS BY SPECIES

The following tables are taken from the 2004 National Report of the United States to ICCAT (NAT-035) (NMFS, 2004). The purpose of this section is to provide a summary of recent landings of HMS on a species by species basis for comparison to Sections 4.1 through 4.5 of the 2004 HMS SAFE report. Landings for sharks can be found in Sections 3.4.4 and 3.4.5.

Table 3.55 U.S. Landings (mt) of Bluefin Tuna by Gear and Area, 1997-2003. Source: NMFS, 2004

Area	Gear	1997	1998	1999	2000	2001	2002	2003
NW Atlantic	Longline	26.0	30.5	25.1	22.8	17.7	7.8	16.3
	Handline	17.4	29.2	15.5	3.2	9.0	4.5	2.5
	Purse Seine	249.7	248.6	247.9	275.2	195.9	207.7	265.4
	Harpoon	97.5	133.1	115.8	184.2	101.9	55.5	87.9
	*Rod and reel (>145 cm LJFL)	752.6	610.4	657.5	632.8	993.4	1,001.7	676.4
	*Rod and reel (<145 cm LJFL)	178.9	166.3	103.0	49.5	242.9	519.4	314.6
	Unclassified	2.2	0.6	0.1	0.2	0.5	0.0	0.0
Gulf of Mexico	Longline	23.8	18.3	48.4	43.3	19.8	32.8	53.8
	*Rod and reel	0.0	0.0	0.4	0.9	1.7	1.5	0.0
NC Area 94a	Longline			0.0	0.0	0.0	9.3	11.3
All Areas	All Gears	1,348.1	1,237	1,214.1	1,212.1	1,582.8	1,840.2	1,428.2

* Rod and Reel catches and landings represent estimates of landings and dead discards when available based on statistical surveys of the U.S. recreational harvesting sector.

Table 3.56 U.S. Landings (mt) of Yellowfin Tuna by Gear and Area, 1997-2003. Source: NMFS, 2004.

Area	Gear	1997	1998	1999	2000	2001	2002	2003
NW Atlantic	Longline	838.9	464.9	581.3	734.5	631.8	400	272
	Rod and reel*	3,560.9	2,845.7	3,818.2	3,809.5	3,690.5	2,624	4,672
	Troll	218	177.5	0.0	0.0	0.0	0.0	0.0
	Purse seine	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	Gillnet	1.3	1.7	0.2	0.2	7.6	5	1
	Trawl	1.9	0.7	4.1	1.8	2.7	0	2
	Harpoon	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	Handline	34.3	0.0	192	235.7	242.5	137	148
	Trap	**	0.1	0.8	0.5	0.1	0.0	0.0
	Unclassified	0.0	0.0	2.1	1.3	6.8	**	0.0
Gulf of Mexico	Longline	2,571.3	1,864.5	2,736.6	2,133	1,505.5	2,109	1,828

	Rod and reel*	7.7	80.9	149.4	52.3	494.2	200	640
	Handline	55.6	60.8	12.7	28.6	43.4	100	59
	Gillnet	0.0	0.0	**	0.0	0.0	0.0	0.0
	Unclassified	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Caribbean	Longline	135.4	58.6	24.4	11.8	23.1	12	7
	Troll	19.6	0.0	0.0	0.0	0.0	0.0	0.0
	Handline	0.7	3.9	14.5	19.4	14.3	7	9
	Gillnet	**	0.0	0.0	0.1	0.3	0.0	**
	Trap	0.1	0.0	0.1	0.3	0.3	0.0	0.0
NC Area 94a	Longline	6.1	4.6	0.2	2.1	3.5	0.0	5
SW Atlantic	Longline	221.9	55.3	32.4	19.8	36.2	52	42
All Areas	All Gears	7,673.7	5,619.2	7,569	7,050.9	6,702.8	5,646	7,685

* Rod and Reel catches and landings represent estimates of landings and dead discards based on statistical surveys of the U.S. recreational harvesting sector.
** ≤= 0.05 mt

Table 3.57 U.S. Landings (mt) of Skipjack Tuna by Gear and Area, 1997-2003. Source: NMFS, 2004.

Area	Gear	1997	1998	1999	2000	2001	2002	2003
NW Atlantic	Longline	1.0	0.7	0.3	0.0	0.1	**	0.9
	Rod and reel*	42.0	49.5	63.6	13.1	32.9	23.3	34.0
	Troll	0.6	0.4	0.0	0.0	0.0	0.0	0.0
	Purse seine	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	Gillnet	8.9	16.9	26.5	1.9	3.6	**	0.9
	Trawl	0.0	0.2	1.0	0.0	0.2	**	0.5
	Handline	0.1	0.0	0.2	0.2	0.2	0.2	0.2
	Trap	0.0	0.0	17.5	0.0	0.0	**	1.5
	Pound	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	Unclassified	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Gulf of Mexico	Longline	1.3	0.6	0.4	0.2	0.2	**	**
	Rod and reel*	21.7	37.0	34.8	16.7	16.1	13.2	11.0
	Handline	0.0	0.0	0.4	0.7	0.0	0.0	**
	Trap	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	Unclassified	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Caribbean	Longline	1.2	0.0	1.3	1.6	4.0	2.5	3.3
	Gillnet	0.2	0.0	0.4	0.6	1.6	0.6	0.4
	Harpoon	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	Handline	0.0	0.0	5.8	8.8	10.3	12.5	9.2
	Trap	**	0.0	0.1	0.3	0.4	0.7	0.2
	Troll	7.3	0.0	0.0	0.0	0.0	0.0	0.0

	Unclassified	0.0	0.0	0.0	0.0	0.0	0.0	0.0
SW Atlantic	Longline	**	0.0	0.0	0.0	0.0	0.0	0.0
All Areas	All Gears	84.3	105.3	152.3	44.1	69.6	53.0	62.1

* Rod and Reel catches and landings represent estimates of landings and dead discards based on statistical surveys of the U.S. recreational harvesting sector.
** ≤= 0.05 mt

Table 3.58 U.S. Landings (mt) of Bigeye Tuna by Area and Gear, 1997-2003. Source: NMFS, 2004**.**

Area	Gear	1997	1998	1999	2000	2001	2002	2003
NW Atlantic	Longline	476.3	544.3	737.8	333.2	506.1	328.6	168.7
	Rod and reel*	333.5	228.0	316.1	34.4	366.2	49.6	188.5
	Troll	3.9	4.0	0.0	0.0	0.0	0.0	0.0
	Gillnet	**	0.4	0.2	0.0	0.2	0.0	0.0
	Handline	2.7	0.0	11.9	4.1	33.2	13.8	6.0
	Pairtrawl	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	Trawl	1.0	0.5	1.2	1.7	0.4	0.5	**
	Harpoon	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	Haul Seine	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	Unclassified	0.5	0.0	0.9	0.0	1.8	0.0	0.0
Gulf of Mexico	Longline	33.9	25.6	54.6	44.5	15.3	41.0	27.5
	Rod and reel*	0.0	0.0	1.8	0.0	0.0	0.0	0.0
	Handline	**	0.1	0.2	0.1	0.5	0.6	0.3
Caribbean	Longline	50.0	48.5	23.2	13.7	31.9	29.7	7.2
	Handline	0.0	0.0	0.2	1.5	0.0	0.0	0.0
NC Area 94a	Longline	91.8	48.4	35.3	63.1	61.0	45.2	36.9
SW Atlantic	Longline	142.8	28.5	78.2	77.4	68.2	91.3	44.6
All Areas	All Gears	1,136.4	928.3	1,261.4	573.7	1,084.8	600.3	479.7

* Rod and Reel catches and landings represent estimates of landings and dead discards based on statistical surveys of the U.S. recreational harvesting sector.
** ≤= 0.05

Table 3.59 U.S. Landings (mt) of Albacore Tuna by Gear and Area, 1997-2003. Source: NMFS, 2004.

Area	Gear	1997	1998	1999	2000	2001	2002	2003
NW Atlantic	Longline	140.0	155.4	179.5	130.5	171.7	124.0	95.6
	Gillnet	42.8	40.1	27.0	0.8	3.3	2.6	0.1
	Handline	4.8	0.0	0.6	2.9	1.7	3.9	1.4
	Trawl	2.6	2.4	0.4	**	0.0	0.3	**
	Troll	1.6	5.8	0.0	0.0	0.0	0.0	0.0
	Rod and reel*	220.2	601.1	90.1	250.8	122.3	323.0	333.8
	Pair Trawl	0.0	0.0	0.0	0.0	0.0	0.0	0.0

	Pound	1.3	0.9	0.4	0.0	0.0	0.0	0.0
	Unclassified	0.2	0.0	0.0	0.1	0.1	0.0	0.0
Gulf of Mexico	Longline	16.9	3.9	3.8	4.1	4.9	9.5	7.7
	Rod and reel*	49.3	0.0	0.0	0.0	0.0	0.0	0.0
	Handline	0.0	0.0	**	0.0	0.0	0.0	**
Caribbean	Longline	16.1	17.8	8.3	9.2	8.7	8.4	4.0
	Troll	3.6	0.0	0.0	0.0	0.0	0.0	0.0
	Gillnet	**	0.0	0.2	0.1	0.5	**	**
	Trap	**	0.0	**	0.2	0.3	0.6	0.2
	Handline	0.0	0.0	3.8	5.0	2.2	2.7	2.0
NC Area 94a	Longline	11.4	1.6	1.5	2.6	6.1	4.8	1.6
SW Atlantic	Longline	4.7	1.4	1.4	0.9	2.4	8.3	2.0
All Areas	All Gears	515.5	830.4	317	407.2	324.2	488.1	448.4

* Rod and Reel catches and landings represent estimates of landings and dead discards based on statistical surveys of the U.S. recreational harvesting sector.
** ≤= 0.05 mt

Table 3.60 U.S. Catches and Landings (mt) of Swordfish by Gear and Area, 1997-2003. Source: NMFS, 2004.

Area	Gear	1997	1998	1999	2000	2001	2002	2003
NW Atlantic	*Longline	1,262.2	1,624.1	1,872.3	1,547.6	1,220.8	1,132.8	1,347.0
	Gillnet	0.4	36.3	0.0	0.0	0.0	0.1	0.0
	Pair Trawl	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	Handline	1.3	0.0	5.0	7.7	8.6	8.8	10.2
	Trawl	8.0	5.9	7.5	10.9	2.5	3.9	6.0
	Troll	0.4	0.7	0.0	0.0	0.0	0.0	0.0
	*Unclassified	11.9	9.1	3.8	1.4	1.8	0.1	0.0
	Harpoon	0.7	1.5	0.0	0.6	7.4	2.8	0.0
	***Rod and Reel	10.9	4.7	21.3	15.6	1.5	21.5	5.1
	Trap	0.0	0.1	**	0.0	0.0	**	0.1
Gulf of Mexico	*Longline	759.9	633.1	579.6	631.7	494.6	549.1	515.8
	Handline	0.0	0.0	**	1.2	0.3	2.9	1.5
Caribbean	*Longline	688.9	516.0	260.5	331.9	347.0	329.0	276.4
	Trap			0.0	0.3	0.0	0.1	**
NC Atlantic	*Longline	688.2	658.6	650.0	804.6	420.6	587.9	632.9
SW Atlantic	*Longline	417.9	170.1	185.2	143.8	43.2	199.9	20.9
All Areas	All Gears	3,850.7	3,660.2	3,585.2	3,497.3	2,548.3	2,838.9	2,815.9

* Includes landings and estimated dead discards from scientific observer and logbook sampling programs.
** ≤ = 0.5 mt
*** Rod and Reel catches and landings represent estimates of landings and dead discards based on statistical surveys of the U.S. recreational harvesting sector.

Table 3.61 U.S. Landings (mt) and dead discards of Blue Marlin, White Marlin and Sailfish by Gear and Area, 1998-2002. Source: NMFS, 2003.

		Blue Marlin					White Marlin					Sailfish				
Area	**Gear**	**1998**	**1999**	**2000**	**2001**	**2002**	**1998**	**1999**	**2000**	**2001**	**2002**	**1998**	**1999**	**2000**	**2001**	**2002**
NW Atlantic	Longline*	23.3	22.0	28.8	10.9	17.3	15.3	18.6	10.3	5.1	11.5	6.4	13.7	11.2	2.2	0.4
	Unclassified*	0.6	0.0	0.1	0.0	0.2	0.7	0.1	0.0	0.0	0.4	0.1	0.0	0.0	0.0	0.0
	Rod and reel**	34.1	24.8	13.8	9.0	9.8	2.4	-	-	-	-	0.1	-	-	-	-
Gulf of Mexico	Longline*	18.5	55.2	29.6	9.4	17.8	11.8	31.5	29.9	10.1	15.6	17.0	57.4	33.9	8.2	6.3
	Rod and reel**	4.5	7.5	4.7	5.1	4.4	0.2	-	-	-	-	1.0	-	-	-	-
Caribbean	Longline*	2.3	1.6	0.5	1.2	0.8	1.3	5.0	0.5	0.7	1.5	0.2	0.5	0.1	0.0	0.2
	Rod and reel**	10.6	4.6	5.7	2.3	2.9	<.05	-	-	-	-	0.05	-	-	-	-
	Other	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Unknown & NC Area 94a	Longline*	6.1	1.6	0.7	0.9	0.5	2.8	1.1	0.1	0.6	0.7	0.8	<.05	0.1	0.3	<.05
SW Atlantic	Longline*	1.6	1.7	0.0	0.0	0.0	0.9	0.5	0.0	0.0	0.0	2.7	<.05	0.1	0.0	0.0
NW Atlantic& Caribbean & Gulf of Mexico	Rod and reel***	-	-	-	-	-	-	5.2	1.3	3.4	5.6	-	163.0	75.7	57.8	103.0
All Areas	All Gears	101.6	119.0	83.9	38.8	54.7	35.4	62.0	42.1	19.9	35.3	28.3	234.6	121.1	68.5	109.9

* Includes landings and estimated discards from scientific observer and logbook sampling programs.
** Recreational billfish landings estimates are based on tournament reports and the Large Pelagic Survey (see Section 2.3 of the Billfish Amendment).
*** Estimation method no longer provides area-specific information.

3.5 Economic Status of HMS Fisheries

The review of each rule, and of HMS fisheries as a whole, is facilitated when there is a baseline against which the rule or fishery may be evaluated. In this analysis, as in past SAFE reports, NMFS decided to use 1996 as a baseline. NMFS believes that this baseline is appropriate because the Regulatory Flexibility Act (RFA) was amended in 1996, the Magnuson-Stevens Act was amended in 1996, NMFS began to collect economic information voluntarily for vessels using the pelagic logbook in 1996, and regarding HMS specifically, no rules were implemented in 1996 that were classified as significant under RFA. Additionally, while the Atlantic Tunas, Swordfish, and Shark FMP and the Billfish Amendment 1 were finalized in 1999, scoping for these two major documents and its final rule began in 1997. It is possible that anticipation of these documents and any potential changes in their implementing regulations could have begun to impact the decisions made by HMS fishermen and any associated businesses.

In addition to using the 1996 baseline, this DEIS also provides five years of data, when possible, in order to facilitate the analysis of trends. It also should be noted that all dollar figures are reported in nominal dollars (*i.e.*, current dollars), unlike past SAFE reports. If analysis of real dollar (*i.e.*, constant dollar) trends controlled for inflation is desired, price indexes for 1996 to 2003 are provided in Table 3.62. To determine the real price in base year dollars, divide the base year price index by the current year price index, and then multiply this result by the price that is being adjusted for inflation. From 1996 to 2003, the Consumer Price Index (CPI-U) indicates that prices have risen by 17.3 percent, the Gross Domestic Product (GDP) Implicit Price Deflator indicates that prices have risen 12.9 percent, and the Producer Price Index (PPI) for unprocessed finfish indicates a 5.6 percent rise. From 2002 to 2003, the CPI, GDP Deflator, and the PPI for unprocessed finfish indicate prices rose by 2.3 percent, 1.8 percent, and -2.8 percent respectively.

Table 3.62 **Inflation Price Indexes.** The CPI-U is the standard Consumer Price Index for all urban consumers (1982 – 1984 = 100) produced by U.S. Department Of Labor Bureau of Labor Statistics. The source of the Producer Price Index (PPI) for unprocessed finfish (1982 = 100) is also the Bureau of Labor Statistics. The Gross Domestic Product Implicit Price Deflator (2000 = 100) is produced by the U.S. Department of Commerce Bureau of Economic Analysis and obtained from the Federal Reserve Bank of St. Louis (http://www.stlouisfed.org/).

Year	CPI-U	GDP Deflator	PPI Unprocessed Finfish
1996	156.9	93.8	185.5
1997	160.5	95.4	165.7
1998	163	96.5	170.7
1999	166.6	97.9	191.7
2000	172.2	100.0	182.4
2001	177.1	102.4	176.1
2002	179.9	104.1	201.5
2003	184	106.0	195.8

3.5.1 Commercial Fisheries[3]

In 2003, the total commercial landings at ports in the 50 states by U.S. fishermen were 9.5 billion pounds and were valued at $3.3 billion. The overall value of landings was up eight percent from 2002 estimates. The total value of commercial HMS landings in 2003 was $73.7 million (Table 3.65). The 2003 ex-vessel price index indicated that seven of the 17 finfish species tracked had increasing ex-vessel prices, nine species had decreasing ex-vessel prices, and one species maintained ex-vessel prices. The total edible finfish ex-vessel price index for 2003 was up eight percent from 2002.

The estimated value of the 2003 domestic production of all fishery products was $7.0 billion. This is $670 million less than the estimated value in 2002. The total import value of fishery products was $21.3 billion in 2003. This is an increase of $1.6 billion from 2002. The total import value in 1996 was $13.1 billion. The total export value of fishery products was $12.0 billion in 2003. This is an increase of $294 million from 2002. The total export value in 1996 was $8.7 billion.

Consumers spent an estimated $61.2 billion for fishery products in 2003 including $42.0 billion at food service establishments, $18.9 billion in retail sales for home consumption, and $290.4 million for industrial fish products. The commercial marine fishing industry contributed $31.5 billion to the U.S. Gross National Product in 2003. In 1996, consumers spent an estimated $41.2 billion including $27.8 billion at food service establishments, $13.2 billion for home consumption, and $283.9 billion for industrial fish products. The commercial marine fishing industry contributed $21.0 billion to the U.S. Gross National Product in 1996.

3.5.1.1 Ex-Vessel Prices

The average ex-vessel prices per pound dressed weight (dw) for 1996 and 1999 to 2003 by area, Atlantic HMS, and major gear types are summarized in Table 3.63. The average ex-vessel prices per lb dw for 1996 and 1999 to 2003 by species and area are summarized in Table 3.64. For both of these tables, prices are reported in nominal dollars. The ex-vessel price depends on a number of factors including the quality of the fish (*e.g.,* freshness, fat content, method of storage), the weight of the fish, the supply of fish, and consumer demand.

[3] All the information and data presented in this section were obtained from NMFS 1997a and NMFS 2004b.

Table 3.63 **Average ex-vessel prices per lb dw for Atlantic HMS by gear and area.** Source: Dealer weighout slips from the Southeast Fisheries Science Center and Northeast Fisheries Science Center, and bluefin tuna dealer reports from the Northeast Regional Office. HND=Handline, harpoon, spears, trot lines, and trolls, PLL=Pelagic longline, BLL=Bottom longline, Net=Gillnets and pound nets, TWL=Trawls, SEN=Seines, TRP=Pots and traps, DRG=Dredge, and UNK=Unknown. Gulf of Mexico includes: TX, LA, MS, AL, and the west coast of FL. S. Atlantic includes: east coast of FL. GA, SC, and NC dealers reporting to Southeast Fisheries Science Center. Mid-Atlantic includes: NC dealers reporting to Northeast Fisheries Science Center, VA, MD, DE, NJ, NY, and CT. N. Atlantic includes: RI, MA, NH, and ME. For bluefin tuna, all NC landings are included in the Mid-Atlantic.

Gulf of Mexico							
Species	**Gear**	**1996**	**1999**	**2000**	**2001**	**2002**	**2003**
Bigeye tuna	HND	$0.68	$2.13	$1.83	$1.82	$1.44	$1.25
	PLL	-	$4.04	$2.82	$2.64	$5.09	$3.41
	BLL	-	$4.41	$2.31	$0.50	$4.24	$3.53
Bluefin tuna	HND	-	-	$1.86	$1.25	$2.69	-
	PLL	$5.83	$6.32	-	-	$6.40	$6.32
	BLL	-	-	-	-	$4.50	-
Yellowfin tuna	HND	-	$2.38	$2.48	$2.55	$2.83	$2.34
	PLL	-	$3.18	$3.40	$3.25	$3.68	$3.64
	BLL	-	$3.06	$3.68	$3.31	$3.23	$3.73
Other tunas	HND	$0.28	$0.90	$0.76	$0.79	$0.91	$0.87
	PLL	-	$0.78	$0.72	$0.70	$0.79	$0.66
	BLL	-	$0.67	$0.85	$0.74	$0.75	$0.55
	NET	$0.38	$0.33	$0.58	$0.33	$0.83	$0.29
	TWL	-	$0.70	$0.61	$0.78	$0.40	$0.30
	SEN	-	$0.52	-	$0.61	$0.19	-
	TRP	-	-	-	-	$0.30	$0.30
Swordfish	HND	-	$3.21	$3.91	$2.84	$3.19	$3.68
	PLL	-	$3.39	$3.33	$3.41	$2.94	$2.91
	BLL	-	$3.29	$3.10	$3.25	$2.88	$2.67
Large coastal sharks	HND	$0.23	$0.64	$0.59	$0.51	$0.44	$0.45
	PLL	-	$0.79	$0.48	$0.45	$0.36	$0.38
	BLL	$0.60	$0.55	$0.43	$0.44	$0.36	$0.38
	NET	$0.38	$0.41	$0.48	$0.50	$0.39	$0.43
	TWL	$0.15	$0.49	$0.15	$0.25	$0.25	$0.25
Pelagic sharks	HND	-	$1.35	$1.38	$1.48	$0.93	$1.04
	PLL	-	$1.27	$1.27	$1.32	$1.06	$1.11
	BLL	-	$1.43	$1.31	$1.42	$1.19	$1.15
Small coastal sharks	HND	-	$0.59	$0.93	$0.37	$0.38	$0.32
	PLL	-	$0.50	$0.47	$0.74	$0.32	$0.33
	BLL	-	$0.52	$0.41	$0.61	$0.53	$0.50
	NET	-	$0.67	-	$0.45	$0.46	$0.36
	TRP	-	-	-	$0.74	-	-
Shark fins	HND	-	$8.51	$21.57	$15.90	$21.28	$13.97
	PLL	-	$14.02	$15.65	$21.08	-	$15.21
	BLL	-	$14.34	$15.89	$21.50	$22.72	$20.17
	NET	-	$7.78	$15.50	$11.02	-	$6.05
	TWL	-	-	$9.17	-	-	-

South Atlantic							
Species	**Gear**	**1996**	**1999**	**2000**	**2001**	**2002**	**2003**
Bigeye tuna	HND	$1.30	$2.02	$1.02	$2.14	$2.29	$1.89
	PLL	$1.33	$2.87	$2.27	$2.78	$2.33	$2.26
	BLL	$1.30	$3.00	$1.87	$2.63	$2.74	$2.66
	NET	$1.30	-	-	-	-	-
Bluefin tuna	HND	-	-	$7.99	$3.52	$3.35	-
	PLL	$4.62	$4.71	$5.36	$4.82	$4.95	$4.11
	BLL	-	-	-	$3.61	$5.15	-
Yellowfin tuna	HND	$1.55	$1.41	$1.56	$1.41	$1.54	$1.54
	PLL	$1.63	$2.17	$2.23	$2.14	$1.89	$2.09
	BLL	$1.41	$2.45	$2.29	$2.45	$2.29	$2.60
	NET	$1.07	$0.87	-	$1.21	$1.12	-
	TWL	-	-	-	-	$0.44	-
Other tunas	HND	$0.75	$0.67	$0.59	$0.61	$0.47	$0.58
	PLL	$0.79	$1.47	$1.31	$1.33	$1.09	$1.26
	BLL	$0.87	$1.41	$1.49	$1.86	$1.67	$1.13
	NET	$0.35	$0.19	$0.20	$0.23	$0.21	$0.21
	TWL	$0.31	$0.56	$0.25	$0.47	$0.26	-
	SEN	-	$0.11	-	-	-	-
	TRP	-	-	-	$0.18	-	-
Swordfish	HND	$2.48	$3.04	$3.92	$4.24	$3.93	$3.91
	PLL	$2.88	$3.27	$3.12	$3.27	$2.84	$2.98
	BLL	$2.46	$3.39	$3.42	$3.14	$2.76	$3.19
	NET	-	-	-	-	$2.50	-
Large coastal sharks	HND	$0.72	$0.66	$0.59	$0.96	$1.01	$0.49
	PLL	$1.54	$1.32	$1.21	$1.69	$2.63	$0.35
	BLL	$0.73	$1.13	$0.78	$0.89	$1.10	$0.39
	NET	$1.30	$1.70	$0.91	$1.49	$1.59	$0.30
	TWL	$0.86	$0.67	$0.49	$0.51	$0.81	$0.41
	TRP	-	-	-	-	$0.23	-
Pelagic sharks	HND	$0.82	$0.95	$0.78	$0.71	$0.68	$0.84
	PLL	$0.68	$1.04	$0.95	$0.95	$0.93	$0.93
	BLL	$0.59	$0.89	$0.90	$0.78	$0.75	$0.87
	NET	$0.33	$0.28	$0.35	$0.36	$0.34	$0.34
	TWL	-	$0.21	$0.20	$0.26	$0.26	-
Small coastal sharks	HND	$0.25	$0.39	$0.40	$0.46	$0.53	$0.49
	PLL	-	$0.57	$0.57	$0.63	$0.41	$0.24
	BLL	-	$0.57	$0.56	$0.53	$0.54	$3.19
	NET	$0.25	$0.52	$0.48	$0.54	$0.54	$0.53
	TWL	-	$0.52	$0.23	$0.23	-	-
Shark fins	HND	$14.00	$5.65	$11.92	$19.75	$15.53	$17.17
	PLL	-	$11.18	$10.34	$11.44	$6.81	$12.72
	BLL	$14.00	$15.76	$17.57	$22.21	$22.26	$17.83
	NET	-	$5.19	$6.95	$10.60	$10.41	$12.85
	TWL	$9.11	$6.61	-	$12.17	$14.00	$10.77

Mid-Atlantic							
Species	**Gear**	**1996**	**1999**	**2000**	**2001**	**2002**	**2003**
Bigeye tuna	HND	$5.74	$3.62	$4.45	$4.32	$3.97	$3.79
	PLL	$3.51	$3.19	$4.30	$3.81	$4.12	$3.92
	BLL	$2.61	$4.33	$3.45	$4.37	$2.84	$3.91
	NET	$3.87	$4.63	$5.55	$4.50	-	-

Mid-Atlantic							
Species	**Gear**	**1996**	**1999**	**2000**	**2001**	**2002**	**2003**
	TWL	$4.68	$3.16	$5.68	-	-	-
	DRG	-	-	-	-	$1.50	-
	UNK	-	-	-	-	$5.00	-
Bluefin tuna	HND	$14.70	$3.51	$6.60	$4.93	$4.06	$7.54
	PLL	$6.12	$7.34	$5.73	$6.83	$5.72	$6.25
	NET	$15.71	-	-	$2.23	-	-
	BLL	-	-	-	$7.00	$7.00	-
Yellowfin tuna	HND	$2.49	$1.60	$2.14	$2.11	$2.00	$1.93
	PLL	$2.51	$2.15	$2.32	$2.30	$2.14	$2.00
	BLL	$3.28	$1.51	$1.86	$2.11	$1.81	$1.89
	NET	$1.07	$1.07	$1.77	$1.49	$1.81	$1.50
	TWL	$2.40	$1.59	$1.56	$1.53	-	$1.48
	TRP	-	-	-	-	$1.97	$1.57
	DRG	-	-	-	-	$1.94	-
	UNK	-	-	-	-	$2.75	-
Other tunas	HND	$1.34	$0.89	$0.94	$0.89	$0.69	$0.66
	PLL	$1.84	$1.59	$1.03	$0.88	$0.86	$0.93
	BLL	-	$0.83	$1.17	$0.78	$0.83	$1.08
	NET	$0.45	$0.54	$0.44	$0.49	$0.75	$0.48
	TWL	$0.45	$0.66	$0.70	$0.47	$0.42	$0.62
	TRP	-	-	-	-	$0.57	$0.47
	DRG	-	-	-	-	$1.00	-
	UNK	-	-	-	-	$1.03	$1.69
Swordfish	HND	$3.61	$3.13	$3.25	$3.70	-	-
	PLL	$4.31	$3.53	$3.59	$3.47	$3.18	$2.97
	BLL	$4.88	$3.77	$2.91	$3.45	$4.00	-
	NET	$4.63	$3.81	-	$4.19	$3.51	-
	TWL	$4.56	$3.29	$3.94	$2.86	$3.34	$3.21
Large coastal sharks	HND	$0.74	$0.96	$0.50	$0.88	$2.09	$2.19
	PLL	$0.58	$0.79	$0.45	$2.62	$2.78	$2.32
	BLL	$0.54	$0.56	$0.41	$0.55	$1.11	$2.08
	NET	$0.45	$0.46	$0.53	$0.89	$1.02	$1.02
	TWL	$0.47	$0.49	$0.72	$0.55	$0.52	$0.50
	TRP	-	-	-	-	$2.50	-
	SEN	-	-	-	-	$1.26	-
	UNK	-	-	-	-	$0.50	-
Pelagic sharks	HND	$1.47	$1.71	$1.41	$1.26	$1.41	$1.57
	PLL	$1.25	$1.39	$1.45	$1.56	$1.31	$1.32
	BLL	$1.47	$1.04	$1.24	$0.97	$1.12	$1.17
	NET	$0.99	$0.99	$1.02	$1.02	$0.97	$1.08
	TWL	$1.00	$1.10	$0.90	$0.69	$1.03	$0.88
	TRP	-	-	-	$0.40	-	$1.43
	DRG	-	-	-	$0.49	$2.00	-
	UNK	-	-	-	-	-	$0.57
Small coastal sharks	HND	-	$0.46	$0.38	$0.51	$0.45	$0.36
	PLL	$0.25	-	$0.20	$0.44	$0.50	$0.39
	BLL	-	-	-	$0.95	-	-
	NET	-	$0.45	$0.40	-	$0.42	$0.39
	TWL	-	$0.53	-	-	$1.26	-
Shark fins	HND	$2.74	$3.60	$6.17	-	-	-
	PLL	$7.79	$3.35	$8.57	-	-	-

Mid-Atlantic							
Species	**Gear**	**1996**	**1999**	**2000**	**2001**	**2002**	**2003**
	BLL	$8.00	-	-	-	-	-
	NET	$4.77	$3.96	$3.38	-	-	-

North Atlantic							
Species	**Gear**	**1996**	**1999**	**2000**	**2001**	**2002**	**2003**
Bigeye tuna	HND	$3.69	$3.41	$4.22	$6.00	-	-
	PLL	$3.36	$3.26	$4.39	$3.42	$4.08	$3.50
	BLL	$2.15	-	-	-	-	-
	NET	$3.31	-	$0.42	-	-	-
	TWL	$8.00	$3.29	$3.87	$3.54	$3.76	-
Bluefin tuna	HND	$10.73	$8.44	$10.02	$8.21	$7.94	$6.33
	PLL	$5.56	$7.06	$5.65	$5.24	$5.96	$4.21
	NET	-	-	-	$4.26	-	-
	SEN	$11.05	$7.83	$7.80	$7.43	$6.61	$4.92
	TWL	-	-	-	$3.80	-	-
Yellowfin tuna	HND	$2.50	$1.16	$2.66	$2.87	$3.25	$1.90
	PLL	$2.14	$2.44	$2.77	$3.01	$2.76	$2.57
	BLL	$2.03	$0.51	$2.32	$3.77	-	-
	NET	$2.43	$0.50	-	-	$4.75	-
	TWL	$2.67	$2.21	$2.31	$2.10	$2.19	$1.65
	TRP	-	-	-	-	$4.50	$3.10
Other tunas	HND	$1.90	$1.41	$1.59	$2.39	$2.03	$1.56
	PLL	$0.98	$0.60	$1.13	$0.70	$1.15	$1.00
	BLL	$1.50	-	$0.50	$3.00	-	-
	NET	$0.73	$0.20	$0.50	$0.36	$0.70	$1.14
	TWL	$1.08	$0.37	$0.22	$0.80	$0.69	$0.37
	TRP	-	-	-	-	$0.34	$0.44
	DRG	-	-	-	-	$3.00	-
Swordfish	HND	$5.20	-	$8.00	$5.69	$5.32	-
	PLL	$4.01	$3.30	$3.67	$3.58	$3.30	$3.36
	BLL	$3.07	-	$2.00	-	-	-
	NET	$5.62	-	-	-	$4.25	-
	TWL	$3.08	$3.77	$4.05	$4.75	$3.05	$3.18
	TRP	-	-	-	-	$3.74	-
Large coastal sharks	HND	-	$0.74	-	$0.50	$0.45	$0.74
	PLL	$1.03	-	$1.00	$1.21	$0.29	$0.28
	BLL	$0.99	$1.03	$0.65	$1.43	$1.00	-
	NET	$0.83	$0.64	$1.06	$0.99	$0.89	$0.89
	TWL	$0.80	$1.00	$1.08	$0.93	$0.86	$0.66
	TRP	-	-	-	-	$0.28	$0.22
Pelagic sharks	HND	$1.60	-	-	$1.38	$1.71	-
	PLL	$1.26	$3.30	$1.38	$1.37	$1.31	$1.30
	BLL	$1.85	$0.89	$1.50	-	$0.65	-
	NET	$1.12	$0.70	$0.82	$0.98	$0.60	$1.30
	TWL	$0.96	$0.77	$0.97	$1.19	$0.81	$0.63
	TRP	-	-	-	-	$0.69	$0.68
Small coastal sharks	HND	-	-	-	-	-	-
	NET	-	-	-	$1.51	-	-
	TWL	-	-	-	-	$0.58	-
Shark fins	PLL	$4.25	-	$5.54	-	-	-
	BLL	$3.00	$0.33	$25.19	-	-	-

North Atlantic							
Species	**Gear**	**1996**	**1999**	**2000**	**2001**	**2002**	**2003**
	NET	$1.96	$2.79	$2.41	-	-	-
	TWL	$2.32	$0.49	$3.00	-	-	-

Table 3.64 Average ex-vessel prices per lb for Atlantic HMS by area.

Species	Area	1996	1999	2000	2001	2002	2003
Bigeye tuna	Gulf of Mexico	$0.68	$3.38	$2.26	$1.94	$4.33	$3.29
	S. Atlantic	$1.32	$2.77	$1.98	$2.57	$2.45	$2.24
	Mid-Atlantic	$3.99	$3.52	$4.39	$4.26	$3.82	$3.77
	N. Atlantic	$3.59	$3.30	$4.12	$4.32	$4.03	$3.45
Bluefin tuna	Gulf of Mexico	$5.83	$6.32	$1.86	$1.25	$5.56	$6.32
	S. Atlantic	$4.62	$4.70	$6.83	$4.00	$3.77	$4.11
	Mid-Atlantic	$9.48	$5.90	$5.98	$5.25	$4.70	$7.38
	N. Atlantic	$10.78	$8.26	$8.94	$5.79	$7.31	$5.71
Yellowfin tuna	Gulf of Mexico	-	$2.94	$3.22	$2.98	$3.23	$3.31
	S. Atlantic	$1.56	$1.77	$1.88	$1.70	$1.73	$1.76
	Mid-Atlantic	$2.43	$1.61	$2.12	$1.91	$2.02	$1.91
	N. Atlantic	$2.35	$1.52	$2.65	$2.93	$2.90	$2.38
Other tunas	Gulf of Mexico	$0.29	$0.86	$0.74	$0.76	$0.84	$0.75
	S. Atlantic	$0.62	$0.61	$0.58	$0.58	$0.49	$0.59
	Mid-Atlantic	$1.10	$0.80	$0.76	$0.70	$0.73	$0.70
	N. Atlantic	$1.31	$0.51	$0.93	$1.46	$1.17	$0.95
Swordfish	Gulf of Mexico	-	$3.35	$3.25	$3.31	$2.91	$2.95
	S. Atlantic	$2.79	$3.27	$3.24	$3.43	$3.14	$3.26
	Mid-Atlantic	$4.43	$3.47	$3.67	$3.53	$3.25	$2.97
	N. Atlantic	$4.09	$3.45	$3.87	$4.67	$3.47	$3.33
Large coastal sharks	Gulf of Mexico	$0.21	$0.56	$0.43	$0.44	$0.36	$0.38
	S. Atlantic	$1.02	$1.10	$0.78	$1.12	$1.27	$0.39
	Mid-Atlantic	$0.55	$0.59	$0.53	$1.09	$1.56	$1.62
	N. Atlantic	$0.88	$0.77	$1.01	$1.02	$0.77	$0.72
Pelagic sharks	Gulf of Mexico	-	$1.36	$1.31	$1.42	$1.11	$1.13
	S. Atlantic	$0.62	$0.83	$0.76	$0.68	$0.67	$0.71
	Mid-Atlantic	$1.21	$1.23	$1.20	$1.09	$1.17	$1.21
	N. Atlantic	$1.31	$0.81	$1.10	$1.23	$1.00	$1.12
Small coastal sharks	Gulf of Mexico	-	$0.55	$0.52	$0.58	$0.48	$0.40
	S. Atlantic	$0.25	$0.50	$0.48	$0.52	$0.53	$0.51
	Mid-Atlantic	$0.25	$0.47	$0.38	$0.55	$0.48	$0.38
	N. Atlantic	-	-	-	$1.51	$0.58	-
Shark fins	Gulf of Mexico	-	$14.01	$15.99	$20.90	$22.64	$18.12
	S. Atlantic	$10.74	$11.10	$14.16	$18.43	$17.10	$15.85
	Mid-Atlantic	$4.60	$3.41	$4.90	-	-	-
	N. Atlantic	$2.69	$1.19	$6.83	-	-	-

Table 3.63and Table 3.64indicate that the average ex-vessel prices for bigeye tuna have generally increased since 1996. However, prices from 2002 to 2003 have decreased in all four regions. The gears used also influenced the average price of bigeye tuna. Longline-caught fish brought the highest average value in 2003.

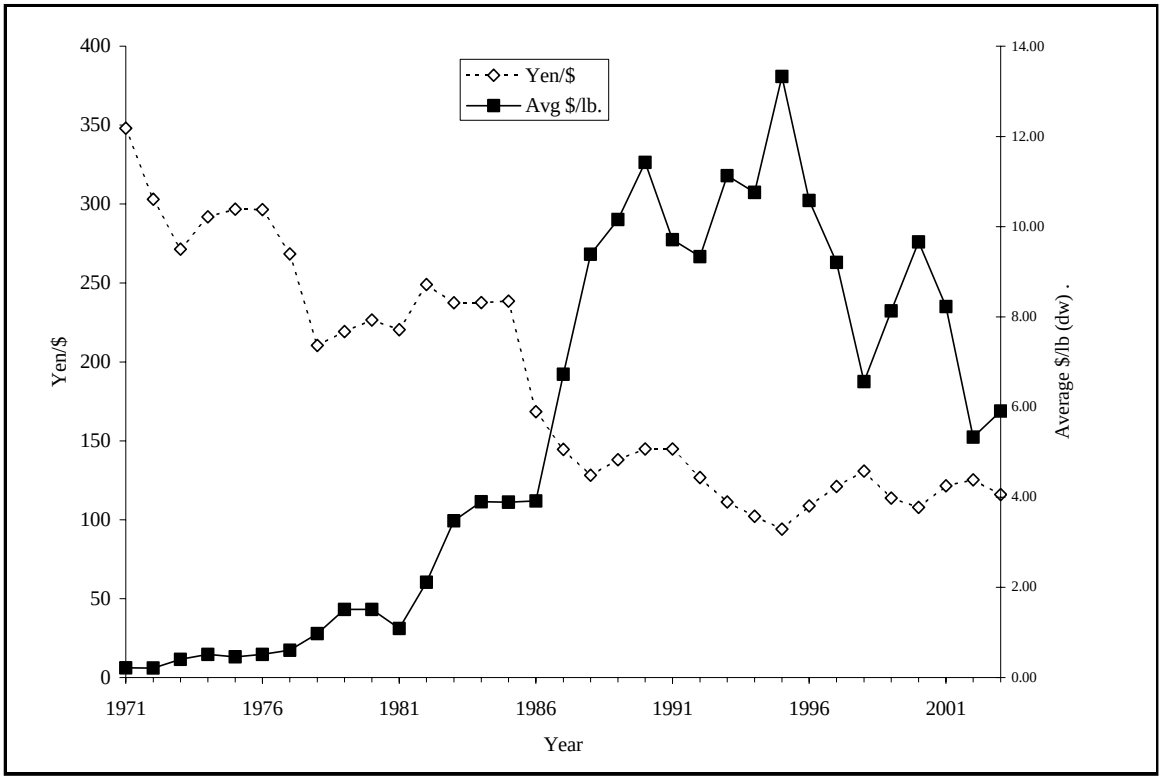


Figure 3.26 **Average Annual Yen/$ Exchange Rate and Average U.S. BFT Ex-vessel $/lb (dw) for all gears: 1971-2003.** Source: Federal Reserve Bank (www.stls.frb.org) and Northeast Regional Office.

Average ex-vessel prices for bluefin tuna have generally declined since 1996. Since 2002, however, prices increased in all regions except the North Atlantic (Table 3.64). As with bigeye tuna, the gear used also made a difference in the ex-vessel price (Table 3.63). In the North Atlantic and Mid-Atlantic, bluefin tuna caught with handgear had higher average prices than those caught with longline. This trend has been fairly consistent over the years between 1996 and 2003. The ex-vessel prices for bluefin tuna can be influenced by many factors, including market supply and the Japanese Yen/U.S. Dollar (¥/$) exchange rate. Figure 3.26 shows the average ¥/$ exchange rate, plotted with average ex-vessel bluefin tuna prices, from 1971 to 2003.

The average ex-vessel prices for yellowfin tuna have decreased slightly in 2003 in the Mid-Atlantic and North Atlantic while increasing slightly in the Gulf of Mexico and South Atlantic (Table 3.64). Yellowfin tuna caught with longline gear had higher average ex-vessel prices than fish caught with other gear types in 2003 (Table 3.63).

The average ex-vessel price for other tunas decreased in all regions except the South Atlantic in 2003 (Table 3.64). The average price of other tunas is lowest in the South Atlantic compared to other regions. The type of gear used did not appear to consistently influence the average ex-vessel prices of other tuna.

In the South Atlantic and Gulf of Mexico, average ex-vessel prices for swordfish increased in 2003, while they decreased in the Mid-Atlantic and North Atlantic (Table 3.64). Swordfish caught using handline gear had higher average ex-vessel prices than other gear types, except in the Mid-Atlantic where it was trawls (Table 3.63).

The average ex-vessel price for LCS increased in the Gulf of Mexico and Mid-Atlantic in 2003. However, prices for LCS declined in the North Atlantic and South Atlantic (Table 3.64). Large coastal sharks caught on handline gear versus longline gear tended to have higher average ex-vessel prices in 2003, except in the Mid-Atlantic (Table 3.63).

The average ex-vessel prices for pelagic sharks increased in all regions in 2003 (Table 3.64). The 2003 prices for pelagic sharks are not significantly different than 1996 prices and are actually lower than 1996 when adjusting for inflation.

The average ex-vessel prices for small coastal sharks (SCS) declined in all regions in 2003 (Table 3.64). Small coastal sharks caught using bottom longline gear in 2003 had higher ex-vessel prices in 2003 than SCS caught in other gear types (Table 3.63).

3.5.1.2 Revenues

Table 3.65 summarizes the average annual revenues of the Atlantic HMS fishery based on average ex-vessel prices and the weight reported landed as per the U.S. National Report (NMFS 2004), the Shark Evaluation Reports (NMFS, 1997), information given to ICCAT (Cortes, 2001), as well as price and weight reported to the NMFS Northeast Regional Office by Atlantic bluefin tuna dealers. These values indicate that the estimated total annual revenue of Atlantic HMS fisheries has increased 11 percent from approximately $66.4 million in 1996 to approximately $73.7 million in 2003. However, adjusting for inflation using the CPI, there has actually been a decrease in real revenue from $77.9 million in 1996 (in 2003 dollars) to $73.7 million in 2003. From 2002 to 2003, the tuna fishery total revenue decreased by 16 percent. A majority of that decrease can be attributed to reduced commercial landings of bluefin tuna. From 2002 to 2003, the annual revenues from swordfish also decreased by 24 percent. From 2002 to 2003, the annual revenues from shark decreased by five percent.

Table 3.65 **Estimates of the total ex-vessel annual revenues of Atlantic HMS fisheries.** Source: NMFS, 1997; NMFS 2004a; Cortes, 2003; and bluefin tuna dealer reports from the Northeast Regional Office.

Species		1996	1999	2000	2001	2002	2003
Bigeye tuna	Ex-vessel $/lb dw	$2.40	$3.24	$3.18	$3.27	$3.66	$3.19
	Weight lb dw	1,212,706	1,664,385	1,012,352	2,391,350	1,267,645	846,191
	Fishery Revenue	$2,910,494	$5,395,971	$3,222,636	$7,827,218	$4,637,372	$2,697,233

Species		1996	1999	2000	2001	2002	2003
Bluefin tuna	Ex-vessel $/lb dw	$10.58	$8.14	$9.66	$8.23	$5.33	$5.91
	Weight lb dw	1,652,989	1,926,442	2,137,580	2,176,016	4,133,625	2,519,345
	Fishery Revenue	$17,488,624	$15,677,959	$20,648,413	$17,904,240	$22,042,839	$14,889,328
Yellowfin tuna	Ex-vessel $/lb dw	$2.11	$1.96	$2.46	$2.38	$2.48	$2.34
	Weight lb dw	6,679,938	6,351,717	12,435,708	14,777,800	12,885,887	13,556,340
	Fishery Revenue	$14,094,669	$12,433,149	$30,577,372	$35,193,181	$31,919,170	$31,721,836
Other tunas*	Ex-vessel $/lb dw	$0.83	$0.69	$0.75	$0.87	$0.81	$0.75
	Weight lb dw	368,433	495,241	795,243	867,960	1,298,509	900,522
	Fishery Revenue	$305,799	$343,771	$593,595	$754,322	$1,057,273	$673,140
Total tuna	**Fishery Revenue**	**$34,799,586**	**$33,850,849**	**$55,042,015**	**$61,678,960**	**$59,656,653**	**$49,981,537**
Swordfish**	Ex-vessel $/lb dw	$3.77	$3.38	$3.51	$3.74	$3.20	$3.13
	Weight lb dw	7,170,619	5,942,839	4,832,384	5,662,350	5,985,489	4,668,466
	Fishery Revenue	$27,033,234	$20,104,498	$16,974,346	$21,153,927	$19,150,819	$14,600,627
Large coastal sharks	Ex-vessel $/lb dw	$0.67	$0.76	$0.68	$0.91	$0.99	$0.78
	Weight lb dw	5,262,314	3,919,570	3,762,000	3,562,546	4,097,363	4,421,249
	Fishery Revenue	$3,525,750	$2,950,102	$2,560,307	$3,256,955	$4,040,977	$3,437,521
Pelagic sharks	Ex-vessel $/lb dw	$1.05	$1.06	$1.09	$1.11	$0.99	$1.04
	Weight lb dw	695,531	400,821	215,005	362,925	303,666	616,967
	Fishery Revenue	$730,308	$424,273	$233,650	$401,430	$299,487	$643,188
Small coastal sharks	Ex-vessel $/lb dw	$0.25	$0.51	$0.46	$0.79	$0.52	$0.43
	Weight lb dw	460,667	672,245	672245*	719,484	579,441	549,799
	Fishery Revenue	$115,167	$340,890	$309,926	$568,441	$299,023	$236,414
Shark fins (weight = 5% of all sharks landed)	Ex-vessel $/lb dw	$6.01	$7.43	$10.47	$19.67	$19.87	$17.09
	Weight lb dw	320,926	249,632	232,462	232,248	249,024	279,401
	Fishery Revenue	$218,561	$1,854,313	$2,434,344	$4,568,937	$4,949,056	$4,774,959
Total sharks	**Fishery Revenue**	**$4,589,786**	**$5,569,578**	**$5,538,227**	**$8,795,763**	**$9,588,545**	**$9,092,082**
Total HMS	Fishery Revenue	$66,422,606	$59,524,926	$77,554,588	$91,628,650	$88,396,016	$73,674,245

Note: Average ex-vessel prices may have some weighting errors, except for bluefin tuna which is based on a fleet-wide average.

* Other tunas includes skipjack and albacore.

** Swordfish estimates do not include dead discards.

3.5.1.3 Wholesale Market

Currently, NMFS does not collect wholesale price information from dealers. However, the wholesale price of some fish species is available off the web (http://www.st.nmfs.gov/st1/market_news/index.html). The wholesale prices presented in Table 3.66 are from the annual reports of the Fulton Fish Market. As with ex-vessel prices, wholesale prices depend on a number of factors including the quality of the fish, the weight of the fish, the supply of fish, and consumer demand.

As reported by the Fulton Fish Market, Table 3.66 indicates that the average wholesale price of HMS sold in Atlantic and Gulf of Mexico states generally decreased from 1996 to 2003, except for blacktip shark. During that same period, the wholesale price of swordfish weighing over 100 pounds decreased 19 percent, swordfish weighing between 50 and 99 pounds decreased 25 percent, and swordfish cuts decreased 15 percent. The wholesale price of blacktip shark increased 27 percent from 1996 to 2003, with most of the increase occurring in 2003. The wholesale price of mako shark decreased 14 percent from 1996 to 2003, however 2003 wholesale prices were up from 2002. The wholesale price of thresher shark has decreased 22 percent from 1996 to 2003. Wholesale yellowfin tuna prices have remained relatively stable from 1996 to 2003. The yellowfin tuna wholesale price of #2 quality fish had decreased eight percent while the price of #2 cuts has increased seven percent from 1996 to 2003. Bigeye tuna wholesale prices from 1999 to 2003 have increased significantly for both high grade cuts and fish.

Table 3.66 The overall average wholesale price per lb of fresh HMS sold in Atlantic and Gulf of Mexico states as reported by the Fulton Fish Market. Source: NMFS, 2004.

Species	Description	1996 Price/lb	1999 Price/lb	2000 Price/lb	2001 Price/lb	2002 Price/lb	2003 Price/lb	Percent Change 1996 to 2003
Blacktip	-	$1.05	$1.04	$1.04	$1.05	$1.00	$1.33	27%
Mako	-	$2.77	$2.74	$3.18	$3.00	$2.00	$2.37	-14%
Thresher	-	$1.00	$0.91	$0.82	$1.25	$1.25	$0.78	-22%
Swordfish	100# and up	$6.28	$5.26	$5.26	$5.42	$5.19	$5.08	-19%
	50-99#	$6.02	$4.54	$4.72	$4.81	$4.59	$4.50	-25%
	26-49#	$5.50	$3.36	$3.58	$4.05	$3.50	-	-
	Cuts	$7.74	$6.55	$6.54	$6.73	$6.84	$6.55	-15%
Yellowfin tuna	#1: BTF	$7.00	$5.97	$5.69	$5.50	$7.42	-	-
	#1: Cuts	$9.38	$8.23	$8.00	$8.23	$10.67	-	-
	#2: BTF	$5.00	$4.24	$4.36	$3.97	$4.92	$4.60	-8%
	#2: Cuts	$6.52	$6.22	$6.20	$6.00	$7.29	$6.98	7%
	#3: BTF	-	$3.00	-	-	-	$2.50	-
	#3: Cuts	-	$4.50	-	-	-	-	-
Bigeye tuna	#1: BTF	-	$4.00	-	-	-	$6.50	-
	#1: Cuts	-	$5.50	-	-	-	$8.50	-
	#2: BTF	-	$4.26	-	-	-	-	-
	#2: Cuts	-	$6.00	-	-	-	-	-

Note: #'s indicate quality (1 is highest, 3 is lowest); BTF is by the fish.

3.5.2 Recreational Fisheries

Although NMFS believes that recreational fisheries have a large influence on the economies of coastal communities, NMFS has only recently been able to gather additional information on the costs and expenditures of anglers or the businesses that rely on them.

An economic survey done by the U.S. Fish and Wildlife Service[2] in 2001 found that 9.1 million saltwater anglers (including anglers in state waters) went on approximately 72 million fishing trips and spent approximately $8.4 billion (USFWS, 2001). Expenditures included lodging, transportation to and from the coastal community, vessel fees, equipment rental, bait, auxiliary purchases (*e.g.*, binoculars, cameras, film, foul weather clothing, *etc.*), and fishing licenses (USFWS, 2001). Saltwater anglers spent $4.5 billion on trip-related costs and $3.9 billion on equipment (USFWS, 2001). Approximately 76 percent of the saltwater anglers surveyed fished in their home state (USFWS, 2001). The next USFWS survey is expected in 2006.

Specific information regarding angler expenditures for trips targeting HMS species was extracted from the recreational fishing expenditure survey add-on (1998 in the Northeast, 1999-2000 in the Southeast) to the National Marine Fisheries Service's Marine Recreational Fisheries Statistics Survey (MRFSS). This angler expenditure data were analyzed on a per person per trip-day level and reported in 2003 dollars. The expenditure data include the costs of tackle, food, lodging, bait, ice, boat fuel, processing, transportation, party/charter fees, access/boat launching, and equipment rental. The overall average expenditure on HMS related trips is estimated to be $122 per person per day. Specifically, expenditures are estimated to be $686 per person per day on billfish directed trips (based on a low sample size), $85 on pelagic shark directed trips, $95 on large coastal shark directed trips, $81 on small coastal sharks, and $106 on tuna trips.

The American Sportfishing Association (ASA) also has a report listing the 2001 economic impact of sportfishing on specific states. This report states that all sportfishing (in both Federal and state waters) has an overall economic importance of $116 billion dollars (ASA, 2001). Florida, Texas, North Carolina, New York, and Alabama are among the top ten states in terms of overall economic impact for both saltwater and freshwater fishing (ASA, 2001). Florida is also one of the top states in terms of economic impact of saltwater fishing with $2.9 billion in angler expenditures, $5.4 billion in overall economic impact, $1.5 billion in salaries and wages related to fishing, and 59,418 fishing related jobs (ASA, 2001). California followed Florida with $0.8 billion in angler expenditures, $1.7 billion in overall economic impact, $0.4 billion in salaries and wages, and 15,652 jobs (ASA, 2001). Texas and New Jersey were the next highest states in terms of economic impact (ASA, 2001).

At the end of 2004, NMFS began collecting market information regarding advertised charterboat rates. This preliminary analysis of the data collected includes 99 observations of advertised rates on the internet for full day charters. Full day charters vary from six to 14 hours long with a typical trip being 10 hours. Most vessels can accommodate six passengers, but this also varies from two to 12 passengers. Table 3.67 summarizes the average charterboat rate for

[2] This survey interviewed over 77,000 households during phase 1 and approximately 25,070 sports persons during phase 2. The response rate during phase two of the survey was 75 percent.

full day trips on vessels with HMS Charter/Headboat permits. The average price for a full day boat charter was $1,053 in 2004. Sutton *et al.*, (1999) surveyed charterboats throughout Alabama, Mississippi, Louisiana, and Texas in 1998 and found the average charterboat base fee to be $762 for a full day trip. Holland *et al.* (1999) conducted a similar study on charterboats in Florida, Georgia, South Carolina, and North Carolina and found the average fee for full day trips to be $554, $562, $661, and $701, respectively. Comparing these two studies conducted in the late 1990s to the average advertised daily HMS charterboat rate in 2004, it is apparent that there has been a significant gain in charterboat rates.

Table 3.67 **Average Atlantic HMS charterboat rates for day trips.** Source: NMFS searches for advertised daily charter rates of HMS Charter/Headboat permit holders. (Observations = 99)

State	2004 Average Daily Charter Rate
AL	$1,783
CT	$1,500
DE	$1,060
FL	$894
LA	$1,050
MA	$777
MD	$1,167
ME	$900
NC	$1,130
NJ	$1,298
NY	$1,113
RI	$917
SC	$1,300
TX	$767
VA	$825
Overall Average	**$1,053**

In 2003, Ditton and Stoll published a paper that surveyed the literature regarding what is currently known about the social and economic aspects of recreational billfish fisheries. It was estimated that 230,000 anglers in the United States spent 2,136,899 days fishing for billfish in 1991. This is approximately 3.6 percent of all saltwater anglers over age 16. The states with the highest number of billfish anglers are Florida, California, North Carolina, Hawaii, and Texas in descending order. Billfish anglers studied in the U.S. Atlantic, Puerto Rico, and Costa Rica fished between 39 and 43 days per year.

Billfish recreational anglers tend to spend a great deal of money on trips. Ditton and Stoll (2003) report that a 1990 study of U.S. total trip costs for a typical billfish angler estimated a mean expenditure of $2,105 per trip for the Atlantic and $1,052 per trip for Puerto Rico. The aggregate economic impact of billfish fishing trips in the U.S. Atlantic is conservatively estimated to be $22.7 million annually.

In addition to the economic impact of recreational billfish angling, Ditton and Stoll (2003) report that using a contingent valuation method they estimated consumer's surplus or net

economic benefit to maintain current billfish populations in the U.S. Atlantic to be $497 per billfish angler per year in the U.S. Atlantic and $480 in Puerto Rico. They also estimate that the number of annual billfish anglers in the U.S. Atlantic to be 7,915 and 1,627 in Puerto Rico. The aggregate willingness-to-pay for maintaining current billfish populations is $3.93 million in the U.S. Atlantic and 0.78 million in Puerto Rico. The aggregate direct impact of billfish expenditures is estimated to be $15.13 million for the U.S. Atlantic and $32.40 million for Puerto Rico. Thus, the total aggregate economic value of billfish angler fishing is $19.06 million per year for the U.S. Atlantic and $33.18 million per year for Puerto Rico.

Generally, HMS tournaments last from three to seven days, but lengths can range from one day to an entire fishing season. Similarly, average entry fees can range from approximately $0 to $5,000 per boat (average approximately $500/boat - $1,000/boat), depending largely upon the magnitude of the prize money that is being awarded. The entry fee would pay for a maximum of two to six anglers per team during the course of the tournament. Additional anglers can, in some tournaments, join the team at a reduced rate of between $50 - $450. The team entry fee did not appear to be directly proportional to the number of anglers per team, but rather with the amount of money available for prizes and, possibly, the species being targeted. Prizes may include citations, T-shirts, trophies, fishing tackle, automobiles, boats, or other similar items, but most often consists of cash awards. In general, it appears that billfish and tuna tournaments charge higher entry fees and award more prize money than shark and swordfish tournaments, although all species have a wide range.

Cash awards distributed in HMS tournaments can be quite substantial. Several of the largest tournaments, some of which are described below, are part of the World Billfish Series Tournament Trail whereby regional winners are invited to compete in the World Billfish Series Grand Championship for a new automobile and a bronze sculpture. Other tournament series include the International Game Fish Association (IGFA) Rolex Tournament of Champions, and the South Carolina Governor's Cup. White marlin is a top billfish species from Cape Hatteras, North Carolina to the eastern tip of Georges Bank from June through October each year. The White Marlin Open in Ocean City, Maryland, which is billed as the "world's richest fishing tournament," established a new world record payout for catching a fish when it awarded $1.32 million in 2004 to the vessel catching the largest white marlin. The 21st Annual Pirates Cove Billfish Tournament in North Carolina awarded over $1 million in prizes in 2004, with the top boat garnering over $400,000 for winning in six categories. Total prize money awarded in the Big Rock Tournament in North Carolina has exceeded $1 million since 1998.

Blue marlin, sailfish, and tunas are also often targeted in fishing tournaments, including those discussed above. In 2004, blue marlin was the HMS most frequently identified as a prize category in registered HMS tournaments. Forty-five teams participated in the 2004 Emerald Coast Blue Marlin Classic at Sandestin, Florida, with over $482,000 in cash prizes and the top boat receiving over $58,000. The 34th Annual Pensacola (Florida) International Billfish Tournament indicated that it would award over $325,000 in cash and prizes in 2004. The World Sailfish Championship in Key West, Florida has a $100,000 guaranteed first prize for 2005. In South Carolina, the Megadock Billfishing Tournament offers a $1,000,000 prize for any boat exceeding the current blue marlin state record. The 2004 Florida Billfish Masters Tournament in Miami, Florida awarded over $123,000 in prize money, with the top boat receiving over $74,000.

Sixty-two boats competed in the 2003 Babylon Tuna Club Invitational in Babylon, New York for over $75,000 in cash prizes, and the Mid-Atlantic Tuna Tournament sponsored by the South Jersey Marina in Cape May, New Jersey anticipates awarding over $25,000 in prizes in 2005.

Several tournaments target sharks. Many shark tournaments occur in New England, New York, and New Jersey, although other regions hold shark tournaments as well. In 2004, the 24th Annual South Jersey Shark Tournament hosted over 200 boats and awarded over $220,000 in prize money, with an entry fee of $450 per boat. The "Mako Fever" tournament, sponsored by the Jersey Coast Shark Anglers, in 2004 awarded over $55,000 in prizes, with the first place vessel receiving $25,000. In 2004, the 18th Annual Monster Shark Tournament in Martha's Vineyard, Massachusetts was broadcast on ESPN, and featured a new fishing boat valued at over $130,000 awarded to the winner.

Swordfish tournaments have gained increased popularity in recent years, especially on the east coast of Florida, as the swordfish population has recovered. Events include the Islamorada Swordfish Tournament that began in 2004, and the Miami Swordfish Tournament that began in 2003. Both of these tournaments anticipated awarding over $30,000 in total cash and prizes, assuming that 50 boats would participate.

In addition to official prize money, many fishing tournaments may also conduct a "calcutta" whereby anglers pay from $200 to $5,000 to win more money than the advertised tournament prizes for a particular fish. Tournament participants do not have to enter calcuttas. Tournaments with calcuttas generally offer different levels depending upon the amount of money an angler is willing to put down. Calcutta prize money is distributed based on the percentage of the total amount entered into that Calcutta. Therefore, first place winner of a low level Calcutta (entry fee ~$200) could win less than a last place winner in a high level calcutta (entry fee ~$1000). On the tournament websites, it was not always clear if the total amount of prizes distributed by the tournament included prize money from the calcuttas or the estimated price of any equipment. As such, the range of prizes discussed above could be a combination of fish prize money, Calcutta prize money, and equipment/trophies.

Fishing tournaments can sometimes generate a substantial amount of money for surrounding communities and local businesses. Besides the entry fee to the tournament and possibly the calcutta, anglers may also pay for marina space and gas (if they have their own vessel), vessel rental (if they do not have their own vessel), meals and awards dinners (if not covered by the entry fee), hotel, fishing equipment, travel costs to and from the tournament, camera equipment, and other miscellaneous expenses. Fisher and Ditton (1992) found that the average angler who attended a billfish tournament spent $2,147 per trip (2.59 days), and that billfish tournament anglers spent an estimated $180 million (tournament and non-tournament trips) in 1989. Ditton and Clark (1994) estimated annual expenditures for Puerto Rican billfish fishing trips (tournaments and non-tournaments) at $21.5 million. More recently, Ditton, *et al*., (2000) estimated that the total expenditure (direct economic impact) associated with the 1999 Pirates Cove Billfish Tournament, not including registration fees, was approximately $2,072,518. The total expenditure (direct economic impact) associated with the 2000 Virginia Beach Red, White, and Blue Tournament was estimated at approximately $450,359 (Thailing, *et al*., 2001). These estimated direct expenditures do not include economic effects that may ripple

through the local economy leading to a total impact exceeding that of the original purchases by anglers (*i.e*., the multiplier effect). Less direct, but equally important, fishing tournaments may serve to generally promote the local tourist industry in coastal communities. In a survey of participants in the 1999 Pirates Cove Billfish Tournament, Ditton, *et al*., (2000) found that almost 80 percent of tournament anglers were from outside of the tournament's county. For this reason, tourism bureaus, chambers of commerce, resorts, and state and local governments often sponsor fishing tournaments.

3.6 Community and Social Update

Chapter 9 consolidates all of the communities profiled in previous HMS management plans or amendments and updates the community information, where possible. To ensure continuity with the 1999 HMS FMP and previous amendments, if a community was selected and described as being involved with an HMS fishery, the same community was included in this assessment. The communities profiled were originally selected due to the proportion of HMS landings, the relationship between the geographic communities and the fishing fleets, the existence of other community studies, and input from the HMS and Billfish Advisory Panels. The communities selected for detailed study are Gloucester and New Bedford, Massachusetts; Barnegat Light and Brielle, New Jersey; Wanchese, and Hatteras Township, North Carolina; Pompano Beach, Fort Pierce, Madeira Beach, Panama City Beach, and Islamorada, Florida; Boothville/Venice and Dulac, Louisiana; and Arecibo, Puerto Rico. These communities are not intended to be an exhaustive list of every HMS-related community in the United States; rather the objective is to give a broad perspective of representative areas.

The demographic profiles in this document have been modified to include the same baseline information for each community profiled; as a result, most of the tables include more information than portrayed in the 1999 HMS FMP and its amendments. The demographic tables still use both 1990 and 2000 Bureau of the Census data for comparative purposes. The descriptive community profiles include the same information provided by the Wilson, *et al*,. (1998) and Kirkley (2005) analyses with some new information provided by Impact Assessment, Inc (2004) on the Gulf of Mexico communities. Unlike the Wilson, *et al.*, (1998) study used in the 1999 HMS FMP, it was not possible to undertake field research for this assessment.

This assessment also reviewed the HMS permit databases to incorporate information about residence. This information was also used to identify additional HMS-related fishing communities that should be profiled in the future. Six GIS maps were generated to identify the communities where angler, charter/headboat, HMS dealers (tunas, shark, and swordfish combined), commercial tuna (all gear categories combined), directed and incidental shark, and swordfish (directed, incidental, and handgear combined) permit holders reside (Figure 9.1 to Figure 9.6). In past community profile and social impact analyses, it was difficult to identify where recreational HMS fishermen were located because no data were available for the number of recreational fishermen, as well as recreational landings by community. Previous social impact assessments report on charter fishing operations, fishing tournaments, and related activities to identify the scope of recreational fishing for each of the communities described. The information provided by the HMS permit databases should facilitate the identification of recreational HMS communities that should be profiled in the future.

For future social impact analyses, the HMS permit databases, landings information, and HMS APs should be consulted to determine the most appropriate community profiles for HMS-related fisheries. The 2005 HMS permit data indicates that several new community profiles should be developed and some of the previously profiled communities may not have as significant an investment in the fishery as the community may have in the past (Figure 9.1 to Figure 9.6). Wakefield, Rhode Island should be considered due to the number of commercial tuna and swordfish permit holders in the area. Montauk, New York has a large concentration of charter/headboat, commercial tuna, and HMS dealers in the community. A large number of Cape May, New Jersey residents hold an HMS angling, charter/headboat, shark and/or swordfish permits. Morehead City, North Carolina is home to a number of HMS angling, charter/headboat, and commercial tuna permit holders. Each of these towns is actively involved with more than one sector of the HMS fisheries, and therefore changes to HMS regulations may have could have an impact on each of these communities.

While the permit holders in Puerto Rico and the Virgin Islands are not as numerous as the permit holders on the U.S. mainland, HMS fisheries are active in these two areas and several of the communities benefit from those activities. Future HMS actions should consider developing a community profile for Christiansted, St. Croix, as well as San Juan, Guaynabo, Aguadilla, Mayaguez, and/or Vega Baja, Puerto Rico; due to the number of HMS permit holders in these areas. While NMFS may have community profiles describing these areas, to best determine the impact of changes to HMS-related regulations, an HMS-specific community profile should be developed for these towns.

3.7 International Trade and Fish Processing

Several regional fishery management organizations (RFMOs) including ICCAT have taken steps to improve collection of international trade data to further international conservation policy for management of HMS. While RFMOs cannot re-create information about stock production based on trade data, this information can be used provisionally to estimate landings related to these fisheries, and to identify potential compliance problems with certain ICCAT management measures. United States participation in HMS related international trade programs, as well as a review of trade activity, is discussed in this section. This section also includes a review of the available information on the processing industry for Atlantic HMS species.

3.7.1 Overview of International Trade for Atlantic HMS

3.7.1.1 Trade Monitoring

The United States collects general trade monitoring data through the U.S. Bureau of Customs and Border Protection (CBP; imports) and the U.S. Bureau of the Census (Census Bureau; exports and imports). These programs collect data on the amount and value of imports and exports categorized under the Harmonized Tariff Schedule (HTS). Many HMS have distinct HTS codes, and some species are further subdivided by product (*e.g.* fresh or frozen, fillets, steaks, etc.). NMFS provides Census Bureau trade data for marine fish products online for the public at http://www.st.nmfs.gov/st1/trade/index.html. Some species, such as sharks, are grouped together, which can limit the value of these data for fisheries management when species-specific information is needed. These data are further limited since the ocean area of

origin for each product is not distinguished. For example, the HTS code for Atlantic, Pacific, and even Indian Ocean bigeye tuna is the same.

Trade data for Atlantic HMS are of more use as a conservation tool when they indicate the flag of the harvesting vessel, the ocean of origin, and the species for each transaction. Under the authority of ATCA and the Magnuson-Stevens Act, NMFS collects this information while monitoring international trade of bluefin tuna, swordfish, southern bluefin tuna, and frozen bigeye tuna. These programs implement ICCAT recommendations and support rebuilding efforts by collecting data necessary to identify nations and individuals that may be fishing in a manner that diminishes the effectiveness of ICCAT fishery conservation and management measures. Copies of all trade monitoring documents associated with these programs may be found on the NMFS HMS Management Division webpage at www.nmfs.noaa.gov/sfa/hms/. These and several other trade monitoring programs established by NMFS for HMS are described in further detail below.

3.7.1.2 Bluefin Tuna Statistical Document

The trade of bluefin tuna is tracked internationally as a result of the ICCAT recommendation to implement the Bluefin Statistical Document (BSD) program (Recommendation 92-01). Japan's support for the program, as a major importer of bluefin tuna, is partially responsible for the success of this program. In the United States, each bluefin tuna is tagged when documented, and for all nations, the BSD travels with each shipment until the final point of destination. This document is used to track both imports and exports of bluefin tuna by ICCAT and other participating nations. If bluefin tuna are exported from, or imported to, the United States, the document is submitted to NMFS as part of the monitoring program. Since 1997, NMFS has also received CBP data (derived from Entry Form 7501) on imports of fresh and frozen bluefin tuna and swordfish on a monthly basis. Comparison of these data with BSD data allows NMFS to identify shipments without BSDs in order to obtain missing data and enforce dealer reporting requirements. In 2003, ICCAT updated the BSD program to include the collection of farming related information on the BSD. In 2005, NMFS added a re-export certificate to the program and expanded it to include southern bluefin tuna as well. Data collected under the BSD program are discussed in Sections 3.7.2 and 3.7.3, which addresses U.S. exports and imports of HMS.

3.7.1.3 Swordfish Certificate of Eligibility and Statistical Document

The U.S. Swordfish Certificate of Eligibility (COE) has tracked U.S. imports of swordfish since it was implemented in 1999. In 2005, this program was replaced by a swordfish statistical document (SD) program similar to the BSD program described above. The swordfish SD program is based on a 2001 ICCAT recommendation (01-22), and will incorporate all of the prior functions of the COE, including the following: ensuring that all imported swordfish are greater than the minimum size of 14.9 kg (33 lb) dw, identifying the flag of the harvesting vessel, and indicating ocean area of origin. Similar to the BSD program, CBP data on swordfish imports is also used to obtain missing data and identify dealers that are not following the required reporting procedures. With implementation of the swordfish SD program, the swordfish COE is no longer in effect.

3.7.1.4 Bigeye Tuna Statistical Document

Like the two previous trade monitoring programs, the bigeye tuna SD program is used to track movement of internationally traded bigeye tuna to its final destination. ICCAT recommended the implementation of a bigeye tuna SD program in 2001 (01-21). The initial program was implemented in 2005 along with the swordfish SD, and applies only to frozen bigeye tuna. It may be expanded to cover fresh product in the future. Other RFMOs including the Inter-American Tropical Tuna Commission and the Indian Ocean Tuna Commission have also adopted frozen bigeye SD programs.

3.7.1.5 Yellowfin Tuna Form 370

Since the late 1970's, NOAA Form 370 has been used to document imports of yellowfin tuna and other species of tuna for the purpose of protecting dolphins in the Eastern Tropical Pacific Ocean. Form 370 is filed with other documents necessary for entry of yellowfin tuna into the United States. The form is *not* required for fresh tuna, animal food, or canned petfood made from tuna.

3.7.1.6 Billfish Certificate of Eligibility

The Billfish Certificate of Eligibility is used to ensure that any billfish being imported or sold in the United States (outside of the Pacific states) is not of Atlantic origin. In the Pacific states, billfish involved in trade are presumed to be of Pacific origin. Any statement that contains the specified information is sufficient to meet the certificate of eligibility documentation requirements; it is not necessary to use the form available from NMFS or to submit the form to NMFS upon final disposition of the billfish.

3.7.2 U.S. Exports of HMS

“Exports” may include merchandise of both domestic and foreign origin. The Census Bureau defines exports of "domestic" merchandise to include commodities which are grown, produced, or manufactured in the United States (*e.g.*, fish caught by U.S. fishermen). For statistical purposes, domestic exports also include commodities of foreign origin which have been altered in the United States from the form in which they were imported, or which have been enhanced in value by further manufacture in the United States. The value of an export is the f.a.s. (free alongside ship) value defined as the value at the port of export based on a transaction price including inland freight, insurance, and other charges incurred in placing the merchandise alongside the carrier. It excludes the cost of loading the merchandise, freight, insurance, and other charges or transportation costs beyond the port of exportation.

3.7.2.1 Atlantic and Pacific Bluefin Tuna Exports

As discussed in the previous section, NMFS collects detailed export data on Atlantic and Pacific bluefin tuna through the BSD program. Table 3.68 gives bluefin tuna export data for exports from the United States. Recent decreases in Atlantic BFT exports since 1999 could in part be a result of the growing U.S. market for high-quality fresh bluefin tuna meat. In 2003, exports also could have been impacted by a reduction in U.S. landings. BFT re-exports are discussed separately in Section 3.7.3.1 and shown in Table 3.7.

Table 3.68 **U.S. exports of Atlantic and Pacific bluefin tuna, 1999 – 2003.** Source: NMFS BSD Program, NERO, and Census Bureau.

Year	Commercial Landings (NERO, MT)	Atlantic BFT Exports (BSD, MT)	Pacific BFT Exports (BSD, MT)	Total U.S. Exports (BSD, MT)	Total U.S. Exports (Census Bureau, MT)	Value of U.S. Exports (Census Bureau, $ million)
1999	876.0	735.6	95.7	831.3	1,183.3	9.37
2000	903.9	758.0	76.0	834.0	1,044.9	11.20
2001	987.0	812.3	67.0	879.0	1,020.0	10.70
2002	964.0	730.4	0.1	730.5	922.5	10.74
2003	756.9	572.2	2.1	574.3	998.2	11.36

Note: most exports of Pacific BFT were in round (whole) form, although some exports were of dressed and gilled/gutted fish; Atlantic exports included whole, dressed, and product forms (dw); data are preliminary and subject to change.

3.7.2.2 Other Tuna Exports

Export data for other tunas is gathered by the Census Bureau, and includes trade data for albacore, yellowfin, bigeye, and skipjack tuna from all ocean areas of origin combined. Behind bluefin tuna, albacore tuna accounts for the next most valuable tuna export from the United States (Table 3.69). Comparing the last five years, the amount and value of exported albacore was greatest for the year 2003. In general, the amount and value of albacore exports appears to be on the rise. During the time period covered by this table, the annual amount and value of frozen exports exceeded fresh exports for every year.

Table 3.69 **Amount and value of U.S. exports of albacore tuna from all ocean areas, 1999 – 2003 (Census Bureau data) and U.S. landings of North Atlantic albacore tuna.** Source: U.S. National Report to ICCAT, 2004.

Year	Atlantic Landings (mt ww)	**U.S. Exports** (from all ocean areas)					
		Fresh		Frozen		Total for all Exports	
		MT	US$ (million)	MT	US$ (million)	MT	US$ (million)
1999	317	517	1.01	2,743	5.52	3,260	6.54
2000	407	263	0.78	2,747	6.04	3,010	6.83
2001	324	1,542	3.62	4,609	9.83	6,151	13.45
2002	488	680	1.50	4,483	8.28	5,163	9.78
2003	448	893	1.86	9,731	18.85	10,624	20.71

Note: Landings may be calculated on a calendar or fishing year basis; exports may be in whole (ww) or product weight (dw); data are preliminary and subject to change .

Table 3.70 and Table 3.71 show U.S. Atlantic landings and U.S. exports from all ocean areas combined for yellowfin and skipjack tuna, respectively. Yellowfin exports were greater and more valuable than exports for skipjack or bigeye tuna (Table 3.72). Export of fresh yellowfin product exceeded the value of frozen yellowfin product for all years except 2001. Fresh product exports were highest in 2002 and 2003. The amount and value of exported fresh and frozen skipjack tuna has varied over the five year period covered in Table 3.71, without any

discernable trends. Exports and landings of skipjack in 1999 far exceeded values for the following four years.

Table 3.70 **Amount and value of U.S. exports of yellowfin tuna from all ocean areas, 1999 - 2003 (Census Bureau data) and U.S. landings of Atlantic yellowfin tuna.** Source: U.S. National Report to ICCAT, 2004.

Year	Atlantic Landings (mt ww)	**U.S. Exports** (from all ocean areas)					
		Fresh		**Frozen**		**Total for all Exports**	
		MT	**US$ (million)**	**MT**	**US$ (million)**	**MT**	**US$ (million)**
1999	7569	947	2.09	390	.84	1,337	2.93
2000	7051	412	1.12	406	.76	819	1.89
2001	6703	290	.71	834	1.45	1,124	2.17
2002	5653	1,612	2.37	420	.81	2,033	3.19
2003	7701	1,792	2.93	176	.68	1,968	3.62

Note: Landings may be calculated on a calendar or fishing year basis; exports may be in whole (ww) or product weight (dw); data are preliminary and subject to change.

Table 3.71 **Amount and value of U.S. exports of skipjack tuna from all ocean areas, 1999 - 2003 (Census Bureau data) and U.S. landings of West Atlantic skipjack tuna.** Source: U.S. National Report to ICCAT, 2004.

Year	Atlantic Landings (mt ww)	**U.S. Exports** (from all ocean areas)					
		Fresh		**Frozen**		**Total for all Exports**	
		MT	**US$ (million)**	**MT**	**US$ (million)**	**MT**	**US$ (million)**
1999	152	88	.20	1,092	.89	1,181	1.10
2000	44	7	.01	83	.05	91	.06
2001	69	82	.15	34	.04	117	.20
2002	66	66	.17	11	.01	77	.18
2003	77	81	.22	0	0	81	.22

NOTE: Landings data may have been ported on either a fishing year or calendar year basis; exports may be in whole (ww) or product weight (dw); data are preliminary and subject to change.

Bigeye tuna exports and Atlantic landings are given in Table 3.72. No data were available for bigeye tuna exports in 2001, and prior to 2001 bigeye exports were included in the category of unspecified tuna. Annually, bigeye tuna exports include more fresh than frozen product, and increased from 2002 to 2003.

Table 3.72 **Amount and value of U.S. exports of bigeye tuna from all ocean areas, 1999 - 2003 (Census Bureau data) and U.S. landings of Atlantic bigeye tuna.** Source: U.S. National Report to ICCAT, 2004.

Year	Atlantic Landings (mt ww)	**U.S. Exports** (from all ocean areas)					
		Fresh		**Frozen**		**Total for all Exports**	
		MT	**US$ (million)**	**MT**	**US$ (million)**	**MT**	**US$ (million)**
2002	600	95	.22	8	.01	104	.24
2003	483	255	.47	40	.08	295	.56

NOTE: Landings data may have been reported on either a fishing year or calendar year basis; exports may be in whole (ww) or product weight (dw); data are preliminary and subject to change.

3.7.2.3 Shark Exports

Export data for sharks are gathered by the Census Bureau, and includes trade data for sharks from any ocean area of origin. Shark exports are not categorized down to the species level with the exception of dogfish, and are not identified by specific product code other than fresh or frozen meat and fins. Due to the popular trade in shark fins and their high relative value compared to shark meat, a specific HTS code was assigned to shark fins in 1998. It should be noted that there is no tracking of other shark products besides meat and fins. Therefore, NMFS cannot track trade in shark leather, oil, or shark cartilage products.

Table 3.73 indicates the magnitude and value of shark exports by the United States from 1999-2003. The reduction in shark fin exports from 2001 to 2002 and 2003 is of particular note, as is the increase in the unit value of shark fins during this time period. Decreases in shark fin trade are expected to be the result of the Shark Finning Prohibition Act, which was enacted in December of 2000 and implemented by final rule in February 2002.

Table 3.73 Amount and value of U.S. shark product exports from 1999-2003. Source: Census Bureau.

Yr	Shark Fins Dried			Non-specified Fresh Shark			Non-specified Frozen Shark			Total for all Exports	
	MT	US$ (million)	$/KG	MT	US$ (million)	$/KG	MT	US$ (million)	$/KG	MT	US$ (million)
1999	106	.91	8.54	270	.48	1.80	155	.46	2.97	532	1.86
2000	365	3.51	9.62	430	.78	1.82	345	.81	2.35	1140	5.10
2001	335	3.16	9.44	332	.54	1.64	634	2.34	3.69	1301	6.04
2002	123	3.46	28.00	968	1.47	1.52	982	2.34	2.38	2,075	7.28
2003	45	4.03	87.79	837	1.31	1.57	592	1.34	2.28	1,476	6.70

NOTE: exports may be in whole (ww) or product weight (dw); data are preliminary and subject to change.

3.7.2.4 Re-exports of Atlantic HMS

For purposes of international trade tracking of HMS, the term “re-export” refers to a product that has been entered for consumption into the United States and then exported to another country, with or without further processing in the United States (from 50 CFR Part 300, Subpart M, International trade documentation and tracking programs for HMS). For most HMS species, re-export activity is a small fraction of export activity, and well below reference points of 1000 mt and/or one million dollars annually. Exceptions to this include fresh yellowfin tuna re-exports which were valued at $1.5 million in 2003 and fresh and frozen yellowfin valued at $1.1 million in 2002 (Census Bureau data). In 2003, dried shark fin re-exports reached a five year maximum value of $1.6 million (34 mt).

Bluefin tuna re-exports also reached a five year maximum in 2003 at 1,184 mt valued at $18.94 million (Census Bureau data), which exceeded the amount of bluefin exports for the year, for the first time in the history of the BSD program (K. Goldsmith, pers. com.). To date, the BSD program has tracked considerably fewer 2003 BFT re-exports (Table 3.74) than indicated

by Census Bureau data; however, the trend of re-exports exceeding exports remains. In 2002, Census Bureau data identified bluefin re-exports of 167 mt dw valued at a value of $2.39 million. Further investigation into BSD program data found that the recent increases in bluefin re-exports reflects the growth of the Mexican farming/mariculture industry which exports product to the U.S. for re-export to Japan.

3.7.2.5 Summary of Atlantic HMS Exports

Nationally, the value of HMS exports (from all ocean areas combined) is dominated by bluefin tuna, albacore tuna, and shark products. In 2003, fresh and frozen products of these three species accounted for 12,674 mt dw or 0.6 percent of the 1,814,370 mt dw of fresh and frozen seafood products imported into the United States, as indicated in *Fisheries of the United States, 2003*. The value of these HMS products accounted for $38.77 million, out of a national total of $9.8 billion.

Data reflecting international trade of HMS species harvested from all ocean areas are of limited value for describing trade of HMS harvested from the Atlantic Ocean. For example, Atlantic landings of albacore tuna (commercial and recreational) for 2003 were reported in the *2004 U.S. National Report to ICCAT* as 448 mt (Table 3.69). National trade data show that over 10,000 mt of albacore were exported, which indicates that the majority of albacore exports were Pacific Ocean product. Trade tracking programs such as the BSD program, swordfish certificate of eligibility, and bigeye tuna statistical document programs are much more useful for describing the international disposition of Atlantic HMS than national data from all ocean areas combined.

3.7.3 U.S. Imports of Atlantic HMS

All import shipments must be reported to the U.S. Bureau of Customs and Border Protection. “General" imports are reported when a commodity enters the country, and "consumption" imports consist of entries into the United States for immediate consumption combined with withdrawals from CBP bonded warehouses. “Consumption” import data reflect the actual entry of commodities originating outside the United States into U.S. channels of consumption. As discussed previously, CBP data for certain products are provided to NMFS for use in implementing the BSD program and swordfish certificate of eligibility program. U.S. Census Bureau import data are used by NMFS as well.

3.7.3.1 Bluefin Tuna Imports

United States imports and re-exports of bluefin tuna for 1999 through 2003, as reported through both CBP and BSD program data, are shown in Table 3.74. The difference in import numbers between the CBP and BSD data may be explained by a lack of knowledge and compliance with the BSD program by importers, especially those on the Pacific coast.

The recent rise in the popularity of sashimi in the United States has generated increased imports of bluefin tuna, and dealers are reporting an expanded domestic market for both locally-caught and imported raw tuna. As discussed previously, the large amount of re-exports in 2003 resulted from the increase in importation of farmed bluefin from Mexico and re-exportation to Japan.

Table 3.74 **Imports of Atlantic and Pacific bluefin tuna into the United States.** Source: NMFS BSD program and CBP data.

YEAR	NMFS BSD Program		U.S. CBP Data	
	Imports (MT)	Re-exports (MT)	Imports (MT)	VALUE (US$ million)
1999	411.9	16.6	558.6	3.02
2000	361.9	99.3	453.4	7.67
2001	512.9	7.0	532.3	8.21
2002	529.3	94.1	605.0	9.75
2003	649.9	691.0	780.3	11.67

NOTE: most imports of BFT were in dressed form, and some were round and gilled/gutted fish, fillets or belly meat (dw); data are preliminary and subject to change.

3.7.3.2 Other Tuna Imports

Since January 2001, CBP has been collecting species-specific import information for bigeye tuna (grouped to include all ocean areas). Previously, bigeye tuna had been included under general tuna imports. Amount and value of bigeye tuna imports have been gradually increasing over the last three years, as shown in Table 3.75.

Table 3.75 **Imports of bigeye tuna into the United States from all ocean areas combined: 2001-2003.** Source: Census Bureau data.

Year	Fresh		Frozen		Total for all Imports	
	MT	US$ (million)	MT	US$ (million)	MT	US$ (million)
2001	4,684	25.70	135	.32	4,820	26.02
2002	6,312	39.84	319	.70	6,632	40.55
2003	7,312	51.01	560	1.48	7,872	52.49

NOTE: Imports may be whole weight (ww) or product weight (dw); data are preliminary and subject to change.

Annual yellowfin tuna imports into the United States for all ocean areas combined are given in Table 3.76. As indicated by the data in this section, yellowfin tuna are imported in the greatest quantity of all fresh and frozen tuna products. The annual value of yellowfin imports has increased gradually from 1999-2003. The total annual amount of product imported has remained fairly consistent, with a slight dip in 2000.

Table 3.76 Imports of yellowfin tuna into the United States from all ocean areas combined, 1999-2003. Source: Census Bureau data.

Year	Fresh		Frozen		Total for all Imports	
	MT	US$ (million)	MT	US$ (million)	MT	US$ (million)
1999	11,756	63.04	9,411	24.90	21,168	87.94
2000	13,153	70.27	3,290	18.73	16,443	89.00
2001	15,563	85.50	3,967	23.45	19,530	108.95
2002	15,966	95.22	4,619	29.31	20,585	124.53
2003	13,157	83.39	5,579	39.67	20,878	133.71

NOTE: Imports may be whole weight (ww) or product weight (dw); data are preliminary and subject to change.

Imports of fresh albacore product from all ocean areas have decreased somewhat since 1999 while imports of frozen product have decreased dramatically over the last five years, with the greatest reduction occurring between 2002 and 2003 (Table 3.77). In 1999, albacore imports were valued at $144 million while in 2003 the value dropped to approximately $30 million. Products in airtight containers are not included in these data.

Table 3.77 Imports of albacore tuna into the United States from all ocean areas combined: 1999-2003. Source: Census Bureau data.

Year	Fresh		Frozen		Total for all Imports	
	MT	US$ (million)	MT	US$ (million)	MT	US$ (million)
1999	1,776	5.39	63,284	139.50	65,060	144.89
2001	1,843	6.42	51,001	127.33	52,845	133.76
2002	1,107	3.85	40,428	105.58	41,536	109.43
2003	1,296	4.81	11,903	24.49	13,200	29.31
2004	1,062	4.12	12,569	25.90	13,632	30.02

NOTE: Imports may be whole weight (ww) or product weight (dw); data are preliminary and subject to change.

Skipjack tuna imports into the United States are comprised mainly of frozen product (Table 3.78). Like albacore tuna, the amount and value of skipjack imports have also decreased dramatically since 1999. The amount of product imported fell from over 8,000 mt dw in 1999 to 224 mt dw in 2003. Likewise, the value of these products during this time period fell from $6.3 million to $0.43 million.

Table 3.78 Imports of skipjack tuna from all ocean areas combined into the United States, 1999-2003. Source: U.S. Census Bureau data.

Year	Fresh		Frozen		Total for all Imports	
	MT	US$ (million)	MT	US$ (million)	MT	US$ (million)
1999	0	0	8,238	6.30	8,238	6.30
2000	0	0	904	2.75	904	2.75
2001	<1	<0.01	377	0.61	378	0.62
2002	<1	0.01	824	0.83	825	0.84
2003	0	0	224	0.43	224	0.43

NOTE: Imports may be whole weight (ww) or product weight (dw); data are preliminary and subject to change.

3.7.3.3 Swordfish Imports

Table 3.79 summarizes swordfish import data collected by NMFS' Swordfish Import Monitoring Program for the 2003 calendar year. According to these data, most swordfish imports were Pacific Ocean product. For Atlantic product, the most imports came from Brazil (62 percent), followed by Uruguay (15 percent). CBP data located at the bottom of the table reflect a larger amount of imports than reported by the import monitoring program, and may be used by NMFS staff to follow up with importers, collect certificates of eligibility that have not been submitted, and enforce dealer reporting requirements.

Table 3.79 Swordfish import data for the 2003 calendar year collected under the NMFS Swordfish Import Monitoring Program.

Flag of Harvesting Vessel	Ocean of Origin				Total* (mt dw)
	Atlantic (mt dw)	Pacific (mt dw)	Indian (mt dw)	Not Provided (mt dw)	
Not Provided	0.3	0.7	16.5	0.0	17.5
Australia	0.0	2.4	0.0	0.0	2.4
Barbados	2.4	0.0	0.0	0.0	2.4
Brazil	698.6	0.0	0.0	0.0	698.6
Canada	62.2	0.0	0.0	0.0	62.2
Chile	0.0	664.6	0.0	0.0	664.6
Costa Rica	1.7	161.4	0.0	0.6	163.7
Ecuador	0.0	233.8	0.0	0.0	233.8
El Salvador	0.0	10.1	0.0	0.0	10.1
Fiji Island	0.0	53.6	0.0	0.0	53.6
Grenada	17.0	0.0	0.0	0.0	17.0
Indonesia	0.0	0.0	12.7	0.0	12.7
Malaysia	0.0	44.7	13.3	36.0	93.9
Mexico	0.0	249.4	0.0	0.0	249.4
Namibia	23.0	0.0	0.0	1.7	24.7
New Zealand	0.0	143.5	0.0	0.0	143.5
Nicaragua	0.0	0.3	0.0	0.0	0.3
Panama	0.0	1,065.9	0.0	0.0	1,065.9
Philippines	0.0	13.4	0.0	0.0	13.4
R.S.A.	0.0	0.0	79.3	0.0	79.3
Seychelles	0.0	0.0	0.1	1.1	1.2
Singapore	0.0	72.6	64.2	0.0	136.7
South Africa	94.1	0.0	251.3	0.0	345.4
Sri Lanka	0.0	0.0	0.0	8.8	8.8
Taiwan	0.9	407.6	1,198.8	0.0	1,607.3
Tonga	0.0	3.1	0.0	0.1	3.3

Flag of Harvesting Vessel	Ocean of Origin				Total* (mt dw)
	Atlantic (mt dw)	Pacific (mt dw)	Indian (mt dw)	Not Provided (mt dw)	
Trinidad & Tobago	31.1	0.0	0.0	0.0	31.1
Uruguay	170.0	0.0	0.0	0.0	170.0
Venezuela	20.5	0.0	0.0	0.0	20.5
Vietnam	0.0	23.4	0.0	0.0	23.4
Total Reported by COES	1,121.7	3,150.7	1,636.1	48.3	5,956.8
Total Imports Reported to CBP					13,855.0
Total Not Reported by COEs					7,898.2

*** COE Data as of 7/11/04**

Table 3.80 indicates the amount and value of swordfish product imports by the United States from 1999-2003, as recorded by the U.S. Census Bureau, for all ocean areas combined. The amount of each product imported per year and annual totals for product and value were fairly consistent for the time period covered.

Table 3.80 Imported swordfish products by year: 1999-2003. Source: Census Bureau data.

Year	Fresh (MT)		Frozen (MT)			Total for all Imports	
	Steaks	Other	Fillets	Steaks	Other	MT	US$ (million)
1999	81	8,595	4,377	401	386	13,842	71.70
2000	161	8,626	4,833	524	167	14,314	85.57
2001	71	8,982	3,814	710	119	13,697	81.89
2002	195	9,726	4,156	956	677	15,711	88.26
2003	147	8,079	3,929	433	560	13,150	75.62

NOTE: Imports may be whole weight (ww) or product weight (dw); data are preliminary and subject to change.

3.7.3.4 Shark Imports

Similar to tuna imports other than bluefin tuna, NMFS does not require importers to collect and submit information regarding the ocean area of catch. Shark imports are also not categorized by species, and lack specific product information on imported shark meat such as the proportion of fillets, steaks, or loins. The condition of shark fin imports; *e.g.*, wet, dried, or further processed products such as canned shark fin soup, is also not collected. There is no longer a separate tariff code for shark leather, so its trade is not tracked by CBP or Census Bureau data.

The United States may be an important transshipment port for shark fins, which may be imported wet, processed and then exported dried. It is also probable that U.S.-caught shark fins are exported to Hong Kong or Singapore for processing, then imported back into the United States for consumption by urban-dwelling Asian Americans (Rose, 1996).

Table 3.81 summarizes Census Bureau data on shark imports for 1999 through 2003. Imports of fresh shark products have decreased by approximately 50 percent since 1999 while imports of shark fins have decreased by over 80 percent since 1999. The 2004 ICCAT recommendation addressing the practice of shark finning may result in a further reduction of imports in the near future. Over the last 5 years, the overall annual amount and value of shark imports decreased fairly consistently year after year to equal approximately half the 1999 amount and value in 2003.

Table 3.81 **U.S. imports of shark products from all ocean areas combined: 1999-2003.** Source: Census Bureau data.

Year	Shark Fins Dried		Non-specified Fresh Shark		Non-specified Frozen Shark		Total For All Imports	
	MT	US$ (million)	MT	US$ (million)	MT	US$ (million)	MT	US$ (million)
1999	59	2.10	1,095	2.03	105	.62	1,260	4.76
2000	66	2.35	1,066	1.85	90	.57	1,222	4.79
2001	50	1.08	913	1.38	123	1.78	1,087	4.25
2002	39	1.02	797	1.24	91	1.09	928	3.35
2003	11	.11	515	0.72	100	0.99	626	1.82

NOTE: Imports may be whole weight (ww) or product weight (dw); data are preliminary and subject to change.

3.7.3.5 Summary of U.S. Imports of Atlantic HMS

The import data in this section show that many HMS species are part of a valuable import market. As discussed previously regarding exports, most data documenting imports include products harvested from many ocean areas, not just the Atlantic Ocean. However, the BSD program and Swordfish Import Monitoring Program provide information specifically about product harvested from the Atlantic Ocean and imported into the United States.

In 2003, the U.S. domestic market for swordfish supported a domestic fishery of 4,281 mt dw worth $18.18 million and an active import market of 13,150 mt dw valued at $75.62 million. Despite recent increases in the U.S. quota of North Atlantic swordfish (consistent with ICCAT rebuilding programs), swordfish from the Pacific and Indian Oceans are expected to continue to supply the lucrative U.S. swordfish market during the near future.

3.7.4 The Use of Trade Data for Conservation Purposes

Trade data has been used in a number of ways to support international management of HMS. When appropriate, the SCRS uses trade data on bluefin tuna, swordfish, bigeye tuna, and yellowfin tuna that are submitted to ICCAT as an indication of landings trends. These data can then be used to augment estimates of fishing mortality rates (F) of these species, which improves scientific stock assessments. In addition, these data can be used to assist in assessing compliance with ICCAT recommendations and identify those countries whose fishing practices diminish the effectiveness of ICCAT conservation and management measures. On numerous occasions, ICCAT has adopted recommendations to address the lack of compliance with management programs for the bluefin tuna, bigeye tuna, and North and South Atlantic swordfish fisheries by ICCAT members. Penalties for non-compliance or fishing in a manner that diminishes the

effectiveness of ICCAT conservation measures may include catch limit reductions and, if necessary, trade restrictive measures.

For example, an analysis of vessel sighting and Japanese BSD data led to the 1996 determination that fishing vessels from the countries of Panama, Honduras, and Belize were fishing in a manner that diminished the effectiveness of the bluefin tuna rebuilding program, and resulted in a 1996 ICCAT recommendation for sanctions against the import of bluefin tuna from these countries (Table 3.82). In 1999, ICCAT recommended this trade restriction on Panama be lifted as a result of the Government of Panama's efforts to substantially reduce fishing vessel activities deemed inconsistent with ICCAT measures. In 2001, Honduras became a member of ICCAT, and based on this change in status and Honduras' significant efforts to control its fleet and address ICCAT concerns, ICCAT recommended lifting trade sanctions for bluefin tuna. The bluefin sanction for Belize was lifted by ICCAT in 2002.

In another example, import data from 1997 – 1999 revealed significant Atlantic bluefin tuna exports from Equatorial Guinea despite the fact that a zero catch limit was in effect for that country. The government of Equatorial Guinea had not responded to ICCAT inquiries and had reported no bluefin tuna catch data to ICCAT, and as a result ICCAT recommended trade restrictions as a penalty for non-compliance. Based on information regarding improved compliance presented by Equatorial Guinea at the 2004 ICCAT meeting, specifically, that Equatorial Guinea had canceled licenses and flags of large-scale longline vessels previously participating in IUU tuna fishing in the Convention area and guaranteed compliance with ICCAT conservation and management measures, the trade sanction was lifted by ICCAT.

As indicated in Table 3.82, most of the trade sanctions recommended by ICCAT since 1996 have been lifted. In fact, only trade sanctions for Bolivia and Georgia remain in effect. Thus, the imposition of trade sanctions seems to be an effective measure for ensuring that countries involved in international trade operate in a manner consistent with ICCAT recommended conservation programs. As illustrated above, the data obtained by monitoring international trade in HMS is instrumental in the development of ICCAT trade restrictions. In 2004, the European Union submitted an ICCAT working paper discussing the expanding role of statistical document programs in conservation and enforcement efforts. An intersessional meeting is scheduled for mid-2005 to further address this issue and consider any necessary program modifications in light of the new uses for these programs.

Table 3.82 Summary and current status of ICCAT recommended trade sanctions for bluefin tuna, swordfish, and bigeye tuna implemented by the United States.

Country	Species	ICCAT Recommended Sanction	U.S. Sanction Implemented	ICCAT Sanction Lifted	U.S. Sanction Lifted
Panama	Bluefin	1996	1997	1999	2000
Honduras	Bluefin	1996	1997	2001	2004
	Bigeye	2000	2002	2002	2004
	Swordfish	1999	2000	2001	2004
Belize	Bluefin	1996	1997	2002	2004

Country	Species	ICCAT Recommended Sanction	U.S. Sanction Implemented	ICCAT Sanction Lifted	U.S. Sanction Lifted
	Swordfish	1999	2000	2002	2004
	Bigeye	2000	2002	2002	2004
Equatorial Guinea	Bluefin	1999	2000	2004	2005
	Bigeye	2000	2002	2004	2005
Cambodia	Bigeye	2000	2002	2004	2005
St. Vincent & the Grenadines	Bigeye	2000	2002	2002	2004
Bolivia	Bigeye	2002	2004	In effect	In effect
Sierra Leone	Bluefin	2002	2004	2004	2005
	Bigeye	2002	2004	2004	2005
	Swordfish	2002	2004	2004	2005
Georgia	Bigeye	2003	2004	In effect	In effect

3.7.5 Overview of the Processing Industry for Atlantic HMS

Understanding the harvesting and processing sectors is essential when analyzing world trade in highly migratory fish species. The processing related entities that depend on Atlantic HMS are as diverse as the species and products themselves. Processing techniques range from the simple dressing and icing of swordfish at sea, to elaborate grading and processing schemes for bluefin tuna, to processing shark fins. Like all other seafood, HMS are perishable and may pose health hazards if not handled properly. Products range from those having a long shelf-life, such as swordfish, to highly perishable species like yellowfin tuna. Improperly handled yellowfin tuna can produce histamine, swordfish and sharks may contain high levels of mercury, and shark meat requires careful handling due to the high concentrations of urea in the body of the shark. Processing companies are aware of these characteristics and their costs of doing business vary accordingly to protect consumers. The Food and Drug Administration (FDA) works closely with NOAA Office of Law Enforcement to monitor incoming shipments of seafood, including highly migratory species.

FDA's Seafood Hazard Analysis Critical Control Point (HACCP) program implemented regulations that require processors of fish and fishery products to operate preventive control systems to ensure human food safety. Among other things, processors must effectively maintain the safety of their products, systematically monitor the operation of critical control points to ensure that they are working as they should, and keep records of the results of that monitoring. Processors must also develop written HACCP plans that describe the details and operation of their HACCP systems. Each processor may tailor its HACCP system to meet its own circumstances. The best way for FDA to determine whether a processor is effectively operating a HACCP system is by inspecting the processor. Federal review of monitoring and other records generated by the HACCP system is a critical component of an inspection because it allows the inspector to match records against the practices and conditions being observed in the plant and it discourages fraud. NMFS works closely with the FDA, in support of the HACCP program.

Just as HACCP plans vary between processors, transportation of the seafood to market also varies widely from the direct domestic sale of some shark or swordfish meat by a fisherman to a restaurant (carried by truck) to the quick, and sometimes complicated, export of bluefin tuna from fisherman to dealer to broker to the Japanese auction (carried by a commercial airline carrier). Frozen swordfish and tunas are often brought to the United States by overseas shipping companies and sharks and other products may be exported from the United States, processed overseas, and imported in a final product form.

It is unknown how many U.S. companies depend on HMS fisheries, other than the registered dealers who buy fish directly from U.S. fishermen and/or who import bluefin tuna or swordfish. The proportion of those companies that depend solely on Atlantic HMS versus those that handle other seafood and/or products is also unknown. This section provides a summary of the most recent trade data that NMFS has analyzed, as well as a brief description of the processing and trade industries employed in transitioning Atlantic HMS from the ocean to the plate.

3.7.5.1 Processing and Wholesale Sectors

NMFS has limited quantitative information on the processing sector, including the amount of HMS products sold in processed forms. In addition, knowledge regarding the utilization of Atlantic HMS is largely limited to the major or most valuable product forms, such as export quality bluefin tuna.

Much of the processing of export-quality Atlantic bluefin tuna occurs onboard the vessel harvesting the fish, which serves to maximize fish quality. Bluefin are gutted and bled, and protected from the heat and sunlight by immersion in ice or an icy brine. Upon landing, bluefin are immediately graded and prepared for export to Japan's fresh fish market. The fish are either refrigerated or exported immediately in insulated crates or "coffins" filled with ice or icepacks.

Other Atlantic tunas, especially bigeye tuna, are frequently shipped fresh to Japan in dressed form. Swordfish are sold fresh and frozen in dressed form and as processed products (*e.g.*, steaks and fillets). The utilization of sharks is also not well known since trade statistics frequently do not indicate product forms such as skins and leather, jaws, fishmeal and fertilizer, liver oil, and cartilage (Rose, 1996). Domestically-landed sandbar and blacktip shark meat may be sold to supermarkets and processors of frozen fish products. NMFS continues to work with industry to collect information specific to U.S. and foreign processing of Atlantic HMS to better track markets, conserve stocks, and manage sustainable fisheries.

The U.S. processing and wholesale sectors are dependent upon both U.S. and international HMS fisheries. Individuals involved in these businesses buy the seafood, cut it into pieces that transform it into a consumer product, and then sell it to restaurants or retail outlets. Employment varies widely among processing firms. Often employment is seasonal unless the firms also process imported seafood or a wide range of domestic seafood. The majority of firms handle other types of seafood and are not solely dependent on HMS. Other participants in the commercial trade sector include brokers, freight forwarders, and carriers (primarily commercial airlines, trucking, and shipping companies). Swordfish, tunas, and sharks are important

commodities on world markets, generating significant amounts in export earnings in recent years.

NMFS has recently observed that many seafood dealers that buy and sell highly migratory species and other seafood products have expanded their operations into internet-powered trading platforms specifically designed to meet the needs of other seafood professionals. Through these platforms, interested parties can conduct very detailed negotiations with many trading partners simultaneously. Buyers and sellers can bargain over all relevant elements of a market transaction (not just price) and can specify the product needed to buy or sell in detail, using seafood-specific terminology. The platforms are purportedly very easy to use because they mimic the pattern of traditional negotiations in the seafood industry. NMFS expects that the use of the internet will continue to change the way HMS trade occurs in the future.

3.8 Bycatch, Incidental Catch, and Protected Species

Bycatch in commercial and recreational fisheries has become an important issue for the fishing industry, resource managers, scientists, and the public. Bycatch can result in death or injury to the discarded fish, and it is essential that this component of total fishing-related mortality be incorporated into fish stock assessments and evaluation of management measures. Bycatch precludes other more productive uses of fishery resources and decreases the efficiency of fishing operations. Although not all discarded fish die, bycatch can become a large source of mortality, which can slow the rebuilding of overfished stocks. Bycatch imposes direct and indirect costs on fishing operations by increasing sorting time and decreasing the amount of gear available to catch target species. Incidental catch concerns also apply to populations of marine mammals, sea turtles, seabirds, and other components of ecosystems which may be protected under other applicable laws and for which there are no commercial or recreational uses but for which existence values may be high.

In 1998, NMFS developed a national bycatch plan, *Managing the Nation's Bycatch* (NMFS, 1998), which includes programs, activities, and recommendations for Federally managed fisheries. The national goal of the Agency's bycatch plan activities is to implement conservation and management measures for living marine resources that will minimize, to the extent practicable, bycatch and the mortality of bycatch that cannot be avoided. Inherent in this goal is the need to avoid bycatch, rather than create new ways to utilize bycatch. The plan also established a definition of bycatch as fishery discards, retained incidental catch, and unobserved mortalities resulting from a direct encounter with fishing gear.

3.8.1 Bycatch Reduction and the Magnuson-Stevens Act

The Magnuson-Stevens Act defines bycatch as fish which are harvested in a fishery, but which are not sold or kept for personal use, and includes economic and regulatory discards. Fish is defined as finfish, mollusks, crustaceans, and all other forms of marine animal and plant life other than marine mammals and birds. Seabirds and marine mammals are therefore considered "incidental catch." Bycatch does not include fish released alive under a recreational catch-and-release fishery management program.

National Standard 9 of the Magnuson-Stevens Act requires that fishery conservation and management measures shall, to the extent practicable, minimize bycatch and minimize the mortality of bycatch that cannot be avoided. In many fisheries, it is not practicable to eliminate all bycatch and bycatch mortality. Some relevant examples of fish caught in Atlantic HMS fisheries that are included as bycatch or incidental catch are marlin, undersized swordfish and bluefin tuna, sea turtles, and seabirds caught and released by commercial fishing gear; undersized swordfish and tunas in recreational hook and line fisheries; species for which there is little or no market such as blue sharks; and species caught and released in excess of a bag limit.

There are benefits associated with the reduction of bycatch, including the reduction of uncertainty concerning total fishing-related mortality, which improves the ability to assess the status of stocks, to determine the appropriate relevant controls, and to ensure that overfishing levels are not exceeded. It is also important to consider the bycatch of HMS in fisheries that target other species as a source of mortality for HMS and to work with fishery constituents and resource manager partners on an effective bycatch strategy to maintain sustainable fisheries. This strategy may include a combination of management measures in the domestic fishery, and if appropriate, multi-lateral measures recommended by international bodies such as ICCAT or coordination with Regional Fishery Management Councils or States. The bycatch in each fishery is summarized annually in the SAFE report for Atlantic HMS fisheries. The effectiveness of the bycatch reduction measures is evaluated based on this summary.

A number of options are currently employed (*) or available for bycatch reduction in Atlantic HMS fisheries. These include but are not limited to:

Commercial

1. *Gear Modifications (including hook and bait types)
2. *Circle Hooks
3. *Time/Area Closures
4. Performance Standards
5. *Education/Outreach
6. *Effort Reductions (*i.e.*, Limited Access)
7. Full Retention of Catch
8. *Use of De-hooking Devices (mortality reduction only)

Recreational

1. Use of Circle Hooks (mortality reduction only)
2. Use of De-hooking Devices (mortality reduction only)
3. Full Retention of Catch
4. *Formal Voluntary or Mandatory Catch-and-Release Program for all Fish or Certain Species
5. Time/Area Closures

There are probably no fisheries in which there is no bycatch because none of the currently legal fishing gears are perfectly selective for the target of each fishing operation (with the possible exception of the swordfish/tuna harpoon fishery and proposed speargun fishery). Therefore, to totally eliminate bycatch of all non-target species in Atlantic HMS fisheries would

be impractical. The goal then is to minimize the amount of bycatch to the extent practicable and minimize the mortality of species caught as bycatch.

3.8.2 Standardized Reporting of Bycatch

Section 303(a)(11) of the Magnuson-Stevens Act requires that a fishery management plan establish a standardized reporting methodology to assess the amount and type of bycatch occurring in the fishery. In 2004, NMFS published a report entitled *"Evaluating Bycatch: A National Approach to Standardized Bycatch Monitoring Programs,"* which described the current status of and guidelines for bycatch monitoring programs (NMFS, 2004a). The data collection and analyses that are used to estimate bycatch in a fishery constitute the "standardized bycatch reporting methodology" (SBRM) for that fishery (NMFS, 2004a). Appendix 5 of the report specifies the protocols for SBRMs established by NMFS throughout the country.

As part of the Agency's National Bycatch Strategy, NMFS established a National Working Group on Bycatch (NWGB) to develop a national approach to standardized bycatch reporting methodologies and monitoring programs. This work is to be the basis for regional teams, established in the National Bycatch Strategy, to make fishery-specific recommendations.

The NWGB reviewed regional issues related to fisheries and bycatch and discussed advantages and disadvantages of various methods for estimating bycatch including: 1) fishery-independent surveys; 2) self-reporting through logbooks, trip reports, dealer reports, port sampling, and recreational surveys; 3) at-sea observation, including observers, digital video cameras, digital observers, and alternative platform and remote monitoring; and 4) stranding networks. All of the methods may contribute to useful bycatch estimation programs, but at-sea observation (observers or electronic monitoring) provides the best mechanism to obtain reliable and accurate bycatch estimates for many fisheries. Often, observer programs also will be the most cost-effective of these alternatives. However, observers are not always the most cost-effective or practicable method for assessing bycatch (NMFS, 2004a).

The effectiveness of any SBRM depends on its ability to generate estimates of the type and quantity of bycatch that are both precise and accurate enough to meet the conservation and management needs of a fishery. The National Bycatch Report (NMFS, 2004a) contains an in-depth examination of the issues of precision and accuracy in estimating bycatch. Precision of an estimate refers to its variability, or how repeatable the estimate is. The more precise an estimate is, the less variable it is. Precision of estimates is usually expressed in terms of a statistical value, the coefficient of variation (CV) of the estimate (NMFS, 2004a), which is the ratio of the square root of the estimate (also known as the standard error) to the estimate itself. The lower the CV, the more precise the estimate is considered to be. The National Bycatch Report (NMFS, 2004a) contains an extensive discussion of how precision relates to sampling and to assessments.

The other important aspect of obtaining bycatch estimates that are useful for management purposes is accuracy. Accuracy is the difference in the mean of the sample and the true value of that property in the sampled universe (NMFS, 2004a). In other words, accuracy refers to how correct the estimate is. While there are differences between the terms accuracy and bias they have been used interchangeably. A "biased" estimate is inaccurate while an "accurate" estimate is unbiased (Rago *et al*., 2005.).

The NWGB recommended that at-sea sampling designs should be formulated to achieve precision goals for the least amount of observation effort, while also striving to increase accuracy (NMFS, 2004a). This can be accomplished through random sample selection, developing appropriate sampling strata and sampling allocation procedures, and by implementing appropriate tests for bias. Sampling programs will be driven by the precision and accuracy required by managers to address management needs for estimating management quantities such as allowable catches through a stock assessment, for evaluating bycatch relative to a management standard such as allowable take, and for developing mitigation mechanisms. The recommended precision goals for estimates of bycatch are defined in terms of the coefficient of variation (CV) of each estimate. For marine mammals and other protected species, including seabirds and sea turtles, the recommended precision goal is a 20-30 percent CV for estimates of interactions for each species/stock taken by a fishery. For fishery resources, excluding protected species, caught as bycatch in a fishery, the recommended precision goal is a 20-30 percent CV for estimates of total discards (aggregated over all species) for the fishery; or if total catch cannot be divided into discards and retained catch, then the goal is a 20-30 percent CV for estimates of total catch (NMFS, 2004a). The report also states that attainment of these goals may not be possible or practical in all fisheries and should be evaluated on a case-by-case basis.

The CV of an estimate can also be reduced and the precision increased by increasing sample size. In the case of observer programs, this would entail increasing the number of trips or gear deployments observed. Increasing the number of trips observed increases both the cost in terms of funding, but also the logistical complexities and safety concerns. However, the improvements in precision will decline at a decreasing rate as sample size is increased to a point where it will not be cost-effective to increase sample size any further. This concept is illustrated in Figure 1 of Section 4.3.1.2 of the National Bycatch Report (NMFS, 2004a). As a result of this statistical relationship, fishery managers select observer coverage levels that should achieve the desired or required balance between precision of bycatch estimates and cost.

While the relationship between precision and sample size is relatively well known (NMFS, 2004), the relationship between sample size and accuracy is not so easily determined. Observer programs strive to achieve samples that are representative of both fishing effort and catches. Representativeness of the sample is critical not only for obtaining accurate (*i.e.*, unbiased) estimates of bycatch, but also for collecting information about factors that may be important for mitigating bycatch. Bias may be introduced at several levels: when vessels are selected for coverage, when hauls are selected for sampling, or when only a portion of the haul can be sampled (NMFS, 2004a).

A simplistic approach in trying to get more accurate bycatch estimates is to increase observer coverage. A report by Babcock *et al,*. (2003) suggests that relatively high percentages of observer coverage are necessary to adequately address potential bias in bycatch estimates from observer programs. However, the examples cited by Babcock *et al.,* (2003) as successful in reducing bias through high observer coverage levels are fisheries comprised of relatively few vessels compared to many other fisheries, including the Atlantic HMS fishery. Their examples are not representative of the issues facing most observer programs and fishery managers, who must work with limited resources to cover large and diverse fisheries. It is also incorrect to

assume that simply increasing observer coverage ensures accuracy of the estimates (Rago *et al.*, 2005). Bias due to unrepresentative sampling may not be reduced by increasing sample size due to logistical constraints, such as if certain fishermen refuse to take observers, or if certain classes of vessels cannot accommodate observers. Increasing sample size may only result in a larger, but still biased, sample.

Although the precision goals for estimating bycatch are important factors in determining observer coverage levels, other factors are also considered when determining actual coverage levels. These may result in lower or higher levels of coverage than that required to achieve the precision goals for bycatch estimates. Factors that may justify lower coverage levels include lack of adequate funding; incremental coverage costs that are disproportionately high compared to benefits; and logistical consideration such as lack of adequate accommodations on a vessel, unsafe conditions, and lack of cooperation by fishermen (NMFS, 2004a).

Factors that may justify higher coverage levels include incremental coverage benefits that are disproportionately high compared to costs and other management focused objectives for observer programs. The latter include total catch monitoring, in-season management of total catch or bycatch, monitoring bycatch by species, monitoring compliance with fishing regulations, monitoring requirements associated with the granting of Experimental Fishery Permits, or monitoring the effectiveness of gear modifications or fishing strategies to reduce bycatch. In some cases, management may require one or even two observers to be deployed on every fishing trip. Increased levels of coverage may also be desirable to minimize bias associated with monitoring "rare" events with particularly significant consequences (such as takes of protected species), or to encourage the introduction of new "standard operating procedures" for the industry that decrease bycatch or increase the ease with which bias can be monitored (NMFS, 2004a).

NMFS utilizes self-reported logbook data (Fisheries Logbook System or FLS, and the supplemental discard report form in the reef fish/snapper-grouper/king and Spanish mackerel/shark logbook program), at-sea observer data, and survey data (recreational fishery dockside intercept and telephone surveys) to produce bycatch estimates in HMS fisheries. These data are collected with respect to fishing gear type and have been presented by gear type in this report in prior sections (see Section 3.4). The number and location of discarded fish are recorded, as is the disposition of the fish (*i.e.*, released alive vs. released dead). Post-release mortality of HMS is accounted for in stock assessments to the extent that the data allow.

The fishery logbook systems in place are mandatory programs, and it is expected that the reporting rates are generally high (Garrison, 2005). Due to the management focus on these fisheries, there has been close monitoring of reporting rates, and observed trips can be directly linked to reported effort. In general, the gear characteristics and amount of observed effort is consistent with reported effort. However, under-reporting is possible, which can lead to a negative bias in bycatch estimates. In some instances, logbooks are used to provide effort information against which bycatch rates obtained from observers is multiplied to estimate bycatch. In other sectors/fisheries, self-reporting provides the primary method of reporting bycatch because of limited funding, priorities, *etc*.

The following section provides a review of the bycatch reporting methodology for all HMS fisheries currently in place. Future adjustments may be implemented based on evaluation of the results of studies developed as part of the HMS Bycatch Reduction Implementation Plan, or as needed due to changing conditions in the fisheries.

3.8.2.1 U.S. Atlantic Pelagic Longline Fishery

NMFS utilizes both self-reported data (mandatory logbooks for all vessels) and observer data to monitor bycatch in the pelagic longline fishery. The observer program has been in place since 1992 to document finfish bycatch, characterize fishery behavior, and quantify interactions with protected species (Beerkircher *et al.*, 2002). The program is mandatory for those vessels selected and all vessels with directed and indirect swordfish permits are selected. The program has had a target coverage level of five percent of the U.S. fleet within the North Atlantic (waters north of 5° N. latitude), as was agreed to by the United States at ICCAT. Actual coverage levels achieved from 1992-2003 ranged from two to nine percent depending on quarter and year. Observer coverage was 100 percent for vessels participating in the NED experimental fishery during 2001-2003. Overall observer coverage in 2003 was 11.5 percent of the total sets made, including the NED experiment. The program began requiring an eight percent coverage rate due to the requirements of the 2004 Biological Opinion for Atlantic Pelagic Longline Fishery for HMS. Observer coverage in 2004 ranged from 6.2 - 9.0 percent per quarter. Since 1992, data collection priorities have been to collect catch and effort data of the U.S. Atlantic pelagic longline fleet on highly migratory fish species, although information is also collected on bycatch of protected species.

Bycatch rates (catch per 1,000 hooks) are quantified based upon observer data by year, fishing area, and quarter (Garrison, 2005). The estimated bycatch rate is then multiplied by the fishing effort (number of hooks) in each area and quarter reported to the FLS program to obtain estimates of total interactions for each species of marine mammal and sea turtle (Garrison, 2005).

3.8.2.2 Purse Seine Fishery

Vessels operating in the bluefin tuna purse seine fishery submit either Vessel Trip Reports (NERO) or HMS logbooks (Southeast) based on the type of Federal permits they hold in addition to their HMS permit. Observers were placed on purse seine vessels operating in this fishery in the mid 1990's in order to monitor groundfish bycatch in closed areas in the Northwest Atlantic (B. McHale, pers. comm.). The purse seine fishery was observed to have very little bycatch of groundfish or other species of fish and no protected species interactions. As a result, no recent observer coverage has been used to document bycatch or validate logbook reports.

3.8.2.3 Shark Bottom Longline Fishery

Vessels participating in the bottom longline fishery for sharks are required to submit snapper/grouper/reef fish/shark logbooks to report their catch and effort, including bycatch species. All vessels having Shark Limited Access Permits are required to report. The Commercial Shark Fishery Observer Program (CSFOP) has monitored the shark bottom longline fishery since 1994. The program has been mandatory for vessels selected to carry observers beginning in 2002. Prior to that, it was a voluntary program relying on cooperating

vessels/captains to take observers. During the 2002 - 2003 fishing season, observer coverage was equal to 3.8 percent of the total large coastal shark landings.

Effective August 1, 2001, selected Federal permit holders that report on the Gulf of Mexico reef fish, South Atlantic snapper-grouper, king and Spanish mackerel, and shark fisheries logbook must report all species and quantities of discarded (alive and dead) sea turtles, marine mammals, birds, and finfish on a supplemental discard form. A randomly selected sample of 20 percent of the vessels with active permits in the above fisheries is selected each year. The selection process is stratified across geographic area (Gulf of Mexico and South Atlantic), gear (handline, longline, troll, gillnet, and trap), and number of fishing trips (ten or less trips and more than 11 trips). Of the 3,359 vessels with Federal permits in these fisheries in 2003, a total of 452 vessels were selected to report. Of the 3,517 vessels with Federal permits in the fisheries in 2004, 428 were selected to report. Shark fishermen can use the pelagic longline logbook or the northeast vessel trip reports depending on the permits held by the vessel. If they use either the PLL logbook or VTR, they need to report all of the catch and effort, as well as all the bycatch or incidental catch.

3.8.2.4 Shark Gillnet Fishery

Vessels participating in the gillnet fishery for sharks are required to submit logbooks to report their catch and effort, including bycatch species. An observer program for the directed shark gillnet fishery has been in place from 1993 - 1995 and from 1998 to the present. The objectives of this program are to obtain estimates of catch and bycatch and bycatch mortality rates of protected species, juvenile sharks, and other fish species. Catch and bycatch estimates are produced to meet the mandates of the Atlantic Large Whale Take Reduction Plan and the October 2003 Biological Opinion.

During right whale calving season (15 November to 31 March), 100 percent observer coverage is required for shark gillnet vessels operating from West Palm Beach, FL, to Sebastian Inlet, FL. Outside right whale calving season, observer coverage is equal to that which would obtain a sample size needed to provide estimates of sea turtle or marine mammal interactions with an expected CV of 0.3 (in 2003, this was 33.8 percent of the total trips). NMFS has proposed modifying the time and areas where 100 percent observer coverage is required during right whale calving season. NMFS has proposed that, from November 15 to April 15, 100 percent observer coverage would be required for gillnet vessels fishing between the SC/GA border and 29° 00 North and 32° 00 North. Gillnet vessels fishing between 29° 00 North and 26° 46.5 North would be required to have 100 percent observer coverage from December 1 to March 31.

In addition, one of the alternatives to reduce mortality of finetooth sharks in this document would increase observer coverage to all vessels with directed shark permits that report landing sharks with gillnet.

Effective August 1, 2001, selected Federal permit holders that report on the Gulf of Mexico reef fish, South Atlantic snapper-grouper, king and Spanish mackerel, and shark fisheries logbook must report all species and quantities of discarded (alive and dead) sea turtles, marine mammals, birds, and finfish on a supplemental discard form. A randomly selected

sample of 20 percent of the vessels with active permits in the above fisheries is selected each year. The selection process is stratified across geographic area (Gulf of Mexico and South Atlantic), gear (handline, longline, troll, gillnet, and trap), and number of fishing trips (ten or less trips and more than 11 trips). Of the 3,359 vessels with Federal permits in these fisheries in 2003, a total of 452 vessels were selected to report. Of the 3,517 vessels with Federal permits in the fisheries in 2004, 428 were selected to report. Shark fishermen can also use the pelagic longline logbook or the northeast vessel trip reports. If they use either the PLL logbook or VTR, they need to report all of the catch and effort, as well as all the bycatch or incidental catch.

3.8.2.5 Commercial Handgear Fishery

The commercial handgear fishery includes vessels using handline, harpoon, rod and reel, or bandit gear to fish for HMS. NMFS has the authority to use observers to collect bycatch information from commercial vessels fishing for tunas. Many of these vessels are already required to complete Federal and/or state logbooks (*e.g.*, the NMFS Northeast Region Vessel Trip Report (VTR) Program), in which they are required to report all fishing information, including that for HMS and bycatch. NMFS is currently evaluating various alternatives to increase fishery data collection of vessels fishing for HMS with handgear, such as selecting additional HMS permitted vessels to report in logbooks or be selected for observer coverage, and is investigating alternatives for electronic reporting. Therefore, no estimates of bycatch are available at this time.

3.8.2.6 Recreational Handgear Fishery

NMFS collects recreational catch-and-release data from dockside surveys (the Large Pelagics Survey and the Marine Recreational Fishery Statistics Survey) for the rod and reel fishery and uses these data to estimate total landings and discards of bycatch or incidental catch. Statistical problems associated with small sample size remain an obstacle to estimating bycatch reliably in the rod and reel fishery. CVs are very high for most HMS (rare event species in the MRFSS) and LPS does not cover all times/geographic areas for non-bluefin tuna species. New survey methodologies are being developed, however, especially for the Charter/Headboat sector of the rod and reel fishery, which should help to address some of the problems in estimating bycatch for this fishery. In addition, selecting recreational vessels for voluntary logbook reporting may be an option for collecting bycatch information for this sector of the HMS fishery.

NMFS has the authority to use observers to voluntarily collect bycatch information from vessels with HMS Charter/Headboat or Angling Category permits. Many of the charter/headboat vessels are required to complete Federal and/or state logbooks (*e.g.*, the NMFS Northeast Region Vessel Trip Report (VTR) Program), in which they are required to report all fishing information, including that for HMS and bycatch. NMFS is currently evaluating various alternatives to increase logbook coverage of vessels fishing for HMS, such as selecting additional HMS vessels to report in logbooks or be selected for observer coverage, and is investigating alternatives for electronic reporting.

3.8.3 Bycatch Reduction in HMS Fisheries

The NMFS HMS bycatch reduction program includes an evaluation of current data collection programs, implementation of bycatch reduction measures such as gear modifications and time/area closures, and continued support of data collection and research relating to bycatch. Additional details on bycatch and bycatch reduction measures can be found in Section 3.5 of the Fishery Management Plan for Atlantic Tunas, Swordfish and Sharks (NMFS, 1999), in Regulatory Amendment 1 to the 1999 FMP (NMFS, 2000), in Regulatory Adjustment 2 to the 1999 FMP (NMFS, 2002), and in Amendment 1 to the 1999 FMP (NMFS, 2003a). In addition, an HMS Bycatch Reduction Implementation Plan was developed in late 2003 which identifies priority issues to be addressed in the following areas: 1) monitoring, 2) research, 3) management, and 4) education/outreach. Individual activities in each of these areas were identified and new activities may be added or removed as they are addressed or identified.

3.8.4 Evaluation and Monitoring of Bycatch

The identification of bycatch in Atlantic HMS fisheries is the first step in reducing bycatch and bycatch mortality. The Magnuson-Stevens Act requires the amount and type of bycatch to be summarized in the annual SAFE reports. Bycatch reporting is addressed in Section 3.8.3. Additional species and fishery specific data have already been presented in Section 3.4.

Pelagic longline dead discards of swordfish, billfish, large coastal sharks and pelagic sharks are estimated using data from NMFS observer reports and pelagic logbook reports. Shark bottom longline discards have been estimated using logbook data and observer reports as well. Shark gillnet discards can be estimated using logbook data.

NMFS has not estimated swordfish harpoon bycatch estimates. NMFS has limited historical observer data on harpooned swordfish from driftnet trips in which harpoons were sometimes used. However, swordfish harpoon fishermen are required to submit pelagic logbooks and NMFS will examine those data for use in estimating bycatch. NMFS has not estimated bluefin tuna harpoon bycatch estimates because these tuna fishermen have not been selected to submit logbooks. NMFS has not estimated bycatch in the General category commercial rod and reel tuna fishery although anecdotal evidence indicates that some undersized bluefin tuna may be captured. Studies of release mortality are ongoing.

There is concern about the accuracy of discard estimates in the recreational rod and reel fishery for HMS due to the low number of observations by the Large Pelagics Survey and the MRFSS. These bycatch estimates are not currently available, except for bluefin tuna. For some species, encounters are considered rare events, which might result in bycatch estimates with considerable uncertainty. Due to improvements in survey methodology, increased numbers of intercepts (interviews with fishermen) have been collected during 2002 - 2004. NMFS is planning to devote more time and effort in developing bycatch estimates and estimates of uncertainty from the recreational fishery. These data will be included in future SAFE reports. Bycatch estimates may also be estimated using tournament data for the recreational fishery.

3.8.5 Bycatch Mortality

3.8.5.1 Introduction

The reduction of bycatch mortality is an important component of National Standard 9. Physical injuries may not be apparent to the fisherman who is quickly releasing a fish because there may be injuries associated with the stress of being hooked or caught in a net. Little is known about the mortality rates of many of the species managed under this FMP but there are some data for certain species. Information on bycatch mortality of these fish will continue to be collected, and in the future, will be used to estimate bycatch mortality in stock assessments.

NMFS submits annual data (Task I) to ICCAT on mortality estimates (dead discards). These data are included in the SAFE reports and National Reports to ICCAT to evaluate bycatch trends in HMS fisheries.

3.8.5.2 Mortality by Fishery

Pelagic Longline Fishery

NMFS collects data on the disposition (released alive or dead) of bycatch species from logbooks submitted by fishermen in the pelagic longline fishery. Observer reports also include disposition of the catch as well as information on hook location, trailing gear and injury status of protected species interactions. These data are used to estimate post-release mortality of sea turtles and marine mammals. See Section 3.4.1 for more information.

Purse Seine Fishery

NMFS has limited observer data on the bluefin tuna purse seine fishery. There are no recorded instances of non-tuna finfish, other than minimal numbers of blue sharks, caught in tuna purse seines. Anecdotal evidence indicates that if fish are discarded, they are easily released out of the net with minimal bycatch mortality.

Bottom Longline Fishery

The shark bottom longline fishery has relatively low observed bycatch rates. Historically, finfish bycatch has averaged approximately five percent in the bottom longline fishery. Observed protected species bycatch (sea turtles) has typically been much lower, less than 0.01 percent of the total observed catch. See Section 3.4.5.3 for more information. Disposition of discards is recorded by observers and can be used to estimate discard mortality.

Shark Gillnet Fishery

The shark gillnet fishery has relatively low observed bycatch rates. Finfish bycatch during the 2003 fishery ranged from 3.3 to 20.7 percent of the total catch. Observed protected species bycatch (sea turtles and marine mammals) was very low, less than 0.1 percent. See Section 3.4.5.4 for more information. Disposition of discards is recorded by observers and can be used to estimate discard mortality.

Commercial Handgear Fishery

The deliberate fishing nature of harpoon gear is such that bycatch is expected to be low. Harpoon vessels targeting bluefin tuna have not been selected for observer coverage. Therefore, there are no recorded instances of non-target finfish caught with harpoons and NMFS cannot quantify the bycatch of undersized bluefin tuna in this fishery. Bycatch in the swordfish harpoon fishery is virtually if not totally, non-existent. Since bycatch approaches zero in this fishery, it follows that bycatch mortality is near zero. Disposition of bycatch reported in logbooks is used to estimate mortality of bycatch in the hook and line handgear fisheries.

Recreational Handgear Fishery

The LPS collects data on disposition of bycatch (released alive or dead) in recreational HMS fisheries. Rod and reel discard estimates from Virginia to Maine during June through October can be monitored through the expansion of survey data derived from the LPS (dockside and telephone surveys). However, the actual numbers of fish discarded for many species are low. See Section 3.4.4 for more information.

Post-release mortality studies have been conducted on very few HMS at this time. Immediate mortality in recreational hook and line-caught juvenile bluefin tuna can be high (29.2 percent) due to injuries or predation (Belle, 1997). This is thought to be a conservative estimate because scientific personnel in the study were professionally trained and had extensive experience in fish handling techniques designed to reduce mortality. Mortality often occurs ten minutes or longer after the fish is released under normal circumstances. Injuries may not be readily apparent to the angler and seemingly minor capture injuries may be related to substantial internal injuries. Forty percent of sampled tuna that died during that study did not have injuries that would be apparent to the angler in the boat. Skomal and Chase (1996) provided evidence that the stress of rod and reel angling did not cause immediate post release mortality in larger bluefin (50 to 150 kg). However, they did document metabolic and pH disturbances in bluefin tuna sampled off of Hatteras, NC. The physiological consequences of angling stress are poorly understood for several species of large pelagic fishes (Skomal and Chase, 1996).

A study by Graves *et al*, (2002), investigated short-term (5 days) post-release mortality of Atlantic blue marlin using pop-up satellite tag technology. A total of nine recreationally caught blue marlin were tagged and released during July and August of 1999. All hooks employed in the study were "J" hooks. The attached tags were programmed to detach from the fish after five days and to record direct temperature and inclination of the buoyant tag to determine if the fish were actively swimming after being released. After detachment, the tags floated to the surface and began transmitting recorded position, temperature and inclination data to satellites of the Argos™ system. Three different lines of evidence provided by the tags (movement, water temperature, and tag inclination) suggested that at least eight of the nine blue marlin survived for five days after being tagged and released. One of the tags did not transmit any data, which precluded the derivation of a conclusion regarding the tagged marlin's survival.

The study was continued in 2003 to evaluate post release survival and habitat use of white marlin using pop-up satellite archival tags (PSATs) caught and released from four locations in the western North Atlantic recreational fishery (Horodysky and Graves, 2005).

Forty-one tags were attached to white marlin caught using dead baits rigged on straight shank ("J") hooks (n = 21) or circle hooks (n = 20) offshore of the U.S. Mid-Atlantic, the Dominican Republic, Mexico, and Venezuela. Survival was significantly higher ($p<0.01$) for white marlin caught on circle hooks (100 percent) relative to those caught on straight-shank ("J") hooks (65 percent). These results, along with previous studies on circle hook performance, suggest that a simple change in hook type can significantly increase the survival of white marlin released from recreational fishing gear. Data from these short term deployments also suggest that white marlin strongly associated with warm, near surface waters. However, based on the frequency, persistence, and patterns of vertical movements, white marlin appear to direct a considerable proportion of foraging effort well below surface waters, a behavior that may account for relatively high catch rates of white marlin on some pelagic longline sets. NMFS continues to support studies on recreational post-release mortality and intends to account for this source of mortality when additional information becomes available.

3.8.5.3 Code of Angling Ethics

NMFS developed a Code of Angling Ethics as part of implementing Executive Order 12962 – Recreational Fisheries. NMFS implemented a national plan to support, develop, and implement programs that were designed to enhance public awareness and understanding of marine conservation issues relevant to the wellbeing of fishery resources in the context of marine recreational fishing. This code is consistent with National Standard 9, minimizing bycatch and bycatch mortality, and is therefore reproduced below. These guidelines are discretionary, not mandatory, and are intended to inform the angling public of NMFS views regarding what constitutes ethical angling behavior. Part of the code covers catch-and-release fishing and is directed towards minimizing bycatch mortality.

Code of Angling Ethics

- Promotes, through education and practice, ethical behavior in the use of aquatic resources.
- Values and respects the aquatic environment and all living things in it.
- Avoids spilling, and never dumps any pollutants, such as gasoline and oil, into the aquatic environment.
- Disposes of all trash, including worn-out lines, leaders, and hooks, in appropriate containers, and helps to keep fishing sites litter-free.
- Takes all precautionary measures necessary to prevent the spread of exotic plants and animals, including live baitfish, into non-native habitats.
- Learns and obeys angling and boating regulations, and treats other anglers, boaters, and property owners with courtesy and respect.
- Respects property rights, and never trespasses on private lands or waters.
- Keeps no more fish than needed for consumption, and never wastefully discards fish that are retained.
- Practices conservation by carefully handling and releasing alive all fish that are unwanted or prohibited by regulation, as well as other animals that may become hooked or entangled accidentally.

- Uses tackle and techniques, which minimize harm to fish when engaging in "catch-and-release" angling.

3.8.6 Interactions of HMS Fishing Gears with Protected Species

This section examines the interaction between protected species and Atlantic HMS fisheries under consideration in this FMP. As a point of clarification, interactions are different than bycatch. Interactions take place between fishing gears and marine mammals, sea turtles, and seabirds while bycatch consists of discards of fish. Following a brief review of the three acts (Marine Mammal Protection Act, Endangered Species Act, and Migratory Bird Treaty Act) affecting protected species, the interactions between HMS gears and each species is examined. Additionally, the interaction of seabirds and longline fisheries are considered under the auspices of the United States "National Plan of Action for Reducing the Incidental Catch of Seabirds in Longline Fisheries" (NPOA – Seabirds).

3.8.6.1 Interactions and the Marine Mammal Protection Act

The Marine Mammal Protection Act of 1972 as amended (MMPA) is one of the principal Federal statutes that guide marine mammal species protection and conservation policy. In the 1994 amendments, section 118 established the goal that the incidental mortality or serious injury of marine mammals occurring during the course of commercial fishing operations be reduced to insignificant levels approaching a zero mortality rate goal (ZMRG) and serious injury rate within seven years of enactment (*i.e*,. April 30, 2001). In addition, the amendments established a three-part strategy to govern interactions between marine mammals and commercial fishing operations. These include the preparation of marine mammal stock assessment reports, a registration and marine mammal mortality monitoring program for certain commercial fisheries (Category I and II), and the preparation and implementation of take reduction plans (TRP).

NMFS relies on both fishery-dependent and fishery-independent data to produce stock assessments for marine mammals in the Atlantic Ocean, Gulf of Mexico, and Caribbean Sea. Draft stock assessment reports are typically published around January and final reports are typically published in the Fall. Final 2003 and draft 2004 stock assessment reports are available and can be obtained on the web at:
http://www.nmfs.noaa.gov/prot_res/PR2/Stock_Assessment_Program/sars.html

The following marine mammal species occur off the Atlantic and Gulf Coasts that are or could be of concern with respect to potential interactions with HMS fisheries.

Common Name	**Scientific Name**
Atlantic spotted dolphin	*Stenella frontalis*
Blue whale	*Balaenoptera musculus*
Bottlenose dolphin	*Tursiops truncatus*
Common dolphin	*Delphinis delphis*
Fin whale	*Balaenoptera physalus*
Harbor porpoise	*Phocoena phocoena*
Humpback whale	*Megaptera novaeangliae*
Killer whale	*Orcinus orca*

Long-finned pilot whale	*Globicephela melas*
Minke whale	*Balaenoptera acutorostrata*
Northern bottlenose whale	*Hyperoodon ampullatus*
Northern right whale	*Eubalaena glacialis*
Pantropical spotted dolphin	*Stenella attenuata*
Pygmy sperm whale	*Kogia breviceps*
Risso's dolphin	*Grampus griseus*
Sei whale	*Balaenoptera borealis*
Short-beaked spinner dolphin	*Stenella clymene*
Short-finned pilot whale	*Globicephela macrorhynchus*
Sperm whale	*Physeter macrocephalus*
Spinner dolphin	*Stenella longirostris*
Striped dolphin	*Stenella coeruleoalba*
White-sided dolphin	*Lagenorhynchus acutus*

Under MMPA requirements, NMFS produces an annual list of Fisheries (LOF) that classifies domestic commercial fisheries, by gear type, relative to their rates of incidental mortality or serious injury of marine mammals. The LOF includes three classifications:

1. Category I fisheries are those with frequent serious injury or mortality to marine mammals;
2. Category II fisheries are those with occasional serious injury or mortality; and
3. Category III fisheries are those with remote likelihood of serious injury or mortality to marine mammals.

The proposed 2005 MMPA LOF was published on December 2, 2004 (69 FR 70095). The Atlantic Ocean, Caribbean, and Gulf of Mexico large pelagic longline fishery is classified as Category I (frequent serious injuries and mortalities incidental to commercial fishing) and the southeastern Atlantic shark gillnet fishery is classified as Category II (occasional serious injuries and mortalities). The following Atlantic HMS fisheries are classified as Category III (remote likelihood or no known serious injuries or mortalities): Atlantic tuna purse seine; Gulf of Maine and mid-Atlantic tuna, shark and swordfish, hook-and-line/harpoon; southeastern mid-Atlantic and Gulf of Mexico shark bottom longline; and mid-Atlantic, southeastern Atlantic, and Gulf of Mexico pelagic hook-and-line/harpoon fisheries. Commercial passenger fishing vessel (charter /headboat) fisheries are subject to Section 118 and are listed as a Category III fishery. Recreational vessels are not categorized since they are not considered commercial fishing vessels. For additional information on the fisheries categories and how fisheries are classified, see http://www.nmfs.noaa.gov/prot_res/readingrm/Fisheries/2005_proposed_LOF.pdf.

Fishermen participating in Category I or II fisheries are required to register under the MMPA and to accommodate an observer aboard their vessels if requested. Vessel owners or operators, or fishermen, in Category I, II, or III fisheries must report all incidental mortalities and serious injuries of marine mammals during the course of commercial fishing operations to NMFS. There are currently no regulations requiring recreational fishermen to report takes, nor are they authorized to have incidental takes (*i.e.*, they are illegal).

NMFS continues to investigate serious injuries to marine mammals as they are released from fishing gear. In April 1999, NMFS held a joint meeting of the three regional scientific review groups to further discuss the issue. NMFS is continuing to develop marine mammal serious injury guidelines and until these are published, NMFS will apply the criteria listed by the review groups to make determinations for specific fisheries. The current Biological Opinions for Atlantic HMS fisheries have resulted in a conclusion of no jeopardy for marine mammals. A Pelagic Longline Take Reduction Team (PLLTRT) was recently formed and convened on June 29-30, 2005. A summary of the observed and estimated marine mammal interactions with the pelagic longline fishery is presented in Table 3.83 and Table 3.84. The PLLTRT must develop a Take Reduction Plan (TRP) for pilot whales within 11 months. The PLLTRT replaces the disbanded Atlantic Offshore Cetacean Take Reduction Team (AOCTRT). The 1999 HMS FMP implemented several of the recommendations of the AOCTRT including: 1) a requirement that vessels fishing for HMS move one nautical mile (nm) after an entanglement with protected species; 2) limiting the length of the mainline to 24 nm in the MAB from August 1, 1999 through November 30, 2000; 3) voluntary vessel operator education workshops for HMS pelagic longline vessels; 4) handling and release guidelines; and 5) limited access for swordfish, shark and tuna longline permits.

Table 3.83 Summary of marine mammal interactions in the pelagic longline fishery, 1992 - 1998.
Source: Yeung, 1999a; Yeung, 1999b.

Year	Species	Total		Mortality		Alive	
		Obs	Est	Obs	Est	Obs	Est
1992	Risso's Dolphin	3	121	2	74	1	47
	Common Dolphin	1	24			1	24
	Dolphin	1	17			1	17
	Pilot Whale	12	420	3	105	9	319
1993	Risso's Dolphin	3	62	1	36	2	26
	Bottlenose Dolphin	2	29			2	29
	Pilot Whale	16	193	1	15	15	178
	Spotted Dolphin	1	11			1	11
1994	Atlantic Spotted Dolphin	1	17	1	17		
	Pantropical Spotted Dolphin	1	20			1	20
	Killer Whale	1	16	1	16		
	Pilot Whale	14	161	12	137	2	26
	Risso's Dolphin	7	87	7	87		
1995	Risso's Dolphin	5	101	4	85	1	16
	Unidentified Marine Mammal	1	22			1	22
	Pilot Whale	13	252	11	200	2	53
	Shortfin Pilot Whale	2	58	2	58		
1996	Risso's Dolphin	4	99	2	52	2	47
	Unidentified Marine Mammal	1	43			1	43
1997	Pilot Whale	1	29			1	29
	Short-Beaked Spinner Dolphin	1	16			1	16
1998	Beaked Whale	1	88			1	88
	Bottlenose Dolphin	2	46	1	31	1	15
	Risso's Dolphin	2	47	1	23	1	24
	Pilot Whale	1	24			1	24

Table 3.84 Summary of marine mammal interactions in the pelagic longline fishery, 1999 - 2003.
Sources: Yeung, 2001; Garrison, 2003; Garrison and Richards, 2004.

Year	Species	Total		Mortality		Serious Injury		Alive	
		Obs	Est	Obs	Est	Obs	Est	Obs	Est
1999	Risso's Dolphin	1	23			1	23		
	Unidentified Marine Mammal	1	14					1	14
	Pilot Whale	5	385	1	94	4	291		
2000	Common Dolphin	1	32					1	32
	Risso's Dolphin	3	93	1	41	1	23	1	29
	Pilot Whale	8	231	1	24	4	109	3	98
	Whale	1	19			1	19		
	Pygmy Sperm Whale	1	28			1	28		
2001	Risso's Dolphin	8	83.6	1	24.4	6	48.9	1	14.3
	Pilot Whale	6	92.9	1	19.8	4	50.2	1	22.7
	Striped Dolphin	1	1					1	1
	Northern Bottlenose Whale	1	1			1	1		
2002	Risso's Dolphin	10	87.2			4	11	6	59.6
	Pilot Whale	10	113.5			4	49.9	6	67.8
	Common Dolphin	1	1					1	1
	Unidentified Dolphin	2	2			1	1	1	1
	Unidentified Marine Mammal	1	1			1	1		
2003	Beaked Whale	2	48.8			1	5.3	1	43.5
	Dolphin	1	16.2			1	16.2		
	Atlantic Spotted Dolphin	1	29.8			1	29.8		
	Bottlenose Dolphin	1	2					1	2
	Common Dolphin	2	45.6					2	45.6
	Risso's Dolphin	14	109.5	1	1	3	40.1	10	68.4
	Striped Dolphin	1	1					1	1
	Pilot Whale	4	32.1			2	21.4	1	11.3
	Baleen Whale	1	1					1	1
	Minke Whale	1	22.3					1	22.3

3.8.6.2 Interactions and the ESA

The Endangered Species Act of 1973 as amended (16 U.S.C. 1531 et seq.) provides for the conservation and recovery of endangered and threatened species of fish, wildlife, and plants. The listing of a species is based on the status of the species throughout its range or in a specific portion of its range in some instances. Threatened species are those likely to become endangered in the foreseeable future [16 U.S.C. §1532(20)] if no action is taken to stop the decline of the species. Endangered species are those in danger of becoming extinct throughout all or a significant portion of their range [16 U.S.C. §1532(20)]. Species can be listed as endangered without first being listed as threatened. The Secretary of Commerce, acting through NMFS, is authorized to list marine and anadromous fish species, marine mammals (except for walrus and sea otter), marine reptiles (such as sea turtles), and marine plants. The Secretary of the Interior, acting through the USFWS, is authorized to list walrus and sea otter, seabirds, terrestrial plants and wildlife, and freshwater fish and plant species.

In addition to listing species under the ESA, the service agency (NMFS or USFWS) generally must designate critical habitat for listed species concurrently with the listing decision

to the "maximum extent prudent and determinable" [16 U.S.C. §1533(a)(3)]. The ESA defines critical habitat as those specific areas that are occupied by the species at the time it is listed that are essential to the conservation of a listed species and that may be in need of special consideration, as well as those specific areas that are not occupied by the species that are essential to their conservation. Federal agencies are prohibited from undertaking actions that are likely to destroy or adversely modify designated critical habitat.

Marine Mammals	**Status**
Blue whale *(Balaenoptera musculus)*	Endangered
Fin whale *(Balaenoptera physalus)*	Endangered
Humpback whale *(Megaptera novaeangliae)*	Endangered
Northern right whale *(Eubalaena glacialis)*	Endangered
Sei whale *(Balaenoptera borealis)*	Endangered
Sperm whale *(Physeter macrocephalus)*	Endangered
Sea Turtles	
Green turtle *(Chelonia mydas)*	*Endangered/Threatened
Hawksbill sea turtle *(Eretmochelys imbricata)*	Endangered
Kemp's ridley sea turtle *(Lepidochelys kempii)*	Endangered
Leatherback sea turtle *(Dermochelys coriacea)*	Endangered
Loggerhead sea turtle *(Caretta caretta)*	Threatened
Olive ridley sea turtle *(Lepidochelys olivacea)*	Threatened
Critical Habitat	
Northern right whale	Endangered
Finfish	
Smalltooth sawfish *(Pristis pectinata)*	Endangered

*Green sea turtles in U.S. waters are listed as threatened except for the Florida breeding population, which is listed as endangered. Due to the inability to distinguish between the populations away from the nesting beaches, green sea turtles are considered endangered wherever they occur in U.S. waters.

Sea Turtles

NMFS has taken several steps in the past few years to reduce sea turtle bycatch and bycatch mortality in domestic longline fisheries. On March 30, 2001, NMFS implemented via interim final rule requirements for U.S. flagged vessels with pelagic longline gear on board to have line clippers and dipnets to remove gear on incidentally captured sea turtles (66 FR 17370). Specific handling and release guidelines designed to minimize injury to sea turtles were also implemented. NMFS published a final report which provides the detailed guidelines and protocols (Epperly *et al*., 2004) and a copy can be found at http://www.nmfs.noaa.gov/sfa/hms/Protected%20Resources/TM_524.pdf

A Biological Opinion completed on June 14, 2001, found that the actions of the pelagic longline fishery jeopardized the continued existence of loggerhead and leatherback sea turtles.

This document reported that the pelagic longline fishery interacted with an estimated 991 loggerhead and 1,012 leatherback sea turtles in 1999. The estimated take levels for 2000 were 1,256 loggerhead and 769 leatherback sea turtles (Yeung 2001).

On July 13, 2001 (66 FR 36711), NMFS published an emergency rule that closed the Northeast Distant (NED) area to pelagic longline fishing (effective July 15, 2001), modified how pelagic longline gear may be deployed effective August 1, 2001, and required that all longline vessels (pelagic and bottom) post safe handling guidelines for sea turtles in the wheelhouse. On December 13, 2001 (66 FR 64378), NMFS extended the emergency rule for 180 days through July 8, 2002. On July 9, 2002, NMFS published a final rule (67 FR 45393) that closed the NED to pelagic longline fishing. As part of the Reasonable and Prudent Alternative, the BiOp required NMFS to conduct an experiment with commercial fishing vessels to test fishery-specific gear modifications to reduce sea turtle bycatch and mortality. This rule also required the length of any gangions to be 10 percent longer than the length of any floatline on vessels where the length of both is less than 100 meters; prohibited stainless steel hooks; and required gillnet vessel operators and observers to report any whale sightings and required gillnets to be checked every 0.5 to 2 hours.

The experimental program required in the BiOp was initiated in the NED area in 2001 in cooperation with the U.S. pelagic longline fleet that historically fished on the Grand Banks fishing grounds. The goal of the experiment was to test and develop gear modifications that might prove useful in reducing the incidental catch and post-release mortality of sea turtles captured by pelagic longline gear while striving to minimize the loss of target catch. The experimental fishery had a three-year duration and utilized 100 percent observer coverage to assess the effectiveness of the measures. The gear modifications tested in 2001 included blue-dyed squid and moving gangions away from floatlines. In 2002, the NED experimental fishery examined the effectiveness of whole mackerel bait, squid bait, circle and "J" hooks, and reduced daylight soak time in reducing the capture of sea turtles. The experiment tested various hook and bait type combinations in 2003 to verify the results of the 2002 experiment.

On November 28, 2003, based on the conclusion of the three-year NED experiment, and preliminary data that indicated that the Atlantic pelagic longline fishery may have exceeded the Incidental Take Statement in the June 14, 2001, BiOp, NMFS published a Notice of Intent to prepare an SEIS to assess the potential effects on the human environment of proposed alternatives and actions under a proposed rule to reduce sea turtle bycatch (68 FR 66783). A new BiOp for the Atlantic pelagic longline fishery was completed on June 1, 2004. The BiOp concluded that long-term continued operation of the Atlantic pelagic longline fishery, authorized under the 1999 FMP, was not likely to jeopardize the continued existence of loggerhead, green, hawksbill, Kemp's ridley, or olive ridley sea turtles; and was likely to jeopardize the continued existence of leatherback sea turtles.

On July 6, 2004, NMFS implemented additional regulations for the Atlantic pelagic longline fishery to further reduce the mortality of incidentally caught sea turtles (69 FR 40734). These measures include requirements on hook type, hook size, bait type, dipnets, lineclippers, and safe handling guidelines for the release of incidentally caught sea turtles. These requirements were developed based on the results of the 2001-2003 NED experiment (Watson *et*

al., 2003; Watson *et al*., 2004a; Shah *et al*., 2004). These requirements are predicted to decrease the number of total interactions, as well as the number of mortalities, of both leatherback and loggerhead sea turtles (NMFS, 2004c). Post-release mortality rates are expected to decline due to a decrease in the number of turtles that swallow hooks which engage in the gut or throat, a decrease in the number of turtles that are foul-hooked and improved handling and gear removal protocols. NMFS is working to export this new technology to pelagic longline fleets of other nations to reduce global sea turtle bycatch and bycatch mortality.

Internationally, the United States is pursuing sea turtle conservation through international, regional, and bilateral organizations such as ICCAT, the Asia Pacific Fisheries Commission, and FAO Committee on Fisheries (COFI). The United States intends to provide a summary report to FAO for distribution to its members on bycatch of sea turtles in U.S. longline fisheries and the research findings as well as recommendations to address the issue. At the 24th session of COFI held in 2001, the United States distributed a concept paper for an international technical experts meeting to evaluate existing information on turtle bycatch, to facilitate and standardize collection of data, to exchange information on research, and to identify and consider solutions to reduce turtle bycatch. COFI agreed that an international technical meeting could be useful despite the lack of agreement on the specific scope of that meeting. The United States has developed a prospectus for a technical workshop to address sea turtle bycatch in longline fisheries as a first step. Other gear-specific international workshops may be considered in the future.

Smalltooth sawfish

On April 1, 2003, NMFS listed smalltooth sawfish as an endangered species (68 FR 15674) under the Endangered Species Act (ESA). After reviewing the best scientific and commercial information, the status review team determined that the U.S. DPS (Distinct Population Segment) of smalltooth sawfish is in danger of extinction throughout all or a significant portion of its range from a combination of the following four listing factors: the present or threatened destruction, modification, or curtailment of habitat or range; over utilization for commercial, recreational, scientific, or educational purposes; inadequacy of existing regulatory mechanisms; and other natural or manmade factors affecting its continued existence.

To date, there has been only one observed catch of a smalltooth sawfish in shark gillnet fisheries. The sawfish was taken on June 25, 2003, in a gillnet set off of southeast Florida and it was released alive (Carlson and Baremore, 2003). The set was characteristic of a typical drift gillnet set, with gear extending 30 to 40 feet deep in 50 to 60 feet of water. Prior to this event, it was speculated that the depth at which drift gillnets are set above the sea floor may preclude smalltooth sawfish from being caught. Although sometimes described as a lethargic demersal species, smalltooth sawfish feed mostly on schooling fishing, thus they would occur higher in the water column during feeding activity. In fact, smalltooth sawfish and Atlantic sharks may be attracted to the same schools of fish, potentially making smalltooth sawfish quite vulnerable if present in the area fished. The previous absence of smalltooth sawfish incidental capture records is more likely attributed to the relatively low effort in this fishery and the rarity of smalltooth sawfish, especially in Federal waters. These factors may result in little overlap of the species with the gear. The recently observed smalltooth sawfish was cut from the net and

released alive with no visible injuries. This suggests that smalltooth sawfish can be removed safely if entangled gear is sacrificed.

As discussed previously, gillnets are also used to "strikenet." When strike gillnetting, fishermen target and encircle specific schools of sharks after visually detecting them (usually by spotter pilot). Given the large and/or distinct morphology of smalltooth sawfish, this species would likely be detected visually, as well as distinguished from shark species, and thus avoided. This fishing method has been shown to also reduce potential encounters by limiting the time that gear is in the water. Strike gillnet sets are typically only one to two hours in contrast to six to ten hours for each drift gillnet set. Endangered and threatened species, or protected marine mammals, have never been observed taken in strikenet sets.

Given the high rate of observer coverage in the shark gillnet fishery, NMFS believes that smalltooth sawfish takes in this fishery are rare. The fact that there were no smalltooth sawfish caught during 2001, when 100 percent of the fishing effort was observed, indicates that smalltooth sawfish takes (observed or total) most likely do not occur on an annual basis. Based on this information, the 2003 BiOp estimates that one incidental capture of a sawfish (released alive) over the next five years, will occur as a result of the use of gillnets in this fishery (NMFS, 2003a).

Smalltooth sawfish have been observed caught (seven known interactions, six released alive, one released in unknown condition) in shark bottom longline fisheries from 1994 through 2002 (A. Morgan pers. comm.). Based on these observations, expanded sawfish take estimates for 1994-2002 were developed for the shark bottom longline fishery (NMFS, 2003a). A total of 466 sawfish were estimated to have been taken in this fishery during 1994 - 2002, resulting in an average of 52 per year. Additionally, it is important to note that all of the sawfish takes observed, except for one, were released alive. NMFS is working on designating critical habitat for smalltooth sawfish.

3.8.6.3 Interactions with Seabirds

Observer data from 1992 through 2003 indicate that seabird bycatch is relatively low in the U.S. Atlantic pelagic longline fishery (Table 3.85). Since 1992, a total of 116 seabird interactions have been observed, with 79 observed killed. In 2003, there were 127 active U.S. pelagic longline vessels fishing for swordfish in the Atlantic Ocean, Gulf of Mexico, and Caribbean Sea. Approximately, 7.2 million hooks were reported set in the pelagic longline fishery.

Observed bycatch has ranged from one to 18 seabirds observed dead per year and zero to 15 seabirds observed released alive per year from 1992 through 2003. Half of the seabirds observed were not identified to species (n = 58). Of the seabirds identified, gulls represent the largest group (n = 29), followed by greater shearwaters (n = 19), and northern gannets (n = 8) (Table 3.86). Greater shearwaters experienced the highest mortality (100 percent), followed by gulls (76 percent), and unidentified seabirds (67 percent). Northern gannets had the lowest mortality rate (12 percent).

Preliminary estimates of expanded seabird bycatch and bycatch rates from 1995-2002, varied by year and species with no apparent pattern (Table 3.87). The estimated number of all seabirds caught and discarded dead ranged from zero to 468 per year, while live discards ranged from zero to 292 per year. The annual bycatch rate of birds discarded dead ranged from zero to 0.0486 birds per 1,000 hooks, while live discards ranged from zero to 0.0303 birds per 1,000 hooks.

The National Plan of Action (NPOA) for Reducing the Incidental Catch of Seabirds in Longline Fisheries was released in February 2001. The NPOA for Seabirds calls for detailed assessments of longline fisheries, and, if a problem is found to exist within a longline fishery, for measures to reduce seabird bycatch within two years. NMFS, in collaboration with the appropriate Councils and in consultation with the U.S. Fish and Wildlife Service, will prepare an annual report on the status of seabird mortality for each longline fishery. The United States is committed to pursuing international cooperation, through the Department of State, NMFS, and U.S. Fish and Wildlife Service, to advocate the development of National Plans of Action within relevant international fora. The HMS Management Division intends to meet with longline fishery participants and other members of the public in the future to discuss possibilities for complying with the intent of the plan of action. Because interactions appear to be relatively low in Atlantic HMS fisheries, the adoption of immediate measures is unlikely.

Bycatch of seabirds in the shark bottom longline fishery has been virtually non-existent. A single pelican has been observed killed from 1994 through 2003. The pelican was caught in January 1995 off the Florida Gulf Coast (between 25° 18.68 North, 81° 35.47 West and 25° 19.11 North, 81° 23.83 West) (G. Burgess, University of Florida, pers. comm.). No expanded estimates of seabird bycatch or catch rates are available for the bottom longline fishery.

Table 3.85 Seabird Bycatch in the U.S. Atlantic Pelagic Longline Fishery, 1992 - 2004. Source: NMFS, 2004; NMFS PLL fishery observer program (POP) data.

Year	Month	Area	Type of Bird	Number observed	Status
1992	10	MAB	GULL	4	dead
1992	10	MAB	SHEARWATER GREATER	2	dead
1993	2	SAB	GANNET NORTHERN	2	alive
1993	2	MAB	GANNET NORTHERN	2	alive
1993	2	MAB	GULL BLACK BACKED	1	alive
1993	2	MAB	GULL BLACK BACKED	3	dead
1993	11	MAB	GULL	1	alive
1994	6	MAB	SHEARWATER GREATER	3	dead
1994	8	MAB	SHEARWATER GREATER	1	dead
1994	11	MAB	GULL	4	dead
1994	12	MAB	GULL HERRING	7	dead
1995	7	MAB	SEA BIRD	5	dead
1995	8	GOM	SEA BIRD	1	dead
1995	10	MAB	STORM PETREL	1	dead
1995	11	NEC	GANNET NORTHERN	2	alive
1995	11	NEC	GULL	1	alive
1997	6	SAB	SEA BIRD	11	dead

Year	Month	Area	Type of Bird	Number observed	Status
1997	7	MAB	SEA BIRD	1	dead
1997	7	NEC	SEA BIRD	15	alive
1997	7	NEC	SEA BIRD	6	dead
1998	2	MAB	SEA BIRD	7	dead
1998	7	NEC	SEA BIRD	1	dead
1999	6	SAB	SEA BIRD	1	dead
2000	6	SAB	GULL LAUGHING	1	alive
2000	11	NEC	GANNET NORTHERN	1	dead
2001	6	NEC	SHEARWATER GREATER	7	dead
2001	7	NEC	SHEARWATER GREATER	1	dead
2002	7	NEC	SEABIRD	1	dead
2002	8	NED	SHEARWATER GREATER	1	dead
2002	8	NED	SEABIRD	1	dead
2002	9	NED	SHEARWATER GREATER	3	dead
2002	9	NED	SEABIRD	3	alive
2002	9	NED	SHEARWATER SPP	1	dead
2002	10	NED	GANNET NORTHERN	1	alive
2002	10	NED	SHEARWATER SPP	1	dead
2002	10	NED	SEABIRD	2	dead
2002	10	MAB	GULL	3	alive
2002	10	MAB	GULL	1	dead
2002	11	MAB	GULL	3	dead
2003	1	GOM	SEABIRD	1	alive
2003	8	NED	SEABIRD	1	dead
2003	9	MAB	SEABIRD	1	dead
2004	1	MAB	GULL		5
2004	3	MAB	GREATER SHEARWATER	1	4
2004	4	NED	SEABIRD		1

MAB - Mid Atlantic Bight, SAB - South Atlantic Bight, NEC - Northeast Coastal, GOM - Gulf of Mexico, NED - Northeast Distant Water

Table 3.86 Status of Seabird Bycatch in the U.S. Atlantic Pelagic Longline Fishery, 1992 - 2004. Source: NMFS PLL fishery observer program (POP) data.

Species	Release Status		Total	Percent Dead
	Dead	Alive		
GULLS (incl. Blackback, Herring, Laughing, and unid. gulls)	27	7	34	79.4%
UNIDENTIFIED SEABIRD	40	19	59	67.8%
GREATER SHEARWATER	22	1	23	95.6%
SHEARWATER SPP	2	0	2	100%
NORTHERN GANNET	1	7	8	12.5%
STORM PETREL	1	0	1	100%
TOTAL ALL SEABIRDS	93	34	127	73.2%

Table 3.87 **Preliminary expanded estimates of seabird bycatch (D = discarded dead and A = discarded alive) and bycatch rates (all seabirds per 1,000 hooks) in the U.S. Atlantic pelagic longline fishery, 1997 - 2004.** Source: NMFS, 2004; NMFS PLL fishery observer program (POP) data.

	1997		1998		1999		2000		2001		2002		2003		2004	
Species	**D**	**A**	**D**	**A**	**D**	**A**	**D**	**A**	**D**	**A**	**D**	**A**	**D**	**A**	**D**	**A**
Unid. seabirds	468	292	155	0	14	0	0	0	0	0	3	3	8	13	4	0
Gulls	0	0	0	0	0	0	0	18	0	0	14	83	0	0	48	0
Shearwaters	0	0	0	0	0	0	0	0	210	0	6	0	0	0	59	15
Northern gannet	0	0	0	0	0	0	11	0	0	0	0	1	0	0	0	0
Storm petrel	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
All seabirds	468	292	155	0	14	0	11	18	210	0	23	87	8	13	111	15
Total hooks set	9,637,807		8,019,183		7,901,789		7,975,529		7,563,951		7,150,231		7,008,500		7,186,000	
Bycatch rate	0.0486	0.0303	0.0194	0	0.0017	0	0.0014	0.0023	0.0278	0	0.0032	0.0121	0.0011	0.0019	0.015	0.002

3.8.7 Measures to Address Protected Species Concerns

NMFS has taken a number of actions designed to reduce interactions with protected species over the last few years. Bycatch reduction measures have been implemented through the Fishery Management Plan for Atlantic Tunas, Swordfish and Sharks (NMFS, 1999), in Regulatory Amendment 1 to the 1999 FMP (NMFS, 2000), in Regulatory Adjustment 2 to the 1999 FMP (NMFS, 2002), in Amendment 1 to the 1999 FMP (NMFS, 2003a), and in the June 2004 Final Rule for Reduction of Sea Turtle Bycatch and Bycatch Mortality in the Atlantic Pelagic Longline Fishery (69 FR 40734). NMFS continues to monitor observed interactions with marine mammals and sea turtles on a quarterly basis and reviews data for appropriate action, if any, as necessary.

3.8.8 Bycatch of HMS in Other Fisheries

NMFS is concerned about bycatch mortality of Atlantic HMS in any Federal or state-managed fishery, which captures them. NMFS plans to address bycatch of these species in the appropriate FMPs through coordination with the responsible management body. For example, capture of swordfish and tunas incidental to squid trawl operations is addressed in the Squid, Mackerel, and Butterfish FMP. Capture rates of tunas in coastal gillnet fisheries are being explored by SF1 through issuance of exempted fishing permits and reporting requirements. NMFS continues to solicit bycatch data on HMS from all state, interjurisdictional, and Federal data collection programs. NMFS supports development of an interstate management plan for coastal sharks by the Atlantic States Marine Fisheries Commission to protect sharks caught incidentally in state-managed fisheries. NMFS has requested assistance from the ASMFC, GSMFC, and Atlantic and Gulf Regional Fishery Management Councils in identifying potential sources of bycatch of finetooth sharks in state waters fisheries or other fisheries outside the jurisdiction of this FMP.

3.8.8.1 Squid Mid-Water Trawl

U.S. squid trawl fishermen, using mid-water gear, landed 8.6 mt ww of yellowfin tuna, skipjack tuna, albacore tuna, bigeye tuna, and swordfish in 2003 incidental to the squid, mackerel, and butterfish trawl fishery (Table 3.88). Bycatch of HMS in other trawl fisheries may be included as a portion of the overall reported trawl landings in Table 3.88. Landings decreased from 2002 for bigeye and albacore tuna, and increased slightly for yellowfin and skipjack tuna. Swordfish landings increased by 50 percent but remain at a low level relative to the directed fishery landings. A retention limit of five swordfish per trip allows squid trawl fishermen with swordfish limited access permits to land some of the swordfish that are encountered, although regulatory discards still occur.

Table 3.88 Atlantic HMS Landed (mt ww) Incidental to Trawl Fisheries, 1998 - 2003. Source: NMFS, 2004.

Species	1998	1999	2000	2001	2002	2003
Yellowfin tuna	0.7	4.1	1.76	2.7	0.3	2
Skipjack Tuna	0.2	1.0	<0.05	0.2	<0.05	0.5
Bigeye Tuna	0.5	1.2	1.7	0.4	0.5	<0.05
Albacore	2.4	0.4	<0.05	0.0	0.3	<0.05
Swordfish	5.9	7.5	10.9	2.5	3.9	6.0
Total	9.7	14.2	14.43	5.8	4.8	8.6

3.8.8.2 Menhaden Purse Seine Fishery

In the menhaden purse seine fishery, sharks were caught incidentally in approximately 30 percent of the purse seine sets observed (deSilva *et al.*, 2001). Ten species of sharks were identified with blacktip sharks being the most common species. Approximately 20 percent of the sharks were not identified to species. An estimated 30,000 sharks were taken in this fishery annually in 1994 and 1995. At the time of release, 75 percent of sharks were dead, 12 percent were disoriented, and eight percent were healthy. The odds of observing shark bycatch was highest in April and May. Stomach analyses of sharks suggest that their occurrence in the fishery is probably the result of sharks preying on gulf menhaden (deSilva *et al*., 2001). No new data are available at this time.

Industry workers in this fishery employ a fish excluder device to reduce the retention of sharks and other large species (Rester and Condrey, 1999). In addition, a recently introduced hose cage modification may prove to be effective in reducing shark bycatch. These devices vary in effectiveness and no standards exist for such bycatch reduction measures in this fishery. In addition, there are currently no reporting requirements for takes of sharks in the menhaden purse seine fishery. Recent estimates of large coastal sharks discarded in this fishery range from 24,000 - 26,200 individuals (Cortés, 2005).

3.8.8.3 Shrimp Trawl Fishery

Shark bycatch in the shrimp trawl fishery consists mainly of sharks too small to be highly valued in the commercial market. As a result, few sharks are retained. Bycatch estimates of LCS in this fishery have been generated and were reviewed in the most recent LCS assessment (Cortés *et al*. 2002). Cortés (2002) estimated bycatch in the south Atlantic shrimp trawl fishery (North Carolina, South Carolina, Georgia, and Florida) for Atlantic sharpnose, bonnethead, and finetooth sharks based on expansion by fishing effort. Annual estimates of bycatch ranged from zero to almost six million sharks from 1992 to 1997 (Table 3.89) (Cortés, 2002). The 2002 SCS assessment included estimates of SCS bycatch because they were likely to exceed the actual landings for those species (Cortés, 2002). However, requirements for turtle excluder devices in this fishery have probably resulted in less bycatch because sharks are physically excluded from entering the gear.

Table 3.89 **Expanded estimates of bycatch (number of fish) of bonnethead, Atlantic sharpnose, and finetooth sharks in the U.S. south Atlantic shrimp trawl fishery based on within stratum expansion by effort as trips by fishing year.** Source: Cortés, 2002.

Year	Estimated number of trips	Bonnethead	Atlantic sharpnose	Finetooth
1992-93	20,181	53,674	1,753,829	0
1993-94	20,445	0	5,873,333	447,495
1995-96	23,333	34,378	0	0
1996-97	19,320	38,517	358,457	0

Bycatch of the SCS complex in the Gulf of Mexico shrimp trawl fishery consists mainly of Atlantic sharpnose and bonnethead sharks (Cortés, 2002). Estimates of the bycatch of SCS in this fishery ranged from 3.2 to 1.3 million sharks per year from 1972 - 2000 (Table 3.90). Finetooth sharks were added as a select species in shrimp trawl observer program to help determine if this fishery has bycatch of finetooth sharks as well.

Table 3.90 **Estimates (in thousands of individuals and pounds dressed weight) of the bycatch of small coastal sharks (as a complex and by species) in the shrimp trawl fishery operating in the Gulf of Mexico.** Source: S. Nichols, NMFS Pascagoula Lab., pers. comm. as cited in Cortés, 2002.

Year	All SCS (numbers)	All SCS (lb dw)	Atlantic sharpnose (numbers)	Atlantic sharpnose (lb dw)	Bonnethead (numbers)	Bonnethead (lb dw)
1972	1,575	1,500	1,051	1,010	468	371
1973	1,579	1,580	831	842	620	525
1974	1,903	1,899	1,508	1,407	420	400
1975	2,055	1,997	1,587	1,473	347	313
1976	2,193	2,209	1,706	1,632	456	436
1977	2,187	2,142	1,507	1,457	520	427
1978	2,223	2,156	1,799	1,625	367	370
1979	2,829	2,754	2,384	2,254	388	341
1980	2,591	2,436	2,148	1,933	368	330
1981	2,081	2,007	1,830	1,649	242	252
1982	2,281	2,203	1,850	1,661	302	310
1983	2,138	2,193	1,856	1,821	255	250
1984	1,551	1,509	1,277	1,191	232	230
1985	1,767	1,796	1,451	1,442	260	249
1986	2,222	2,234	1,464	1,519	624	506
1987	3,216	3,123	2,636	2,392	516	519
1988	2,535	2,272	1,959	1,664	421	404
1989	2,116	2,216	1,632	1,713	336	286
1990	1,981	2,069	1,503	1,507	489	431
1991	2,350	2,322	1,784	1,756	365	323
1992	2,759	2,879	1,968	1,997	494	459

Year	All SCS (numbers)	All SCS (lb dw)	Atlantic sharpnose (numbers)	Atlantic sharpnose (lb dw)	Bonnethead (numbers)	Bonnethead (lb dw)
1993	2,226	2,213	1,710	1,626	416	400
1994	2,197	2,243	1,586	1,591	395	347
1995	2,401	2,362	1,806	1,636	311	299
1996	2,923	2,457	2,069	1,644	519	428
1997	2,883	2,926	1,732	1,681	486	439
1998	2,657	2,410	1,662	1,494	376	329
1999	1,282	1,257	906	848	218	198
2000	1,282	1,257	906	848	218	198

3.8.9 Effectiveness of Existing Time/Area Closures in Reducing Bycatch

During the past several years, NMFS has implemented several time/area closures in the Atlantic Ocean and Gulf of Mexico for the PLL fishery to reduce discards and bycatch of a number of species (juvenile swordfish, bluefin tuna, billfish, sea turtles, etc.). Analyses of the effectiveness of these closures are included in Section 4.1.2 and summarized here.

The combined effects of the individual area closures were examined by comparing the 2001 - 2003 catch and discards to the averages for 1997 - 1999 throughout the entire U.S. Atlantic fishery. Changes in the numbers of fish caught and discarded were compared to the predicted values from Regulatory Amendment 1 to the 1999 FMP (NMFS, 2000). Overall effort, expressed as the number of hooks set, declined by 15 percent between the two time periods. Declines were noted for both the numbers of kept and discards of all species examined including swordfish, tunas, sharks, billfish, and sea turtles. The number of reported discards of swordfish, bluefin and bigeye tuna, pelagic sharks, dolphin, wahoo, blue and white marlin, sailfish, and spearfish all declined by more than 30 percent. The reported discards of blue and white marlin declined by about 50 percent and sailfish discards declined by almost 75 percent. The reported number of sea turtles caught and released declined by almost 28 percent.

The reported declines in swordfish kept and discarded, large coastal sharks kept and discarded, and dolphin kept were similar to the predicted values developed for Regulatory Amendment 1. Reported discards of bluefin tuna, pelagic sharks, all billfish (with the exception of spearfish for which no predicted change was developed in Regulatory Amendment 1), and total BAYS tunas kept all declined more than the predicted values.

3.8.9.1 Prohibition of Live Bait in the Gulf of Mexico

Regulatory Amendment 1 to the 1999 FMP also prohibited the use of live bait on pelagic longline gear in the Gulf of Mexico due to concerns over the incidental bycatch of billfish. Based on reported data, the number of hooks set with live bait or a combination of live and dead bait in the Gulf of Mexico decreased from 22.7 percent in 2000, to less than 0.1 percent in 2003 (Table 3.91). However, the number of hooks set with no bait type specified increased from zero in 1999 - 2001 to 3.7 percent in 2003. The reported number of hooks set in the Gulf of Mexico has increased in recent years. The reported effort in 2003 represents an increase of 13 percent

from 2000. NMFS will continue to analyze the effectiveness of the live bait prohibition in the Gulf of Mexico pelagic longline fishery.

Table 3.91 Comparison of the number of hooks set in the Gulf of Mexico with dead or live bait, or a combination of both baits, 1999 - 2003 (numbers in parentheses are percent of the total number of hooks set in the Gulf of Mexico). Source: PLL Logbook data.

Bait Type	Year				
	1999	2000	2001	2002	2003
Dead	2,335,845 (70.9)	2,598,083 (77.3)	3,176,493 (98.3)	3,494,577 (97.63)	3,668,687 (96.27)
Live	372,162 (11.3)	259,256 (7.7)	5,500 (0.2)	750 (0.02)	1,514 (0.04)
Both	584,473 (17.8)	505,582 (15.0)	49,250 (1.5)	13,115 (0.37)	1,000 (0.03)
Unknown	0	0	0	71,011 (1.98)	139,569 (3.66)
Total	3,292,480	3,362,921	3,231,243	3,579,453	3,810,770

3.8.9.2 Conclusions

It appears as though the time/area closures and live bait prohibition in the Gulf of Mexico have been relatively successful at reducing bycatch in the HMS pelagic longline fishery. Reported discards of all species of billfish have declined. The reported number of turtles caught, swordfish discarded, bluefin tuna discarded, and pelagic and large coastal shark discards have also declined. However, the reported number of target species kept, such as swordfish and BAYS tuna, have decreased more than was predicted. This is contrary to the other objective of the time/area closures, which was to minimize the reduction in target catch. NMFS will continue to analyze these measures as additional data become available and examine the effects of ongoing regulatory change over time.

3.8.10 Evaluation of Other Bycatch Reduction Measures

NMFS continues to monitor and evaluate bycatch in HMS fisheries through direct enumeration (pelagic and bottom longline observer programs, shark gillnet observer program), evaluation of management measures (closed areas, trip limits, gear modifications, *etc*.), and vessel monitoring systems (VMS).

The following section provides a review of additional management measures or issues that may address bycatch reduction:

- Atlantic Large Whale Take Reduction Plan (ALWTRP) regulations

Observers were placed on shark gillnet vessels during the 2003 season and covered 41 strikenet and 24 driftnet sets during and outside of right whale calving season (Carlson and Baremore, 2003). No marine mammals or sea turtles were observed caught in strikenet sets. Protected species interactions occurred in three separate drift gillnet sets. No marine mammals

or sea turtles were observed caught in strikenet sets. Two bottlenose dolphin (one mortality) and one smalltooth sawfish were caught in driftnet sets. No sea turtles were observed caught in any driftnet sets. NMFS has published a proposed rule to modify the right whale areas and the time periods when 100 percent observer coverage would be required.

- Atlantic Bottlenose Dolphin Take Reduction Team

Due to the observed takes of Atlantic bottlenose dolphin in the shark drift gillnet fishery, representatives of the fishery have been included in the Atlantic Bottlenose Dolphin Take Reduction Team. The Team held seven meetings during 2001-2003 and developed a set of recommendations which formed the basis for a Take Reduction Plan (TRP). NMFS published a proposed rule on November 10, 2004, to implement the TRP. Included in the proposed rule are: 1) effort reduction measures; 2) gear proximity rules; 3) gear or gear deployment modifications; 4) fishermen training; and 5) outreach and education measures to reduce dolphin bycatch below the stock's potential biological removal level. The proposed rule also includes time/area closures and size restrictions on large mesh fisheries to reduce incidental takes of endangered and threatened sea turtles as well as to reduce dolphin bycatch.

- MMPA List of Fisheries Update/Stock Assessment

NMFS continues to update the MMPA List of Fisheries and the 2004 final list is available. The proposed 2005 List of Fisheries was published on December 2, 2004. Final 2003 marine mammal stock assessment reports and draft 2004 reports are also available. See Section 3.8.6.1 for information on obtaining these reports.

- Atlantic Offshore Cetacean Take Reduction Team (AOCTRT)

NMFS has disbanded the AOCTRT due to the fact that two of the three fisheries addressed by the AOCTRT were closed by fishery management actions, leaving only the pelagic longline fishery in operation. This fishery has been the subject of recent fishery management actions and increased observer coverage related to bycatch. As discussed below, a take reduction team specific to the pelagic longline fishery has been formed.

- Pelagic Longline Take Reduction Team (PLLTRT)

NMFS has appointed a PLLTRT to address issues in the longline fishery and marine mammals, specifically pilot whales. The first meeting of the PLLTRT was held June 29-30, 2005. As required by the MMPA, the PLLTRT must develop a Take Reduction Plan within eleven months. NMFS intends to continue reviewing the fishery and any marine mammal interactions to determine if additional take reduction measures are necessary.

- Observer coverage of shark drift gillnet fleet

On March 30, 2001, NMFS reduced the level of observer coverage required in the shark drift gillnet fishery from 100 percent year-round to 100 percent during right whale calving season and a statistically significant level during the rest of the year. Recent scientific analyses indicate that a 33.8 percent level of coverage is statistically significant and adequate to provide reasonable estimates of sea turtle and marine mammal takes outside of the right whale calving season. The level of observer coverage necessary will be re-evaluated annually and adjusted accordingly. During the 2003 season, 41 strikenet and 24 driftnet sets were observed (Carlson and Baremore, 2003). One bottlenose dolphin was discarded dead in a driftnet set and one was released in

unknown condition. A single smalltooth sawfish was also taken and released alive. No interactions with sea turtles or marine mammals were observed in strikenet sets. NMFS began placing observers on vessels with directed shark permits that were targeting species other than sharks in 2005. Management options to address issues in the shark drift gillnet fishery, particularly overfishing of finetooth sharks, are considered in this document.

- Vessel monitoring systems in the pelagic longline fishery

NMFS adopted fleet-wide VMS requirements in the Atlantic pelagic longline fishery in May 1999, but was subsequently sued by an industry group. By order dated September 25, 2000, the U.S. District Court for the District of Columbia prevented any immediate implementation of VMS in the Atlantic pelagic longline fishery, and instructed to "undertake further consideration of the scope of the [VMS] requirements in light of any attendant relevant conservation benefits." On October 15, 2002, the court issued a final order that denied plaintiff's objections to the VMS regulations. Based on this ruling, NMFS implemented the VMS requirement in September 2003.

- Vessel monitoring systems in other HMS fisheries

Starting in 2004, gillnet vessels with a directed shark permit and gillnet gear onboard were required to install and operate a VMS unit during the Right Whale Calving Season (November 15 – March 31). In an attempt to better quantify bycatch, NMFS will require all vessels with Limited Access Shark Permits to participate in the Directed Shark Gillnet Observer program. Directed shark bottom longline vessels located between 33° N and 36° 30' N need to install and operate a VMS unit from January through July.

3.9 HMS Permits and Tournaments

This section provides updates for the number of permits that were issued in conjunction with HMS fishing activities as of April 2005. Furthermore, Section Atlantic HMS Tournaments, provides a comprehensive synthesis of recreational fishing tournaments and their role in the context of HMS management.

3.9.1 History of the Program Established in the 1999 Tunas, Swordfish, and Sharks FMP

The 1999 Tunas, Swordfish, and Sharks FMP initiated the limited access permit system for commercial swordfish, shark, and tuna fisheries. The objectives of this program were to:

- Minimize, to the extent practicable, economic displacement and other adverse impacts on fishing communities during the transition from overfished fisheries to healthy ones;

- Consistent with other objectives of this FMP, manage Atlantic HMS fisheries for continuing optimum yield to provide the greatest overall benefit to the Nation, particularly with respect to food production, providing recreational opportunities, preserving traditional fisheries, and taking into account the protection of marine ecosystems;

- Reduce latent effort and overcapitalization in HMS commercial fisheries;

- Develop eligibility criteria for participation in the commercial shark and swordfish fisheries based on historical participation, including access for traditional swordfish handgear fishermen to participate fully as the stock recovers; and

- Create a management system to make fleet capacity commensurate with resource status so as to achieve the dual goals of economic efficiency and biological conservation.

This program was designed to prevent further overcapitalization of the fishery and reduce latent effort, without significantly affecting the livelihoods of those who are dependent on the fisheries. Because this program did not directly reduce the capacity in these fisheries, this program was merely meant to be the first step towards reducing capacity in the Atlantic swordfish, shark, and tuna longline fisheries.

The program implemented in the 1999 Tunas, Swordfish, and Sharks FMP set up six different limited access permit types: 1) directed swordfish, 2) incidental swordfish, 3) swordfish handgear, 4) directed shark, 5) incidental shark, and 6) tuna longline. In order to address bycatch concerns in the pelagic longline fishery, these permits were designed so that the swordfish directed and incidental permits are valid only if the permit holder also holds both a tuna longline and a shark permit. Similarly, the tuna longline permit is valid only if the permit holder also holds both a limited access swordfish (directed or incidental, not handgear) and a shark permit. Swordfish handgear and shark gillnet permits are valid without another limited access permit.

3.9.2 Status of the Permit Program Established in the 1999 Tunas, Swordfish, and Sharks FMP

NMFS' HMS Management Division continues to monitor capacity in HMS fisheries. Updated permit numbers for HMS fisheries as of April 2005, are included in Table 3.92 through Table 3.97. These tables have been updated since the 2005 SAFE report, which listed numbers of permits as of late 2004. The overall number of limited access permits for Atlantic swordfish, tunas, and sharks declined from 1,187 to 1,144 (Table 3.92), however, this is subject to change based upon on-going permit renewal or expiration. The overall number of tuna permits increased in some categories and declined in others (Table 3.93). The HMS Angling Permit category went into effect on March 1, 2003 (67 FR 77434, December 18, 2003), and there has been a significant increase in Angling category permits over the past few years (Table 3.93). The number of tuna dealer permits decreased from 466 to364 (Table 3.96).

Table 3.92 Distribution of Shark, Swordfish, and Tuna longline Limited Access Permits Between 2001 and 2005.

State	# Directed Swordfish	# Incidental Swordfish	# Swordfish Handgear	# Directed Shark	# Incidental Shark	# Tuna Longline	# Permit Holders/# Permits
ME	2	-	4	2	4	1	11/13
NH	-	-	1	1	1	-	1/3
MA	13	3	19	4	15	9	40/63
RI	2	3	25	-	10	3	27/43

State	# Directed Swordfish	# Incidental Swordfish	# Swordfish Handgear	# Directed Shark	# Incidental Shark	# Tuna Longline	# Permit Holders/# Permits
CT	-	-	1	-	1	-	1/2
NY	18	3	11	10	12	13	28/67
NJ	30	15	8	28	28	27	53/136
DE	2	-	-	1	2	4	5/9
MD	6	-	-	4	5	6	9/21
VA	1	6	-	3	4	4	6/18
NC	8	10	2	20	17	11	37/68
SC	5	2	-	8	16	5	20/36
GA	-	-	-	1	3	1	5/5
FL	64	32	22	137	141	79	295/475
AL	-	2	-	2	2	1	3/7
MS	-	2	-	-	8	1	8/11
LA	32	7	-	4	38	47	47/128
TX	3	5	-	2	11	9	12/30
CA	1	-	-	-	1	1	1/3
IN	1	-	-	-	1	-	1/2
VI	1	-	-	-	1	-	1/2
Totals 2005**	**189**	**90**	**93**	**229**	**321**	**222**	**611/1144**
2004	**195**	**99**	**96**	**241**	**348**	**213**	**657/1187**
2003	**206**	**99**	**95**	**251**	**359**	**235**	**696/1245**
2002	**205**	**110**	**94**	**251**	**376**	**226**	**713/1262**
2001	**208**	**112**	**100**	**252**	**390**	**213**	**752/1275**

* Number of permit holders in each category, and state, is subject to change as permits are renewed or expire.
** Totals for 2005 are as of April 20, 2005.

3.9.3 Upgrading and Safety Issues

When the limited access program was implemented, NMFS included upgrading restrictions that were the same as those implemented by the New England Fishery Management Council (NEFMC) and Mid-Atlantic Fishery Management Council (MAFMC) in order to help minimize the number of regulations for fishermen in those areas. These regulations restrict vessels from any increase over 10 percent length overall (LOA), 10 percent gross or net tonnage, and 20 percent horsepower. NMFS continues to receive comments that these vessel upgrading restrictions are not appropriate for primarily longline fisheries, are not the preferred vessel characteristics to limit overcapitalization, and have caused safety at sea concerns. In developing the current upgrading restrictions, hold capacity was identified by constituents as a vessel characteristic that would not impact safety at sea and would meet the objective of addressing overcapitalization in HMS commercial fisheries. NMFS did not implement hold capacity as a

measure to limit vessel upgrading in 1999 due to the lack of standard measurements of vessel hold capacity as well as the lack of consistent collection of this information for HMS commercial vessels as part of existing vessel registration systems. NMFS has considered other possible options including: eliminating upgrading restrictions; limiting hold capacity instead of, or in addition to, the current restrictions; allowing a greater percentage increase; and creating vessel categories. NMFS heard similar comments as those listed above from the Advisory Panel (AP) in February of 2004. NMFS is considering these options, and, as with any potential changes in the permitting system, will allow for adequate public comment during the rulemaking process before making any changes to the regulations.

3.9.4 Atlantic Tunas Permits

The number of Atlantic Tunas permit holders by category is listed in Table 3.93. The number of permits in the Longline, General, and Charter/Headboat (CHB) categories increased between 2004 and April 2005. In previous years, CHB vessels fishing for HMS only needed a CHB permit if they were fishing for Atlantic tunas.

In December 2002, NMFS published a final rule (67 FR 77434, December 18, 2002) that required the owner of each vessel used to fish recreationally for Atlantic HMS or on which Atlantic HMS are retained or possessed, to obtain an HMS Angling permit. Effective March 1, 2003, this permit replaced the Atlantic Tunas Angling category permit. It is discussed in greater detail in the HMS Angling Permit section.

Table 3.93 **The number of Atlantic tuna permit holders in each category between 2001 and 2005.** The actual number of permit holders in each category is subject to change as individuals renew or allow their permits to expire.

Category	2001	2002	2003	2004	2005***
Longline	213	226	235	213	222
Angling *	12,685	13,263	18,804	20,245	21,735
Harpoon	53	56	47	49	49
Trap	1	6	2	2	2
General	6,072	6,431	5,526	5,057	5,267
Purse Seine	5	5	5	5	5
CHB**	3,260	3,659	4,167	3,881	4,029
Total	**22,289**	**23,646**	**28,789**	**29,452**	**31,309**

* HMS Angling permit became effective March 1, 2003 (67 FR 77434, December 18, 2003) and includes all HMS, not just tunas.
**** No longer a tuna-only permit, now a HMS CHB permit
*** Permit numbers as of April 20, 2005

3.9.5 HMS CHB Permits

In 2002, NMFS published a final rule (67 FR 77434, Dec. 18, 2002) expanding the HMS recreational permit from tuna only to include all HMS and define CHB operations. This established a requirement that owners of charterboats or headboats that are used to fish for, take, retain, or possess Atlantic tunas, sharks, swordfish, or billfish must obtain a HMS CHB permit. This permit replaced the Atlantic Tunas CHB permit. A vessel issued a HMS CHB permit for a fishing year will not be issued an HMS Angling permit or any Atlantic Tunas permit in any category for that same fishing year, regardless of a change in the vessel's ownership. The total number of CHB increased between 2004 and April 2005.

Table 3.94 CHB Permits by State as of April 20, 2005.

State	CHB permits	State	CHB Permits
AL	81	NH	58
CT	102	NJ	516
DE	97	NV	3
FL	684	OH	5
GA	43	PA	140
LA	108	PR	30
MA	491	RI	123
MD	174	SC	142
ME	48	TN	6
MI	4	TX	162
MS	36	VA	162
NC	446	VI	13
NY	342	Other	13
Total			**4,029**

3.9.6 HMS Angling Permit

Effective March 2003 (67 FR 77434, Dec. 18, 2002), the HMS Angling category permit allows all recreational anglers aboard permitted vessels to fish for HMS and is required to fish for, retain, or possess, including catch-and-release fishing, any federally regulated HMS. These species include: sharks, swordfish, white and blue marlin, sailfish, spearfish, and federally regulated Atlantic tunas (bluefin, yellowfin, bigeye, skipjack, and albacore). Atlantic HMS caught, retained, possessed, or landed by persons on board vessels with an HMS Angling permit may not be sold or transferred to any person for a commercial purpose. By definition, recreational landings of Atlantic HMS are those that are not marketed through commercial

channels, therefore it is not possible to monitor anglers' catches through ex-vessel transactions as in the commercial fishery. Instead, NMFS conducts statistical sampling surveys of the recreational fisheries. These survey programs have been used for over a decade and include the Marine Recreational Fisheries Statistics Survey (MRFSS) and the Large Pelagic Survey (LPS). A vessel issued an HMS Angling permit for a fishing year shall not be issued an HMS Charter/ Headboat permit or an Atlantic Tunas permit in any category for that same fishing year, regardless of a change in the vessel's ownership.

3.9.7 Dealer Permits

Dealer permits are required for commercial receipt of Atlantic tuna, swordfish, and sharks, and are described in further detail in the 1999 Tunas, Swordfish, and Sharks FMP. Dealer permits are not limited access. Additionally, the appropriate dealer permit is necessary for those importing bluefin tuna and/or swordfish from any ocean. Fishermen caught selling HMS to unpermitted dealers and persons without a dealer permit buying HMS from fishermen could be subject to enforcement action. Similarly, persons caught buying HMS from non-commercial fishermen could also be subject to enforcement action. All dealer permit holders are required to submit reports detailing the nature of their business. For swordfish and shark permit holders (including those who *only* import swordfish), dealers must submit bi-weekly dealer reports on all HMS they purchase. Tuna dealers must submit, within 24 hours of the receipt of a bluefin tuna, a landing report for each bluefin purchased from U.S. fishermen. Dealers must also submit bi-weekly reports that include additional information on tunas that they purchase. To facilitate quota monitoring "negative reports" for shark and swordfish are also required from dealers when no purchases are made (*i.e.*, NMFS can determine who has not purchased fish versus who has neglected to report). NMFS continues to automate and improve its permitting and dealer reporting systems and plans to make additional permit applications and renewals available online in the near future.

Starting July 1, 2005, dealers who import and/or export certain HMS species are required to obtain the NMFS HMS International Trade Permit (ITP) (69 FR 67268, November 17, 2004). The permit has been established to coordinate U.S. implementation of ICCAT and IATTC trade tracking recommendations. The HMS ITP will be required for trade of bluefin tuna, southern bluefin tuna, swordfish, and frozen bigeye tuna. Reporting associated with the HMS ITP will include biweekly reports and submission of swordfish, bluefin tuna, southern bluefin tuna and bigeye tuna statistical documents. Atlantic tunas and swordfish dealer permits will no longer be required for international trade of these species, and will be necessary only for domestic transactions. Additionally, the Pacific Ocean bluefin tuna dealer permit will no longer be in effect.

Table 3.95 Number of shark and swordfish dealer permits issued in each state or country, as of April 20, 2005. The actual number of permits per may change as permit holders move or sell their businesses.

State/Country	Atlantic swordfish	Atlantic sharks	# of permits
AL	2	4	6
CA	35	5	40
FL	101	91	192
GA	2	1	3
HI	8	5	13
LA	14	15	29
MA	34	19	51
MD	3	3	6
ME	4	3	7
MO	--	1	1
MS	--	1	1
NC	11	14	25
NJ	14	12	26
NY	23	10	33
OH	1	1	2
PA	2	--	2
PR	1	1	2
RI	11	7	18
SC	11	18	29
TX	9	9	18
VA	2	4	6
VI	1	1	2
WA	10	1	11
Canada	10	4	14
Chile	2	1	3
New Zealand	1	--	1
Ecuador	1	1	2
Totals 2005	**310**	**230**	**540**
2004	**321**	**230**	**559**
2003	**319**	**254**	**573**
2002	**321**	**267**	**588**
2001	**302**	**249**	**551**

Table 3.96 Number of Atlantic tuna dealer permits by state as of April 20, 2005. Dealers may obtain a permit to sell and purchase only bluefin tuna, only BAYS tunas, or both bluefin and BAYS tunas.

State	Bluefin Only *	BAYS Only	Bluefin and BAYS	Total Atlantic Tunas Dealer Permits
AL	--	--	1	1
CA	7	1	2	10
CT	--	--	2	2
DE	--	--	2	2
FL	1	1	14	16
GA	--	--	1	1
IL	1	--	--	1
HI	--	--	2	2
LA	1	--	11	12
MA	12	5	61	78
MD	--	1	7	8
ME	5	--	12	17
NC	6	7	22	35
NH	--	--	5	5
NJ	1	9	25	35
NY	2	13	47	62
PA	--	--	2	2
PR	--	3	2	4
RI	2	3	28	33
SC	--	4	7	11
TX	--	1	2	3
VA	1	5	13	19
VI	--	3	1	4
VT	--	--	1	1
WA	--	--	1	1
Total	**39**	**56**	**269**	**364**

* Does not include Pacific bluefin tuna dealer permits, which will be eliminated July 1, 2005.

3.9.5 Exempted Fishing Permits (EFPs), Display Permits, and Scientific Research Permits (SRPs)

EFPs, display permits, and SRPs are requested and issued under the authority of the Magnuson-Stevens Act (16 U.S.C. 1801 et seq.) and/or the ATCA (16 U.S.C. 971 et seq.). EFPs are issued to individuals interested in being exempted from regulations for the purpose of conducting research or other fishing activities using private (non-NOAA) vessels, whereas an SRP would be issued to agency scientists who are using NOAA vessels as their research platform. Display permits are issued to individuals who are fishing for, catching, and then

transporting HMS to certified aquariums for public display. Regulations at 50 CFR 600.745 and 50 CFR 635.32 govern scientific research activity, exempted fishing, and exempted educational activity with respect to Atlantic HMS. Amendment 1 to the Atlantic Tunas, Swordfish, and Sharks FMP implemented and created a separate display permitting system, which operates apart from the exempted fishing activities that are focusing on scientific research. However, the application process for display permits is similar to that required for EFPs and SRPs. The quota is 60 mt ww for all sharks collected under exempted fishing permits.

Issuance of EFPs, display permits, and SRPs may be necessary because possession of certain shark and billfish species are prohibited, possession of billfishes on board commercial fishing vessels is prohibited, and because the commercial fisheries for bluefin tuna, swordfish and large coastal sharks may be closed for extended periods during which collection of live animals and/or biological samples would otherwise be prohibited. These EFPs, SRPs, and display permits would authorize collections tunas, swordfish, billfishes, and sharks from Federal waters in the Atlantic Ocean and Gulf of Mexico for the purposes of scientific data collection and public display. In addition, NMFS regulations at 50 CFR 635.32 regarding implantation or attachment of archival tags in Atlantic HMS require prior authorization and a report on implantation activities.

In order to implement the chartering recommendations of ICCAT, NMFS recently published a rule on December 6, 2004 (69 FR 70396), requiring U.S. vessel owners with HMS permits to apply for and obtain a chartering permit before fishing under a chartering arrangement outside U.S. waters. These permits are issued in a similar manner as other EFPs. Under this final rule and consistent with the ICCAT recommendations, vessels issued a chartering permit are not be authorized to use the quota or entitlement of the United States until the chartering permit expires or is terminated. Having a chartering permit does not obviate the need to obtain a fishing license, permits, or other authorizations issued by the chartering nation in order to fish in foreign waters, or obtain other authorizations such as a High Seas Fishing Compliance Act Permit, 50 CFR 300.10 et seq. Additionally, incidental takes of, or interactions with, protected resources are included against the Incidental Take Statement specified in any relevant Biological Opinions. A U.S. vessel shall not be authorized to fish under more than one chartering arrangement at the same time. NMFS will issue chartering permits only if it determines that the chartering arrangement is in conformance with ICCAT's conservation and management programs.

The number of EFPs, display permits, and SRPs issued in 2004 by category and species are listed in Table 3.97. Year-end reports for permits issued for 2004 are required, and are expected to be submitted to NMFS in early 2005.

Table 3.97 Number of Exempted Fishing Permits (EFPs), Display Permits, and Scientific Research Permits (SRPs) issued between 2002-2005.

Permit type		2002	2003	2004	2005*
Exempted Fishing Permit	Sharks for display	7	8	8	6
	HMS for display	1	1	1	1
	Tunas for display	0	0	1	--
	Shark research on a non-scientific vessel	5	9	6	4
	Tuna research on a non-scientific vessel	4	5	11	2
	HMS research on a non-scientific vessel	5	18	5	4
	Billfish research on a non-scientific vessel	0	0	1	1
	Shark Fishing	1	1	0	0
	HMS Fishing	0	0	1	0
	Tuna Fishing	6	7	2	0
	TOTAL	**29**	**49**	**36**	**18**
Scientific Research Permit	Shark research	2	1	3	3
	Tuna research	1	0	0	0
	Billfish research	0	0	0	0
	HMS (multi-species) research	1	1	1	3
	TOTAL	**4**	**2**	**4**	**6**
Letters of Acknowledgement	Shark research	3	3	2	4
	Tuna research	0	0	0	0
	Billfish research	0	0	0	0
	HMS (multi-species) research	0	0	0	0
	TOTAL	**3**	**3**	**2**	**4**

***** Permit numbers for 2005 are as of June 27, 2005.

3.9.6 Atlantic HMS Tournaments

Fishing tournaments are an important component of HMS recreational fisheries. A tournament is defined in the HMS regulations as any fishing competition involving Atlantic HMS in which participants must register or otherwise enter or in which a prize or award is offered for catching or landing such fish. Since 1999, Federal regulations have required that each HMS tournament operator register their tournament with NMFS at least four weeks prior to the commencement of tournament fishing activities. Within one week after the tournament concludes operators may be selected to report tournament results to the SEFSC.

Tournament registration and reporting is necessary because it provides an important source of information used to assess HMS fish stocks and to estimate the annual catch of Atlantic HMS. The information may be used by NMFS to plan for the assignment of tournament observers to assist in catch/effort data compilation and to obtain biological data and samples from landed fish (length/weight, stomach contents, injuries, parasites, hard and soft tissue samples for age determination, genetic and microconstituent analysis, spawning condition, fecundity, etc.). Additionally, with an accurate tournament database, NMFS may better assess the practicality of using tournaments for angler educational outreach efforts including distribution of written informational materials, notification of public hearings, and explanation of HMS regulations. HMS tournament registration and reporting information further allows NMFS, in the course of developing fishery management plans, to evaluate the economic impact of tournament angling in relation to other types of angling (*e.g.*, commercial, non-tournament recreational) and the relative effect of tournament angling on populations of various regulated HMS. Finally, the information is essential for the U.S. to meet its reporting obligations to ICCAT.

When registering an HMS tournament, the following information is required to be submitted to the HMS Management Division in St. Petersburg, FL: 1) Tournament name; 2) tournament location; 3) name, address, phone number, fax number, and e-mail address of tournament operator; 4) fishing dates; and 5) HMS species for which points or prizes are awarded. If selected for reporting, operators must submit the following information to the SEFSC: 1) Tournament name; 2) tournament dates; 3) tournament location; 4) number of boats fishing; 5) hours fished; 6) recorder's name, phone number, and e-mail address; 7) the number of each species kept; 8) the number of each species lost; 9) the number of each species tagged and released; 10) the number of each species released without a tag; 11) the number of each species released dead; and, 12) the weight and length of all fish boated. This information is routinely collected during tournament operations to award prizes. Generally, 100 percent of all billfish tournaments are selected for reporting, as this information is critical to determining billfish landings.

The reasons for participation in fishing tournaments include, but are not limited to, competition, camaraderie, and the opportunity to win valuable prizes. A recent search on the Internet for fishing tournaments (December, 2004) indicated that many saltwater tournaments target HMS. It has been estimated that approximately 300 – 400 HMS fishing tournaments occur annually along the U.S. Atlantic coast, including the Gulf of Mexico and Caribbean (NMFS, 1999). These tournaments may range from smaller, club member-only events with as few as ten participating boats (40 - 60 anglers) to larger, statewide tournaments with 250 or more participating vessels (1,000 – 1,500 anglers). For the larger tournaments, corporate sponsorship from tackle manufactures, marinas, boat dealers, beverage distributors, resorts, publications, chambers of commerce, restaurants, and others are often involved.

Many HMS fishing tournaments, particularly those that target billfish, promote strict conservation principles in their rules. For example, significant numbers of blue and white marlin tournaments are "release-only," utilizing observers, angler affidavits, polygraph tests, or photographs to document the live release of marlins. Minimum sizes for fish that are landed are often larger than state and Federal requirements. Also, some tournaments prohibit treble hooks

and may require circle hooks on certain baits. Because tournament participants are often well-respected anglers (*i.e*. highliners), these conservation trends and ethics likely influence the general angling population in a positive manner.

For anglers in HMS tournaments, winning the prize money may not be the only motive for participation. Many HMS fishing tournaments support charitable organizations; an internet search revealed that some of the charities who have benefited from fishing tournaments include: the Cystic Fibrosis Foundation, Make-A-Wish Foundation, Sloan-Kettering Skin Cancer Center, Boy Scouts of America, Ducks Unlimited, The Boys and Girls Club, The Broadstreet Clinic, Core Sound Waterfowl Museum, Hope Mission Christian Ministries, Sertoma by the Bay (breast cancer research), Take A Kid Fishing, Capt. Bob Lewis Scholarship Fund, South Nassau Communities Hospital, South Texas Children's, T. H. Rogers School for Impaired Children's Home, The Billfish Foundation, and Kids In Distress.

Table 3.98 presents the number of registered HMS tournaments, by state, between 2000 and 2004. This table indicates that HMS fishing tournaments are especially important in Florida, Texas, Louisiana, North Carolina, South Carolina, Maryland, New Jersey, New York, Puerto Rico, Virginia, Alabama, Georgia, and other coastal states. The largest numbers of registered HMS tournaments have consistently occurred in the state of Florida.

Table 3.98 Number of Registered HMS Tournaments by State between 2000 and 2004. Source: NMFS Atlantic HMS Tournament Registration Database

STATE	2000	2001	2002	2003	2004
ME	0	2	3	3	5
NH	0	0	0	0	0
MA	4	7	1	7	10
RI	1	2	2	3	3
CT	0	1	0	0	0
NY	2	5	4	14	14
NJ	9	11	5	18	17
DE	0	2	0	0	1
MD	7	4	2	14	14
VA	3	5	1	5	4
NC	16	11	5	15	16
SC	7	6	3	13	9
GA	4	6	1	12	3
FL	51	46	26	66	57
AL	6	7	7	9	8
MS	1	3	2	7	2
LA	11	19	0	20	22
TX	18	14	1	17	10
MI	0	1	0	0	0
PR	19	16	4	13	17

STATE	2000	2001	2002	2003	2004
USVI	9	9	0	6	1
Bahamas[1]	0	3	2	1	2
Mexico[1]	0	1	0	0	0
Turks/Caicos[1]	0	0	0	1	0
TOTAL	**168**	**181**	**68**	**244**	**215**

[1]Some foreign tournaments voluntarily registered because the participants were mostly U.S. citizens.

Table 3.99 shows the number and percentage of HMS tournaments awarding points or awards for a particular HMS, based upon 2004 tournament registrations. Blue marlin, yellowfin tuna, white marlin, and sailfish are the predominant target species in HMS fishing tournaments.

Table 3.99 Number and Percent of All 2004 HMS Tournaments Awarding Points or Prizes for a HMS. Source: NMFS Atlantic HMS Tournament Registration Database

Species	Number of Tournaments	Percent of tournaments
Blue Marlin	142	66.0%
Yellowfin Tuna	131	60.1%
White Marlin	129	60.0%
Sailfish	128	59.5%
Bluefin Tuna	68	31.6%
Bigeye Tuna	61	28.4%
Pelagic Sharks	55	25.6%
Swordfish	53	24.6%
Albacore Tuna	23	10.7%
Skipjack Tuna	9	4.2%
Small Coastal Sharks	8	3.7%
Ridgeback Sharks	5	2.3%
Non-Ridgeback Sharks	4	1.9%

Table 3.100 through Table 3.102 indicate the percentage and number of 2004 HMS registered tournaments, by state (or country), for blue marlin, white marlin and sailfish, respectively.

Table 3.100 Registered Blue Marlin Tournaments, 2004. Source: NMFS Atlantic HMS Tournament Registration Database.

State	Number of 2004 Tournaments Awarding Points or Prizes for Blue Marlin	Percent of Total 2004 Tournaments Awarding Points or Prizes for Blue Marlin
Florida	30	21.1%
Louisiana	20	14.1%

State	Number of 2004 Tournaments Awarding Points or Prizes for Blue Marlin	Percent of Total 2004 Tournaments Awarding Points or Prizes for Blue Marlin
North Carolina	15	10.6%
Puerto Rico	14	9.8%
Maryland	10	7.0%
New Jersey	10	7.0%
Texas	10	7.0%
South Carolina	8	5.6%
Alabama	6	4.2%
Massachusetts	4	2.8%
Virginia	4	2.8%
Georgia	3	2.1%
Bahamas	2	1.4%
Rhode Island	2	1.4%
Delaware	1	0.7%
Mississippi	1	0.7%
New York	1	0.7%
U.S. Virgin Islands	1	0.7%
TOTAL	**142**	**100%**

Table 3.101 Registered White Marlin Tournaments, 2004. Source: NMFS Atlantic HMS Tournament Registration Database.

State	Number of 2004 Tournaments Awarding Points or Prizes for White Marlin	% of Total 2004 Tournaments Awarding Points or Prizes for White Marlin
Florida	27	20.9%
Louisiana	20	15.5%
North Carolina	14	10.8%
Maryland	10	7.8%
New Jersey	10	7.8%
Puerto Rico	8	6.2%
South Carolina	8	6.2%
Texas	8	6.2%
Alabama	6	4.6%
Massachusetts	4	3.1%
Virginia	4	3.1%
Georgia	3	2.3%
Bahamas	2	1.5%
Rhode Island	2	1.5%

State	Number of 2004 Tournaments Awarding Points or Prizes for White Marlin	% of Total 2004 Tournaments Awarding Points or Prizes for White Marlin
Delaware	1	0.8%
Mississippi	1	0.8%
New York	1	0.8%
TOTAL	**129**	**100%**

Table 3.102 Registered Sailfish Tournaments, 2004. Source: NMFS Atlantic HMS Tournament Registration Database.

State	Number of 2004 Tournaments Awarding Points or Prizes for Sailfish	% of Total 2004 Tournaments Awarding Points or Prizes for Sailfish
Florida	40	31.2%
Louisiana	20	15.6%
North Carolina	15	11.7%
Maryland	9	7.0%
Puerto Rico	9	7.0%
Texas	9	7.0%
South Carolina	8	6.2%
Alabama	6	4.7%
Virginia	4	3.1%
Georgia	3	2.3%
Bahamas	1	0.8%
Delaware	1	0.8%
Massachusetts	1	0.8%
Mississippi	1	0.8%
New Jersey	1	0.8%
TOTAL	**128**	**100%**

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4.0 ENVIRONMENTAL CONSEQUENCES OF ALTERNATIVES

4.1 Bycatch Reduction

National Standard 9 of the Magnuson-Stevens Act requires that conservation and management measures shall, to the extent practicable, minimize bycatch and to the extent bycatch cannot be avoided, minimize the mortality of such bycatch. The National Standard 9 Guidelines, 50 CFR 600.350, provide that, in determining whether conservation and management measures minimize bycatch and bycatch mortality to the extent practicable, consistent with the other national standards and maximization of net benefits to the Nation, consideration should be given to the following factors:

(A) Population effects for the bycatch species
(B) Ecological effects due to changes in bycatch of that species (effects on other species in the ecosystem)
(C) Changes in the bycatch of other species and the resulting population and ecosystem effects
(D) Effects on marine mammals and birds
(E) Changes in fishing, processing, disposal, and marketing costs
(F) Changes in fishing practices and behavior of fishermen
(G) Changes in research administration, enforcement costs, and management effectiveness
(H) Changes in the economic, social, or cultural value of fishing activities and non-consumptive uses of fishery resources
(I) Changes in the distribution of benefits and costs
(J) Social effects

NMFS analyzed several alternatives in Sections 4.1.1 and 4.1.2 as well as other sections of this document, such as Section 4.2.3, to address bycatch and bycatch mortality. In analyzing those and other alternatives, NMFS took the above factors into consideration. Other parts of this document, such as Chapters 3, 6, 7, 8, and 9 and other sections within Chapter 4, also provide information relevant to the National Standard 9 Guidelines' factors.

4.1.1 Workshops

The 1999 FMP identified reducing bycatch and bycatch mortality as a critical management goal pursuant to National Standard 9 of the Magnuson-Stevens Fishery Conservation and Management Act (MSA). The October 29, 2003, and the June 1, 2004, Biological Opinions (BiOp) advise further actions to reduce bycatch and bycatch mortality of protected resources in the HMS fisheries. The following sections evaluate a number of alternatives to meet these goals. Workshops enabling fishermen to become more proficient with the techniques, protocols, and equipment for dehooking and disentanglement of protected resources, as well as proper identification of these species, are an integral component to ensuring that the post-release mortality reduction goals are realized.

4.1.1.1 Protected Species Release, Disentanglement, and Identification Workshops for Pelagic Longline, Bottom Longline, and Gillnet Fishermen

Longline release, disentanglement and identification workshops are intended to help further reduce the mortality of sea turtles, smalltooth sawfish, and other protected resources captured incidentally in the HMS pelagic (PLL) and bottom (BLL) longline fisheries. Longline workshops would also disseminate information specific to the identification of protected resources commonly encountered during longline fishing activities. Additionally, separate workshops would be held for shark gillnet fishery participants to address issues specific to the identification, safe handling, and safe release and disentanglement of bycatch including sea turtles, marine mammals, smalltooth sawfish, and other non-target species.

If implemented, these workshops would demonstrate and train participants in techniques specific to sea turtle safe release and disentanglement protocols as per the current NMFS standards for the pelagic and bottom longline fisheries. Participants would also receive instruction on disentanglement and release for protected resources that lack formal protocols. Through these workshops, participants would be trained to safely disentangle, resuscitate, release, and identify protected species. The dissemination of this information is an important element in further reducing post-release mortality of protected resources in the PLL, BLL, and gillnet fisheries. The incidental take statements issued in the October 2003 and June 2004 BiOp's were contingent upon fishermen becoming increasingly proficient with required release equipment and protocols, while reducing the number of sea turtle mortalities resulting from longline interactions over time.

In order to ensure that fishery participants are able to use the release and disentanglement equipment effectively, workshop participants would be given hands-on instruction and a practical examination. Participants who successfully complete the workshops would receive a multi-year certification. A certificate would be required to be on board each longline and gillnet vessel during fishing operations and it would serve as proof to law enforcement officials that the participant has completed the necessary training workshop. These workshops would be held at several locations per region to minimize travel costs for most participants and during non-peak fishing times to minimize disruptions to fishing activities. After the initial series of workshops, NMFS will continue to provide certification opportunities for fishermen entering the HMS fisheries or re-certification for those who remain in the fishery. NMFS is aware of industry-sponsored workshops for participants in the PLL fishery and may consider having these workshops satisfy the NMFS certification, if selected as mandatory. Anyone who wishes to attend these workshops, including constituents not directly impacted by these workshops (*i.e.*, recreational fishermen, commercial fish dealers, law enforcement officials, and non-governmental organization representatives) would be welcome to attend as well.

Potential locations for these workshops include public and/or private facilities with handicapped access in the vicinity of: Galveston, Texas; New Orleans, Louisiana; Pensacola, Florida; Panama City, Florida; Tampa, Florida; Key West, Florida; Fort Pierce, Florida; Cape Canaveral, Florida; Jacksonville, Florida; Charleston, South Carolina; Manteo, North Carolina; Ocean City, Maryland; Barnegat Light, New Jersey; Montauk, New York; New Bedford, Massachusetts; and Gloucester, Massachusetts.

As described in Chapter 2, the alternatives considered for pelagic longline, bottom longline, and gillnet fishery workshops are:

A1 Voluntary workshops for longline fishermen (No Action)
A2 Mandatory workshops and certification for all HMS pelagic and bottom longline vessel owners – Preferred Alternative
A3 Mandatory workshops and certification for vessel operators actively participating in HMS pelagic and bottom longline fisheries – Preferred Alternative
A4 Mandatory workshops and certification for all HMS longline vessel owners, operators, and crew
A5 Mandatory workshops and certification for shark gillnet vessel owners and operators – Preferred Alternative
A6 Certification Renewal Timeline (Certification renewal every 3 years) – Preferred Alternative

Ecological Impacts

Under alternative A1, the No Action alternative, NMFS would continue to provide voluntary workshops for longline fishermen and continue to distribute wheelhouse placards, the safe release protocols, and educational videos, as well as disseminate additional information through the activities of the NMFS PLL Point of Contact (POC). Table 4.1, Table 4.2, and Table 4.3 provide a summary of protected species interactions in the HMS PLL, BLL, and gillnet fisheries, respectively, in recent years. More information on individual HMS fisheries as well as observed and extrapolated takes of protected species is provided in Chapter 3.

The June 2004 BiOp sets specific post-release mortality (PRM) targets that the PLL fishery must achieve by the first quarter of each year until the target post-release mortality rates of 13.1 and 17.1 percent are achieved for leatherback and loggerhead sea turtles, respectively, in the first quarter of 2007 (Table 4.4). While NMFS does not have estimates of PRM for BLL and gillnet gears, estimates of protected species takes are available and are summarized in Table 4.2 and Table 4.3.

Table 4.1 Extrapolated Total Sea Turtle and Marine Mammal Interactions in the HMS PLL fishery for 1999 – 2004 and the 3 Year ITSs for 2004-2006 and 2007-2009. Sources: Yeung, 2001; Garrison, 2003; Garrison and Richards, 2004; NMFS, 2004; Garrison, 2005.

PLL	1999	2000	2001	2002	2003	2004	Average	3 year ITS, 2004-2006 (2007-2009)	
Leatherback	1016	769	1208	962	1112	1362	1072	1981 (1764)	660 (588)/year
Loggerhead	994	1256	312	575	727	734	766	1869 (1905)	632 (635)/year
Other/Unidentifiec	66	128	N/A	50	N/A	N/A	81	105 (105)	35 (35)/year
Marine Mammals	N/A	403	177	201	300	164	249	N/A	N/A

Table 4.2 **Extrapolated Takes of Sea Turtles and Sawfish in the HMS BLL Fishery Based on Observed Interactions Between 1994 - 2002 and the 5 Year ITS for the BLL fishery.** Source: NMFS, 2005

BLL	1994-2002	5 year ITS, (mortality)	
Leatherback	269 (30/year)	150 (85)	30 (17)/year
Loggerhead	2003 (222/year)	1360 (754)*	272 (150)/year
Unidentified Sea Turtles	503 (56/year)	30 (5)**	6 (1)/year
Sawfish	466 (52/year)	260 (0)	52/year

* 1360 = 1110 + 250 of the expected 280 unidentified, which are most likely loggerhead sea turtles
** 30 total in combination of hawksbill, green, and Kemp's ridley sea turtles (remaining 30 of the expected 280 unidentified). Five lethal takes per species.

Table 4.3 **Extrapolated Takes of Protected Resources in the Shark Gillnet Fishery.*** Source: NMFS, 2003b

DRIFTNET	1999	2000	2001	2002	2003	2004	5 year ITS	
Leatherback	0	0	12(2)	3.4	0	0	22 (3)	4.4/year
Loggerhead	0	4.4(1)	1	1.7	0	0	10 (1)	2/year
Sawfish	0	0	0	0	1	N/A	1 (0)	<1/year
Bottlenose Dolphin**	(6.25)	(6.25)	(6.25)	(6.25)	2 (1)	N/A	N/A	N/A
Spotted Dolphin	(1)	0	0	0	0	N/A	N/A	N/A

*All values include both live takes and mortalities, with mortalities listed in parenthesis.
**Extrapolated estimate was provided over the 1999-2002 period; to provide an annual extrapolated estimate the 4-year estimate was evenly split between the four years.

Table 4.4 **Post-release Mortality Targets for Leatherback and Loggerhead Sea Turtles in the HMS PLL Fishery.** Source: NMFS, 2004

PLL	Assumed 3rd and 4th quarters, 2004	Target for 1st quarter, 2005	Target for 1st quarter, 2006	Target for 1st quarter, 2007
Leatherback	32.8%	26.2%	19.6%	13.1%
Loggerhead	21.8%	20.2%	18.6%	17.0%

Alternative A1 could provide some positive ecological impacts by continuing to provide outreach activities through the NMFS PLL POC. A critical component of achieving the post-release mortality targets by the first quarter of 2007 is to ensure that participants in the PLL fisheries are proficient with the safe handling, dehooking, and resuscitation techniques, including use of all the necessary equipment. These efforts will increase the amount of gear removed from sea turtles, and therefore increase their probability of survival. The most effective way to ensure compliance with the BiOps is to provide intensive hands-on training for participants in the longline fisheries and continue the distribution of wheelhouse placards, safe release protocols, educational videos, and additional information as necessary.

These efforts may continue to reduce the post-release mortality of protected species captured in HMS fisheries, however, the voluntary nature of the workshops may limit the

dissemination of the safe release, disentanglement, and protected resource identification information, reducing potential ecological benefits. Furthermore, it is essential that fishermen are able to properly identify the protected resources with which they interact, in order to comply with regulations. Alternative A1 would not formally certify or require that fishery participants be formally trained. In the past, voluntary workshops have not been well attended, therefore, this alternative would not be effective at including a large audience of fishery participants.

Alternative A1 would likely not maintain compliance with the October 2003 or June 2004 BiOps because attendance at these workshops would not be mandatory. Additionally, under this alternative, the post-release mortality targets established for the PLL fishery would not likely be met by 2007 because current rates under the status quo exceed those targets. Not achieving these targets, and further jeopardizing stocks of threatened or endangered sea turtles, would likely result in negative ecological impacts to these species.

Alternative A2 would require mandatory workshops and certification by January 1, 2007, for all vessel owners that have pelagic and bottom longline on their vessel and that have been issued or are required to be issued limited access permits. A distinct advantage of certifying vessel owners at workshops is that their attendance and demonstrated understanding of the handling, disentanglement, resuscitation, release, and identification techniques could be linked to an HMS permit if logbooks have been submitted indicating that longline has been used on at least one trip in the past year or since the permit was issued, whichever is more recent. Owners would not be able to renew their existing HMS permits until they could provide proof of successful completion of a workshop. This would restrict the ability of permit holders that do not have this certification from participating in HMS fisheries. Linking workshop certification to the issuance of HMS permits would likely ensure industry participation. Poor attendance at voluntary workshops has been an issue in the past.

This alternative would likely have positive ecological impacts. The level of actual ecological impacts realized would be contingent upon the number of vessel owners who are directly involved in fishing activities. It is difficult to estimate the proportion of HMS longline permit holders that are actually the owners/operators of their vessels. Additionally, vessels may have several operators associated with fishing operations in any given year.

Based on the estimated takes presented in Table 4.1, there were an average of 1,072 leatherbacks; 766 loggerheads; and 81 other sea turtles taken per year in the PLL fishery between 1999 and 2004. These estimated takes are based on using 7/0 and 9/0 J-hooks with no bait specifications. It has been shown that J-hooks can increase the number of sea turtle interactions and increase the likelihood of hook ingestion, compared to using circle hooks and specific baits (NMFS, 2004). The post-release mortality target identified in the 2004 BiOp would result in post-release mortality decreasing by 4.8 and 19.7 percent for loggerhead and leatherback sea turtles, respectively, between 2004 and 2007. Achieving the post-release mortality targets could decrease the number of sea turtle mortalities resulting from interactions with PLL gear by 211 leatherback, 37 loggerhead, and three other sea turtles each year. This decrease in post-release mortality represents a best-case scenario, dependant on vessel owners disseminating information from the workshops to operators and crew involved in fishing activities. As a result of the jeopardy finding for leatherback sea turtles, the 2004 BiOp included additional measures

requiring additional closures for PLL fishing if sea turtle incidental take and post-release mortality targets are not met. This may provide adequate incentive for vessel owners to informally train their operators and crew.

Extrapolated estimates in the BLL fishery (1994 - 2002) indicate that this fishery interacted with an average of 30, 222, and 56, leatherback, loggerhead, and unidentified sea turtles (Table 4.2), respectively, on an annual basis. Because NMFS does not have post-release mortality estimates specific to sea turtle interactions in the BLL fishery, it is difficult to estimate the post-release mortality reduction benefits of this alternative. However, NMFS anticipates positive ecological impacts resulting from any transfer of the safe release and disentanglement protocols to owners in the BLL fishery. As stated above, the ecological benefits realized from reduced post-release mortality will be dependent upon the proportion of bottom longline owners that are actually engaged in fishing activities and/or take the initiative to properly train the operators and crew that are working on the vessel. Available data show that the BLL fishery has fewer interactions with sea turtles than the PLL fishery. The BLL fishery is not currently required to use circle hooks or specific baits to reduce sea turtle interactions.

In addition to providing information and ensuring proficiency with the safe handling, dehooking, and release of sea turtles, these workshops will also include information on the proper techniques for safe release of smalltooth sawfish. Extrapolated estimates indicate that, on average, the BLL fishery interacts with 52 smalltooth sawfish a year. The October 2003 BiOp found that Atlantic shark fisheries would result in the temporary disturbance of behavior and short term injury of smalltooth sawfish but fishing activities are not expected to affect the reproduction of the individuals that are caught, nor result in mortality. Alternative A2 would ensure BLL vessel owners understand safe release techniques, which would likely reduce mortality of smalltooth sawfish. Ecological benefits would likely be increased if vessel owners are involved in fishing activities or successfully train their operators and crew members in safe techniques covered in the workshops.

There have been no documented interactions between PLL gear and smalltooth sawfish to date. However, if PLL owners are aware of safe handling and release techniques, this information would likely benefit them in case of future interactions or if they participate in other fisheries. Since PLL fishermen are required to possess at least an incidental shark permit and because of the relative ease of modifying pelagic longline to fish on the bottom of the sea floor, fishermen could set bottom longline gear on their way back to port to target sharks, and potentially interact with smalltooth sawfish. In addition to safe release and disentanglement protocols, alternative A2 would also provide information related to the proper identification of protected resources.

The proper identification of protected resources listed under the ESA or MMPA is an important skill for PLL and BLL vessel owners to possess. The MMPA classifies the PLL and BLL fishery as Category I and III, respectively. A Category I fishery results in frequent serious injuries and mortalities of marine mammals, whereas a Category III fishery has a remote likelihood or no known serious injuries or mortalities. Most longline interactions with marine mammals are in the PLL fishery. Species commonly encountered include: Risso's dolphin; pilot whales; pygmy sperm whales; beaked whales; spotted dolphins; common dolphin; and Minke

whales. Table 4.1 contains the estimated interactions with marine mammals in the pelagic longline fisheries. The shark BLL fishery has only interacted with two marine mammals (Delphinids) between 1994 - 2002. Both fisheries interact with protected resources listed under the ESA, including sea turtles as discussed above. Improved identification skills may improve the accuracy of logbook data and assist fishermen in complying with the regulations.

These species can be difficult to identify, especially since these interactions are a relatively rare occurrence. Alternative A2 would provide information on key morphological characteristics, distribution, and basic life history to improve identification of protected resources. Positive identification of sea turtles and marine mammals in fishermen's logbooks would reduce uncertainty and increase accuracy of extrapolated estimates by species. This is essential information for agency biologists, managers, and law enforcement officials to increase knowledge of home range, habitat use, and abundance. Furthermore, interactions with specific longline configurations (depth, hook type, bait, target-fish species) may assist fishermen, managers, gear experts, and scientists in designing experiments and gear to reduce interactions. Positive ecological impacts would likely occur as a result. The extent of these benefits would be dependent on the participants involved. Alternative A2 would likely result in positive ecological impacts, however, the extent of these impacts are dependent upon the dissemination of this information between owners and their operators and crew.

In addition to benefiting sea turtles, sawfish, and marine mammals, alternative A2 could benefit non-target species of HMS and other finfish by reducing post-hooking mortality of these animals through use of dehooking equipment required for sea turtles.

Alternative A3 would require mandatory workshops and certification for HMS longline vessel operators (pelagic and bottom longline) by January 1, 2007. This alternative would have similar ecological benefits as alternative A2, however, these benefits would be greater in magnitude as operators are directly involved in fishing activities, including gear retrieval. Vessel operators are responsible for everything that takes place on board a vessel during fishing activities and are usually directly involved during the retrieval of gear, when sea turtles or other protected resources are most likely to be encountered. Alternative A3 would not be linked to permit renewal as discussed in alternative A2, however, operators would be required to show proof of certification to avoid enforcement violations if boarded. This alternative would ensure that at least one person directly involved with a vessel's fishing activities is certified in the safe release and disentanglement protocols and identification of protected resources and onboard during fishing activities.

Alternative A4 would require owners, operators, and crew to become certified. This alternative would certify the largest group of individuals involved with fishing activities, and therefore, would likely have the greatest positive ecological impact. Alternative A4 would provide similar benefits to that of alternatives A2 and A3 combined, in addition to including all crewmembers associated with a vessel's fishing activities. Vessel crew members are often directly involved during gear retrieval activities as the operator may be operating the vessel from the wheelhouse. Furthermore, all of these participants would be provided with protected resource identification information, which would have positive ecological impacts, increasing proportionately to the number of individuals that attain certification. NMFS anticipates having

several operators and/or crew members per HMS vessel permit attend these workshops as vessels often have two operators and four crew members. Ensuring that operators and/or crew, who are actually involved in gear retrieval activities, are skilled at handling and release of sea turtles and adept at identification of protected resources will increase the likelihood of achieving the post-release mortality targets prescribed by the 2004 BiOp. This alternative was not selected due to the level of economic impacts to the longline fishery and the transient nature of vessel crew members.

Alternative A5 would mandate that all vessel owners that have been issued a shark permit and operators of vessels where logbooks indicate that gillnet gear has been used on at least one trip in the past year or since the permit was issued, whichever is more recent, attend workshops and achieve certification, by January 1, 2007, for safe release and disentanglement of protected resources, including sea turtles, smalltooth sawfish, and marine mammals. The shark gillnet fishery currently has several requirements aimed towards reducing interactions and mortalities of protected species, such as observer coverage, net checks, and Atlantic Whale Take Reduction Plan (ALWTRP) requirements. This alternative would increase the positive ecological impacts by reducing the mortality of protected resources through the education of safe release and disentanglement protocols, and identification of protected resources.

The 2003 BiOp determined that the shark gillnet fisheries are not likely to jeopardize endangered green, leatherback, and kemp's ridley sea turtles, endangered smalltooth sawfish, threatened loggerhead turtles, or adversely affect marine mammals. However, it does require the implementation of workshops intended to distribute information on gear handling techniques, protocols for gear entanglements with protected species, information on smalltooth sawfish, and HMS requirements and regulations (NMFS, 2003). The current five year ITS for the gillnet fishery is 10 loggerhead sea turtle captures with one mortality and 22 leatherback sea turtle captures with three mortalities (Table 4.3). Additionally, NMFS expects one smalltooth sawfish to be captured and released alive during the same period (NMFS, 2003). This alternative will result in a positive ecological impact by increasing the industry's awareness of information leading to the reduction of protected resource post-release mortality. Furthermore, the gillnet vessel owners and operators, who properly identify protected resources, will be able to apply the appropriate safe release and resuscitation protocols, as well as improve compliance with regulations. Finally, proper species identification will improve veracity and usefulness of logbooks and therefore quota monitoring and stock assessments.

Table 4.3 summarizes the extrapolated gillnet interactions with protected resources between 1999 - 2004 fishery years. The extrapolated estimates are based on observed interactions in the Atlantic shark gillnet fishery. Leatherback sea turtles are periodically encountered in the gillnet fishery. In 1999, two leatherback sea turtles were observed caught and released alive (Carlson and Lee, 1999). Fourteen leatherback sea turtles were observed in the shark drift gillnet in 2001 and two in 2002 (Carlson, 2000; Carlson and Baremore, 2001; Carlson and Baremore, 2002a; and Garrison, 2003). One loggerhead sea turtle was caught in the drift gillnet fishery each year from 2000 - 2002 (Carlson, 2000; Carlson and Baremore, 2001; Carlson and Baremore, 2002a; Garrison, 2003). In 2003 and 2004, there were no interactions sea turtle interactions in the shark gillnet fishery (Carlson and Baremore, 2003; Carlson pers. comm., 2005). The combination of hands-on experience with the safe release and disentanglement

protocols for sea turtle interactions with gillnets, as well as proper sea turtle identification and information on Atlantic shark regulations, will lead to decreased post-release mortalities in the shark gillnet fishery.

The Southeastern U.S. Atlantic shark gillnet fishery is listed as a Category II fishery under the MMPA indicating that occasional serious mortalities and injuries occur in this fishery (69 FR 48407). The listing is attributed to interactions with bottlenose dolphins, North Atlantic right whales, and Atlantic spotted dolphins. Category II fisheries are required to report incidental injuries and mortalities of marine mammals, accommodate an observer, if requested, and comply with the provisions of TRPs. From 1999 – 2004, the observed takes of marine mammals in the Southeast Atlantic shark gillnet fishery totaled 12 bottlenose dolphins and four spotted dolphins (NMFS, 2003). Extrapolated observations indicate serious injury and mortality of 25 bottlenose dolphins and one Atlantic spotted dolphin in the shark gillnet fishery from 1999 through 2002 (Garrison, 2003). In 2003, two bottlenose dolphins were observed in the shark gillnet fishery and resulted in one mortality (Carlson, 2003). The shark gillnet fishery had no observed interactions with marine mammals in 2004 (Carlson *et al*., 2004). While the interactions between gillnet gear and marine mammals are relatively low, the workshops would provide a positive ecological impact through the education of vessel owners and operators regarding protected resource identification and releasing marine mammals to reduce mortalities.

Marine mammals are often difficult to identify due to the infrequency with which they are encountered in the gillnet fishery. It is essential for fishermen to know the morphological characteristics and distribution of protected resources to positively identify these animals to the species level. When marine mammals are encountered, and are properly recorded, the logbooks provide significant information regarding home range, habitat use, and abundance. All of this information is important for Agency biologists, managers, and law enforcement officials because accurate logbooks improve the accuracy of stock assessments and quota monitoring. For these reasons, the protected resources identification component of these workshops would have positive ecological impacts for marine mammals.

Smalltooth sawfish were listed as an endangered species under the ESA in April 2003 (68 FR 15674). While interactions with gillnet fishing gear are infrequent, one observed interaction with a smalltooth sawfish occurred on June 25, 2003 (Carlson and Baremore, 2003). Prior to this event, it was speculated that the depth at which gillnets are set above the sea floor may preclude smalltooth sawfish from being caught. Although sometimes described as a lethargic demersal species, smalltooth sawfish feed mostly on schooling fish, thus are found higher in the water column during feeding. The relatively low effort in this fishery and rarity of smalltooth sawfish, especially in Federal waters, contribute to the low frequency of interaction of smalltooth sawfish and gillnet fishing gear. Because it is such a rare event to encounter a smalltooth sawfish when fishing with gillnet gear, the mandatory workshops for vessel owners and operators could increase the likelihood of a positive identification of the species. In the case of the one observed interaction with gillnet gear and the smalltooth sawfish, the sawfish was cut from the net and released alive with no visible injuries. If the entangled gear is sacrificed, smalltooth sawfish can be removed safely. The workshops will inform owners and operators that smalltooth sawfish are listed as an endangered species, enable them to identify the species, and educate them on the

safe-handling and release techniques to reduce potential sawfish mortalities occurring as a result of encounters with gillnet gear.

An additional ecological benefit of training the vessel owners and operators on the safe handling and release techniques for gillnet fishing gear is to potentially reduce the mortality of non-target species, such as red drum, manta and cownose rays, king mackerel, great barracuda, billfish, and little tunny. Typically, the observed non-target species associated with shark gillnet gear ranges from 0.01 percent to 3.3 percent of the total catch, and 9.2 percent to 29.4 percent for the drift gillnet fishery (Carlson and Baremore, 2001; Carlson and Baremore, 2002a; Carlson and Baremore, 2003; Carlson *et al*., 2004). This alternative would likely benefit overfished non-target species by increasing post-release survival of all species discarded.

An indirect positive ecological impact of involving vessel owners, operators, and/or crew in these safe handling, resuscitation, release, and protected resource identification workshops would be the transferability of this technology to other countries that also target HMS and other species with longline gear. Because of the migratory nature of most sea turtle species, these animals frequently travel thousands of miles and may enter into the jurisdiction of other nations or the high seas. Longline gear employed by different nations is relatively similar between countries, therefore, the protocols discussed and materials employed in these workshops could be translated by interested nations into languages appropriate for their use. The materials are already available in English, Spanish, and Vietnamese. Since many HMS are managed by an international Atlantic-wide commission (ICCAT), there are numerous opportunities for transfer of technology between the United States and other ICCAT contracting parties, reinforcing the United States' role as a leader in global conservation issues.

Alternative A6 includes several sub-alternatives for mandatory certification renewal on a two, three, or five year timetable. The Agency might also consider additional recertification options in the future as a result of significant new information related to safe handling and disentanglement of protected resources or reinitiation of consultation with the Office of Protected Resources.

Requiring renewal of mandatory workshop certification every two years would likely have slightly positive ecological impacts. NMFS assumes that participants engaged in a hands-on, day-long, workshop that requires participants to pass a practical examination demonstrating proficiency at the culmination of the workshop will maintain familiarity with the protocols for a reasonable period of time afterward. All new participants in the fishery will still be required to attain certification before being able to attain their permit and permit holders would need to renew their certification within two years of their original attendance to maintain an HMS permit.

Requiring re-certification every three years would have neutral or slightly positive ecological impacts. Recertification every three years is a reasonable frequency to ensure that participants are kept abreast of the safe handling and release protocols and to also maintain awareness of new research and development related to workshop curricula. Permit holders would be required to attain recertification every three years before being able to renew their shark, swordfish, or tuna permits that allow the use of longline or gillnet gear.

Requiring re-certification every five years would likely have a slightly negative ecological impact. Recertification every five years would allow a more extensive period of time to lapse between certification workshops than necessary to maintain proficiency and provide updates on research and development of handling and dehooking protocols. These impacts may be mitigated somewhat by also selecting alternative A3 (certification for operators) or A4 (certification for owners, operators, and crew) which ensures that both operators and vessel owners are certified, thereby, increasing the number of fishery participants who interact with hooked sea turtles and are aware of how to safely handle and release them.

Social and Economic Impacts

Under alternative A1, there may be some negative economic impacts related to workshop travel costs and lost fishing time that may be incurred by fishery participants who choose to attend, however, the travel costs and lost fishing time for participants attending the voluntary workshops are discretionary, and not mandatory.

Voluntary workshops hosted by NMFS or industry may be viewed more favorably by the affected public than mandatory workshops; however, past experience has shown that these workshops are generally not well attended. Poor attendance and the resultant impacts that this may have on post-release mortality of threatened and endangered species may result in not achieving the target post-release mortality targets issued for protected resources because of lack of proficiency with the dehooking techniques and equipment on the behalf of the participants. Not achieving the target post-release mortality rates by 2007 may result in future closures of geographic areas as specified in the BiOp, including the Gulf of Mexico, which would result in extensive negative economic impacts to the pelagic and bottom longline fisheries. Voluntary workshops may improve communication between constituents and the Agency and would ensure an outlet for increased awareness on the behalf of the Agency personnel regarding concerns among constituents.

Alternatives A2 - A4 would also likely result in some negative economic impacts, as a result of traveling to workshops and the fact that lost fishing time may be incurred by participants that would be required to attend these mandatory workshops. In order to provide fishermen and vessel owners' time to prepare for economic costs associated with this mandatory requirement, the Agency will delay effectiveness until January 1, 2007. Additionally, the Agency will strive to host a number of workshops in regional fishing hubs in order to minimize travel and lost fishing time. The Agency would attempt to hold workshops during periods when the fishery is typically inactive, effectively minimizing lost fishing time. For example, the workshops may be held when the fishery is closed and prior to the start of the next trimester for sharks. However, since the Agency does not know what other fisheries the fishermen may be participating in, the Agency cannot guarantee that all workshops will be held at appropriate times to minimize all lost fishing opportunities. The timing and location of these workshops should lessen the negative social and economic impacts of taking the time away from fishing, work, or other responsibilities. It is estimated that there are 576 vessel owners permitted to fish for HMS with longline gear. This would be the estimated number of participants included in the workshops for alternative A2. The HMS Management Division conducted an analysis of 2003 cost-earnings information as reported in HMS logbooks. According to that analysis, the median

opportunity cost for individual, bottom and pelagic longline vessel owners to participate in a one-day workshop would be $565 and $504, respectively. Additional information regarding economic impacts of this alternative can be reviewed in Chapter 6. Alternative A3 would target vessel operators, the Agency estimates that there are approximately of two operators per vessel owner (permit), resulting in a total of 1,152 participants. According to the cost-earnings analysis mentioned above, the median opportunity cost for individual, bottom and pelagic longline vessel captains to participate in a one-day workshop would be $353 and $166, respectively. Additional information regarding economic impacts of this alternative can be reviewed in Chapter 6. Alternative A4 would include vessel owners, operators, and crew. Based on logbook data, there are an estimated average of four crewmembers associated with any particular vessel. These workshops would have 4,032 participants, thus, alternative A4 would have the largest economic impacts. According to the cost-earnings analysis mentioned above, the median opportunity cost for individual, bottom and pelagic longline vessel crewmembers to participate in a one-day workshop would be $157 and $110, respectively. These individual costs when added to the individual opportunity costs of owners and operators, results in a combined individual opportunity cost of $1,075 for bottom longline fishery participants and $780 for pelagic longline fishery participants to participate in a one-day workshop. Additional information regarding economic impacts of this alternative can be reviewed in Chapter 6.

Under alternative A5, shark gillnet vessel owners and operators would be required to attend workshops discussing safe release and disentanglement protocols, protected resources identification, and current regulations. The administrative costs for workshops are high, but may be mitigated by the benefits associated with increased industry education (*i.e.*, increased compliance, skills, and stewardship). This alternative would likely result in positive social impacts.

The only costs incurred to the vessel owners and operators would be related to travel and time to attend the workshop. NMFS estimates that there are approximately 20 participants in the shark gillnet fishery that would attend workshops; 80 percent of the identified shark gillnet permit holders and operators are located in Florida and 20 percent are in North Carolina and New Jersey. As mentioned earlier, the HMS Management Division conducted an analysis of 2003 cost-earnings information as reported in HMS logbooks. Individual opportunity costs are not available for gillnet vessel owners and operators due to confidentiality concerns, however the median opportunity cost for vessel owners and operators of all gear types combined, including gillnets, to participate in a one-day workshop would be $677 ($508 owner's share plus $169 captain's share). Additional information regarding economic impacts of this alternative can be reviewed in Chapter 6. To minimize cost to the owners and operators, NMFS would offer workshops in the areas where the shark gillnet fishery participants are located. Workshops would be held during periods when the shark gillnet fishery is typically inactive, effectively minimizing lost fishing time. For example, the workshops may be held when the fishery is closed and prior to the start of the next trimester. However, the Agency does not know what other fisheries the fishermen may be participating in when the shark gillnet fishery is closed. The timing and location of these workshops should lessen the negative social and economic impact of taking the time away from fishing, work, or other responsibilities. Additionally, the Agency will delay effectiveness until January 1, 2007, to provide fishermen and vessel owners time to prepare for economic costs associated with this mandatory requirement.

Workshop attendance may increase the time spent away from family, particularly if the workshops are scheduled during the fishery's downtime. Because the workshops will be scheduled where the gillnet fishery is located in significant concentrations, attending the workshop should not take more than a day to a day and a half away from their family, responsibilities, or other fishing activities. The owners and operators will benefit from participating in the workshop by advancing their knowledge and skills in their industry. The positive social and economic benefits associated with the workshop certification will mitigate the negative social impact of one-day way from family and other responsibilities.

The gillnet workshops, under alternative A5 would provide a forum for discussion and education. The vessel owners and operator will have an opportunity learn about the latest advances in safe release and disentanglement protocols, as well as protected species identification and the latest regulations pertaining to their fishery. This knowledge also translates into a skill that could be used to increase operators' bargaining position for employment. Finally, the gillnet workshops are a dedicated opportunity for the Agency to interact and communicate with the industry.

Recertification every two years would likely have the greatest economic impacts on participants, however, the extent of the impacts would depend on the mechanism for recertification: in-person workshops versus the use of alternative sources of media including CD-ROM, DVDs, or web-based media that would not result in travel costs or lost fishing time. The agency will consider ways to moderate the cost involved with recertification for all of the alternatives considered. The potential economic impacts of having to get recertified in-person would increase proportionately as the number of participants increase. Certifying the participants every five years would result in the least negative economic impacts to the fishing community because potentially it would result in the most infrequent recertification schedule. If in-person recertification workshops were selected, travel costs, and lost fishing time would be minimized.

A recertification frequency of three years seems like an appropriate compromise of ecological and economic impacts of attending workshops. This period would allow for sufficient retraining to maintain proficiency and update fishermen on new research and development related to the subject matter while not placing an excessive economic burden on the participants due to lost fishing time and travel resulting from attending a recertification workshop in person.

Conclusion

Workshops for PLL, BLL, and gillnet vessel owners and operators would result in positive ecological impacts by reducing the mortality of protected resources. These workshops are essential for complying with BiOps by reducing the post-hooking mortality of sea turtles and other protected resources. Involving vessel owners will provide a link with the vessels' permit, ensuring that workshops are well attended. Including operators will ensure that at least one person on board the vessel during fishing activities is adept at the safe handling and release protocols. Educating vessel owners and operators on the proper identification of protected resources will enable them to apply the appropriate safe handling and release protocols, improve compliance with regulations, and enhance the utility of vessel logbook data. The one-day

workshops are not expected to result in excessive economic impacts as they will be scheduled at numerous locales along the Atlantic coast, minimizing travel and lost fishing time. The Agency will also delay effectiveness until January 1, 2007, to help operators and vessel owners plan for attending these workshops. Requiring that owners and operators in longline and gillnet fisheries attain recertification every three years balances the ecological benefits of maintaining familiarity with the protocols and the economic impacts of workshop attendance due to travel costs and lost fishing opportunities.

4.1.1.2 HMS Identification Workshops

The purpose of HMS identification workshops is to train individuals involved in the HMS fisheries to improve their HMS identification skills. Participants who successfully complete the workshops would receive a multi-year certification. A certificate would serve as proof to law enforcement officials that the participant has completed the necessary training workshop. Anyone who wishes to attend these workshops, including constituents not directly impacted by these workshops (*i.e.*, recreational fishermen, commercial fish dealers, law enforcement officials, and non-governmental organization representatives) would be welcome to attend as well.

Accurate species identification is important for compliance with HMS fishery regulations, including the avoidance of prohibited species and maintaining quota limits, and also for accurate data collection. Species data collected on vessels and by dealers is entered into vessel logbooks and dealer reports, and is used to establish and monitor quotas, and for stock assessments. It is important that fisheries scientists and managers have the most reliable data possible for assessing the status of the stocks and formulating appropriate fishery management strategies based on this information, both to prevent overfishing and to rebuild those stocks that are already overfished. However, large numbers of sharks commercially landed are reported as "unclassified" (*i.e.*, unidentified), presenting gaps in data collection in terms of actual species. As shown in Tables 3.40, 3.41, and 3.42 in Chapter 3, in 2003 the number of unclassified landings of large coastal, small coastal, and pelagic sharks was 181, 431or 19 percent of total landings, 25,307 or four percent of total landings, and 297,126 or 48 percent of total landings, respectively. Species identification workshops could reduce this problem by enhancing species specific reporting, thereby enhancing the quality of the data used in setting quotas and for stock assessments.

As described in Chapter 2, the alternatives considered for conducting species identification workshops are:

A7 No Identification Workshops (No Action)
A8 Voluntary HMS identification workshops for dealers, all commercial vessel owners and operators, and recreational fishermen
A9 Mandatory HMS identification workshops for all shark dealers – Preferred Alternative
A10 Mandatory HMS identification workshops for all swordfish, shark, and or/tuna dealers
A11 Mandatory HMS identification workshops for all commercial longline vessel owners
A12 Mandatory HMS identification workshops for all commercial longline vessel operators
A13 Mandatory HMS identification workshops for all commercial vessel owners (longline, CHB, General category, and handgear/harpoon)

A14 Mandatory HMS identification workshops for all commercial vessel operators (longline, CHB, General category, and handgear/harpoon)
A15 Mandatory HMS identification workshops for all HMS Angling permit holders
A16 Certification Renewal Timetable
(Certification renewal every 3-years) – Preferred Alternative

Ecological Impacts

Under alternative A7, the No Action alternative, NMFS would continue to make available for purchase the HMS identification manual, *Guide to Sharks, Tunas, & Billfishes of U.S. Atlantic & Gulf of Mexico*, wheelhouse placards, and other related educational materials. Although these materials enhance fishery participants' ability to identify HMS commonly caught in U.S. fisheries, discerning subtle identification features using these materials is of limited value compared to hands-on workshops, particularly when attempting to distinguish species that are similar in appearance (*e.g*., certain sharks). Also, there is no assurance that fishery participants will utilize or fully understand the materials distributed. In addition, as species identification data entered into fisheries logbooks and dealer reports is used in quota monitoring and in preparing stock assessments, identification inaccuracies could be reflected in the resulting quotas and assessments, thereby affecting associated fishery management strategies.

Implementing voluntary workshops under alternative A8 could provide some ecological benefits, providing fishery participants would actually attend the voluntary workshops. In the past, however, voluntary workshops conducted by NMFS have not been well attended, and this could also be the case if future identification workshops are voluntary. The hands-on approach of workshops would enhance understanding of identification features so that those who do attend would be better able to identify HMS and thus provide more accurate information in logbooks and dealer reports. This, in turn, could provide some level of improvement in the accuracy of data used for quota monitoring and stock assessments. In addition, those who attend and gain a better understanding of identification features would be in a better position to comply with fishery regulations, such as identifying prohibited species. All of these factors would indirectly contribute to stock rebuilding efforts and therefore result in positive ecological effects on HMS fishery resources.

Under alternative A9, mandatory workshops and certification would be required for all Federally permitted shark dealers by January 1, 2007, with successful completion and mandatory periodic recertification linked to the dealer's ability to obtain and renew their Federal dealer permit. Mandatory attendance by shark dealers is the preferred alternative because: 1) a single dealer must identify offloaded catches from a number of vessels, involving not only large numbers of fish but many different species of fish, as well; 2) not only are some shark species difficult to distinguish from one another, but dealers need to identify fish that have been dressed on the fishing boats, making accurate identification even more difficult; and 3) the resulting dealer reports are used for quota monitoring and stock assessments. As all permitted dealers may not be geographically located where vessels unload their catches, a proxy could attend the workshop to allow the permitted dealer to meet mandatory attendance requirements. Furthermore, since the actual permit holders may not be involved in fish house activities it may be more appropriate to allow a proxy whom is directly involved with fish house activities to attend in lieu of the permit holder, as necessary. If a dealer opts to send a proxy, then the dealer

must designate a proxy from each place of business covered by the dealer's permit. A proxy must be a person who is employed by a place of business, covered by a dealer's permit, a primary participant in identification, weighing, or first receipt of fish as they are offloaded from a vessel, and involved in filling out dealer reports. NMFS specifically requests comments on proxy designation (*i.e.*, who should be allowed to act as a proxy). Ecological benefits to HMS fishery resources would be similar to those described above under alternative A8, voluntary workshops, but would be expanded in magnitude, as a greater number of individuals would be trained in identification, thereby substantially improving the accuracy of data entered into dealer reports. This, in turn, would contribute to improved stock assessments, quota monitoring, and stock rebuilding efforts.

Under alternative A10, mandatory workshops and certification would be required not only for shark dealers, but for swordfish and tuna dealers as well. As under alternative A9, successful completion of the workshop and mandatory recertification would be linked to obtaining and renewing a dealer's Federal permit. As stated above, as all permitted dealers may not be geographically located where vessels unload their catches, a proxy could attend the workshop in order for the dealership to meet mandatory attendance requirements. If a dealer opts to send a proxy, then the dealer must designate a proxy from each place of business covered by the dealer's permit. A proxy must be a person who is employed by a place of business, covered by a dealer's permit, a primary participant in identification, weighing, or first receipt of fish as they are offloaded from a vessel, and involved in filling out dealer reports. Additional benefits of this alternative are that training would be increased to include additional participants compared to only including shark dealers in which case training would include identification of other commercially fished HMS in addition to sharks. Although ecological benefits would be similar to those described under alternative A9, they would be expanded to include other HMS fisheries, and likely result in greater ecological benefits.

Under alternative A11, mandatory identification workshops and certification would include vessel owners issued limited access permits and using longline gear during fishing operations. Workshop completion and mandatory periodic recertification would be tied to Federal permit issuance and renewal. Training of vessel owners could serve to improve species data entry in vessel logbooks, but only if owners are on board the vessel. In some cases, the vessel owner may not be the vessel operator and thus not on the vessel involved in daily fishing activities and available to identify catches. Because of the limited scope of the participants included for this training - longline vessel owners only, as compared to dealers - ecological benefits would likely be narrower in scope than expected under alternatives A8, A9 and A10.

Under alternative A12, mandatory identification workshops would include all commercial longline vessel operators. Because longline vessel operators are impacted under this alternative and not vessel owners, some of which may not be involved in daily fishing activities and available to identify fish landed, ecological benefits to the fisheries, although similar in nature to those expected under alternative A11, would be expanded in magnitude. This is because operators are actually involved in fishing activities and fish identification. This would result in an increased number of logbooks that would potentially contain a greater degree of accurate identification data. Ecological benefits would be similar in nature as described for the alternatives above, resulting in improved stock assessments indirect benefits to stock rebuilding.

Under alternative A13, mandatory workshops and training certification for *all* commercial vessel owners, would be required. Participants who have more than one permit would only be required to attend one workshop. Successful workshop completion and mandatory periodic recertification would be tied to Federal permit issuance and renewals. Under this alternative, training and identification accuracy would be significantly expanded in magnitude beyond that conducted under alternatives A8 through A12. However, training of vessel owners could serve to improve species data entered into reports only if the owners are on board the vessel, involved in daily fishing activities, and available to identify fish landed, but this is not always the case. However, given that in many cases the vessel owner is the operator aboard the vessel during fishing activities, ecological benefits to HMS fishery resources could be expanded beyond that expected under the other alternatives listed above, resulting in increased indirect benefits to stock rebuilding.

Under alternative A14, mandatory workshops and certification would be required for all commercial vessel operators. For the CHB, General Category, and handgear/harpoon categories the agency assumes that the vessel owners (permit holders) are also the primary operators. Participants who are operators on multiple vessels fishing under different permits would only be required to attend one identification workshop. Due to the large number of participants, training and identification skills would be significantly expanded beyond that under the other alternatives, resulting in a greater indirect benefit to HMS fishery resources. This includes an improvement over alternative A13, as well, since in all cases it can be expected that the vessel operator is on board the vessel, involved in daily fishing activities, and available to identify catches. Therefore, training of vessel operators could serve to significantly improve species data (for fishing activities that are required to submit a logbook) entered into reports and thereby improve the basis for quotas and stock assessments, as well as regulatory compliance. Accordingly, ecological benefits to HMS fishery resources would also be expanded beyond that expected under the alternatives listed above, as a result of more accurate species catch data, and improved regulatory compliance.

Under alternative A15, mandatory workshops and certification would be required for all HMS angling permit holders. The number of individuals trained would be significantly greater than under the other alternatives. This would result in expansive positive ecological benefits for HMS sport fisheries. However, the drawback is that commercial fishermen/dealers would not be trained under this alternative, and, hence, commercial vessel logbooks and dealer reports would not benefit in terms of data accuracy improvement. Thus, quota monitoring, commercial regulatory compliance, and stock assessments would not benefit as they would under the other alternatives.

Alternative A16 includes several options for mandatory certification renewal - on either a two, three, or five-year timetable. The Agency might also consider additional recertification options in the future as a result of significant new information related to HMS species identification. NMFS assumes that participants engaged in a hands-on, day long, workshop that requires participants to pass a practical examination demonstrating proficiency at the culmination of the workshop would maintain familiarity with identification protocols for a reasonable period of time afterward. All new entrants/owners into the fishery would still be required to attain

certification before being able to attain their permit and permit holders would need to renew their certification within two years of their prior attendance to maintain an active HMS permit. Requiring renewal of workshop certification every two years would likely have the most positive ecological impacts. Requiring re-certification every three years would have somewhat less positive ecological impacts. Requiring re-certification every five years would likely have the least positive ecological impact, as this would allow a more extensive period of time to lapse between certification workshops than probably necessary to maintain species identification proficiency. Recertification every three years is a reasonable frequency to ensure that participants are kept abreast of identification protocols.

Social and Economic Impacts

Under alternative A7, the No Action alternative, it is not anticipated that there would be any change, either positive or negative, in social and economic impacts, primarily because current activities related to the dissemination of information to assist in identifying HMS would remain the same.

Under the remaining alternatives, the identification workshops would serve an educational purpose and serve as a forum where fishermen could also share information about their fishery that could be transferred to other fisheries (*e.g.*, recreational to commercial). This atmosphere could give provide attendees with more information about their fisheries and provide participants with a forum for them to express their comments regarding fisheries management and regulations. This communication could lead to better working relationships with NMFS.

Under alternative A8, voluntary workshops, it is not anticipated that there would be any substantial changes in either positive or negative social and economic impacts, primarily because attendance would be voluntary and at the convenience of the participants. For those who do attend, there would be some social benefit related to sharing of fishery information. Any associated travel costs may be considered a minimal economic impact, as it is not likely that participants would go to substantial expense and trouble for this type of voluntary training. In the past, voluntary workshops conducted by NMFS have not been well attended, and this could also be the case if identification workshops are voluntary.

Under alternatives A9 through A15, social and economic impacts would be similar in nature, the main difference being the number of attendees and the associated overall total costs, taking all individuals into consideration. On an individual basis, the only costs anticipated to be incurred by fishermen would be those related to travel and time to attend the workshops. Alternative A9 would require that approximately 230 shark dealers attend mandatory workshops, alternative A10 would also require tuna and swordfish dealers to attend, including an additional 750 dealers. Daily opportunity cost estimates for dealers is not currently known. Alternative A11 would require approximately 576 longline vessel owners to participate in identification workshops, resulting in an individual opportunity cost ranging between $504 (median pelagic longline owner's share) and $565 (median bottom longline owner's share) per day. Alternative A12 would include longline vessel operators; the Agency estimates an average of two operators per vessel, for a total of 1,152 participants. Alternative A12 would result in an individual opportunity cost ranging between $166 (median pelagic longline captain's share) and $353 (median bottom longline captain's share) per day. Alternative A13 would include all

commercial HMS owners (longline, CHB, General category, and handgear/harpoon) and would require approximately 10,022 participants to attend mandatory workshops. This alternative would result in an individual opportunity cost of $508 (median owner's share for all gear types combined). Daily opportunity cost estimates for CHB owners is not currently known. Alternative A14 would include operators of these vessels. Alternative A14 would have additional 1,152 operators as the Agency estimates two operators per vessel in the longline fisheries for a total of 11,174 participants. Alternative A14 would result in a combined opportunity cost of $677 (median owner's share $508 plus median captain's share $169 for all gear types combined). Daily opportunity cost estimates for CHB owners/operators is not currently known. Alternative A15 would require all HMS Angling permit holders to attend workshops, which is the largest single category of permit holders under HMS purview, including approximately 21,735 participants. Daily opportunity cost estimates for HMS Angling permit holders is not currently known. Additional information regarding economic impacts of these alternatives can be reviewed in Chapter 6.

To minimize costs to fishermen, NMFS intends to offer workshops at several locations near commercial and recreational HMS fishing ports. NMFS would also try to hold workshops during non-fishing seasons to minimize lost fishing time. Additionally, the Agency will delay effectiveness until January 1, 2007 to provide dealers time to prepare for economic costs associated with this mandatory requirement. The administrative costs to NMFS for the workshops is high, but may be exceeded by the benefits associated with the possible impacts from increased education. Before implementation, NMFS would attempt to identify ways to minimize costs to attendees as much as possible.

Under alternative A16, social and economic impacts would vary, depending on the frequency of recertification workshop attendance required – two, three, or five years. Furthermore, economic impacts would be dependent on the type of recertification selected by the agency. Hands-on, in-person recertification workshops would result in additional travel costs and lost fishing time. However, the Agency may consider alternative media for recertification, including: DVDs, printed materials, and/or web-based recertification. Negative economic impacts would be greater due to more frequent travel costs and potential down time for fishing, although NMFS intends to schedule recertification workshops so as to minimize these factors, to the extent possible. If in person workshops are selected for recertification than economic impacts will increase proportionately to the frequency chosen.

Conclusion

Alternative A9, mandatory workshops required for all Federally permitted shark dealers, is the preferred alternative because species-specific identification of offloaded shark carcasses is much more difficult than other HMS as evidenced by the large proportion of "unclassified" sharks listed on shark dealer logbooks. This uncertainty compromises quota monitoring and stock assessment efforts. Dealers are a focal point for gathering shark landings information as sharks from numerous vessels are offloaded at each individual dealer. Positive identification is often less difficult for fishermen than dealers as they know exactly where (depth, type of habitat, etc) a shark has been caught and often see the sharks alive and intact. Improving the accuracy of dealer reports and reducing the number of sharks listed as unclassified would result in positive ecological impacts because of the resultant improvements to data collection efforts. The Agency

will attempt to minimize economic impacts to shark dealers by delaying effectiveness until January 1, 2007, as well as holding workshops at fishing ports to minimize travel costs and during non-peak fishing times to minimize perturbations to business activity, to the extent possible.

4.1.2 Time Area Closures

NMFS considered the following alternatives, ranging from the no action alternative of maintaining existing closures to complete prohibition of pelagic longline gear in all areas, in order to reduce the bycatch and bycatch mortality of non-target HMS and protected species such as sea turtles in Atlantic HMS fisheries. While NMFS primarily focused on pelagic and bottom longline gear in this section, NMFS considered other gear types and other approaches to reduce bycatch and bycatch mortality in other sections (*e.g.*, Workshops in Section 4.1.1; restrictions on recreational gears in Section 4.2.3). Alternatives B4 and B5 are the preferred alternatives.

The closure alternatives analyzed were grouped according to the primary objectives of the time/area closure. Alternatives B2(a) through B2(e) consider new closures to address primarily white marlin, bluefin tuna, and sea turtle bycatch. Alternatives B3(a) and B3(b) consider modifying existing closures. Regardless of the grouping, bycatch of non-target species and protected species, such as sea turtles, was taken into consideration for all of the alternatives. Alternatives B4 through B7 did not require grouping. Several other alternatives were initially considered for new closures and modifications to existing closures but were not further analyzed (See Chapter 2 and Appendix A). Tables summarizing data for each of the alternatives considered and an explanation of why certain alternatives (*i.e.* B2(g) – (k) and B3(e) – (d)) were not further analyzed are included in Appendix A. The time/area closure alternatives are:

B1 Maintain existing time/area closures; no new time/area closures (No Action)
B2(a) Prohibit the use of pelagic longline gear in HMS fisheries in the central portion of the Gulf of Mexico from May through November (7 months)
B2(b) Prohibit the use of pelagic longline gear in HMS fisheries in an area of the Northeast during the month of June (1 month)
B2(c) Prohibit the use of pelagic longline gear in HMS fisheries in the Gulf of Mexico from April through June (3 months)
B2(d) Prohibit the use of pelagic longline gear in HMS fisheries in the Gulf of Mexico west of 86 degrees west longitude year-round
B2(e) Prohibit the use of pelagic longline gear in HMS fisheries in an area of the Northeast to reduce sea turtle interactions
B3(a) Modify the existing Charleston Bump time/area closure to allow the use of pelagic longline gear in all areas seaward of the axis of the Gulf Stream
B3(b) Modify the existing Northeastern U.S. time/area closure to allow the use of pelagic longline gear in areas west of 72º 47’ west longitude during the month of June
B4 Implement complementary HMS management measures in Madison-Swanson and Steamboat Lumps Marine Reserves from November through April (6 months) – Preferred alternative
B5 Establish criteria to consider when implementing new time/area closures or making modifications to existing time/area closures – Preferred alternative

B6 Prohibit the use of bottom longline gear in an area southwest of Key West to protect endangered smalltooth sawfish

B7 Prohibit the use of pelagic longline gear in HMS fisheries in all areas

Ecological Impacts

As described below, each of the alternatives would have varying degrees of ecological impacts. To help identify potential benefits and impacts of the various alternatives, summary tables were created to show the reduction in discards of white marlin, blue marlin, sailfish, spearfish, leatherback sea turtles, loggerhead sea turtles, other sea turtles, and bluefin tuna based on data from the Pelagic Observer Program (POP) (Table 4.5) or the Pelagic Longline (PLL) Logbook (Table 4.6) for the various time/area closure alternatives. In addition, individual tables for each of the alternatives are presented to show the monthly discards or landings of non-target or target HMS respectively, that include pelagic and large coastal sharks, and the percent reduction in number of hooks set (*e.g.* Table 4.12 and Table 4.19). Data are also presented for the estimated change in targeted catch of swordfish, bluefin, bigeye, albacore, yellowfin, and skipjack tunas (BAYS). The methods and data used to generate the percentages in the tables are discussed below. For a more thorough description see Appendix A.

The analysis of the time/area closure alternatives utilized data from the POP, the PLL logbook, and the shark bottom longline observer program (SBLL). Data from the observer program is referred to in the text as "observed," and data from the logbook system is referred to as "reported" or "logbook" data. To determine the effectiveness of the current closures, NMFS compared data prior to implementation of the closed areas (1997 - 1999) with effort and catch rates from 2001 - 2003 for various species. The analyses for the new time/area closures considered data primarily from the POP and PLL from 2001 - 2003. Data from 2004 were not yet available during the drafting of this FMP. Data from 2001 – 2003 were used because they include data after the most recent closures went into effect in 2000. For the alternatives considering modifications to existing time/area closures, NMFS compared data prior to implementation of the closed areas (1997 - 1999) for various species. In all cases, the POP and PLL data were used to summarize total monthly U.S. pelagic longline catches throughout the operational range of the U.S. fleet in the Atlantic Ocean, Gulf of Mexico, and Caribbean (throughout the rest of the Section, the range of the PLL fishery is considered the Atlantic Ocean, Gulf of Mexico, and the Caribbean, although all three areas may not be explicitly referenced).

A Geographic Information System (GIS) program was used to plot observed (POP) and reported (PLL) effort and catches of all non-target HMS (white marlin, blue marlin, sailfish, spearfish, and bluefin tuna), protected species (leatherback, loggerhead, and other sea turtles comprised of green, hawksbill, and Kemp's ridley sea turtles), and retained HMS species (swordfish, bluefin, yellowfin, bigeye, and all BAYS tunas combined). Estimates of discards of all target and non-target HMS are comprised of both live and dead discards. All of the areas further analyzed, and areas considered but not further analyzed, were initially selected by examining the PLL and POP data from 2001 - 2003 and identifying areas and times where bycatch was concentrated. NMFS also took into account information received in a petition for rulemaking to consider an additional closure to reduce bluefin tuna discards in a reported spawning area in the Gulf of Mexico (Blue Ocean Institute *et al*., 2005; Block *et al*., 2005). See alternative B2(c) discussion below. In addition, NMFS took into account a settlement agreement

relating to white marlin, which is awaiting approval from the court in Center for Biological Diversity v. NMFS, Civ. Action No. 04-0063 (D.D.C.). With regard to the settlement agreement, NMFS specifically took into account five suggested white marlin time/area closures in the U.S. EEZ described on page 10 in a February 14, 2002 letter from the Biodiversity Legal Foundation, re: Atlantic White Marlin Critical Habitat Designation. See alternatives B2(g) – (k) in Section 2.1.2. The data used to analyze these potential areas reflect more recent data than was presented in the February 14, 2002 letter which relied on data from 1994-1996.

The boundaries of alternatives B2(c) (Blue Ocean Institute *et al*.) and B2(g) – (k) (white marlin settlement) were based on specific information provided in those documents. All other time/area closure boundaries were selected based on the areas of highest interactions for a number of species (primarily white marlin, bluefin tuna, and leatherback and loggerhead sea turtles) (Figure 4.1 to Figure 4.6). Following selection of specific areas, spatial analyses were performed to determine the fishing effort (number of hooks) and number of each species observed and reported caught inside each time/area closure in comparison to the rest of the Atlantic, Gulf of Mexico, and Caribbean, excluding the Northeast Distant restricted fishing area (NED). The NED data were not included in the analyses because the area had been closed to commercial pelagic longlining since June 2001 when a research experiment was initiated to study methods of reducing sea turtle bycatch. Fishermen can now fish in the area with specified gear and release equipment to minimize sea turtle takes and post-release mortality (69 FR 40734, July 6, 2004). Since the data from 2001 – 2003 from the NED were part of an experimental design and not part of normal commercial pelagic longlining operations, the data were not considered appropriate for inclusion in the current analyses.

NMFS analyzed both absolute numbers of discards as well as areas of highest catch and catch per unit effort (CPUE: number of animals per 1,000 hooks) for non-target HMS and protected resources (white marlin, bluefin tuna, and sea turtles). In some cases these areas overlapped, in others, they did not. This may be due to the fact that there are localized areas of high CPUE that may not necessarily represent the areas of highest bycatch in terms of absolute numbers. In cases where the highest CPUE did not overlap with the areas of highest absolute numbers of discards, NMFS decided to further analyze the area that had the highest overall discards (in absolute terms), rather than areas with the highest CPUE. This was done in order to maximize the reduction in overall number of discards. One caveat of using this approach is that the projected number of discards may actually increase when redistribution of fishing effort is taken into account and high levels of effort are displaced into open areas with high CPUEs.

NMFS compared monthly observed and reported catch and CPUE in each of the proposed time/area closure alternatives to catch and CPUE fleet-wide, excluding the NED, rather than just to areas adjacent to the time/area closure. Changes in bycatch and incidental catch rates resulting from time/area closures are thus expressed as a percentage of total U.S. Atlantic pelagic longline catch, calculated on a monthly basis. This approach was used because an analysis of the mobility of the pelagic longline fleet, completed in 2001 for implementation of a vessel monitoring system (NMFS, 2001), indicated that pelagic longline vessels generally exhibit a high degree of mobility and are as likely to fish in areas away from their homeport as they are to fish in areas immediately adjacent to their homeport. Because vessels do not necessarily fish in or next to areas immediately adjacent to their homeport area, but are mobile and capable of moving

considerable distances, this analysis considers fleet-wide catch rather than catch from areas only adjacent to a proposed closure. The approach used in this analysis is consistent with the methods used to analyze previous time/area closures (NMFS, 2000; NMFS, 2004). The 1999 closure in the Northeastern United States to reduce bluefin tuna discards considered an effort displacement model for areas immediately adjacent to the closures because it was considered likely that those fishermen would continue to target yellowfin tuna and retain incidentally-caught bluefin tuna in that area of the Northeast. A similar approach was used in this analysis for displacement of effort in the Gulf of Mexico only, because there are a large number of Vietnamese fishermen who may be reluctant to fish outside the Gulf of Mexico.

It is difficult to predict with precision where fishing effort will be displaced, however the current model assumes that effort will be uniformly distributed into all remaining open areas. As described in Appendix A, the redistribution of fishing effort model thus predicts that fishing effort is as likely to be displaced into areas with high bycatch rates as into areas with low bycatch rates and in many cases, this may potentially result in an increase in bycatch of certain species. For example, as described in more detail below, without redistribution of effort alternative B2(a) would result in a net decrease of 4.6 percent bluefin tuna discards. However, with redistribution of fishing effort, the closure is predicted to result in a 10.3 percent increase in bluefin tuna discards. This is likely due to the fact that there are other areas, particularly in the Northeast, where bycatch and discard rates of bluefin tuna are higher than in the Gulf of Mexico. Once fishing effort from a closed area is theoretically redistributed throughout the Gulf of Mexico and along the Atlantic coast, the higher effort in remaining open areas may result in a net increase in bluefin tuna discards. Therefore, as fishing effort is squeezed into smaller open areas, unintended consequences such as these may result. Another common result is that bycatch of one species may decrease while bycatch of another species may increase. This may be due to the natural variability in distribution and abundance of particular species. For example, interaction rates with leatherback sea turtles tend to be higher in the Gulf of Mexico, whereas interaction rates with loggerhead sea turtles tend to be higher along the Atlantic coast. If fishing effort is redistributed from the Gulf of Mexico into the Atlantic, there may be an increase in loggerhead sea turtle interactions, and conversely, if fishing effort is redistributed from the Atlantic to the Gulf of Mexico, leatherback interactions may increase. Similar interactions of positive and negative feedbacks with redistribution of effort are evident for other species also.

While the current fishing displacement model is not perfect, it does take into account the fact that there may be areas of high CPUE outside the proposed closure area to which fishermen may turn if they are forced out of their current fishing areas. However, to assess how different assumptions of redistributed effort may affect bycatch estimates, NMFS also considered effort displaced only in the Gulf of Mexico for alternative B2(a). NMFS selected this area to analyze redistribution of effort in the Gulf of Mexico only because it is the smallest of the three closures analyzed in the Gulf of Mexico and thus represents the most likely case in which fishermen would stay in the Gulf of Mexico. Since there would still be open areas left to fish in the Gulf of Mexico, fishermen would likely turn to those areas rather than move out of the Gulf and into the Atlantic. For the larger Gulf of Mexico closures (alternatives B2(c) and (d)), approximately 90 percent of the fishing effort in the Gulf of Mexico has historically occurred in those areas, and there would be very few areas left in the Gulf for fishermen to turn to. As a result, fishing effort would likely be displaced outside of the Gulf of Mexico.

Data for each of the new closures were analyzed with and without redistribution of effort. Both POP and PLL data were used to analyze bycatch rates without redistribution of effort, but only the PLL data were used to estimate bycatch rates with redistribution of effort because these data are collected for the entire fleet, whereas the POP data are only collected from a representative portion of the fleet. The analysis 'without redistribution of effort' assumes that all fishing effort in the time/area closures is eliminated, and that none of the fishing effort is redistributed or displaced into open areas of the Atlantic or Gulf of Mexico. The number and percent reduction in catch of both non-target and targeted species in these analyses thus represents the highest possible expected reduction. Conversely, these analyses represent the greatest negative social and economic impacts that are anticipated for the industry. These estimates were used to narrow down the list of potential time/area closures for further analysis. The redistribution of effort analysis, on the other hand, assumes that all effort currently in the time/area closures will be uniformly redistributed to all remaining open areas of the Atlantic and Gulf of Mexico (for a thorough discussion on redistribution of effort analyses, see Appendix A). In reality, the actual result may lie between these two estimates. While some fishermen will continue to fish in open areas of the Atlantic and Gulf of Mexico, others may be forced to leave the fishery entirely as a result of the closure.

Alternatives B2(a) and B2(b) were further analyzed because they had higher overall discards of white marlin and most other species than any of the other closures. Alternative B2(c) was further analyzed in response to a petition received by NMFS from several conservation organizations to consider a closure of the "Gulf of Mexico bluefin spawning area" (Figure 4.7) (Blue Ocean Institute *et al*., 2005). The area analyzed was obtained directly from the petition. Alternatives B2(d) and B2(e) were analyzed in order to determine if any other closure, or combination of closures, would be more effective at reducing bycatch than either alternatives B2(a), B2(b), or B2(c). Nearly all of the closures and combinations of closures considered for white marlin, bluefin tuna, or sea turtles, resulted in a net increase in bycatch for at least some of the primary species considered when redistribution of fishing effort was taken into account (Table 4.6). In addition, the predicted reduction of bycatch once redistribution of fishing effort was taken into account was typically less than 30 percent for any given species with overall reduction in the number of individual species being very low.

The No Action alternative, B1, would maintain the existing time/area closures (Figure 2.1) and would not implement any new time/area closures. These areas include the NED closure (effective June 1, 1999), the DeSoto Canyon (effective November 1, 2000), the Charleston Bump and Florida East Coast closures (effective March 1, 2001), and the Northeast Distant closed area (effective July 9, 2002, modified July 6, 2004). The Northeast Distant area is currently a restricted fishing area with specific gear requirements (69 FR 40734, July 6, 2004). Since most of the time/area closures were implemented in 2001 or earlier, data from 2001 - 2003 provide the basis for evaluating the effectiveness of the closures. The following provides an overview of the effectiveness of the closures in reducing discards and bycatch and in maintaining target catch for the entire fishery. These analyses are ongoing and additional data will be collected and reviewed annually.

Data used in these analyses were taken from the PLL logbook database administered through the NMFS Southeast Region. Catch data for each species and the number of hooks were summarized on a monthly basis by year. The monthly and annual Atlantic wide totals were calculated for each species as well. A reference period of 1997 - 1999 was chosen for the initial comparisons to examine the effect of closures implemented in 2000 - 2001. The percent change from 1997 - 1999 to 2001 – 2003 in numbers kept and discarded were calculated for the entire Atlantic (Table 4.7 and Table 4.8). Changes in the numbers of fish caught and discarded were compared to the predicted values from Regulatory Amendment 1 to the 1999 FMP (NMFS, 2000). The reported distribution of hooks set by area each year was examined to evaluate trends and/or shifts in fishing effort. In addition, the reported number of fish kept and discarded in the MAB and NEC was compared to the reported numbers for all other areas combined in order to evaluate the effectiveness of the June Northeastern U.S. closure.

Existing closures have been effective at reducing bycatch of protected species and non-target HMS and have provided positive ecological benefits. For example, the overall number of reported discards of swordfish, bluefin and bigeye tunas, pelagic sharks, blue and white marlin, sailfish, and spearfish all declined by more than 30 percent. The reported discards of blue and white marlin declined by about 50 percent and sailfish discards declined by almost 75 percent. The reported number of sea turtles caught and released declined by almost 28 percent (Table 4.8). Thus, the No Action alternative would continue to have a positive ecological impact by reducing the overall bycatch of non-target and protected species.

The closures have had an impact on targeted species landings as well. For example, from 1997 to 2003, the number of swordfish kept declined by nearly 28 percent, the number of yellowfin tuna kept declined by 23.5 percent, and the total number of BAYS kept (including yellowfin tuna) declined by 25.1 percent (Table 4.7). The reported declines in swordfish kept and discarded, large coastal sharks kept and discarded, and dolphins kept were similar to the predicted values developed for Regulatory Amendment 1. Reported discards of bluefin tuna, pelagic sharks, all billfish with the exception of spearfish for which no predicted change was developed in Regulatory Amendment 1, and total BAYS kept all declined more than the predicted values. Thus, the existing closures appear to have had a positive ecological impact on these species as well. However, such declines in landings may also have had negative economic impacts as discussed later in this section.

Overall effort in the Atlantic pelagic longline fishery based on reported number of hooks set declined by 15 percent during the pre- to post-closure period (Table 4.9). The distribution of effort does not indicate a major shift in fishing effort as a result of the time/area closures (Table 4.9). The average number of hooks reported set in 2001 - 2003 by area was compared to the average for 1997 - 1999. Declines in effort were reported for the majority of the areas. However, effort did increase during the pre- to post-closure period in the Gulf of Mexico, by a little more than eight percent (Table 4.9). This increase may be a result of a shift in effort due to the Florida East Coast closure. Reported effort also increased in the Sargasso (SAR) and North Central Atlantic (NCA) where little activity had been reported prior to 2002. This increase may also represent a shift in effort due to the closure off east Florida as well as the seasonal Charleston Bump closure. Effort in the South Atlantic Bight, where the Charleston Bump closure is located, declined by 30 percent from the 1997 - 1999 level. Effort in the MAB and

NEC also declined, 26 and 31 percent, respectively. The June Mid-Atlantic Bight closure area is located within these two areas, which probably contributed to the decline.

The June Mid-Atlantic Bight (MAB) closure area was (64 FR 29090, May 28, 1999) in order to decrease bluefin tuna discards in the Atlantic pelagic longline fishery. The closure spans a portion of two reporting areas, the MAB and the NEC. The reported effort, catch and discards were combined for these two areas to evaluate the effectiveness of the closure (Table 4.10). The reported effort, catches, and discards for the remaining areas were also combined and presented.

It appears that bluefin tuna discards in the MAB and NEC have been reduced considerably since the implementation of the June closure in 1999 (Table 4.10). Reported discards of bluefin tuna prior to implementation of the closure ranged from 558 to almost 2,800 per year. Since 1999, the number of bluefin tuna reported discarded has remained below 500 per year. The number of swordfish kept in the MAB and NEC has increased since the closure was implemented while the number of billfish discarded has declined.

Analysis of the change in effort and bycatch after implementation of existing closures indicates that reduction in bycatch may have been greater than predicted with redistribution of effort, and in some cases, without redistribution of effort. There are several possible explanations for the higher than predicted decline in bycatch and effort resulting from time/area closures that may have ecological impacts as well as economic repercussions on fishing behavior and the pelagic longline fishing industry: (1) stocks may be declining; (2) time/area closures may have acted synergistically with declining stocks to produce greater declines in catch than predicted; (3) fishermen may have left the fishery; and (4) fishing effort may have been displaced into areas with lower CPUEs. With regard to the last point, the redistribution of effort model is incapable of making predictions based on a declining CPUE. Instead the model assumes a current CPUE that remains constant in the remaining open areas when estimating reductions. It is possible that one or more of these factors, or others, may have contributed to the observed decline in landings and bycatch in recent years. However, despite these declines, several species continue to be overfished with overfishing still occurring, warranting the further consideration of closures or the other alternatives described in this draft FMP.

Alternative B2(a) would prohibit the use of pelagic longline gear by all U.S. flagged-vessels permitted to fish for HMS in an 11,991 nm^2 area of the central Gulf of Mexico (Figure 4.7) from May through November of each year (7 months). The effectiveness of alternative B2(a), and all subsequent closure alternatives, was evaluated by determining the percent reduction in bycatch of non-target HMS, protected species, and target species on a monthly basis with and without redistribution of effort. Without redistribution of effort, the observer program data indicate that the alternative B2(a) from May through November would potentially reduce discards (live and dead combined) of all non-target HMS and sea turtles from 4.5 percent for spearfish to 25.0 percent for other sea turtles (Table 4.5). Without redistribution of effort, the logbook data indicate that alternative B2(a) from May through November would potentially reduce discards from 3.4 percent for loggerhead sea turtles to 17.6 percent blue marlin discards (Table 4.6). Thus, the percent reductions in most bycatch were similar for the observed and reported data, and for the year-round versus May through November closures.

Data from monthly catches and discards were examined for both a year-round closure and a seven-month closure (Table 4.5 and Table 4.6). The seven-month closure was selected for further analysis because the reductions in bycatch were similar to the year-round closure without redistribution of effort, and in some cases, higher than the year-round closure with redistribution of effort (Table 4.6). For example, white marlin discards (live and dead combined) increased one percent with redistribution of effort for the year-round closure, as did sailfish (1.1 percent), spearfish (four percent), and bluefin tuna discards (7.9 percent). The May through November closure, on the other hand, would reduce discards of all species except loggerhead sea turtles and bluefin tuna.

With redistribution of effort, the logbook data indicate that there would be a reduction in bycatch for some species, but an increase in others. For example, the bycatch of leatherback sea turtles would be decreased by eight percent (76 leatherback sea turtles over a three year period, or 25 per year), whereas loggerhead sea turtle bycatch would potentially increase by 7.9 percent (six loggerhead sea turtles over a three year period, or two per year) (Table 4.6), bluefin tuna discards would increase by 10.3 percent (167 discards over a three year period, or 56 per year), and pelagic and LCS discards would increase by 14.5 percent and 11.7 percent, respectively (Table 4.12). For some of the species, the percent reduction in discards was minimal. For example, white marlin discards are predicted to decrease by only 2.7 percent. This amounts to a projected decrease of 85 white marlin over three years, or 28 white marlin per year (3,143 x 0.027 = 85) (Table 4.6 and Table 4.12). When compared to the overall annual reported white marlin discards (1,047 annually, of which 31 percent are dead discards), this reduction would provide minimal benefit. Thus, while there may be an ecological benefit for some species such as leatherback sea turtles and blue marlin, the benefits to other species as a result of this closure are less clear.

Alternative B2(b) would prohibit the use of pelagic longline gear by all U.S. flagged-vessels permitted to fish for HMS in a 2,251 nm^2 area of the Northeast in June primarily to reduce bluefin tuna discards (Figure 4.7). NMFS decided to further analyze this area because it had a high concentration of bluefin tuna discards, with a greater number of discards than any other area in the Atlantic or the Gulf of Mexico. For example, from 2001 - 2003, there were 461 reported bluefin tuna discards in this area, compared to 470 reported discards in the entire Gulf of Mexico (Figure 4.8). Furthermore, approximately 80 percent of the discards in alternative B2(b) (365 bluefin tuna) occurred in the month of June only. By contrast, the majority of bluefin tuna discards in the Gulf of Mexico occurred over a three-month period from March through May, and were much more randomly and broadly distributed.

Additionally, alternative B2(b) had a lower number of bluefin tuna kept (34 over three years) than the Gulf of Mexico (133 over three years), which may have potential social and economic consequences for both areas, as discussed in greater detail later in this section. NMFS considered both a year-round and a June only closure, but decided not to analyze a year-round closure because the percent reductions were similar for the June only versus year-round closure for most of the species considered (Table 4.6). The following information thus pertains to the June only closure.

According to observer program data, alternative B2(b) would reduce bluefin tuna discards by 15.4 percent and loggerhead sea turtles by 6.0 percent. All other non-target HMS and protected resources would experience zero-percent reductions (Table 4.5). Without redistribution of effort, the logbook data indicate that alternative B2(b) would result in a 22.6 percent decrease in bluefin tuna discards (461 bluefin tuna over 3 years, or an average of 154 per year) (Table 4.11 andTable 4.13) and an 11.2 percent decrease in loggerhead sea turtle interactions (Table 4.11). The PLL logbook and POP data are therefore comparable. While not large, most other species would have reductions in bycatch as well, ranging from a zero-percent reduction in leatherback and loggerhead sea turtle interactions to 14.9 percent for pelagic sharks (Table 4.11 and Table 4.13). With redistribution of effort, the area would result in a 21.9 percent reduction in bluefin tuna discards (354 bluefin tuna over three years or 118 per year) (Appendix A), but relatively small increases in bycatch for nearly all of the other species except leatherback and loggerhead sea turtles.

Although there may be an ecological benefit for bluefin tuna as a result of this closure, the benefits to other species are less clear and may, in fact, be negative. Clearly, alternative B2(b) would reduce bluefin tuna discards, but would potentially increase the bycatch of other species as well. This is likely the result of a lower than average CPUE for most of the other species in the area. When redistribution of effort is considered, there may be an increase in bycatch of species such as blue and white marlin, spearfish, sailfish, and LCS.

Alternative B2(c) would prohibit the use of pelagic longline gear by all U.S. flagged-vessels permitted to fish for HMS in a 101,670 nm^2 area in the Gulf of Mexico from April through June (three months) (Figure 4.7). According to observer program data, alternative B2(c) would reduce discards of all non-target HMS and protected resources from a minimum of 2.3 percent for spearfish to a maximum of 25.0 percent for other sea turtles. Without redistribution of effort, the logbook data indicate that alternative B2(c) would potentially reduce discards of all of the species being considered from a minimum of 0.8 percent for pelagic sharks to a maximum 21.5 percent for bluefin tuna (Table 4.6 and Table 4.14). With redistribution of effort, however, bycatch is predicted to increase for all species except leatherback and other sea turtles (Table 4.14). Even bluefin tuna discards, which showed a fairly dramatic decline without redistribution of effort, are predicted to increase by 9.8 percent with redistribution of effort (for an overall increase of 43 bluefin tuna over three years or an average increase of 14 per year) (Table 4.21). The apparent increase in predicted bluefin tuna discards with redistribution of effort is likely due to the fact that bluefin tuna are caught in months other than April through June in the Gulf of Mexico, as well as the high number of bluefin tuna discards in other areas, as described in alternative B2(b) above. Bluefin tuna kept (landed), on the other hand, would be reduced by 18.3 percent (a decrease of 58 bluefin tuna kept over three years, or an average of 19 per year), indicating that the Gulf of Mexico has a high number of bluefin tuna landed in addition to bluefin tuna discards. Thus, there could be an overall reduction of 8.5 percent (or an average of five fish per year) of combined bluefin tuna landed and discarded. As with the alternatives described above, with redistribution of effort, there may be an ecological benefit to some species, but negative impacts on others. For example, LCS discards are predicted to increase 25.9 percent and loggerhead sea turtles by 23.5 percent under this alternative.

The petition to close 101,670 nm^2 in the Gulf of Mexico from April through June is predicted to decrease the number of bluefin tuna kept and discarded by five per year. Alternative B2(b), on the other hand, would close 2,251 nm^2 in the Northeast for the month of June only, and would potentially reduce the number of bluefin tuna discards by 118 per year. Although alternative B2(b) is not considered a bluefin tuna spawning area, data from the observer program indicate that adult fish (>171 cm TL) are present in the area. Additionally, there is evidence to indicate that the area is utilized as a feeding and staging area by bluefin tuna prior to migrating to the Gulf of Mexico to spawn (Block *et al*., 2005). Pop-up satellite tags on bluefin tuna tagged in feeding areas of the Northeast show fairly rapid (~ one month) migrations from the Northeast to the Gulf of Mexico (Block *et al*., 2005). Hence, fish discarded in the Northeast could be considered spawning stock that did not have the opportunity to spawn in the Gulf of Mexico. Furthermore, the total proportion of dead discards in the Northeast was similar to the Gulf of Mexico. In the northeast, 48 percent (219 out of 461) of all bluefin tuna discards from 2001 – 2003 were discarded dead, whereas 53 percent (249 out of 470) of all bluefin tuna discards from the Gulf of Mexico were discarded dead. Given the high number of discards in the Northeast, a closure there may provide greater ecological benefit than a closure in the Gulf of Mexico, and would minimize the economic impacts when compared to a closure of 101,670 nm^2 area of the Gulf of Mexico, as discussed in more detail later in this section.

Alternative B2(d) would prohibit the use of pelagic longline gear by all U.S. flagged-vessels permitted to fish for HMS in a 162,181 nm^2 area in the Gulf of Mexico west of 86 degrees W. Long. year-round (Figure 4.7), thus eliminating an area where approximately 50 percent of all effort (Atlantic, Gulf of Mexico, and Caribbean) and 90 percent of all effort in the Gulf of Mexico has been reported in recent years (2001 – 2003). According to observer program data, alternative B2(d) would have the greatest positive ecological impact of all the alternatives considered (Table 4.5). It would potentially reduce discards (live and dead combined) of all non-target HMS and protected resources by a minimum of 15.9 percent for spearfish to a maximum of 52.8 percent for leatherback sea turtles (Table 4.5). Similarly, the logbook data indicate that there could be large reductions in all non-target HMS, ranging from a 10.1 percent reduction in loggerheads to 83.5 percent reduction in spearfish discards (Table 4.6 and Table 4.15).

With redistribution of effort, alternative B2(d) is predicted to reduce discards of blue marlin, sailfish, spearfish, bluefin tuna, and leatherback sea turtles, but increase discards of white marlin, pelagic sharks, LCS, and loggerhead sea turtles (Table 4.6 and Table 4.15). Loggerhead sea turtles in particular would be of great concern since interactions could potentially increase by 65.5 percent (116 over three years, or an average of 39 per year). White marlin discards could potentially increase by 0.3 percent (94 over three years, or an average of 31 per year), and pelagic shark discards by 88 percent (30,194 over three years, or an average of 10,064 per year). The reason for the dramatic increase in discards for some species with redistribution of effort is that these species are more commonly encountered in the Atlantic than the Gulf of Mexico. With nearly 50 percent of overall effort predicted to redistribute into open areas of the Atlantic, the discards of these species would likely increase. For an example of the impact of redistribution of effort, see Table A.28 in Appendix A. Since a majority of leatherback sea turtles interactions occur in the Gulf of Mexico, and a majority of loggerhead interactions occur in the Atlantic, closing an area of this size in the Gulf of Mexico could potentially redistribute effort to areas of the Atlantic where loggerhead interaction rates are higher.

Alternative B2(e) would prohibit the use of pelagic longline gear by all U.S. flagged-vessels permitted to fish for HMS in a 46,956 nm^2 area in the Northeast year-round (Figure 4.7). The area was considered primarily to reduce loggerhead sea turtle interactions, which occur with greater frequency there than in nearly all other areas. Without redistribution of effort, the closure is predicted to decrease bycatch and discards of all non-target HMS and protected species by a minimum of 0.3 percent for spearfish, to a maximum of 36.3 percent for loggerhead sea turtles (Table 4.6 and Table 4.16). However, with redistribution of effort, bycatch of all species except pelagic sharks, leatherback, and loggerhead sea turtles is predicted to increase (Table 4.16).

Given the mixed results for some of the species in each of the alternatives analyzed individually above, NMFS considered combining alternatives B2(a) and B2(b), as well as alternatives B2(d) and B2(e) to maximize bycatch reduction. Combining these areas could potentially reduce the number of discards beyond what could be achieved by a single closure. For alternatives B2(a) and B2(b), NMFS considered both a year-round closure and a closure during the months of May through November for alternative B2(a), combined with a closure during June only for alternative B2(b), similar to the individual closures described previously. For alternatives B2(d) and B2(e), NMFS considered a year-round closure only.

With redistribution of effort, combining alternatives B2(a) and B2(b) year-round would increase discards of most species except bluefin tuna and sea turtles (Table 4.6 and Table 4.17). Thus, a year-round closure of both of these areas could have a positive ecological impact on bluefin tuna and all sea turtle species, but a negative impact on blue and white marlin, sailfish, spearfish, pelagic sharks, and LCS. Combining alternatives B2(a) and B2(b) on a seasonal basis from May through November for B2(a) and June only for B2(b), as described above, would result in reductions in discards of all species except sailfish (which would increase 1.5 percent), pelagic sharks (which would increase 9.6 percent), LCS (which would increase 10.1 percent), and other sea turtles (which would increase 7.1 percent) (Table 4.6 and Table 4.17). The net ecological benefit of combining the closures with redistribution of effort would be an 8.4 percent decline in leatherback sea turtle interactions (~ 41 leatherback sea turtles from 2001 - 2003, or 14 per year), a 3.1 percent decline in loggerhead interactions (~ six loggerheads from 2001 - 2003, or two per year), a 13.6 percent decline in bluefin tuna discards (~ 220 bluefin tuna from 2001 - 2003, or 73 per year), a 1.7 percent decline in white marlin discards (~ 53 white marlin from 2001 - 2003, or 18 per year), and a 6.7 percent decline in blue marlin discards (~ 164 blue marlin from 2001 – 2003, or an average of 55 per year) (Table 4.6, Table 4.17, and Table 4.24).

Thus, the overall benefit would be greater for a seasonal closure than a year-round closure. In particular, the seasonal closure would potentially decrease leatherback and loggerhead sea turtle interactions, bluefin tuna discards, and blue and white marlin discards. However, the overall reduction in bycatch for most species was relatively low when combining closures, resulting in some ecological benefit to most species. Although discards of some species may decline with combined seasonal closures of alternatives B2(a) and B2(b), the positive ecological impacts would be offset by an increase in discards of other species. When considering the economic impacts of two additional closures on the pelagic longline industry, the positive ecological benefits may be outweighed by the social and economic costs.

With redistribution of effort, combining alternative B2(d) and B2(e) year-round would increase discards of white marlin, spearfish, pelagic sharks, LCS, and loggerhead sea turtles (Table 4.6 and Table 4.18). Discards of pelagic sharks and LCS in particular, are predicted to increase by 65 percent and 102 percent, respectively, because these species are discarded at much higher rates in the Atlantic than in the Gulf of Mexico. Redistributing a large amount of effort from the Gulf of Mexico into the Atlantic would thus increase discards of these, and other species. The only species for which there would be a substantial positive benefit would be leatherback sea turtles, for which interactions would decrease by 30.2 percent annually or an average of 50 fewer interactions per year (Table 4.18).

In addition to proposing new closed areas, NMFS initially considered modifying current or existing time/area closures (alternatives B3(a) and B3(b); see Section 2.1.2). In general, closed areas considered for modification (*i.e.*, partial re-opening) were chosen based on examining the PLL and POP data from 1997 through 1999. The data were analyzed in GIS, allowing NMFS to identify areas associated with minimal bycatch within current time/area closures for re-opening (*e.g.*, Figure 4.10 and Figure 4.11). The overall goal was to modify existing areas, if possible, using the latest analysis techniques and technology available to NMFS, while minimizing bycatch and maximizing catch of targeted species. This is especially pertinent for target species such as swordfish, where the United States is currently not fully utilizing its swordfish quota. In addition, due to the natural variability of many of the HMS fisheries, it may be necessary to change or refine the boundaries of time/area closures to reduce bycatch of non-targeted species.

Given that fishing effort and landings have declined in recent years, NMFS considered modifying existing closures to increase the opportunity to harvest the swordfish quota (Figure 4.9). In addition, if new time/area closures were to be implemented, then NMFS wanted to consider possible ways to offset those additional economic impacts by lifting restrictions in areas that had minimal bycatch. Originally four modifications to existing time/area closures were considered: B3(a) (the Charleston Bump), B3(b) (the Northeastern United States (NEC)), B3(c) (the Florida East Coast (FEC)), and B3(d) (DeSoto Canyon) (Figure A.2 in Appendix A). However, only alternatives B3(a) and B3(b) were further analyzed because they minimized bycatch while maximizing targeted catch when compared to the other two alternatives. For each modification, NMFS considered the bycatch and targeted species catch that would be affected by re-opening a portion of a current closure (Table 4.27 through Table 4.30).

Alternative B3(a) would modify the Charleston Bump time/area closure boundary to include only those areas shoreward of the axis of the Gulf Stream. The remaining areas seaward of the axis of the Gulf Stream would be reopened from February 1 through April 30. The B3(a) modification area (*i.e.*, the hatched area in Figure 4.9) was chosen because a minimal increase in bycatch would be expected with the 0.5 percent predicted increase in fishing effort associated with this re-opening based on 1997 - 1999 logbook data and fishing practices from that time. The majority of the bycatch from 1997 - 1999 occurred in the portion that would remain closed (*i.e.*, the shaded area of Figure 4.10 and Figure 4.11; Table 4.27). On average, the area considered for re-opening in B3(a) would have an increase of bycatch of 0.5 percent whereas the predicted average bycatch associated with the area that would remain closed was 2.7 percent (Table 4.27). Thus, by using refined GIS maps (see Figure 4.10 and Figure 4.11) that were not

available to NMFS when the time/area closures were first implemented, NMFS is now able to identify and refine areas of higher bycatch within current time/area closures.

As described above, NMFS considered re-opening existing closures in conjunction with new time/area closures (Table 4.6). Such combinations would help balance social and economic impacts of additional closures, while mitigating any potential negative ecological impacts of opening or modifying existing time/area closures. Year-round closures of B2(a) and B2(b) in combination with the B3(a) modification would potentially result in increases of bycatch of all species considered except sea turtles and bluefin tuna. Leatherback sea turtles and bluefin tuna bycatch would decline by approximately 20 percent (Table 4.6). However, seasonal closures of the B2(a)/B2(b) in conjunction with the B3(a) modification would result in a decrease, albeit small (on average, 5.5 percent), in bycatch of all species considered except sailfish (Table 4.6). This could result in small, but net positive ecological impact. Similarly, NMFS considered B3(a) in conjunction with the B2(d)/B2(e) year-round closure. This combination could result in decreases of discards for blue marlin, sailfish, leatherback sea turtles and bluefin tuna (Table 4.6). However, it could also result in increases of discards for white marlin, spearfish, and loggerhead sea turtles (Table 4.6). Therefore, the ecological effects of such a combination would be variable.

Alternative B3(b) would modify the existing NEC time/area closure to allow the use of pelagic longline gear in areas west of 72º 47’ W Longitude during the month of June. This area was mainly considered as a way to refine the NEC and re-open areas where there were few swordfish or bluefin tuna discards (Figure 4.10 and Figure 4.12; Table 4.30). Based on fishing effort from 1997 - 1999 before the closures went into effect (taken from logbook data from 1997 - 1999), there could be an estimated 0.4 percent increase in fishing effort associated with this modification. However, this modification could result in additional fishing effort given management actions that have taken place since 2000 (*i.e.*, time/area closure put into place in 2000). While there is predicted to be a minimal increase in targeted catch, there would be virtually no increase in bycatch associated with this modification (Table 4.28 and Table 4.30). For example, there is predicted to be only one bluefin tuna discard associated with this modification (Table 4.30). Discards of sailfish and sea turtles are not predicted to increase. Thus, such a modification would have minimal to no ecological impact.

Since the bycatch associated with B3(b) was essentially zero (Table 4.6 and Table 4.28), combinations of this modification with any time/area closure would mirror the benefits in bycatch reduction associated with the particular time/area closure. For instance, seasonal closures of B2(a)/B2(b) in conjunction with the B3(b) modification could result in small decreases (on average, six percent), in bycatch of all species considered except sailfish (Table 4.6). This could result in a small, but net positive ecological impact. NMFS also considered a combination of B3(b) with year-round closures of B2(a)/B2(b). However, this combination resulted in a higher number of discards (with the exception of sea turtles and bluefin tuna) than the combination with seasonal closures (Table 4.6). Thus, a larger, overall ecological benefit could be gained from B3(b) in combination with seasonal closures of B2(a)/B2(b). When B3(b) was considered in conjunction with the B2(d)/B2(e) closure, there could increases in bycatch for white marlin, spearfish, and loggerhead sea turtles (Table 4.6). Decreases in bycatch could be seen for blue marlin, sailfish, leatherback sea turtles, and bluefin tuna. So, as with the

B2(d)/B2(e) closure, this modification in combination with this closure could have variable ecological effects.

As described in Chapter 2, alternative B4 would implement complementary HMS management measures in the Madison-Swanson and Steamboat Lumps Marine Reserves, consistent with the recommendations of the Gulf of Mexico Fishery Management Council (GOMFMC) (Figure 4.13). Specifically, this alternative would prohibit fishing for and possessing HMS in the marine reserves from November through April (except when transiting and the gear is stowed). The possession of Gulf reef fish in these areas is already prohibited year-round (except when transiting and the gear is stowed). From May through October, surface trolling would be the only HMS fishing activity allowed. Surface trolling is defined as fishing with lines trailing behind a vessel that is in constant motion, at speeds in excess of four knots, and with a visible wake (according to the Southeast regional regulations; 622.34(k)(5); NMFS is currently proposing to adopt the same definition for surface trolling in the proposed rule associated with this document). Such surface trolling may not involve the use of down riggers, wire lines, planers, or similar devices. The marine reserves are located just shoreward of the Desoto Canyon Closed Area (see Section 2.1.2).

At a July 14 – 17, 2003, meeting, the Gulf Council approved a six-year extension of these two marine reserves, originally implemented in 2000, to protect spawning aggregations of gag grouper. An Environmental Assessment (EA) describing the ecologic, economic, and social impacts associated with the marine reserves was prepared and submitted to the Secretary in August 2003. On September 3, 2003, NMFS received a formal request from the Gulf Council for the Secretary to implement "compatible" regulations for HMS fisheries in these two areas. The final rule, effecting non-HMS fishing activities, published in the Federal Register on May 4, 2004 (69 FR 24532), and became effective on June 3, 2004. It will expire on June 16, 2010. If alternative B4 is implemented, the HMS management measures described above would similarly expire on June 16, 2010.

As described in the EA prepared by the Gulf Council (GOMFMC, August 2003), the purpose of this alternative is to implement compatible HMS regulations in the Madison-Swanson and Steamboat Lumps marine reserves to provide protection for spawning aggregations of gag grouper to prevent overfishing, improve spawning success, protect a portion of the offshore population of male gag grouper, and facilitate continued evaluation of the effect and usefulness of marine reserves as a fishery management tool. These two marine reserves were originally implemented in 2000 by the Gulf Council (for Gulf species) in response to a determination by NMFS that gag grouper were experiencing overfishing and scientific information indicating that the proportion of male gag had declined substantially since the 1970s. A four-year timeframe for the reserves was initially established in 2000, so that their effects could be evaluated before deciding whether to continue with the marine reserves. In 2002, NMFS reclassified gag grouper as neither overfished, nor undergoing overfishing. However, the stock was not at optimum yield. Therefore, the Gulf Council voted to extend the marine reserves an additional six years, for a total of ten years, and to request compatible HMS management measures. This alternative would significantly reinforce the protections afforded gag grouper and other Gulf reef species by closing a potential loophole whereby vessels can currently fish for HMS in the marine reserves.

Closing this loophole will provide the Gulf Council with a better opportunity to evaluate the effectiveness of the marine reserves as a fishery management tool.

As described in the EA (GOMFMC, 2003), anticipated conservation benefits of the marine reserves include the protection of seasonal spawning aggregations of gag grouper, and the year-round protection of a portion of the male gag grouper population. Other reef species that may also benefit from the marine reserves include red grouper, snowy grouper, red snapper, silk snapper, vermillion snapper, scamp, speckled hind, red porgy, knobbed porgy, triggerfish, greater amberjack, honeycomb moray, and bank sea bass. A complete description of the ecological benefits for Gulf reef fish is provided in the EA prepared by the Gulf Council (GOMFMC, August 2003) and is not repeated here. Although this alternative is not specifically intended to provide protection for HMS, it could provide some minor ancillary conservation benefits for HMS as a result of the proposed year-round prohibition on HMS fishing activities in the reserves (except for surface trolling from May through October). Any positive ecological impacts on HMS are expected to be minimal because there has been little reported or observed HMS fishing effort in the area in recent years; however, such complementary management measures would help prevent future potential increases in fishing efforts, thus offering protection to the gag grouper spawning aggregations until 2010. From 1997 to 2003, only one pelagic longline set and two bottom longline sets were reported in the HMS logbook in these areas. All three sets occurred in the Madison-Swanson site. Four swordfish were kept on the pelagic longline set, and eight swordfish were discarded. There were no reported HMS caught on the two bottom longline sets. One bottom longline vessel carried an observer onboard in the Madison- Swanson site. The observed set occurred in 1996 and kept eight sandbar sharks (Shark Bottom Longline Observer Program). In summary, NMFS anticipates positive ecological benefits for gag grouper and other Gulf reef species, as described in the EA prepared by the Gulf Council. Any conservation benefits for HMS, however, are expected to be minor for several reasons, but are expected to enhance the protection for spawning gag grouper aggregations. As described above, very little HMS fishing activity has occurred in recent years in the Madison-Swanson and Steamboat Lumps marine reserves. Because the proposed closure areas are relatively small, any HMS fishing activity that otherwise would have occurred in these areas would likely relocate to nearby open areas with similar catch rates. Furthermore, because possession of Gulf reef species is already prohibited within the areas (except when transiting), bottom longline sets targeting both sharks and Gulf reef species have already likely decreased since initial implementation of the reserves by the Gulf Council in 2000. Finally, recreational and charter/headboat fishing trips for HMS in the proposed marine reserves are not likely to be significantly curtailed due to the allowance for surface trolling from May through October, which are the prime fishing months.

Preferred alternative B5 would establish criteria for regulatory framework adjustments to implement new time/area closures or make modifications to existing time/area closures. These criteria would provide a more definitive process for the establishment or modification of time/area closures while allowing for greater transparency and predictability in the decision making process. Criteria that would be considered may include the following: any ESA-related issues, concerns, or requirements including applicable Biological Opinions; bycatch rates of protected species, prohibited HMS, or non-target species both within the specified or potential closure area (s) and throughout the fishery; bycatch rates and post-release mortality rates of

bycatch species associated with different gear types; applicable research; new or updated landings; bycatch and fishing effort data; social and economic impacts; and the practicability of implementing new or modified closures, including consistency with the FMP, Magnuson-Stevens Act, and other applicable law. If the species is an ICCAT managed species, NMFS would need to determine the overall effect of the United States' catch on that species before implementing time/area closures. In these cases, other factors that NMFS would consider before implementing time/area closures include gear types and the location of and timing of a closed area. NMFS would attempt to balance the ecological benefits with economic and social impacts. NMFS would also consider alternatives to closed areas, such as reducing quota, mandatory gear modifications, or alternative fishing practices such as designated fishing days. Thus, before the implementation of a time/area closure, NMFS would determine that such a closure would be the best option for a given set of management goals, consistent with the FMP, the Magnuson-Stevens Act, and applicable law.

Ultimately, the criteria are aimed to develop smaller, more focused time/area closures that maximize bycatch reduction and catch of target species. The criteria themselves would not be expected to have positive ecological impacts and minimal, to the extent practicable, economic and social impacts.

As a clarification, the primary goals of time/area closures are to maximize the reduction of bycatch or non-target and protected species while minimizing the reduction in the catch of target species. However, closures are not the only means of addressing bycatch and in some cases may increase bycatch (see Table 4.6). Bycatch in and of itself would not necessitate implementation of a time/area closure, but could if the HMS stock was either overfished and/or experiencing overfishing; the bycatch is a prohibited, threatened or endangered species; and no other option exists to reduce interactions in the time period required. In such cases, time/area closures could be part of a rebuilding plan for overfished species and/or serve as a method for decreasing interactions with protected species.

If the public believes that modification to an existing time/area closure or the establishment of a new time/area closure wanted is warranted based on these criteria, they can submit a petition for rulemaking to NMFS. A petition for rulemaking should contain sufficient information for NMFS to consider the substance of the petition. For a petition regarding a new time/area closure or a change or modification to an existing time/area closure, pursuant to 5 U.S.C. § 553(e), the petition should, at a minimum:

- Indicate the area that should be considered as a time/area closure or the current time/area closure that should be modified
- Identify which criteria warrant the addition or modification of a time/area closure
- Provide data, information, etc., relevant to those identified criteria
- State the resources necessary to develop the proposed regulations
- Explain the interest of the petitioner in the action requested
- Indicate the size of the population affected (*i.e.*, who is affected by the action)
- Indicate the public interest in the proposed regulation
- Explain the importance of the action requested to promoting NMFS' established priorities and policies.

Alternative B6 would prohibit the use of all bottom longline gear targeting HMS in an area southwest of Key West to protect endangered smalltooth sawfish (Figure 4.14). Smalltooth sawfish were listed under the ESA in 2001, but critical habitat has not yet been designated. NMFS has assembled a Smalltooth Sawfish Recovery Team (SSRT) comprised of researchers, managers, and representatives from constituent groups to develop a recovery plan for the U.S. population of smalltooth sawfish. Once a plan is completed, NMFS may consider time/area closures to reduce sawfish interactions. Preliminary analysis of some of the SSRT data (Burgess, unpublished data) documented approximately 178 smalltooth sawfish interactions, mainly in state and Federal waters off of the state of Florida, between 1990 and 2004. Of the 178, three (1.7 percent) were caught on hook and line, five (2.8 percent) were caught in shrimp trawl gear, and three were observed while people were swimming. All other interactions (167 out of 178 or 94 percent) occurred with shark bottom longline gear. In addition, the combined Shark Bottom Longline, Gillnet, and Pelagic Observer Programs (POP) only documented one interaction of smalltooth sawfish with gillnet gear in 2003 off the southeast coast of Florida. It should be noted that only one smalltooth sawfish interaction documented in the POP occurred during a bottom longline set. Therefore, since smalltooth sawfish seem to be much more susceptible to bottom longline gear, only bottom longline would be prohibited in this closure.

The interactions with smalltooth sawfish from 1994 to 2003 during the Shark Bottom Longline Observer Program are shown in Figure 4.14. A total of eight smalltooth sawfish were caught on bottom longline gear (out of 1,433 total observed sets) from South Carolina to the west coast of Florida. Given how widely dispersed and few in number the interactions with smalltooth sawfish were, NMFS tried to choose the smallest area possible that would encompass the highest number of interactions. The result was a 49 nm^2 area off the southwest tip of the Key West (Figure 4.15). This area encompasses 18 of the 1,433 total observed sets and is where five of the eight smalltooth sawfish were observed caught with bottom longline gear from 1994 to 2003.

While this area is small compared to the other closures being considered for other species, this closure could have a bycatch reduction of almost 63 percent (five out of eight observed interactions). Given the small size of the closure and the low incidence of smalltooth sawfish bycatch, even with redistribution of fishing effort, there could be a high percentage in bycatch reduction with this closure. The overall reduction would depend on whether sawfish occur regularly in the area, or whether the high number of interactions observed during 1997 were an anomaly. There have been no observed interactions in the area since 1997, and only one observed interaction each year in 1999, 2002, and 2003 in different areas (Figure 4.15). While this closure could have a positive ecological impact percentage-wise (*i.e.*, upwards of 63 percent), this still only translates into five individuals. Of the five observed sawfish interactions that occurred in this area, four were on a single set, highlighting the episodic nature of sawfish interactions. Additionally, seven of eight sawfish were released alive, and one was released in unknown condition. The one sawfish observed caught in the shark gillnet fishery was also released alive. Given the limited amount of data available, it is difficult to determine whether the area being considered would result in overall reduction in interactions, or whether sawfish exhibit a higher degree of mobility, and are as likely to be caught in other areas. A Smalltooth Sawfish Recovery team is currently in the process of identifying sawfish critical habitat, which may be helpful in determining an appropriate closure area in the future.

Alternative B7 would prohibit the use of pelagic longline gear in all HMS fisheries. Prohibiting the use of longlines would likely have positive ecological benefits on HMS, non-target HMS, and protected species. The number of discards would potentially be reduced by 1,047 white marlin, 816 blue marlin, 343 sailfish, 141 spearfish, 11,340 pelagic sharks, 5,524 LCS, 165 leatherback sea turtles, 60 loggerhead sea turtles, and 539 bluefin tuna annually (Table 4.12 and Table 4.19; annual discards were estimated by dividing the total from 'All Areas' by three). The number of targeted species would also be reduced by a significant amount. The number of fish kept would be reduced by 42,500 swordfish, 200 bluefin tuna, 55,734 yellowfin tuna, 12,378 bigeye tuna, and 75, 385 BAYS annually (Table 4.19; total from all areas divided by three). However, elimination of this targeted catch would result in substantial negative social and economic impacts as described below. In addition, any ecological benefits may be lost if ICCAT decides to reallocate U.S. quota to other countries that may not implement as restrictive bycatch reduction measures as the United States. The United States remains a strong market for swordfish, and imports would likely increase with the elimination of domestic commercial swordfish fishery. Therefore, this may ultimately support the fisheries of other countries, as mentioned above, that do not implement restrictive conservation and bycatch reduction methods.

Social and Economic Impacts

Each of the alternatives considered for time/area closures (new or modified) would have varying degrees of social and economic impacts. To determine the potential impacts, NMFS estimated the amount of fishing effort (number of hooks), total number of vessels, landings of target species, and total loss or gain in gross revenues for each species that would be affected by any new closure with and without redistribution of fishing effort. A similar approach was used to predict the economic impact of any potential modifications to existing closures. To estimate the loss (or gain) in gross revenues for a single species, NMFS first estimated the total weight (lb dw) of each species harvested by pelagic longline gear only (Table 4.40) based on data from Section 3.4.6, and then calculated the total weight lost or gained for each species as a result of the closure. Total weight for each species was then multiplied that by the average ex-vessel price ($/lb dw) by area based on 2003 prices (Section 3.5.1). The gross revenues for all species were then added together to estimate a total annual loss or gain in gross revenues as a result of the closure. As described above, the model 'without redistribution of fishing effort' assumes that all fishing effort within a proposed time/area closures is eliminated. While this may not be realistic, it provides a worst-case scenario of the potential economic impacts of any new closure(s). The redistribution of effort analysis, on the other hand, assumes that all fishing effort is displaced into open areas, which also may not be realistic given that a closure of a prime fishing area may force some fishermen out of business. Overall effort may also increase slightly if there is a need to compensate for increased operating costs. Therefore, the actual result may lie somewhere in between. NMFS considered both estimates because they provide a range of potential economic impacts depending upon the response of the pelagic longline industry.

The estimates of gross revenues lost or gained as a result of a closure do not take into account additional costs that may be incurred by having to relocate to new fishing grounds. These costs may be substantial. For example, Alternative B2(d), a closure of nearly the entire Gulf of Mexico would require fishermen to move to the Atlantic, resulting in relocation costs, additional travel and fuel costs, additional crew costs, losses to fish dealers and distributors, and

other associated social and economic costs. Other impacts may include intense competition for existing resources as fishermen are forced into smaller open areas resulting in potential gear conflicts, shifting to other fisheries, or fishermen going out of business. There may also be a concern for species whose landings are predicted to rise substantially with redistribution of effort, and whether those species can sustain a large increase in harvest.

NMFS also examined the impacts of each of the alternatives on gross vessel revenues based on the number of vessels that reported fishing in potential closed areas from 2001 to 2003 (Table 4.33), as well as the number of vessels per state potentially impacted by a particular closure (Table 4.34).

Alternative B1, the No Action alternative to maintain existing closures has, and would likely continue to have, negative economic impacts on the pelagic longline industry. As described earlier, when comparing pre- and post-closure logbook reported data, the existing closures may have contributed to the reported 15 percent decline in fishing effort (Table 4.9), and the ten percent decline in the number of directed and incidental limited access permits from 1,275 permits in 2001 to 1,144 permits in 2005 (Table 3.92 in Section 3.9.2). The number of target species kept has declined by 37.4 percent for bigeye tuna, 27.9 percent for swordfish, 23.5 percent for yellowfin tuna, and 25.1 percent for BAYS tunas (Table 4.7). In addition, there are a number of other species that are frequently targeted by pelagic longline fishermen, and landings of these species have been declining also (Table 4.8). For example, the number of pelagic sharks kept declined by 18.9 percent, LCS by 38.9 percent, dolphin by 25.9 percent, and wahoo by 25 percent. Although an exact figure is not available, the estimated annual loss in gross fishery revenues when compared to other alternatives with similar reductions in target species may have been in the millions of dollars (Table 4.35). However, the decline in landings reflect the period immediately after the closures were implemented, and do not reflect continuing loss of revenue on an annual basis for the fishery.

A number of factors may be contributing to the decline in permits and overall fishing effort including, but not limited to: (1) the time/area closures implemented in 1999 to 2002; (2) an increase in swordfish and tuna imports; (3) a decline in ex-vessel prices for swordfish and some tunas (Table 3.65 in Section 3.5) in combination with increasing fuel and operational costs that may have forced fishermen to curtail fishing effort; and (4) fishermen transitioning to other fisheries to adjust for declining revenues. It is unclear at this point whether the decline in fishing effort and number of permits will continue, or whether the fishery has stabilized at its current level. Given that North Atlantic swordfish stock is estimated to be at 94 percent of B_{MSY} (SCRS, 2004), overfishing is no longer occurring, and there have been large underharvests in recent years resulting in an ever larger quota, it is possible that effort may stabilize and possibly increase despite the existence of current time/area closures.

Alternative B2(a), a closure from May through November, would potentially impact a total of 61 vessels that reported fishing in the area from 2001 - 2003, or an average of 46 vessels per year (Table 4.33). A total of 2,918 sets were reported from 2001 - 2003, or an average of 973 sets per year (Table 4.33). Without redistribution of effort, alternative B2(a) would potentially result in an 11.4 percent decline in fishing effort, and reductions in landings of target species ranging from a minimum of 1.1 percent for bigeye tuna to a maximum 14.3 percent for

yellowfin tuna. For yellowfin tuna, the most lucrative species affected by a Gulf of Mexico closure, this would amount to a loss of $1,796,654 in annual gross revenues based on Gulf of Mexico prices (Table 4.35). Swordfish landings would potentially decrease by 3.1 percent for a loss of approximately $423,382, bluefin tuna landings would decrease by 6.7 percent for a loss of $60,791, and bigeye tuna landings would decrease by 1.1 percent for a loss of approximately $18,190 (Table 4.35). Thus, the combined total loss in gross revenues for alternative B2(a) without redistribution of effort would be approximately $2,299,018 annually (Table 4.35), or $49,978 per vessel annually ($2,299,018 / 46 vessels). Of the three major states bordering the Gulf of Mexico with vessels permitted to fish for HMS with pelagic longline gear (Florida, Louisiana, Texas), Louisiana had the highest number of vessels (40 out of 61, or 66 percent) that fished in the area from 2001 - 2003 (Table 4.34). The vessels with homeports in Louisiana also reported a majority (88 percent) of all sets in the area.

With redistribution of fishing effort, alternative B2(a) is predicted to result in an increase in all targeted species landings and gross revenues except yellowfin tuna, which are predicted to decrease by 1.1 percent for a loss of approximately $138,204 annually (Table 4.35). Swordfish landings, on the other hand, would potentially increase by 9.1 percent for a gain in gross revenues of $1,242,832. Similarly, bluefin and bigeye tuna gross revenues are predicted to increase by $27,871 and $72,383 respectively (Table 4.35). Thus, the combined total gain in gross revenues for alternative B2(a) with redistribution of effort would be approximately $1,204,883 annually (Table 4.35), or $26,193 per vessel annually ($1,204,883 / 46 vessels).

These results reflect differences in abundance and CPUEs for different HMS in different regions, and the variability in landings and economic estimates with redistribution of effort. For example, the entire Gulf of Mexico accounted for 68.8 percent of all yellowfin tuna landings, 57.6 percent of all bluefin tuna landings, but only 22.8 percent of all swordfish landings from 2001 - 2003 (Table 4.38). As a consequence, with redistribution of effort outside of the Gulf of Mexico, yellowfin tuna landings would be expected to decrease and swordfish landings to increase. In the event that effort is displaced into open areas of the Gulf of Mexico only, NMFS analyzed the landings from alternative B2(a) in comparison to landings from the Gulf of Mexico only (as opposed to overall landings from the Atlantic and Gulf of Mexico). Without redistribution of effort, landings of all targeted species are predicted to decrease with a total loss in gross revenues of $5,003,298 (Table 4.39), or $108,767 per vessel annually ($5,003,298 / 46 vessels). With redistribution of effort, there would be an increase in all targeted species kept except bigeye tuna resulting in a predicted increase in gross revenues of $679,212 (Table 4.39), or $14,765 per vessel annually ($679,212 / 46 vessels). Incidentally caught bluefin tuna and targeted bigeye tuna are the only two species for which landings are predicted to decrease by 0.8 percent and 8.7 percent, respectively, with redistribution of effort in the Gulf of Mexico only. Thus, the predicted economic impacts to gross revenues for the fleet could range from a loss of approximately $5.0 million to a gain of approximately $1.2 million.

The apparent increase in landings and gross revenues for several of the species with redistribution of effort in the Gulf of Mexico only is somewhat surprising, and may point to the fact that tunas other than bluefin and bigeye tuna are more likely to be caught outside the alternative B2(a) area. This may indicate that fishermen are targeting not only yellowfin tuna, which has the highest overall economic value, but also bluefin tuna. In other words, even though

catch rates for yellowfin tuna may be higher outside the alternative B2(a) area, fishermen may be targeting the area for the increased opportunity to catch an occasional bluefin tuna. The incidental catch limit in all areas, at all times, is 2,000 lb to retain one bluefin tuna, 6,000 lb to retain two bluefin tuna, and 30,000 lb to retain three bluefin tuna. Analysis of both the observer program and logbook data indicate that the central Gulf of Mexico is one of the prime areas for bluefin tuna discards, as well as bluefin and yellowfin tuna landings. NMFS is concerned about the potential negative economic impacts of closing this prime fishing ground for tunas as well as indications that PLL vessels may be targeting bluefin tuna (as incidental only species). By comparison, alternative B2(b) could result in a much higher reduction in bluefin tuna discards, with a much lower decrease in overall landings than alternative B2(a). Additionally, anecdotal information suggests that a proportion of the Gulf of Mexico pelagic longline fishing fleet is comprised of Vietnamese fishermen, who may be reluctant to leave their traditional homeports and would likely stay in the Gulf of Mexico (Wilson *et al*., 1998; NMFS, 2004) perhaps making a redistribution model of effort in the Gulf of Mexico more realistic. Closing this area could thus have potential social impacts in addition to economic impacts.

Alternative B2(a), and most of the other time/area closures described in this section, could have numerous social impacts ranging from disruption of local fishing communities to relocation of vessels and homeports, loss of crew, and other social hardships associated with loss of income. A majority of the vessels (66 percent) impacted by alternative B2(a) have a homeport in Louisiana (Table 4.34), whereas 23 percent have a homeport in Florida and 11 percent have a homeport in Texas. Depending on the analysis used in estimating gross fishery revenues, revenues could range from a loss of $5.0 million to a gain of approximately $1.2 million. Thus, the homeports and communities associated with those homeports in TX, LA, and FL could experience either loss of fishery revenues and social hardship associated with the loss, or they could potentially benefit from increased revenues. Given that this is the smallest closure considered for the Gulf of Mexico, the types of impacts described above would be similar for most other alternatives, although the scale of impacts from other alternatives considered would likely be greater.

Alternative B2(b), would potentially impact a total of 20 vessels that fished in an area of the Northeast from 2001 - 2003, or an average of 10 vessels per year. There were a total of 226 sets reported from 2001 - 2003, or an average 75 sets per year (Table 4.33). Without redistribution of effort, alternative B2(b) would potentially result in a 0.9 percent decrease in fishing effort, with reductions in landings of target species ranging from a minimum of 0.3 percent for yellowfin tuna to a maximum 1.8 percent for incidentally caught bluefin tuna (Table 4.11). Swordfish landings would potentially decrease by 1.5 percent for a loss of approximately $231,252, yellowfin tuna landings would decrease by 0.3 percent for a loss of $27,102 and bigeye tuna landings would decrease by 1.5 percent for a loss of approximately $26,011. Thus, the combined total loss in gross revenues for a alternative B2(b) closure without redistribution of effort would be approximately $299,120 annually (Table 4.35), or $29,912 per vessel annually ($299,120 / 10 vessels). Vessels with homeports in ten different states reported landings from the area in 2001 – 2003, with the highest number of vessels from New York (Table 4.34).

With redistribution of fishing effort, alternative B2(b) is predicted to result in a decrease in all targeted species landings and gross revenues except yellowfin tuna, which are predicted to

increase by 0.9 percent for a predicted gain of approximately $81,306 annually (Table 4.35). Swordfish landings would potentially decrease by 0.8 percent for a loss in gross revenues of $123,334, and bigeye tuna and incidental bluefin tuna gross revenues are predicted to decrease by $81,306 and $9,837 annually, respectively. Thus, the combined total loss in gross revenues for alternative B2(b) with redistribution of effort would be approximately $72,675 annually (Table 4.35), or $7,267 per vessel annually ($72,675 / 10 vessels).

Alternative B2(c), would potentially impact a total of 75 vessels that fished in the area from 2001 - 2003, or an average of 64 vessels per year. A total of 12,623 sets were reported from 2001 - 2003, or an average 4,207 sets per year (Table 4.33). Without redistribution of effort, alternative B2(c) would potentially result in a 13.4 percent decrease in fishing effort, and reductions in landings ranging from a minimum of 0.2 percent for bigeye tuna (kept) to a maximum 29.0 percent for incidentally-caught bluefin tuna (kept) (Table 4.11). For yellowfin tuna, the most lucrative species affected by alternative B2(c), a 19.8 percent reduction in landings would amount to an estimated loss of $2,483,678 annually based on Gulf of Mexico prices (Table 4.35). Swordfish landings would potentially decrease by 2.8 percent for a loss of approximately $384,981, and incidental bluefin tuna landings would decrease by 29.0 percent for a loss of approximately $263,563 annually (Table 4.35). Thus, the total loss in gross revenues for alternative B2(c) without redistribution of effort, would be approximately $3,136,229 annually (Table 4.35), or $49,003 per vessel annually ($3,136,229 / 64 vessels). Similar to alternative B2(a), a majority of the vessels that would be affected by the closure were from Louisiana (Table 4.34).

With redistribution of fishing effort, alternative B2(c) is predicted to result in a decrease in bluefin and yellowfin tuna landings of 18.3 and 11.0 percent respectively, for estimated losses of approximately $166,040 and $1,382,042 annually (Table 4.35). Swordfish and bigeye tuna landings would potentially increase by 21.1 and 11.4 percent respectively for a gain in gross revenues of approximately $2,881,732 and $317,372 annually, respectively. Thus, there would be a net gain in gross revenues for alternative B2(c) with redistribution of effort of approximately $1,651,023 annually (Table 4.35), or $25,797 per vessel annually ($1,651,023 / 64 vessels).

Alternative B2(d), closing all areas west of 86 degrees W. Long. to pelagic longlining in the Gulf of Mexico, would potentially impact a total of 78 vessels that fished in the area from 2001 - 2003, or an average of 65 vessels per year. A total of 12,897 sets were reported from 2001 - 2003, or an average 4,299 sets per year (Table 4.33). Without redistribution of fishing effort, alternative B2(d) would potentially result in a 47.4 percent decrease in fishing effort, and reductions in landings ranging from a minimum of 3.5 percent for bigeye tuna to a maximum of 64 percent for yellowfin tuna (Table 4.11). For yellowfin tuna, this would amount to an estimated loss of $8,035,791 annually. The total loss for all species combined would be approximately $10,638,133 annually (Table 4.35), or $163,663 per vessel annually ($10,638,133 / 65 vessels). The closure of a major portion of the Gulf of Mexico would have the largest impact on Louisiana, where approximately 56 percent of all the vessels that reported 72 percent of all sets from the area have their homeports (Table 4.34).

With redistribution of fishing effort, alternative B2(d) is predicted to result in an overall increase in gross revenues of approximately $6,079,756 annually, or $93,534 per vessel, due primarily to the large potential increase in swordfish landings (62.5 percent) and bigeye tuna landings (80.6 percent) that are predicted to occur with redistribution of effort (Table 4.35). As discussed earlier, these estimates do not take into account fishermen who may not relocate to open areas in the Atlantic, but may instead stay in the Gulf of Mexico where competition for existing resource may be intense, potentially resulting in fishermen going out of business.

Alternative B2(e), a 46,956 nm^2 closure in the Northeast, would potentially impact a total of 49 vessels that fished in the area from 2001 - 2003, or an average of 35 vessels per year. A total of 2,587 sets were reported from 2001 - 2003, or an average 862 sets per year (Table 4.33). Without redistribution of effort, total gross revenues losses would amount to approximately $3,234,660 annually (Table 4.35), or $92,418 per vessel annually ($3,234,660 / 35 vessels). With redistribution of effort, gross revenues losses are predicted to total $820,132 annually (Table 4.35), or $23,432 per vessel annually ($820,132 / 35 vessels).

NMFS also considered combining alternatives B2(a) and B2(b), as well as alternatives B2(d) and B2(e), as described earlier under ecological impacts, to maximize bycatch reduction. Combining closures B2(a) from May through November and B2(b) in June only, resulted in the highest overall reduction in bycatch for the largest number of species under consideration. Combining these alternatives would potentially impact a total of 81 vessels that fished in the area from 2001 - 2003. A total of 3,144 sets were reported from 2001 – 2003 (Table 4.33). Without redistribution of effort, the economic impact of combining these closures would be a decrease in landings of all targeted species for a loss of $5,428,120 annually (Table 4.35), or $96,930 per vessel annually ($5,428,120 / 56 vessels). With redistribution of effort, the landings of all targeted species are predicted to increase. The percent increase ranged from a minimum 0.3 percent for yellowfin tuna to a maximum of 10.0 percent for bigeye tuna. The result would be an increase in total gross revenues of approximately $1,091,570 annually (Table 4.35), or $19,492 per vessel annually ($1,091,570 / 56 vessels). Thus, the overall economic cost of combining alternatives B2(a) and B2(b) could potentially range from a loss of $5.42 million to a gain of $1.09 million. Given that the actual decline in overall effort of previously enacted time/area closures was nearly twice what was predicted (Section 3.8.9), the combined closures are likely to have a substantial negative economic impacts. When considering the comparatively low numbers of leatherback and loggerhead sea turtle interactions, and bluefin tuna and white marlin discards that would avoided by this closure, the economic costs appear to be high in comparison to the ecological benefits.

Combining closures B2(d) and B2(e) year-round would potentially impact a total of 127 vessels that fished in the area from 2001 - 2003. A total of 15,484 sets were reported from 2001 – 2003. Without redistribution of effort, the economic impact of combining these closures would be result in a decrease in landings for a loss of $13.8 million annually (Table 4.35), or $109,234 per vessel annually ($13,872,793 / 127 vessels). With redistribution of effort, the landings of swordfish and bigeye tuna are predicted to increase, whereas the remaining species are predicted to decrease. The percent increase ranged from a minimum 63.1 percent for swordfish to a maximum of 78.4 percent for bigeye tuna (Table 4.11). The result would be an increase in total gross revenues of approximately $7,600,416 annually (Table 4.35), or $58,845 per vessel

annually ($7,600,416 / 56 vessels). Thus, the overall economic cost of combining alternatives B2(a) and B2(b) could potentially range from a loss of $13.8 million to a gain of $7.6 million.

In addition to any economic impacts, there could be a range of social impacts from disruption of local fishing communities to relocation of vessels and homeports as a result of any additional closures. Anecdotal information suggests that many pelagic longline fishermen own several permits in addition to HMS limited access permits and engage in other fisheries during periods when they are not pursuing HMS. Thus, fishermen have had to diversify to continue to meet financial obligations and remain in business. Any additional economic hardship such as a time/area closure could potentially result in fishermen going out of business.

The modifications to the two closed areas, B3(a) and B3(b), would potentially result in positive social and economic impacts. Re-opening areas of either closure would allow fishermen access to previously closed fishing grounds, resulting in increased landings of targeted species. In addition, the modified area of B3(b) would be inshore, which would allow fishermen to have access to nearshore fishing grounds, reducing fuel costs and time at sea. However, this may create gear conflicts between recreational and commercial fishermen. Conversely, the modified area of B3(a) would be along the axis of the Gulf Stream, which would afford recreational fishermen closed portions inshore and allow pelagic longline gear to fish in re-opened areas offshore.

Alternative B3(a), the Charleston Bump modification, would potentially result in a 0.5 percent increase in fishing effort based on 1997-1999 logbook data. The most prominent increase in landings would be for swordfish (1.1 percent; Table 4.29). This potential increase could result in increased revenue of $220,806 annually for swordfish alone (Table 4.36). In addition, the modification could result in increased landings of yellowfin tuna (0.16 percent; Table 4.29) and bigeye tuna (0.02 percent; Table 4.29). The total increase in potential revenues from increased landings resulting from this modification would be $234,460 annually (Table 4.36).

Alternative B3(b), the NEC modification, would potentially result in a very small increase in fishing effort (0.01 percent; Table 4.30). As with B3(a), the largest increase in landings would be for swordfish, which would translate into an increase in an annual revenue of $482 (Table 4.36). There is also a small predicted increase in yellowfin tuna landings; however, the total increase in revenue associated with this modification is $550 annually (Table 4.36). While this is small in comparison to B3(a), this modification serves as a way for NMFS to pinpoint areas of high bycatch and refine current closed areas.

While NMFS considered each alternative individually, there is the possibility that a closure, or a combination of closures, could also be implemented in concert with a potential modification to a closed area. Since the potential modifications would most likely have positive social and economic impacts, any combination of closures with potential modifications would result in an increase in revenue. In addition, re-opening portions of previously closed areas while implementing new closures would help mitigate any negative social and economic impacts of closing additional fishing grounds. When looking at revenues associated with the potential closures after the consideration of the redistribution of fishing effort (Table 4.35), B3(a), in

combination with most of the potential closed areas or combinations of potential closed areas, would result in a net increase in revenue (Table 4.35 and Table 4.36). The largest increase in annual revenue would be the B2(d)/B2(e) closure combination with the B3(a) modification ($7,834,876), or the B2(d) closure and the B3(a) modification ($6,314,216; Table 4.35 and Table 4.36). Conversely, the greatest loss in annual revenue would result from the B2(e) closure and the B3(a) modification ($-585,672; Table 4.35 and Table 4.36). Similarly, the B3(b) modification would result in the largest increases in annual revenue if combined with the B2(d)/B2(e) closure combination ($7,600,966) or the B2(d) closure ($6,080,306; Table 4.35 and Table 4.36). The greatest loss in annual revenue would also result from the B2(e) closure and the B3(b) modification ($-819,582; Table 4.35 and Table 4.36). One drawback to such combinations of closed areas and modifications would be the difficulty of compliance by the public and subsequent enforcement. Such combinations of closures and modifications during different time periods could add complex regulations for the public to adhere to and enforcement to monitor.

The preferred alternative B4 to implement complementary HMS management measures in Madison-Swanson and Steamboat Lumps Marine Reserves could potentially impact commercial and recreational fishery participants that have (1) traditionally harvested HMS from the two proposed marine reserves, (2) provided charter or headboat trips for HMS to the areas, and (3) harvested HMS from the two areas, or would be expected to harvest HMS from the two areas prior to the sunset date associated with this alternative (June 16, 2010).

As described above, from 1997 – 2003, only one pelagic longline set and two bottom longline sets were reported in the HMS logbook in these areas (Figure 4.13). All three sets occurred in the Madison-Swanson site. Four swordfish were kept on the pelagic longline set, and eight swordfish were discarded. With regard to observer data, only one set was observed within the areas from 1994 – 2003, out of a total of 1,433 observed sets in the Shark Bottom Longline Observer Program during that period. These data indicate that comparatively little HMS commercial fishing activity has historically occurred within these two areas, although some sandbar sharks and swordfish have been caught. Most HMS fishing activity has been reported to the west of Madison-Swanson and Steamboat Lumps.

The EA prepared by the Gulf Council estimated that the Council's closures could affect 356 commercial fishing vessels that reported fishing in the larger Statistical Areas 6 or 8, in the snapper/grouper logbook and unknown number of for-hire vessels. The Council's closures were projected to reduce total gross revenues of commercial vessels fishing primarily in the snapper-grouper and reef fish fishery by $352,000 annually, based upon pre-closure fishing information. This was estimated to represent approximately one percent to four percent of individual gross vessel revenues if equally divided among the 356 affected vessels, or two percent to five percent of individual gross vessel revenues if 59 trap vessels (which fish in shallower waters) are excluded from the universe of affected vessels. The vast majority of the revenues derived from these areas were from landings of shallow-water groupers and other reef fish. In 2001 and 2002, coastal migratory pelagics represented only 2.1 percent of gross revenues derived from Statistical Areas 6 and 8. Based upon this information, Shark Bottom Longline Observer Program data, and reported sets in the Pelagic Longline Logbook, NMFS does not anticipate any significant reduction in gross vessel revenues associated with implementing complementary HMS

regulations in the Madison-Swanson and Steamboat Lumps marine reserves beyond those already projected in the Gulf Council EA (GOMFMC, 2003). Because the proposed closure areas are relatively small, any HMS fishing activity that otherwise would have occurred in these areas would likely relocate to nearby open areas with similar catch rates.

The extent of HMS recreational and charter/headboat fishing activity within the marine reserves is unknown. It is, therefore, not possible to provide an estimate of the impacts of the two marine reserves on the gross revenues and profits of charter/headboat vessels. However, given the interest this topic generated among the recreational fishing community during 2003 Gulf Council deliberations on extending the duration of the marine reserves, it may be inferred that traditionally there has been some HMS recreational fishing activity within these areas. The Gulf Council recommended that NMFS implement compatible regulations that would provide for a seasonal allowance (May – October) for surface trolling to partially alleviate any negative social or economic impacts associated with the marine reserves. Because this alternative includes the seasonal surface trolling allowance, it is not expected to substantially impact the HMS recreational and charter/headboat sector. These months coincide with a period of increased HMS recreational fishing activity in the western Gulf of Mexico. This alternative strives to balance the need to ensure adequate conservation benefits with minimizing regulatory effects that is not expected to adversely affect reef fish species.

Preferred alternative B5 would establish criteria for regulatory framework adjustments to implement new time/area closures or make modifications to existing time/area closures. This alternative would help provide greater transparency and predictability in the decision making process and would allow fishermen to plan for future changes.

Although there are no direct economic impacts resulting from the establishment of the criteria themselves, the implementation of new closures or modification of existing closures could have variable economic impacts. Positive economic impacts could result from modifications or removals of time/area closures, which would reopen areas to commercial fishing. Such modifications could allow fishermen to more readily utilize target stocks, resulting in additional economic opportunity for fishermen. However, modifications to current time/area closures (*i.e.*, opening up current closures) could lead to negative social impacts if there are gear conflicts involved between recreational and commercial fishermen. Additional closures could also result in negative economic impacts in the short-term. Since the economic and social impacts related to the criteria are difficult to predict, specific economic and social impacts would be analyzed when a particular closure is contemplated.

There are expected to be minimal negative economic or social impacts due to alternative B6, the closure off the southwest tip of Key West to bottom longline gear to protect smalltooth sawfish. Since this closure is small in size, it is expected to affect very few bottom longline fishermen. For instance, 18 sets of the total 1,433 sets observed by the Shark Bottom Longline program from 1994 - 2003 occurred in the potential closed area. The level of observer coverage has ranged from approximately 1.6 percent (based on the number of hooks set) to four percent (based on LCS landings) of the HMS-permitted bottom longline vessels. Using a mid-range value of observer coverage (2.8 percent), it is estimated that approximately 51,179 HMS commercial bottom longline sets (1,433 sets / 2.8 percent observer coverage) occurred during

this time, with 642 sets occurring in the closure area (18 sets / 2.8 percent observer coverage). Since bottom longline vessels in the Gulf of Mexico soak their gear an average of 11.25 hr/set (Burgess and Morgan, 2003), NMFS estimates that each vessel would have made one set per day. Thus, the closed area could affect 1.3 percent (642 sets / 51,179 sets) of the sets based on the number of sets between 1994 - 2003 or approximately 64 fishing days a year for the entire HMS bottom longline fleet (*i.e.*, 642 sets / 10 years ~ 64 sets per year).

In addition, the closed area would help reduce the number of interactions with smalltooth sawfish by the bottom longline fishing industry, thereby helping the bottom longline industry stay below their Incidental Take Statement (ITS) for smalltooth sawfish (which is 260 interactions over five years with no reported fishing mortalities). Staying below the ITS will have positive economic and social impacts by keeping the entire bottom longline fishery open and operating, allowing economic gain by the bottom longline fishermen and their associated communities.

Alternative B7, which would prohibit pelagic longlining in all areas, would potentially impact a total of 177 active vessels that made 30,409 sets from 2001 – 2003 (Table 4.33). Active vessels are defined as vessels that reported landings in the PLL logbook during the years in question. It would have immediate and significant economic and social impacts on the longline vessel owners, vessel operators, and crew that would need to re-rig their vessels to continue fishing for HMS, find alternative fisheries, or discontinue fishing. It would also negatively impact dealers that purchase fish from pelagic longline vessels, and families who own the fishing vessels that would either have to re-rig or discontinue fishing. It would also indirectly impact the local communities that support the pelagic longline fishery. In 2003, the total fishery revenue was $49.9 million for tunas and $14.6 million for swordfish (Table 3.65 in Section 3.5.1.2). In 2003, the pelagic longline fishery accounted for annual gross revenues of $14.5 million for swordfish, $848,614 for bluefin tuna, $8.8 million for yellowfin tuna, and $1.6 million for bigeye tuna based on average ex-vessel prices ($/lb dw) for 2003 (Table 4.40 and Table 3.65 in Section 3.5.1.2). Thus, closing the pelagic longline fishery would result in, at a minimum, a loss of $25.8 million in revenue. However, this does not include revenue lost from sharks and other tunas and finfish landings. In addition, this estimate does not take into account the negative indirect economic and social impacts that small local businesses and fishing communities, which support the pelagic longline industry, will also experience from such an industry closure.

In addition, under ATCA, the United States cannot implement measures that have the effect of raising or lowering quota, although NMFS has the ability to change the allocation of that quota among different gear groups. The swordfish fishery is confined, by regulation, to three gear types: harpoon, longline, and handlines. Since it is unlikely that the hand gear sector would be able to catch the quota given the size distribution of the stock, prohibiting longline gear would essentially have the effect of hindering the ability of U.S. fishermen to harvest the full quota. It would also have the effect of reducing traditional participation in the swordfish fishery by U.S. vessels relative to the foreign competitors because the United States would harvest the vastly reduced proportion of the overall quota.

Conclusion

Alternatives B4 and B5 are currently the preferred alternatives. Alternative B4 would establish complementary HMS regulations in the Madison-Swanson, Steamboat Lumps marine preserve with minimal ecological, economic, or social impacts. Alternative B5 would establish criteria that would guide future decision-making regarding implementation or modification of time/area closures. This would provide enhanced transparency, predictability, and understanding of HMS management decisions, allow for more adaptive management, and should result in minimal social and economic impacts. Any impacts for specific closures would be analyzed when those closures are considered.

At this time, the other alternatives are not preferred for a variety of reasons. The ecological benefits of alternatives B2(a) through B2(e) are predicted to be minimal, with potential negative ecological impacts to several species with redistribution of effort. With redistribution of effort, each of these alternatives (B2(a) through B2(e)) would result in an increase in bycatch of at least one, and in several cases more than one of the species considered (Table 4.6). For example, alternative B2(a) (May - Nov), intended primarily to reduce leatherback sea turtle interactions, and white marlin and bluefin tuna discards, would result in a 7.9 percent increase in loggerhead sea turtle interactions and a 10.3 percent increase in bluefin tuna discards. Discards for the B2(a) year-round closure were predicted to increase for several species as well. Even when closure areas were combined, the result was an increase in discards of several species with redistribution of effort. For example, combining alternatives B2(a) (May – Nov) with B2(b) (June only) would result in a 1.5 percent increase in sailfish, 9.6 percent increase in pelagic sharks, and 10.1 percent increase in LCS discards. Combining alternatives B2(d) with B2(e) (year-round) would result in a 6.5 percent increase in white marlin, a 12.1 percent increase in spearfish discards, and a 4.8 percent increase in loggerhead sea turtle interactions.

Since HMS and protected species are not uniformly distributed throughout the ocean, but tend to occur in higher concentrations in certain areas, a closure in one area might reduce the bycatch of one or two species, but may increase bycatch of others. In considering the bycatch of several species (blue and white marlin, sailfish, spearfish, pelagic sharks, LCS, bluefin tuna, leatherback and loggerhead sea turtles), NMFS did not find any alternatives that reduced bycatch for all species across the board. Furthermore, the economic impacts of each of the alternatives may be substantial, ranging in losses of up to several million dollars annually, depending upon the alternative, and displacement of a significant number of fishing vessels. Even when alternatives were combined in an attempt to maximize bycatch reduction, the ecological benefits were minimal at best, with increases in discards of some species.

Alternatives B3(a) and B3(b) were considered as ways to refine existing closures so as to provide additional opportunity to harvest legal-sized swordfish while not increasing bycatch. These alternatives were not preferred because they would have minimal economic impacts, since very few target and non-target HMS were reported in the areas considered for reopening. Moreover, the two alternatives were considered primarily as a means to offset any negative

economic impacts resulting from new time/area closures. The modifications to existing closures would only have been implemented if there were an overall reduction in bycatch for most species being considered. Since no new closures are preferred in this amendment, NMFS does not believe that reopening of existing closures is warranted at this time.

Alternative B6, to prohibit bottom longline gear in an area southwest of Key West to protect endangered smalltooth sawfish is not preferred due to the low number of observed interactions with BLL gear, the highly variable and episodic nature of interactions with smalltooth sawfish, and the fact that all of the smalltooth sawfish observed caught on BLL gear were released alive (one was released in unknown condition). Only one smalltooth sawfish has been observed in the shark gillnet fishery and it was also released alive. There is also a lack of current information on smalltooth sawfish critical habitat. Once critical habitat has been designated by the Smalltooth Sawfish Recovery Team, NMFS may consider a closure in areas where bottom longline or other HMS gears overlap with critical habitat.

Finally, while alternative B7 (close all areas to pelagic longline gear in HMS fisheries) would result in the greatest short-term ecological benefits of all the alternatives, it could potentially result in an increase in discards if the U.S. quota is reallocated to other countries. It would also have severe economic impacts on permit holders in multiple communities and states ranging from Maine to Texas. As described above under Social/Economic consequences, in recent years there have been 177 active pelagic longline vessels with annual gross fishery revenues in excess of $25 million in 2003. This alternative would have a significant impact on communities, individuals and small businesses. NMFS is not preferring eliminating the entire pelagic longline fishery at this time because of the significant economic impacts, the potential effect of shifting quota to other countries, and the likely increase in bycatch of both HMS and protected species. NMFS is addressing bycatch and bycatch mortality in other sections of this FMP (Chapters 6, 7, 8, and 9 and other sections within Chapter 4 such as workshops and Atlantic billfish).

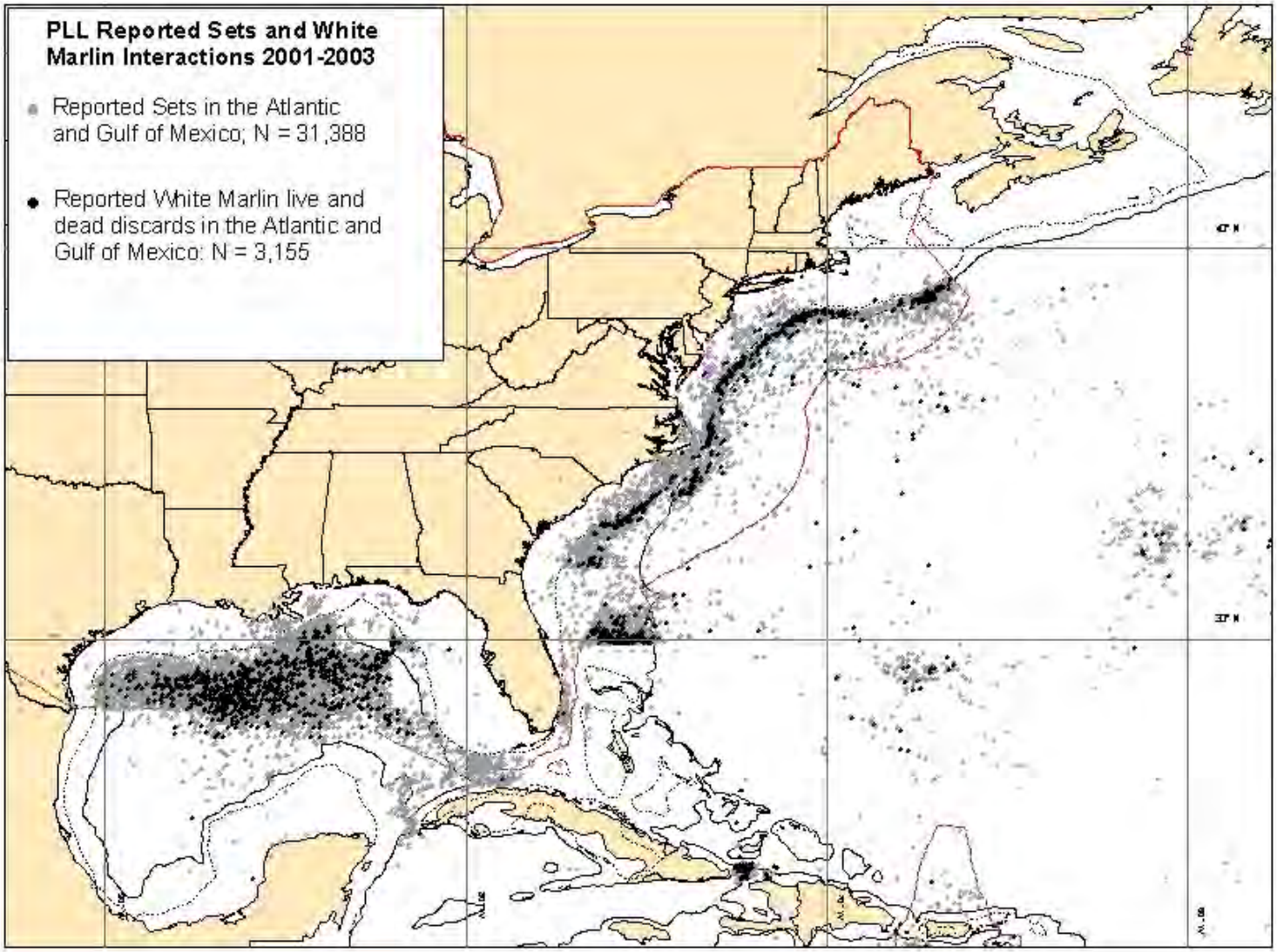

Figure 4.1 **Map showing all reported sets and white marlin interactions.** Source: Pelagic Longline Logbook 2001-2003.

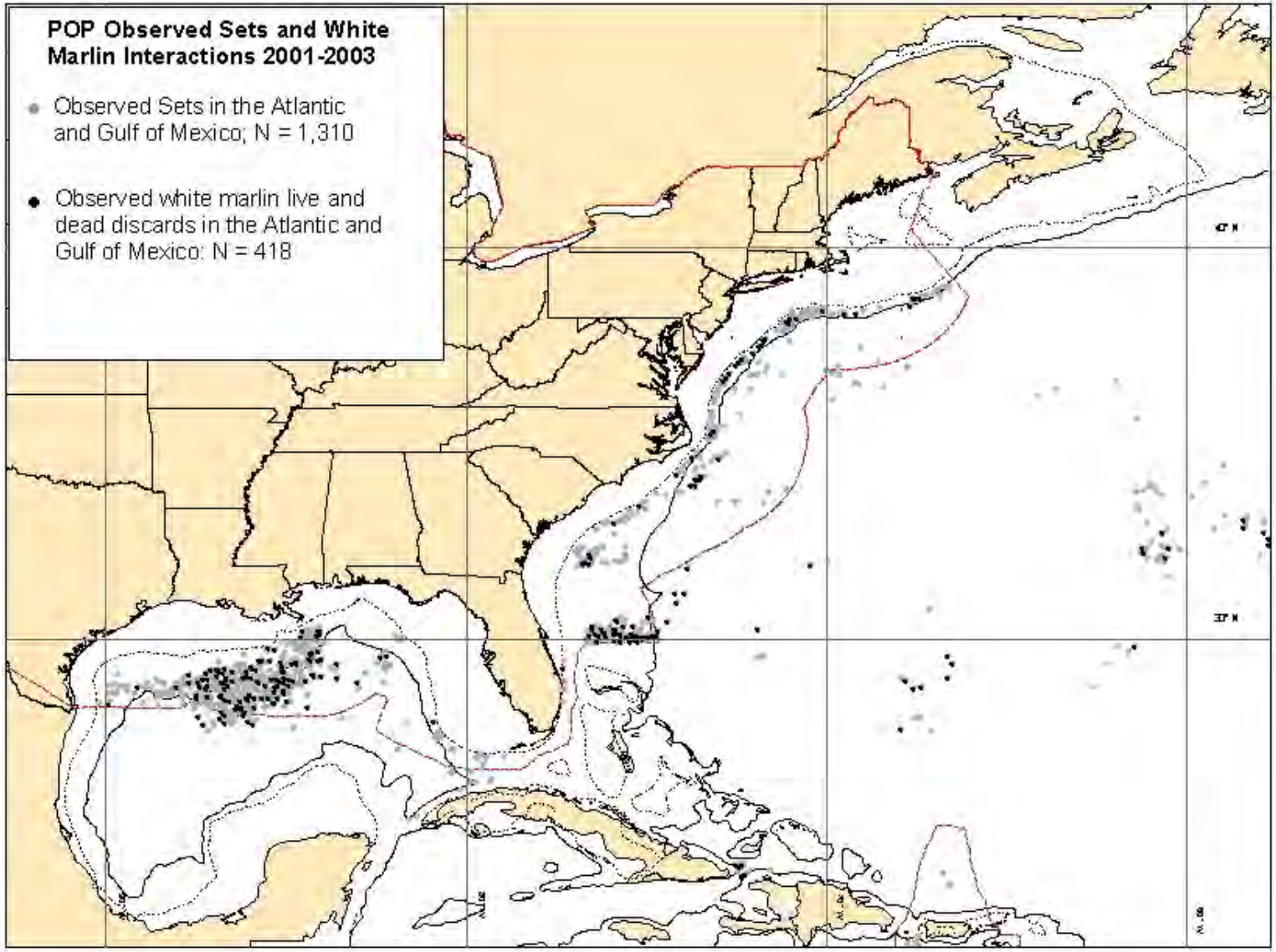

Figure 4.2 **Map showing all observed sets and white marlin interactions.** Source: Pelagic Observer Program 2001-2003.

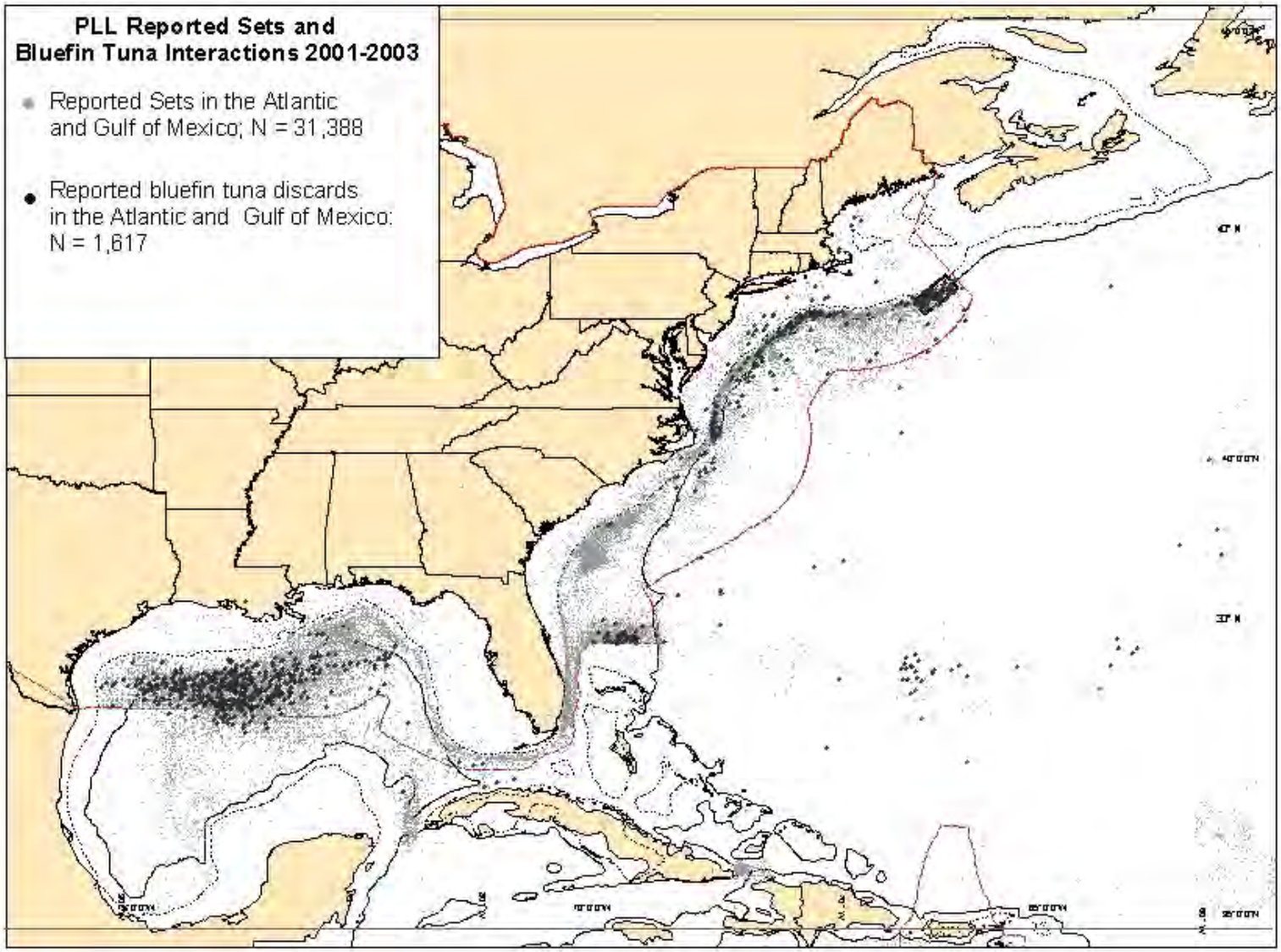

Figure 4.3 **Map showing all reported sets and bluefin tuna discards.** Source: Pelagic Longline Logbook 2001-2003.

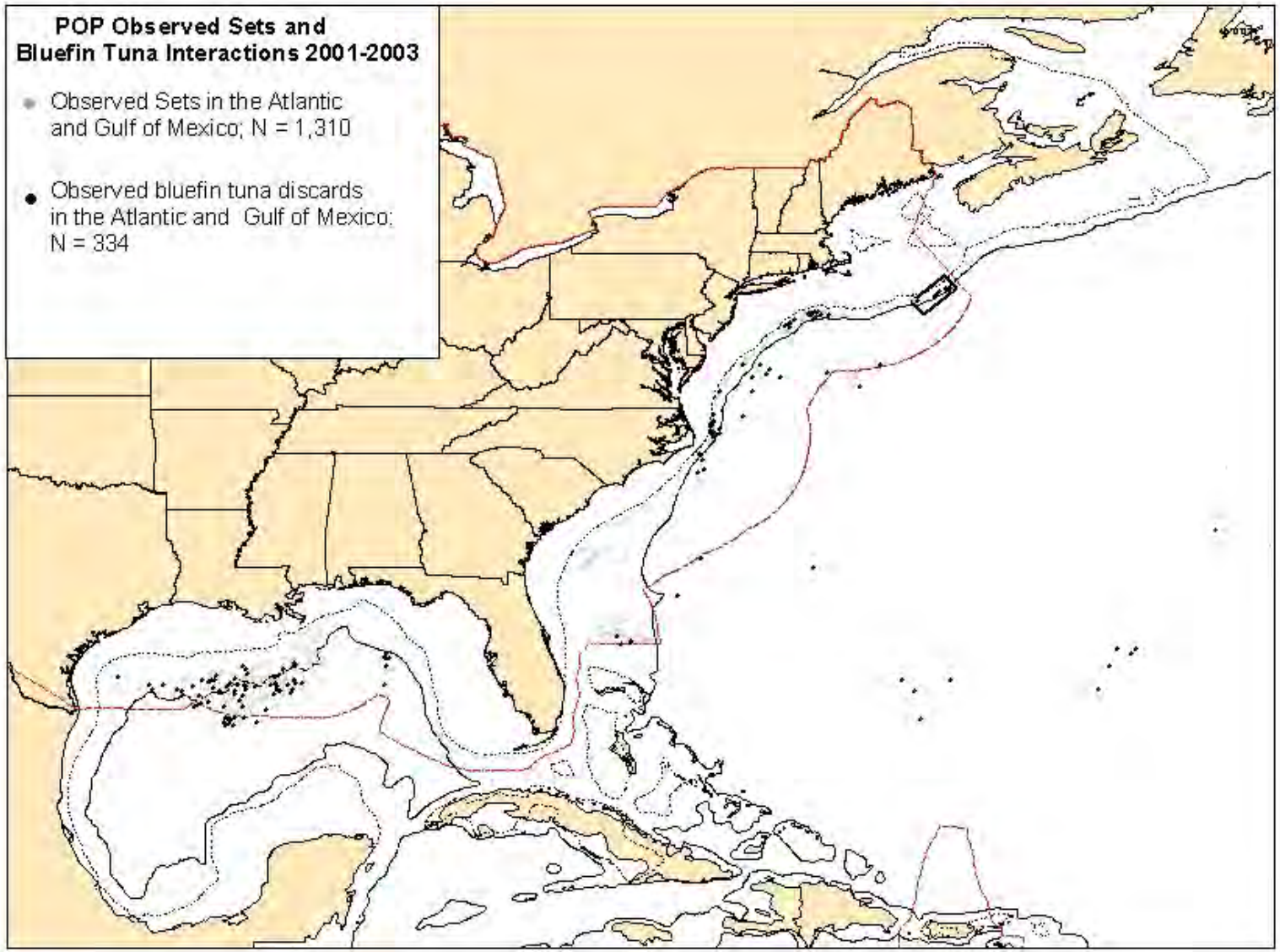

Figure 4.4 **Map showing all observed sets and bluefin tuna discards.** Source: Pelagic Observer Program 2001-2003.

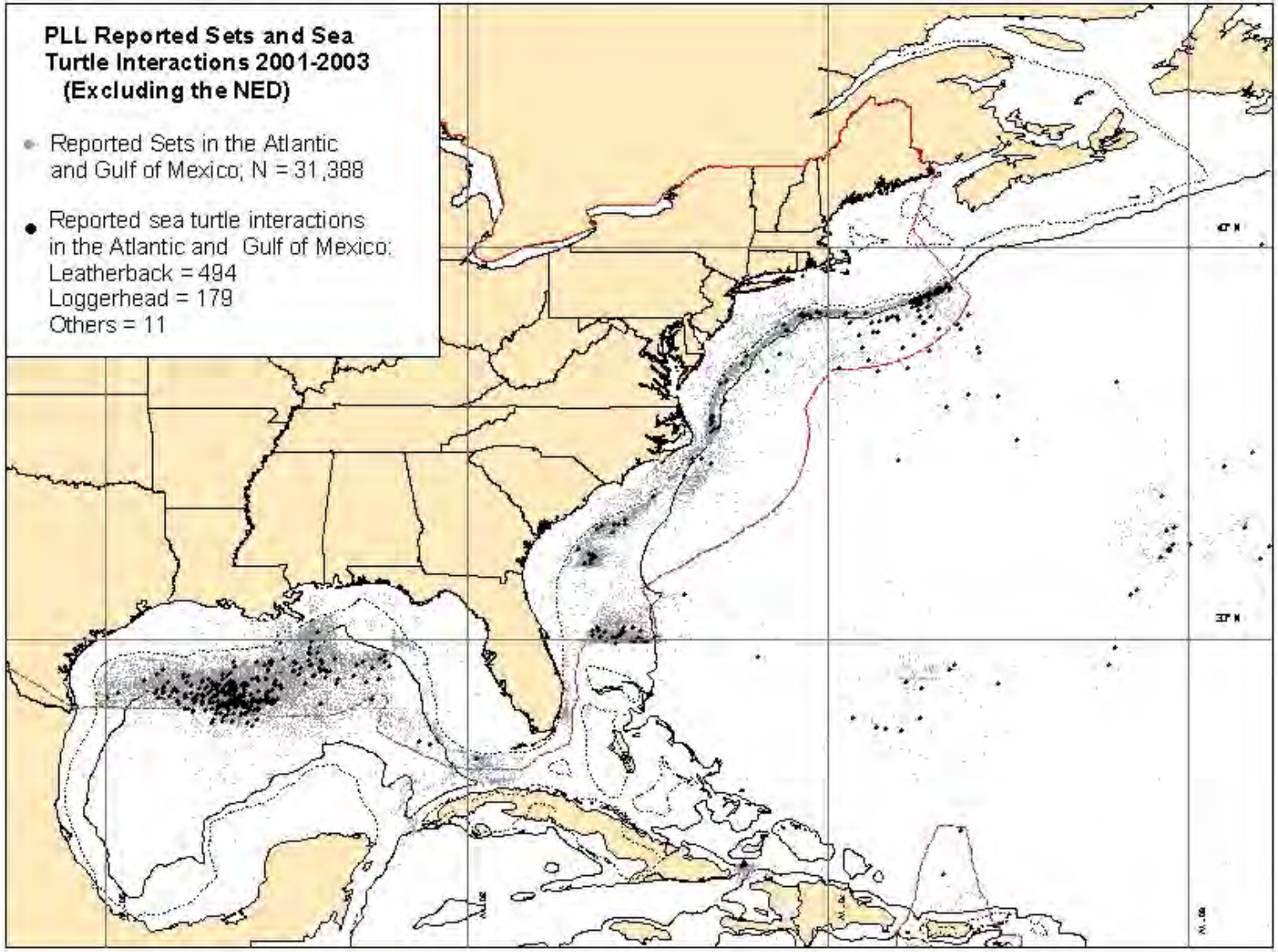

Figure 4.5 **Map showing all reported sets and sea turtle interactions.** Source: Pelagic Longline Logbook 2001-2003.

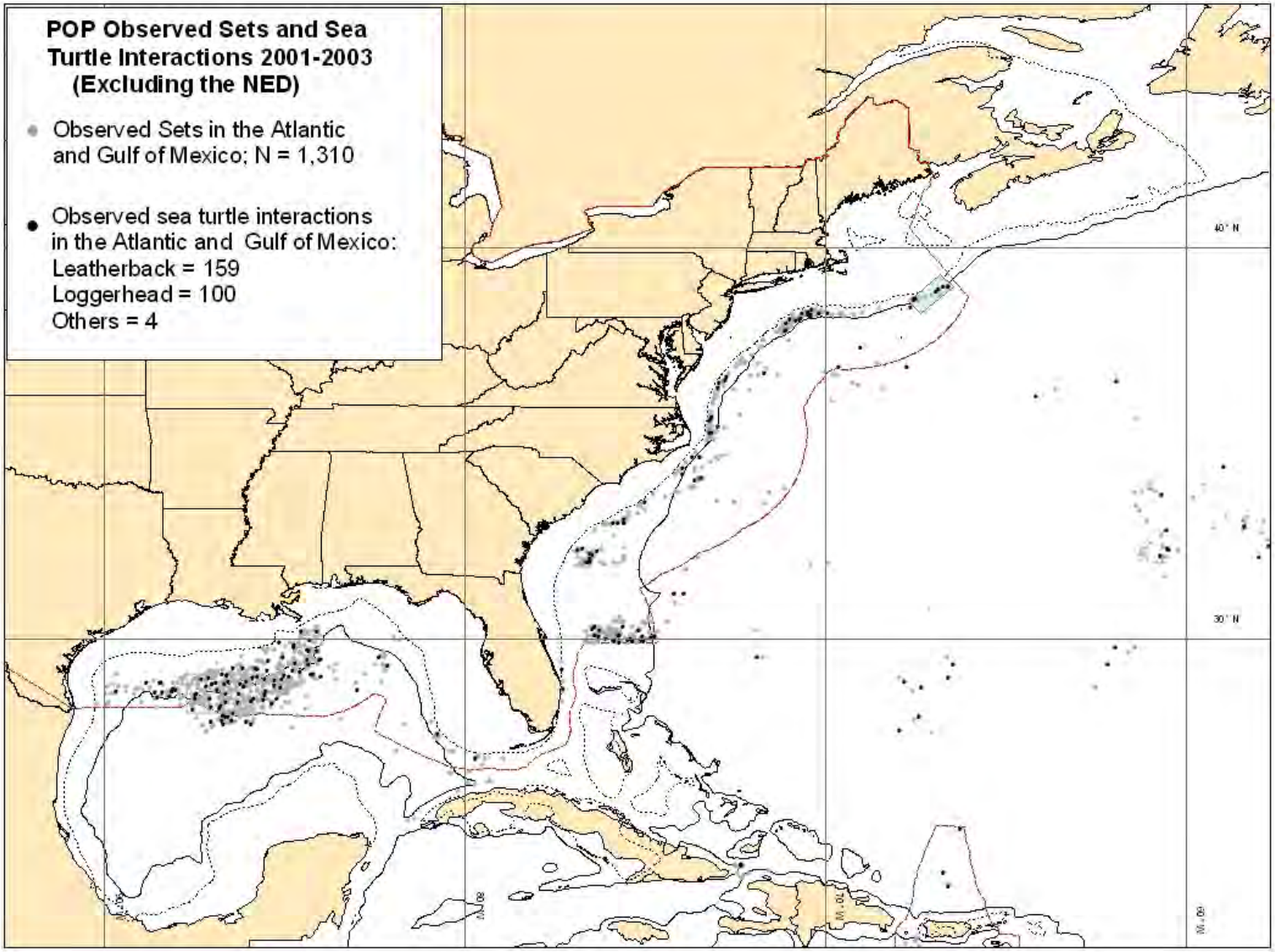

Figure 4.6 **Map showing all observed sets and sea turtle interactions.** Source: Pelagic Observer Program 2001-2003.

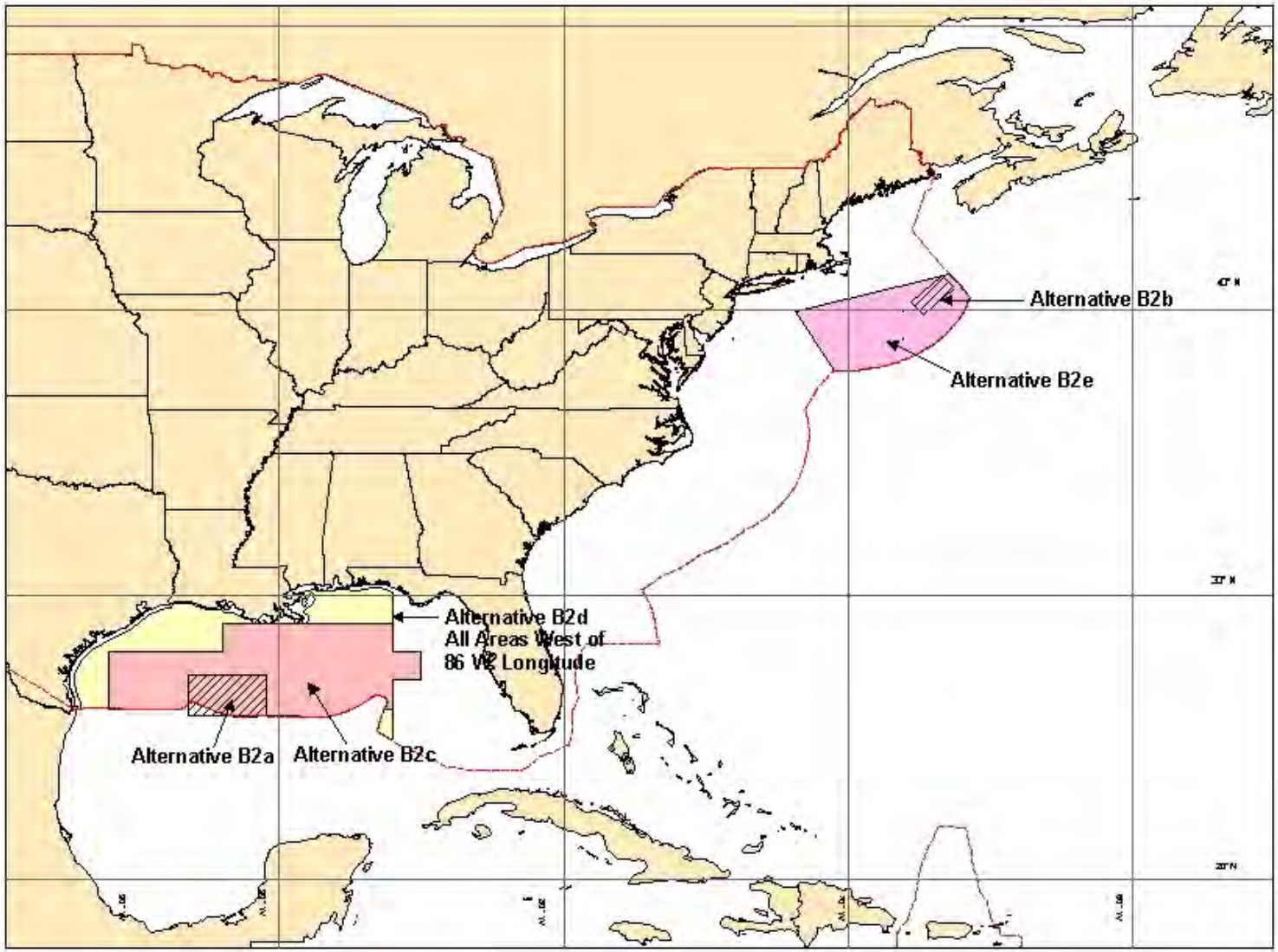

Figure 4.7 **Map showing areas being considered for new time/area closures to reduce non-target HMS and protected species interactions.**

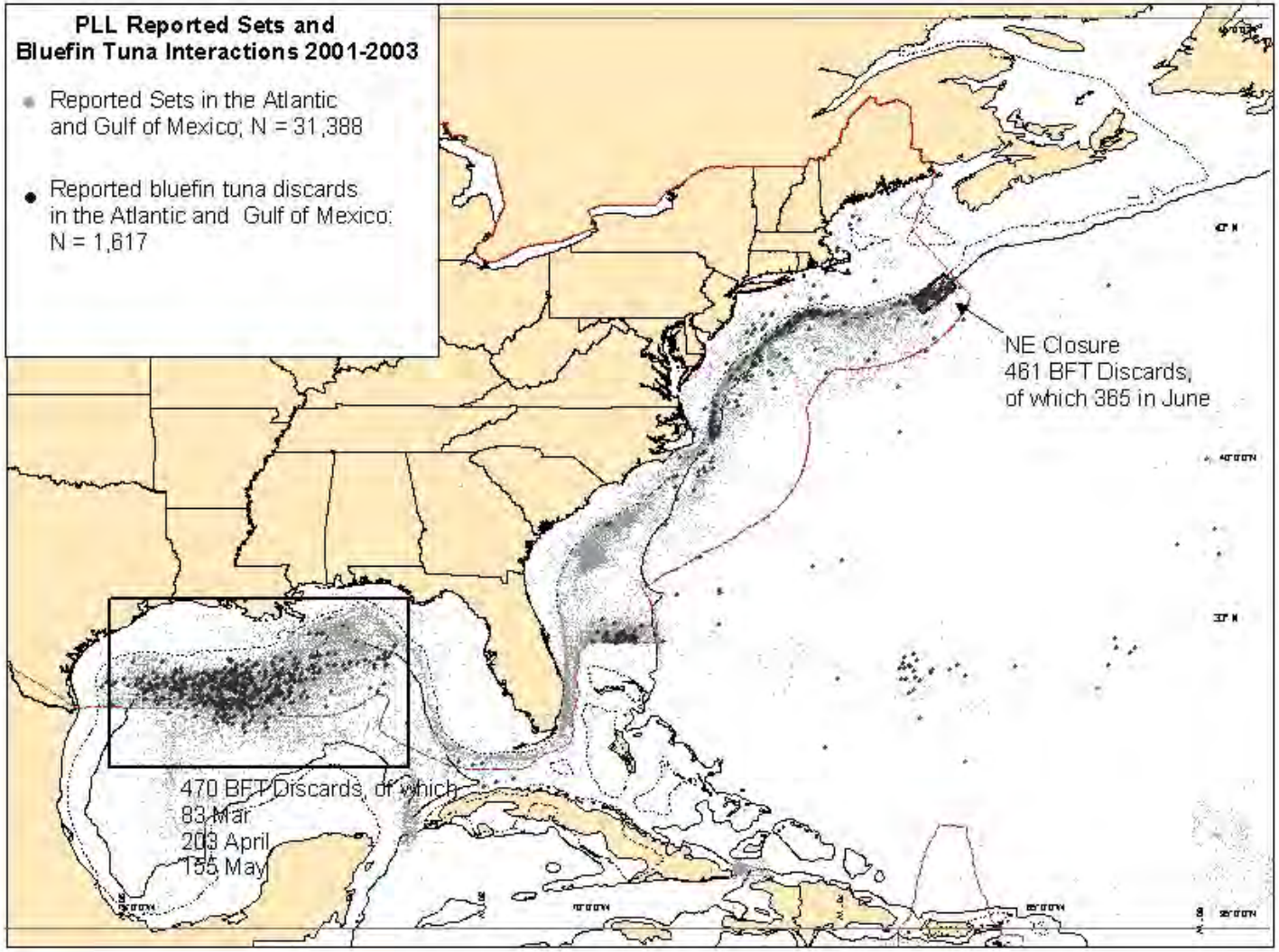

Figure 4.8 **Map showing discards of bluefin tuna in the Atlantic and Gulf of Mexico from 2001-2003. The large box is not a proposed time/area closure, but is shown for illustrative purpose only to delineate an area with high bluefin tuna discards. The bluefin tuna discards are listed by month below the box.** Source: Pelagic Longline Logbook 2001-2003

Table 4.5 **Percent reduction in discards of white marlin, blue marlin, sailfish, spearfish, leatherback, loggerhead, and other sea turtles, and bluefin tuna kept and discards combined, based on various time/area closure alternatives without redistribution of effort.** Source: Pelagic Observer Program data (2001-2003). + = increase, - = decrease in discards or bycatch.

Alternative	White Marlin discards	Blue Marlin discards	Sailfish discards	Spearfish discards	Bluefin Tuna	Leather-back	Logger-head	Other Sea turtles
Alternative B2(a) (year-round)	-14.6%	-11.1%	-20.9%	-4.5%	-12.2%	-18.9%	-7.0%	-25.0%
Alternative B2(a) (May-Nov)	-13.2%	-9.3%	-19.6%	-4.5%	-7.0%	-11.3%	-4.0%	0.0%
Alternative B2(b) (year-round)	-1.4%	-0.7%	0.0%	0.0%	-16.2%	-0.6%	-9.0%	0.0%
Alternative B2(b) (June only)	0.0%	0.0%	0.0%	0.0%	-15.4%	0.0%	-6.0%	0.0%
Alternative B2(c) (April-June)	-8.4%	-11.1%	-14.2%	-2.3%	-18.4%	-15.1%	-7.0%	-25.0%
Alternative B2(d) (year-round)	-38.8%	-26.8%	-52.0%	-15.9%	-24.3%	-52.8%	-14.0%	-75.0%
Alternative B2(e) (year-round)	-3.3%	-1.1%	0.0%	-2.3%	-44.3%	-6.9%	-16.0%	0.0%

Table 4.6 **Percent reduction in discards of white marlin, blue marlin, sailfish, spearfish, leatherback, loggerhead, and bluefin tuna based on various time/area closure alternatives with and without redistribution of effort.** Source: Pelagic Longline Logbook data (2001-2003). + = increase, - = decrease in discards or bycatch.

Alternative	White Marlin discards	Blue Marlin discards	Sailfish discards	Spearfish discards	Leatherback	Loggerhead	Bluefin Tuna discards
	WITHOUT REDISTRIBUTION OF EFFORT						
Alternative B2(a) (year-round)	-16.0%	-19.9%	-15.8%	-14.9%	-34.6%	-5.0%	-12.2%
Alternative B2(a) (May-Nov)	-14.7%	-17.6%	-14.2%	-11.3%	-15.4%	-3.4%	-4.6%
Alternative B2(b) (year-round)	-3.9%	-0.9%	-0.1%	-0.5%	-5.7%	-20.7%	-28.5%
Alternative B2(b) (June only)	-0.4%	-0.2%	0.0%	0.0%	-2.0%	-11.2%	-22.6%
Alternative B2(c) (April-June)	-10.3%	-10.0%	-12.1%	-8.3%	-11.1%	-3.9%	-21.5%
Alternative B2(d) (year-round)	-47.3%	-57.0%	-62.4%	-83.5%	-57.5%	-10.1%	-27.1%
Alternative B2(e) (year-round)	-8.7%	-1.6%	-0.3%	-1.9%	-9.9%	-36.3%	-43.3%
	WITH REDISTRIBUTION OF EFFORT						
Alternative B2(a) (year-round)	0.9%	-4.0%	1.1%	4.0%	-20.0%	15.0%	7.9%
Alternative B2(a) (May-Nov)	-2.7%	-7.3%	-0.8%	-2.1%	-8.0%	7.9%	10.3%
Alternative B2(b) (year-round)	3.5%	6.7%	8.3%	4.8%	-1.7%	-18.5%	-27.0%
Alternative B2(b) (June only)	1.0%	0.9%	1.7%	0.8%	-1.3%	-10.3%	-21.9%
Alternative B2(c) (April-June)	7.0%	2.0%	4.4%	13.2%	-2.6%	23.5%	9.8%
Alternative B2(d) (year-round)	0.3%	-20.3%	-26.8%	-73.3%	-21.3%	65.5%	-3.3%
Alternative B2(e) (year-round)	6.0%	14.7%	17.7%	9.1%	-0.6%	-33.3%	5.7%
	COMBINATIONS WITH REDISTRIBUTION OF EFFORT						
Alternative B2(a)/B2(b) (year-round)	4.3%	3.3%	11.9%	8.6%	-22.7%	-7.3%	-24.3%
Alternative B2(a) (May-Nov)/B2(b) (June)	-1.7%	-6.7%	1.5%	-2.3%	-8.4%	-3.1%	-13.6%
Alternative B2(d)/B2(e) (year-round)	6.5%	-3.5%	-3.1%	12.1%	-30.2%	4.8%	-35.2%
	COMBINATIONS W/ REDISTRIBUTION of EFFORT & REOPENED AREAS						
Partial Reopening of Charleston Bump and:							
Alternative B2(a)/B2(b) (year-round)	4.9%	4.0%	12.9%	9.5%	-22.7%	-6.7%	-24.3%

Alternative	White Marlin discards	Blue Marlin discards	Sailfish discards	Spearfish discards	Leatherback	Loggerhead	Bluefin Tuna discards
Alternative B2(a) (May-Nov)/B2(b) (June)	-1.4%	-6.1%	2.5%	-1.4%	-8.4%	-2.5%	-13.6%
Alternative B2(d)/B2(e) (year-round)	6.8%	-3.6%	-2.4%	-13.1%	-30.2%	5.4%	-35.2%
Partial Reopening of NEC and:							
Alternative B2(a)/B2(b) (year-round)	4.3%	3.3%	11.9%	8.6%	-22.7%	-7.3%	-24.24%
Alternative B2(a) (May-Nov)/B2(b) (June)	-1.7%	-6.7%	1.5%	-2.3%	-8.4%	-3.1%	-13.54%
Alternative B2(d)/B2(e) (year-round)	6.5%	-3.5%	-3.1%	12.1%	-30.2%	4.8%	-35.14%

Table 4.7 **Total number of swordfish, bluefin tuna, yellowfin tuna, bigeye tuna, total BAYS (bigeye, albacore, yellowfin and skipjack tuna), reported landed or discarded in the U.S. Atlantic pelagic longline fishery, 1997-2003. Pred [1] = without redistribution of effort, Pred [2] = with redistribution of effort.** Source: Pelagic Longline Logbook (PLL) data**.**

Year	Number of hooks set (x1000)	Swordfish kept	Swordfish discards	Bluefin Tuna kept	Bluefin Tuna discards	Yellowfin Tuna kept	Yellowfin Tuna discards	Bigeye Tuna kept	Bigeye Tuna discards	Total BAYS kept	Total BAYS discards
1997	9,637.8	68,691	20,433	178	681	74,035	1,847	21,405	1,611	102,706	4,223
1998	8,019.2	70,310	23,234	231	1,320	54,662	2,628	19,259	874	81,610	3,932
1999	7,901.8	67,120	20,558	263	604	83,619	2,885	22,467	906	114,438	4,384
2000	7,975.5	62,978	17,074	235	737	72,385	1,769	13,678	344	94,136	2,944
2001	7,564.0	47,560	13,993	177	348	52,337	1,798	18,216	554	80,466	3,757
2002	7,150.2	49,320	13,035	178	585	59,255	1,635	13,826	277	79,917	2,552
2003	7,008.1	51,835	11,829	273	881	50,817	1,987	7,473	337	63,321	2,763
1997-99	8,519.6	68,707	21,408	224	868	70,772	2,453	21,044	1,130	99,585	4,180
2001-03	7,240.8	49,572	12,952	209	605	54,136	1,807	13,172	389	74,568	3,024
% dif	-15.0	-27.9	-39.5	-6.7	-30.3	-23.5	-26.3	-37.4	-65.6	-25.1	-27.7
Pred [1]		-24.6	-41.5		-1.0					-5.2	
Pred [2]		-13.0	-31.4		10.7					10.0	

Table 4.8 **Total number of pelagic sharks, large coastal sharks, dolphin (mahi mahi), and wahoo reported landed or discarded and number of billfish (blue and white marlin, sailfish, spearfish) and sea turtles caught and discarded in the U.S. Atlantic pelagic longline fishery, 1997-2003. Pred [1] = without redistribution of effort, Pred [2] = with redistribution of effort.** Source: PLL data.

Year	Pelagic Sharks kept	Pelagic Shark discards	Large Coastal Sharks kept	Large Coastal Shark discards	Dolphin kept	Dolphin discards	Wahoo kept	Wahoo discards	Blue Marlin discards	White Marlin discards	Sailfish discards	Spearfish discards	Sea Turtles
1997	5,078	81,518	13,217	7,762	62,770	1,201	4,503	90	2,290	2,422	1,735	380	267
1998	3,717	44,516	6,401	5,470	23,503	298	5,253	305	1,295	1,506	843	103	886
1999	2,894	28,967	6,382	5,442	31,536	320	5,136	128	1,253	1,969	1,407	151	631
2000	3,065	28,046	7,896	6,973	29,125	292	4,193	46	1,443	1,261	1,091	78	271
2001	3,460	23,813	6,478	4,836	27,586	325	3,068	62	635	848	356	137	424
2002	2,987	22,828	4,077	3,815	30,384	185	4,188	32	1,175	1,438	379	148	465
2003	3,037	21,705	5,326	4,813	29,372	451	3,919	126	595	809	277	108	399
1997-99	3,896	51,667	8,667	6,225	39,270	606	4,964	174	1,613	1,966	1,328	211	595
2001-03	3,161	22,782	5,294	4,488	29,114	320	3,725	73	802	1,032	337	131	429
% dif	-18.9	-55.9	-38.9	-27.9	-25.9	-47.2	-25	-58.1	-50.3	-47.5	-74.6	-37.9	-27.9
Pred [1]	-9.5	-2.0	-32.1	-42.5	-29.3				-12.0	-6.4	-29.6		-1.9
Pred [2]	4.1	8.4	-18.5	-33.3	-17.8				6.5	10.8	-14.0		7.1

Table 4.9 **Reported distribution of hooks set by area, 1995-2003 (CAR=Caribbean, GOM=Gulf of Mexico, FEC=Florida East Coast, SAB=South Atlantic Bight, MAB=Mid-Atlantic Bight, NEC=Northeast Coastal, NED=Northeast Distant, SAR=Sargasso, NCA=North Central Atlantic, and TUNS=Tuna North & Tuna South).** Source: PLL data.

Year	*CAR*	GOM	FEC	SAB	MAB	NEC	NED	SAR	NCA	TUNS	Total
1995	688,754	2,662,303	646,841	852,230	2,394,364	1,072,433	765,485	16,430	785,727	297,730	10,182,297
1996	651,673	3,530,127	574,284	1,588,944	1,039,594	1,137,229	588,782	87,285	501,674	611,116	10,310,708
1997	473,500	3,402,436	784,920	946,220	1,203,832	1,226,406	688,344	21,640	209,946	680,563	9,637,807
1998	333,766	3,003,054	667,592	719,125	1,319,860	883,059	503,579	3,500	247,457	338,191	8,019,183
1999	177,628	3,619,402	709,809	769,738	1,276,008	587,225	338,719	17,795	117,031	288,434	7,901,789
2000	259,369	3,648,345	700,505	810,272	1,032,173	610,103	544,549	10,959	236,864	122,390	7,975,529
2001	196,733	3,453,533	467,155	725,951	1,092,030	865,531	316,559	11,437	256,383	178,639	7,563,951
2002	169,562	3,577,753	495,245	435,231	1,011,138	550,096	456,668	104,165	215,121	135,252	7,150,231
2003	137,315	3,808,066	494,113	537,660	692,196	448,438	576,727	112,787	132,205	68,600	7,008,107
1997-99	328,298	3,341,631	720,774	811,694	1,266,567	898,897	510,214	14,312	191,478	435,729	8,519,593
2001-03	167,870	3,613,117	485,504	566,281	931,788	621,355	449,985	76,130	201,236	127,497	7,240,763
% dif	-48.9	8.1	-32.6	-30.2	-26.4	-30.9	-11.8	431.9	5.1	-70.7	-15.0

Table 4.10 **Number of bluefin tuna (BFT), swordfish (SWO), sharks (PEL-pelagic; LCS-Large Coastal Sharks), billfish, and turtles kept and/or discarded in the Mid-Atlantic Bight (MAB) and Northeast Coastal (NEC) areas combined versus all other areas as reported in the pelagic logbook data, 1995-2003.** Source: PLL Data.

			SPECIES									
AREA	**YEAR**	**Hooks set (x1000)**	**BFT kept**	**BFT discards**	**SWO kept**	**SWO discards**	**PEL shark kept**	**PEL shark discards**	**LCS kept**	**LCS discards**	**Billfish discards**	**Turtle interactions**
MAB & NEC	1995	3,466.8	95	2,755	5,824	5,382	2,647	36,395	7,717	2,121	1,454	80
	1996	2,176.8	74	1,596	3,108	871	2,456	37,638	6,433	1,975	1,179	20
	1997	2,430.2	71	558	6,247	3,642	3,043	40,085	6,423	928	800	52
	1998	2,209.2	93	1,156	9,659	4,943	2,136	27,889	1,837	907	399	54
	1999	1,863.2	70	335	8,168	4,308	1,727	12,468	1,974	746	816	174
	2000	1,892.5	29	437	11,168	3,756	2,229	15,689	4,796	1,433	262	39
	2001	1,957.6	45	200	10,559	3,981	2,506	8,903	4,383	991	307	69
	2002	1,561.2	18	380	10,704	4,212	2,324	7,005	2,331	1,207	311	40
	2003	1,140.6	67	471	10,752	2,951	2,135	6,875	2,761	1,384	169	42
All Other Areas (non-MAB/NEC)	1995	6,715.5	137	96	66,795	24,367	3,007	53,787	17,469	6,121	6,165	1,047
	1996	8,137.3	124	105	70,168	23,514	2,978	47,388	13,815	8,246	6,445	472
	1997	7,210.6	107	123	62,470	16,801	2,037	41,433	6,794	6,834	6,029	215
	1998	5,816.3	138	164	60,651	18,291	1,581	16,627	4,564	4,563	3,348	832
	1999	6,038.6	193	269	58,952	16,250	1,167	16,499	4,408	4,696	3,964	457
	2000	6,333.2	209	382	54,319	13,743	970	15,038	3,106	5,563	3,633	241
	2001	5,606.4	132	148	37,001	10,012	954	14,910	2,095	3,845	1,669	355
	2002	5,589	160	205	38,616	8,823	663	15,823	1,746	2,608	2,829	425
	2003	5,867.5	206	410	41,083	8,878	902	14,830	2,565	3,429	1,620	357

Table 4.11 **Percent reduction in kept and discarded species based on different time/area closure alternatives with and without redistribution of effort. - = decrease + = increase in kept and discarded target species; * with redistribution of effort assumes no reduction in the number of hooks set.** Source: Pelagic Longline Logbook data (2001-2003).

Alternative	Number of hooks set	Swordfish kept	Swordfish discards	Bluefin tuna kept	Bluefin tuna discards	Yellowfin tuna kept	Yellowfin tuna discards	Bigeye tuna kept	Bigeye tuna discards	BAYS kept	BAYS discards
	WITHOUT REDISTRIBUTION OF EFFORT										
Alternative B2(a) (year-round)	-18.4%	-6.6%	-14.8%	-22.2%	-12.2%	-22.1%	-23.9%	-1.8%	-0.5%	-16.8%	-17.6%
Alternative B2(a) (May-Nov)	-11.4%	-3.1%	-8.1%	-6.7%	-4.6%	-14.3%	-17.4%	-1.1%	-0.2%	-10.8%	-12.8%
Alternative B2(b) (year-round)	-4.7%	-8.6%	-5.4%	-5.7%	-28.5%	-4.6%	-1.5%	-4.4%	-0.5%	-4.7%	-1.1%
Alternative B2(b) (June only)	-0.9%	-1.5%	-0.7%	-1.8%	-22.6%	-0.3%	-0.2%	-1.5%	0.0%	-0.6%	-0.2%
Alternative B2(c) (April-June)	-13.4%	-2.8%	-9.9%	-29.0%	-21.5%	-19.8%	-27.0%	-0.2%	-0.2%	-14.7%	-18.7%
Alternative B2(d) (year-round)	-47.4%	-15.1%	-31.5%	-53.6%	-27.1%	-64.0%	-66.4%	-3.5%	-1.9%	-48.2%	-51.8%
Alternative B2(e) (year-round)	-10.1%	-13.7%	-11.0%	-12.4%	-43.3%	-7.6%	-3.6%	-19.7%	-13.8%	-12.0%	-8.3%
	WITH REDISTRIBUTION OF EFFORT										
Alternative B2(a) (year-round)	*	15.3%	5.4%	-3.9%	7.9%	-4.6%	-6.9%	21.2%	20.8%	2.3%	1.4%
Alternative B2(a) (May-Nov)	*	9.1%	4.4%	3.4%	10.3%	-1.1%	3.0%	2.6%	11.6%	2.6%	0.0%
Alternative B2(b) (year-round)	*	-5.5%	-1.9%	-3.5%	-27.0%	1.3%	4.1%	-0.5%	5.6%	0.7%	4.5%
Alternative B2(b) (June only)	*	-0.8%	-0.1%	-1.2%	-21.9%	0.9%	1.1%	-1.2%	0.3%	0.4%	0.9%
Alternative B2(c) (April-June)	*	21.1%	6.0%	-18.3%	9.8%	-11.0%	-18.3%	11.4%	1.7%	-5.4%	-11.8%
Alternative B2(d) (year-round)	*	62.5%	31.9%	-12.1%	38.0%	-29.8%	-35.6%	80.6%	84.8%	-0.6%	-6.9%
Alternative B2(e) (year-round)	*	-6.8%	-2.9%	-7.6%	-40.7%	5.5%	8.3%	-11.9%	-2.5%	-0.3%	4.1%
	COMBINATIONS WITH REDISTRIBUTION OF EFFORT										
Alternative B2(a)/B2(b) (year-round)	*	9.8%	3.6%	-7.4%	-19.1%	-3.2%	-2.9%	20.8%	26.5%	2.9%	5.9%
Alternative B2(a) (May-Nov)/B2(b) (June)	*	5.8%	4.4%	5.4%	-13.6%	0.3%	2.2%	10.0%	11.8%	3.2%	3.5%
Alternative B2(d)/B2(e) (year-round)	*	63.1%	36.1%	-22.0%	-35.2%	-25.1%	-21.6%	78.4%	117.4%	-0.4%	5.6%

Table 4.12 **Alternative B2(a). Example of temporal variation in effectiveness of the closure on discards from May through November. Totals, and percent decreases are for months of May-Nov only.** Source: Pelagic Longline Logbook data (2001-2003). * excluding the NED

Month	Number of hooks set	White Marlin discards	Blue Marlin discards	Sailfish discards	Spearfish discards	Pelagic Shark discards	Large Coastal Shark discards	Leatherback	Loggerhead	Other Sea turtles
1	354,851	14	16	5	4	19	24	11	1	0
2	183,157	2	4	1	0	18	61	9	0	0
3	239,525	3	4	2	3	19	56	18	1	0
4	337,802	7	13	5	5	27	27	16	0	2
5	412,790	37	21	14	5	25	35	10	5	0
6	343,018	124	89	26	7	15	45	12	0	0
7	287,935	121	127	37	13	10	24	9	1	0
8	354,682	67	66	22	5	13	24	5	0	0
9	277,354	45	58	21	4	15	31	7	0	0
10	329,758	40	49	13	11	10	38	18	0	0
11	341,643	29	22	13	3	11	24	15	0	0
12	347,767	14	18	4	3	20	21	41	1	3
Total (May-Nov)	2,347,180	463	432	146	48	99	410	76	6	0
All Areas*	21,148,706	3,143	2,449	1,029	424	34,020	16,573	494	179	11
% Reduction **without** redistribution of effort	-11.1%	-14.7%	-17.6%	-14.2%	-11.3%	-0.3%	-2.5%	-15.4%	-3.4%	0.0%
% Reduction **with** redistribution of effort	0.0%	-2.7%	-7.3%	-0.8%	-2.1%	14.5%	11.7%	-8.0%	7.9%	-7.1%

Table 4.13 **Alternative B2(b). Example of temporal variation in effectiveness of the closure on discards in June. Totals, and percent decreases are for month of June only.** Source: Pelagic Longline Logbook data (2001-2003). * excluding the NED

Month	Number of hooks set	White Marlin discards	Blue Marlin discards	Sailfish discards	Spearfish discards	Pelagic Shark discards	Large Coastal Shark discards	Leatherback	Loggerhead	Other Sea turtles
1	0	0	0	0	0	0	0	0	0	0
2	0	0	0	0	0	0	0	0	0	0
3	0	0	0	0	0	0	0	0	0	0
4	0	0	0	0	0	0	0	0	0	0
5	648	0	0	0	0	21	0	0	0	0
6	184,435	12	4	0	0	1,302	7	10	20	0
7	256,598	31	3	0	0	1,720	196	7	9	0
8	235,512	49	6	0	0	645	85	5	3	0
9	224,296	26	7	1	2	603	41	1	3	0
10	78,130	6	2	0	0	457	13	0	1	0
11	10,086	0	0	0	0	310	2	4	0	0
12	1,500	0	0	0	0	13	0	1	1	0
Total (June)	184,435	12	4	0	0	5,071	344	10	20	0
All Areas*	21,148,706	3,143	2,449	1,029	424	34,020	16,573	494	179	11
% Reduction **without** redistribution of effort	-0.9%	-0.4%	-0.2%	0.0%	0.0%	-14.9%	-2.5%	-2.0%	-11.2%	0.0%
% Reduction **with** redistribution of effort		1.0%	0.9%	1.7%	0.8%	-2.6%	2.2%	-1.3%	-10.3%	0.0%

Table 4.14 **Alternative B2(c). Example of temporal variation in effectiveness of the time/area closure on discards from April through June. Totals, and percent decreases are for month of June only.** Source: Pelagic Longline Logbook data (2001-2003). * excluding the NED

Month	Number of hooks set	White Marlin discards	Blue Marlin discards	Sailfish discards	Spearfish discards	Pelagic Shark discards	Large Coastal Shark discards	Leatherback	Loggerhead	Other Sea turtles
1	734,991	19	29	17	10	60	93	11	1	0
2	480,238	8	6	4	0	55	138	12	0	0
3	533,964	6	9	3	5	44	161	17	1	0
4	814,452	22	28	12	6	71	130	19	0	2
5	1,075,255	78	54	36	9	147	294	15	6	0
6	954,628	225	162	76	20	69	195	21	1	0
7	1,102,300	545	547	178	58	58	123	65	3	0
8	1,100,973	248	187	110	23	52	102	28	1	0
9	807,867	110	146	71	26	41	96	25	1	0
10	818,964	120	92	42	13	60	132	29	0	0
11	715,282	53	44	20	6	30	228	19	1	0
12	714,878	35	34	5	9	46	64	67	3	3
Total April-June	2,844,335	325	244	124	35	287	619	55	7	2
All Areas*	21,148,706	3,143	2,449	1,029	424	34,020	16,573	494	179	11
% Reduction **without** redistribution of effort	-13.4%	-10.3%	-10.0%	-12.1%	-8.3%	-0.8%	-3.7%	-11.1%	-3.9%	-18.2%
% Reduction **with** redistribution of effort		7.0%	2.0%	4.4%	13.2%	17.1	25.9	-2.6%	23.5%	-18.2%

Table 4.15 **Alternative B2(d). Example of temporal variation in effectiveness of the time/area closure on discards.** Source: Pelagic Longline Logbook data (2001-2003). * excluding the NED

Month	Number of hooks set	White Marlin discards	Blue Marlin discards	Sailfish discards	Spearfish discards	Pelagic Shark discards	Large Coastal Shark discards	Leatherback	Loggerhead	Other Sea turtles
1	739,191	19	29	17	13	60	101	11	1	0
2	488,238	8	6	5	0	58	175	12	0	0
3	546,944	6	9	3	6	47	188	17	1	0
4	825,627	22	28	12	9	78	146	19	0	2
5	1,085,255	78	55	37	17	149	309	14	6	0
6	978,848	224	173	108	49	70	197	18	1	0
7	1,136,250	547	583	209	108	59	347	47	3	0
8	1,125,483	248	188	110	59	52	138	21	1	0
9	820,167	126	151	74	46	43	97	14	1	0
10	828,954	120	95	42	28	60	132	26	0	0
11	725,772	53	46	20	10	30	233	19	1	0
12	720,028	36	34	5	9	47	80	67	3	3
Total	10,020,757	1,487	1,397	642	354	753	2,143	285	18	5
All Areas*	21,148,706	3,143	2,449	1,029	424	34,020	16,573	494	179	11
% Reduction **without** redistribution of effort	-47.4%	-47.3%	-57.0%	-62.4%	-83.5%	-2.2%	-2.5%	-57.7%	-10.1%	-45.5%
% Reduction **with** redistribution of effort		0.3%	-20.3%	-26.8%	-73.3%	88.8%	66.9%	-21.3%	65.5%	-3.3%

Table 4.16 **Alternative B2(e). Example of temporal variation in effectiveness of the time/area closure on discards**. Source: Pelagic Longline Logbook data (2001-2003). * excluding the NED

Month	Number of hooks set	White Marlin discards	Blue Marlin discards	Sailfish discards	Spearfish discards	Pelagic Shark discards	Large Coastal Shark discards	Leatherback	Loggerhead	Other Sea turtles
1	9,800	0	0	0	0	157	2	0	1	0
2	6,300	0	0	0	0	90	0	0	1	0
3	4,200	0	0	0	0	65	0	0	2	0
4	999	0	0	0	0	35	0	0	0	0
5	8,913	0	0	0	0	72	0	1	0	0
6	247,068	16	5	0	1	1750	11	11	27	0
7	476,917	52	3	1	2	2257	284	9	10	0
8	515,418	121	10	1	4	1290	204	9	6	0
9	395,521	71	19	1	1	1192	75	3	3	0
10	277,781	9	2	0	0	1755	102	3	8	0
11	137,838	4	1	0	0	1724	18	10	6	0
12	46,755	1	0	0	0	372	2	3	1	0
Total	2,127,510	274	40	3	8	10,759	698	49	65	0
All Areas*	21,148,706	3,143	2,449	1,029	424	34,020	16,573	494	179	11
% Reduction **without** redistribution of effort	-10.1%	-8.7%	-1.6%	-0.3%	-1.9%	-31.6%	-2.5%	-9.9%	-36.3%	0.0%
% Reduction **with** redistribution of effort		6.0%	14.7%	17.7%	9.1%	-23.9%	5.8%	-0.6%	-33.3%	5.7%

Table 4.17 B2(a) and B2(b) Combined. Example of temporal variation in effectiveness of the time/area closure on discards for combined alternatives B2(a) and B2(b) year-round, and from May through November for B2(a) and in June for B2(b).

Month	Number of hooks set	White Marlin discards	Blue Marlin discards	Sailfish discards	Spearfish discards	Pelagic Shark discards	Large Coastal Shark discards	Leatherback	Loggerhead	Other Sea turtles
1	352,141	14	16	5	4	19	24	11	1	0
2	176,609	2	4	1	0	18	61	9	0	0
3	232,645	3	4	2	3	19	56	18	1	0
4	330,682	7	13	5	5	27	27	16	0	2
5	397,942	37	19	13	5	46	35	10	5	0
6	514,590	135	90	20	8	1,317	52	22	20	0
7	524,443	149	128	35	13	1,730	220	16	10	0
8	564,244	107	65	16	5	658	109	10	3	0
9	489,540	71	64	22	5	618	72	8	3	0
10	399,058	46	50	12	11	467	51	18	1	0
11	344,368	29	22	13	3	321	26	18	0	0
12	341,864	14	13	4	2	33	21	41	2	2
Total	4,668,126	614	488	148	64	5,273	754	197	46	4
All Areas	21,148,706	3,143	2,449	1,029	424	34,020	16,573	494	179	11
% Decrease **without** redistribution of effort	-22.1%	-19.5%	-19.9%	-14.4%	-15.1%	-15.5%	-4.5%	-39.9%	-25.7%	-36.4%
% Decrease **with** redistribution of effort (Year-round)		4.3%	3.3%	11.9%	8.6%	9.2%	21.9%	-22.7%	-7.3%	-20.3%
% Decrease **with** redistribution of effort B2(a) (May-Nov) and B2(b) (June)		-1.7%	-6.7%	1.5%	-2.3%	9.6%	10.1%	-8.4%	-3.1%	7.1%

Table 4.18 B2(d) and B2(e) Combined. Example of temporal variation in effectiveness of the time/area closure on discards for combined alternatives B2(d) and B2(e)year-round.

Month	Number of hooks set	White Marlin discards	Blue Marlin discards	Sailfish discards	Spearfish discards	Pelagic Shark discards	Large Coastal Shark discards	Leather-back	Logger-head	Other Sea turtles
1	748,991	19	29	17	10	217	103	11	2	0
2	494,538	8	6	5	0	148	175	12	1	0
3	551,144	6	9	3	5	112	188	17	3	0
4	826,626	22	28	12	6	113	146	19	0	2
5	1,094,168	78	55	37	9	221	309	15	6	0
6	1,225,916	240	178	108	21	1820	208	29	28	0
7	1,615,167	599	586	210	60	2322	631	56	13	0
8	1,640,901	369	198	111	27	1342	342	30	7	0
9	1,215,688	197	170	75	28	1235	172	17	4	0
10	1,106,735	129	97	42	13	1815	234	29	8	0
11	863,610	57	47	20	6	1754	251	29	7	0
12	766,783	37	34	5	9	419	82	70	4	3
Total	12,150,267	1,761	1,437	645	194	11,518	2,841	334	83	5
All Areas	21,148,706	3,143	2,449	1,029	424	34,020	16,573	494	179	11
% Reduction **without** redistribution of effort	-57.5%	-56.0%	-58.7%	-62.7%	-45.8%	-33.9%	-17.1%	-67.6%	-46.4%	-45.5%
% Reduction **with** redistribution of effort		6.5%	-3.5%	-3.1%	12.1%	65.0%	102.0%	-30.2%	4.8%	18.3%

Table 4.19 **Alternative B2(a). Percent reduction in incidental bluefin tuna and target catch and discards without redistribution of effort.** Source: Pelagic Longline Logbook data (2001-2003). * excluding the NED

Month	Number of hooks set	Swordfish kept	Swordfish discards	Bluefin tuna kept	Bluefin tuna discards	Yellowfin tuna kept	Yellowfin tuna discards	Bigeye tuna kept	Bigeye tuna discards	BAYS kept	BAYS discards
YEAR-ROUND											
1	355,191	1,110	488	9	2	3,425	105	95	1	3,563	110
2	193,937	928	361	14	2	853	13	40	1	904	14
3	242,885	718	468	29	36	1,678	42	9	0	1,691	48
4	347,360	556	656	32	82	3,726	121	10	0	3,738	122
5	424,810	526	991	31	71	3,923	335	2	0	3,928	345
6	352,129	597	543	7	3	4,333	176	17	0	4,350	198
7	304,242	414	241	0	0	3,978	103	33	0	4,017	120
8	351,376	602	239	0	0	3,184	85	46	0	3,249	96
9	281,104	452	262	0	1	2,515	45	34	0	2,553	80
10	337,578	635	396	0	0	3,053	139	121	2	3,226	166
11	351,773	733	316	2	0	2,860	69	147	0	3,097	147
12	356,739	1,098	484	9	1	3,369	77	130	1	3,622	140
Total	3,899,124	8,369	5,445	133	198	36,897	1,310	684	5	37,938	1,586
All Areas*	21,148,706	127,500	36,748	599	1,617	167,203	5,486	37,133	1,006	226,156	8,990
% Reduction	-18.4%	-6.6%	-14.8%	-22.2%	-12.2%	-22.1%	-23.9%	-1.8%	-0.5%	-16.8%	-17.6%
MAY THROUGH NOVEMBER ONLY											
5	424,810	526	991	31	71	3,923	335	2	0	3,928	345
6	352,129	597	543	7	3	4,333	176	17	0	4,350	198
7	304,242	414	241	0	0	3,978	103	33	0	4,017	120
8	351,376	602	239	0	0	3,184	85	46	0	3,249	96
9	281,104	452	262	0	1	2,515	45	34	0	2,553	80
10	337,578	635	396	0	0	3,053	139	121	2	3,226	166
11	351,773	733	316	2	0	2,860	69	147	0	3,097	147
Total	2,403,012	3,959	2,988	40	75	23,846	952	400	2	24,420	1,152
All Areas*	21,148,706	127,500	36,748	599	1,617	167,203	5,486	37,133	1,006	226,156	8,990
% Reduction **w/out** redistribution	-11.4%	-3.1%	-8.1%	-6.7%	-4.6%	-14.3%	-17.4%	-1.1%	-0.2%	-10.8%	-12.8%
% Reduction **with** redistribution		9.1%	4.4%	3.4%	10.3%	-1.1%	3.0%	2.6%	11.6%	2.6%	0.0%

Table 4.20 **Alternative B2(b). Percent reduction in incidental bluefin tuna and target catch and discards without redistribution of effort.** Source: Pelagic Longline Logbook data (2001-2003). * excluding the NED

Month	Number of hooks set	Swordfish kept	Swordfish discards	Bluefin tuna kept	Bluefin tuna discards	Yellowfin tuna kept	Yellowfin tuna discards	Bigeye tuna kept	Bigeye tuna discards	BAYS kept	BAYS discards
YEAR-ROUND											
1	0	0	0	0	0	0	0	0	0	0	0
2	0	0	0	0	0	0	0	0	0	0	0
3	0	0	0	0	0	0	0	0	0	0	0
4	0	0	0	0	0	0	0	0	0	0	0
5	648	7	0	0	0	0	0	0	0	0	0
6	183,851	1,867	256	11	365	505	11	557	0	1,337	15
7	256,598	2,712	394	14	43	552	5	197	0	929	8
8	235,512	2,327	499	3	2	2,625	12	157	2	3,019	16
9	225,096	2,875	509	2	48	3,407	51	373	3	4,167	54
10	78,630	1,076	207	1	0	524	2	180	0	980	3
11	10,086	85	124	3	3	39	0	159	0	266	1
12	1,500	25	8	0	0	10	0	4	0	15	0
Total	991,921	10,974	1,997	34	461	7,662	81	1,627	5	10,713	97
All Areas*	21,148,706	127,500	36,748	599	1,617	167,203	5,486	37,133	1,006	226,156	8,990
% Reduction	-4.7%	-8.6%	-5.4%	-5.7%	-28.5%	-4.6%	-1.5%	-4.4%	-0.5%	-4.7%	-1.1%
JUNE ONLY											
6	183851	1,867	256	11	365	505	11	557	0	1,337	15
Total	183851	1,867	256	11	365	505	11	557	0	1,337	15
All Areas*	21,148,706	127,500	36,748	599	1,617	167,203	5,486	37,133	1,006	226,156	8,990
% Reduction **w/out** redistribution	-0.9%	-1.5%	-0.7%	-1.8%	-22.6%	-0.3%	-0.2%	-1.5%	0.0%	-0.6%	-0.2%
% Reduction **with** redistribution		-0.8%	-0.1%	-1.2%	-21.9%	0.9%	1.1%	-1.2%	0.3%	0.4%	0.9%

Table 4.21 **Alternative B2(c). Percent reduction in incidental bluefin tuna and target catch and discards without redistribution of effort.** Source: Pelagic Longline Logbook data (2001-2003). * excluding the NED

Month	Number of hooks set	Swordfish kept	Swordfish discards	Bluefin tuna kept	Bluefin tuna discards	Yellowfin tuna kept	Yellowfin tuna discards	Bigeye tuna kept	Bigeye tuna discards	BAYS kept	BAYS discards
	YEAR-ROUND										
1	734,991	2,334	1,052	26	2	8,144	278	212	6	8,454	303
2	480,238	2,512	931	31	4	2,274	91	72	3	2,371	98
3	533,964	1,872	1,104	49	73	3,657	122	22	0	3,688	134
4	814,452	1,288	1,176	92	189	7,772	370	20	0	7,796	380
5	1,075,255	1,185	1,520	64	151	11,768	571	13	0	11,804	641
6	954,628	1,121	925	18	8	13,513	539	57	2	13,576	656
7	1,102,300	1,294	994	3	0	15,432	528	84	0	15,545	714
8	1,101,773	1,412	752	0	5	13,612	300	76	1	13,716	436
9	807,867	1,002	663	20	1	8,615	147	77	0	8,715	254
10	818,964	1,132	726	0	1	7,728	234	198	5	7,992	340
11	715,282	1,186	600	2	4	5,745	163	264	1	6,166	281
12	714,878	1,747	894	13	1	6,780	235	199	1	7,194	344
Total	9,854,592	18,085	11,337	318	439	105,040	3,578	1,294	19	107,017	4,581
All Areas*	21,148,706	127,500	36,748	599	1,617	167,203	5,486	37,133	1,006	226,156	8,990
% Reduction	-46.6%	-14.2%	-30.9%	-53.1%	-27.1%	-62.8%	-65.2%	-3.5%	-1.9%	-47.3%	-51.0%
	APRIL THROUGH JUNE ONLY										
4	814,452	1,288	1,176	92	189	7,772	370	20	0	7,796	380
5	1,075,255	1,185	1,520	64	151	11,768	571	13	0	11,804	641
6	954,628	1,121	925	18	8	13,513	539	57	2	13,576	656
Total (Apr-Jun)	2,844,335	3,594	3,621	174	348	33,053	1,480	90	2	33,176	1,677
All Areas*	21,148,706	127,500	36,748	599	1,617	167,203	5,486	37,133	1,006	226,156	8,990
% Reduction **w/out** redistribution	-13.4%	-2.8%	-9.9%	-29.0%	-21.5%	-19.8%	-27.0%	-0.2%	-0.2%	-14.7%	-18.7%
% Reduction **with** redistribution		21.1%	6.0%	-18.3%	9.8%	-11.0%	-18.3%	11.4%	1.7%	-5.4%	-11.8%

Table 4.22 **Alternative B2(d). Percent reduction in incidental bluefin tuna and target catch and discards without redistribution of effort.** Source: Pelagic Longline Logbook data (2001-2003). * excluding the NED

Month	Number of hooks set	Swordfish kept	Swordfish discards	Bluefin tuna kept	Bluefin tuna discards	Yellowfin tuna kept	Yellowfin tuna discards	Bigeye tuna kept	Bigeye tuna discards	BAYS kept	BAYS discards
1	739,191	2,354	1,067	26	2	8,158	278	214	6	8,470	305
2	488,238	2,746	986	31	4	2,274	91	72	3	2,371	98
3	547,564	2,230	1,168	50	73	3,660	122	22	0	3,691	134
4	825,627	1,591	1,248	93	189	7,780	370	20	0	7,804	380
5	1,085,255	1,260	1,530	64	151	11,836	571	14	0	11,873	641
6	978,848	1,134	924	18	8	14,310	582	56	2	14,372	705
7	1,136,250	1,304	998	3	0	15,687	530	84	0	15,800	716
8	1,127,083	1,442	758	0	5	13,864	301	77	1	13,969	446
9	820,167	1,023	668	20	1	8,832	154	78	0	8,933	261
10	828,954	1,140	727	0	1	7,839	234	199	5	8,104	340
11	725,772	1,243	610	3	4	5,829	169	264	1	6,250	287
12	720,028	1,748	895	13	1	6,872	239	199	1	7,286	348
Total	10,022,977	19,215	11,579	321	439	106,941	3,641	1,299	19	108,923	4,661
All Areas*	21,148,706	127,500	36,748	599	1,617	167,203	5,486	37,133	1,006	226,156	8,990
% Reduction **w/out** Redistribution	-47.4%	-15.1%	-31.5%	-53.6%	-27.1%	-64.0%	-66.4%	-3.5%	-1.9%	-48.2%	-51.8%
% Reduction **with** redistribution		62.5%	31.9%	-12.1%	38.0%	-29.8%	-35.6%	80.6%	84.8%	-0.6%	-6.9%

Table 4.23 **Alternative B2(e). Percent reduction in incidental bluefin tuna and target catch and discards without redistribution of effort.** Source: Pelagic Longline Logbook data (2001-2003). * excluding the NED

Month	Number of hooks set	Swordfish kept	Swordfish discards	Bluefin tuna kept	Bluefin tuna discards	Yellowfin tuna kept	Yellowfin tuna discards	Bigeye tuna kept	Bigeye tuna discards	BAYS kept	BAYS discards
1	9,800	37	36	0	0	27	0	72	0	187	0
2	7,700	28	23	0	2	0	0	10	0	70	0
3	4,200	5	4	0	2	1	0	9	0	16	0
4	999	0	1	0	40	2	0	0	0	3	0
5	8,913	45	9	0	12	6	0	12	1	39	2
6	247,068	2,344	322	13	388	729	17	705	0	1,762	21
7	475,917	4,016	590	20	66	1,313	10	450	5	2,188	23
8	515,418	3,532	838	5	2	3,997	32	1,463	48	6,345	91
9	394,621	3,856	805	2	52	4,175	88	1,592	62	6,786	187
10	277,781	2,648	897	11	49	1,548	41	1,350	14	5,357	105
11	138,463	647	495	23	86	690	10	1,109	2	3,111	205
12	46,755	264	34	0	1	204	2	531	7	1,277	114
Total	2,127,635	17,422	4,054	74	700	12,692	200	7,303	139	27,141	748
All Areas*	21,148,706	127,500	36,748	599	1,617	167,203	5,486	37,133	1,006	226,156	8,990
% Reduction **w/out** Redistribution	-10.1%	-13.7%	-11.0%	-12.4%	-43.3%	-7.6%	-3.6%	-19.7%	-13.8%	-12.0%	-8.3%
% Reduction **with** Redistribution		-6.8%	-2.9%	-7.6%	-40.7%	5.5%	8.3%	-11.9%	-2.5%	-0.3%	4.1%

Table 4.24 **B2(a) and B2(b) Combined. Percent reduction in incidental bluefin tuna and target catch and discards without redistribution of effort.**
Source: Pelagic Longline Logbook data (2001-2003). * excluding the NED

Month	Number of hooks set	Swordfish kept	Swordfish discards	Bluefin tuna kept	Bluefin tuna discards	Yellowfin tuna kept	Yellowfin tuna discards	Bigeye tuna kept	Bigeye tuna discards	BAYS kept	BAYS discards
1	355,191	1,110	488	9	2	3,425	105	95	1	3,563	110
2	193,937	928	361	14	2	853	13	40	1	904	14
3	242,885	718	468	29	36	1,678	42	9	0	1,691	48
4	347,360	556	656	32	82	3,726	121	10	0	3,738	122
5	425,458	533	991	31	71	3,923	335	2	0	3,928	345
6	535,980	2,464	799	18	368	4,838	187	574	0	5,687	213
7	560,840	3,126	635	14	43	4,530	108	230	0	4,946	128
8	586,888	2,929	738	3	2	5,809	97	203	2	6,268	112
9	506,200	3,327	771	2	49	5,922	96	407	3	6,720	134
10	416,208	1,711	603	1	0	3,577	141	301	2	4,206	169
11	361,859	818	440	5	3	2,899	69	306	0	3,363	148
12	358,239	1,123	492	9	1	3,379	77	134	1	3,637	140
Total	4,891,045	19,343	7,442	167	659	44,559	1,391	2,311	10	48,651	1,683
All Other Areas	21,148,706	127,500	36,748	599	1,617	167,203	5,486	37,133	1,006	226,156	8,990
% Reduction **w/out** Redistribution	-23.1%	-15.2%	-20.3%	-27.9%	-40.8%	-26.6%	-25.4%	-6.2%	-1.0%	-21.5%	-18.7%
% Reduction **with** Redistribution (year-round)		9.3%	3.4%	-7.6%	-24.3%	-3.1%	-2.2%	21.6%	29.0%	3.2%	7.1%
% Reduction **with** Redistribution B2(a) (May-Nov) and B2(b) (June)		5.8%	4.4%	5.4%	-13.6%	0.3%	2.2%	10.0%	11.8%	3.2%	3.5%

Table 4.25 **B2(d) and B2(e) Combined. Percent reduction in incidental bluefin tuna and target catch and discards without redistribution of effort.**
Source: Pelagic Longline Logbook data (2001-2003). * excluding the NED

Month	Number of hooks set	Swordfish kept	Swordfish discards	Bluefin tuna kept	Bluefin tuna discards	Yellowfin tuna kept	Yellowfin tuna discards	Bigeye tuna kept	Bigeye tuna discards	BAYS kept	BAYS discards
1	748,991	2,391	1,103	26	2	8,185	278	286	6	8,657	305
2	495,938	2,774	1,009	31	6	2,274	91	82	3	2,441	98
3	551,764	2,235	1,172	50	75	3,661	122	31	0	3,707	134
4	826,626	1,591	1,249	93	229	7,782	370	20	0	7,807	380
5	1,094,168	1,305	1,539	64	163	11,842	571	26	1	11,912	643
6	1,225,916	3,478	1,246	31	396	15,039	599	761	2	16,134	726
7	1,615,167	5,355	1,589	23	66	17,006	540	538	5	17,998	739
8	1,642,501	4,974	1,596	5	7	17,861	333	1,540	49	20,314	537
9	1,214,788	4,879	1,473	22	53	13,007	242	1,670	62	15,719	448
10	1,106,735	3,788	1,624	11	50	9,387	275	1,549	19	13,461	445
11	864,235	1,890	1,105	26	90	6,519	179	1,373	3	9,361	492
12	766,783	2,012	929	13	2	7,076	241	730	8	8,563	462
Total	12,153,612	36,672	15,634	395	1,139	119,639	3,841	8,606	158	136,074	5,409
All Other Areas	21,148,706	127,500	36,748	599	1,617	167,203	5,486	37,133	1,006	226,156	8,990
% Reduction **w/out** Redistribution	-57.5%	-28.8%	-42.5%	-65.9%	-70.4%	-71.6%	-70.0%	-23.2%	-15.7%	-60.2%	-60.2%
% Reduction **with** Redistribution		63.1%	36.1%	-22.0%	-35.2%	-25.1%	-21.6%	78.4%	117.4%	-0.4%	5.6%

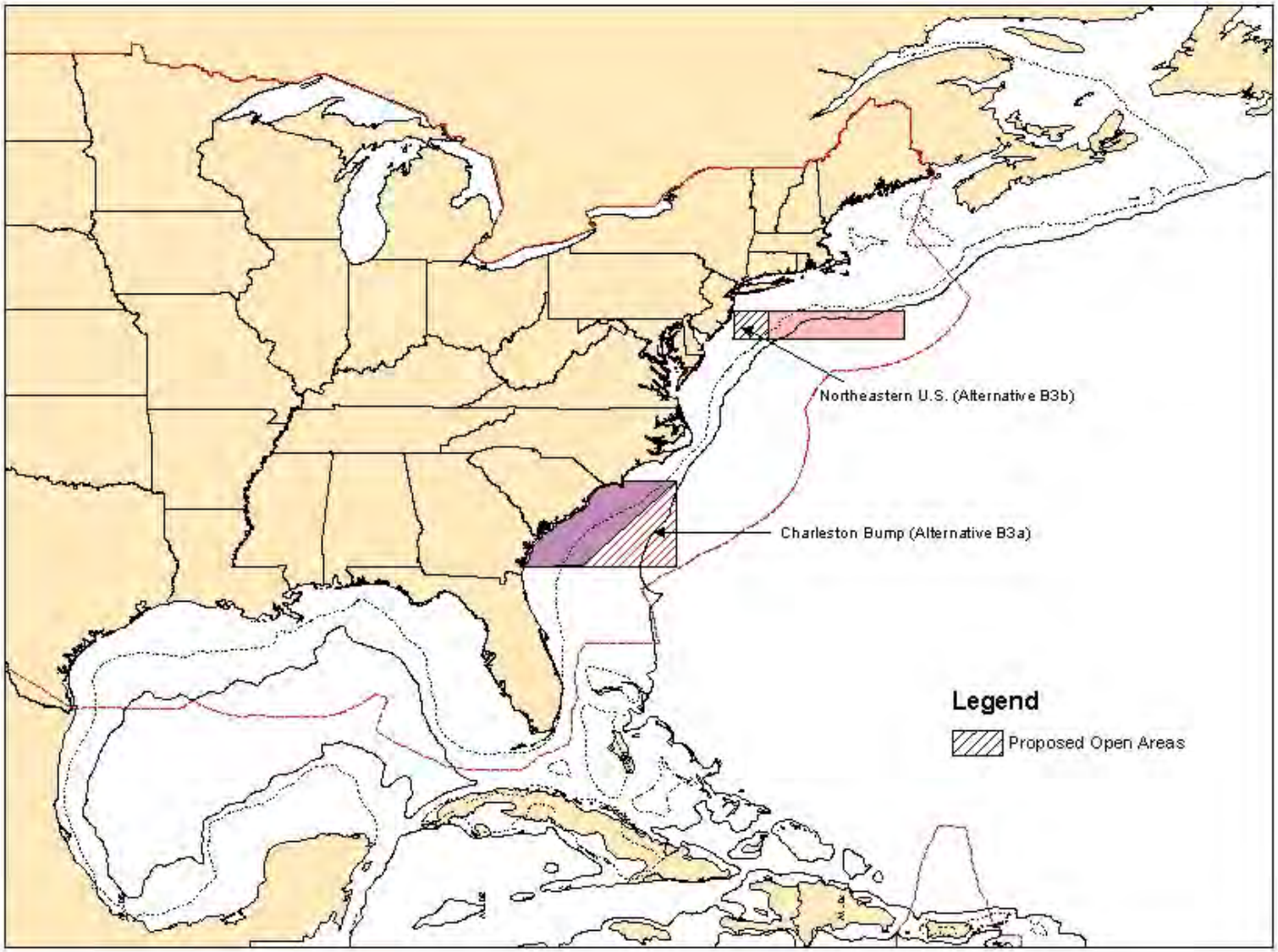

Figure 4.9 Map showing areas being considered for modifications to existing closures.

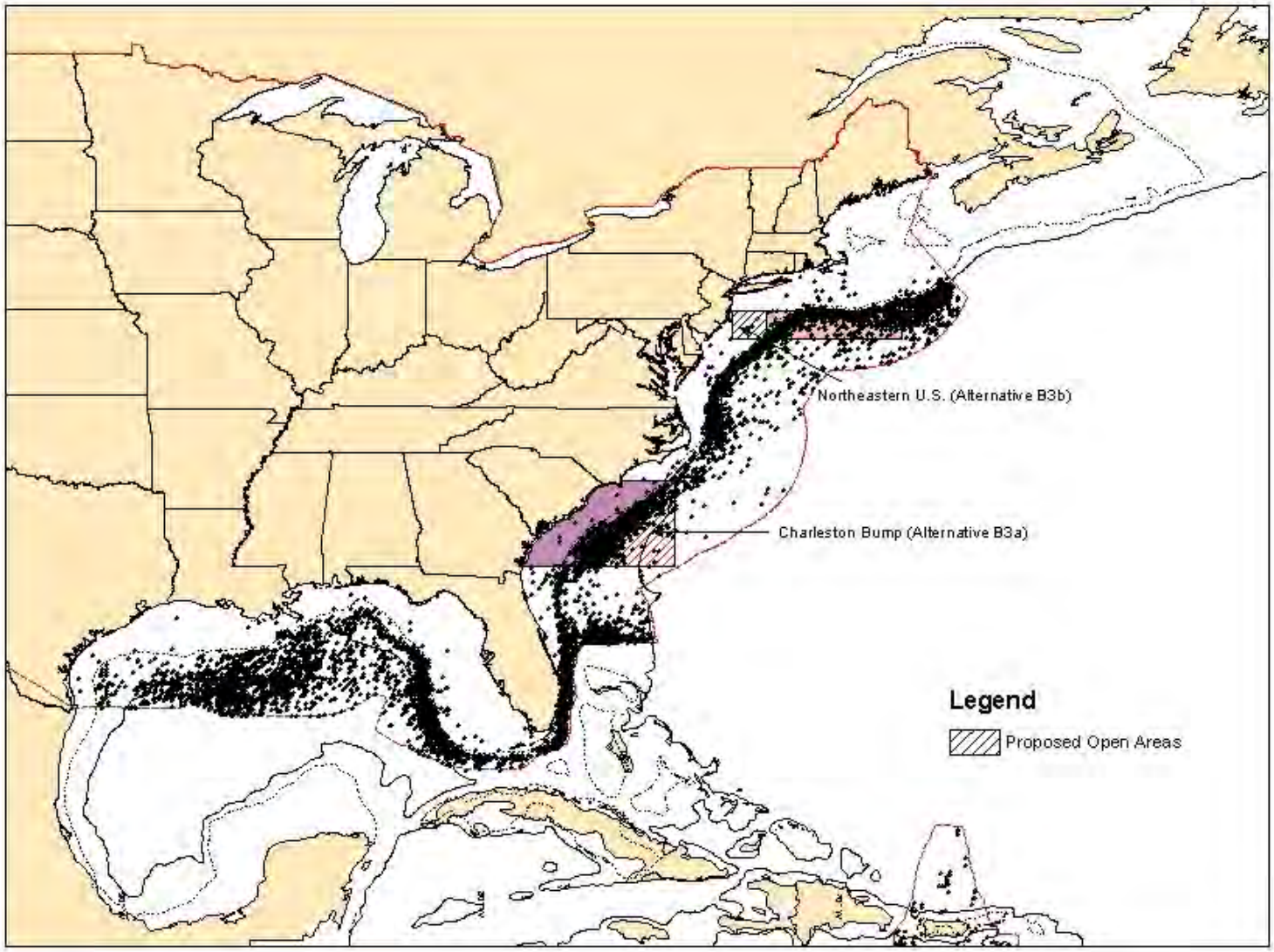

Figure 4.10 **Map showing areas being considered for modifications to existing closures and juvenile swordfish data (<180 cm LJFL).** Source: Pelagic Observer Program 1997-1999.

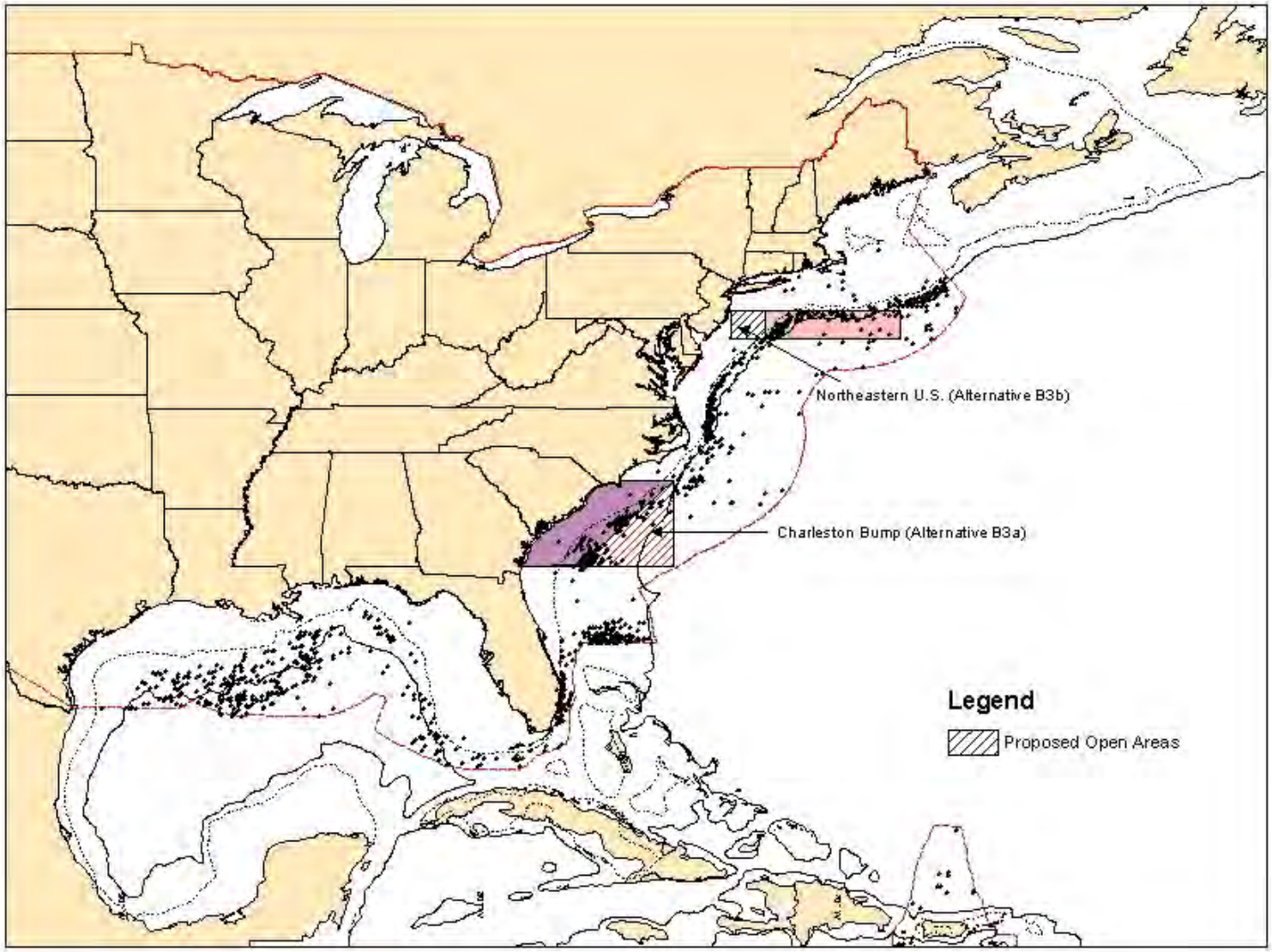

Figure 4.11 Map showing areas being considered for modifications to existing closures and adult swordfish data (>180 cm LJFL) from the Pelagic Observer Program. Source: Pelagic Observer Program 1997-1999

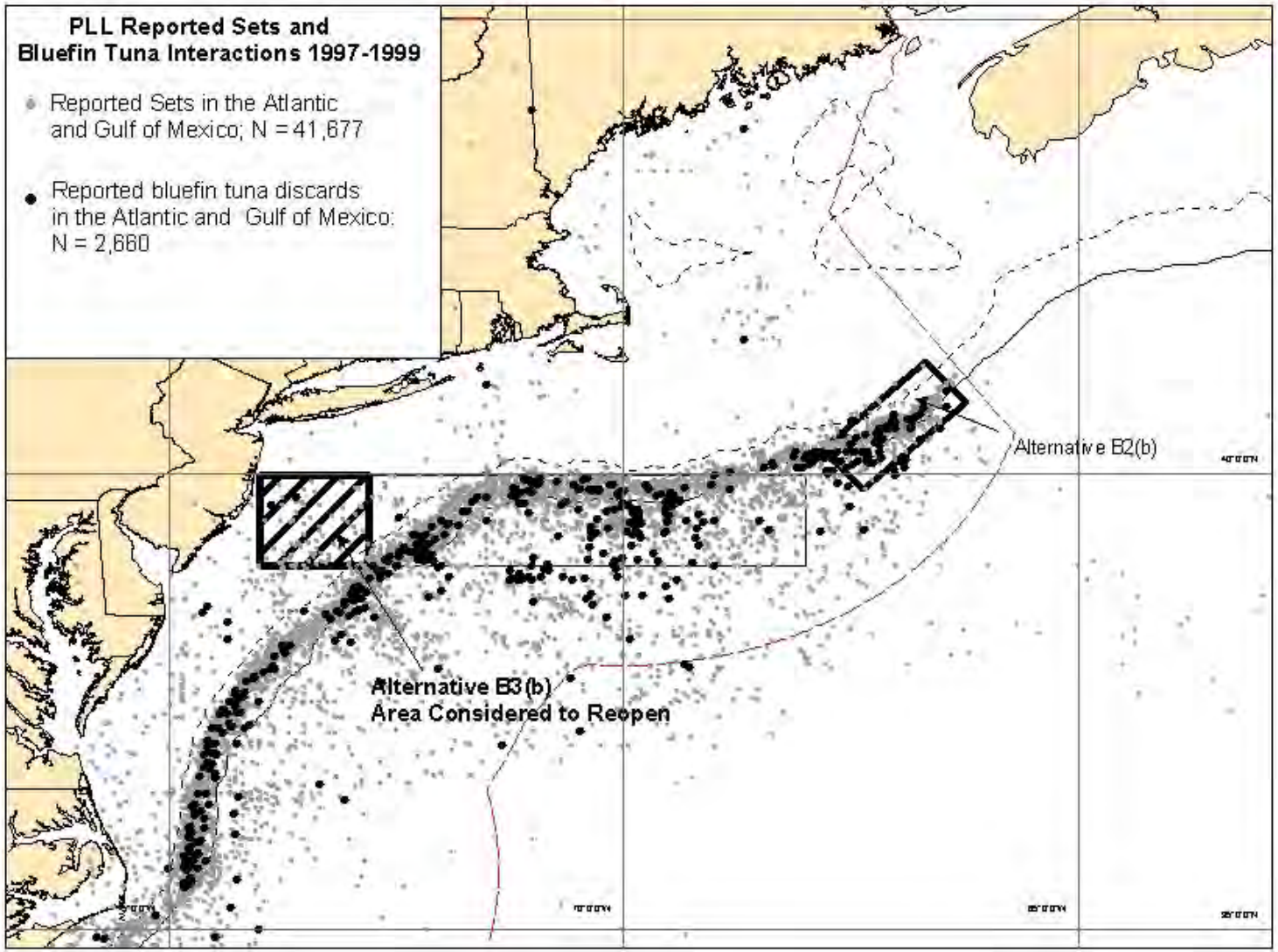

Figure 4.12 **Map showing modification to the existing Northeast United States closure and bluefin tuna discards.** Source: Pelagic Longline Logbook1997-1999.

Table 4.26 **Swordfish lengths (cm LJFL) in closed areas (inside) and open areas (outside) of current time/area closures.** Source: Pelagic Observer Program 1992-1999.

Closed Area	Inside	Sample Size	Outside	Sample Size	t-test
	1992-1999				
B3(a) Charleston Bump	124	3,374	125	1,664	$P = 0.372$
B3(b) NEC	96	1695	71	2	$P = 0.34$
	1997 - 1999				
B3(a) Charleston Bump	125	2,067	126	455	$P = 0.10$
B3(b) NEC	112	409	71	2	$P = 0.05$

Table 4.27 **Alternative B3(a) Charleston Bump modification. Discards of white marlin, blue marlin, sailfish, spearfish, leatherback, loggerhead and other sea turtles from closed and open areas being considered.** Source: Pelagic Longline Logbook 1997 - 1999. * excluding the NED

Month	Number of hooks set	White Marlin discards	Blue Marlin discards	Sailfish discards	Spearfish discards	Leatherback	Loggerhead	Other Sea turtles
	CLOSED AREA							
1	154,536	7	4	7	2	0	0	1
2	156,595	11	7	5	3	0	1	1
3	302,955	35	7	15	1	0	1	0
4	117,133	18	17	11	6	0	0	0
5	229,426	24	26	16	2	0	0	0
6	210,309	53	54	45	7	6	3	1
7	99,983	11	27	45	0	1	1	0
8	42,198	3	17	31	0	1	0	0
9	24,456	2	11	10	0	1	0	0
10	28,830	4	7	6	1	1	0	0
11	26,455	4	5	7	0	2	0	0
12	30,934	1	9	5	0	0	0	
Total (Feb - April)	576,683	64	31	31	10	0	2	1
All Areas*	21,148,706	3,143	2,449	1,029	424	494	179	11
% of All Areas*	2.7%	2.0%	1.3%	3.0%	2.4%	0.0%	1.1%	9.1%
	OPEN AREA							
1	28,429	2	3	4	1	0	1	0
2	35,545	4	7	2	1	0	0	0
3	29,920	8	2	5	1	0	1	0
4	42,938	7	8	3	2	0	0	0
5	50,773	7	3	2	0	0	0	0
6	84,298	33	15	18	5	0	0	0
7	42,229	2	7	21	1	0	0	0
8	33,900	1	15	24	3	0	0	0
9	57,915	4	38	27	2	0	0	0
10	69,360	6	23	19	1	0	1	0
11	27,882	3	10	4	1	0	1	0
12	26,765	0	8	3	0	0	0	
Total (Feb - April)	108,403	19	17	10	4	0	1	0
All Areas*	21,148,706	3,143	2,449	1,029	424	494	179	11
% of All Areas*	0.5%	0.6%	0.7%	1.0%	0.9%	0.0%	0.6%	0.0%

Table 4.28 **Alternative B3(b) Northeastern U.S. closure modification. Discards of white marlin, blue marlin, sailfish, spearfish, leatherback, loggerhead and other sea turtles from closed and open areas being considered.** Source: Pelagic Longline Logbook 1997 - 1999. * excluding the NED

Month	**Number of hooks set**	**White Marlin discards**	**Blue Marlin discards**	**Sailfish discards**	**Spearfish discards**	*Leatherback*	**Loggerhead**	**Other Sea turtles**
	OPEN AREA							
1		0	0	0	0	0	0	0
2		0	0	0	0	0	0	0
3	0	0	0	0	0	0	0	0
4	0	0	0	0	0	0	0	0
5	0	0	0	0	0	0	0	0
6	2,400	0	0	0	0	0	0	0
7	32,535	0	0	0	0	0	0	0
8	2,550	4	1	0	0	0	0	0
9	8,739	0	1	0	0	0	0	0
10	1,200	0	0	0	0	0	0	0
11	0	0	0	0	0	0	0	0
12	0	0	0	0	0	0	0	0
Total	47,424	4	2	0	0	0	0	0
All Areas*	21,148,706	3,143	2,449	1,029	424	494	179	11
% of All Areas*	0.2%	0.1%	0.1%	0.0%	0.0%	0.0%	0.0%	0.0%

Month	Number of hooks set	White Marlin discards	Blue Marlin discards	Sailfish discards	Spearfish discards	Leatherback	Loggerhead	Other Sea turtles
	OPEN AREA							
6	2,400	0	0	0	0	0	0	0
Total	2,400	0	0	0	0	0	0	0
All Areas*	21,148,706	3,143	2,449	1,029	424	494	179	11
% of All Areas*	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%

Table 4.29 **Alternative B3(a) Charleston Bump modification. Catches and discards of incidental bluefin tuna and target species in the open area being considered.** Source: Pelagic Longline Logbook 1997 - 1999. * excluding the NED

Month	Number of hooks set	Swordfish kept	Swordfish discards	Bluefin tuna kept	Bluefin tuna discards	Yellowfin tuna kept	Yellowfin tuna discards	Bigeye tuna kept	Bigeye tuna discards	BAYS kept	BAYS discards
	OPEN AREA (Year-round)										
1	28,429	644	196	0	0	65	11	0	0	65	11
2	35,545	484	164	0	0	97	3	5	0	105	3
3	29,920	461	181	0	0	53	3	3	1	57	4
4	42,938	426	203	0	0	125	13	0	0	135	14
5	50,773	359	77	1	1	118	4	6	0	134	4
6	84,298	963	202	2	0	323	7	9	0	339	8
7	42,229	969	227	0	0	85	7	1	0	86	7
8	33,900	787	199	0	0	54	10	2	0	56	10
9	57,915	2,192	540	0	0	282	13	16	0	301	14
10	69,360	2,864	1,007	0	0	536	17	4	3	540	20
11	27,882	880	312	1	2	150	12	0	2	152	14
12	26,765	717	157	0	0	115	15	1	2	116	17
Total	529,954	11,746	3,465	4	3	2,003	115	47	8	2,086	126
All Areas*	21,148,706	127,500	36,748	599	1,617	167,203	5,486	37,133	1,006	226,156	8,990
% Increase	2.5%	9.2%	9.4%	0.7%	0.2%	1.2%	2.1%	0.1%	0.8%	0.9%	1.4%
	OPEN AREA (Feb-April)										
2	35,545	484	164	0	0	97	3	5	0	105	3
3	29,920	461	181	0	0	53	3	3	1	57	4
4	42,938	426	203	0	0	125	13	0	0	135	14
Total	108,403	1,371	548	0	0	275	19	8	1	297	21
All Areas*	21,148,706	127,500	36,748	599	1,617	167,203	5,486	37,133	1,006	226,156	8,990
% Increase	0.51%	1.1%	1.5%	0.0%	0.0%	0.16%	0.35%	0.02%	0.1%	0.13%	0.23%

Table 4.30 **Alternative B3(b) Northeastern U.S. closure modification. Catches and discards of incidental bluefin tuna and target species in the open area being considered.** Source: Pelagic Longline Logbook 1997 - 1999. * excluding the NED

Month	Number of hooks set	Swordfish kept	Swordfish discards	Bluefin tuna kept	Bluefin tuna discards	Yellowfin tuna kept	Yellowfin tuna discards	Bigeye tuna kept	Bigeye tuna discards	BAYS kept	BAYS discards
	OPEN AREA (Year-round)										
1	0	0	0	0	0	0	0	0	0	0	0
2	0	0	0	0	0	0	0	0	0	0	0
3	0	0	0	0	0	0	0	0	0	0	0
4	0	0	0	0	0	0	0	0	0	0	0
5	0	0	0	0	0	0	0	0	0	0	0
6	2,400	3	0	0	1	1	0	0	0	1	0
7	32,535	0	1	0	1	9	0	0	0	10	0
8	2,550	27	2	0	0	13	0	12	0	28	0
9	8,739	20	20	0	0	129	0	29	1	161	1
10	1,200	6	0	0	0	9	0	5	0	18	0
11	0	0	0	0	0	0	0	0	0	0	0
12	0	0	0	0	0	0	0	0	0	0	0
Total	47,424	56	23	0	2	161	0	46	1	218	1
All Areas*	21,148,706	127,500	36,748	599	1,617	167,203	5,486	37,133	1,006	226,156	8,990
% Increase	0.2%	0.0%	0.1%	0.0%	0.1%	0.1%	0.0%	0.1%	0.1%	0.1%	0.0%
	OPEN AREA (June only)										
6	2,400	3	0	0	1	1	0	0	0	1	0
Total	2,400	3	0	0	1	1	0	0	0	1	0
All Areas*	21,148,706	127,500	36,748	599	1,617	167,203	5,486	37,133	1,006	226,156	8,990
% Increase	0.01%	0.002%	0.0%	0.0%	0.06%	0.001%	0.0%	0.0%	0.0%	0.0004%	0.0%

Table 4.31 **Comparison of open areas on discards of white marlin, blue marlin, sailfish, spearfish, leatherback and loggerhead sea turtles.** Source: Pelagic Longline Logbook 1997-2000. - = decrease + = increase. * excluding the NED

	Number of hooks set	White Marlin discards	Blue Marlin discards	Sailfish discards	Spearfish discards	Leatherback	Loggerhead	Other Sea turtles
	OPEN AREAS							
B3(a) Charleston Bump (Feb - Apr)	108,403	19	17	10	4	0	1	0
B3(b) Northeastern U.S. (June)	2,400	0	0	0	0	0	0	0
All Areas*	21,148,706	3,143	2,449	1,029	424	494	179	11
	% of All Areas							
B3(a) Charleston Bump (Feb - Apr)	0.3%	0.6%	0.7%	1.0%	0.9%	0.0%	0.6%	0.0%
B3(b) Northeastern U.S.	0.01%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%

Table 4.32 **Comparison of open areas catch of swordfish, incidental bluefin tuna, yellowfin tuna, bigeye tuna, and BAYS.** Source: Pelagic Longline Logbook 1997 - 1999. * excluding the NED

	Number of hooks set	Swordfish kept	Swordfish discards	Bluefin tuna kept	Bluefin tuna discards	Yellowfin tuna kept	Yellowfin tuna discards	Bigeye tuna kept	Bigeye tuna discards	BAYS kept	BAYS discards
	OPEN AREA										
B3(a) Charleston Bump (Feb-Apr)	108,403	1,371	548	0	0	275	19	8	1	297	21
B3(b) Northeastern U.S. (June)	2,400	3	0	0	1	1	0	0	0	1	0
All Areas*	21,148,706	127,500	36,748	599	1,617	167,203	5,486	37,133	1,006	226,156	8,990
	% of All Areas										
B3(a) Charleston Bump (Feb-Apr)	0.51%	1.1%	1.5%	0.0%	0.0%	0.16%	0.35%	0.02%	0.1%	0.13%	0.23%
B3(b) Northeastern U.S. (June)	0.01%	0.002%	0.0%	0.0%	0.06%	0.001%	0.0%	0.0%	0.0%	0.0004%	0.0%

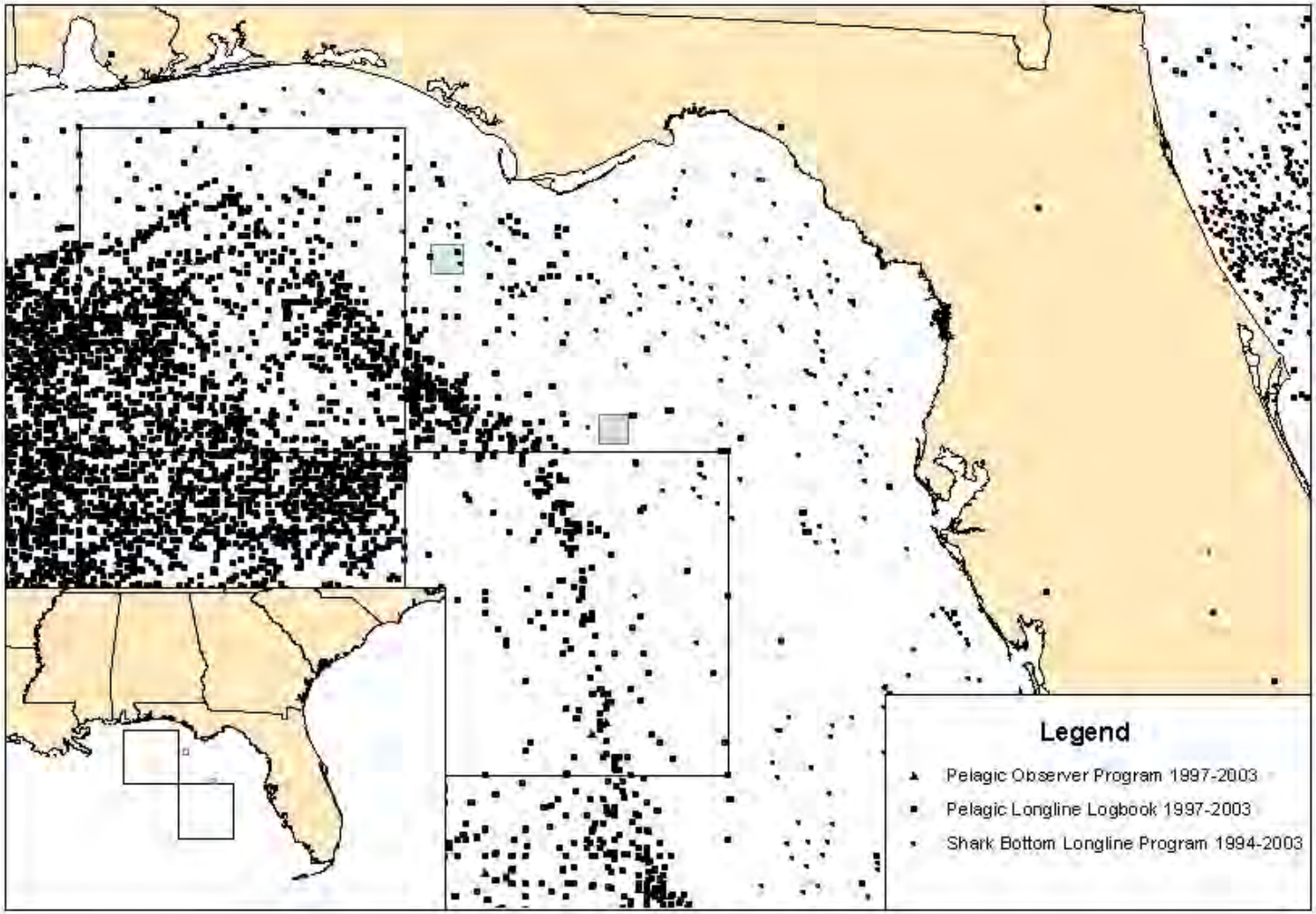

Figure 4.13 **Pelagic and Bottom Longline Sets in the Madison-Swanson (upper left) and Steamboat Lumps (lower right) Marine Reserves.** Source: Pelagic Longline Logbook, Pelagic Observer Program, Shark Observer Program. The Desoto Canyon closure is also shown for reference.

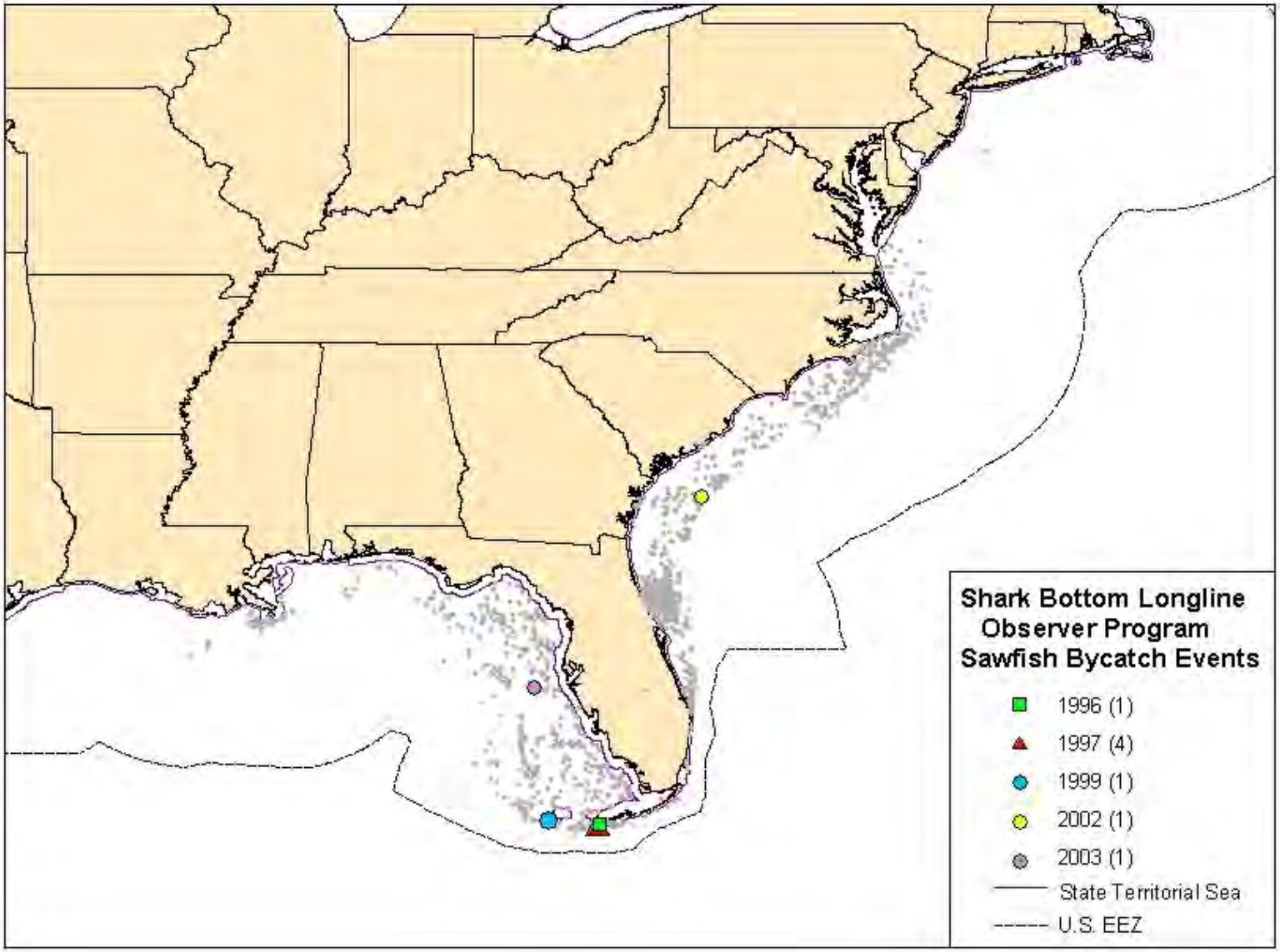

Figure 4.14 **Map showing smalltooth sawfish bycatch. Numbers in parentheses in the legend are the number of sawfish interactions. Gray dots indicate the location of each observed set.** Source: Shark Bottom Longline Observer Program 1994-2003.

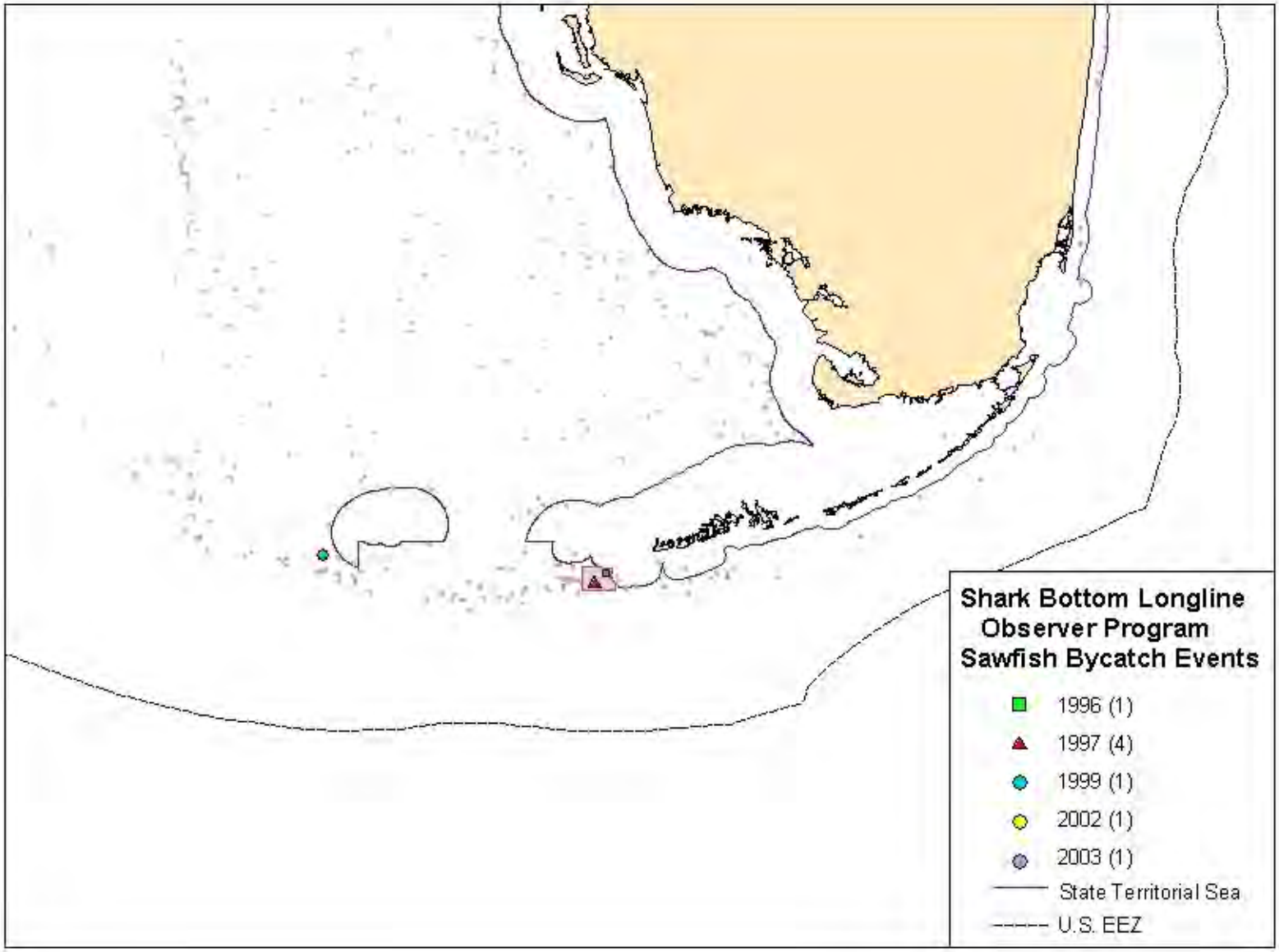

Figure 4.15 **Map showing the potential closed area to bottom longline gear to reduce bycatch of endangered smalltooth sawfish.** Source: Shark Bottom Longline Observer Program 1994-2003.

Table 4.33 **Total number of individual vessels and sets by year in each of the time/area closures.** Source: Pelagic Longline Logbook 2001-2003.

Alternative	Number of Vessels	Number of Sets
Alternative B2(a)		
2001	47	1,092
2002	42	880
2003	50	946
Total No. Vessels 01-03	61	2,918
Alternative B2(b)		
2001	12	97
2002	10	78
2003	7	51
Total No. Vessels 01-03	20	226
Alternative B2(c)		
2001	62	3,946
2002	65	4,201
2003	63	4,476
Total No. Vessels 01-03	75	12,623
Alternative B2(d)		
2001	62	4,046
2002	66	4,312
2003	66	4,539
Total No. Vessels 01-03	78	12,897
Alternative B2(e)		
2001	41	1,156
2002	36	764
2003	28	667
Total No. Vessels 01-03	49	2,587
Alternative B7		
2001	123	10,857
2002	145	9,847
2003	157	9,705
Total No. Vessels 01-03	177	30,409

Table 4.34 **Total number of vessels by state for each of the time/area closures.** Source: Pelagic Longline Logbook 2001-2003.

State	Number of Vessels	Number of Sets
Alternative B2(a)		
FL	14	262
LA	40	2574
TX	7	88
Total No. 2001-03	61	2924
Alternative B2(b)		
DE	1	3
FL	1	7
MD	1	18
NC	1	7
NJ	4	91
NY	7	66
PA	4	32
RI	1	2
Total No. 2001-03	20	226
Alternative B2(c)		
AL	1	46
FL	21	2145
LA	44	9214
TX	9	1218
Total No.	75	12623
Alternative B2(d)		
AL	1	50
FL	24	2266
LA	44	9258
TX	9	1323
Total No. 2001-03	78	12897
Alternative B2(e)		
CT	1	15
DE	2	30
FL	6	309
MA	4	127
MD	1	62
NC	5	189
NJ	9	510
NY	11	1014
PA	6	223
RI	1	70
SC	1	9
TX	1	18
VA	1	11
Total No. 2001-03	49	2587

Table 4.35 **Average annual gain or loss in gross revenues by species for each of the alternatives in comparison to landings from the Atlantic and Gulf of Mexico.** Source: NMFS, 2005. - = decrease, + = increase

Alternative	Swordfish kept	Swordfish discards	Bluefin tuna kept	Bluefin tuna discards	Yellowfin tuna kept	Yellowfin tuna discards	Bigeye tuna kept	Bigeye tuna discards	BAYS kept	BAYS discards	Total
	WITHOUT REDISTRIBUTION OF EFFORT										
Alternative B2(a) (May-Nov)	-3.1%	-8.1%	-6.7%	-4.6%	-14.3%	-17.4%	-1.1%	-0.2%	-10.8%	-12.8%	
Weight	-143,519		-9,619		-542,796		-5,529				
Gross Revenues	-$423,382		-$60,791		-$1,796,654		-$18,190				-$2,299,018
Alternative B2(b) (June only)	-1.5%	-0.7%	-1.8%	-22.6%	-0.3%	-0.2%	-1.5%	0.0%	-0.6%	-0.2%	
Weight	-69,445		-2,584		-11,387		-7,540				
Gross Revenues	-$231,252		-$14,755		-$27,102		-$26,011				-$299,120
Alternative B2(a) (May-Nov)/B2(b) (June)	-15.2%	-20.3%	-27.9%	-40.8%	-26.6%	-25.4%	-6.2%	-1.0%	-21.5%	-18.7%	
Weight	-703,708		-40,054		-1,009,676		-31,163				
Gross Revenues	-$2,209,644		-$240,926		-$2,872,529		-$105,021				-$5,428,120
Alternative B2(c) (Apr-June)	-2.8%	-9.9%	-29.0%	-21.5%	-19.8%	-27.0%	-0.2%	-0.2%	-14.7%	-18.7%	
Weight	-130,502		-41,703		-750,356		-1,218				
Gross Revenues	-$384,981		-$263,563		-$2,483,678		-$4,008				-$3,136,229
Alternative B2(d)	-15.1%	-31.5%	-53.6%	-27.1%	-64.0%	-66.4%	-3.5%	-1.9%	-48.2%	-51.8%	
Weight	-697,717		-76,935		-2,427,731		-17,583				
Gross Revenues	-$2,058,265		-$486,227		-$8,035,791		-$57,849				-$10,638,133
Alternative B2(e)	-13.7%	-11.0%	-12.4%	-43.3%	-7.6%	-3.6%	-19.7%	-13.8%	-12.0%	-8.3%	
Weight	-632,611		-17,736		-288,129		-98,854				
Gross Revenues	-$2,106,596		-$101,271		-$685,746		-$341,047				-$3,234,660
	WITH REDISTRIBUTION OF EFFORT										
Alternative B2(a) (May-Nov)	9.1%	4.4%	3.4%	10.3%	-1.1%	3.0%	2.6%	11.6%	2.6%	-0.04%	
Weight	421,299		4,881		-41,754		13,069				
Gross Revenues	$1,242,832		$27,871		-$138,204		$72,383				$1,204,883

Alternative	Swordfish kept	Swordfish discards	Bluefin tuna kept	Bluefin tuna discards	Yellowfin tuna kept	Yellowfin tuna discards	Bigeye tuna kept	Bigeye tuna discards	BAYS kept	BAYS discards	Total
Alternative B2(b) (June only)	-0.8%	-0.1%	-1.2%	-21.9%	0.9%	1.1%	-1.2%	0.3%	0.4%	0.9%	
Weight	-37,037		-1,723		34,162		-6,032				
Gross Revenues	-$123,334		-$9,837		$81,306		-$20,809				-$72,675
Alternative B2(c) (Apr-June)	21.1%	6.0%	-18.3%	9.8%	-11.0%	-18.3%	11.4%	1.7%	-5.4%	-11.8%	
Weight	976,858		-26,272		-417,535		57,301				
Gross Revenues	$2,881,732		-$166,040		-$1,382,042		$317,372				$1,651,023
Alternative B2(d)	62.5%	31.9%	-12.1%	38.0%	-29.8%	-35.6%	80.6%	84.8%	-0.6%	-6.9%	
Weight	2,893,538		-17,371		-1,131,141		405,125				
Gross Revenues	$8,535,936		-$109,786		-$3,744,077		$1,397,683				$6,079,756
Alternative B2(e)	-6.8%	-2.9%	-7.6%	-40.7%	5.5%	8.3%	-11.9%	-2.5%	-0.3%	4.1%	
Weight	-314,817		-10,911		208,768		-59,814				
Gross Revenues	-$1,048,340		-$62,301		$496,867		-$206,358				-$820,132
	COMBINATIONS WITH REDISTRIBUTION OF EFFORT										
Alternative B2(a) (May-Nov)/B2(b) (June)	5.8%	4.4%	5.4%	-13.6%	0.3%	2.2%	10.0%	11.8%	3.2%	3.5%	
Weight	268,520		7,752		11,387		50,264				
Gross Revenues	$843,154		$46,631		$32,397		$169,389				$1,091,570
Alternative B2(d) /B2(e) (year-round)	63.1%	36.1%	-22.0%	-35.2%	-25.1%	-21.6%	78.4%	117.4%	-0.4%	5.6%	
Weight	2,921,315		-31,584		-952,740		394,067				
Gross Revenues	$9,172,931		-$189,978		-$2,710,544		$1,328,007				$7,600,416

Table 4.36 Average annual gain or loss in gross revenues by species for each of the modifications to the existing time/area closures in comparison to landings from the Atlantic and Gulf of Mexico. Source: NMFS, 2005. - = decrease, + = increase. * excluding the NED

	Swordfish kept	Swordfish discards	Bluefin tuna kept	Bluefin tuna discards	Yellowfin tuna kept	Yellowfin tuna discards	Bigeye tuna kept	Bigeye tuna discards	BAYS kept	BAYS discards	Total
B3(a) Charleston Bump (Feb-Apr)	1.1%	1.5%	0.0%	0.0%	0.2%	0.4%	0.0%	0.1%	0.1%	0.2%	
Number	1,371	548	0	0	275	19	8	1	297	21	
Weight	67,732		0		7,598		126				
Gross Revenues	$220,806		$0		$13,372		$281				$234,460
B3(b) Northeastern U.S. (June)	0.002%	0.000%	0.000%	0.062%	0.001%	0.000%	0.000%	0.000%	0.000%	0.000%	
Number	3	0	0	1	1	0	0	0	1	0	
Weight	145		0		28		0				
Gross Revenues	$482		$0		$68		$0				$550
All Other Areas	127,500	36,748	599	1,617	167,203	5,486	37,133	1,006	226,156	8,990	

Table 4.37 **Percent of total discards in the Gulf of Mexico (GOM) in comparison to all areas (excluding the NED).** Source: Pelagic Longline Logbook 2001-2003. * excluding the NED

Month	Number of hooks set	White Marlin discards	Blue Marlin discards	Sailfish discards	Spearfish discards	Pelagic Shark discards	Large Coastal Shark discards	Leatherback	Loggerhead	Other Sea turtles
1	748,991	27	37	19	10	78	147	16	1	0
2	494,538	11	16	12	2	92	307	14	1	0
3	551,144	10	26	7	5	91	621	19	1	0
4	826,626	30	39	17	6	92	278	19	0	2
5	1,094,168	93	67	54	10	173	440	15	6	0
6	1,225,916	253	200	126	22	88	386	24	1	0
7	1,615,167	574	604	218	58	82	762	49	3	0
8	1,640,901	269	214	118	23	62	162	22	1	0
9	1,215,688	140	171	79	29	63	126	14	1	0
10	1,106,735	131	100	43	14	66	151	26	1	0
11	863,610	58	52	22	6	50	279	20	1	0
12	766,783	42	42	7	9	58	104	72	3	3
Total	12,150,267	1,638	1,568	722	194	995	3,763	310	20	5
All Areas*	21,148,706	3,143	2,449	1,029	424	34,020	16,573	494	179	11
Percent of Total	57.5%	52.1%	64.0%	70.2%	45.8%	2.9%	22.7%	62.8%	11.2%	45.5%

Table 4.38 **Percent of total landings and discards in the Gulf of Mexico (GOM) in comparison to all areas (excluding the NED).** Source: Pelagic Longline Logbook 2001-2003. * excluding the NED

Month	Number of hooks set	Swordfish kept	Swordfish discards	Bluefin tuna kept	Bluefin tuna discards	Yellowfin tuna kept	Yellowfin tuna discards	Bigeye tuna kept	Bigeye tuna discards	BAYS kept	BAYS discards
1	856,057	3,454	1,514	27	4	8,633	333	246	6	8,982	364
2	578,574	3,853	1,397	34	5	2,453	111	89	3	2,570	118
3	679,555	3,865	1,578	61	83	4,061	151	56	10	4,128	173
4	928,458	2,783	1,452	97	203	8,097	402	31	3	8,132	415
5	1,187,637	2,310	1,862	68	155	12,663	588	36	0	12,726	658
6	1,092,622	1,857	1,237	18	8	15,719	669	73	2	15,798	836
7	1,253,510	1,882	1,151	3	0	16,878	610	99	0	17,006	857
8	1,218,704	1,674	905	0	5	15,014	334	82	1	15,124	522
9	872,529	1,482	803	20	1	9,352	169	87	0	9,463	294
10	901,145	2,005	883	0	1	8,419	244	212	5	8,698	372
11	795,768	1,811	762	3	4	6,324	173	283	3	6,764	313
12	773,885	2,094	973	14	1	7,348	241	211	1	7,781	391
TOTAL in GOM	11,138,444	29,070	14,517	345	470	114,961	4,025	1,505	34	117,172	5,313
All Areas*	21,148,706	127,500	36,748	599	1,617	167,203	5,486	37,133	1,006	226,156	8,990
Percent of Total	52.7%	22.8%	39.5%	57.6%	29.1%	68.8%	73.4%	4.1%	3.4%	51.8%	59.1%

Table 4.39 **Average annual gain or loss in gross revenues by species for each of the proposed time/area closures in comparison to landings from the Gulf of Mexico only.** Source: NMFS, 2005. - = decrease, + = increase.

Alternative	Swordfish kept	Swordfish discards	Bluefin tuna kept	Bluefin tuna discards	Yellowfin tuna kept	Yellowfin tuna discards	Bigeye tuna kept	Bigeye tuna discards	BAYS kept	BAYS discards	Total
	WITHOUT REDISTRIBUTION OF EFFORT										
Alternative B2(a) (May-Nov)											
Number caught in B2(a)	3,959	2,988	40	75	23,846	952	400	2	24,420	1,152	
% Reduction vs. Overall	-3.1%	-8.1%	-6.7%	-4.6%	-14.3%	-17.4%	-1.1%	-0.2%	-10.8%	-12.8%	
% Reduction vs. GOM only	-13.6%	-20.6%	-11.6%	-16.0%	-20.7%	-23.7%	-26.6%	-5.9%	-20.8%	-21.7%	
Weight	-629,634		-16,653		-785,725		-133,701				
Gross Revenues	-$1,857,420		-$105,249		-$2,600,751		-$439,878				-$5,003,298
	WITH REDISTRIBUTION OF EFFORT										
Alternative B2(a) (May-Nov)											
Number caught in B2(a)	11,590	1,635	20	166	-1,881	166	4,393	117	5,897	-4	
% Reduction vs. Overall	9.1%	4.4%	3.4%	10.3%	-1.1%	3.0%	2.6%	11.6%	2.6%	-0.04%	
% Reduction vs. GOM only	2.4%	11.3%	-0.8%	-4.3%	4.0%	30.4%	-8.7%	10.4%	3.7%	1.7%	
Weight	111,112		-1,149		151,831		-43,729				
Gross Revenues	$327,780		-$7,259		$502,561		-$143,870				$679,212

Table 4.40 **Landings by region from the pelagic longline fishery for swordfish, bluefin tuna, yellowfin tuna and bigeye tuna.** Source: NMFS, 2004.

Region	Pelagic Longline Landings (mt)	2003 Gross Fishing Revenues
SWORDFISH		
Northwest Atlantic	1,347	
Gulf of Mexico	515.8	
Caribbean	276.4	
NC Area 94a	632.9	
Southwest Atlantic	20.9	
Total (mt)	2,793	
Total (lb)	6,157,448	
Total (lb dw)	4,629,660	
Percent of all landings	**99.2%**	**14,481,889**
BLUEFIN TUNA		
Northwest Atlantic	16.3	
Gulf of Mexico	53.8	
Caribbean	0	
NC Area 94a	11.3	
Southwest Atlantic	0	
Total	81.4	
Total (lb)	179,454	
Total (lb dw)	143,564	
Percent of all landings	**5.7%**	**848,614**
YELLOWFIN TUNA		
Northwest Atlantic	272	
Gulf of Mexico	1828	
Caribbean	7	
NC Area 94a	5	
Southwest Atlantic	42	
Total	2154	
Total (lb)	4,748,708	
Total (lb dw)	3,795,775	
Percent of all landings	**28.0%**	**8,891,195**
BIGEYE TUNA		
Northwest Atlantic	168.7	
Gulf of Mexico	27.5	
Caribbean	7.2	
NC Area 94a	36.9	
Southwest Atlantic	44.6	
Total	284.9	
Total (lb)	628,091	
Total (lb dw)	502,637	
Percent of all landings	**59.4%**	**1,601,921**
TOTAL		**25,823,620**

4.2 Rebuilding and Preventing Overfishing

4.2.1 Northern Albacore Tuna

ICCAT assumes three Atlantic albacore stocks for assessment purposes: northern and southern Atlantic stocks, separated at 5° N latitude, and a Mediterranean stock (See Section 3.2.3.3). ICCAT's SCRS conducted a stock assessment for the northern stock in 2000, using data from 1975 through 1999. Based on the results of this stock assessment, at its November 2000 meeting, ICCAT recommended a total allowable catch (TAC) of 34,500 mt ww with an allocation to the United States of 607 mt ww. Subsequent ICCAT recommendations have extended the 34,500 mt ww TAC, and the U.S. share of 607 mt ww, through 2006.

In 2004, SCRS attempted to update the assessment, but concluded that it was not appropriate to proceed using 2003 catch-at-age data until the data could be reviewed and validated. Consequently, advice was based on the 2000 assessment as updated with CPUE trends through 2003. SCRS concluded that the northern stock is probably about 30 percent below B_{MSY}, but the possibility of a lower B_{MSY} could not be dismissed. It was further concluded that northern albacore was not being growth overfished while spawning stock biomass could be increased if catches do not exceed 31,000 mt ww (SCRS, 2004). SCRS plans to conduct the next stock assessment in 2007. ICCAT does not have a rebuilding plan for this species.

U.S. harvest of albacore tuna, based on 1997 through 2003 data, is landed primarily by rod and reel and pelagic longline fisheries in the Northwest Atlantic. Approximately 98 percent of total U.S. landings are harvested in the Northwest Atlantic (Table 3.59). The commercial pelagic longline fishery harvests northern albacore tuna as incidental catch in the swordfish and other tuna pelagic fisheries. Landings vary between years by up to 30 percent for the longline fleet and by as high as a factor of four for the rod and reel fishery. Since the ICCAT recommendation of a 607 mt TAC was implemented, U.S. landings have been 322 mt (53 percent), 480 mt (79 percent), and 446 mt (73 percent) in 2001, 2002, and 2003, respectively, and have averaged 416 mt per year. These landings have been well below the annual TAC of 607 mt ww and did not exceed it in any one year. The United States has annually taken less than two percent of the recorded total annual international landings.

As described in Chapter 2, the alternatives considered for a rebuilding plan are:

C1 Maintain compliance with the current ICCAT recommendation (No Action)
C2 Unilateral proportional reduction of United States northern albacore fishing mortality
C3 *Establish the foundation with ICCAT for developing an international rebuilding program – Preferred Alternative*

Ecological Impacts

ICCAT has adopted quotas for northern albacore tuna, but an international rebuilding program has not been implemented. However, ICCAT has recognized the need for management and, since 2001, has established a TAC of 34,500 metric tons. SCRS has determined that under

the current exploitation limits the total catch has remained below the TAC for 2001 - 2003. The SCRS has not been able to assess the effect of this limit on the stock. However in 2004, a northern albacore tuna stock update using CPUE trends through 2003 indicated the stock was probably about 30 percent below MSY. Alternative C1, the No Action alternative, would not be expected to change the stock status, bycatch, or catch rates. Alternative C2, which would implement unilateral U.S. restrictions, would be unlikely to change the stock status because the U.S. harvest is so low relative to that of other ICCAT countries that any ecological impacts would be negligible. However, a unilateral rebuilding plan would likely require reductions in landings in both the commercial and recreational sectors and would potentially change fishing behavior and/or increase dead discards. Alternative C3, which would establish a foundation for an international rebuilding plan, would have no immediate impacts, as ICCAT would probably develop an international rebuilding plan following the next scheduled assessment in 2007. Following implementation of rebuilding plan recommendation(s), changes in fishing practices may be necessary to reduce fishing mortality, which might result in an increase in dead discards in U.S. fisheries. But as the stock rebuilds and more resource is available to the fleet, quotas would likely increase and discards may decline.

The No Action alternative, alternative C1, would not establish a foundation to develop an international rebuilding plan for overfished northern albacore tuna and would be inconsistent with Magnuson-Stevens Act requirements. Also, alternative C2 would not be consistent with Magnuson-Stevens Act §304(g)(1)(d) and ATCA because it would set the U.S. quota above or below the current ICCAT recommendation. Furthermore, implementation of an ineffective unilateral rebuilding plan may weaken the U.S. negotiation position at ICCAT to implement an international rebuilding plan, potentially resulting in continued international fishing on a stock biomass below MSY.

Under alternative C3, the United States would work through ICCAT to establish a foundation for and adopt a rebuilding program for northern albacore tuna as recommended by ICCAT. However, implementation of this alternative would depend on a thorough analysis of the ICCAT Rebuilding Program to ensure that it includes a specified recovery period, biomass targets, fishing mortality rate limits, and explicit interim milestones expressed in terms of measurable improvement of the stock. Each of these components is necessary to support the objectives of this FMP and the intent of the Magnuson-Stevens Act. If successful, an Atlantic-wide TAC for northern albacore tuna, along with other conservation and management measures, would be adopted by ICCAT to rebuild the stock. The United States would then implement the ICCAT Rebuilding Program for northern albacore tuna through appropriate management measures such as quotas and/or increased minimum sizes and retention limits in domestic fisheries. Such a rebuilding plan would be expected to reduce harvest levels, which could increase discards of northern albacore tuna because the pelagic longline fishery primarily targets other species and fishermen may increase fishing effort to compensate for lost revenues from northern albacore that would have to be discarded. A reduction in landings of northern albacore tuna could also cause a shift in both commercial and recreational fishing effort, and perhaps mortality, towards other species. Overall, however, alternative C3 would result in long term positive ecological impacts on the stock because current international catch rates exceed the levels needed to produce MSY.

Social and Economic Impacts

There would be essentially no impact from alternative C1, the No Action alternative, as the U.S. fleets are currently fishing below their ICCAT allocation. For commercial fisheries, alternative C2, implementation of a unilateral rebuilding plan, would likely result in a reduction in income, as incidental catches of northern albacore tuna would have to be discarded rather than landed. However, expected reductions in income would be small since the level of landings for northern albacore is two orders of magnitude smaller than pelagic longline target species (*e.g.*, swordfish, other tunas). For the recreational fishery, alternative C2 would result in shifts for other opportunistic target species and catch-and-release of northern albacore tuna. Economic impacts would be difficult to evaluate for the recreational fishery since there is such a high variation in the catch from year to year. As ICCAT has not yet adopted a rebuilding program for northern albacore tuna, a complete analysis of the social and economic impacts of alternative C3 cannot be conducted at this time. If the ICCAT Rebuilding Program involves a substantial reduction in allowable catch, minimum size restrictions, or effort restrictions, there would likely be a short-term reduction in economic benefits to the pelagic longline fishery until the stock recovers. Since recreational fishermen target northern albacore tuna in certain times of the year and in certain areas, it is difficult to estimate the effect that a reduction in allowable landings of northern albacore would have on angler consumer surplus. It might be reduced, but to an unknown extent, since many recreational trips targeting northern albacore tuna often target other tuna species. Overall, however, ICCAT recommendations for stock rebuilding tend to be long term and so any negative social and economic impacts may be mitigated in the short term.

Conclusion

The preferred alternative for northern albacore tuna is C3, which would establish a foundation with ICCAT for developing an international rebuilding plan, because it appears to be the most effective alternative for meeting the objectives of the Magnuson-Stevens Act, ATCA, and this FMP. NMFS will continue to work with ICCAT member nations to develop and adopt an appropriate international rebuilding plan for northern albacore tuna with a specified recovery period, biomass targets, fishing mortality rate limits, and explicit interim milestones. The U.S. harvest of the North Atlantic stock is proportionally so low that the socio-economic impacts to the United States would likely be minimal but would depend upon the specifics of the rebuilding plan adopted by ICCAT. The other alternatives of no action or unilateral action would not be consistent with the Magnuson-Stevens Act or ATCA.

4.2.2 Finetooth Sharks

The 2002 stock assessment for SCS determined that overfishing of finetooth sharks is occurring (Cortes, 2002). More detailed information on the stock assessment can be found in the Status of the Stocks section (Section 3.2.5), of this document. As described in Chapter 2, the alternatives considered for preventing overfishing of finetooth sharks are:

D1 Maintain current regulations for recreational and commercial fisheries. (No Action)
D2 Implement commercial management measures to reduce fishing mortality of finetooth sharks.

D3 Implement recreational management measures to reduce fishing mortality of finetooth sharks.

D4 Identify sources of finetooth shark fishing mortality to target appropriate management actions - Preferred Alternative

Ecological Impacts

Alternative D1 would likely maintain fishing mortality of finetooth sharks at current levels and therefore may have negative ecological impacts. Over 80 percent of finetooth sharks harvested commercially are landed with either drift gillnets, strikenets, or encircling nets. Finetooth sharks are susceptible to this type of gear as they have a tendency to "roll" upon contact with gillnets, becoming entangled by a wide range of gillnet mesh sizes (Carlson and Cortes, 2003), and are often dead at haulback. Currently, gillnets are banned in most states' waters throughout the finetooth sharks' range, including South Carolina, Georgia, Florida, Texas, and Louisiana. Between 1997 and 2003, 95 and 99 percent of the finetooth landings reported to the General Canvass and Coastal Fisheries logbooks, respectively, were from the South Atlantic region. Finetooth sharks are generally found in state waters. For more information on finetooth shark life history, please see Section 3.2.5.3.

It is difficult to discern exactly which fisheries are contributing to commercial landings of finetooth sharks because dealer logbooks are not linked to a specific vessel. Federally permitted vessels are required to submit logbooks, however, these landings only represent a fraction of the total landings (General Canvas landings) for finetooth sharks (Table 4.41). This discrepancy may be a result of landings in state waters, landings by Federally permitted fishermen who are not reporting all their catch in logbooks, or misidentification of finetooth sharks on the behalf of the dealers. Of the Federally permitted vessels, only five vessels are "targeting" sharks with gillnets and all of them are subject to observer coverage. Observer data indicate their landings are only a small portion of the total finetooth shark landings.

The General Canvass data indicate that the majority of finetooth sharks are being landed with nets (runaround or drift gillnets and entangling nets), however, gillnets are illegal in many states' waters within the finetooth shark range. General Canvass data cannot be traced to a specific vessel, which might provide information related to which permits the vessel has, and therefore, what species they are targeting when finetooth sharks are landed. Some state fisheries do not require that a logbook be submitted for commercial landings. Coordination between state and Federal management authorities could be improved. Additionally, there are fisheries in Federal waters not under management (*i.e.*, southern kingfish, *Menticirrhus americanus*) that may be incidentally harvesting finetooth sharks.

Maintaining the status quo (alternative D1) may result in negative economic impacts because it would not enable the Agency to determine the fisheries that are responsible for the majority of the finetooth shark landings. This information is an important component of initiating collaborative management measures and preventing further overfishing.

Alternative D2 would implement commercial fishery management measures (*e.g.*, directed trip limits for SCS, gillnet gear restrictions, prohibiting the use of gillnet gear for targeting sharks, and/or reducing the SCS quota) to reduce fishing mortality of finetooth sharks.

These measures may have slightly positive ecological impacts; however, they may not have a significant impact on the commercial fisheries that are the largest source(s) of finetooth shark fishing mortality. Based on General Canvass (dealer reports) data, commercial landings of finetooth sharks in all regions, for all gear types, ranged from 55.4 to 137.6 mt dw per year between 1999 and 2003 (Table 4.42). Most commercial landings of finetooth sharks occur in the South Atlantic, with the primary gear being drift gillnets (Table 4.41). Currently, there are only five directed shark gillnet vessels targeting sharks in Federal waters in this fishery. These vessels are subject to high observer coverage levels and mandatory logbook reporting.

The five gillnet vessels that target sharks with gillnet gear are responsible for less than 10 percent of the commercial finetooth shark landings (Table 4.42). The majority of finetooth sharks may be landed either in state waters, or by fishermen pursuing other species, such as those managed by the Gulf of Mexico or South Atlantic Fishery Management Councils (*i.e.*, Spanish and king mackerel) or species that are not currently managed (*i.e.*, southern kingfish). Since these fishermen hold directed shark permits, they can opportunistically keep all finetooth sharks; however, because their harvest of finetooth sharks is incidental to landing of other non-HMS species, these vessels have not been selected for HMS observer coverage. Between 1999 and 2003, total commercial landings of all SCS ranged from 249 - 330 mt dw per year, well below the quotas established for SCS during this time period which ranged from 327 - 1,760 mt dw per year. The annual SCS quota has been 454 mt dw since 2004.

Alternative D2 considers implementing a trip limit for directed shark permit holders. A trip limit for directed shark permit holders would not likely have any significant ecological impacts. Currently, there is no directed trip limit for SCS; however, incidental shark permit holders are limited to 16 SCS and pelagic sharks (combined) per trip. A directed trip limit for SCS could potentially reduce the number of finetooth sharks landed per trip. However, since the overall SCS quota has never been taken in any single year, fishermen could compensate for lower trip limits by increasing the number of trips taken and fish harvested in excess of the trip limit would be discarded. Therefore, the net effect of this action may not reduce fishing mortality of finetooth sharks and could potentially increase finetooth shark mortality and increase dead discards.

Alternative D2 also considers implementing gear restrictions, specifically to modify mesh size and/or limit gillnet soak times. Modifying gillnet mesh size and/or limiting gillnet soak times would not likely reduce finetooth shark fishing mortality and therefore, would not likely have any significant ecological impacts. As noted under alternative D1, finetooth sharks are highly susceptible to entanglement in gillnet gear regardless of mesh size. Therefore, regulating the mesh size used in directed shark fisheries may have little impact on reducing finetooth shark fishing mortality. Limiting the soak time, or time gillnet gear is in the water, may reduce the number of finetooth sharks harvested per trip as well as the catch of other SCS and LCS. However, implementing soak time restrictions may result in fishermen simply increasing the number of sets made per trip to compensate for reduced catches that could potentially negate any benefit gained by reduced soak times.

Alternative D2 considers implementing a reduction in the overall SCS quota. Since 1999, commercial shark fishermen have never caught the annual SCS quota and finetooth sharks

are the only species in the SCS complex that are experiencing overfishing. Reducing the quota would not have any significant ecological impacts. The SCS quota has changed from 1,760 mt dw annually during 1999 - 2002, to 326 mt dw in 2003, and since 2004, has been 454 mt dw per year. Between 2002 and 2004, the SCS quota was reduced by 1,306 mt dw per year or 337 percent. Overall landings of SCS have ranged from 249 mt dw to 330 mt dw from 1999 - 2003. Commercial landings of finetooth sharks averaged 34.8 percent of the SCS landings over this same time period (Table 4.42). Given that the quota for SCS has never been reached, a reduction in the overall quota may have minimal beneficial impacts on reducing the mortality of finetooth sharks.

Lastly, alternative D2 considers closing the shark gillnet fishery and removing gillnet gear from the list of authorized gear types. A similar alternative was analyzed in Amendment 1 to the 1999 FMP and, as was determined at that time, would likely have positive ecological impacts on finetooth sharks. Furthermore, this alternative would positively impact other species by reducing bycatch and bycatch mortality of protected resources, other HMS and non-HMS fish species, and reducing fishing effort in areas that are designated as right whale critical habitat. However, because of the fact that only five vessels use gillnets to target sharks and these vessels are only responsible for a small portion of the finetooth shark fishing mortality (Table 4.42), closing this fishery would not likely prevent overfishing. Based on observer reports this fishery landed an average of 587 (2.9 mt dw) finetooth sharks per year between 1998 and 2004 (Table 4.42) and annual landings are highly variable, ranging from 65 – 1615 finetooth sharks per year. These landings equate to approximately 3 percent of the finetooth landings reported to the General Canvass during the same time period. While observer coverage is extensive (100 percent from November 15 – April 1), it does not include all finetooth shark landings in this fishery outside the right whale calving season (April 2 – November 14) when observer coverage is reduced to approximately 30 percent. Moreover, a permanent closure of the shark gillnet fishery may displace fishing effort to other fisheries, resulting in unknown ecological impacts. Selecting this alternative would also result in an end to the DSGFOP program, which currently provides scientists and managers with valuable observer data information on HMS, non-HMS fishes, protected resources, and bycatch.

While NMFS is not preferring alternative D2 at this time, the Agency may consider this alternative after it has better determined which fisheries are contributing to the majority of finetooth shark landings and/or has received further information regarding the status of finetooth sharks.

Alternative D3 would implement recreational management measures (*e.g.*, mandatory use of circle hooks and/or increasing the minimum size) to reduce fishing mortality of finetooth sharks. This alternative would likely have limited ecological impacts because based on current data, most finetooth sharks are landed in commercial fisheries and there is already a conservative bag limit in place (one shark per vessel per day). Finetooth sharks are predominantly found in inshore waters, under states' jurisdiction, where Federal regulations would have limited impact. Furthermore, the current minimum size is already approximately six to eight inches greater than the fork length at which finetooth sharks are sexually mature. Current Federal regulations allow anglers to retain one finetooth shark over 137 cm (54 inches) fork-length per vessel per trip, and require the release of any fish under this limit. Finetooth sharks reach sexual maturity at

approximately 118 cm (46 inches) and 123 cm (48 inches) total length for males and females, respectively.

Most recreational landings of finetooth sharks occur in the South Atlantic region. Between 2000 and 2003, 6,732 and 5,742 finetooth sharks were reported landed by the MRFSS in the South Atlantic and Gulf of Mexico, respectively. Anglers in Florida, Georgia, Mississippi, and Louisiana accounted for the majority of the landings. Table 4.42 provides estimates of recreational landings of finetooth sharks, including both MRFSS and Texas Parks and Wildlife Data, between 1999 and 2003 and compares these landings to commercial landings reported via the general canvass (dealer) logbook and observed catches by the DSGFOP. Finetooth sharks accounted for approximately 1.5 percent of the SCS caught by recreational anglers between 1999 and 2003.

Increasing the minimum size may have slightly positive ecological impacts by reducing the number of sexually mature male and female finetooth sharks that are harvested. However, according to Babcock and Pikitch (2002), the majority of sharks (LCS, SCS, and Pelagic sharks) sampled by the MRFSS survey were below the minimum size limit. They also found that additional reductions in mortality could be achieved if all recreational fishermen complied with existing bag and minimum size limits suggesting that recreational outreach/education and simultaneous enforcement of these existing regulations may need to be increased. In certain states, fishermen are governed by regulations that include smaller minimum size requirements and more liberal bag limits and are not required to comply with Federal regulations when fishing in state waters. Since recreational fisheries for finetooth sharks are predominately in state waters, measures affecting the minimum size in Federal waters may have negligible ecological impacts.

Similar analyses related to increasing the minimum size were conducted during the development of Amendment 1 to the 1999 FMP. Additional analysis of this alternative has produced no new information/data on which to change the agency's previous decision. The results from the next SCS stock assessment should be available in 2007 and further information regarding the status of finetooth shark stocks may warrant reconsideration of this alternative at that time.

Alternative D3 also considers implementing a requirement to use circle hooks when targeting SCS in the recreational fishery. Currently, there are no other recreational HMS fisheries that have a circle hook requirement. This alternative might have limited ecological impacts by reducing the post-release mortality of finetooth sharks, assuming that similar decreases in post-release mortality may be achieved for finetooth sharks as for other HMS that have been studied. In general, sharks caught in recreational fisheries are thought to have low post-release mortalities. Cooke and Suski (2004) suggest that overall post-release mortality rates are often lower when using circle hooks compared to J-hooks because of the reduced likelihood of fish ingesting the hook. However, they also recommend that management agencies implement circle hook requirements only in instances in which appropriate scientific data for similar species exists. There have been numerous studies evaluating ecological benefits of circle hook usage in recreational fisheries including several HMS, however, these experiments have not been conducted in recreational fisheries that specifically target sharks to demonstrate decreases

in post release mortality compared to J-hooks for these fishes. As such, it is difficult to quantitatively estimate, and assume, that ecological benefits to finetooth sharks would be assured by adding a requirement to use circle hooks.

Alternative D4 is expected to result in positive long-term ecological impacts by addressing overfishing of finetooth sharks. Table 2.1 lists activities, anticipated outcomes, and a timeline for actions that would occur as a result of this selecting this alternative. This alternative is the preferred alternative for addressing overfishing of finetooth sharks because of the fact that vessels targeting sharks are responsible for a small proportion of commercial landings. Most landings of finetooth sharks take place outside the directed shark gillnet fishery in fisheries landing them incidentally to other species. In addition, as noted in Section 3.2.5, data from the stock assessment for finetooth sharks reflect large ranges in F_{2000} and F_{MSY} ; thus, making it difficult to target management actions.

This alternative will address the above issues by increasing information on landings of finetooth sharks that occur outside of the five vessels that are targeting sharks with gillnet gear. Under this alternative, NMFS will contact and coordinate with Regional Fishery Management Councils and Interstate Marine Fisheries Commissions, port agents, and experts working for individual states that are within the finetooth sharks range to attain a better understanding of where finetooth sharks are being landed. Expanding the Directed Shark Gillnet Fishery Observer Program (DSGFOP) coverage in the South Atlantic to select any vessels that are fishing with gillnet gear and in possession of a directed or incidental shark permit would provide additional landings data that NMFS can use to consider further management action and/or collaboration with other fishery management bodies to minimize mortality.

NMFS estimates that there are an additional eight to 15 vessels fishing with gillnet gear that might account for a significant proportion of finetooth landings in the South Atlantic. During the spring of 2005, several observers from DSGFOP were placed on vessels fishing with gillnet gear and targeting other species (*i.e.*, Spanish mackerel and southern kingfish) as part of a pilot program. The DSGFOP observers identified finetooth shark landings on these vessels. Placing additional observers on these vessels would provide the affirmation and positive identification necessary to get a better representation of where, and to what extent, finetooth shark landings are occurring in other fisheries. Additional ecological benefits of expanding observer coverage in this fishery include: additional catch series data that can be used to improve inputs for the upcoming SCS stock assessment, verification of logbook data, and more detailed information on target catch composition and protected resources interactions in gillnet fisheries.

Alternative D4 would also expand data collection efforts by listing finetooth sharks as a select species with the Shrimp Trawl Fishery Observer Program operated by the Galveston Lab of NMFS. Shrimp trawl vessels operate in shallow, inshore waters that are likely habitat for finetooth sharks. Including finetooth sharks as a select species would result in subsamples of bycatch, including identification, measurement, and estimates of interactions in this fishery which may facilitate future management actions to minimize bycatch of finetooth sharks in this fishery. Furthermore, since there was a lack of bycatch catch series data for finetooth available for review during the 2002 SCS assessment, including this data in the future would improve the management recommendations derived from the forthcoming SCS assessments. Increased

attention to finetooth sharks on the behalf of the observers may result in inclusion of other HMS as select species in this observer program in the future, thereby, improving estimates of interactions between HMS and trawl fisheries in the Gulf of Mexico.

Alternative D4 would likely have long-term positive ecological impacts as it would expand Agency efforts to identify sources of fishing mortality for finetooth sharks and other HMS. Short-term ecological impacts would likely be neutral. Improved coordination between NMFS HMS Management Division and Regional Fishery Management Councils, Interstate Marine Fisheries Commissions, states, and other management bodies would result in better collaborative efforts to manage fish that move between jurisdictional boundaries. Furthermore, since there may be fisheries that are lacking an FMP or other management measures and incidentally catching finetooth sharks (*i.e.*, the fishery for southern kingfish), increased collaboration with other management entities may result in the inclusion of these fisheries into existing management initiatives, thereby, improving management and conservation efforts.

Social and Economic Impacts

Alternative D1 would not likely result in any adverse economic or social impacts as the status quo would not substantially modify or alter commercial or recreational fishing practices for finetooth or other shark species. As stated above and in Chapter 3, finetooth sharks are generally a coastal, inshore species of SCS found predominately in state waters. Based on data from the DSGFOP, finetooth sharks comprised an average of 4.3 percent of the total shark harvest for these five to six vessels between 1998 and 2004. Recreational fisheries would not likely be affected either as most recreational shark anglers target large coastal sharks when fishing in Federal waters.

Implementing trip limits on directed SCS trips under alternative D2 may impose negative economic and social impacts on a limited number of gillnet vessels that target sharks. Vessels that possess directed shark permits but are targeting other finfish species may also experience negative economic and social impacts, but to a lesser degree, since it is assumed that finetooth sharks would comprise a smaller proportion of their landings since they are not targeting sharks. Implementing a trip limit for finetooth sharks would increase travel time to and from the port resulting in lost fishing time and increased expenditures for fuel.

Modifying gillnet mesh size may result in negative economic impacts to a small number of gillnet vessels that target sharks. These vessels would have to replace existing gear in order to comply with any new mesh size requirements, as there is not currently a mesh size requirement in place. Gillnet vessels not targeting sharks may be unaffected by new mesh size requirements and might experience a positive economic effect at the expense of the directed shark vessels, however, this would depend on whether gear restrictions were linked to possession of a shark permit. Vessels targeting king and Spanish mackerel already have minimum mesh size restrictions of 4.75 and 3.5 inches (12.1 and 8.9 cm), respectively. Specifying maximum soak times for gillnet vessels targeting sharks may impose a negative economic effect as vessels would have to work longer hours and make more sets in order to maintain their current catch levels. Fisheries targeting king and Spanish mackerel in Federal waters already have a one-hour maximum soak time for gillnets. Additional restrictions, coupled with increased fuel prices, would have negative economic impacts on the fishery.

Finally, alternative D2 considers implementing a reduced quota for SCS. This may have a negative economic impact on the fishery dependant on the amount of the quota reduction. A small reduction in the overall SCS quota may have no effect since the SCS quota has never been reached in a single year. Landings of SCS were 76.4 percent of the SCS quota of 326 mt dw in 2003 and, prior to that, SCS landings were less than 20 percent of the quota. The current SCS quota is 454 mt dw while the highest landings of SCS occurred in 1999 at 330 mt dw, approximately 73 percent of the quota. The SCS quota would have to be reduced by more than 25 percent to have economic impacts on the shark gillnet fishery, or future landings would have to increase. Furthermore, catch rates and restrictions implemented in other fisheries may also have economic impacts on the shark gillnet fishery. Reductions in the SCS quota of less than 25 percent would appear to have no negative impact on the fishery based on the current level of landings.

Closing the shark gillnet fishery and removing gillnet gear from the list of authorized gear types would likely have significant negative economic impacts on the five vessels currently engaged in this fishery but minimal impacts on the shark fishery as a whole. It would likely cause economic dislocation of five individuals or small entities and may put them out of business if there are not other fisheries from which they can substitute lost revenues resulting from the closure.

The five vessels participating in the directed shark gillnet fishery are concentrated in the Ft. Pierce/Cape Canaveral region of southeast Florida. Therefore, there might be negative social impacts as a result of measures that affect the commercial harvest of sharks by these vessels as they may not have the necessary permits to re-direct fishing effort towards other species in the area. Also regulations on other species may be prohibitive.

Alternative D3 considers implementing a requirement to use circle hooks when targeting SCS in the recreational fishery. This may result in possible negative economic impacts to the shark recreational fishery and related industries as there would be a proportion of the fishery that would have to switch to circle hooks from J hooks. The Agency is not aware of the proportion of the recreational fishery that actually targets sharks recreationally in Federal waters since an HMS Angling permit allows participants to land tunas, certain species of sharks, swordfish, and billfish. A limited survey of hook prices indicated that J-hooks of the sizes and styles used by HMS recreational fishermen ranged in price from a low of $0.50 to a high of $7.50 each, with an average price of $2.70. Similarly, circle hooks of the sizes and styles used by HMS recreational fishermen ranged in price from a low of $0.30 to a high of $7.00 each, with an average price of $2.24. The Agency does not have information regarding the proportion of the recreational shark fishing community that is currently using circle hooks. It is assumed that fishing effort for sharks would remain relatively constant, as mandating circle hook use would not result in prohibitively exorbitant costs to remaining in the fishery. Generally, the purchase of hooks represents only a minor capital expenditure relative to other costs associated with participating in marine fisheries, including the purchasing, equipping, maintaining, and running of vessels, which can in easily cost thousands of dollars.

Alternative D3 considers increasing the existing size limit for finetooth sharks and may have some negative social and economic impacts on nearshore anglers and the supporting recreational industry. This alternative would increase the number of finetooth sharks that are released but would not affect other species of sharks that are landed. The social and economic impacts may be variable depending on the willingness of anglers to release finetooth sharks caught and/or substitute harvested fish with other similar species. Angler expenditure data attained from MRFSS between 1998 – 2000 indicates that mean expenditures on excursions targeting small coastal sharks were $81.30/person/day. NMFS does not believe this minimum size increase would have an adverse impact on angler consumer surplus or satisfaction in recreational fisheries, especially since several states already have smaller minimum size limits and more liberal bag limits in their waters. Furthermore, since finetooth sharks only comprise 1.5 percent of the overall SCS recreational harvest, encounters are relatively rare. This alternative allows for the continuation of current revenues to charterboat owners, captains, and others who rely on the recreational shark fishery. Tournaments would still be able to offer prize categories for finetooth sharks provided they are above the minimum size. In the long-term, as overfishing of finetooth sharks is eliminated, revenues may increase as less time would be required to catch finetooth sharks and as larger sharks increase in abundance. This alternative would not jeopardize participant safety, as recreational fishermen already have to determine the length of finetooth sharks relative to the minimum size.

Alternative D4 would not likely have significant social and economic impacts as it primarily expands agency efforts to discern sources of finetooth fishing mortality and would not enact additional management measures on fishing activities in recreational or commercial sectors at this time. As per 50 CFR § Part 635.7, NMFS may select, for at sea observer coverage, any vessel that has an Atlantic HMS, tunas, shark or swordfish permit under §§ 635.4 or 635.32. Vessels fishing with a directed or incidental permit for HMS can be selected for observer coverage. The number of additional vessels fishing with gillnet gear and possessing an incidental or directed shark permit and not currently subject to observer coverage is estimated at approximately eight to 15 vessels. These additional vessels would be subject to the same observer coverage that is currently in place for the five vessels participating in the DSGFOP, including 100 percent observer coverage during the right whale calving season (November 15 – April 1) and approximately 30 percent coverage outside of this season. Vessels would be expected to attain the proper safety certification decals from the United States Coast Guard and ensure that there are adequate accommodations on board for observers prior to taking an observer. An observer program (*e.g.*, DSGFOP) is currently in place for the shark gillnet fishery, and the Agency does not anticipate any problems or difficulties that may be expected as a result of starting a new observer program.

Efforts to expand data that are currently collected on shrimp trawl vessels would not result in any social or economic impacts as the percentage of observer coverage would not be expanded, only the select species of bycatch that are sampled. This observer program already exists and adding finetooth sharks to the select species list would not significantly impact the time required for observers to complete their sampling of bycatch in the trawl fishery. Furthermore, coordination with Regional Fishery Management Council, Commission, and state agency staff regarding fisheries that may be contributing to finetooth shark fishing mortality, would not result in any negative social or economic impacts to the public in the short term, and

would likely result in long term social and economic benefits by determining where management measures should be enacted to reduce finetooth fishing mortality. Furthermore, collaboration with these entities may increase future collaborative efforts and result in additional landings information for other HMS species and protected resources that may be harvested in other fisheries.

Summary

Alternative D4 is the preferred alternative because of the fact that, based on data from comprehensive observer coverage, the five vessels targeting sharks with gillnet gear are contributing to a small proportion of the total finetooth shark landings. Further restrictions on these five vessels would not prevent overfishing or significantly reduce finetooth shark fishing mortality and would likely increase dead discards and fishing effort. Reducing finetooth shark fishing mortality is further confounded by the fact that finetooth sharks are within the SCS complex, which is not currently overfished or experiencing overfishing, and commercial fishermen only caught, on average, 28.5 percent of the SCS quota between 1999-2003. Measures aimed at the recreational fishery would only impact a small portion of the overall finetooth shark landings and, until comparative research on the merits of circle hooks versus J-hooks for reducing post-release mortality exists for sharks, implementing a circle hook requirement may be ineffective.

As described in Table 2.1. and in this section, this alternative would determine which fisheries are contributing to finetooth shark mortality. Expanding observer coverage in the South Atlantic gillnet fisheries that are landing sharks incidentally and in the Gulf of Mexico shrimp trawl fishery would provide substantive information on which fisheries are currently contributing to the majority of finetooth shark landings and would also provide bycatch data. Furthermore, working directly with the Regional Fishery Management Councils, Interstate Marine Fisheries Commissions, and states to identify all fisheries that may be interacting with finetooth sharks is a critical step to discern appropriate management options. Since finetooth shark carcasses can be difficult for shark dealers to positively identify, workshops on shark identification, which are preferred by alternative A9 in Section 4.1.1, would improve the accuracy of General Canvass logbooks received from dealers.

By first identifying sources of finetooth shark fishing mortality, Alternative D4 would facilitate targeted, informed management measures that can best meet conservation and management goals while avoiding significant, and potentially unnecessary, economic and social impacts. Further consideration of Alternatives D2 and/or D3 (commercial and recreational management measures) may be warranted consistent with additional information regarding finetooth shark landings, any change in the finetooth sharks status per the upcoming SCS stock assessment, post-release mortality benefits of using circle hooks in recreational shark fisheries, or other relevant information as necessary.

Table 4.41 Finetooth shark landings (lb dw) by gear type in the Gulf of Mexico (GOM) and South Atlantic (SA), 1999-2003, as reported in the General Canvass (CN) and Coastal Fisheries (CL) Logbooks. Source: Cortes, pers. comm.

Year	Gillnet Gear				Longline Gear				Other			
	GOM		SA		GOM		SA		GOM		SA	
	CN	CL	CN	CL	CN	CL	CN	CL	CN	CL	CN	CL
1999	2,560	--	269,685	17,837	671	--	12,897	7,435	565	--	3,250	--
2000	--	--	185,907	29,241	11	2,820	17,678	5,847	--	--	633	--
2001	--	--	296,897	50,389	600	--	4,919	6,392	83	--	889	--
2002	--	--	152,507	70,388	894	1,704	7,708	6,780	--	--	732	129
2003	--	--	123,791	28,717	2,654	6,994	7,449	5,437	--	14	4,181	14

Table 4.42 Summary of finetooth shark quotas and landings in commercial and recreational fisheries between 1999-2004. Sources: Data from 1998 – 2000,Cortés, pers. comm., data from 2001 – 2003, Cortés, 2005; Carlson and Baremore, 2001; Carlson and Baremore, 2002; Carlson and Baremore, 2003; Carlson *et al*., 2004; NMFS, 2005.

Year	SCS quota, mt dw	SCS landings, mt dw	Commercial Finetooth Landings, mt dw (General Canvass	Recreational Finetooth Landings, numbers of fish (mt dw) **	Finetooth shark observed landings, numbers of fish (mt dw) * [a]
1999	1760	330	129.4	78 (0.38)	340 (1.69)**
2000	1760	269	92.6	1438 (7.2)	168 (0.83)
2001	1760	329	137.6	6701 (33.4)	1302 (6.5)
2002	1760	263	73.4	2952 (14.7)	1615 (8.05)
2003	326	249	55.4	1774 (8.85)	621 (3.09)
2004	454	N/A	N/A	N/A	65 (0.32)

* Numbers of fish multiplied by 11 lb (4.3 kg) (mean weight of finetooth sharks used in 2002 SCS assessment) then divided by 2204.6 to attain mt dw

** 1998 and 1999 combined

[a] Obtained from 100% observer coverage (November 15 – April 1) and approximately 30% observer coverage April 2 – November 14, values not extrapolated. Includes observed strikenet and drift gillnet trips from DSGFOP

4.2.3 Atlantic Billfish

As described in Chapter 2, the alternatives considered for the management of the directed Atlantic billfish fishery are:

E1 Retain existing regulations regarding recreational billfish fishing, including permit requirements, minimum size limits, prohibited species, landing form, allowable gear, and reporting requirements (No Action)

E2 Effective January 1, 2007, limit all participants in Atlantic HMS recreational fisheries to using only non-offset circle hooks when using natural baits or natural bait/artificial lure combinations

E3 Effective January 1, 2007, limit all Atlantic billfish tournament participants to using only non-offset circle hooks when using natural baits or natural bait/artificial lure combinations – Preferred Alternative

E4(a) Increase the minimum legal size for Atlantic white marlin to a specific size between 68 and 71 inches LJFL (172 - 180 cm)

E4(b) Increase the minimum size for blue marlin to a specific size between 103 and 106 inches LJFL (261 – 269 cm)

E5 Implement a recreational bag limit of one Atlantic billfish per vessel per trip

E6 Effective January 1, 2007, Implement ICCAT Recommendations on Recreational Marlin Landings Limits – Preferred Alternative

E7 Effective January 1, 2007 – December 31, 2011, allow only catch and release fishing for Atlantic white marlin – Preferred Alternative

E8 Effective January 1, 2007 – December 31, 2011, allow only catch and release fishing for Atlantic blue marlin

Ecological Impacts

Alternative E1 would maintain the *status quo* in the domestic recreational billfish fishery. This alternative would retain all existing regulations regarding recreational billfish fishing in the Atlantic Ocean, including permit requirements, minimum size limits, prohibited species, catch and release fishery management program, landing form, allowable gear, and reporting requirements, unless otherwise modified during this rulemaking. As discussed in additional detail below, alternative E1 would likely continue to provide minor ecological benefits for Atlantic billfish populations.

The primary domestic sources of Atlantic billfish mortality include the Atlantic pelagic longline fishery and the directed recreational billfish fishery. Bycatch and discards of blue marlin, white marlin, and sailfish in the pelagic longline fishery show a generally decreasing trend from 1999 to 2003, as seen in Table 3.20. There is no discernable trend for Atlantic spearfish. Dead discards of Atlantic white and blue marlin and sailfish in the Atlantic pelagic longline fishery follow a similarly decreasing but more steady downward trend, as reported to ICCAT by the United States, with the exception of 2002 for blue marlin and white marlin, as seen in Figure 4.16 and Table 4.43. Trends in recreational landings of Atlantic billfish show an overall decrease from 1999 to 2003, but show greater inter-year fluctuations than do Atlantic pelagic longline dead discard trends. The fluctuations in the downward trend are noticeable for

white marlin between 2000 and 2002, and for blue marlin between 2001 and 2003 where landings increased during these periods for these species, but remained lower than 1999 levels. As shown in Figure 4.16 and Table 4.43, reported mortalities of Atlantic blue marlin resulting from pelagic longline dead discards and rod and reel landings were equivalent in 2003. Sailfish mortality attributable to rod and reel landings exceeded those attributable to pelagic longline dead discards in 1999 – 2003. Mortalities of Atlantic white marlin attributable to pelagic longline dead discards exceeded those attributable to rod and reel landings annually for the period 1999 – 2003.

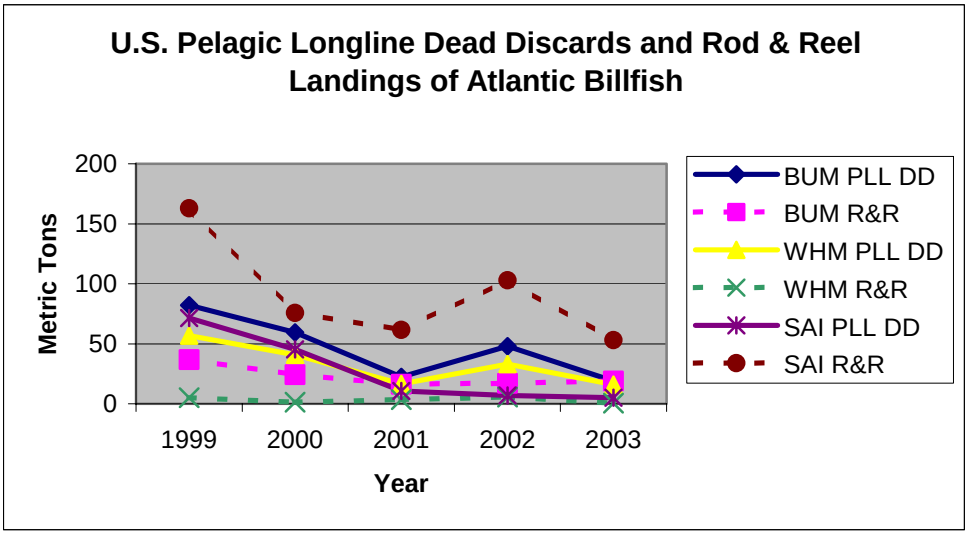

Figure 4.16 **U.S. Pelagic Longline Dead Discards and Rod & Reel Landings of Atlantic Billfish.** Source: Pelagic U.S. National Reports to ICCAT 2003 and 2004

Table 4.43 **U.S. Pelagic Longline Dead Discards and Rod & Reel Landings of Atlantic Billfish (MT).** Source: Pelagic U.S. National Reports to ICCAT 2003 and 2004

	BUM		WHM		SAI	
Year	**PLL DD**	**R&R**	**PLL DD**	**R&R**	**PLL DD**	**R&R**
1999	82.1	36.9	56.7	5.2	71.6	163.0
2000	59.6	24.2	40.8	1.3	45.4	75.7
2001	22.4	16.4	16.5	3.4	10.7	61.7
2002	48.0	17.1	33.0	5.6	7.0	103.0
2003	19.0	19.0	16.0	0.6	5.0	53.0

Domestic recreational Atlantic billfish catch (landing and release) statistics are less robust than commercial catch statistics. This is due to a number of factors including the sheer number of recreational vessels and possible landing locations, less stringent reporting requirements in the recreational HMS fishing sector than the commercial sector, and significant non-compliance with recreational non-tournament reporting requirements. Identifiable gaps in self-reported non-tournament landings data include, but are not limited to, blue marlin landings in Puerto Rico and swordfish landings in the mid-Atlantic region. An examination of the

Atlantic recreational billfish and swordfish reporting database shows that non-compliance or limited compliance with reporting requirements is pervasive throughout the recreational swordfish and billfish fishery. For example, in 2004, swordfish landings were reported in only Florida, Alabama, and Rhode Island. A review of sportfishing magazines, local newspapers, and internet fishing websites provides ample evidence of non-reported fish. Further, NMFS staff is regularly informed by the sportfishing community that compliance with non-tournament HMS reporting requirements is low. As a result, all non-tournament recreational billfish statistics are considered minimum estimates with an unquantifiable bias toward low estimates. NMFS is working to improve compliance with reporting requirements through various outreach efforts, including distribution of outreach materials, participating in national, regional, and local meetings with constituents, and increasing enforcement of reporting violations.

Minimum size limits are the primary management measure in effect to limit landings and potentially limit total fishing mortality of Atlantic billfish. Minimum size limits can achieve these effects by limiting the universe of potential fish that qualify for landing. Current minimum size limits were implemented to decrease domestic landings in an effort to comply with ICCAT Recommendation (97-09). In addition to limiting fishing mortality by potentially reducing the number of fish landed, if set appropriately, minimum sizes can also ensure some level of reproductive potential remains in the fishery by allowing fish to reach the size at sexual maturity before recruiting into the fishery, where they are eligible for landing. Current domestic minimum sizes are set above the size at maturity for Atlantic blue marlin, white marlin, and sailfish. Minimum size limits do not, in and of themselves, guarantee that landings will remain at any given level or have a direct impact on post-release mortality of billfish. Billfish that are released in the recreational fishery are not considered as bycatch because of the catch-and-release fishery management program that was established in Amendment 1 to the Atlantic Billfish FMP (NMFS, 1999).

Known recreational landings of Atlantic billfish have remained at relatively low levels since 1999 through the use of minimum sizes and a strong voluntary adherence to the practice of catch and release fishing. Recent recreational landings, as reported to ICCAT in metric tons, can be seen in Table 4.43 above. The number of recreationally landed Atlantic blue and white marlin, as reported to ICCAT, since adoption of Recommendation 00-13, can be seen in Table 4.44. In 2002, the United States exceeded its combined annual limit of 250 recreationally landed blue and white marlin, as established by ICCAT, but carried forward underharvest from 2001 per ICCAT Recommendation 00-14. ICCAT Recommendation 00-14 allows for the carryover of underharvest and mandates carryover of overharvest from a previous fishing year to a subsequent fishing year for any species under quota or catch limit management. It should be noted that the accounting methodology on which the 2003 numbers reported to ICCAT were based differs from the methodology used to generate the 2002 and 2001 numbers that were reported to ICCAT. The methodology used to generate the 2001 and 2002 landings shown in Table 4.44 resulted in higher landings being reported to ICCAT for those years than would have been reported if the 2003 methodology had been applied. For additional information on this methodological issue, please see Van Voorhees *et al*., 2004.

Table 4.44 **U.S. Landings of Atlantic Blue and White Marlin as Reported to ICCAT in Numbers of Fish.** Source: U.S. National Reports to ICCAT 2003; 2004; Erika Carlsen, NMFS International Office., pers. comm.

Year	BUM	WHM	Total	Annual Over/Underharvest
2001	77	116	193	57
2002	191	88	279	-29
2003	108	23	131	119
Total	376	227	603	

Table 4.45 **Tournament Landings and Releases 1999-2003 in Number of Fish.** Source: NMFS Recreational Billfish Survey (RBS) Database

	BUM			WHM			SAI		
Year	**Retained**	**Released**	**Live Release Rate**	**Retained**	**Released**	**Live Release Rate**	**Retained**	**Released**	**Live Release Rate**
1999	172	1527	0.899	36	1456	0.976	30	1907	0.985
2000	117	1467	0.926	8	975	0.992	18	2198	0.992
2001	75	1038	0.933	22	1306	0.983	11	3073	0.996
2002	84	1132	0.931	33	2207	0.985	14	3117	0.996
2003	96	1133	0.922	20	614	0.968	24	4171	0.994

As previously discussed, recreational billfish data are less robust than commercial data. There are several sources of recreational data with overlapping samples. Each data source provides a unique view of billfish fisheries, including both landed and released fish. Recreational Billfish Survey (RBS) data represent the majority of verifiable domestic Atlantic billfish landings and can be seen in Table 4.45. The RBS was designed to provide a complete census of tournament landings, and as such it is considered to be both accurate and precise in this regard. However, it is important to note that the RBS represents a subset of total billfish landings and brings with it certain biases. Because the RBS captures only tournament landings it is, by design, a subset of aggregate United States' landings. Further, given that tournament fishermen do not, as a general rule, land a fish that is smaller than one that has already been landed in a tournament, both the size of tournament reported fish and the release percentages that can be calculated from RBS data are likely biased high relative to the fishery as a whole.

Another source of recreational billfish data is the Marine Recreational Fishery Statistics Survey (MRFSS). MRFSS includes Atlantic HMS, but was not specifically designed for HMS fisheries, which are considered rare event fisheries in comparison to inshore fisheries such as red drum. Further, MRFSS does not cover the State of Texas. For these reasons, the MRFSS data are not considered to be highly accurate in determining the exact number of landings or releases of Atlantic HMS, but it does provide useful additional data for purposes of comparison with other data sets. The Large Pelagics Survey (LPS) is another statistical sampling survey that includes Atlantic HMS. This survey was designed to intercept HMS, but operates only from

Virginia to Maine on the Eastern seaboard from June through October. As such, LPS landings data are known to be a subset of aggregate U.S. Atlantic landings. Both the MRFSS and LPS can overlap with the RBS data, which must be accounted for when attempting to quantify aggregate landings.

The directed billfish fishery is primarily catch and release in nature. Fisher and Ditton (1992) estimate that between 74 and 99 percent of all billfish are released by billfish anglers in general. RBS data, as presented in Table 4.45, indicate Atlantic HMS tournament release rates of 89.9 to 93.3 percent for blue marlin, 96.8 to 99.2 percent for white marlin, and 98.5 to 99.6 percent for sailfish. MRFSS data, as presented in Table 4.46, indicate release rates of 92.6 to 100 percent for blue marlin, 99.6 to 100 percent for white marlin, and 93.5 to 99 percent for sailfish. LPS data, as presented in Table 4.47 indicate release rates of 87 to 100 percent for blue marlin, 89.4 to 99.4 percent for white marlin, and zero to 100 percent for sailfish. Obviously, the estimates pertaining to sailfish indicate the wide variability in some data sets. Nevertheless, the preponderance of this data indicate a strong adherence by Atlantic billfish anglers to catch and release fishing, both within and outside of tournaments.

Table 4.46 MRFSS Estimated Aggregate Landings and Releases of Atlantic Billfish 1999-2003 in Number of Fish (includes Puerto Rico, excludes Texas). Source: NMFS MRFSS Database.

	BUM			WHM			SAI		
Year	Landings	Releases	Dead Discards	Landings	Releases	Dead Discards	Landings	Releases	Dead Discards
1999	?*	3,265*	0*	?*	3,475*	58*	5,238*	75,752*	90*
2000	0	2,492	0	26	7,069	0	1,000	41,905	171
2001	0	6,525	0	0	11,255	0	981*	35,509*	0*
2002	556	6,956	0	?*	4,633*	?*	541	53,474	625
2003	0	4,344	0	?*	339*	?*	2,821	46,105	18

* Incomplete data available.

Table 4.47 Large Pelagics Survey Estimated Aggregate Landings and Releases of Atlantic Billfish (Virginia to Maine) 1999-2004 in Number of Fish. Source: NMFS LPS Database.

	BUM				WHM				SAI			
Year	Retained	Released	Dead Discard	Live Release Rate	Retained	Released	Dead Discard	Live Release Rate	Retained	Released	Dead Discard	Live Release Rate
1999	3	28	0	0.903	6	156	0	0.963	0	3	0	1
2000	0	1886	0	1.000	4	705	0	0.994	6	0	0	0
2001	0	302	0	1.000	4	703	0	0.994	N/A	N/A	N/A	N/A
2002	0	568	0	1.000	218	5616	0	0.963	0	60	0	1
2003	101	673	84	0.870	365	3069	0	0.894	0	68	0	1
2004	45	1112	0	0.961	78	5573	0	0.986	0	27	0	1

Despite the widespread practice of catch and release fishing in the Atlantic billfish fishery, as discussed above, recent data on post-release mortality rates of recreationally caught billfish indicate that the adverse ecological impacts of recreational activities on billfish resources may be greater than previously recognized. Post-release survival of recreationally caught and released Atlantic billfish was previously estimated to be 90 percent or greater (NMFS, 1999).

Conversely, this means that post-release mortality of recreationally caught and released billfish was previously estimated to be ten percent or lower. This estimate was derived from a review of the relevant literature at the time, which consisted primarily of studies examining catch and release mortality of bluefin tuna and sharks and Gulf of Mexico longline post-release survivorship. Since that time, there have been a number of pertinent studies examining both J-hook and circle performance and effects on billfishes.

In a review and analysis of 43 previous post-release circle hook studies, Cooke and Suski (2004), found that circle hooks resulted in lower fishing mortality than other types of hooks and that mortality was consistently higher for J-hook caught fish. Factors identified as affecting mortality of released fish included hooking depth, anatomical hooking location, bleeding, and ease of hook removal. Cooke and Suski (2004), Prince *et al.* (2002), and Horodsky and Graves (2005) found that J-hook caught fish were more likely to be deep hooked than circle hook caught fish, circle hooks were more likely to result in jaw hooking than J-hooks, and J-hooks were more likely to cause tissue trauma resulting in bleeding. The reduced occurrence of deep hooking associated with circle hooks as compared to J-hooks reduces the opportunity for damage to vital organs and excessive bleeding. Cooke and Suski found that, in general, hooking mortality rates were reduced by approximately 50 percent by using circle hooks relative to J-hooks. The authors attributed the mortality reduction associated with the use of circle hooks to the tendency of circle hooks to jaw-hook fish, resulting in shallow hooking depths. Taken in aggregate, the available science indicates that hook type can have a significant effect on survival of released fish.

A recent study by Horodysky and Graves (2005) examining the post-release mortality in the recreational fishery for Atlantic white marlin strongly suggests that mortality levels using traditional J-hooks may be higher than previously assumed by NMFS. Horodysky and Graves found that the mortality rate of white marlin associated with J-hooks was 35 percent. This number was higher than post-release mortality rates for other billfish species. Horodysky and Graves noted post-release mortality rates of 11 percent for blue marlin and 29 percent for striped marlin caught with this hook type, which had been previously identified in other studies discussed in Horodysky and Graves. As discussed above, previous post-release survival estimates were thought to be in excess of 90 percent. These recent statistics, when combined with estimates for the number of Atlantic blue and white marlin released by U.S. anglers significantly increase the estimated mortality contribution of the recreational fishery.

Table 4.48 presents the estimated number of white marlin mortalities resulting from catch and release fishing activities based on NMFS' RBS, MRFSS, and LPS databases. In deriving these estimates, an assumption was made that all billfish anglers use J-hooks. NMFS acknowledges that some limited, but unquantified portion, of billfish anglers currently use circle hooks, and, as such, this assumption could bias the estimates to higher than actual levels. NMFS currently does not have an estimate of the proportion of billfish anglers that regularly use circle hooks. Mortality estimates were derived by applying a post-release mortality rate of 0.35 (Horodysky and Graves, 2005) to the reported number of releases (*e.g.*, $100_{\text{releases}} * 0.35_{\text{post-release mortality rate}} = 35_{\text{mortalities}}$). Using this methodology, estimated release mortalities of Atlantic white marlin range from 215 to 773 based on RBS data (1999 – 2003), 119 to 3,939 based on MRFSS data (1999 – 2003), and 55 to 1,966 for LPS data (1999 – 2004). Actual post-release mortalities of white marlin likely fall somewhere between these estimates. As previously discussed, each of

these databases has particular limitations, however, taken in combination, the data provide some indication of the magnitude of U.S. induced recreational white marlin mortalities.

Table 4.48 Estimated Post-Release Mortality of White Marlin in Numbers of Fish Based on J-hooks and 35 Percent Post-Release Mortality Rate as derived from Data from the RBS, MRFSS, and LPS.

	RBS		MRFSS		LPS	
Year	Live Releases	Estimated Post-Release Mortalities	Live Releases	Estimated Post-Release Mortalities	Live Releases	Estimated Post-Release Mortalities
1999	1456	510	3475*	1,216	156	55
2000	975	341	7,069	2,474	705	247
2001	1306	457	11,255	3,939	703	246
2002	2207	773	4633*	1,622	5,616	1,966
2003	614	215	339*	119	3,069	1,074
2004	N/A		N/A		5,573	1,951

*Incomplete data available for these years for this data set.

Table 4.49 presents the estimated number of Atlantic blue marlin mortalities resulting from catch and release fishing activities based on the RBS, MRFSS, and LPS databases. Estimates were derived by applying a post-release mortality rate of 0.11 to the reported number of releases (*e.g.*, $100_{\text{releases}} * 0.11_{\text{post-release mortality rate}} = 11_{\text{mortalities}}$). Consistent with the calculations for white marlin, NMFS assumed that all billfish anglers use J-hooks. NMFS acknowledges that some billfish anglers currently use circle hooks, and, as such, this assumption could bias the estimates to higher than actual levels. NMFS currently does not have an estimate of the proportion of billfish anglers that regularly use circle hooks. Between 1999 and 2003, estimated post-release mortalities of Atlantic blue marlin range from 114 to 168 fish based on RBS data, and 274 to 765 fish based on MRFSS data. Between 1999 and 2004, estimated post-release mortalities of Atlantic blue marlin ranged from 3 to 207 fish for LPS data. It is likely that the true post-release mortalities of blue marlin fall somewhere between these estimates. As previously discussed, each of these databases has particular limitations, however, taken in combination, the data indicate that U.S. induced mortalities of Atlantic blue and white marlin are likely higher than previously assumed in Amendment 1 to the Billfish FMP (NMFS, 1999).

Table 4.49 Estimated Post-Release Mortality of Blue Marlin in Numbers of Fish Based on J-hooks and 35 Percent Post-Release Mortality Rate as derived from Data from the RBS, the MRFSS, and LPS.

Year	RBS		MRFSS		LPS	
	Live Releases	Estimated Post-Release Mortalities	Live Releases	Estimated Post-Release Mortalities	Live Releases	Estimated Post-Release Mortalities
1999	1527	168	3265*	359*	28	3
2000	1467	161	2,492	274	1,886	207
2001	1038	114	6,525	718	302	33
2002	1132	125	6,956	765	568	62
2003	1133	125	4,344	478	673	74
2004	N/A		N/A		1,112	122

*Incomplete data available for these years for this data set.

As previously stated, alternative E1 would likely continue to provide only minor ecological benefits, given the limited measures (minimum size limit) currently in place to limit fishing mortality by limiting landings. Minimum sizes alone cannot directly limit landings or mortalities, but can indirectly limit landings by limiting the available pool of legal sized fish. Continuation of existing management measures would likely continue to provide a low level of positive ecological impacts for Atlantic billfish by constraining increases in billfish landings in this manner and thereby limiting mortality to a lesser degree. However, new data on the post-release mortality of white marlin, as discussed above, indicate a larger contribution by U.S. recreational anglers toward Atlantic-wide white marlin mortality rates than assumed in Amendment 1 to the Atlantic Billfish FMP (NMFS, 1999). Alternative E1 would not likely result in any substantial change in the number of Atlantic billfish landed, released, or discarded dead, or result in any significant change in the current levels of post-release mortality in the near future. Under the No Action alternative, landings, dead discards, and post-release mortality attributable to the directed billfish fishery could increase or decrease depending on angler behavior, with negative or positive ecological impacts given that there are no management measures currently in place to directly control landings or effort. However, no shifts in angler behavior are anticipated under the No Action alternative. New post-release mortality information suggests that the No Action alternative may have greater adverse ecological impacts on Atlantic white marlin, and to a lesser extent on Atlantic blue marlin, than was previously estimated. Alternative E1 would likely not reduce or reverse the current Atlantic-wide fishing mortality rates for either blue or white marlin. Further, the No Action alternative cannot, in and of itself, ensure compliance with the ICCAT marlin landing limit. Alternative E1 is not anticipated to increase or decrease interactions with protected resources including sea turtles, seabirds, or marine mammals, or impact non-target species because no changes in fishing effort or practices would be expected.

Alternative E2 would require the use of non-offset circle hooks in all segments of HMS recreational fisheries, for all species, whenever natural baits or natural bait/artificial lure combinations are used, beginning on January 1, 2007. This includes HMS Angling category permitted vessels, Charter/Headboat permitted vessels on for-hire trips, and all General category

permitted vessels participating in registered HMS tournaments. Circle hooks are defined in 50 CFR §635.2 as "a fishing hook originally designed and manufactured so that the point is turned perpendicularly back to the shank to form a generally circular, or oval, shape." Natural bait/artificial lure combinations would include, but are not limited to, rigs such as natural baits used in combination with artificial hoods, heads, and or skirts. This alternative could reduce the overall mortality rates of Atlantic white marlin, sailfish, and likely other species that HMS fishermen interact with by reducing post-release mortality rates. Alternative E2 would allow the use of J-hooks with artificial lures. NMFS received public comment during scoping and on the pre-draft document that fishermen tend to target white marlin and sailfish with natural baits while either drifting or slow trolling and target blue marlin by trolling at a higher rate of speed with the fish striking at the lure. Because of these fishing practices and feeding habits, it is believed that blue marlin have less opportunity to deeply ingest baits, therefore resulting in a higher proportion of hook-ups in the mouth with less damage to vital tissues and lower rates of post-release mortality. In a study evaluating pop-up satellite tags for estimating post-release survival of blue marlin from a recreational fishery, Graves *et al.* 2001, mouth hooked seven of nine blue marlin tagged by trolling at high speed using high speed lures or skirted dead baits with J-hooks. The remaining two fish were tail wrapped. Commenters also strongly suggested that given the feeding habits of blue marlin, mandating circle hooks on artificial lures would significantly reduce the viability of trolling for blue marlin.

Alternative E2 would likely provide positive ecological benefits for most, if not all HMS species with which recreational fishermen interact. This alternative would reduce mortality in the directed billfish fishery by reducing post-release mortality. There is mounting evidence that hook choice can significantly impact fishing mortality rates. As discussed under alternative E1, recent studies have demonstrated that J-hooks are far more likely to result in deep hooking, more injurious hooking location, and tissue damage that results in bleeding. Cooke and Susuki (2004) found that circle hooks resulted in lower fishing mortality than other types of hooks and that mortality was consistently higher for J-hook caught fish. Also as previously discussed, Horodysky and Graves (2005) identified a post-release mortality rate of 35 percent for recreationally caught Atlantic white marlin when J-hooks were used. During this study, 13 of 20 white marlin caught on J-hooks died, while none of the 20 white marlin caught on circle hooks died. Clearly, it is not a reasonable assumption that all circle hook caught white marlin will survive the catch and release experience in every instance. Based on data from the same study, Dr. John Graves (pers. comm.) indicated that the research team identified a post-release mortality rate of 0 - 12 percent for Atlantic white marlin caught on circle hooks based on 10,000 runs of the data. This provides a post-release survival rate of 88 - 100 percent. Assuming a worst case scenario where 12 percent of all Atlantic white marlin caught on circle hooks die, this provides a net mortality benefit of approximately 23 percent (35 percent J-hook post-release mortality estimate - 12 percent circle hook post-release mortality benefit) for circle hook caught white marlin over J-hook caught marlin.

Table 4.50 provides a retroactive estimate of the net mortality benefit for Atlantic white marlin of switching the entire HMS fishery to circle hooks from J-hooks. In applying the benefit to previous release estimates, the estimated mortality benefit for white marlin ranged from 141 to 508 fish using RBS data, 78 to 2,589 fish using MRFSS data, and 19 to 674 fish using LPS data. Under alternative E2, NMFS estimates that approximately 88 percent of future released white

marlin would survive as a result of being caught on circle hooks. Averaging the annual mortality reduction benefits identified in Table 4.50, NMFS estimates that alternative E2 could result in the annual savings of approximately 302 Atlantic white marlin according to RBS data, 1,232 white marlin based on MRFSS data, and 607 white marlin using LPS data, when compared to continuing use of J-hooks throughout the fishery (alternative E1). Again, estimates are based on the assumption that all or nearly all white marlin are currently caught on J-hooks. Presently, NMFS cannot accurately estimate the proportion of anglers using J-hooks or circle hooks. Given that some unquantified subset of Atlantic white marlin are currently captured on circle hooks, the actual ecological benefits would likely be somewhat below this estimate. Some limited but unquantified proportion of white marlin may become tail-wrapped and suffocate, suffer predation from sharks, or be caught on J-hook rigged artificial lures, which could also reduce post-release benefits. Tail-wrapping and predation occur in association with J-hook caught fish also.

The ecological benefits ultimately derived from circle hooks are somewhat dependent upon angler behavior and fishing techniques. Variables include decisions by the angler to retain a fish caught on a circle hook, off-setting hooks, or allowing circle hooks to be deeply ingested, all of which can influence mortality benefits associated with circle hooks. The use of offset hooks appears to be a key variable influencing mortality levels associated with circle hooks. Prince *et al.* (2002) found that highly offset (15 degrees or greater) hooks were associated with deep hooking, whereas minor (four degrees or less) and non-offset hooks were typically associated with jaw hooking. Overall, Prince *et al*. found highly offset hooks were approximately three times more likely to result in deep hooking for sailfish. Another variable that likely impacts survival is drop-back time. When "dropping back", an angler free spools the bait, allowing the fish to deeply ingest the hook prior to setting it. It is believed that this practice results in higher rates of deep hooking and likely to higher rates of damage to internal organs (E. Prince, pers. comm.). As such, if anglers offset hooks or drop-back excessively, post-release mortality benefits would be expected to decrease. Additional research is needed on both of these variables.

Table 4.50 White Marlin Estimated Net Circle Hook Mortality Benefit in Numbers of Fish. Source: RBS, MRFSS, LPS

	RBS				MRFSS				LPS			
Year	Live Releases	Estimated J-Hook Post-Release Mortalities	Estimated Circle Hook Post-Release Mortalities	Estimated Net Circle Hook Benefit	Live Releases	Estimated J-Hook Post-Release Mortalities	Estimated Circle Hook Post-Release Mortalities	Estimated Net Circle Hook Benefit	Live Releases	Estimated J-Hook Post-Release Mortalities	Estimated Circle Hook Post-Release Mortalities	Estimated Net Circle Hook Benefit
1999	1456	510	175	335	3475*	1,216	417*	799	156	55	19	36
2000	975	341	117	224	7,069	2,474	848	1,626	705	247	85	162
2001	1306	457	157	300	11,255	3,939	1351	2,589	703	246	84	162
2002	2207	773	265	508	4633*	1,622	556*	1066	5,616	1,966	674	1292
2003	614	215	74	141	339*	118.7	41*	78	3,069	1,074	368	706
2004	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	5,573	1,951	669	1282

* Partial data available this data field.

As mentioned above, alternative E2 would likely result in positive ecological benefits for most, if not all HMS species that recreational fishermen interact with. Cooke and Suski (2004)

found circle hooks to be broadly beneficial in reducing mortality and/or improving hooking location when compared to J-hooks. As discussed, hooking location is a key variable in post-release mortality. Additional studies examined during this analysis reinforce these conclusions, specifically for HMS including Atlantic white marlin (Horodysky and Graves, 2005), sailfish (Prince *et. al*., 2002), and bluefin tuna (Skomal *et. al*., 2002).

Declines in post-release mortality of any overfished HMS stock would result in positive ecological benefits. Positive ecological gains (*i.e.*, reducing fishing mortality rates) would be relevant to considerations in the anticipated 2007 ESA Status Listing Review for Atlantic white marlin. As shown in Table 4.50, alternative E2 could decrease Atlantic white marlin mortalities by between 302 to 1,232 fish annually, assuming no significant changes in effort or angler behavior, and exclusive use of natural bait/circle hook combinations. NMFS does not expect any significant changes in effort or angler behavior, but acknowledges that not all anglers will always use circle hooks and natural baits when J-hooks with artificial lures remain an option. Given these assumptions, the potential ecological benefits could be somewhat below the numbers stated above. However, given data limitations on recreational catches and releases, the actual number of releases may be higher than those that are presented in the tables above, thereby resulting in a larger ecological benefit than identified above. The overall ecological impact of alternative E2 would be positive, but limited, given the relatively small contribution of U.S. anglers to total Atlantic-wide mortality. As such, alternative E2 would likely reduce the current Atlantic-wide fishing mortality rates for both blue or white marlin to some degree, but would not be capable of decreasing the Atlantic-wide fishing mortality rate to F_{msy}. While the benefits of requiring circle hooks are loosely quantifiable for Atlantic white marlin, the benefits remain unquantifiable at this time for other species. As mentioned, Skomal et al. (2002) noted improved hooking location associated with circle hooks, which as discussed, may contribute to a reduced post-release mortality as compared to J-hooks. Still, there are relatively few data available on the efficacy and impacts of using circle or J-hooks on sharks, other tunas, and swordfish, which could be used to quantify impacts.

Alterative E2 would likely have limited positive ecological benefits for blue marlin given fishing techniques for, and feeding behavior of, this species. As previously discussed, blue marlin are typically targeted by trolling lures or rigged natural baits at high speed. As a result, blue marlin are often mouth or foul hooked as they aggressively strike and bat at the lures. As a result, many anglers would likely make use of an artificial lure rigged with a J-hook when fishing for blue marlin to improve the odds of success. This would be allowable under alternative E2. Potential ecological benefits derived from the use of circle hooks stemming from improved hooking location and reduced tissue damage may be undermined by angler actions including offsetting hooks and increasing drop-back time, which allows the fish to deeply ingest baits before “setting” the hook.

This alternative would not be expected to increase interactions with protected resources. Interactions with protected species in the directed Atlantic billfish fishery are virtually unknown. However, this alternative may contribute to a reduction of interactions as well as the mortality rates associated with any such interactions that may occur based on the hooking mechanics, improved hooking location, and decreased damage of vital tissues generally associated with the use of circle hooks.

Alternative E3, a preferred alternative, would require the use of non-offset circle hooks by all Atlantic billfish tournament participants whenever natural baits or natural bait/artificial lure combinations are used, effective January 1, 2007. Any tournament as defined under 50 CFR §635.2 that has an award category, or awards points or prizes for Atlantic billfish is considered a billfish tournament. Natural bait/artificial lure combinations would include, but are not limited to, rigs such as natural baits used in combination with artificial hoods, heads, and or skirts. This alternative would allow the use of J-hooks with artificial lures in tournaments for the reasons discussed under alternative E2.

The ecological impacts of alternative E3 would be similar to those identified under alternative E2, but would be somewhat reduced in scope. This alternative would reduce mortality in the directed billfish fishery by reducing post-release mortality. Under alternative E3, post-release mortality benefits would be primarily realized in the billfish tournament segment of the recreational fishery, but may also realized outside of tournaments as anglers become comfortable and proficient with circle hooks and potentially increase their use voluntarily outside of tournaments. As such, based on RBS release data, this alternative would likely result in a decrease of white marlin post-release mortalities by approximately 23 percent, resulting in an estimated 302 fish released alive that would otherwise be expected to die. There would likely be positive mortality benefits (decreased post-release mortality) of an unquantified nature for sailfish, blue marlin, tunas, sharks, and, to a lesser extent, swordfish as well other non-HMS species with which billfish tournament anglers interact (blackfin tuna, mahi-mahi, wahoo, etc.), resulting from improved hooking location and decreased damage to vital tissues. See alternative E1 and E2 for more complete discussions of the impacts of J-hooks and circle hooks of target and non-target species. The overall ecological impact of alternative E2 would be positive, but limited, given the relatively small contribution of U.S. anglers to total Atlantic-wide mortality. As such, alternative E3 would likely reduce, but not reverse the current Atlantic-wide fishing mortality rates for both blue or white marlin and possibly other species with which billfish tournament anglers interact. Based on the expectation that some anglers will continue to use J-hooks when targeting Atlantic blue marlin while participating in billfish tournaments, for the reasons described under alternative E2, the positive ecological benefits for blue marlin would likely be less than those anticipated for white marlin under alternative E3. As discussed under alternative E2, potential ecological benefits derived from the use of circle hooks may be undermined by angler actions including offsetting hooks and increasing drop-back time.

Alternative E3 would not be expected to increase interactions with protected resources. Interactions with protected species in the directed Atlantic billfish fishery are virtually unknown. However, this alternative may contribute to a reduction of interactions as well as the mortality rates associated with any such interactions that may occur based on the hooking mechanics, improved hooking location, and decreased damage of vital tissues generally associated with the use of circle hooks.

Alternative E4a would increase the minimum legal size for Atlantic white marlin to a specific size between 68 and 71 inches LJFL (172 - 180 cm) to reduce white marlin landings and mortalities resulting from landings. The current minimum size for white marlin is 66 inches LJFL (167 cm) and has been in place since 1998 (63 FR 14030). The aforementioned range was

selected for analysis because, within a relatively small range of minimum sizes, it provides potentially significant reductions in landings (65-92 percent). The minimum sizes analyzed represent the upper and lower limits of the sizes analyzed and do not represent a "slot limit" for white marlin. If E4(a) were to be implemented, a new specific minimum size would be implemented from within the range analyzed. NMFS would select a specific minimum size within this range of analyzed minimum sizes based on public comment, the need to reduce fishing mortality based on the severely overfished status of this species, the need to comply with ICCAT landing limitations, and other relevant factors. Conservation measures, such as increasing the minimum size to reduce landings, may improve the likelihood of consistency with the ICCAT recreational marlin landings limit, particularly if methodological changes in the accounting methodology are made. In addition, management measures implemented prior to the 2007 ESA status review, such as increasing the minimum size to reduce landings, would be relevant considerations during the deliberations of the status review team.

Alternative E4b would increase the minimum size for blue marlin to a specific size between 103 and 106 inches LJFL (261 – 269 cm) to reduce blue marlin landings and mortalities resulting from landings. The current minimum size for blue marlin is 99 inches LJFL (251 cm) and has been in place since 1998 (63 FR 14030). The aforementioned range was selected for analysis because within this relatively small range of minimum sizes, significant reductions in landings (26-47 percent) can potentially be achieved. The minimum sizes analyzed represent the upper and lower limits of the sizes analyzed and do not represent a "slot limit" for blue marlin. If E4(b) were to be implemented, a new specific minimum size would be implemented from within the range analyzed. NMFS would select a specific minimum size within this range of analyzed minimum sizes based on public comment, the need to reduce fishing mortality given the overfished status of this species, the need to comply with ICCAT landing limitations, and other relevant factors. Conservation measures, such as increasing the minimum size to reduce landings, may improve the likelihood of consistency with the ICCAT recreational marlin landings limit, particularly if methodological changes in the accounting methodology are made. In addition, management measures implemented prior to the 2007 ESA status review, such as increasing the minimum size to reduce landings, would be relevant considerations during the deliberations of the status review team.

Alternative E4a and E4b would both likely have positive ecological impacts because increasing the minimum size would be expected to decrease landings and the mortalities associated with landings by decreasing the pool of legal sized fish available for landing. The extent of these benefits would be dependent on fishing effort remaining relatively constant to current levels, as well as a continuation of the widespread practice of catch and release fishing for Atlantic billfish. In addition to potentially limiting known mortalities via reducing the number of fish landed, increasing the minimum sizes would also ensure that a larger proportion of the billfish population attain sexual maturity and that larger, more fecund, individuals remain in the fishery and have another opportunity to spawn. The magnitude of this ecological benefit is unknown. Current domestic minimum sizes are set above the size at which billfish initially reach sexual maturity. Increasing the minimum size is not anticipated to have an effect on post-hooking mortality of released fish because the relationship between the size of a released fish and mortality is not known.

Between 1999 and 2003, RBS data indicate that there were an average of 96 and 20 blue and white marlin, respectively, that were landed and above the current minimum sizes each year in tournaments. Tournament landings are used as a proxy in this analysis due to uncertainly in non-tournament landings. Increasing the minimum legal size limit for Atlantic blue and white marlin could potentially reduce the number of legal landings on an annual basis. Based on RBS data cited above, landings could potentially be reduced by a maximum of 39 percent for blue marlin and 84 percent for white marlin if the largest minimum sizes were selected. Table 4.51 shows the number of fish landed and cumulative proportion of total landings, providing potential landings reductions for each size with the corresponding ranges for blue and white marlin. Each minimum size within the range would provide unique reductions in landings and conservation benefits. Positive ecological impacts resulting from decreased landings of blue and white marlin increase as the minimum size is increased within the range analyzed. The actual reduction in landings and known mortalities would be dependent on the specific minimum size selected, and future fishing effort. Figure 4.17 and Figure 4.18 show the overall number of tournament landings, by size (inches, LJFL), for blue and white marlin for the years 1999 - 2003 combined.

In general, for each one-inch incremental increase in minimum size, landings are reduced. The ranges analyzed for blue and white marlin are 103 - 106 inches and 68 - 71 inches, respectively. Table 4.51 describes the conservation benefits or number of marlin that would potentially not be landed based on selecting each minimum size within the analyzed range.

Table 4.51. Number of white and blue marlin landed at or below each minimum size in tournaments between 1999 - 2003 within the ranges identified. A minimum size would be selected between 68 - 71 inches for WUM and 103 - 106 for BUM. Source: NMFS RBS Database.

Blue Marlin			White Marlin		
Length (inches, LJFL)	Number of Fish < or = LJFL	Percentage of Overall Landings < or = LJFL	Length (Inches, LJFL)	Number of Fish < or = LJFL	Percentage of Overall Landings < or = LJFL
103	25	26	68	22	65
104	33	33	69	16	81
105	34	40	70	3	84
106	35	47	71	8	92

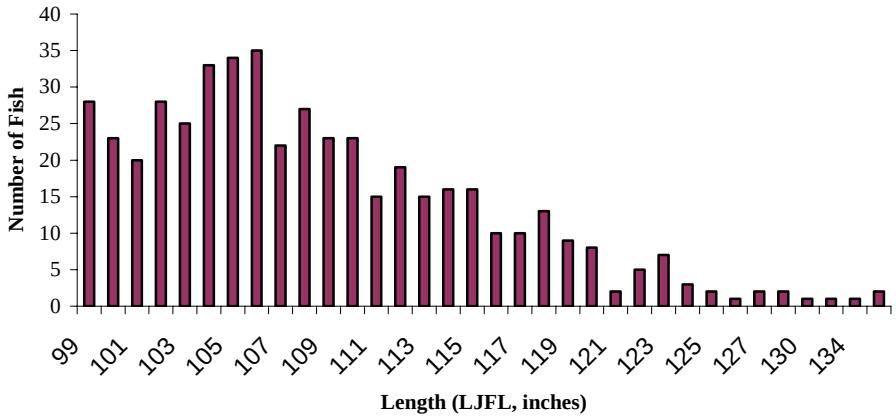

Figure 4.17 Number of blue marlin landed in tournaments between 1999-2003 by size (inches, LJFL). Source: Southeast Fisheries Science Center.

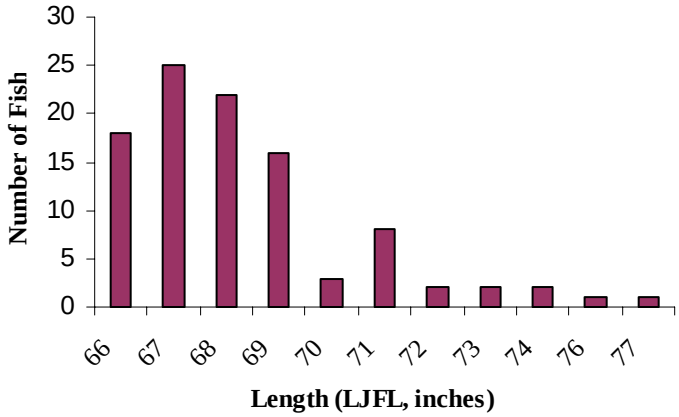

Figure 4.18 Number of white marlin landed in tournaments between 1999 - 2003 by length (inches, LJFL). Source: Southeast Fisheries Science Center.

Catch per unit effort (CPUE) data for blue and white marlin indicate that interactions with these species are a relatively rare event, ranging from 0.5 - 1.7 interactions per 100 hours of fishing between 1999 and 2003, as shown in Table 4.52. The conservation benefits of a larger minimum size would be dependent, in part, on fishing effort and practices remaining relatively constant. If fishing effort were to increase significantly, the number of landings could also increase despite increases to the minimum size. Interactions would likely also increase with increased effort, which would likely increase the number of post-release mortalities of billfish and other species.

Table 4.52 Catch per unit effort and numbers of blue and white marlin kept and released 1999-2003. Source: Billfish Tournament Database, Southeast Fisheries Science Center.

	Blue Marlin			White Marlin			Sailfish		
Year	Kept	Released Alive	CPUE/ 100 hours	Kept	Released Alive	CPUE/ 100 hours	Kept	Released Alive	CPUE/ 100 hours
1999	172	1527	1.4	36	1456	1.3	30	1907	1.6
2000	117	1467	1.1	8	975	0.7	18	2198	1.5
2001	75	1038	0.9	22	1306	1.0	11	3073	2.4
2002	84	1132	0.9	33	2207	1.7	14	3117	2.3
2003	96	1133	0.9	20	614	0.5	24	4171	3.0

These alternatives (E4a and E4b) are aimed at reducing landings and mortalities that result from landings for billfish, however, fishing mortality of released fish would continue to occur as a result of physical stress and fatigue, hook induced trauma, and physical damage to the gills, esophagus, and/or stomach even if a fish is not landed. Mortality reductions associated with these alternatives would likely be limited, based on the relatively small decrease in the number of fish landed as a result of an increased minimum size as well as the continuation of post-release mortalities. As discussed under alternative E1, minimum sizes do not directly impact the level of post-release mortality. Given the post-release mortality benefits of circle hooks, circle hook requirements (alternative E2 or E3) in combination with this alternative could increase the ecological benefits by reducing post-release mortalities and landings. For a more detailed discussion of the merits of circle hook use compared to J hooks, see alternatives E1 and E2 above.

While NMFS cannot predict angler behavior, under alternative E4a and E4b, anglers may choose to reduce effort if they believe that they would be unable to land a marlin given increased minimum sizes. This could result in unquantified positive ecological impacts for Atlantic billfish, other HMS, and non-HMS species with which recreational billfish fishermen interact. These potential impacts would be dependent upon significant shifts in fishing effort to other non-billfish species. If billfish effort were shifted to other species, this reaction could have negative ecological impacts on tunas, swordfish, sailfish, spearfish, sharks, and other species typically interacted with, or targeted by Atlantic billfish fishermen if effort shifts to other fisheries. As mentioned, it is not possible to predict angler response to increased minimum sizes, so the effects are uncertain. This alternative is not anticipated to have any negative impacts on interactions with protected species.

Alternative E5 would implement a recreational bag limit of one Atlantic billfish per vessel per trip. No more than one Atlantic billfish would be allowed to be possessed, retained, or landed on, or by, a vessel regardless of the length of the trip. Alternative E5 would likely have minimal positive ecological impacts. As discussed in the analysis for alternative E4, billfish fisheries have some of the lowest CPUE estimates of any recreational fishery. In 2003, there were 140,817 tournament hours of fishing resulting in 6,058 billfish being caught, or 0.04 billfish caught per angling hour. Fisher and Ditton (1992) found that billfish anglers reported an average of 13 trips/year, ranging from 8.7 - 17.3 depending on the region. On average, each angler landed < one (0.7) billfish per year, or 1 billfish every 1.4 years. Data collected during the same survey found that only 11 percent of billfish caught during respondents' last tournament were

landed (Fisher and Ditton, 1992). NMFS is aware that some anglers continue to land multiple billfish on a single trip, however the Agency has little data on how frequently this occurs. Anecdotal information suggests that this is a rarity for marlins, and occurs with more frequency with sailfish. Based on the overall rarity of catching an Atlantic billfish that meets the minimum size requirements, implementing a bag limit of one fish per vessel per trip would have minimal ecological benefits. However, alternative E5 would provide additional protection to these species, which are considered, overfished with overfishing still occurring.

Sailfish are often found closer to shore and travel in schools during winter months. Therefore, the likelihood of anglers catching multiple fish during excursions, especially in areas off the Florida Keys and Southeastern Florida, is increased. Landings reported to the HMS call-in line indicate that up to three sailfish have been landed during a single trip in 2005. Information obtained from a brief survey of internet websites (2005) indicates that some billfish anglers have retained as many as nine billfish in a single trip. The CPUE for sailfish landed in tournaments between 1999 - 2003 ranged from 1.5 - 3.0 fish per 100 hours fishing, significantly greater than for blue or white marlin. Sailfish were determined to be overfished in 1998. The 2001 stock assessment for sailfish did not estimate MSY or the fishing mortality rate, so it is difficult to discern the exact status of sailfish at this time. Multiple ICCAT resolutions and recommendations advise that Contracting Parties should consider methods to reduce fishing mortality rates for Atlantic billfish. Implementation of a bag limit of one billfish per vessel per trip would be consistent with this objective by potentially reducing landings and mortalities of Atlantic billfish with attendant positive ecological impacts.

Overall, implementing a bag limit of one Atlantic billfish per vessel per trip is not expected to have substantial ecological impacts because multi-billfish excursions, especially for blue and white marlin, are rare events. However, if a multi-fish trip did occur, a bag limit would prevent excessive landings on these exceptional excursions. As with alternative E4, efforts to reduce billfish landings should be considered concurrently with other alternatives that may reduce the post-hooking mortality of billfish via the use of alternatives to J-hooks that reduce the risk of hooks becoming deeply ingested by billfish (alternatives E2 and E3). If anglers shifted effort to other non-billfish species as a result of the implementation of a bag limit, it could adversely impact these species to some unquantified extent.

Alternative E6, a preferred alternative, would allow NMFS to implement ICCAT Recommendations pertaining to recreational marlin landing limits. Alternative E6 would establish an in-season adjustment framework to increase minimum sizes and shift the billfish fishery to catch and release only for Atlantic marlin, if necessary, to ensure compliance with ICCAT recommended landing limits. As noted earlier, the United States is currently limited to landing 250 recreationally caught Atlantic blue and white marlin, combined.

To provide for maximum utilization of the U.S. recreational Atlantic marlin landing limit without exceeding it, this alternative would allow NMFS to increase the legal minimum size of blue and or white marlin, as appropriate. The anticipated effect of an in-season minimum size increase would be to slow landings, if necessary, and thereby reduce the probability of having to shift to catch and release fishing only for Atlantic marlins. Under this alternative, the proposed size range that would be made available to NMFS for in-season management actions is from 117

to 138 inches for Atlantic blue marlin and 70 to 79 inches for Atlantic white marlin. The need for action and the specific minimum size temporarily implemented would be based upon a review of landings, time remaining until conclusion of the current fishing year, current and historical landings trends, and any other relevant factors. As a backstop to ensure that U.S. actions remain consistent with the ICCAT landing limit, the fishery would become catch and release only for the remainder of a fishing year if the landing limit were achieved. If marlin minimum sizes were increased to slow landings during a given fishing year, they would revert back to the previous minimum size at the start of the next fishing season. Consistent with ICCAT recommendations, NMFS would subtract any overharvest from the subsequent fishing year's landing limit.

Alternative E6 would likely have minor positive ecological benefits if implemented on its own. This alternative could reduce mortalities of Atlantic billfish by reducing the mortality associated with landings. The United States' landings (landings and dead discards) of Atlantic blue and white marlin averaged 2.29 percent and 4.31 percent (respectively) of aggregate Atlantic-wide landings for these species, as reported to ICCAT for the period 1999 - 2003. The total contribution of the U.S. recreational fleet to aggregate Atlantic-wide marlin mortality has not been definitively quantified, but may be larger than previously estimated based on new post-release mortality estimates for white marlin. Since implementation by ICCAT of the U.S. recreational limit in 2001, reported U.S. recreational marlin landings have ranged from a high of 279 in 2002 to a low of 131 in 2003. Details can be seen in Table 4.44.

Given that the known level of U.S. recreational marlin landings have been within the 250 fish limit for two of the three years, and that the 2002 overage was offset by the 2001 underharvest, the ecological benefits of this alternative are likely limited. Alternative E6 may prevent future landings in excess of the ICCAT landing limit, and therefore may prevent future increases in mortalities associated with known landings. However, because a landing limit cannot directly control effort or post-release mortality, this alternative cannot directly control fishing mortality, which may increase or decrease with changing effort and fishing practices despite domestic implementation of the ICCAT landing limit. This alternative is not anticipated to have any impact on interactions with protected resources or impact other non-billfish species, but cannot prevent such changes if fishing effort changes. Alternative E6 may result in limited impacts on the landings, discards, and interactions with other HMS, and other finfish species such as dolphin fish, king mackerel, and wahoo that are frequently encountered by HMS fishermen. Positive or negative ecological impacts may occur for these species, and would depend on whether or not the threshold for action is achieved and angler response. However, no impacts are anticipated because, based on the current accounting methodology and the widespread practice of catch and release fishing for billfish, it seems unlikely that the threshold for action would be reached. Nevertheless, as noted above, the likelihood of achieving the threshold for action could change with changes in effort, compliance with reporting requirements, or improved accuracy of accounting methodologies.

Alternative E6 may result in minor positive ecological benefits if minimum size increases or catch and release only fishing requirements are implemented for Atlantic blue and white marlin as a result of the threshold for action being achieved under this alternative. Impacts on non-billfish species, in terms of landings and post-release mortality may remain the same,

increase, or decrease depending on angler response to increased minimum sizes and or a shift to catch and release only fishing. Given the widespread practice of catch and release fishing for billfish, as discussed under alternative E1, it is likely that most billfish anglers would continue to expend effort fishing for Atlantic marlins, which would result in some level of landings and continuing post-release mortalities under increased minimum sizes or a shift to a catch and release only fishery. Assuming no change in effort or angler behavior, there would likely be little change in the ecological impacts from the status quo. Alternatively, anglers may reduce effort if they believe that they would be unable to land a billfish given a minimum size increase, or would be prohibited from landing a marlin given a landings prohibition. This could result in unquantified ecological benefits for Atlantic billfish, other HMS, and non-HMS species with which recreational billfish fishermen interact. Further, it is also possible that anglers may shift effort to other non-marlin species. This response could increase negative ecological impacts on tunas, swordfish, sailfish, spearfish, sharks, and other species typically interacted with or targeted by Atlantic billfish fishermen. In conjunction with E3 and E7, alternative E6 could maximize ecological benefits to Atlantic billfish by reducing post-release mortality and limiting mortalities associated with landings to levels consistent with ICCAT landing limits. Further, the United States may benefit from increased negotiating leverage at ICCAT, and thus allow for more rapid implementation of additional international management as appropriate. Positive ecological benefits, specifically reducing fishing mortality, would be relevant considerations in the anticipated 2007 ESA Status Listing Review for white marlin.

Alternative E7, a preferred alternative, would allow only catch and release fishing for Atlantic white marlin effective January 1, 2007 through December 31, 2011. Possession and retention of Atlantic white marlin would be prohibited at all times and under all circumstances by all U.S. flagged vessels. This provision would expire five years from the effective date unless specifically extended by NMFS.

The ecological impacts of eliminating recreational landings of white marlin can be estimated from U.S. landings reported to ICCAT, as well as other domestic fisheries surveys. Alternative E7 would reduce mortalities of white marlin by eliminating mortalities associated with landings. The reported U.S. white marlin landings for 2001 - 2003 can be seen in Table 4.44. In 2001, 2002, and 2003, there were 116, 88, and 23, respectively, white marlin reported landed in the U.S. Atlantic billfish fishery. In 2004, billfish landings reported to ICCAT were based on tournament reports, state catch-card reports, and HMS non-tournament reports. Because non-compliance with many of these reporting requirements is pervasive throughout the fishery, NMFS considers all billfish self-reported statistics to be minimum estimates with an unquantified bias toward low estimates. Fishing surveys, such as MRFFS and the LPS, discussed above, provide additional data useful for estimating landings of Atlantic billfish (Table 4.46 and Table 4.47). The MRFSS survey includes HMS species, however, it was not designed for these species, which are considered “rare event” species as compared to other recreational fisheries. The LPS survey was designed to intercept HMS fisheries, but because it does not operate in all Atlantic coastal states and operates for only a portion of the year, it is only a subset of aggregate U.S Atlantic landings. The recent LPS white marlin landings estimates are both substantially lower and higher than those calculated directly from observed landings. For the years 1999 through 2004, the LPS estimated landings of white marlin were six, four, four, 218, 365, and 78, respectively. Additionally, as discussed above, the United States is currently

limited to 250 blue and white marlin landings (combined) annually by ICCAT. This recommendation was adopted in 2000 and entered into force in 2001.

As such, alternative E7 would likely provide limited ecological benefits to Atlantic-wide white marlin stocks by itself. Under this alternative, a large portion of the fish currently landed would likely be conserved, however estimates vary. Table 4.44 through Table 4.46 provide the potential range of mortality reductions that could be achieved if alternative E7 was implemented. Impacts on other species with which HMS fishermen typically interact will depend on angler response to a catch and release fishery for white marlin. Anglers are likely to respond in three ways: 1) no change in effort or target species; 2) decreased effort; and, 3) shift target species. If angler behavior does not change to any appreciable extent, NMFS anticipates that the impacts would be similar to those as discussed under alternative E1. If anglers respond by decreasing effort, alternative E7 could result in positive ecological impacts for HMS and other species by potentially reducing landings and interactions, which could reduce post-release mortality. If anglers respond by shifting effort to other target species, such as sailfish, blue marlin, dolphin, and wahoo, this alternative may result in increased landings and interactions with these and other species. Data are unavailable to allow quantification of these impacts, nevertheless, any one or any combination of the aforementioned responses and their attendant impacts are possible. However, as stated above, the impacts are likely to be limited given the current angler ethics and high levels of participation in catch and release fishing.

Alternative E7 cannot by itself reduce post-release mortalities of white marlin. As such, all mortality gains would be expected to occur through the reduction in landings. However, alternative E7, if used in conjunction with alternative E3 (mandatory use of circle hooks in billfish tournaments), could substantially expand possible ecological benefits by reducing landings to zero and considerably reducing the post-release mortality of recreationally captured white marlin. If alternatives E7 and E3 are preferred and proven effective, the United States may also benefit from an improved negotiating position at ICCAT. Positive ecological gains, specifically reducing fishing mortality, would also be relevant considerations during the anticipated 2007 ESA Status Listing Review for white marlin. As such, and given that the synergistic effects of alternatives E3 and E7 are anticipated to confer substantial positive ecological benefits to Atlantic white marlin, these alternatives are preferred in combination.

Alternative E8 would allow catch and release only fishing for Atlantic blue marlin effective January 1, 2007. This provision would sunset five years from date of implementation unless specifically extended by NMFS. This alternative would prohibit the possession, retention, and landing of Atlantic blue marlin at all times and under all circumstances by all U.S.-flagged vessels. The ecological benefits of eliminating recreational landings of blue marlin can be estimated from U.S. landings reported to ICCAT, as well as other domestic fisheries surveys. The reported U.S. blue marlin landings for 2001 - 2003 can be seen in Table 4.44. In 2001, 2002, and 2003, there were 77, 191, and 108, respectively, blue marlin reported landed in the U.S. Atlantic billfish fishery. As discussed above, in 2004, billfish landings reported to ICCAT were based on tournament reports, state catch-card reports, and HMS non-tournament reports. Because non-compliance with many of these reporting requirements is pervasive throughout the fishery, NMFS considers all billfish self-reported statistics to be minimum estimates with an unquantified bias toward low estimates. Fishing surveys, such as MRFFS and the LPS,

discussed above, provide additional data useful for estimating landings of Atlantic billfish (Table 4.46 and Table **4.47**). The recent LPS blue marlin landings estimates are lower than those calculated directly from observed landings. For the years 1999 through 2004, the LPS estimated landings of blue marlin were three, zero, zero, zero, 101, and 45, respectively. Additionally, as discussed above, the United States is currently limited to 250 blue and white marlin landings (combined) annually by ICCAT.

Alternative E8 would likely provide some ecological benefits to blue marlin stocks, however, with the ICCAT marlin landings limit and the currently low recreational landings rate for the species, NMFS believes this alternative would likely provide limited ecological benefits. Alternative E8 would reduce mortalities of blue marlin by eliminating mortalities associated with landings. Under this alternative, a large portion of the fish currently landed would likely be conserved, however estimates vary. Alternative E8 cannot, by itself, reduce post-release mortalities of Atlantic blue marlin. As such, all mortality gains would likely occur through the reduction in landings.

As with alternative E7, impacts on other species with which HMS fishermen typically interact will depend on angler response to a catch and release fishery for blue marlin. Anglers are likely to respond in three ways: 1) no change in effort or target species; 2) decreased effort; and, 3) shift target species. If angler behavior does not change to any appreciable extent, NMFS anticipates that the impacts would be similar to those as discussed under alternative E1. If anglers respond by decreasing effort, alternative E8 could result in positive ecological impacts for HMS and other species by potentially reducing landings and interactions, which could reduce post-release mortality. If anglers respond by shifting effort to other target species, such as sailfish, white marlin, dolphin, and wahoo, this alternative may result in increased landings and interactions with these and other species. Data are unavailable to allow quantification of these impacts, however, any one or any combination of the aforementioned responses and their attendant impacts are likely. However, as stated above, the impacts are likely to be limited given the current angler ethics and high levels of participation in catch and release fishing.

Additionally, this alternative, if used in conjunction with alternative E3 (mandatory use of circle hooks in billfish tournaments), could maximize the ecological benefits by reducing landings to zero and substantially reducing the post-release mortality of recreationally captured blue marlin. If alternatives E8 and E3 were selected and proven effective, the United States may benefit from an improved negotiating position at ICCAT.

None of the management alternatives pertaining to the directed billfish fishery (E1 – E8) are anticipated to have impacts on EFH. Recreational fishing gear used to fish for Atlantic billfish is not believed to interact with bottom structures or otherwise damage habitat.

Socio-Economic Impacts

Alternative E1, the No Action alternative would likely have no adverse short-term economic impacts. Ditton and Stoll (2003) conservatively estimate the aggregate economic impact of billfish fishing trips in the U.S. Atlantic to be $22.7 million annually, not including Puerto Rico. Please see Section 3.5.2 for additional discussion of the economic status of the directed billfish fishery.

As of April 20, 2005, there were 21,800 HMS Angling category permits, 4,039 CHB category permit holders, and 5,268 General category permits which represent the number of vessels that are legally authorized to participate in the Atlantic billfish fishery. General category permit holders are eligible to fish for, retain, or posses, Atlantic billfish only when participating in a registered HMS tournament. The number of Angling category permit holders is thought to be considerably below the number vessels that should be permitted. See Section 3.9 of this document for additional detail regarding permitting issues. Further, because HMS Angling, CHB, and General category permits are vessel permits, any given vessel could have multiple anglers on board. Given the multi-species nature of HMS Angling and CHB permits, and the fact that vessels are permitted rather than individual anglers, NMFS does not have the ability to identify what subset of these permitted vessels, or how many anglers, engage in billfishing based on the best scientific information available. Ditton and Stoll (2003) estimate that there are 7,915 billfish anglers in the U.S. Atlantic and 1,627 billfish anglers in Puerto Rico.

Alternative E1 would likely result in a continuation of the fishery consistent with current operating patterns. It would not be expected to alter participation rates of private anglers, demand for CHB trips, or to impact participation in billfish tournaments. Alternative E1 would not likely result in any change or redistribution of fishing effort in the short-term or impact hook manufactures, retailers, or other small businesses associated with the recreational billfish fishery.

Alternative E2 would likely have limited adverse social and economic impacts. As discussed in Section 3.9.4, there were 21,800 Angling, 4,039 CHB, and 5,268 valid General category permits as of April 20, 2005. This represents the universe of vessels that could be impacted by circle hook requirements under alternative E2. However, given that these are vessel permits, it is not possible to quantify the number of individual fishermen participating in HMS Fisheries who may be impacted by circle hook requirements.

Hooks employed by recreational anglers while pursuing HMS typically range in size from 5/0 to 14/0 for J-hooks and 7/0 to 20/0 for circle hooks. A limited survey of hook prices indicated that J-hooks of the sizes and styles used by HMS recreational fishermen ranged in price from a low of $0.50 to a high of $7.50 each, with an average price of $2.70. Similarly, circle hooks of the sizes and styles used by HMS recreational fishermen ranged in price from a low of $0.30 to a high of $7.00 each, with an average price of $2.24. A comparison of the two indicates that anglers could, on average, save approximately $0.46 for every circle hook purchased for use in place of a J-hook, if mandatory circle hook requirements were implemented in HMS fisheries. As such, initial purchases of circle hooks to comply with circle hook requirements would represent a minor negative economic impact, however, over the long-term, circle hook requirements associated with this alternative may result in a minor economic benefits, assuming the price differential between circle and J-hooks remains stable. Nevertheless, the purchase of hooks represents only a minor capital expenditure relative to other costs associated with participating in this fishery, including purchasing, equipping, maintaining, and running of vessels, which can run into the hundreds of thousands of dollars or more. As such, any potential economic impacts, either positive or negative, stemming from the purchase hooks are likely to be *de minimus* in nature. As previously discussed, NMFS cannot quantify the number of impacted anglers. Further, the quantity of hooks purchased by individual anglers varies widely from the

occasional angler to those who fish regularly, and as a result of these factors, NMFS cannot estimate an aggregate economic impact. The delay in implementation of circle hook requirements, specifically requested by HMS and Billfish Advisory Panel members, is anticipated to allow hook manufacturers, retailers, and anglers adequate time to utilize current inventories and alter production rates of J-hooks, thereby minimizing any adverse economic impacts associated with alternative E2.

Alternative E2 may result in a temporary decrease in angler consumer surplus given anticipated or real loss of fish as fishermen adjust to and become more proficient with the use of circle hooks. However, Prince *et al*., (2002) found that circle hooks were actually 1.83 times more likely to hook a sailfish than a J-hook, and that once hooked, the catch percentage was virtually identical for each type of terminal gear. Skomal *et al*. (2002) reported similar findings with bluefin tuna, stating that catching success was similar for the two hook types. Skomal *et al*. found that 68 percent of recorded J-hook bites and 74 percent of circle hook bites resulted in landed tuna. Taken in combination, data from these studies suggest that there could potentially be an increase in angler consumer surplus as a result of increased catches, and that any loss of angler consumer surplus may be due to a perceived loss of fish, as opposed to a real loss of fish. However, the true effect of circle hooks on catch rates is not known for most HMS species. Any reduction of angler consumer surplus could be mitigated to an extent by the ability of anglers to continue to utilize J-hooks with artificial lures under alternative E2. In addition, the lengthy phase-in period associated with this alternative should allow anglers time to become comfortable and proficient with circle hook use prior to mandatory implementation, further mitigating any potential loss of angler consumer surplus.

Impacts on tournaments would likely be minimal, given the increase in the number of tournaments that provide special award categories or additional points for billfish captured and released on circle hooks. While unlikely, it is possible that there could be a decrease in tournament participation and demand for CHB trips, as well as trips taken by individual anglers based on real or perceived declines in catch under this alternative. NMFS cannot predict angler behavior with regard to participation in tournaments, demand for CHB trips, or trips taken by individual anglers in reaction to potential circle hook requirements. As such, if any tournaments are cancelled, demand for CHB trips decreases, or trips taken by individual anglers decline as a result of circle hook requirements, NMFS acknowledges that there could be some unquantified adverse impacts depending on the size of the tournament or the number of CHB trips forgone.

While there may be an initial decrease in angler consumer surplus, alternative E2 may provide long-term positive benefits with regard to increased angler consumer surplus and willingness to pay if circle hooks contribute to rebuilding efforts and result in increased encounter rates. However, given the limited contribution of U.S. fishermen to aggregate Atlantic-wide catches of billfish, the Atlantic-wide benefits to billfish populations of alternative E2 may be limited. This alternative may enhance the United States' negotiating position at ICCAT by demonstrating the United States' commitment to the conservation of recreationally caught HMS at a time when other ICCAT nations are beginning to determine the extent of their domestic recreational fisheries. Improved negotiating position at ICCAT may allow for the more rapid implementation of recreational circle hook requirements Atlantic-wide. Alternative E2

may be difficult to enforce given the ability of anglers to possess both circle and J-hooks onboard at the same time.

The economic and social impacts of alternative E3, a preferred alternative, are anticipated to be similar to, but reduced from the estimated impacts discussed under alternative E2. Vessels with HMS Angling, CHB, or General category permits that participate in Atlantic billfish tournaments represent the universe of potentially affected vessels of alternative E3. However, given the multi-species nature of the HMS permits and the fishery, it is not possible to accurately quantify the subpopulation of billfish anglers. Further, NMFS is not able to quantify the exact number of anglers or vessels participating in tournaments that may be impacted. On average, for the period 1999 – 2003, 50 vessels participated per tournament, however the average varies by year and state from 40 to 78. In 2003 and 2004, there were 244 and 214 registered HMS tournaments respectively. These figures include all HMS tournaments, including billfish and non-billfish tournaments. On average for the period 1999 - 2003, there were approximately 154 billfish tournaments annually, ranging from a low of 129 to a high of 179, in any given year. However, combining the number of tournaments with average number of vessels per tournaments is not a reliable indicator of how many individual vessels participated in tournaments because many vessels participate in multiple tournaments each year. It is possible, but unlikely, that alternative E3 could result in decreased tournament participation based on real or perceived declines in catches. Tournament participation would not be expected to decrease given the high rates of participation in catch and release fishing and the continued availability of fish for landing under this alternative. Further, as discussed under the analysis of alternative E2, circle hooks have been found to actually improve the likelihood of catching some HMS. Impacts on tournaments would likely be minimal, given the increase in the number of tournaments that provide special award categories or additional points for billfish captured and released on circle hooks. As previously discussed, NMFS cannot predict angler behavior with regard to participation in tournaments, demand for CHB trips, or trips taken by individual anglers in reaction to potential circle hook requirements. As such, if any tournaments are cancelled, demand for CHB trips decreases, or trips taken by individual anglers decline as a result of circle hook requirements, NMFS acknowledges that there could be some unquantified adverse impacts depending on the size of the tournament or the number of CHB trips forgone.

The minor initial adverse economic impacts associated with compliance costs with regard to circle hook requirements, and potential minor long-term positive economic impacts of approximately $0.46 per hook purchased by anglers for use in HMS fisheries, as discussed under the analysis for alternative E2, would only apply to billfish tournament participants if alternative E3 were implemented. Billfish tournament participants may be impacted to a slightly greater degree by this requirement, as tournament participants tend to be regular participants in the billfish fishery, and are likely to purchase more hooks than the occasional billfish fisher. Again, however, the purchase of hooks represents only a minor capital expenditure relative to other capital costs in the fishery, including the purchase, equipping, and maintenance of vessels, and tournament registration fees, and thus, the impact is considered *de minimus*.

Impacts of alternative E3 on hook manufactures, retailers, and anglers would likely be limited given that J-hooks would continue to permitted outside of tournaments, and in tournaments with artificial lures. As discussed under alternative E2, the extended delay in

implementation of circle hook requirements, specifically requested by HMS and Billfish Advisory panel members, should allow hook manufacturers, retailers, and anglers adequate time to utilize current inventories of J-hooks, thereby minimizing any adverse economic impacts associated with alternative E2. Alternative E3, consistent with the analysis of alternative E2, may result in a temporary decrease or increase in angler consumer surplus, and may result in a long-term increases in angler consumer surplus should this alternative assist in the recovery of Atlantic marlin. Also similar to alternative E2, alternative E3 may result in improved negotiating position at ICCAT, potentially speeding the implementation of recreational circle hooks requirements through ICCAT. As with alternative E2, alternative E3 could present enforcement problems, however, these would likely be diminished to some extent given the self-policing that is likely to occur among tournament participants competing for prizes, as well as the increasing use of tournament observers.

Alternative E4a and E4b would increase the minimum size for blue and white marlins, likely reducing the number of legally landed white and or blue marlin, respectively. NMFS cannot predict angler behavior, and so cannot be sure if these measures would or would not affect angler participation rates. As previously discussed, catch and release rates are already quite high in the billfish fishery, with anglers often keeping only trophy-sized fish. As such, an increase in minimum sizes is not anticipated to dissuade any substantial portion of billfish anglers from pursuing Atlantic marlins. Furthermore, since many tournament organizers already require higher minimum sizes than those imposed by NMFS, of their own volition, this indicates that angler participation, and resultant economic impacts would likely be minor. Further, increased minimum sizes do not reduce the number of fish available for landing, simply the odds of landing a fish. As such, anglers can continue to pursue and land marlins, should they choose to, given that the ICCAT landing limit would not be impacted by alternative E4. Table 4.45 indicates that between 1999 and 2003, 91, 98, and 99.4 percent of blue marlin, white marlin, and sailfish were released in tournaments, respectively. Fisher and Ditton (1992) conducted a survey of 1,984 billfish anglers and found that these anglers, on average, released 89 percent of billfish depending on the region (range = 74-95 percent). Further, Ditton and Oh (2004) found that some anglers were willing to pay an additional $69 to participate in catch and release fisheries.

High catch and release rates coupled with low CPUE for billfish indicate that an increase in the minimum size of four to seven inches for blue marlin and three to seven inches for white marlin would have negligible impacts on angler participation. Fisher and Ditton (1992) also found that 60 percent of respondents either agree or strongly agree with increased minimum sizes. Eighty-one percent of anglers interviewed stated that that the minimum size limits implemented in 1988 had no effect on their billfishing activity. The Agency received comments during the formulation of Amendment 1 to the Billfish FMP (NMFS, 1999) indicating that increasing the minimum size limits would be preferable to implementing bag limits if additional management action is necessary. If angler participation remains consistent, negative social and economic impacts would likely be minor as a result of increasing the minimum size for blue or white marlin.

Alternative E5 would likely have minor economic impacts. Recreational billfish fisheries have very low CPUE rates, however, it is believed that participation in these fisheries continues to expand. Because of the rarity of catching a billfish and the conservative minimum sizes in

place, the chances of landing more than one white or blue marlin on a single trip are low. Sailfish are somewhat of an exception, in that during certain times of the year at several locales off the coast of Florida, anglers may have the opportunity to catch and land several sailfish that meet the minimum size requirements in one trip.

Fisher and Ditton (1992) indicate that 77 percent of anglers would not change their fishing behaviour if a bag limit of one billfish were implement. As the fishery continues to expand, without corresponding increases in CPUE, it is reasonable to assume that anglers would maintain current levels of participation based on the *opportunity* of catching and possibly landing one trophy billfish. A bag limit of zero billfish, or implementing catch and release only might affect angler behaviour more because anglers would no longer have that opportunity to catch an exceptionally large billfish, which is afforded by a one billfish bag limit.

Furthermore, since this is largely a catch and release fishery, both within and outside of tournaments, NMFS assumes that implementing a bag limit will not deter anglers from participating in billfish excursions, likely minimizing the negative impacts to CHB operators. However, it is possible that there will be an unquantifiable decrease in demand for CHB trips if not all individual anglers on a given trip would have the opportunity to land a billfish. In this vein, multi-angler, multi-day trips could be impacted to a greater extent than day trips if alternative E5 were selected as a preferred alternative.

Tournament participation would not be expected to decrease in a substantial manner as tournament rules often prohibit participants from entering more than one marlin per day, which would likely prevent participants from possessing multiple fish. The high catch and release ratio indicates that the majority of billfish anglers are more interested in the experience of "hooking" a billfish rather than landing a billfish. If anglers continue to take marlin trips, as anticipated, then many of the negative economic impacts associated with the landing limit would be minimal or non-existent.

Alternative E5 would be anticipated to assist the United States in maintaining compliance with the 250 fish limit imposed by ICCAT. Eliminating the opportunity for vessels to land several blue and/or white marlin would decrease the likelihood of overages, closures, or increases in the minimum size that may occur as a result of achieving the threshold for action described in alternative E6. However, since multiple landings of blue marlin and white marlin are rare, a bag limit in and of itself may not guarantee compliance.

Alternative E6 is anticipated to result in minimal to moderate adverse economic impacts depending on catch rates, angler response, and which of the available management actions (no action, minimum size increase, or catch and release only) become necessary. Available historical data suggest it is unlikely that the United States will achieve the 250 marlin landing limit. See Table 4.44 for historical landings data, as reported to ICCAT. As noted under alternative E1, between 2001 and 2003 (inclusive), the United States remained substantially below the ICCAT landing limit with the exception of 2002, where a post-fishing year adjustment to accounting methodologies indicated a small one-time exceedance of the landing limit. At the 2004 ICCAT meeting, the United States reported landing 131 marlin (108 blue marlin, 23 white marlin) based on data from the RBS, landings cards from the States of North Carolina and

Maryland, and self-reported non-tournament landed fish. RBS data represented roughly 88 percent of marlin landings reported to ICCAT. However, the likelihood of achieving the 250 fish limit may change with improved accuracy in quantifying domestic recreational billfish landings. Further, given the open access nature of the fishery, and relatively low compliance with self-reporting requirements, it is possible for documented landings to increase if effort increases and or if compliance improves with reporting requirements.

There are several unknowns that currently make an assessment of the socio-economic impacts of the marlin management alternatives difficult to quantify. These include uncertainty regarding total marlin landings, uncertainty regarding the number of marlin fishermen and absolute effort, and uncertainty regarding changes in angler behavior when faced with increased minimum sizes or a catch and release only fishery. As such, the analysis presented in this DEIS is based on the best available data, and makes use of proxies at appropriate points to assist in evaluating the impacts of this alternative. Socio-economic impacts are discussed for CHBs, tournaments, anglers, and associated businesses by under three potential management action scenarios: no in-season adjustments; implementation of minimum sizes; and, shift to catch and release only fishery for Atlantic marlins.

Scenario 1: Threshold For In-Season Management Action Not Achieved

Alternative E6 is not expected to result in impacts to the recreational marlin fishery if the threshold for action is not reached or projected to be reached. Alternative E6 is intended to allow some level of landings to continue for the entire duration of the fishing year by increasing the minimum size of Atlantic blue and or white marlin, if necessary, to prevent a shift to catch and release fishing. If the threshold for action is not achieved or expected to be achieved, NMFS anticipates no impact on demand for CHB trips, tournament participation, or participation in the fishery by non-tournament anglers. Under this scenario, NMFS would not anticipate any adverse socio-economic impacts on dependant shoreside businesses, such as tackle shops or marinas. Thus, under the no in-season action scenario of alternative E6 (where the threshold for action is not achieved or anticipated to be achieved), NMFS anticipates few or no positive or negative socio-economic impacts, while remaining consistent with ICCAT recommendations. As such, the impacts would be similar to those discussed under alternative E1.

Scenario 2: Threshold For an In-Season Minimum Size Increase Achieved

Alternative E6 provides the option of increasing the minimum sizes of Atlantic blue and white marlin to between 117 and 138 inches and 70 and 79 inches, respectively, if in-season evaluation of the action criteria indicate that additional management measures are necessary to ensure consistency with the ICCAT landing limit. As discussed under the ecological evaluation of alternative E6, the action criteria include a review of landings, time remaining until conclusion of the current fishing year, current and historical landings trends, and any other relevant factors. Based on RBS landing data (1999 - 2003), these proposed minimum size ranges correspond to sizes at which 84 to 100 percent of all blue marlin have been landed and 68 percent to 100 percent of white marlin have been landed.

For purposes of analysis only, this document assumes that the threshold for action is reached in a given year when 85 percent of the ICCAT landings limit (213 fish under the current

ICCAT landing limit) has been landed. This threshold for action is for purposes of discussion only and is in no way intended to indicate that that 85 percent is the actual threshold for action. The threshold for action will vary by year based on the action criteria identified above. To determine an approximate date at which the 85 percent threshold might be achieved, the Agency increased the historical RBS landings distribution of marlins evenly by month for the period 1999 – 2003 until the threshold for action was achieved. The assumptions involved in determining the action date include the following, and are made for only purposes of analysis: 1) the temporal distribution of landings will remain roughly similar to the 1999 – 2003 pattern, as identified from RBS data; 2) landings will increase evenly until at least 85 percent of the ICCAT landings limit is achieved; 3) that 85 percent threshold will be achieved when approximately 85 percent of historical landings have occurred; and, 4) that the Agency benchmark for action is 85 percent of the ICCAT landings limit.

Based on the assumptions identified above, under the June 1 to May 31 fishing year, NMFS estimates that the threshold for implementing an increased minimum size would occur on approximately May 3 , or approximately August 21 based on a calendar year fishing year (see alternative G2, Calendar Year / Fishing Year, Section 4.3.2). The obvious difference in the length of time from the start of the fishing year until the threshold is projected to be achieved, under the assumptions discussed above, (~11 months versus ~eight months, respectively) between the June 1- May 31 and the calendar year, stems from the dearth of landings during the winter months. As such, because those months with few landings occur during the midst of the June 1 – May 31 fishing year, it is lengthened. In the withdrawn proposed rule (68 FR 54410 September 17, 2003) to implement the ICCAT 250 marlin limit, the date at which 80 percent of landings was estimated to occur was identified as October 15. The significant difference in the estimated date when management action could be required (May 3 versus October 15) is due to three factors: 1) use of four years of landings data (1999 - 2003) in this analysis versus use of a single year (2002) of landings data in the September 2003 proposed rule; 2) selection, for purposes of analysis, of the action trigger point at 85 percent of the ICCAT landing limit in this analysis versus an 80 percent action trigger in the September 2003 proposed rule, given the generally slow pace of marlin landings; and, 3) a dearth of landings during the late fall and winter. It should be stated for purposes of clarity that May 3 is much later in the fishing year than October 15 because the fishing year currently runs from June 1 to May 31.

During the period 1999 - 2003, RBS data indicates that 78 blue marlin 117 inches or larger have been landed in tournaments and 35 white marlin 70 inches or larger have been landed in tournaments. These sizes equate to an average of approximately 20 blue marlin (19.5) and nine white marlin (8.75) of their respective size classes being landed annually during this period. Thus, it is anticipated that the minimum size increase scenario under alternative E6 action would likely have the effect of maintaining compliance with the current ICCAT landing limit ($213_{\text{fish prior to minimum size increase}} + 20_{\text{blue marlin 117 inches or larger}} + 9_{\text{white marlin 70 inches or larger}} = 242_{\text{landed fish}}$), while allowing the fishery to continuously operate.

The large minimum size range available to NMFS under alternative E6 provides NMFS the flexibility to respond to multiple in-season scenarios with a minimum of disruption to the fishery. NMFS has the ability to slow landings and keep the fishery open by choosing a minimum size limit appropriate to allow maximum utilization of the U.S. landing limit, but not

exceed it. While the proposed temporary minimum size increases for Atlantic blue and white marlin that could be imposed under alternative E6 are substantially larger than current minimum sizes (99" BUM, 66" WHM), NMFS believes that, in most cases, anglers will continue to pursue Atlantic marlin. NMFS does not believe such minimum size increases would substantially decrease demand for charter/headboat trips, trips by individual anglers, or participation in billfish tournaments given the catch and release ethic of billfish anglers (87 to 99.2 percent release rate, see alternative E1) as well as the significant number of fish that would still likely be available for landing under the above scenario. However, as discussed in more detail under the ecological benefits of this alternative, there is no way to predict angler behavior. Angler response may be to maintain current effort for marlin, reduce fishing effort, or shift fishing effort to other species. Should effort be maintained or shifted to other species, adverse socio-economic impacts to the fishing community, including CHB operators, tournament operators, tackle shops, marinas, and others would likely be very limited as anglers would continue to make expenditures to pursue fish recreationally. If effort were switched to other species, billfish tournament operators may see a disproportionate adverse impact of the stakeholders identified above, unless points or prizes were awarded for released billfish or non-billfish species. To this point, some billfish tournaments already operate under a catch and release format with many having award categories for non-billfish species. Taken together these facts reinforce conclusions that impacts would be limited because anglers would likely continue to participate in tournaments. Assuming effort is reduced as a result of marlin minimum size increases, alternative E6 would likely result in small adverse economic impacts for all stakeholders for the reasons previously identified.

The potential impacts of a minimum size increase for Atlantic marlins under alternative E6 could be noticeably affected, either constrained or increased, by the date at which a minimum size increase may occur in a given fishing year. Given the estimated date (May 3) at which a minimum size increase could occur under the assumptions made in this analysis, some sense of regional impacts can be outlined. An annual average of 18 billfish tournaments occur in the month of May (Table 4.53), and could potentially be impacted, should the ICCAT limit or threshold be reached during a fishing year. The majority of these tournaments occur in Florida (4), South Carolina (3), and North Carolina (3). On average, Louisiana and Texas each hold two billfish tournaments in May, with Georgia, Alabama, Puerto Rico, and the U.S. Virgin Islands each holding one tournament on average. Not unexpectedly, the South Atlantic and Gulf of Mexico regions have the highest probability of being impacted. In addition, the relative size of billfish tournaments (as estimated by the number of participating vessels, Table 4.63 in Section 4.3.2) in Florida, South Carolina, and North Carolina is large, with each averaging greater than the average size of a billfish tournament (50 vessels). However, as previously stated, the impacts to tournaments from minimum size increases are anticipated to be minimal for the reasons discussed above.

Table 4.53 **Table 4.2.3.11 Average Number of Billfish Tournaments by Month and State 1999-2003*:** Source RBS Data Base

State	Month												Avg. No. of Tournaments by State
	JAN	FEB	MAR	APR	MAY	JUNE	JULY	AUG	SEPT	OCT	NOV	DEC	
MA	--	--	--	--	--	--	0	3	--	--	--	--	3
RI	--	--	--	--	--	--	0	2	--	--	--	--	2
NY	--	--	--	--	--	--	1	--	--	--	--	--	1
NJ	--	--	--	--	--	0	4	1	1	--	--	--	6
MD	--	0	--	--	--	1	2	3	1	--	--	--	7
VA	--	--	--	--	--	1	1	1	--	--	--	--	3
NC	--	--	--	--	3	2	2	4	0	--	--	--	11
SC	--	--	--	0	3	2	1	0	--	--	--	--	6
GA	--	--	--	0	1	1	0	0	0	--	--	--	2
FL	10	4	1	2	4	4	4	3	3	2	2	3	42
AL	--	--	--	--	1	2	2	2	0	--	--	--	7
MS	--	--	--	--	--	0	0	1	--	--	--	--	1
LA	1	--	--	0	2	4	4	2	2	--	--	--	15
TX	0	--	--	--	2	4	4	4	2	--	--	--	16
PR	0	1	0	1	1	1	1	3	1	1	1	1	12
VI	0	0	1	--	1	1	1	1	0	0	1	--	6
Avg. No. of Tournaments by Month	11	5	2	3	18	23	27	30	10	3	4	4	140

* Cells with a zero had a tournament in at least one year during that month, but the average was less than 1. Cells with a -- had no tournaments in that month at all.

Prior conclusions that impacts would likely be limited are reinforced by the facts that only 28 days remain in the fishing year after May 3, that a minimum size increase still allows fishermen to continue to land marlins, and that there would still likely be approximately 15 percent of the ICCAT landing limit available for landing. Late season tournaments occurring in May, specifically on the Memorial Day weekend, would likely still operate under this scenario for the reasons discussed above, and given reports suggesting that an increasing percentage of tournaments are adopting a catch and release format. As such, NMFS estimates that there would likely be limited adverse economic impacts for the CHB fleet, individual anglers, or tournaments.

Scenario 3: Threshold for Implementing Catch and Release Only Fishing is Achieved

Under alternative E6, NMFS would be required to shift the entire Atlantic recreational marlin fishery to catch and release only if the ICCAT landing limit for any given year is achieved. Under these circumstances, NMFS believes that, in a worst-case scenario, marlin anglers may reduce their demand for charter fishing trips by between 0.6 and 13 percent of the available trips remaining during a given season. The range of 0.6 to 13 percent is derived from landing and release data (RBS, MRFSS, LPS) which indicate that between 1999 and 2003, anglers released between 87.0 and 100 percent of blue marlin and between 89.4 and 100 percent of white marlin. Clearly, it is not logical to assume that 100 percent of blue and white marlin are released, given that there have been observed landings during this period. As such, the release

estimate of 99.4 percent of white marlin from LPS data is used here as an upper limit for purposes of analysis. This was the highest release rate identified below 100 percent. As such, retention rates of 0.6 percent to 13 percent are used as proxies to represent worst-case scenarios of fishermen who do not practice catch and release marlin fishing and completely exit the fishery. If the landing limit were achieved earlier in the season, then more trips would logically be impacted as compared with achieving the landing limit later in the season. The average value of a CHB trip was $1,026 in 2003 dollars. Data are not available to determine the number of CHB trips targeting marlin in any given month, and, as such, NMFS cannot quantify the impacts of the estimated decrease in participation. While the number of Angling category permits are known, as previously mentioned, it is not possible to determine what proportion of permitted anglers participate in the billfish fishery. As such, it is not possible to quantify an impact on non-CHB billfish anglers. Based on the rationale stated above, NMFS assumes participation in the directed billfish fishery by individual anglers would also decline by 0.6 to 13 percent if the marlin fishery is shifted to catch and release only under alternative E6.

If alternative E6 is selected as a preferred alternative, NMFS estimates that between 0.8 and 10.1 percent of tournaments may cease to operate in a worst-case scenario. This range was derived from the low and high end billfish tournament release rates (RBS data) of 89.9 and 99.2 percent for use as a proxy, and represents a worst case scenario. Approximately 140 billfish tournaments operated annually, on average, for the period 1999 - 2003. If catch and release fishing for Atlantic marlins was implemented for an entire season, which would not likely occur because 250 marlins would have to be landed prior to the fishery becoming catch and release only, this could equate to between 1 and 14 billfish tournaments ($140_{\text{annual billfish tournaments}} * 0.008$ to $0.101_{\text{estimated reduction in participation}} = 1.12$ to $14.14_{\text{tournaments potentially not operating}}$) not operating, with a potentially minor to substantial direct local and or regional adverse economic impact. However, as stated above, this scenario is highly unlikely, given that the ICCAT landing limit must be achieved prior to the fishery becoming catch and release. The only way this scenario could occur would be if the previous year's overage was of sufficient magnitude to completely fill the next season's landing allocation. Only in 2002 did reported U.S. marlin landings exceed the 250 fish limit, and, as previously discussed, by only 29 fish. Additional information regarding the potential impacts to tournaments of achieving the threshold for implementing catch and release only fishing under alternative E6 are discussed below.

To estimate socio-economic impacts given a scenario where the ICCAT landing limit is achieved, NMFS has used the 2002 reported landings (279 marlin) as a proxy for determining when a future switch to catch and release only fishing may occur in the future. The 2002 reported landings are the only available proxy for estimating impacts of achieving the ICCAT landing limit, as this is the only time the limit has been achieved. As such, by examining the historical distribution of RBS marlin landings by month (1999 - 2003) and distributing 2002 landings proportionally across the fishing year according to the historical landings pattern, NMFS estimates that, if landings increase evenly during all months to levels that would match 2002 landings, the ICCAT landings limit could be achieved on May 11 based on the current June 1 to May 31 fishing year, and August 25 based on a potential switch to a calendar year fishing year. Again, based on current landings patterns this is unlikely to occur, but it is possible for recorded landings to increase as per previously discussed factors. For purposes of clarity it should be noted that the close proximity of the date at which a minimum size increase could

occur (August 21), as per scenario two, and the date at which a shift to catch and release could occur (August 25), under scenario three, is a reflection of the different assumptions made for purposes of analysis. Readers should not draw the conclusion that a minimum size increase would be followed four days later by a shift to catch and release fishing. Please re-read the methodological discussions pertaining to both scenarios for clarification.

The economic impacts of switching to a catch and release marlin fishery on May 11 (under the June 1 to May 31 fishing year), under the assumptions made for purposes of this analysis would likely be minor. There are only 20 days left in the June 1 - May 31 fishing year at that point. Using the most recently available tournament data for purposes of analysis, in 2004 there were 16 registered marlin tournaments in May. Of these, three operated prior to May 11th; the point at which catch and release only fishing would be required under this analysis. Of the 13 billfish tournaments occurring after the May 11 "closure" date, it is anticipated that 0.8 to 10.1 percent may cease operations based on the previously discussed assumptions, which equates to between zero and one tournaments based on standard rounding practices, or between one and two tournaments if any fraction of a tournament is rounded up ($13_{\text{tournaments}} * 0.008$ to $0.101_{\text{estimated decrease in participation}} = 0.1$ to $1.3_{\text{tournaments potentially not operating}}$). However, even these low numbers may be an over estimate as Ditton and Stoll (2004) suggest that at least some anglers would be willing to pay as much as $69 (2003 dollars) over current entry fees to participate in catch and release tournaments (Ditton, 2004). The estimated date for a shift to catch and release fishing provides a limited ability to identify potential regional impacts. The 13 marlin tournaments occurring late in the 2004 fishing year were held in North Carolina, South Carolina, Louisiana, Texas, Alabama, Florida, Puerto Rico, and Georgia. Four occurred in North Carolina, three in Louisiana, and one each in South Carolina, Texas, Alabama, Puerto Rico, Georgia, and Florida. Most were clustered around the Memorial Day weekend. Depending on which one or two tournaments may potentially cease operations, the impacts would be felt in different regions. Given the locations of the tournaments, North Carolina has the highest probability of being adversely impacted of any single state, followed by Louisiana. The South Atlantic region has the greatest probability of being adversely impacted with seven of the 13 tournaments that could be among those affected. The Gulf region is slightly less likely to be potentially negatively impacted with five of the 13 tournaments, and Puerto Rico is least likely to be adversely impacted. However, while states with the smallest number of tournaments are less likely to be impacted, they would be expected to realize heightened localized adverse impacts if a tournament were canceled. However, there is no way to accurately predict exactly which tournaments may operate or not. Using an average value of $1,339,800 for an average HMS tournament (Ditton and Clark, 1994, converted to 2003 dollars), should one to two tournaments cease operations as a result of alternative E6, this could result in an estimated adverse economic impact of $1,339,800 to $2,679,600 dollars to the local community, including tournament operators, CHB operators, marinas, and others. Loss of one to two tournaments would likely result in some small decrease in angler consumer surplus to the vessels participating in those tournaments. Data indicate that on average, approximately 50 vessels participate in Atlantic billfish tournaments (see Table 4.63 in Section 4.3.2). Impacts on shoreside businesses would likely be minor, but could be increased or decreased depending on angler response and when in the season a shift to catch and release only fishing might occur. However, other shoreside businesses could be impacted.

Alternative E6 could have smaller long-term adverse socio-economic impacts than Alterative E1, the No Action alternative, if landing rates increase in the future. Alternative E6 allows NMFS significant flexibility in determining if and when action should be taken to remain consistent with international obligations. Alternative E6 allows the response to be tailored to the peculiarities of a given fishing year to ensure maximum utilization of the ICCAT landing limit. This response would likely allow the Agency to avoid disproportionately impacting CHB operators, tournaments, and anglers who fish for marlin late in the fishing year by providing anglers the greatest opportunity to land marlin over the entire length of the fishing year. Alternative E1 would simply result in the shutdown (catch and release fishing only) of the fishery by emergency rule if the ICCAT landing limit were achieved. The shift to catch and release only fishing under that scenario would likely occur at an earlier point in the season than under alternative E6, where landings would first be slowed by increasing the minimum size, and then prohibited if the landings reached the ICCAT landing limit. Alternative E6 is anticipated to allow a shutdown of the marlin fishery to be avoided, and at a minimum, significantly extend the open period of the fishing year prior to a closure, thereby minimizing negative socio-economic impacts. Alternative E6 may result in a temporary decrease in angler consumer surplus if increased minimum sizes or catch and release requirements are implemented for the remainder of a fishing year. The loss of angler consumer surplus should be mitigated to an extent by the ability of anglers to continue to land fish if the minimum size is increased, and given that minimum sizes and the ability to land fish would be restored at the start of the next fishing year.

Alternative E7, a preferred alternative, could potentially lead to negative social and economic impacts, although the magnitude is difficult to assess. As discussed under alternative E1, the majority of data indicate a strong adherence by Atlantic billfish anglers to catch and release fishing for white marlin. Based on RBS, LPS, and MRFSS data, NMFS estimates that between 0.6 percent and 10.6 percent of all white marlin catches are landed (Table 4.45, Table 4.46, and Table 4.47).

As of April 20, 2005, there were 21,800 Angling, 4,039 CHB, and 5,268 General category permit holders. See Chapter 3 for additional permit information. Given the multi-species nature of HMS permits, and the fact that vessels are permitted rather than individual anglers, NMFS does not have the ability to identify what subset of these permitted vessels, or how many anglers, participate in the recreational billfish fishery.

It is difficult to estimate the percentage of Angling category fishing trips that would not be taken if catch and release fishing for white marlin was mandatory, however the Agency acknowledges that some percentage of total Angling category trips will likely be canceled due to the inability to land a white marlin. Ditton and Stoll (2003) estimate that there are 7,915 billfish anglers in the U.S. Atlantic and 1,627 billfish anglers in Puerto Rico. Angler expenditures for marlin targeted trips are estimated to be $686.00 per angler (in 2003 dollars), based on a limited sample size. In contrast, angler expenditures for other HMS targeted trips are estimated at $122.00 per angler (in 2003 dollars), based on 621 observations (NMFS, 2001). Ditton and Stoll (2003) report that a 1990 study estimated average expenditures of $2,105.00 ($2,963.00 in 2003 dollars) for Atlantic billfish trips and that a 1994 study estimated a mean expenditures of $1,052.00 ($1,306.00 in 2003 dollars) for Puerto Rico billfish trips. As reported by Ditton and Stoll (2003) the aggregate economic impact of billfish fishing trips in the U.S. Atlantic is

conservatively estimated to be $22.7 million annually, not including Puerto Rico. These data indicate that billfish anglers place a high value on billfish fishing. Under alternative E7, Angling category fishermen may reduce the number of trips targeting white marlin. Reduced participation in the billfish fishery would likely result in negative social and economic impacts for this sector. Considering the overwhelming catch and release ethic of billfish anglers (23 white marlin reported landed in 2003), however, NMFS anticipates that any negative social and economic impacts under this alternative would be small. The short-term social impacts of not being able to land trophy or record category fish is difficult to assess, however NMFS anticipates that this alternative could lead to a decrease in angler consumer surplus. The long-term impacts of alternative E7 may result in an increase in net benefits as stocks rebuild and recreational encounters with white marlin become more frequent.

Sutton *et al.* 1999, estimate that CHB operators each take 109 for-hire trips per year on average, with approximately 2.6 percent of those trips targeting billfish. Multiplying the average number of CHB trips by the number of CHB permits ($109_{\text{avg. CHB trips per year}} * 4{,}039_{\text{CHB permits}} = 440{,}251$) and multiplying the product by 0.026 ($440{,}251_{\text{total CHB trips}} * 0.026_{\text{percentage of CHB billfish trips}} = 11{,}447$) provides a rough estimate of the annual number of billfish trips taken by CHB operators. Of the 11,447 billfish targeted CHB trips, between 69 and 1,213 trips may be canceled given the inability to retain white marlin ($440{,}251_{\text{CHB trips}} * 0.026_{\text{percent of CHB trips BLF directed}} * .006_{\text{WHM low retention rate}} = 68.7$) ($440{,}251_{\text{CHB trips}} * 0.026_{\text{percent of CHB trips BLF directed}} * 0.106_{\text{WHM high retention rate}} = 1{,}213.3$). NMFS estimates that the cost of a CHB trip currently averages $1,026.00 (in 2003 dollars). Given this figure, the Agency estimates that alternative E7 could result in between $70,794 and $1,244,538 in lost revenues to CHB vessels ($69_{\text{estimated lost trips}} * \$1{,}026.00_{\text{avg. cost per trip}} = \$70{,}794$) ($1{,}213_{\text{estimated lost trips}} * \$1{,}026.00_{\text{avg. cost per trip}} = \$1{,}244{,}538$). The loss of revenues of this magnitude would likely result in minor to moderate negative social and economic impacts to the CHB sector. While NMFS cannot definitively forecast angler behavior, given the previously discussed catch and release ethic of billfish anglers (23 white marlin reported landed in 2003), NMFS anticipates that most anglers will continue to fish for Atlantic white marlin under catch and release restrictions. As such, NMFS anticipates that negative impacts under this alternative would be less severe than those estimated above. Further, the continued ability of anglers to pursue and land other Atlantic billfish species, and other non-HMS may further mitigate potential adverse impacts, which may result from this alternative.

General category permit holders are only allowed to fish for, retain, or possess white marlin in registered HMS tournaments; however the Agency does not possess information regarding how many General category permit holders participate and land white marlin in tournaments. Under alternative E7, negative social and economic impacts could occur if General category vessels that normally participate in HMS tournaments cease operations. Potential negative impacts would not likely be realized by those general category vessels that already practice catch and release fishing for white marlin or participate in catch and release tournaments, because NMFS anticipates that these anglers would continue to pursue Atlantic white marlin under a catch and release only fishery.

In 2004, there were 129 registered tournaments that awarded points or prizes for white marlin captures (see Chapter 3). Based on RBS data from 1999 – 2003 (Table 4.45), the retention rates of white marlin in tournaments range from 0.8 percent to 3.2 percent. For

purposes of analysis only, NMFS assumes that under a worst-case scenario, that this same percentage (0.8 to 3.2 percent) of tournaments may stop operating. Under these assumptions, NMFS estimates that alternative E7 may result in between one and four tournaments would not continue to operate in a catch and release only fishery for white marlin. As previously discussed, NMFS estimates the average value of an HMS tournament to be $1,339,800 (in 2003 dollars). Assuming that one to four tournaments cease operations, the Agency estimates that alternative E7 could result in negative economic impacts ranging from $1,339,800 to $5,359,200. The loss of revenues of this magnitude would likely result in moderate social and economic impacts for tournaments, tournament participants, and associated businesses. While NMFS cannot definitively forecast angler behavior, given the previously discussed catch and release ethic of billfish anglers, NMFS anticipates that most anglers would likely continue to pursue white marlin under a catch and release only fishery and most tournaments would continue to operate under a revised format. As such, adverse impacts under this alternative would likely be of a lesser magnitude than those estimated above. Additionally, a recent survey based on tournament anglers in Texas, determined that angler willingness to pay is $69.00 (2003 dollars) higher for participation in catch and release tournaments than it is for participation kill tournaments (Ditton and Oh, 2004).

Negative social and economic impacts resulting from alternative E7 may be mitigated by the delayed effective date of implementing a catch and release only requirement for Atlantic white marlin. The delayed effective date is anticipated to allow tournament operators sufficient time to alter tournament rules to provide for a catch and release format and allow anglers to adjust to new requirements.

Angler consumer surplus would likely remain high, give the currently high release rate of white marlin, which is reinforced by the low number of verified landings that occurred in recent years. However, it is possible that angler consumer surplus may decrease given the inability to land white marlin. Further, under alternative E7, anglers would still have the ability to land other billfish, including trophy-sized sailfish and blue marlin. To mitigate negative socio-economic impacts, alterative E7 delays implementation of catch and release only fishing requirements to allow the fishery time to adjust to new measures, and includes a sunset provision five years from implementation of catch and release requirements.

Considering the biological status of Atlantic white marlin populations, alternative E7 would provide the greatest benefit for the species and likely result in lesser socio-economic impacts to the billfish community than alternative E8.

Similar to alternative E7, alternative E8 could potentially lead to negative social and economic impacts, although the magnitude is difficult to assess. As discussed under alternative E1, the majority of data indicate a strong adherence by Atlantic billfish anglers to catch and release fishing for blue marlin. Based on RBS, MRFSS, and LPS data, NMFS estimates that between 3.9 percent and 13.0 percent of all blue marlin catches are landed (Table 4.45, Table 4.46, and Table 4.47).

As of April 20, 2005, there were 21,800 Angling, 4,039 CHB, and 5,268 General category permit holders. Given the multi-species nature of HMS permits, and the fact that

vessels are permitted rather than individual anglers, NMFS does not have the ability to identify what subset of these permitted vessels, or how many anglers, participate in the recreational billfish fishery. It is difficult to estimate the percentage of Angling category fishing trips that would not be taken if catch and release fishing for blue marlin was mandatory, however the Agency acknowledges that some percentage of total Angling category trips would likely be canceled due to the inability to land a blue marlin.

Under alternative E8, Angling category fishermen may reduce the number of trips targeting blue marlin. Reduced participation in the billfish fishery would likely result in negative social and economic impacts for this sector, however, considering the catch and release ethic of billfish anglers (108 blue marlin reported landed in 2003), NMFS anticipates that the negative economic impacts under this alternative would not be large. The short-term social impacts of not being able to land trophy or record category fish is difficult to assess, however NMFS anticipates that this alternative could lead to a decrease in angler consumer surplus. The long-term impacts of alternative E8 may result in an increase in net benefits as stocks rebuild and recreational encounters with blue marlin become more frequent.

Using the same assumptions discussed above, the Agency estimates that of the 440,251 CHB trips occurring yearly, 11,447 of those are billfish directed CHB trips ($440{,}251 * 0.026_{\text{Percent of BLF directed CHB trips}} = 11{,}447$). Of the 11,447 BLF targeted CHB trips, between 446 and 1,488 trips may be canceled given the inability to retain blue marlin ($440{,}251_{\text{CHB trips}} * 0.026_{\text{percent of CHB trips BLF directed}} * 0.039_{\text{BUM low retention rate}} = 446$) ($440{,}251_{\text{CHB trips}} * 0.026_{\text{percent of CHB trips BLF directed}} * 0.13_{\text{BUM high retention rate}} = 1{,}488$). NMFS estimates that the cost of a CHB trip currently averages $1,026.00 (in 2003 dollars). Given this figure, the Agency estimates that alternative E8 would have greater adverse economic impacts that alternative E7 and could result in between $457,596 and $1,526,688 in lost revenues to CHB vessels annually. The loss of revenues of this magnitude would likely result in moderate negative social and economic impacts to the CHB sector, however considering the catch and release ethic of billfish anglers, NMFS anticipates that negative impacts under this alternative would be of a lesser magnitude than those calculated above.

General category permit holders are only allowed to fish for, retain, or possess blue marlin in registered HMS tournaments, however the Agency does not possess any information regarding how many General category permit holders participate and land blue marlin in tournaments. Under alternative E8, negative social and economic impacts could occur if General category vessels that normally participate in HMS tournaments cease operations. Potential negative impacts would not likely be realized by those General category vessels that already practice catch and release fishing for blue marlin or participate in catch and release tournaments, because NMFS anticipates that these anglers would continue to pursue blue marlin under a catch and release only fishery. As such, adverse impacts under this alternative would likely be of a lesser magnitude than those estimated above.

In 2004, there were 142 registered tournaments that awarded points or prizes for blue marlin captures (see Chapter 3). Based on RBS data from 1999 – 2003 (Table 4.45), the retention rates of blue marlin in tournaments range from 6.7 percent to 10.1 percent. For purposes of analysis only, NMFS assumes that under a worst-case scenario, that this same

percentage (6.7 to 10.1 percent) of tournaments may stop operating. Under these assumptions, NMFS estimates that under alternative E8 between ten and 14 tournaments would not continue to operate in a catch and release only fishery for blue marlin. As discussed above, NMFS estimates the average value of an HMS tournament to be $1,339,800 (in 2003 dollars). Assuming that ten to 14 ($142_{\text{tournaments}} * 0.067$ to $0.101_{\text{decrease in tournament participation}} = 9.5$ to $14.3_{\text{tournament that may cease operations}}$) tournaments cease operations, the Agency estimates that alternative E8 could result in negative economic impacts ranging from $13,398,000 to $18,757,200. The loss of revenues of this magnitude would likely result in sizeable local negative social and economic impacts for tournaments, tournament participants, and associated businesses, however, considering the catch and release ethic of billfish anglers, NMFS anticipates that negative impacts under this alternative would be of a lesser magnitude than those calculated above. Relative to the fishery as a whole, these impacts would be minor, however, as stated, the localized impacts may be felt more acutely. Additionally, a recent survey based on tournament anglers in Texas, determined that angler willingness to pay is $69.00 (2003 dollars) higher for participation in catch and release tournaments than it is for participation kill tournaments (Ditton and Oh, 2004).

Negative social and economic impacts resulting from this alternative may be mitigated by the delayed effective date of implementing a catch and release only requirement for Atlantic blue marlin. The delayed effective date is anticipated to allow tournament operators sufficient time to alter tournament rules to provide for a catch and release format and allow anglers to adjust to new requirements.

Under alternative E8, angler consumer surplus would likely remain high, give the currently high release rate of blue marlin, which is reinforced by the low number of verified landings that occurred in recent year. However, it is possible that angler consumer surplus may decrease given the inability to land blue marlin. Further, under alternative E8 anglers would still have the ability to land other billfish, including trophy-sized sailfish and white marlin. To mitigate negative socio-economic impacts, alternative E8 delays implementation of catch and release only fishing requirements to allow the fishery time to adjusts to new measures, and includes a sunset provision five years from implementation of catch and release requirements.

Conclusion

As described in Chapter 1 of this document, the objectives of this document are multifaceted and include, *inter alia*, reducing mortalities of Atlantic billfish in directed and non-directed fisheries. This can be achieved, in part, by addressing known sources of mortality (including landings and post-release mortalities) in the directed recreational marlin fishery. Preferred alternatives E3, E6, and E7, strike an appropriate balance between conserving living marine resources, maintaining robust recreational fisheries, and the objectives of the Billfish FMP, Amendment 1 to the Billfish FMP, and the proposed consolidated HMS FMP objectives contained in this DEIS. The preferred alternatives are anticipated to substantially reduce the post-release mortality and domestic landings of Atlantic white marlin and are likely to provide positive ecological benefits for other species, including blue marlin, sailfish, tunas, and others with which recreational billfish fishermen interact while maintaining consistency United States' international obligations. The delayed date of effectiveness for alternatives E3 and E7 mitigate, to the extent possible, adverse economic impacts and losses in angler consumer surplus by allowing existing stockpiles of J-hooks to be used, allowing use of J-hooks with artificial lures,

and allowing anglers time to become comfortable and proficient with newly required gear. High levels of adherence to the practice of catch and release should further substantially mitigate socio-economic impacts. The suite of preferred alternatives would achieve the purpose and scope of this rulemaking by providing comprehensive and meaningful protection to Atlantic billfish, maintaining a robust directed fishery for billfish, and achieving legal and policy obligations. Importantly, by providing a successful roadmap for billfish conservation, NMFS may provide the impetus for other nations to adopt similar management measures, thereby improving conservation of Atlantic billfish throughout their entire range.

4.3 Management Program Structure

4.3.1 Atlantic Bluefin Tuna Quota Management

4.3.1.1 BFT Quota Management in the General and Angling Categories

As described in Chapter 2, the alternatives considered for BFT time-period subquotas in the General and Angling categories are:

F1 Maintain the time-periods, subquota allocations, and geographic set-asides for the General and Angling categories as established in the 1999 FMP (No Action)

F2 Establish General category time-periods, subquotas, and geographic set-asides annually via framework actions

F3 Amend the management procedures regarding General category time-periods, subquota, as well as geographic set-asides to allow for future adjustments to take place via a regulatory framework action – Preferred Alternative

F3(a) Establish monthly General category time-periods and subquotas (June-Jan; 12.5 percent each)

F3(b) Revise General category time-periods and subquotas to allow for a formalized winter fishery (June-Aug, 54 percent; Sept, 26.5 percent; Oct-Nov, 9 percent; Dec, 5.2 percent; and Jan, 5.3 percent)

F3(c) Revise General category time-periods and subquotas to allow for a formalized winter fishery (June-Aug, 50 percent; Sept, 26.5 percent; Oct-Nov, 13 percent; Dec, 5.2 percent; and Jan, 5.3 percent) – Preferred Alternative

F3(d) Revise General category time-periods and subquotas to allow for a formalized winter fishery (June-Aug, 38.7 percent; Sept, 26.6 percent; Oct-Nov, 13 percent; Dec, 10.8 percent; and Jan, 10.9 percent)

F4 Clarify the procedures for calculating the Angling category school size-class BFT subquota allocation and remove the Angling category North/South dividing line – Preferred Alternative

Ecological Impacts

Minimal, if any, ecological impacts are expected as a result of adjusting the General category time-periods and or associated subquotas, removing the Angling category North/South

division line, and/or amending the school size-class tolerance calculation because the overall quotas and size-classes of BFT being targeted by each domestic quota category are not being changed. In the case of the General category, only the proportion of the coastwide General category quota being assigned to each particular time-period would be altered. For example, even though the time-period subquota percentage for December and January is proposed to be increased, the time-period subquota for June through August is proposed to be decreased. As a result, there may be increased harvest in the later portions of the General category BFT season, but a corresponding decrease in harvest in the earlier portions of the season. These small orders of change, quantified in either numbers of fish or in weight (mt), or time and/or location of harvest, compared to overall U.S. harvest levels as recommended by ICCAT under the 20-year rebuilding program, equate to ecological impacts that are unlikely to be measurable given the variability in the data used to conduct BFT stock assessments. Additionally, the numbers of BFT harvested from each different size-class would remain consistent with the levels of BFT mortality used in the stock assessment. Therefore there are no ecological impacts expected from the following alternatives, as they relate to the ICCAT-recommended rebuilding plan for BFT.

Alternative F1 (No Action) would implement and maintain the General category time-period subquota allocation scheme and the Angling category size-class subquota allocation procedures, as stated in the 1999 FMP. The BFT fishery has been managed via these allocations and procedures since the implementation of the 1999 FMP. These allocations and procedures are consistent with the ICCAT recommendations; therefore NMFS does not expect this alternative to result in any negative ecological impacts beyond those accounted for in the 20-year BFT rebuilding plan.

Alternative F2 would establish General category time-periods, subquotas, and geographic set-asides annually via a framework action, and may have slightly different ecological impacts from alternative F1, as the time-periods, subquotas, and/or geographic set-asides may shift temporally and geographically from one year to the next. These shifts may present decreases or increases regarding protected resource interactions, discards, and incidental catch of other finfish and would likely need to be analyzed each year depending on the changes proposed. However, as compared with other commercial gear types, commercial handgear produces relatively low levels of bycatch and bycatch mortality. Bycatch in the commercial handgear fishery can be monitored via the Large Pelagic Survey (LPS), but may be unaccounted for if the fishery is prosecuted in those areas outside LPS coverage or after the LPS sampling season is concluded. The LPS samples private and for-hire vessels and their landings from offshore fishing trips that target HMS in Virginia through Maine from June through October. A separate source of bycatch information can be derived from vessel logbook programs associated with other non-HMS fisheries in which HMS fisheries vessel owner/operators may participate. At this time, there is little information on commercial handgear bycatch. Anecdotal reports suggest that there may be low level of tuna discards due to minimum size restrictions. This process of establishing General category time-periods and associated subquotas annually via a regulatory framework action would not dramatically alter current fishing methods or effort. Therefore, there are no adverse ecological impacts expected from this alternative. For further information/analyses regarding commercial handgear interactions with protected resources, see Section 3.4.3.

Alternative F3 (preferred) would remove specific General category time-period, subquota, and geographic set-aside language from the consolidated HMS FMP. This alternative would also codify the time-periods and the associated subquota allocations, including percentages and the corresponding tonnage, in the regulatory text implementing the consolidated FMP and would remove the New York Bight set-aside. The sub-alternatives F3(a) through F3(d) would have similar ecological impacts as those presented in alternatives F1 and F2, in the sense that the BFT quotas would be consistent from one year to the next, provided the ICCAT-recommended U.S. BFT TAC remains consistent. There may be a slight shift in BFT landings, both temporally (to later in the season) and geographically to the South, however, the numbers of BFT harvested from each different size-class would remain consistent with the levels of BFT mortality used in the stock assessment. These temporal and special shifts in landings may present decreases or increases regarding protected resource interactions, discards, and incidental catch of other finfish. However, for the same reasons mentioned in alternative F2, NMFS does not expect any adverse ecological impacts associated with this alternative. For further information/analyses regarding commercial handgear interactions with protected resources, see Section 3.4.3.

Alternative F4 (preferred) would clarify the procedures for calculating the Angling category school size-class BFT subquota allocation. Specifically, the eight percent school BFT tolerance for the Angling category would be determined prior to removing the NED Statistical set-aside allocation, which would result in a slight increase (*i.e.*, 0.02 percent) in the school BFT baseline quota allocation. Effort on the school size-class BFT is not expected to increase as a result of this alternative, due to the very minor increase in available quota. Therefore, substantial changes in either current fishing methods or interaction rates with protected resources or other finfish are also not expected. This alternative would also remove the Angling category subquota North/South dividing line, which would also not have any adverse ecological impacts, as it would not alter current fishing patterns. As this alternative does not alter the Angling category quota or the overall U.S. BFT TAC, nor the effort expended by recreational participants, NMFS does not expect any adverse ecological impacts associated with this alternative.

NMFS, based on the best scientific information available, is unaware of any definitive ecological impacts on protected resources associated with implementation of any of the alternatives discussed in this section. Limited data is available on the interactions of commercial and recreational handgear with protected resources, marine mammals, and other finfish. NMFS will continue to monitor HMS handgear fishery interactions with protected resources, marine mammals, and non-targeted finfish and will work to resolve any issues that may arise.

Social and Economic Impacts

Alternative F1 would maintain the historical General category time-period and subquota allocation scheme as well as the process used to establish them, *i.e.*, specific details contained in the 1999 FMP itself. This alternative would require an FMP amendment to adjust these time-periods, subquota percentages, and/or geographic set-asides. This alternative may have both positive and negative social and economic impacts. The positive impacts would be attributed to the General category time-periods and associated subquota allocation percentages remaining consistent with those of prior years (Table 4.54), as well as maintaining the General category New York Bight set-aside allocation for those participants operating in that designated area. The

perceived positive impacts, in regards to the Angling category would entail maintaining the North/South dividing line; thereby perpetuating the perception the agency has the appropriate data in a timely fashion to use this management tool to provide fair and equitable recreational fishing opportunities. The adverse impacts would consist of hindering NMFS' ability to adapt BFT management measures to account for variations inherent to the fishery from one year to the next due to the timeframes associated with conducting an FMP amendment. This alternative would also have some adverse social and economic impacts on fishermen, dealers, and the support industries located in the South Atlantic region due to the fact that under the No Action alternative, BFT quota tends to be harvested prior to BFT showing up later in the season (Nov-Jan). This inconsistency in the amount of BFT quota available late in the season does not allow for business to plan accordingly. For instance, as a fishermen, obtaining the appropriate gear and outfitting the vessel properly; or as a dealer, maintaining the appropriate staff and shipping/packing material as well as maintaining leases etc.; or in the case of a support industry like a bait/tackle supplier, having the appropriate gear pre-ordered so it is available to be purchased. These adverse impacts could be mitigated if South Atlantic General category participants were to travel north in the early portion of the season. Overall, the adverse social and economic impacts associated with this alternative are expected to outweigh the positive impacts.

The potential gross revenues generated under the No Action alternative were calculated for each specific time-period by using the status quo time-period subquota allocation percentages, the whole weight equivalent (in metric tons and pounds), and the average ex-vessel prices (whole weight) for 1999 through 2003, inclusive.

Table 4.54 Alternative F1: Gross revenues associated with the No Action alternative regarding the General Category time-period subquota allocation.

Time-Period	Percentage	Equivalent in mt*	Approx. Equivalent in lb*	Average Ex-Vessel $	Gross Revenues
JUNE – AUG	60.0	413.9	912,483.9	7.02	6,406,000.00
SEPTEMBER	30.0	206.9	456,131.7	6.87	3,134,000.00
OCT - JAN	10.0	69.0	152,117.4	6.51	990,000.00
TOTAL	100.0	689.8	1,520,733.0		10,530,000.00

*Time-period allocations may differ slightly due to rounding; ** No BFT landed in Jan during these years; preliminary ex-vessel prices for the 2004 season are used as a proxy.
- For comparison purposes this table assumes the New York Bight set-aside is distributed evenly throughout the fishing year.

Alternative F2 would provide NMFS with more flexibility, in comparison to the other alternatives, by establishing the General category time-periods, subquotas, and geographic set-asides annually via a regulatory framework action (*i.e.*, not an FMP amendment). The administrative burden may increase because the annual BFT specifications, plus the analytical documents, would be conducted annually. Plus, there is a heightened importance to finalize the

specifications prior to June 1 of each year. Under this alternative, the industry would not have the necessary information to devise a business plan for the upcoming year prior to the start of the fishery because the time-periods and associated subquotas would be establish each and every year. For example, each year permit applicants may choose what quota category in which to permit their vessel. This decision is usually based on the amount of quota and the rules and regulations that pertain to each individual category. As the time-periods, associated subquota allocations, and potential geographic set-asides would be established just prior to the start of the fishing season, fishermen would only have the overall General category quota allocation on which to base their decisions. There may also be positive social and economic impacts attributed to increases in a domestic quota category, time-period subquota, or geographic set-aside quota in a given year. However, the likelihood of experiencing negative social or economic impacts due to a decrease in any of these areas is equally the same.

Alternative F3 (preferred) would blend aspects of alternatives F1 and F2 together to optimize the positive social and economic impacts associated with this alternative by enhancing NMFS' flexibility to adapt to the fisheries' inherent variability. This alternative would provide consistent time-periods and subquota, from one year to the next, as the quota tonnage derived from the domestic quota allocations percentages and the ICCAT recommended BFT TAC would be codified in the regulatory text implementing the consolidated HMS FMP. These baseline quota amounts would only change when ICCAT modifies or amends the BFT TAC recommendation. This alternative would also authorize adjustments to the General category time-periods, associated subquotas, and geographical set-asides via a regulatory framework action versus an FMP amendment, if warranted, based on changes to the ICCAT BFT quota recommendations. This balance between providing consistent baseline quota allocations and having the flexibility and ability to amend them, if warranted, in a relatively timely fashion would provide positive social and economic impacts because fishermen would have the ability to plan their business activities in advance while the agency would have the flexibility to adapt to an ever changing fishery.

This alternative would also adjust the actual General category time-periods and the associated subquotas to reflect historical General category BFT allocations while incorporating recent trends in the fishery, both temporally and geographically. For instance, historically, the General category BFT fishery has been prosecuted in the summer and early fall months primarily in the waters off of New England. However, in recent years, BFT have been available in large numbers during the winter months in waters off of the South Atlantic states. Therefore, this alternative would have positive social and economic impacts on the General category as a whole by providing reasonable fishing opportunities to General category BFT fishery participants over a broader geographic and temporal range when BFT are available to them, as well as providing some level of certainty as to the amount of quota that would be available for a given time-period. Any adverse social and economic impacts that may be associated with this alternative would be minor and would be primarily linked to the slight shifts in General category quota allocation as discussed in further detail under each subalternative.

Under these sub-alternatives, the potential gross revenues are calculated using 2003 average monthly ex-vessel prices per pound (whole weight), the quota tonnage for each time-period (based on the proposed allocation percentages), the assumption that catch rates are

consistent across time, and that each time-period subquota allocation is harvested in its designated time frame. NMFS is aware that while these assumptions may not account for the variability inherent in the fishery (*i.e.*, availability of BFT, skill level of fishermen, weather conditions, etc.); the analyses, however, show the relative impacts of the various alternatives.

All of the following sub-alternatives would allow for the carryover of unharvested General category quota to the subsequent time-period allocation as stated in the No Action alternative (F1) or, if selected, as stated in alternative F4. These alternatives would also formally respond the Petition for Rulemaking submitted by the NCDMF. The Petition claims that the current General category BFT quota allocation scheme does not provide a reasonable opportunity to harvest BFT with commercial handgear off the South Atlantic coast during the winter months, thereby not ensuring fair and equitable treatment of all General category permit holders.

Subalternative F3(a) would distribute the coastwide General category quota equally among the eight months that currently make up the General category BFT season (June-January), in 12.5 percent shares (Table 4.55). This subalternative would have both positive and negative social and economic impacts as it would provide some stability to the constituency by establishing a known amount of quota that would be available at the first of each month. However, if catch rates tend to be high, these quotas could be harvested rapidly and could lead to derby style fisheries on the first of each month, which is contrary to NMFS' intent. This subalternative would formalize the recent General category winter BFT fishery, but would do little to recognize historical General category BFT allocations, thereby potentially excluding a group of long-time participants. This subalternative would result in positive social and economic impacts for those General category participants located in the South Atlantic region attributed to a 40 percent increase in available quota, compared to the No Action alternative, during the time from of October through January. This increase in quota would equate to approximately four million dollars in additional gross revenue for the later part of the General category season. However, those General category participants in the New England area or to those participants, which pursue BFT in the summer months, may experience some adverse social and economic impacts due to the shift in quota to the later portion of the season. For instance under this alternative, the status quo June through August time-period subquota allocation would be reduced by approximately 22.5 percent and the September time-period allocation would be reduced by approximately 17.5 percent. These reductions in allocation would result in decrease gross revenues of approximately 2.5 and two million dollars respectively. This subalternative would also reduce the need for specific geographic set-asides because quota allocation would be made on a monthly basis and would be evenly distributed. This subalternative would assist in distributing the General category BFT catch, temporally and geographically, which is beneficial for the collection of CPUE data and could assist in avoiding large scale landings in a constrained time frame, thus reducing market gluts.

Table 4.55 Alternative F3(a): Gross revenues associated with the even sub-allocation of the General Category quota between the 8-month fishing season.

Time-Period	Percentage	Approx. Equivalent in mt*	Approx Equivalent in lb*	Average Ex-Vessel $	Approx. Gross Revenues
JUNE	12.5	86.23	190,102.65	6.22	1,182,000.00
JULY	12.5	86.23	190,102.65	8.04	1,528,000.00
AUGUST	12.5	86.23	190,102.65	6.80	1,292,000.00
SEPTEMBER	12.5	86.23	190,102.65	6.87	1,306,000.00
OCTOBER	12.5	86.23	190,102.65	3.96	753,000.00
NOVEMBER	12.5	86.23	190,102.65	6.95	1,321,000.00
DECEMBER	12.5	86.23	190,102.65	7.34	1,395,000.00
JANUARY	12.5	86.23	190,102.65	7.79**	1,481,000.00
TOTAL	100.0	689.8	1,521,174.0		10,262,000.00

*Time-period allocations may differ slightly due to rounding; ** No BFT landed in Jan during these years; preliminary ex-vessel prices for the 2004 season are used as a proxy.

Subalternative F3(b) would implement General category time-periods, and associated subquota allocation percentages similar to those contained in the 1999 FMP, but would separate the October through January time-period into three distinct time-periods of October through November, December, and January, and establish a formal General category winter BFT fishery on which fishermen, dealers, and supporting industries could depend and plan. The General category time-period subquota allocation percentages would be adjusted slightly to incorporate the allocations in the winter months, but would still recognize the historical General category allocations during the summer and fall months (Table 4.56).

This subalternative would have positive social and economic impacts to those General category participants located in the South Atlantic region attributed to a 9.5 percent increase in available quota, compared to the No Action alternative, during the time from of October through January. This increase in quota would equate to approximately 1.2 million dollars in additional gross revenue for the later part of the General category season. However, those General category participants in the New England area or to those participants, which pursue BFT in the summer months, may experience some adverse social and economic impacts due to the shift in quota to the later portion of the season. For instance under this alternative, the status quo June through August time-period subquota allocation would be reduced by approximately six percent and the September time-period allocation would be reduced by approximately 3.5 percent. These reductions in allocation would result in decreased early season gross revenues of approximately 0.8 and 0.3 million dollars respectively. These negative impacts may be mitigated by individuals traveling to where the BFT are located at any time of the season. However, NMFS has little specific information at this time regarding the costs that would be incurred due to this travel.

Table 4.56 Alternative F3(b): Gross revenues associated with the proposed sub-allocation of the General Category quota, providing a BFT winter fishery in the South Atlantic

Time-Period	Percentage	Approx Equivalent in mt*	Approx Equivalent in lb*	Average Ex-Vessel $	Approx. Gross Revenues
JUNE - AUG	54.0	372.5	821,213.5	6.80	5,584,000.00
SEPTEMBER	26.5	182.8	403,000.9	6.87	2,769,000.00
OCT - NOV	9.0	62.2	137,126.1	6.94	952,000.00
DECEMBER	5.2	35.9	79,145.1	7.34	581,000.00
JANUARY	5.3	36.5	80,467.9	7.79**	627,000.00
TOTAL	100.0	689.8	1,520,953.5		10,512,000.00

*Time-period allocations may differ slightly due to rounding; ** No BFT landed in Jan during these years; preliminary ex-vessel prices for the 2004 season are used as a proxy.

Subalternative F3(c) (preferred) would implement the same time-periods as mentioned in Subalternative F3(b), but would implement slightly different subquota allocation percentages for the June through August and October through November time-periods (Table 4.57). This subalternative was designed to redistribute the quota from the early time-periods to provide a winter General category BFT fishery to during the months of December and January. This subalternative would reduce the allocation to the June through August time-period to a higher degree, than subalternative F3(b) and increase the suballocation to the October through November time period, thus shifting more of the potentially adverse social and economic impacts to the earliest portion of the season.

This subalternative would enhance equity among regional General category participants, given that access to fish available at different times of the year in different locations is likely to occur. Because this alternative would allocate General category quota based on a balance between historical General category BFT allocations, recent BFT landing trends, and the NCDMF Petition for Rulemaking, there would be no significant social or economic impacts to the fishery as a whole. However, this subalternative would have similar positive and adverse social and economic impacts as outlined in subalternative F3(b). The adverse social and economic impacts would be slightly shifted to the earliest portion of the fishery, where the General category subquota allocations have traditionally been the highest. This subalternative would have positive social and economic impacts to those General category participants fishing in the later portion of the season due to a 13.5 percent increase in available quota, compared to the No Action alternative, during the time from of October through January. This increase in quota would equate to approximately 2.6 million dollars in additional gross revenue for the later part of the General category season. However, those General category participants who pursue BFT in the summer months may experience some adverse social and economic impacts due to the shift in quota to the later portion of the season. For instance under this alternative, the status quo June through August time-period subquota allocation would be reduced by approximately ten percent and the September time-period allocation would be reduced by approximately 3.5 percent. These reductions in allocation would result in decreased gross revenues of approximately 1.2 and 0.3 million dollars respectively for each of these time periods.

Reallocating more quota from the June through August time-period to the later time-periods would slightly mitigate some of these adverse social and economic impacts because the amount of quota being reallocated would equate to a smaller percentage of the June through August subquota relative to the other time-period subquotas. This subalternative is preferred due to the balance it strikes between providing all General category BFT fishery participants an equitable opportunity to harvest a portion of the coastwide General category quota, while still recognizing the historical participation in this fishery. Any adverse social or economic impacts associated with this alternative would be minimized and may even be mitigated as fishermen are allowed to travel to the geographical location of where the BFT are located at any give time. However, NMFS has little specific information at this time regarding the costs that would be incurred due to this travel.

Table 4.57 Alternative F3(c) (preferred): Gross revenues associated with the proposed sub-allocation of the General Category quota, providing a BFT winter fishery in the South Atlantic.

Time-Period	Percentage	Approx. Equivalent in mt*	Approx. Equivalent in lb*	Average Ex-Vessel $	Approx. Gross Revenues
JUNE - AUG	50.0	345.0	760,587.0	6.80	5,172,000.00
SEPTEMBER	26.5	182.8	403,000.9	6.87	2,769,000.00
OCT - NOV	13.0	89.7	197,752.6	6.94	1,372,000.00
DECEMBER	5.2	35.9	79,145.1	7.34	581,000.00
JANUARY	5.3	36.5	80,467.9	7.79**	627,000.00
TOTAL	100.0	689.8	1,520,953.5		10,521,000.00

*Time-period allocations may differ slightly due to rounding; ** No BFT landed in Jan during these years; preliminary ex-vessel prices for the 2004 season are used as a proxy.

Subalternative F3(d) would implement the same time-periods as described in sub-alternatives F3(b) and F3(c), but would allocate the General category time-period subquota in accordance with the NCDMF's Petition for Rulemaking (*i.e.*, 150 mt total for the months of December and January or approximately 21.7 percent of the coastwide General category quota (Table 4.58). This alternative would have a greater positive social and economic impact to General category participants in the South Atlantic region, region due to a 24.7 percent increase in available quota, compared to the No Action alternative, during the time from of October through January. This increase in quota would equate to approximately 2.9 million dollars in additional gross revenue for the later part of the General category season. However, those General category participants in the New England area or to those participants, which pursue BFT in the summer months, may experience greater adverse social and economic impacts due to the shift in quota to the later portion of the season. For instance under this alternative, the status quo June through August time-period subquota allocation would be reduced by approximately 21.3 percent and the September time-period allocation would be reduced by approximately 3.4 percent. These reductions in allocation would result in decrease gross revenues of approximately 2.5 and 0.3 million dollars respectively. These negative impacts may be mitigated by individuals traveling to where the BFT are located at any time of the season. However, NMFS has little specific information at this time regarding the costs that would be incurred due to this travel.

Table 4.58 Alternative F3(d): Gross revenues associated with the proposed sub-allocation of the General Category quota, providing a BFT winter fishery in the South Atlantic.

Time-Period	Percentage	Equivalent in mt*	Equivalent in lb*	Average Ex-Vessel $	Gross Revenues
JUNE - AUG	38.7	267	588,628.2	6.80	4,003,000.00
SEPTEMBER	26.6	183.5	404,544.1	6.87	2,779,000.00
OCT - NOV	13	89.7	197,752.6	6.94	1,372,000.00
DECEMBER	10.8	74.5	164,252.7	7.34	1,206,000.00
JANUARY	10.9	75.2	165,785.9	7.79**	1,291,000.00
TOTAL	100	689.9	1,520,953.5		10,651,000.00

*Time-period allocations may differ slightly due to rounding; ** No BFT landed in Jan during these years; preliminary ex-vessel prices for the 2004 season are used as a proxy.

Alternative F4 (preferred) would clarify the procedures NMFS used in calculating the ICCAT recommendation regarding the eight percent tolerance for BFT under 115 cm (young school and school bluefin tuna). This alternative would have slightly more positive social and economic impacts than the No Action alternative, as it would slightly increase the school size-class BFT quota by approximately 0.02 percent of the status quota allocation. This alternative would implement the ICCAT recommendation more accurately based on the specific language contained in the recommendation itself. This alternative would also remove the North/South dividing line that separates the Angling category size-class subquota allocations into more finite geographic allocations. This alternative may have some perceived negative social and economic impacts attributed to less finite quota management of the recreational BFT fishery. However, NMFS requires real-time landings data from the recreational sector of the BFT fishery to use this management tool and currently, the recreational BFT monitoring programs do not provide data in the necessary timeframe for this dividing line to be effective. Therefore, this alternative would dispel any false expectations that the agency can manage the recreational BFT fishery using this tool. This alternative also more closely reflects current management practices. As recreational catch monitoring programs are improved over time, this management option may be revisited if the timeliness of the data derived from recreational monitoring programs warrants its usage.

Conclusion

Sub-alternatives F3(c) and F4 are the preferred alternatives because they enhance NMFS' flexibility to address inherent variability in the BFT fishery while still allowing for business planning. They also respond in part the NCDMF's Petition for Rulemaking and would allow for a formal General category winter BFT fishery while still recognizing the historical BFT catch rates in the New England area fishery. These preferred alternatives would also clarify the procedures NMFS uses to implement the ICCAT recommendation regarding the eight percent tolerance limit of school BFT as well as dispel any misconceptions regarding the current effectiveness of the recreational North/South dividing line as a management tool.

4.3.1.2 Annual BFT Management Measures

As described in Chapter 2, the alternatives considered for amending annual BFT quota adjustment procedures are:

F5 Maintain the annual BFT quota specification process and the under/overharvest procedures within individual domestic quota categories and individual vessels in the Purse seine category (No Action)

F6 Revise the annual BFT quota specification process to refer back to the supporting analytical documents of the consolidated HMS FMP and include seasonal management measures in annual framework actions – Preferred Alternative

F7 Eliminate unharvested quota carryover provisions and return unharvested quota to the resource, while maintaining status quo overharvest provisions

F8 Establish an individual quota category carryover limit of 100 percent of the baseline allocation (i.e., no more than the annual baseline allocation may be carried forward), except for the Reserve category, and authorize the transfer of quota exceeding the 100 percent limit to the Reserve or another domestic quota category, while maintaining status quo overharvest provisions – Preferred Alternative

Ecological

One of the conservation and management tools recommended by ICCAT is the use of total allowable catch (TAC) quotas for a particular species. When the United States accepts an ICCAT recommendation, ATCA provides the Secretary with the necessary authority to implement these binding recommendations. However, no regulation promulgated under ATCA may have the effect of increasing or decreasing any allocation or quota of fish or fishing mortality level to which the United States agreed pursuant to a recommendation of ICCAT.

Alternative F5 (No Action) would maintain and implement regulations as outlined in the 1999 FMP. NMFS would conduct an annual rulemaking to allocate ICCAT-recommended baseline BFT quotas, adjust those baseline quotas to account for each domestic quota category's under/overharvests that occurred in the previous fishing year, and establish the General category effort controls for the upcoming fishing year (*e.g.*, an RFD schedule). Under this alternative, NMFS would also be authorized to allocate any remaining quota from the Reserve to cover potential overharvests, consistent with the criteria described in Section 4.3.1.3. The total of the adjusted quotas and the Reserve would need to be consistent with the 20-year ICCAT Rebuilding Program for BFT. These small orders of change, quantified in either numbers of fish or in weight (mt), or time and/or location of harvest, compared to overall U.S. harvest levels as recommended by ICCAT under the 20-year rebuilding program, equate to ecological impacts that are unlikely to be measurable given the variability in the data used to conduct BFT stock assessments. Additionally, the numbers of BFT harvested from each different size-class would remain consistent with the levels of BFT mortality used in the stock assessment. Therefore there are no ecological impacts expected from this alternative. However, the under/overharvest accounting procedures contained in this alternative may have minor adverse impacts. Specifically, a domestic category could experience excessively slow catch rates in a given fishing year, regardless of actions taken to allow for reasonable fishing opportunities, resulting in large amounts of unharvested quota being carried forward from one fishing year to the next, especially if this were to occur in multiple successive years. These rollovers could lead to a quota 'stockpiling' situation in one particular domestic quota category. These stockpiles may

have implications regarding the 20-year ICCAT Rebuilding Plan for BFT, as they could allow for excessive pressure/harvest on a particularly sensitive year class.

Alternative F6 (preferred) would codify the ICCAT–recommended U.S. BFT TAC, as well as the domestic allocation percentages and quota equivalents of that TAC, in the regulations implementing the consolidated HMS FMP. The ICCAT BFT quota recommendations are based on the most recent stock assessment of western Atlantic BFT, which in turn incorporate the most up-to-date scientific information submitted annually by its member nations, and typically cover multiple years. This alternative would eliminate the need to allocate each domestic quota categories' baseline allocation every year as the allocation percentages and quota equivalents (in mt) would be spelled out in the regulations implementing the consolidated HMS FMP, at least until ICCAT alters the U.S. BFT TAC recommendation. NMFS would conduct under/overharvest adjustments annually and appropriate quota transfers, so long as the results of these actions are consistent with all pertinent ICCAT recommendations, especially the 20-year ICCAT Rebuilding Program for BFT. As the ICCAT-recommended U.S. BFT TACs are based on the most recent scientific data, as incorporated in the western Atlantic BFT stock assessment, and the quota allocations are TACs, NMFS does not anticipate any adverse ecological impacts from this alternative.

This alternative would maintain the default General and Angling category BFT retention limits (described in alternative F1) and would propose adjustments to those limits in the annual BFT quota specifications to provide notice of, and an opportunity for the public to comment on these sort of adjustments. To provide maximum utilization of the General category quota, NMFS may increase or decrease the daily retention limit of large medium or giant BFT over a range of zero to a maximum of three BFT per vessel. To provide maximum utilization pf the Angling category quota, NMFS may increase or decrease the retention limit for any size class BFT or change a vessel trip limit to an angler trip limit and vice versa. NMFS would base the proposed adjustments on the determination criteria discussed under Section 4.3.1.3. NMFS would also maintain the ability to alter the retention limits via an inseason action, if warranted. For further details regarding inseason actions, please see Section 4.3.1.3. These adjustments would be inextricably linked to the available BFT quota and would be consistent with all pertinent ICCAT recommendations, especially the 20-year ICCAT Rebuilding Program for BFT. As the ICCAT-recommended U.S. BFT TACs are based on the most recent scientific data, as incorporated in the western Atlantic BFT stock assessment, and the quota allocations are TACs, NMFS does not anticipate any adverse ecological impacts from adjusting daily retention limits adjustments within the scope outlined above.

Under this alternative NMFS would also propose a schedule of RFDs that would be implemented for the upcoming fishing season. This schedule would accompany the annual BFT specifications and would provide notice of, and an opportunity for the public to comment on this type of General category effort control. The number of RFDs proposed and could range from zero RFDs to a large number of consecutive RFDs, blocking out weeks at a time. RFDs, in general, are designed to have positive economic and social impacts, and have neither positive nor negative ecological impacts since they only impact when and where BFT mortality occurs, and not the magnitude. The magnitude of mortality has been dictated by finite quotas established under a 20-year rebuilding plan for BFT and other recommendations by ICCAT. The regulation

of effort helps achieve optimum yield by considering the social and economic interests of the participants. The limited nature of these effort controls is therefore unlikely to have any differential impacts on the life history or overall biological distribution of the western Atlantic BFT stock. However, it is possible that if too many effort controls are implemented, effort may shift to other species or the pace of the fishery could be slowed to such an extent that the full quota is not attained. This would be contrary to the consolidated HMS FMP and ATCA and any quota underage would be applied to the following year so mortality would only be deferred. Alternatively, if not enough effort controls are implemented, it is possible the BFT fisheries would attain their quota rapidly and close prematurely. Fishermen may then turn to other stocks to target, particularly other HMS species, with corresponding impacts to other elements of the ecosystem. Neither of these scenarios is expected to result from this alternative.

Alternative F7 would have more positive ecological effects, in comparison to the other alternatives, because any underharvests from one fishing year would not be carried forward to the subsequent fishing year, thus eliminating the ability for any domestic quota category to 'stockpile' quota. Therefore, this alternative may accelerate the rebuilding plan for western Atlantic BFT, but may also have adverse ecological impacts attributed to the United States not fully utilizing its ICCAT-allocated TAC. Because the BFT quotas are TACs recommended by ICCAT, it is possible that any unused portion of the U.S. TAC could be reallocated to another member nation. Therefore, this alternative may have some potential adverse ecological impacts in the long-term that would be associated with a reallocation of unutilized U.S. BFT quota to an ICCAT member nation that does not have comparable conservation measures to the United States. For instance, a portion of the U.S. BFT TAC could be reallocated to a member nation that has a higher level of interaction with protected resources or has not taken equivalent steps to minimize bycatch.

Alternative F8 (preferred) would have positive ecological impacts by limiting the amount of underharvest that could be rolled over from one year to the next. This alternative would not allow excessive amounts of BFT quota to accumulate in any particular domestic quota category due to multiple successive years of underharvest and therefore, would curb the likelihood of a 'stockpiling' situation. This alternative would allow NMFS to redistribute quota exceeding the 100 percent rollover cap to the Reserve or to other domestic quota categories, provided the redistributions were consistent with ICCAT recommendations and the criteria in Section 4.3.1.3. This alternative would provide reasonable fishing opportunities to harvest the ICCAT-recommended U.S. BFT TAC as close to the timeframe it was originally intended to be harvested as well as reduce the likelihood of reallocating U.S. BFT quota to another member nation that does not have comparable conservation measures (see discussion under alternative F(7)).

Social and Economic Impacts

Alterative F5 (No Action) would maintain the status quo process currently used in allocating the ICCAT-recommended U.S. BFT TAC domestically, accounting for annual under/overharvest, and establishing General category effort controls. This alternative is unlikely to have any substantial immediate social or economic impacts given that these processes have been in place since prior to the implementation of the 1999 FMP. However, NMFS has received public comment in the past regarding the timing of annual BFT specification publication and that

administrative or other delays in publishing the annual BFT specifications can have adverse social and economic impacts due to constituents inability to make informed business decisions. Under this alternative the annual BFT quota specifications establish baseline domestic quota category allocations, as well as adjusts those allocations based on the previous years under/overharvest. Any delay in publishing the annual BFT quota specifications prolongs the establishment of a baseline quota in any of the domestic categories.

Alternative F6 (preferred) would have slightly more positive social and economic impacts, in comparison to alternative F5, as each baseline domestic quota category allocation, quantified in metric tons (not just the percentage of the U.S. BFT TAC) would be codified in the regulatory text implementing the consolidated HMS FMP. Therefore, each established domestic user group would have a quantifiable amount of quota available for harvest at the start of each fishing year (Table 4.59) and would not require the annual BFT specifications to establish the baseline quota. These quotas would remain consistent from one year to the next, until ICCAT amends the recommendation regarding western Atlantic BFT TACs. If and when ICCAT amends its recommendation regarding western Atlantic BFT TACs, NMFS would undertake rulemaking to analyze the impacts associated with the revised recommendation and would codify the results, as they apply to each domestic quota category allocation, in the regulations. This alternative would still require NMFS to conduct an annual rulemaking to account for the previous years under/overharvest, but would provide some level of stability regarding baseline quota availability for each fishing year. This alternative would also establish General category effort controls and establish daily retention limits for the Angling and General categories and any associated time frames in the annual framework action.

This alternative would maintain the default General and Angling category BFT retention limits and would propose adjustments to those limits in the annual BFT quota specifications to provide notice of, and an opportunity for the public to comment on these sort of adjustments. To provide maximum utilization of the General category quota, NMFS may increase or decrease the daily retention limit of large medium or giant BFT over a range of zero to a maximum of three BFT per vessel. To provide maximum utilization of the Angling category quota, NMFS may increase or decrease the retention limit for any size class BFT or change a vessel trip limit to an angler trip limit and vice versa. NMFS would base the proposed adjustments on the determination criteria discussed under Section 4.3.1.3 and would also maintain the ability to alter the retention limits via an inseason action, if warranted. For further details regarding inseason actions, please see Section 4.3.1.3. It is NMFS' intent by adjusting the default daily retention limits to allow for maximum utilization of the available BFT quota by fishery participants in order to help achieve optimum yield in either in the General and/or Angling category fishery.

Under this alternative NMFS would also propose a schedule of RFDs that would be implemented for the upcoming fishing season. This schedule would accompany the annual BFT specifications and would provide notice of, and an opportunity for the public to comment on this type of General category effort control. The proposed RFD schedule could range from zero RFDs to a large number of consecutive RFDs blocking out weeks at a time. In the past, when catch rates have been high, implementing more RFDs has had positive economic impacts by avoiding market gluts and providing access to higher quality fish later in the season. Positive social impacts have also occurred as fishermen have commented that knowing the exact schedule

of RFDs prior to the season facilitates planning and scheduling of trips. However, if catch rates are slow and a large amount of RFDs hinder the ability to harvest a time-period subquota, waiving RFDs in mid-season can cause confusion and disrupt fishermen's activity and, although information regarding the canceling is widespread over various electronic and paper media, there may be some negative social impacts as a result.

It is NMFS' intent to streamline the annual rulemaking by analyzing the full range of possible outcomes as they pertain to accounting for the previous year's under/overharvest (see F(8)), retention limits, and/or effort controls in the analytical supporting documents of the consolidated HMS FMP. This alternative would have positive social and economic impacts to the domestic BFT fishery as a whole by allowing commercial and recreational BFT fishery participants to make informed decisions on how best to establish a business plan for the upcoming season as well as helping to achieve optimum yield form the BFT fishery.

Alternative F7 would more than likely have the most adverse social and economic impacts of all the alternatives considered for this issue. Under this alternative, NMFS would not carry forward unharvested quota from one fishing year to the next. This could result in a perception that domestic quota categories are penalized for not harvesting their allocated quota in the time provided and may lead to derby style fishing where vessels may operate in less than optimal conditions to harvest the quota before the season is closed. This alternative could also result in a domestic quota category not receiving a quota transfer from another domestic quota category with large amounts of underharvest to assist in covering an overharvest situation, which could result in that category having quota deducted from the following year. This could result in reduced fishing opportunities, income, and angler consumer surplus for the commercial and/or recreational fleet, as well as the businesses that support those BFT fisheries. This alternative would potentially also have adverse social and economic impacts attributed to potential BFT quota reallocations at the ICCAT level, as discussed in the ecological impacts section of this issue.

Alternative F8 (preferred) would have both slightly positive and negative social and economic impacts on BFT fishery participants. Under this alternative, each domestic quota category would be limited in the amount of unharvested quota that could be carried forward from one fishing year to the next. This limit, or cap, would in turn limit the amount of revenue each domestic quota category could generate to no more than the value associated with double the baseline allocation (Table 4.59). These adverse economic impacts would be mitigated, overall, by reallocating the tonnage that exceeds the 100 percent cap to the Reserve or to another domestic quota category using the criteria stipulated in Section 4.3.1.3.

Table 4.59 Alternative F8: Gross revenues associated with the proposed rollover cap of 100 percent of the baseline quota allocation.

Category	Baseline quota allocation *	Maximum roll-over allotment	Total Potential Annual Quota (mt)	Total Potential Annual Quota (lb)	Average Ex-vessel price (99-03)	Total Potential Gross Revenues
General	689.8	689.8	1,379.6	3,041,466	7.02	21,351,091
Harpoon	57.1	57.1	114.2	251,765	7.12	1,792,567

Category	Baseline quota allocation *	Maximum roll-over allotment	Total Potential Annual Quota (mt)	Total Potential Annual Quota (lb)	Average Ex-vessel price (99-03)	Total Potential Gross Revenues
Purse Seine	272.4	272.4	544.8	1,201,066	5.95	7,146,343
Longline	118.6**	118.6**	237.2	522,931	5.15	2,693,095
Trap	1.5	1.5	3.0	6,614	???	???
Angling	288.6	288.6	577.2	1,272,495	N/A	N/A

*based on current ICCAT-recommended U.S. BFT TAC ** Does not include the NED Statistical set-aside annual allocation of 25 mt.

Conclusion

Alternatives F6 and F8 are the preferred alternatives because they would provide participants in the BFT fishery a timely and stable baseline quota allocation from one year to the next, the ability to address under/overharvest from the previous year, the ability to establish the General category effort controls as well as recreational and commercial handgear daily retention limits for the upcoming season, and streamline the annual rulemaking process. Additionally, implementing a cap on the amount of quota that can be carried forward from one fishing year to the next would allow NMFS to manage to harvest of BFT with more finite precision and minimize the occurrence of 'stockpiling' in any one quota category.

4.3.1.3 Inseason Actions

As described in Chapter 2, the alternatives considered for amending inseason action procedures are:

F9 Maintain inseason action procedures (No Action)

F10 Revise and consolidate criteria considered prior to performing inseason and some annual BFT management actions – Preferred Alternative

F11 Eliminate BFT inseason actions

Ecological

Alternatives F9 and F10 would authorize NMFS to perform inseason adjustments which may include, but would not be limited to, quota transfers between categories, adjustments to daily retention limits, and interim closures of a fishery when deemed necessary. Under these alternatives, NMFS would consider numerous criteria in making a determination, consistent with the objectives of the ICCAT recommended 20-year rebuilding plan, Magnuson-Stevens, ATCA, and the consolidated HMS FMP. As the criteria outlined in Section 4.3.1.3 encompass the objectives of the consolidated HMS FMP, NMFS anticipates neutral ecological impacts from these two alternatives. Under alternative F11, NMFS would not perform any inseason actions, which could result in some ecological impacts. For instance, NMFS would not curtail daily retention limits or impose interim closures if BFT catch rates were high, which could lead to premature closures or overharvests in a particular domestic quota category. Alternatively, catch

rates may be slow, which could lead to not harvesting the available quota in the timeframe it was intended and excessive quota rollovers from one year to the next, or in the case of General category subquotas, from one time-period to the next.

Social and Economic Impacts

Under alternatives F9 and F10, NMFS would conduct inseason management actions, consistent with the determination criteria described in Section 4.3.1.3, which would allow for the flexibility to better meet the objectives of the consolidated HMS FMP, ICCAT recommendations, Magnuson-Stevens Act, and ATCA in a more responsive fashion. Both of these alternatives allow the agency to adapt management measures to the inherent variability in the BFT fishery, and thus provide for maximum utilization of the BFT quota. NMFS would have the ability to adjust the daily retention limits in the domestic quota categories with the highest participation rates, namely the Angling and General categories, and to provide fishery participants an opportunity to harvest a portion of their respective quotas while those fish are available, thereby providing reasonable fishing opportunities to those participants. These alternatives would also allow the agency to curtail effort, if warranted, either by restricting retention limits or imposing an interim closure to help facilitate reasonable fishing opportunities for all participants across temporal and geographic differences.

For instance, NMFS may adjust the General category daily retention limit between a range of zero and three BFT per vessel per day/trip. When catch rates are low, as they have been in the early portion of the season over the last few years, a liberalized retention limit of two or three fish may have positive social and economic impacts on a vessel that is able to harvest multiple fish, due to the limited supply of U.S. fish on the market at that time. Some of the highest ex-vessel prices have occurred during this time-period when catch rates were slow. Providing a multiple fish retention limit may also assists in offsetting operating costs when there is a long steam time to and from the fishing grounds. Fishermen are able to remain on the fishing grounds longer, and in some cases overnight, instead of running long distances on a daily basis if they are allowed to retain multiple fish. Having the ability to liberalize the daily retention limit also has some inherent adverse social and economic impacts as well. For example, if catch rates were to increase dramatically over a short period of time while the retention limits were set at the upper end of the allowable range, large numbers of BFT could be landed in a short time period, thus flooding the market and depressing ex-vessel prices, and harvesting the quota at an accelerated rate. Another adverse impact inherent to having the ability to adjust these retention limits is the inability to accurately forecast when and for how long the adjustments should be effective. Therefore NMFS must remain diligent in monitoring the BFT fishery as close to real time as possible.

In regard to the Angling category retention limits, both positive and negative social and economic impacts are associated with having the flexibility to adjust them inseason, similar to the General category. There would be positive impacts associated with liberalizing the daily retention limits, either by angler, by vessel, or vessel type, due to the enhanced fishing opportunities that would be associated with the increase in retention limits. In past years, NMFS has received comments from the CHB sector that increased retention limits provide additional incentives for individuals to book charters, because the charter party would have the opportunity to retain more fish for the same amount money spent on the charter itself. For those privately

owned and operated recreational vessels, a liberalized retention limit also provides some additional incentive to target BFT, due to an increase in ACS by increasing the amount of BFT that could be retained in relation to the costs incurred running offshore (*i.e.*, in terms of fuel, bait, food, etc.). The adverse impacts would be associated with lowering/constraining retention limits or imposing an interim closure to ensure anglers in different temporal or geographical areas are not precluded from a reasonable opportunity to harvest a portion of the Angling category quota. Another adverse impact inherent to having the ability to adjust these retention limits is the inability to accurately predict catch rates and in turn forecast when and for how long the adjustments should be effective. This is especially true when charter trips are booked at a time when more liberal retention limits are in place but are restricted prior to the actual date the trip is taking place. Therefore NMFS must remain diligent in monitoring the BFT fishery as close to real time as possible.

Therefore, both alternatives F9 and F10 would have both positive and negative economic and social impacts to BFT fishery participants due to the ability to adapt regulations inseason to meet the objectives of the consolidated HMS FMP and the inherent inability to foresee when a change should take place. Alternative F10 would have slightly more positive economic and social impacts as the criteria NMFS must consider when making an inseason action would be consolidated and consistent, regardless of what type of inseason action is under consideration. This consolidation would minimize confusion regarding how NMFS came to a decision, and thereby provide additional transparency to the management process.

Alternative F11 would constrain NMFS' ability to adjust management actions due to the inherent variability of the BFT fishery and could impact its ability to fully meet the objectives of the consolidated HMS FMP, one of which is providing reasonable fishing opportunities. Fishery participants would experience positive social and economic benefits by knowing that quota allocations and daily retention limits would remain stable throughout the entire season, which would aide in plan fishing activities. However, participants would also experience adverse social and economic impacts attributed to the limitations it would impose on NMFS in providing for maximum utilization of the BFT quota spread over the longest period of time (*i.e.*, limits would need to be potentially more restrictive than under alternatives F9 and F10 to ensure quotas are not exceeded.

Conclusion

Western Atlantic BFT are overfished, and one of the main objectives of the consolidated HMS FMP is to end overfishing and rebuild overfished stocks, while providing reasonable fishing opportunities to harvest the limited quota that is available under the BFT rebuilding plan. Consolidating and refining the criteria that NMFS must consider prior to conducting any inseason, and some annual, actions will assist in meeting the consolidated HMS FMP's objectives in a consistent manner, providing reasonable fishing opportunities, increasing the transparency in the decision making process, and balancing the resource's needs with users' needs. Therefore, alternative F10 is the preferred alternative for this issue.

4.3.2 Timeframe for Annual Management of HMS Fisheries

As described in Chapter 2, the alternatives considered to change the annual management timeframe for HMS fisheries are listed below, and depicted in Table 4.60:

G1 Maintain the current fishing year for all HMS (No Action)
G2 Shift the fishing year to January 1 – December 31 for all HMS - Preferred Alternative
G3 Shift the fishing year to June 1 – May 31 for all HMS

Table 4.60 Fishing years by HMS proposed for Alternatives G1-G3.

HMS	Fishing Year		
	Alternative G1 (No Action)	**Alternative G2 (Preferred)**	**Alternative G3**
Tuna	June 1 – May 31	January 1 – December 31	June 1 – May 31
Sharks	January 1 – December 31	January 1 – December 31	June 1 – May 31
Swordfish	June 1 – May 31	January 1 – December 31	June 1 – May 31
Billfish	June 1 – May 31	January 1 – December 31	June 1 – May 31

Ecological Impacts

Changing the annual management timeframe for HMS fisheries is largely an administrative action that would have a minimal ecological impact. From a long-term perspective, the amount of fish harvested and resultant fishing effort would not be expected to change overall. However, the location of harvest could be affected in certain specific situations.

The migratory nature of HMS stocks results in seasonal availability in different geographic regions. If a quota runs out before the end of a fishing year, the geographic area where the fish would normally be located at the end of the fishing year would be expected to experience less fishing. Thus, if sensitive life stages such as spawning adults or limited year classes are concentrated in geographic areas that are not fished because a quota is expended, in general, the stock could experience a positive impact. The converse could also hold true – if a sensitive year class or life history stage were concentrated in a geographic area open to fishing at the beginning of a fishing year, in general, negative impacts to the stock could occur.

HMS stocks that are limited by quotas (BFT, albacore tuna, swordfish, sharks) or subject to catch limits (white and blue marlin) could potentially be impacted in this way. However, for each of these fisheries, there are mitigating circumstances that minimize the potential for these impacts. Neither the albacore tuna nor the swordfish fisheries are harvesting the entire available quota, so these fisheries have remained open throughout the season, thus the potential impact would not apply unless the unlikely event that there are changes in these fisheries that would increase landings. BFT, swordfish and sharks are highly regulated with temporal and/or geographic subquotas, intended in part to spread these fisheries out over the entire fishing year and range of the fishery. In addition, the sensitive life stage of spawning BFT in the Gulf of Mexico is already highly regulated.

For blue and white marlin, the ICCAT 250 marlin catch limit proposed to be codified under alternative E6 has rarely been reached historically, and thus these fisheries are expected to

continue throughout the season without the need for the increase in size limit or catch-and-release restrictions available as management measures proposed under E6. Under the limited potential that a threshold for implementation of these management measures is reached, there is little information available to show that sensitive life stages or year classes of these species are more or less available in different geographic regions. Thus, NMFS does not expect any negative or positive impacts to target species from this perspective as a result of any of the alternatives (G1-G3) considered for this action.

In addition, since this action is largely administrative, few impacts are expected to non-target species, including finfish and protected species. There is a limited potential for some minimal reduction in fishing effort or minimal shift in fishing effort from targeting marlin to targeting some other species as a result of any of the alternatives (G1-G3) in combination with implementing a management measure under alternative E6. If an overall reduction in fishing effort occurred, a small positive impact to non-target species could result under alternatives G1-G3. This potential minimal positive impact would be expected to be slightly higher under alternative G2 (preferred alternative) since the number of days that management measures under alternative E6 are projected to be in place, and thus the number of days that effort could be reduced, would be greater (*e.g.* August 21- December 31 under Scenario 2 or August 25 – December 31 under Scenario 3) than for alternatives G1 and G3 (*e.g.*, May 3-31 under Scenario 2 or May 11-31 under Scenario 3). See the discussion of social and economic impacts under alternative E6 in Section 4.2.3 for a description of the scenarios and analyses.

Some small negative impacts could result for non-target species from a shift in fishing effort under each of the alternatives (G1-G3) in combination with alternative E6; however, the species and amount of impacts are currently not quantifiable. Contrary to the previous discussion, impacts could be slightly higher to non-target species if a shift in effort occurred under alternative G2, since the management measures are expected to be in effect for a longer duration. However, for both these discussions, it is important to remember that it is impossible to predetermine fisherman behavior and that overall impacts are not quantifiable at this time.

Alternative G2 would also include implementation of an abbreviated fishing year for BFT and swordfish, which would provide the entire 2006 quotas for harvest from June-December of 2006 (see Table 4.62). The compressed fishing year would allow the ability to harvest what is usually harvested from January through May during June through December, in addition to what is usually harvested from June through December. Although it may appear that fishing effort would be elevated during this compressed six-month fishing year as compared to a twelve-month fishing year, NMFS expects that this will not be the case. This is illustrated by the average cumulative percentage of BFT that is usually commercially harvested from January through May, which is only 2.7 percent of the overall annual commercial landings (in number of fish, Table 4.61). In addition, the annual specification process for both swordfish and BFT allow a roll-over of any unharvested quota from year to year. There could be some small increase in impacts to non-target species from the small increase in fishing effort that could accompany the additional 2.7 percent of BFT quota harvested during the last six months of a calendar year, but it is unlikely that these impacts would vary perceptibly from those that would occur during a twelve month fishing year. Since swordfish fisheries are currently not harvesting the entire

annual swordfish quota, the availability of additional quota during a certain time-period would only have minimal effects.

Table 4.61 Average number of commercially harvested BFT by month for 1999-2003. Data source: NERO BFT landings database.

	MONTH (1999-2003)												
	Jan	**Feb**	**Mar**	**Apr**	**May**	**Jun**	**Jul**	**Aug**	**Sep**	**Oct**	**Nov**	**Dec**	**Total**
No. of Fish	98	112	182	230	180	1,240	3,032	5,698	9,037	6,547	639	1,361	28,356
% by Month	0.3	0.4	0.6	0.8	0.6	4.3	10.7	20.1	31.9	23.1	2.3	4.8	N/A
% Cum.	0.3	0.7	1.3	2.1	2.7	7.0	17.7	37.8	69.7	92.8	95.1	99.9	99.9

Similarly, alternative G3 would require a bridge period from January 1, 2007 through May 31, 2007 for sharks, as the shark management cycle would change to a fishing year. This bridge period would require that the 2006 quota for sharks be stretched to cover an additional six months. This could result in small positive impacts for sharks on a short-term basis, since the overall harvested quota during calendar year 2006 would be slightly reduced. In addition, alternative G3 would include consideration of shark-pupping seasons during development of new quota trimesters in order to avoid negative ecological impacts. A small reduction in directed shark fishing effort could also result in a small reduction in impacts to non-target species in the form of bycatch, but some impacts to finfish could increase if fishing effort were shifted to other species.

Social and Economic Impacts

The "No Action" alternative (G1) would maintain the fishing years for all HMS species that are currently in place (Table 4.60). This alternative is expected to maintain the current level of compliance with regulations and minimize short-term constituent confusion since nothing would change. In addition, alternative G1 would not result in any anticipated disruption to any of the HMS markets.

Alternative G1 would maintain consistency in the annual shark management cycle since the first shark FMP (1993). If ICCAT should become more involved in shark management, alternative G1 would provide consistent timing for U.S. domestic and international shark management programs since ICCAT manages on a calendar year cycle. However, this current management regime may be somewhat more arduous for fishermen targeting more than one HMS in the long term since sharks are managed on a different timeframe than other HMS.

Alternative G1 would continue to allow approximately six months between the annual adoption of ICCAT recommendations (typically in November) and initiation of the fishing year for tuna, swordfish, and billfish on June 1. This six-month window was intended to provide time to implement necessary changes to domestic management measures to comply with international obligations. It also allowed time for the affected fisheries to anticipate changes to the management program and adjust fishing activities as needed. However, under this "No Action" alternative, U.S. domestic fishery reporting occurs on a June 1 – May 31 fishing year basis for tunas, swordfish, and billfish, while most ICCAT nations report on a calendar year basis. This situation results in complex U.S. reports to ICCAT, with a confusing structure of analyses in the

U.S. National Report. Due to the complexity in reports to ICCAT, the United States' negotiating position during international compliance reviews may be weakened.

As described previously under the ecological impacts section, when a fishery has a finite quota or catch limit, its start date (as well as other factors) can impact quota availability during periods of peak market demand and effort, and the availability of quota for fisheries that occur later in the season. For example, maintaining swordfish management with a June 1 start date would ensure the availability of ample quota for harvest during the summer market. However, since the U.S. fishery is not currently harvesting its full quota, ample swordfish quota is expected to be available year-round. BFT and sharks are highly regulated with subperiods and subquotas, which greatly reduce the potential for negative impacts to fisheries at the tail end of the season. As described previously, the only quota/catch-limited fishery that could potentially be impacted by running out of quota/reaching a catch limit is the fishery for white and blue marlin under the ICCAT 250 limit (alternative E6 in Section 4.2.3). The potential socio-economic impacts to billfish fisheries for the options under the ICCAT 250 catch limit for the status-quo June 1-May 31 fishing year cycle (alternative G1) are discussed in detail in Section 4.2.3 for three scenarios: (1) threshold for inseason management not achieved; (2) threshold for an inseason minimum size increase achieved; and (3) threshold for implementing catch-and-release only fishing achieved. Since data for analysis of these alternatives are very limited and the potential management measures are variable within a range, several proxies and reference points are applied for these analyses.

The preferred alternative (G2) proposes to manage all HMS species on a fishing year cycle from January 1-December 31 (calendar year). This would maintain the status quo in the shark management year cycle established in the first shark FMP (1993). Thus, alternative G2 would not be anticipated to have any social or economic impact on the shark fishery because it currently operates on a calendar year basis.

Use of a consistent calendar year basis would create an overall less complex management regime for all constituents, and as a result could potentially increase compliance. In particular, this alternative would reduce confusion overall for constituents participating in a combination of HMS fisheries, although initially there could be some short-term confusion as tuna, swordfish, and billfish quotas and annual Atlantic tunas, HMS CHB, and HMS Angling vessel permits are adjusted to a calendar year basis.

ICCAT recommendations become effective six months after they are adopted. In most cases, this would be in May of the year following the November ICCAT meeting. Thus, alternative G2 may result in some negative social and economic impacts if fishery participants do not know the regulations for the upcoming fishing year. Since swordfish and billfish landings are relatively low for the first few months of the calendar year, these fisheries would not be impacted, but the January BFT fishery may be over before any changes to the regulations are implemented. This could negatively impact constituents participating in the January fishery by reducing their ability to plan for the upcoming fishing year. However, setting annual quotas and other fishery specifications on a multi-year basis, as proposed for the BFT fishery in Section 2.3.1.2, and re-allocating the BFT subquota time-periods (Section 2.3.1.1) could mitigate these potential negative impacts.

Alternative G2 establishes consistent management year cycles for U.S. domestic and international (ICCAT) management programs, which would reduce the complexity of U.S. reports to ICCAT and create more transparent analyses in the U.S. National Report. Reducing complexity in reporting to ICCAT would strengthen the United States' negotiating position during international compliance review.

An abbreviated 2006 fishing year, from June 1, 2006, through December 31, 2006, would be necessary to transition BFT and swordfish from the current fishing year to a calendar year. (A transition fishing year is not necessary for marlin since a quota/catch limit is not currently in effect, and the preferred alternative for the ICCAT 250 landing limit is not proposed to be implemented until January 2007.) The 1999 FMP switched management of Atlantic tunas and billfish from a calendar year to a fishing year by stretching the 1998 BFT quota through the entire calendar year of 1998 and on through to May 31 of 1999 (Table 4.62). Likewise, a 1996 action shifted swordfish from a calendar year to a fishing year by stretching the 1995 swordfish quota through to May 31, 1996 (61 FR 27304). Thus, NMFS believes it is appropriate to use the full ICCAT 2006 BFT and swordfish quotas during the 2006 abbreviated fishing year. The quotas for these fisheries would be established by the specification process in a separate rulemaking action.

Table 4.62 Graphic representation of the distribution of U.S. domestic BFT quota by year.

ICCAT Quota Yr*	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1997												
1998												
1999												
2000												
2001												
2002												
2003												
2004												
2005												
2006												
2007												
2008												
2009												

*ICCAT Quota yr. = the year following the annual special meeting of ICCAT (usually held in November).

Overall impacts to BFT fisheries from alternative G2 are anticipated to be minimal. As discussed earlier, sectors of the BFT fishery are highly regulated, and time-period subquota allocations and inseason management measures are used to distribute the quota throughout the fishing year, based on guidelines established at 50 CFR 635.27 and 635.28. These guidelines include consideration of the ability of anglers in all geographic areas to participate in the fishery; thus, these regulations minimize any potential negative impacts to fisheries at the tail-end of the management cycle. However, switching the BFT fishery to a calendar year could potentially provide positive impacts to the January winter fisheries in the south Atlantic at the expense of other fisheries unless adjustments are made to current BFT regulations to ensure sufficient time-period subquota management measures are in place for this fishery. In addition, under the

current regulations, the sub-allocation for the winter General category fishery extends between two calendar years from October to January (see Section 2.3.1), and thus an adjusted time-period subquota may be necessary to work with this alternative. The preferred alternatives in Section 2.3.1 for the BFT fishery address these concerns.

NMFS anticipates minor positive impacts to BFT fisheries specifically from the abbreviated fishing year. Having access to the full 2006 quota within a six month time period could provide a small economic benefit to all BFT fisheries, and may offset any negative impacts that occurred when these fisheries were previously shifted from a calendar year to a fishing year and annual quotas were stretched to last 18 months (Table 4.62). In addition, as mentioned under the ecological impacts section, the vast majority of the BFT quota is harvested during June through December (Table 4.61), and any quota that is not harvested during the abbreviated fishing year can be rolled over into the following year. Impacts to swordfish fisheries are expected to be even less since swordfish fisheries are not annually harvesting the entire quota. Since BFT and swordfish fisheries are already strictly managed with seasons, size limits, and subquotas, any impacts are expected to be minor.

Socio-economic impacts to Atlantic billfish fisheries as a result of moving to a calendar year management cycle would vary slightly depending upon the management measures chosen for the directed billfish fishery (see Section 4.2.3). Specifically, each option under alternative E6, which proposes to codify an ICCAT-recommended recreational landings limit for white and blue marlin, could result in minor to moderate negative impacts to billfish fisheries that occur at the tail end of the management cycle. Fisheries and tournaments for billfish that occur early in the calendar year should have sufficient catch available, but tournaments scheduled for later in the calendar year could be negatively impacted if a management threshold is reached and restrictions are implemented before the tournaments occur. As discussed under alternative E6, once activity within the fishery indicates that more restrictive management measures are necessary (*i.e.*, a management threshold for action is achieved), a restrictive measure would be triggered which would impact marlin fishing for the rest of the year. Discussion in Section 4.2.3 under alternative E6 explains potential impacts to billfish fisheries managed under a fishing year (*i.e.*, alternatives G1 and G3) and potential impacts of E6 for billfish fisheries managed under a calendar year are addressed below.

<u>Scenario 1: Threshold for Inseason Management Action is not Achieved</u>

No impacts are anticipated if a management action threshold is not reached.

<u>Scenario 2: Threshold for an Inseason Minimum Size Increase is Achieved</u>

Alternative E6 provides the option of increasing the minimum sizes of Atlantic blue and white marlin to between 117 - 138 inches and 70 - 79 inches, respectively, if inseason evaluation indicates that reducing harvest is necessary.

It is unknown for certain whether fisherman behavior and tournament participation would change as a result in increased minimum size limits. NMFS does not expect that size limit changes would substantially decrease demand for CHB trips, trips by individual anglers, or participation in billfish tournaments, given the catch-and-release ethic of billfish anglers

(estimated 87.0 - 99.2 percent release rate, see Section 4.2.3), in addition to the potential for some landings of fish greater than the minimum size limit to occur. As discussed in Section 4.2.3, RBS data indicate that, on average, 20 blue marlin greater than 117 inches and 9 white marlin greater than 70 inches have been landed annually in tournaments. If there were any unforeseen negative economic impacts as a result of an increase in size limit, the affected stakeholders could include charter/headboat operators, tackle shops, marinas, recreational anglers, tournament operators, and the communities in which tournaments occur.

As explained in the Scenario 2 (fishing year) discussion under Section 4.2.3, the threshold for action under alternative E6 was considered to be when 213 marlin were landed. Note that alternative E6 would implement a series of criteria for determining when a size limit adjustment would be implemented, and that the threshold of 213 marlin was chosen for the purpose of providing a basis for comparative analysis (see Section 4.2.3 for a description of the analysis and assumptions). During a calendar year, the threshold of 213 landed marlin is estimated to occur on August 21. Under this scenario for analysis purposes, once the threshold was reached, the minimum size limit would be raised to 117 inches for blue marlin and 70 inches for white marlin. Should this management action actually occur, and should there be a negative behavioral response from tournament participants, under alternative G2 (calendar year), the tournaments scheduled for the months of August through December could be negatively impacted. Of these five months, the month of August has a greater number of average annual tournaments at 29 (Table 4.53), with a sharp drop in September to eleven, and further reductions to three in October and December and four in November. The increase in number of tournaments in the summer months is reflective of the increase in availability of these fish in more temperate regions such as New England and the Mid-Atlantic bight. Out of these months, impacts in August appear to be of the most regional concern, since 100 percent of the three tournaments in the state of Massachusetts and three of the seven tournaments in the state of Maryland occur in August. In addition, August is the month with the greatest average annual number of vessels per tournament (72; Table 4.63), which appears to be largely influenced by tournaments in the state of Maryland. Impacts for the cumulative five month period (August through December) could also affect Texas (approximately 40 percent of tournaments in that area) and Florida (approximately 30 percent); however, the size of tournaments in these areas is less than the average billfish tournament size of 48 vessels per tournament (Table 4.63). In addition, tournaments in Florida are scheduled year-round. Impacts could be mitigated somewhat for tournaments in more temperate areas if they were held in mid-July through early August, or adopted a catch and release only format.

It is important to note that tournament data are historical and averaged, and do not necessarily reflect the exact time periods of past tournaments or potential future tournaments. Its use as a proxy for interpretation of regional impacts is extremely limited. In some cases, tournament dates could be adjusted to mitigate or avoid potential negative impacts of occurring late in the season with an increased risk for management actions. If, as expected, the negative impacts of an increase in size limit is perceived by tournament participants as minor, then tournaments may not be affected at all.

Scenario 3: Threshold for Implementing Catch-and-release Only Fishing is Achieved

The threshold for implementing catch-and-release fishing only under alternative E6 would be when the ICCAT limit of 250 marlin has been landed. As indicated in Section 4.2.3, available historical data indicate that it is unlikely that the United States will achieve the 250 limit. However, Section 4.2.3, Scenario 3, describes potential impacts to the recreational marlin fishery, including CHB trips, if the threshold for implementing catch-and-release fishing were reached during a June 1 – May 31 fishing year. These impacts as described (potential decrease in number of charter/headboat trips and individual recreational trips by between approximately 0.6 and 13.0 percent), would be expected to apply to both calendar year and fishing year management cycles, although the impacts would likely shift in time and space depending upon when the management action was implemented. Likewise, the use of billfish tournament release rates for analyzing potential negative impacts to tournaments in Section 4.2.3, Scenario 3, would apply to both calendar year and fishing year management cycles with some variability in time and space. The impacts identified in a "worst case" scenario include a potential decrease in tournaments of between 0.8 and 10.1 percent, or the potential of between 1 and 14 tournaments overall not operating (see Section 4.2.3). The impacted tournaments would most likely be the tournaments scheduled for the tail end of the calendar year, and cancellation could result in potential negative impacts locally and/or regionally. However, this is a worst case scenario, and unlikely because achieving the landings limit is unlikely.

A method for more specifically estimating impacts to tournaments is also described in Section 4.2.3, based on the distribution of the 2002 reported landings of marlin (see Section 4.2.3). During 2002, the ICCAT landing limit of marlin was reached. This method uses the distribution of 2002 landings to forecast the potential date when the ICCAT landings limit would be reached during a calendar year as August 25. For analysis purposes under this scenario, catch-and-release would be implemented during a calendar year management cycle after this date. On average, a total of 50 tournaments occur during the months of August through December (Table 4.53), and applying the factors identified in the previous paragraph for the potential decrease in number of tournaments (0.8 - 10.1 percent), this could result in up to five tournament cancellations, which could result in an economic impact of up to $6,699,000 ($1,339,800 per tournament, see Section 4.2.3). Since the hypothetical threshold date for Scenario 2 is so close to the estimated threshold under Scenario 3, the analysis of the tournaments and regions that could be impacted under Scenario 2 also applies to Scenario 3. The impacts described under hypothetical Scenarios 2 and 3 would not be expected to be cumulative since the dates of onset of potential impacts are virtually the same.

Table 4.63 Average Number of Boats per Tournament by Month and State, 1999-2003.

State	Month												State Ave
	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	
MA	--	--	--	--	--	--	**34**	**34**	--	--	--	--	**34**
RI	--	--	--	--	--	--	**14**	**16**	--	--	--	--	**16**
NY	--	--	--	--	--	--	**68**	--	--	--	--	--	**68**
NJ	--	--	--	--	--	**18**	**49**	**113**	**26**	--	--	--	**58**
MD	--	--	--	**72**	--	**22**	**65**	**301**	**20**	--	--	--	**152**
VA	--	--	--	--	--	**38**	**35**	**23**	--	--	--	--	**31**

State	Month												State Ave
	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	
NC	--	--	--	--	52	102	23	70	10	--	--	--	61
SC	--	--	--	42	64	68	102	53	--	--	--	--	71
GA	--	--	--	14	19	15	7	9	4	--	--	--	15
FL	34	45	30	71	70	49	65	29	27	19	43	45	45
AL	--	--	--	--	84	31	31	48	156	--	--	--	53
MI	--	--	--	--	--	24	14	20	--	--	--	--	18
LA	39	--	--	62	27	58	29	24	14	--	--	--	34
TX	10	--	--	--	13	18	52	52	17	--	--	--	34
PR	46	16	33	25	39	21	55	91	42	55	24	28	49
USVI	6	9	13	--	10	10	13	28	10	8	11	--	14
Monthly Ave	34	40	25	54	49	44	47	72	27	34	30	42	48

Alternative G3 establishes a June 1 – May 31 fishing year management cycle for all HMS species (Table 4.60). As with alternative G2, alternative G3 establishes a consistent management cycle for all HMS fisheries, resulting in an overall less complex management regime for all constituents. In particular, this alternative would reduce confusion for constituents participating in a combination of HMS fisheries. While initially there could potentially be short-term confusion as the shark quotas, trimesters, and permits are adjusted to a fishing year basis, overall the HMS management regime would be less complex. A bridge period, from January 1, 2007, through May 31, 2007, would be established to transition the Atlantic shark fishery from a calendar year to a fishing year. Establishing consistent management cycles for all HMS fisheries would simplify the regulations, making them easier to understand and potentially increasing compliance.

In general, alternative G3 would have the same impact to the seasonal availability of quota for tunas, swordfish, or billfish fisheries and tournaments as the No Action alternative, since there would be no change to the management cycle for these species. See alternative G1 for a description of these impacts. In addition, maintaining the current start dates for the tunas, swordfish, or billfish fisheries results in no anticipated disruption in any of these current markets or fishing activities. Alternative G3 could result in some short-term negative economic impacts as shark wholesale and retail markets adjust to the potential disruption in catch rates resulting from the shift to a fishing year and new trimesters.

Under alternative G3, U.S. domestic fisheries data would be managed on a fishing year basis while most ICCAT nations report on a calendar year basis. ICCAT may become more involved in shark management in the future, at which time, if alternative G3 is selected, the HMS management cycle for all fisheries will be inconsistent with ICCAT's calendar year reporting. The inconsistent management timeframes makes the structure of analyses in the U.S. National Report confusing and less transparent. The basis for taking assertive action during the international compliance review may be compromised by the inability to interpret the United States' compliance from its own report.

On a fishing year management cycle, approximately six months are available between the adoption of ICCAT recommendations and initiation of the fishing year. Thus, it is more likely

that NMFS could complete the regulatory implementation process before the start of the fisheries. As in the current tuna, swordfish and billfish fisheries, NMFS would have six months to implement necessary changes to domestic management measures to comply with international obligations, and the fishery would be able to anticipate changes to the management program and adjust fishing activities as needed.

Conclusion

The preferred alternative is alternative G2, transferring all HMS fisheries to a calendar year management cycle. This alternative is preferred because it would simplify the regulatory process for constituents in the long term by managing all HMS fisheries on a calendar year, and would improve the United States' basis for negotiation at international forums. The primary concern regarding this alternative is any potential impact to billfish tournaments if the switch to a calendar year management cycle were to be combined with implementing the ICCAT 250 landings limit (alternative E6 in Section 4.2.3). However, since the ICCAT limit has only been attained once in the last several years, the likelihood of any impact is low. Although economic estimates of impacts on billfish tournaments appear to be larger and of greater regional concern under alternative G2 than other alternatives, the discussion notes that the analysis of historical tournament data are fairly limited as an indicator of potential future impacts. The flexibility provided for implementation of a size limit increase could mitigate impacts since the status of the fishery and any pending tournaments could be taken into account. Tournaments could potentially be re-scheduled to mitigate or avoid the potential of a tournament occurring after the threshold for a management action is reached, which could be more important to more affected regions. However, if several tournaments were rescheduled, the threshold might be reached earlier.

4.3.3 Authorized Fishing Gear

As described in more detail in Chapter 2, the alternatives considered for authorized fishing gear are:

H1 Maintain current authorized gears in Atlantic HMS fisheries (No Action)

H2 Authorize speargun fishing gear as a permissible gear type in the recreational Atlantic tuna fishery - Preferred Alternative

H3 Authorize speargun fishing gear as a permissible gear type in the commercial tuna handgear and recreational Atlantic tuna fisheries

H4 Authorize green-stick fishing gear for the commercial harvest of Atlantic BAYS tunas - Preferred Alternative

H5 Authorize buoy gear as a permissible gear type in the commercial swordfish handgear fishery; limit vessels employing buoy gear to possessing and deploying no more than 35 individual buoys, with each having no more than two hooks or gangions attached. – Preferred Alternative

H6 Authorize buoy gear as a permissible gear type in the commercial swordfish handgear fishery; limit vessels employing buoy gear to possessing and deploying no more than 50 individual buoys, with each buoy having no more than 15 hooks or gangions attached

H7 Clarify the allowance of hand-held cockpit gears used at boat side for subduing HMS captured on authorized gears - Preferred Alternative

Ecological Impacts

Alternative H1 would maintain the status quo for authorized gear in all Atlantic HMS fisheries. The ecological impacts of this alternative can be found in the Description of the Fisheries section of this document (see Chapter 3). Fishing effort and fishing mortality (F) would likely not increase as there would be no new authorized gears and/or participants. Bycatch and discard levels would also not likely increase due to new authorized gears and/or participants. This alternative is not anticipated to result in additional interactions with protected resources. However, this alternative could allow for potential increases in effort in the swordfish handgear fishery and may result in additional bycatch of HMS and other bycatch species. Should such increases in effort occur, this alternative may allow for increased interactions with protected resources.

Alternative H2 would define and authorize speargun fishing gear in the recreational Atlantic tuna fishery. Fishermen using speargun fishing gear would be allowed to freedive, use SCUBA or other underwater breathing devices, and would be required to be physically in the water when they fire their speargun. Only free-swimming fish, not those restricted by fishing lines or other means, could be taken. The use of powerheads, or other explosive devices, would not be allowed to be used to harvest or subdue tunas. Under this alternative, no HMS would be allowed to be taken by speargun fishing gear, other than Atlantic tunas.

Given the quota system in place for BFT, this alternative would not result in additional BFT landings. The potential increase in landings for other Atlantic tunas would be minimal compared with the landings by current participants. This is supported by public comment that suggests that few individual fishermen would be expected to use this gear type, and that spearfishermen expect low encounter rates with target species. In addition, it has been noted that individual spearfishermen could expect to fish for months or years without having an opportunity to spear a tuna. However, western Atlantic BFT and most other Atlantic tunas are already overfished or fully-fished, and allowing speargun fishing gear in the recreational tuna fishery could affect NMFS' efforts to rebuild overfished stocks. As of April, 20, 2005, there were 21,800 permitted vessels participating in the HMS Angling category. Based on public comment and anecdotal information, NMFS anticipates that between 50 and 1,000 individual U.S fishermen may have an interest in using speargun fishing gear to target tunas. Relative to the current number of participants in the recreational Atlantic tuna fishery, and taking into account the estimated low encounter rates for target species, the additional anticipated effort from spearfishermen would likely result in minimal negative ecological impacts on Atlantic tunas.

In the past, there have been concerns that allowing spearguns in the Atlantic tunas fisheries could increase discards (fish speared and lost). During scoping, NMFS received comment that spearfishermen often use detachable spear tips called "slip-tips" designed to retain speared fish as well as use shooting lines, float lines, and floats designed to reduce fish loss. Further, the commenters stated that releases and discards would likely be non-existent as spearfishermen can actively select the species and sizes of fish they hunt. Under alternative H2, NMFS does not anticipate any additional interactions with protected resources or other HMS due to the selectivity of this gear type.

Alternative H3 would authorize the use of speargun fishing gear in the recreational and commercial Atlantic tunas handgear fisheries. As stated in alternative H2, above, fishermen using speargun fishing gear would be allowed to freedive, use SCUBA or other underwater breathing devices, and would be required to be physically in the water when they fire their speargun. Only free-swimming fish, not those restricted by fishing lines or other means, could be taken. The use of powerheads, or other explosive devices, would not be allowed to harvest or subdue tunas. Under this alternative, no HMS would be allowed to be taken by speargun fishing gear, other than Atlantic tunas. The ecological impacts of alternative H3 would likely be similar to those discussed under alternative H2 above, with the potential for some additional effort from commercial handgear tuna fishing vessels. Under this alternative, approximately 21,800 Angling, 221 Tunas Longline, 5,267 General , and 4,029 CHB category vessels would be allowed to use this gear type. However, according to feedback received from HMS AP members, and because of the estimated low encounter rates, the Agency would not anticipate any substantive changes in effort or landings by the commercial handgear sector under this alternative.

Alternative H4 would define green-stick gear and authorize its use in the commercial tuna handgear fishery. Vessels fishing under the General category would continue to be subject to all current General category regulations (such as size limits), and vessels with PLL gear onboard would continue to be subject to all current PLL regulations, including gear restrictions (such as circle hooks) and closed areas. Commercial vessels utilizing or possessing green-stick gear would be prohibited from possessing or retaining BFT.

Available data indicate that green-stick gear is primarily used to target YFT and other BAYS tunas. As discussed in Chapter 3, the most recent YFT stock assessment (2003) age-structure and production model analyses implied that effective effort may have been either slightly below or above the MSY level, depending on the assumptions. Consistent with these model results, yield-per-recruit analyses also indicated that fishing mortality rates could have been either above or about the level which could produce MSY. There is a potential for increases in landings of YFT and other HMS, but NMFS cannot quantify anticipated landings for this gear, at this time, due to the limited amount of landings information available. However, because this gear type has been used in the HMS fisheries for several years but classified as longline (due to the number of hooks involved) or handgear (due to the use of rod and reel), it is not anticipated that authorizing it would significantly increase landings or landings rates, or have significant adverse ecological impacts.

The commercial configuration of green-stick gear, or variations of the gear, has been used in the PLL fishery for several years. Commercial green-stick gear catches reported in the PLL Logbook Program for 1999 – 2003 can be seen in Table 4.64. Of the 45,712 PLL sets reported during this timeframe, 54 of these sets were reported as green-stick gear. Of the 54 green-stick sets reported, 53 of those were reported from the MAB reporting area and one set was reported from the NEC.

On the 54 green-stick sets reported between 1999 and 2003, a total of 4 BFT, 4 BET, 678 YFT, and 54 other BAYS tunas were reported captured. Additionally, 9 swordfish, 11 pelagic sharks, and 3 LCS were also reported captured. No blue marlin, white marlin, sailfish, or

spearfish were reported captured on any of these sets. There were also no sea turtle interactions reported. Accordingly, the Agency does not expect the use of this gear in the Atlantic tuna fishery to increase interactions with sea turtles or other protected resources.

Table 4.64 Reported Atlantic Commercial Green-stick Gear Catch for 1999 - 2003, in Numbers of Fish. Source: PLL Logbook Data

Species	1999	2000	2001	2002	2003*	Total
Swordfish	0	9	0	0	N/A	9
Bluefin tuna	0	2	0	2	N/A	4
Yellowfin tuna	0	344	232	102	N/A	678
Bigeye tuna	0	2	2	0	N/A	4
Other BAYS tunas	0	26	28	0	N/A	54
Blue marlin	0	0	0	0	N/A	0
White marlin	0	0	0	0	N/A	0
Sailfish	0	0	0	0	N/A	0
Spearfish	0	0	0	0	N/A	0
Pelagic sharks	0	1	8	2	N/A	11
Large coastal sharks	0	0	3	0	N/A	3
Dolphin	0	8	2	47	N/A	57
Wahoo	0	0	0	8	N/A	8
Sea turtles	0	0	0	0	N/A	0

* Modified logbook format eliminated green-stick gear data field.

Due to the limited amount of data associated with the use of commercially configured green-stick gear in the Atlantic HMS fisheries, NMFS expanded its analysis to look at other available U.S. data regarding the use of commercially configured green-stick gear, including catch data from the U.S. Pacific (Table 4.65). NMFS is aware that the following information may not have a direct correlation to the use of commercially configured green-stick gear in the Atlantic tuna fisheries; however, to better understand the implications of authorizing this gear, NMFS took this information into consideration.

Table 4.65 Reported U.S. Pacific Commercial Green-stick Gear Catch for 2002 – 2004*, in Numbers of Fish and Weight in Pounds. Source: State of Hawaii, 2005

Species	2002		2003		2004*		Total*	
	No.	Lb.	No	Lb.	No.	Lb.	No.	Lb.
Yellowfin tuna	224	5,825.5	593	42,246.5	261	9,098.5	1,078	57,170.5
Skipjack tuna	183	1,543.0	127	714.0	39	475.0	349	2732.0
Wahoo	13	160.5	13	211.5	4	110.0	30	482.0
Dolphin	7	121.0	26	428.5	1	20.0	34	569.5
Barracuda	1	52.5	0	0	0	0	1	52.5
Blue marlin	0	0	8	1,217.0	1	500.0	9	1,717.0
Striped marlin	0	0	2	67.0	0	0	2	67.0
Short-nosed spearfish	0	0	1	20.0	0	0	1	20.0
Bigeye tuna	0	0	0	0	2	24.0	2	24.0
Black skipjack	0	0	0	0	1	20.0	1	20.0
TOTAL	428	7,662.5	770	44,904.5	309	10,247.5	1,507	62,854.5

* Preliminary data

In the U.S. Pacific commercial green-stick fishery, Calendar Year (CY) 2002 (Oct – Dec only), eight licensees conducted 59 total trips (367.0 hrs), of which 34 were at fish aggregation devices (FADs) (176.0 hours). Six of the total trips were "did not catch" trips. In CY 2003, 17 licensees conducted 172 total trips (1,377.0 hours), of which 33 were at FADs (253.0 hours). Sixteen of the total trips were "did not catch" trips. In CY 2004 (preliminary), 10 licensees conducted 66 total trips (478.0 hours), of which 12 were at FADs (87.0 hours). Twelve of the total trips were "did not catch" trips (Table 4.65).

The U.S. Atlantic and the U.S. Pacific commercial green-stick landings both indicate that vessels employing this gear type target YFT. The data show that, in addition to tunas, dolphin, and wahoo, the Pacific green-stick fishery has interacted with blue marlin, striped marlin, and short-nosed spearfish. This indicates that, although no billfish have been reported captured on commercially configured green-stick gear in the Atlantic fisheries in recent years, increased interactions with Atlantic blue marlin, white marlin, sailfish, and spearfish are possible under alternative H4. However, as stated above, because this gear type has been used in the Atlantic HMS fisheries for several years, it is not anticipated that authorizing it would dramatically increase effort and therefore would likely not result in a significant increases in interaction rates.

Under alternative H5, some positive ecological impacts are anticipated. Current handline restrictions – including requirements that there be no more than two hooks attached to each gear and that gear be released and retrieved by hand – would be included in the definition of the proposed buoy gear. In addition, this alternative would limit the number of buoys that would be allowed to be possessed or deployed. There are no data indicating how many commercial vessels are fishing with unattached handlines, or how many unattached handlines they are deploying. Nevertheless, this alternative is not expected to significantly restrict commercial handline fishing effort from current levels. A limit of 35 buoys was selected for this alternative based on public comment, and because the Agency identified this number as the manageable upper limit for the commercial sector that would prevent excessive amounts of unattended floating gear from being lost while allowing vessels to possess spare gear onboard. If vessels are currently possessing or deploying more than 35 unattached handlines with more than two hooks attached, minor ecological benefits may realized. Relative to the No Action alternative, this alternative may provide some positive ecological benefits by limiting the future expansion of this gear sector and, possibly, by reducing the amount of lost fishing gear. Lost fishing gear may be reduced by the requirement to affix each buoy with gear monitoring equipment, and by limiting the overall number of buoys a vessel may possess or deploy. If future expansion is limited and the amount of lost gear is reduced, there may be an unquantifiable future reduction in the bycatch of undersized swordfish, other HMS species, protected species, and target and non-target catches. However, with regards to commercial swordfish target catches, the United States has consistently landed less than its ICCAT quota in recent years, and overfishing is not occurring on North Atlantic swordfish. Under this alternative, a maximum of 282 permit holders (93 swordfish handgear and 189 swordfish directed) would be authorized to utilize this gear type to target swordfish.

As mentioned above, there are no data indicating exactly how many commercial vessels are currently fishing with unattached handlines because the HMS logbook does not differentiate between "attached" and "unattached." Data presented in Table 4.66 indicate that the number of

commercial HMS fishing trips that reported using handline gear has decreased significantly from 2000 to 2003. However, the average number of hooks fished per trip and the number of swordfish kept per trip has increased. Swordfish kept per hook (CPUE) also increased from 0.02/hook in 2000 to 0.04/hook in 2003 (Table 4.66). This could be due to greater swordfish abundance, or due to the use of more effective fishing techniques. It is likely a combination of both of these factors. While the 2002 SCRS North Atlantic swordfish stock assessment showed signs of substantially improved recruitment and increased spawning biomass, the increased number of hooks fished per trip would indicate either longer trips and/or the use of more effective fishing techniques, including unattached handlines. Although it is not possible to conclusively determine that the HMS handline fishery is becoming more efficient through the use of unattached handlines, the increased number of hooks and the higher numbers of swordfish landed may indicate that this is occurring. Overall, the HMS commercial handline fishery has relatively few discards, and all of the reported discards were released alive.

Table 4.66 Average Catch Per Trip from Vessels that Reported Using Handline Gear in the HMS Logbook 2000 - 2003. Source: HMS Logbook.

	2000	2001	2002	2003
Number of trips	115	83	74	7
Hooks	394	475	428	545
Swordfish kept	7.8	3.7	13.7	20.6
YFT kept	0.7	4.4	1.3	0.0
BET kept	0.0	2.2	3.9	2.0
LCS kept	0.7	0.2	0.3	0
Pelagic shark kept	0.1	0.1	0.3	0.1
Non-HMS kept	8.3	12.0	9.0	1.4
Swordfish discarded alive	0.4	0.0	0.0	0.0
YFT discarded alive	0.5	0.2	1.1	1.0
BET discarded alive	0.0	0.0	0.0	0.0
LCS discarded alive	3.9	4.5	2.2	2.4
Pelagic shark discarded alive	1.2	0.9	0.8	1.8
Non-HMS discarded alive	0.2	0.1	0.0	0.4
Swordfish discarded dead	0.0	0.0	0.0	0.0
YFT discarded dead	0.0	0.0	0.0	0.0
BET discarded dead	0.0	0.0	0.0	0.0
LCS discarded dead	0.0	0.0	0.0	0.0
Pelagic shark discarded dead	0.0	0.0	0.0	0.0
Non-HMS discarded dead	0.0	0.0	0.0	0.0

Under alternative H6, vessels employing buoy gear would be limited to possessing and deploying up to 50 buoys, and attaching up to 15 hooks and/or gangions to each buoy gear. This alternative would have ecological impacts similar to alternative H5, as discussed above, with some potential for additional negative ecological impacts as compared to alternative H5 stemming from an increase in the allowable number of buoys and hooks, and potentially increased soak times. At this time, it is not possible to quantify what impacts this alternative could have on handline/buoy gear effort or bycatch. If it is assumed that handline fishermen

currently deploy no more than two hooks per gear, then this alternative could increase effort in the fishery. This could lead to increased catches of target and non-target species, and has the potential to increase the probability for interactions with protected resources. However, although the number of discards may increase, available data show that all reported discards in this fishery have been released alive.

Alternative H6 may not increase fishing effort substantially as an average of only 70 commercial HMS handline trips per year were reported from 2000 – 2003 (Table 4.66). Further, impacts resulting from potential increases in effort may be limited as anecdotal information, as well as a review of available HMS logbook data, suggest that some commercial handline fishermen could potentially fish with up to 50 buoys and some fishermen may currently be using more than the allowed two hooks per gear.

Under alternative H7, the continued use of secondary hand-held cockpit gears may reduce the loss of fish at boat side and aid anglers in subduing large HMS captured on authorized primary gears types. However, the use of these gears may also increase bycatch mortality/dead discards if undersized or non-target species are gaffed or darted and subsequently discarded. NMFS regulations at 50 CFR § 635.21(a) clearly state that any HMS harvested that is not retained must be released in a manner to ensure maximum probability of survival. Under this alternative, NMFS would encourage restraint prior to using a secondary hand-held cockpit gear on fish that may need to be released. This alternative should not result in an increase in bycatch mortality, over current levels, as the secondary hand-held cockpit gears are currently utilized in HMS fisheries. The Agency does not expect the use of secondary handheld cockpit gears in the Atlantic HMS fisheries to increase interactions with protected resources.

With regards to impacts on EFH, the 1999 FMP and Amendment 1 to the Atlantic Billfish FMP state that Atlantic HMS occupy pelagic oceanic environments. The use of speargun fishing gear, green-stick fishing gear, buoy gear, and handheld cockpit gears will not likely impact bottom structures or otherwise damage habitat. Under all of the above alternatives, NMFS does not anticipate any adverse impacts to EFH.

Social and Economic Impacts

Alternative H1 (No Action) would not be expected to have any additional social or economic impacts because fishermen are already operating under these measures. Similarly, there are no additional significant safety implications anticipated with this alternative. This alternative would, however, not allow the use of speargun fishing gear in the Atlantic tuna fishery and not allow non-PLL vessels to use the commercial configuration of green-stick gear. This alternative would also not address confusion over the allowable use of cockpit gears (*e.g.*, dart harpoon, flying gaff).

Alternative H2 could have positive social and economic impacts for spearfishermen, and may result in negative social and economic impacts for rod and reel fishermen. At the 1993 public hearings on the proposed list of authorized gears in the Atlantic tuna fisheries, no comments were received from spearfishermen and the regulations were made final without listing speargun fishing gear as an authorized gear. Since implementation of the final rule, NMFS has received written requests, comment at public hearings, and has heard presentations at

AP meetings requesting that NMFS authorize the use of speargun fishing gear in the Atlantic tuna fishery. NMFS has received comment that recreational spearfishermen place a high value on spearfishing for tunas and are currently traveling outside of the United States for the opportunity to participate in speargun fisheries for tunas.

A range of potential costs for spearfishing gear was estimated by an informal internet search of spearfishing gear distributor sites. This search found that new spearguns could be purchased for as little as $65.00 and ranged upward to approximately $1,600.00. Terminal gear, such as shooting lines and floats, could cost an additional $50.00 to $500.00. It is likely, however, that most inexpensive spearguns would not be adequate for targeting large tunas. Anecdotal information suggests that some spearfishermen may fabricate their own spearguns and equipment, and may not purchase this equipment from distributors. Additionally, recreational spearfishermen would only be allowed to fish from vessels having HMS Angling and CHB category permits, currently costing $22.00 per year.

Allowing speargun fishing gear as an authorized gear type in the recreational Atlantic tuna fishery would likely result in minor positive economic impacts. Under alternative H2, tunas taken with speargun fishing gear in the Angling category would not be eligible for sale, however, CHB fishermen would continue to be allowed to sell recreational limits of BAYS tunas taken aboard their vessels. Regardless of whether CHB fishermen are operating in a for-hire or non-for-hire manor, BFT harvested by speargun fishing gear may not be sold (see Chapter 2 for more information). Prohibiting the sale of tunas harvested with spearfishing gear will have no economic impact on Angling category fishermen, as the sale of recreationally captured tunas is currently prohibited. Allowing BFT to be taken with speargun fishing gear under the Angling category quota could marginally reduce the amount of quota available for rod and reel anglers, which could result in minor negative social impacts for the recreational rod and reel sector. If BFT are taken with speargun fishing gear, the BFT Angling category season could be shortened with slight potential adverse economic impacts for all Angling category participants. Prohibiting the sale of BFT taken with spearfishing gear from CHB vessels could result in some perceived negative social and economic impacts. However, this activity is not currently allowed under existing regulations, therefore, no additional adverse social or economic impacts are anticipated for the CHB sector.

Rod and reel fishermen may experience a decrease in angler consumer surplus if competition for fishing grounds causes them to travel further and extend their fishing trips. Spearfishermen would likely experience positive social impacts and an increase in angler consumer surplus, as they are currently prohibited from taking tunas with speargun gear in the Atlantic. Spearfishermen have commented that they currently must travel to the West coast or out of the United States to target tunas with speargun fishing gear. The CHB sector may experience positive economic impacts as spearfishermen may increase their use of for-hire vessels, increasing revenues to those vessels. Additionally, alternative H2 could increase the club-nature or camaraderie associated with speargun fishing and may result in positive social impacts. Currently, there are many spearfishing clubs along the Atlantic and Gulf of Mexico coasts, as well as in the Caribbean.

The use of speargun fishing gear was discussed at the March 2005 HMS AP meeting as well as during past AP meetings. At the 2005 AP meeting, the Predraft alternative to allow the use of spearfishing gear in the recreational Atlantic tunas fishery was largely supported. At this most recent meeting, as well as at past AP meetings, AP panel members expressed concerns about the safety of divers and rod and reel fishermen fishing together in the same areas. NMFS has received public comment stating that spearfishermen will likely not attempt to fish near trolling vessels or vessels actively rod and reel fishing for tunas, but instead prefer to raise their own fish using submersible flashers (reflective fish decoys) or other means. Additionally, the commenter added that each spearfishermen tows a series of floats with a dive flag and that they are closely monitored by people aboard support vessels that also display dive flags. NMFS has also received comment that some spearfishermen and rod and reel fishermen have recently fished together in close proximity without incident. This particular commenter also added that spearfishermen were participating in recreational offshore fisheries for dolphin and wahoo in many of the same areas that they would be fishing for tunas, as well as chartering vessels which also cater to the rod and reel sector. This information indicates that gear conflicts are not likely to be problematic.

The social and economic impacts of alternative H3 would likely be similar to those discussed under alternative H2, with potential social and economic benefits for CHB and General category fishermen from the sale of commercially speared tunas. These benefits may also apply to fish houses, gear supply houses, and other associated businesses. Alternative H3 may also increase administrative burden due to additional monitoring and enforcement activities stemming from the retention and sale of commercially speared tunas.

It is not known if commercial tuna handgear fishermen would participate in a commercial speargun fishery for tunas. However, according to feedback received from HMS AP members, and because of the estimated low encounter rates, the Agency does not anticipate that many would. NMFS does not anticipate any substantive changes in impacts for this sector under this alternative.

Alternative H4 could have positive social and economic impacts for those fishermen who wish to employ green-stick gear to target Atlantic BAYS tunas commercially. According to Wescott, 1996, vessels using green-stick gear have reported tuna landings of ten to one over traditional fishing techniques. The use of green-stick gear, and a potential increase in BAYS tuna landings, could provide positive economic impacts to commercial fishermen as well as benefits for fish houses, gear supply houses, and other associated businesses. Additionally, commercial fishermen have found that tuna caught on green-stick gear offer little resistance, as they are subjected to the pull of the mainline in one direction, the pull of the decoy in the other, as well as the pull from other hooked fish. Because tunas caught on green-stick gear may be landed quickly and with minimal fight, the fish may be less stressed and the meat may be of better quality (Wescott, 1996). Landings of higher quality tunas could lead to higher prices, and therefore increased revenues for those commercial vessels deploying this gear type. However, since this gear is currently being used, the Agency does not anticipate this alternative to result in large economic benefits to the commercial sector, in comparison to the current levels. Some commercial tuna fishermen using green-stick gear may experience negative social and economic impacts due to the prohibition on the possession or retention of BFT; however, since the PLL

Logbook data indicate that only four BFT were reported captured using this gear type between 1999 and 2002, NMFS anticipates that any negative impacts would likely be minor.

The vessels that would be authorized to use green-stick gear under alternative H4 would include all permitted Atlantic Tunas Longline, General, and CHB (on non for-hire trips) category vessels, approximately 221, 5,267, and 4,029 vessels, respectively. However, the number of vessels actually reporting using this gear is, as reported in the PLL Logbook data, considerably less (six vessels). These vessels primarily appear to be operating in the MAB area. NMFS is aware that the number of vessels that utilize this gear type likely exceeds those reporting in the PLL Logbook. Other commercial vessels using this gear type likely report landings under the handgear designation. The number of commercial vessels deploying green-stick gear may increase as a result of this alternative due to the reduced confusion regarding the legality of using this type of gear. However, as discussed earlier, NMFS does not anticipate large increases in effort or landings.

Due to limited data on the costs of outfitting a commercial vessel with green-stick gear, the Agency is specifically requesting public comment on the costs associated with this gear type.

Alternative H5 would allow the commercial swordfish handgear fishery to continue utilizing unattached handlines, redefined as buoy gear, and would likely continue affording positive social and economic benefits to current fishery participants. Under this alternative, a maximum of 282 permit holders (93 swordfish handgear and 189 swordfish directed) would be authorized to utilize this gear type to target swordfish. HMS logbook data indicate that effort in the HMS handline fishery has been declining in recent years, with only seven trips being reported in 2003 (Table 4.66). Based on public comment, the swordfish handgear fishery does not appear to be widespread and appears to operate primarily off of the East Coast of Florida. While this alternative would limit the maximum number of buoys possessed or deployed, the Agency selected an upper limit based on information obtained about the fishery through public comment, and based on what NMFS has identified as the manageable upper limit for the commercial sector. This alternative would also require that fishermen using this gear type affix gear monitoring equipment to each buoy to aid in recovery. NMFS anticipates that most swordfish handgear fishermen using unattached handlines likely already possess and utilize some or all of this gear monitoring equipment. If not, minimum compliance costs for the least expensive equipment (*e.g.* reflective tape and spotlight) could be incurred.

If vessels are currently fishing with more than 35 free-floating buoyed handlines, there could be some unquantifiable adverse economic impacts for these vessels. NMFS expects that swordfish catches under this alternative would remain large enough for trips to be profitable. Because this alternative may limit or reduce fishing effort, it could potentially produce adverse social and economic impacts, including an unquantifiable reduction in catches of target species. NMFS does not anticipate that this will occur, however, if fishing effort is reduced, opportunities for the United States to fully utilize its ICCAT swordfish quota could be restricted.

Alternative I5b, a preferred alternative discussed in the Regulatory Housekeeping in Section 4.3.4, would require that all handlines used in HMS fisheries be attached to a vessel. Under alternative H5, the ability to utilize buoy gear represents a positive social and economic

opportunity for commercial swordfish handgear/directed swordfish permit holders. Conversely, this alternative could result in perceived negative social impacts by recreational fishermen by continuing to allow commercial swordfishing in areas closed to HMS pelagic longline gear.

Alternative H6 would likely have social and economic impacts similar to those discussed under alternative H5, with some possible additional positive social and economic impacts stemming from the ability to increase the number of hooks attached to each buoy gear. Allowing vessels to possess or deploy up to 50 buoys and utilize up to 15 hooks per gear could potentially increase catch rates of target species, resulting in increased revenues for those vessels deploying this gear type. Due to limited logbook data, NMFS cannot quantify any potential increases in landings at this time. Alternative H6 could result in perceived negative social impacts by recreational fishermen by continuing to allow commercial swordfishing in areas closed to HMS pelagic longline gear.

Alternative H7 would likely have positive social impacts for those fishermen who target large HMS and wish to employ these secondary gears to aid in the landing or subduing of HMS at boat side. This alternative would also likely reduce confusion over their allowable use. The use of these gears may also promote safety at sea for HMS fishermen, by allowing fishermen to utilize gears specifically designed to gain control of and subdue large fish from safer distances. Conversely, the use of these gears can be dangerous and may create additional safety hazards for fishermen. Many of these gears have sharp edges or points that may be hazardous to those employing them or to others onboard a vessel. Some cockpit gears also incorporate trailing lines that may entangle fishermen and may result in fishermen being pulled overboard, drowning, or suffering other injuries.

Under alternative H7, fishermen who are permitted to sell HMS may experience positive economic benefits stemming from anticipated increased retention rates. Anecdotal information suggests that these gears are currently being used in both recreational and commercial fisheries for HMS. If these gears are being utilized, the resulting benefits from this alternative will likely be less than those discussed above.

Conclusion

Alternative H2 is preferred because it would allow spearfishermen to participate in the Atlantic tuna fishery and would likely result in positive social and economic impacts. This alternative is responsive to specific public comment and requests from constituents. Additionally, alternative H2 is anticipated to result in minimal negative ecological impacts. Alternative H4 is preferred because it would define and authorize the use of green-stick gear and will likely result in positive social and economic impacts for commercial BAYS tuna fishermen. Potential increases in landings of tunas and other HMS could occur under this alternative, however, it is not anticipated that authorizing this gear type would significantly increase landings or landings rates, or have significant adverse ecological impacts. Alternative H5 is preferred because it would allow the swordfish handgear fishery to continue to utilize individual buoyed gears, and would limit the maximum number of buoys possessed or deployed by a vessel. Alternative H5 would likely result in positive social impacts and maintain current economic benefits to this sector. This alternative may provide some positive ecological benefits by limiting future expansion of this gear sector and possibly by reducing the amount of lost fishing

gear. Additionally, the United States has consistently landed less than its ICCAT swordfish quota in recent years, and although the North Atlantic swordfish stock is currently overfished, overfishing is not occurring. Alternative H5 could aid in the rebuilding of North Atlantic swordfish and is anticipated to maintain current economic benefits to this sector. Alternative H7 is preferred because it would clarify the allowable use of secondary cockpit gears and will likely result in positive social impacts. This alternative should not result in an increase in bycatch mortality, over current levels, as secondary gears are currently utilized in HMS fisheries. Alternative H7 is also responsive to requests from fishery participants.

4.3.4 Regulatory Housekeeping

As described in Section 2.3.4.2, eleven issues are analyzed within this section. These include: (Issue 1) Definitions of pelagic longline (PLL) and bottom longline (BLL) gear; (Issue 2) Shark identification; (Issue 3) HMS retention limits; (Issue 4) Definition of East Florida Coast Closed Area; (Issue 5) Definition of handline; (Issue 6) Possession of billfish on vessels issued commercial permits; (Issue 7) BFT dealer reporting; (Issue 8) "No-fishing" and "cost-earnings" reporting forms; (Issue 9) Non-tournament recreational landings reporting; (Issue 10) Pelagic longline 25 mt incidental BFT allocation; and, (Issue 11) Permit condition for recreational trips.

Issue 1: Definitions of Pelagic and Bottom Longlines

As described in Chapter 2, the alternatives being considered to better differentiate between PLL and BLL gear are:

I1(a) Retain current definitions for PLL and BLL gear (No Action)
I1(b) Establish additional restrictions on longline gear in HMS time/area closures by specifying a maximum and minimum allowable number of commercial fishing floats to qualify as a BLL and PLL vessel, respectively – Preferred Alternative
I1(c) Differentiate between PLL and BLL gear based upon the species composition of the catch onboard or landed – Preferred Alternative
I1(d) Require time/depth recorders (TDRs) on all HMS longlines
I1(e) Base HMS time/area closures on all longlines (PLL and BLL)

Ecological Impacts

Alternative I1(a) would retain the current definitions for PLL and BLL gear (No Action). In the existing regulations, the longline definitions are based upon the presence of weights/floats capable of anchoring/supporting the mainline on/in the seafloor/water column. There is no specific threshold regarding how many weights or floats are allowed. Problems have arisen with these definitions because some BLL vessels may possess and utilize floats on bottom longlines, and some PLL vessels may possess and utilize weights on pelagic longlines. Therefore, in some instances, it may be difficult to precisely determine compliance with HMS closed area and VMS regulations, which are specific to either HMS-permitted PLL or BLL vessels. This may compromise the effectiveness of HMS time/area closures. In the absence of full compliance with current closed area restrictions, adverse ecological impacts may occur including increased discards of juvenile and sub-adult swordfish, bluefin tuna, dusky sharks, sandbar sharks, other HMS, other finfish, and protected species.

Alternative I1(b), a preferred alternative, would establish additional restrictions on longline gear in HMS time/area closures. Specifically, to be considered a BLL vessel in a PLL closed area, the vessel must possess no more than 70 commercial fishing floats onboard or deployed, combined. To be considered a PLL vessel in a BLL closed area, the vessel must possess at least 71 commercial fishing floats onboard or deployed, combined. Examples of commercial fishing floats include bullet floats, poly balls, high flyers, and lobster pot buoys. NMFS is specifically seeking comments on this list to determine if it is complete and/or accurate. Also, NMFS is considering whether to include a definition of "fishing floats" in the final rule for this action. Comments are requested on potential language to define "fishing floats." The establishment of quantifiable gear-based criteria to differentiate between PLL and BLL gear would eliminate some of the ambiguity between these gear types. This would improve the monitoring and effectiveness of, and compliance with, HMS closed areas. With improved monitoring and compliance, the ecological benefits associated with HMS closed areas would remain intact, including reductions in discards of juvenile and sub-adult swordfish, bluefin tuna, dusky sharks, sandbar sharks, other HMS, and protected species. However, if the number of allowable floats is not sufficient for the gear to operate as intended, it could potentially result in broken sets or lost fishing gear. The unintended consequence could potentially be an unquantifiable increase in bycatch and species entanglements. Also, establishing a threshold based on the allowable number of floats onboard or deployed could create an incentive for vessel operators to carry just enough floats to comply with one of the two definitions, but actually fish in an opposite manner (pelagically or demersally). This practice could compromise the effectiveness of the closed area restrictions. Thus, alternative I1(b) is being jointly preferred in conjunction with species-based alternative I1(c) to reduce the likelihood of this practice occurring.

Alternative I1(c), a preferred alternative, would establish a five-percent limit (by weight) on the allowable amount of pelagic “indicator” species that BLL vessels may possess or land from PLL closed areas, and establish a five-percent limit (by weight) on the allowable amount of “indicator” demersal species that PLL vessels may possess or land from BLL closed areas. The “indicator” species are listed in Table 4.67. NMFS is specifically seeking comments on the list of pelagic and demersal “indicator” species. The establishment of quantifiable species-based criteria to differentiate between PLL and BLL fishing gear would help to eliminate ambiguities, because PLL gear would logically be expected to capture pelagic species and vice-versa. This would improve the monitoring and effectiveness of, and compliance with, HMS closed areas. With improved monitoring and compliance, the ecological benefits associated with HMS closed areas would remain intact, including reductions in discards of juvenile and sub-adult swordfish, bluefin tuna, dusky sharks, sandbar sharks, other HMS, and protected species. However, establishing a threshold based on the species composition of the catch could result in an increase in regulatory discards if vessel operators discard species because the threshold is exceeded, either intentionally or accidentally. Excessive discards could compromise the effectiveness of the closed area restrictions. Although NMFS does not anticipate significant numbers of regulatory discards, alternative I1(c) is being preferred in conjunction with gear-based alternative I1(b) to reduce the likelihood of this occurring. Because operators would need to comply with the float restrictions described in alternative I1(b), the species threshold will be less likely to be exceeded.

As mentioned above, alternatives I1(b) and I1(c) would work together. This means that if a vessel meets only one of the criteria in the closed areas, it is presumed that the vessel is fishing with prohibited gear in a closed area. For example, if a vessel is found in a PLL closed area and it meets the float restrictions for BLL gear, but exceeds the five-percent limit for pelagic "indicator" species, the vessel would be assumed to be a PLL vessel. Similarly, if a vessel is found in a PLL closed area and meets the species composition criteria for BLL vessels, but possesses more than 70 commercial fishing floats, the vessel will be assumed to be a PLL vessel.

Alternative I1(d) would require time/depth recorders (TDRs), or data loggers, at pre-specified intervals on all HMS longlines. The TDRs must be operational, and able to accurately record the maximum and minimum fishing depths of HMS longline gear using an onboard TDR reader. Pelagic longline gear would be required to remain within the upper two-thirds of the water column while fishing, and bottom longline gear would be required to remain within the bottom third of the water column while fishing. This alternative, in combination with information indicating a vessel's fishing location and water depth information from charts or sounders, could indicate how deep the longline gear was fishing and whether it was fishing pelagically or demersally. This would improve the monitoring and effectiveness of, and compliance with, HMS closed areas. With improved monitoring and compliance, the ecological benefits associated with HMS closed areas would remain intact, including reductions in discards of juvenile and sub-adult swordfish, bluefin tuna, dusky sharks, sandbar sharks, other HMS, and protected species.

Alternative I1(e) would implement longline time/area closures that would be effective for both HMS-permitted PLL and BLL vessels. As mentioned above, the existing time/area closures are specific to either HMS-permitted PLL or BLL vessels, but not to both. This alternative would effectively eliminate any uncertainties in differentiating between the two gear types by prohibiting both in all closed areas. This would improve the monitoring and effectiveness of, and compliance with, time/area closures. With improved monitoring and compliance, the ecological benefits associated with HMS closed areas would remain intact, including reductions in discards of juvenile and sub-adult swordfish, bluefin tuna, dusky sharks, sandbar sharks, other HMS, and protected species. By implementing non-gear-specific closed areas, alternative I1(e) could also provide additional conservation benefits for many other species. Because HMS-permitted BLL vessels would be prohibited from fishing year-round in the Desoto Canyon and East Florida Coast closed areas, and seasonally in the Charleston Bump and Northeastern U.S closed areas, additional conservation benefits for many species of sharks and other demersal finfish could occur. These are areas of intensive BLL fishing activity. For the three-year period (2001 – 2003), 142 BLL sets were reported in these areas in the HMS logbook. Similarly, because HMS-permitted PLL vessels would be prohibited from fishing seasonally in the Mid-Atlantic Shark closed area, pelagic species and some sharks that are caught as bycatch on PLL gear occupying this area could potentially be conserved. This alternative could also provide additional conservation of protected species, including threatened and endangered sea turtles and marine mammals.

Social and Economic Impacts

Alternative I1(a) (No Action) would likely produce the fewest additional adverse social and economic impacts on commercial fishing vessels. However, the No Action alternative does

have some associated negative social impacts. Because it may be difficult to precisely differentiate between PLL and BLL gear, commercial fishing activities on vessels boarded at sea may be interrupted for longer periods of time while compliance with closed area regulations is determined. Valuable economic and administrative resources might be required on behalf of both industry and government to resolve these gear definition issues. Also, negative social impacts would occur under the No Action alternative if some commercial fishing vessels are illegally deploying PLL gear in PLL closed areas or BLL gear in BLL closed areas.

Alternative I1(b), a preferred alternative, would establish additional restrictions on longline gear in HMS time/area closures by requiring that BLL vessels in PLL closed areas possess no more than 70 commercial fishing floats, and that PLL vessels in BLL closed areas possess at least 71 commercial fishing floats. A threshold of 70 floats was chosen to differentiate between PLL and BLL gear based upon data obtained from the HMS logbook. In 2002 and 2003, a total of 233 sets were reported as using BLL gear. Of these, 23 BLL sets (10 percent) deployed 40 or more floats. Only 12 BLL sets (5 percent) reportedly deployed 180 or more floats. The reported median was 15 floats on BLL gear. For the same time period, a total of 19,441 sets were reported as using PLL gear. Of these, 17,496 sets (90 percent) deployed 87 or more floats, and 18,469 sets (95 percent) deployed 72 floats or more. Thus, at least 90 percent of all reported BLL sets in 2002 and 2003 possessed less than 70 floats, and approximately 95 percent of all reported PLL sets in 2002 and 2003 possessed more than 70 floats. In terms of vessels, five vessels reported using greater than 70 floats on bottom longline gear for at least one set in either year; most of these vessels have home ports in North Carolina and north. Eighty-seven vessels reported using fewer than 70 floats on pelagic longline gear for at least one set in either year; most of these vessels have homeports in Florida although some of them have homeports in North Carolina, South Carolina, and Louisiana.

Overall, alternative I1(b) is not expected to produce significant adverse social or economic impacts. Based on the data presented above, this alternative would potentially impact less than five percent of all PLL sets, and less than ten percent of all BLL sets. The actual percent is likely to be smaller than this since the alternative would only apply to the few vessels that are actually fishing with PLL gear in BLL closed areas, or fishing with BLL gear in PLL closed areas. Based on the homeports of the vessels that reported using BLL gear and more than 70 floats for at least one set, few of those vessels are based next to a PLL closed area. They are based next to a BLL closed area. Based on the homeports of the vessels that reported using PLL gear and fewer than 70 floats, few of those vessels are based next to a BLL closed area while they are next to several PLL closed area. Thus, this alternative should not have a large impact on fishermen fishing with BLL in PLL closed areas or with PLL in BLL closed areas. However, it could, appropriately, impact a small number of PLL vessels fishing near PLL closed areas and a small number of BLL vessels fishing near BLL closed areas. To comply with this alternative, BLL vessel operators fishing in a PLL closed area could choose to reduce the overall length of their BLL gear or change the configuration of their gear. This could potentially increase the number of sets deployed and some associated variable costs including fuel, ice and food. Also, if the number of allowable floats is not sufficient for the gear to operate as intended, it could potentially result in broken sets or lost fishing gear. Positive social and economic impacts are anticipated for both industry and government with this alternative if it is successful at providing

a quick method to reliably differentiate between PLL and BLL gear. This alternative is not expected to compromise safety at sea, as it should not significantly alter current fishing practices.

Alternative I1(c), a preferred alternative, would differentiate between PLL and BLL gear based upon the species composition of the catch onboard or landed. It would establish a five-percent limit (by weight) on the allowable amount of "indicator" pelagic species that BLL vessels may possess or land from PLL closed areas, and establish a five-percent limit (by weight) on the allowable amount of "indicator" demersal species that PLL vessels may possess or land from BLL closed areas. The "indicator" species are listed in Table 4.67. These species were chosen because they represent the primary target species in the pelagic and bottom longline fisheries. The percent of "indicator" pelagic species is measured relative to the percent of "indicator" demersal species, and vice-versa. The five-percent incidental allowance is based upon historical landings of species, as reported from 2000 – 2003 in the snapper/grouper logbook (Table 4.68). Table 4.68 shows that the percent of "indicator" pelagic species landed by BLL vessels ranged from 3.21 percent in 2002 to 4.95 percent in 2001, with a four-year average of 3.69 percent. Therefore, because the five-percent threshold is higher than both the average and the single highest year, alternative I1(c) is not expected to produce significant adverse social or economic impacts. The actual percent of affected vessels is likely to be smaller than this, since the alternative would only apply to the few vessels that are actually fishing with PLL gear in BLL closed areas, and fishing with BLL gear in PLL closed areas. However, this alternative could adversely impact those longline vessels that regularly exceed the incidental allowance by targeting both demersal and pelagic species on the same fishing trip. It may require that vessel operators decide, prior to the start of a fishing trip, to specifically target either demersal or pelagic species. For vessel operators that choose to target both, some adverse economic impacts could result if they are unable to retain a portion of the catch that otherwise would have been retained on mixed fishing trips in the closed areas, or they could choose to fish outside of the closed areas. There could be some additional costs on vessels if boarded at sea by enforcement, and it was necessary to retrieve or observe fish in the hold to calculate the percent of demersal and pelagic species possessed onboard. The time required to do this could create an economic burden in terms of lost opportunity costs and, possibly, reduced net revenues associated with re-icing the fish and reduced quality of the catch. These costs would not be incurred if this alternative were enforced dockside. Conversely, positive social and economic impacts would be realized with this alternative if the species composition of the catch can quickly be determined with minimal disruption to commercial fishing and law enforcement activities. This alternative is not expected to compromise safety at sea, as it should not significantly alter current fishing practices.

Table 4.67 List of "Indicator" Species to Determine Composition of Catch.

PELAGIC SPECIES	DEMERSAL SPECIES
DOLPHINFISH	GROUPER, BLACK
SHARK, BLUE	GROUPER, GAG
SHARK, OCEANIC WHITETIP	GROUPER, MARBLED
SHARK, PORBEAGLE	GROUPER, MISTY
SHARK, SHORTFIN MAKO	GROUPER, RED
SHARK, THRESHER	GROUPER, SNOWY
SWORDFISH	GROUPER, WARSAW
TUNA, ALBACORE	GROUPER, YELLOWEDGE
TUNA, BLUEFIN	GROUPER, YELLOWFIN
TUNA, BIGEYE	HIND, RED
TUNA, SKIPJACK	HIND, ROCK
TUNA, YELLOWFIN	HIND, SPECKLED
WAHOO	SHARK, ATLANTIC SHARPNOSE
	SHARK, BLACKNOSE
	SHARK, BLACKTIP
	SHARK, BONNETHEAD
	SHARK, BULL
	SHARK, FINETOOTH
	SHARK, GREAT HAMMERHEAD
	SHARK, LEMON
	SHARK, NURSE
	SHARK, SANDBAR
	SHARK, SCALLOPED HAMMERHEAD
	SHARK, SILKY
	SHARK, SMOOTH HAMMERHEAD
	SHARK, SPINNER
	SHARK, TIGER
	SNAPPER, BLACKFIN
	SNAPPER, CUBERA
	SNAPPER, DOG
	SNAPPER, LANE
	SNAPPER, MANGROVE
	SNAPPER, MUTTON
	SNAPPER, QUEEN
	SNAPPER, RED
	SNAPPER, SCHOOLMASTER
	SNAPPER, SILK
	SNAPPER, VERMILION
	SNAPPER, YELLOWTAIL

Table 4.68 Historical Per Trip Average Catch Composition of "Indicator" Species. Source: Snapper/Grouper Logbook

	Pelagic (lb)	Demersal (lb)	Pelagic (%)	Demersal (%)
2000	507 lb	14,185 lb	3.45 %	96.55 %
2001	636 lb	12,209 lb	4.95%	95.05 %
2002	485 lb	14,241 lb	3.29 %	96.71 %
2003	457 lb	13,772 lb	3.21 %	96.79 %
Average	521 lb	13,602 lb	3.69 %	96.31 %

Alternative I1(d) would require time/depth recorders (TDRs), or data depth loggers, at pre-specified intervals on all HMS longlines. PLL gear would be required to remain within the upper two-thirds of the water column while fishing, and BLL gear would be required to remain within the bottom third of the water column while fishing. This alternative would result in direct economic costs associated with the purchase of TDRs and data readers (communications hardware). Relatively few companies currently manufacture these devices for commercial use, and prices vary widely. Most current applications involve research projects, so prices would be expected to decrease if their use became more widespread as a result of implementing this alternative. Currently, based upon telephone inquiries to two manufacturers, the costs for one TDR and a reader range from approximately $680.00 – $1,300.00. Individual TDRs (without a reader) are available from one manufacturer for approximately $180.00. Therefore, assuming that a minimum of five TDRs and one reader per vessel would be required, the direct costs would range from $1400.00 ($180.00 X 5 + $500.00) to $6,500.00 ($1,300.00 X 5). These costs may be higher if vessel operators purchase extra TDRs to replace lost or damaged equipment. The lead-time for processing orders currently ranges from six to ten weeks. Aside from these direct costs, there could be some indirect costs associated with a loss in efficiency due to attaching TDRs to longlines, and downloading and recording the information. Some positive social and economic impacts could be realized with this alternative if the TDR data could be quickly downloaded and interpreted by law enforcement with minimal disruption to normal commercial fishing and law enforcement activities. This alternative would not be expected to compromise safety at sea, but there is a possibility that attaching and detaching TDRs could alter some current fishing practices.

Alternative I1(e) would implement HMS longline time/area closures that are effective for both pelagic and bottom longline HMS-permitted vessels. If selected, this alternative would prohibit HMS-permitted BLL vessels from fishing year-round in the DeSoto Canyon and East Florida Coast closed areas, in the Charleston Bump closed area from February 1 through April 30 each year, and in the Northeastern U.S. closed area from June 1 through June 30 each year. It would also prohibit HMS-permitted PLL vessels from fishing in the Mid-Atlantic shark closed area from January 1 through July 31 each year. Of all the alternatives for this issue, alternative I1(e) would be expected to produce the most significant negative economic impacts, primarily on HMS-permitted BLL vessels that would be prohibited from fishing year-round in the DeSoto Canyon and East Florida Coast closed areas, in the Charleston Bump closed area from February 1 through April 30 each year, and in the Northeastern U.S. closed area from June 1 through June 30 each year. For HMS-permitted BLL vessels, the DeSoto Canyon area would eliminate approximately 32,860 nm^2 miles of ocean; the East Florida Coast closed area would eliminate approximately 50,720 nm^2 of ocean; the Charleston Bump closed area would seasonally eliminate approximately 49,090 nm^2 of ocean; and, Northeastern U.S. closed area would seasonally eliminate approximately 21,600 nm^2 of ocean. These are areas of intensive bottom longline fishing activity and, in the case of the East Florida Coast closed area, comprise major fishing areas for BLL vessels. For the three-year period (2001 – 2003), 142 bottom longline sets were reported in these PLL closed areas in the HMS logbook. Also, some former BLL vessels may recently have switched to PLL fishing in BLL closed areas to mitigate adverse impacts. This alternative would prohibit both types of HMS longline fishing activity.

Conclusion

NMFS prefers alternatives I1(b) and I1(c), which would establish additional restrictions on PLL and BLL gear in HMS time/area closures by specifying a minimum and maximum number of allowable floats on these gears, and also differentiate between gears based upon the species composition of the catch onboard or offloaded. These alternatives are not expected to create significant adverse economic and social impacts. They are preferred because these alternatives would accommodate the majority of commercial fishing operations and still provide a quantifiable method to differentiate between PLL and BLL vessels. The float requirements in alternative I1(b) are projected to impact less than five percent of all PLL sets, and less than ten percent of all BLL sets. The species threshold to determine the composition of catch in alternative I1(c) is proposed to be higher than both the four-year average and any single year. The actual percent of affected vessels is likely to be smaller than this, since the alternative would only apply to the few vessels that are actually fishing with PLL gear in BLL closed areas, and fishing with BLL gear in PLL closed areas. There may be some minor adverse economic impacts on vessels that deploy unusual numbers of floats or that fish for both pelagic and demersal species on the same trip, but those are expected to be rare occurrences, particularly in the HMS longline closed areas, based upon HMS logbook information. Both limits (float numbers and species composition) were specifically chosen because they are consistent with the vast majority of commercial fishing operations. These alternatives are expected to improve the monitoring of, and compliance with, HMS closed area regulations. Therefore, the ecological benefits associated with HMS closed areas are expected to remain intact, including reductions in discards of swordfish, bluefin tuna, dusky sharks, sandbar sharks, other HMS, other finfish, and protected species. Alternative I1(d) would impose larger negative social and economic impacts than the preferred alternatives because of the requirement to purchase TDRs, and would require precise information on longline location and water depth to determine compliance. Alternative I1(e) would have the largest ecological benefits, but would also have the largest adverse social and economic impacts.

Issue 2: Shark Identification

As described in Chapter 2, the alternatives being considered to aid in shark identification include:

I2(a) Retain current regulations regarding shark landing requirements (No Action)
I2(b) Require that the 2nd dorsal fin and the anal fin remain on all sharks through landing – Preferred Alternative
I2(c) Require that the 2nd dorsal fin and the anal fin remain on all sharks through landing, except for lemon and nurse sharks
I2(d) Require that all fins remain on all sharks through landing

Ecological Impacts

Under alternative I2(a), the current regulations would remain in place. The existing regulations allow fishermen to remove all shark fins from the carcass, as long as the total weight of the shark fins do not exceed five percent of the total weight of the dressed carcass. Additionally, all fins must be offloaded at the first point of landing. These regulations were first

put in place in the 1993 Atlantic Shark FMP (April 26, 1993, 58 FR 21931) and were later implemented nationally through the Shark Finning Prohibition Act (February 11, 2002, 67 FR 6194). The 1993 Shark Fishery Management Plan noted that prohibiting the finning of sharks (removing the fins and throwing the rest of the shark overboard) would reduce fishing mortality of sharks because fishermen would want to save freezer space for the more valuable carcasses, such as swordfish and tuna. While this statement is generally correct, NMFS has found that by allowing all the fins to be removed from the carcass, the ability to identify sharks at the dock has been hampered. This could affect the accuracy of dealer reporting of sharks landed by species, and consequently have implications for stock assessments and quota monitoring. Additionally, NMFS has found that while many fishermen follow the regulations, some fishermen illegally keep fins from species that are different from those they land and, correspondingly, discard a number of unwanted shark carcasses and lower value fins overboard in order to maintain the five percent ratio. In other words, some fishermen mix and match fins and carcasses in order to maintain the highest profit while still coming in under the five percent ratio. Thus, while the current regulations have ultimately reduced shark fishing mortality from the level it was at in 1993, it may not have reduced shark fishing mortality to the extent anticipated.

Under the preferred alternative, alternative I2(b), shark fishermen could still remove the more valuable fins from a shark while at sea (*e.g.*, the dorsal, caudal, and/or pelagic), but the smaller second dorsal and anal fins would need to remain attached to the shark while the vessel was at sea. Once landed, those fins could be removed either by the fisherman or the dealer. While shark "logs"- carcasses with fins removed- with only the second dorsal and anal fin could still be misidentified by the dealer, requiring those fins to remain on the shark until the first point of landing would likely improve dock-side identification of the shark "log." While this alternative would not help in identifying fins separated from the carcass, landings with many high-grade fins from species that normally produce lower grade fins may be more obvious, resulting in increased enforcement and DNA analyses of the fins and carcasses. Additionally, under alternative A8 (see Section 4.1.1), NMFS is proposing to require shark dealers to attend identification workshops. Those workshops, in combination with this alternative, should help to improve the accuracy of dealer reports. Improving identification of the sharks could improve quota monitoring and stock assessments.

Alternative I2(c) is similar to I2(b), however, fishermen would be allowed to remove all the fins from lemon and nurse sharks due to possible economic impacts of requiring that these large fins remain on the shark. In recent years, lemon and nurse shark landings account for one percent or less of total commercial landings for large coastal sharks (see Section 3.4.5.2). If the identification of sharks is improved by requiring that some of the fins remain on the shark, then allowing all the fins to be removed from lemon and nurse sharks should not hinder quota monitoring. However, it is possible that under this alternative, fishermen might decide to remove the second dorsal and anal fin of sharks other than lemon or nurse sharks in order to receive as high an ex-vessel price as possible for the shark. This type of action would be in violation of this alternative. If this action happens, the reported landings of lemon and nurse sharks could increase. Depending upon the species actually being landed and the extent it happens, this activity could have impacts on quota monitoring (*e.g.*, if small coastal sharks are being landed, those sharks would be counted as a lemon or nurse shark both of which are large coastal sharks). This would not facilitate improved data collection for use in stock assessments.

Under alternative I2(d), all shark fins would be required to remain on the shark until the first port of landing. The fins could then be removed either by the fisherman or the dealer. The shark could still be headed, gutted, and bled. To ensure the shark are stored in a manner that would maximize the value and quality of the shark, the fins could be sliced so long as they are not removed completely from the shark (*i.e.*, they could remain attached to the shark via a small amount of uncut skin). Under this alternative, there would be less of a chance of misidentifying the shark or the fin, particularly if the person were trained to identify shark species (see Section 4.1.1 on workshops). Thus, species-specific reporting should improve and, correspondingly, stock assessments should be more accurate. Additionally, because fishermen would no longer be able to bypass the regulations by keeping the fins of sharks that are not landed, fishing mortality of sharks overall could be reduced. This would improve the status of sharks, particularly large coastal sharks, and improve the chances of rebuilding sharks according to the rebuilding plan.

None of the alternatives considered above are likely to have any impacts on protected species or essential fish habitat.

Social and Economic Impacts

Shark fins are the most valuable part of the shark. While fishermen can also sell the meat, teeth, and skin, shark fins comprises the majority of the profit due to the large demand for shark fin soup from Asian countries. While the ex-vessel price of shark meat ranges from $0.25 per pound in 1996 for small coastal sharks to $1.11 per pound in 2001 for pelagic sharks, the ex-vessel price of shark fins range from $6.01 per pound in 1996 to $19.87 per pound in 2002 (see Table 3.65 in Section 3.5.1.2). Fin price depends on the length of the cartilage and the quality of the fin. Large, dry fins are worth more than small, wet fins. Fins are generally bought in sold in three "grades" or quality levels. Through anecdotal information, NMFS knows that the dorsal fin of a large sandbar shark or hammerhead shark can bring top price. According to a discussion on the Elasmo-L listserve, primary fins from a sandbar shark have a larger ex-vessel price than primary fins from a bull shark. The fins from a small shark, such as Atlantic sharpnose, bring in a much lower price.

Under alternative I2(a), there would be no economic or social impacts in the short-term. Fishermen and communities would continue operating as they have since implementation of the regulations in 1993. To the extent that some fishermen are finning sharks illegally, there may be fishing mortality that is not being accounted for in the quota monitoring or the stock assessment. In the long-term, this additional fishing mortality could extend the amount of time required to rebuild large coastal sharks and could increase the chances of pelagic or small coastal sharks becoming overfished. Thus, this illegal activity could reduce the quota available for fishermen and, thus, reduce the overall potential revenues for the fishery.

Under alternative I2(b), fishermen could experience, in the short-term, some adverse economic impacts associated with keeping the second dorsal and anal fins on the sharks. Due to their small size and fiber content, the second dorsal and anal fins of a shark are usually sold as the lowest quality grade and are often referred to as “chips.” Thus, even under the current regulations, these fins are not going to result in a large percentage of the value of the shark. Under this alternative, these fins will remain frozen and will not begin to dry, unlike the other

fins. At the dock, the owner/operator of the vessel will need to determine if the value of these small, wet fins offsets the cost of having crew remove them after the fish have been offloaded from the vessel. This decision will likely rely, in part, on the decision of the dealer regarding (a) whether or not to pay for the fins attached to the shark carcass and (b) whether or not to process the fins while completing the processing of the shark itself. Thus, it is possible that the fishermen will not experience any significant adverse economic impact from this alternative and may experience some benefits if the crew can spend more time processing and packing the sharks at sea and the dealers continue to give them full price for the smaller fins on the carcass. It is equally possible that the fishermen may lose a small portion of their revenue by failing to remove the fins and that the dealers gain by processing the fins after buying the carcass. In the long-term, improved quota monitoring and stock assessment data as a result of this alternative could result in a larger quota and therefore larger net revenues for both the fishermen and the dealer.

Under alternative I2(c), shark fishermen would be allowed to remove all the fins of lemon and nurse sharks while at sea. This would allow these larger fins, which are likely worth more than the anal or second dorsal fin of other sharks, to begin to dry, resulting in a higher profit for the fishermen. However, because currently fishermen land so few lemon and nurse sharks (approximately one percent in total; all nurse sharks are currently released although they can be landed (Burgess and Morgan, 2005)), NMFS believes that any economic benefit gained would be marginal.

Alternative I2(d) would have the largest economic impact of any of the alternatives. In the short-term, this alternative could change the foundation of the U.S. Atlantic shark fin market. At this time and since the fishery began in the 1980s, most shark fins sold in the United States are landed separate from the shark. In 1993, shark fins were required to be removed from the vessel at the first port of landing. This prevented fishermen from drying shark fins onboard their vessel over time in order to increase the value of the fin. Under this alternative, shark fishermen would not be allowed to remove the fins from the shark until the sharks had been removed from the vessel. As with the preferred alternative I2(b), the vessel owner/operator would need to decide whether the benefit of selling the fins separate from the shark outweighed the cost of having the crew remove the fins during offloading. While the fin would likely still be of high quality once dry, it is unlikely that the ex-vessel price of the fins that were packed in ice with the rest of the shark would be as high as the fins that had begun drying. Additionally, if the shark cannot be packed in ice properly due to maintaining the fin on the shark, the quality of the meat, and therefore its value, could also decrease. Costa Rica has implemented this type of regulation that allows fishermen to cut the fin mostly off the shark, as long as a small piece of skin keeps the fin attached to the shark until it is landed. According to a discussion on the Elasmo-L listserve, this practice has allowed fishermen to receive the expected revenues for both the fin and the meat because the fin can be fully removed from the shark, once landed, without thawing the shark.

The overall social impact of any of these alternatives, with the possible exception of alternative I2(d), is likely to be minimal in the long-term. In all cases, shark fins would still be entering the market. For alternatives I2(b) and (c), the economic impact on the fishermen, even if they do not receive as high an ex-vessel price for the wet small fins as they do currently,

should be minimal. Therefore, NMFS would not expect any social impacts. However, under alternative I2(d), it is possible that there could be numerous social impacts, particularly in the short-term, as the market adjusts itself to accepting all wet fins. This could be significant for the fishery and its related communities and support system that has had numerous reductions in quotas and profits since 1993.

Conclusion

NMFS prefers alternative I2(b), requiring the second dorsal and anal fins to remain on the shark through the first port of landing. While this alternative could have some minor economic and social impacts, this alterative could have ecological benefits by enhancing and improving species identification and data collection, thereby leading to improved management and increased shark populations. Alternative I2(c) would have similar economic and social impacts but could confuse the issue of identification and might have adverse ecological impacts compared to either the No Action or the preferred alternative. Alternative I2(d) would have the largest ecological benefits but could also have fairly large adverse economic and social impacts.

Issue 3: HMS Retention Limits

Currently, compliance with many of the HMS retention limits is less effective than intended because the regulations are specific to "persons aboard a vessel" (*i.e.*, vessel owners and operators). As described in Chapter 2, NMFS is considering the following alternatives to address the purchase and sale of HMS by dealers in excess of the retention limits:

I3(a) Retain current regulations regarding retention limits, with no new prohibitions (No Action)

I3(b) Add new prohibition at § 635.71(a)(48) making it illegal for any person to, "Purchase any HMS that was offloaded from an individual vessel in excess of the retention limits specified in §§ 635.23 and 635.24" – Preferred Alternative

I3(c) Add new prohibition at § 635.71(a)(49) making it illegal for any person to, "Sell any HMS that was offloaded from an individual vessel in excess of the retention limits specified in §§ 635.23 and 635.24" – Preferred Alternative

Ecological Impacts

Under alternative I3(a), the No Action alternative, there may be slight negative ecological impacts as vessels may be landing and selling HMS in excess of the commercial retention limits, thus circumventing the conservation benefits derived from those limits. Also under this alternative, dealers are currently not prohibited from purchasing more than the commercial daily or trip-based HMS retention limits from one particular vessel. As the possession of HMS in excess of the commercial retention limit is already illegal under other sections of the regulation implementing the 1999 FMP, there is little data available to accurately assess the magnitude of this issue.

Under alternatives I3(b) and I3(c), the preferred alternatives, the addition of clear prohibitions regarding the sale and purchase of these illegal landings may act as an additional deterrent, and therefore have slightly more positive ecological benefits than the No Action

alternative. These alternatives are not anticipated to result in any additional interactions with protected resources.

Social and Economic Impacts

Under alternative I3(a), individual vessel owner/operators, and/or dealers, may experience some positive economic benefits from the sale, or purchase, of HMS exceeding the current commercial retention limits. However, there may be negative social and economic impacts associated with those activities attributed to violating the vessel trip limits and potential enforcement actions. There would also be negative social impacts associated with the perception of circumventing the intent of the current rules and regulations by law-abiding vessels, owner/operators, and dealers.

Under alternative I3(b), the overall social and economic impacts would be slightly more positive than under the No Action alternative, because it would not only clarify that it is illegal to exceed the commercial retention limits, but clarify that any sale of that excess would also be illegal. Thus, this alternative would further deter illegal activities of this nature.

Under alternative I3(c), the social and economic impacts would be very similar to alternative I3(b), but would hold dealers purchasing HMS accountable for knowing and not purchasing more than the commercial daily retention limits from a particular vessel. Alternatives I3(b) and I3(c) would also aid in the enforcement of HMS regulations.

Conclusion

NMFS prefers alternatives I3(b) and I3(c). The addition of clear prohibitions regarding the sale and purchase of illegal landings may act as an additional deterrent to discourage this practice. Therefore, these alternatives have slightly more positive ecological benefits than the No Action alternative. Although some fishery participants may benefit economically from the illegal sale, or purchase, of HMS exceeding the current commercial retention limits, there will be social benefits obtained as a result of strengthening the regulations on behalf of law-abiding vessel operators and dealers. NMFS believes that these social benefits will outweigh any short-term economic benefit gained as a result of illegally selling catches in excess of the commercial retention limits.

Issue 4: Definition of East Florida Coast Closed Area

As described in Chapter 2, the alternatives that are being considered to better define the East Florida Coast closed area are:

I4(a) Retain current coordinates for the East Florida Coast closed area (No Action)
I4(b) Amend the second coordinate of the East Florida Coast closed area so that it corresponds with the EEZ – Preferred Alternative

Ecological Impacts

Alternative I4(a) would retain the current coordinates for the East Florida Coast PLL closed area (No Action). As such, there would be no additional ecological impacts, either

positive or negative. However, because a current coordinate of the closed area does not extend seaward to the outer boundary of the U.S. EEZ, as originally described in the FSEIS prepared pursuant to the closure (NMFS, June 14, 2000), the No Action alternative provides less of a reduction in the bycatch and discard of juvenile and sub-adult swordfish, sailfish, and other HMS than originally intended in the June 14, 2000, action.

Alternative I4(b) would amend the second coordinate of the East Florida Coast closed area by extending it seaward 1.02 km (0.55 nm), so that it corresponds with the EEZ. Because the closed area would be enlarged, it could provide a greater reduction in the bycatch of juvenile and sub-adult swordfish, sailfish, and other HMS than the No Action alternative. However, this reduction in bycatch and discards is not likely to be substantial, as the outer coordinate being considered in this alternative is only 1.02 km (0.55 nm) seaward (eastward) of the current coordinate.

Social and Economic Impacts

Alternative I4(a) would retain the current coordinates for the East Florida Coast PLL closed area (No Action). As such, there would be no additional social or economic impacts, either positive or negative.

Alternative I4(b) would amend the second coordinate of the East Florida Coast closed area by extending it seaward 1.02 km (0.55 nm) to 28° 17’ 10” N. lat., 79° 11’ 24” W. long. Because the PLL closed area would be enlarged, there would be less area available for PLL fishing activity. This alternative could, therefore, potentially reduce HMS catches and associated landings revenues. However, NMFS expects little, if any, reduction in HMS catches associated with alternative because the geographic size increase is very small. Fishing effort that would have occurred in the area would likely relocate to nearby open areas with similar catch rates. Therefore, overall fishing effort is not expected to change under this alternative, and any potential reduction in catches or revenues would be minimal or nonexistent. This alternative is not expected to compromise safety at sea, as it is not likely to significantly alter current fishing practices.

Conclusion

NMFS prefers alternative I4(b). This alternative would amend the area of the East Florida Coast closed area by extending one coordinate 1.02 km (0.55 nm) seaward of the current coordinate so that it corresponds with the outer boundary of the EEZ. This alternative is not expected to create significant adverse economic and social impacts. Any fishing effort that would have occurred in this area will likely relocate to nearby open areas with similar catch rates. Because the East Florida Coast closed area would be enlarged under this alternative, it could provide a greater reduction in the bycatch of juvenile and sub-adult swordfish, sailfish, and other HMS as compared with the No Action alternative, but this reduction is expected to be minimal.

Issue 5: Definition of Handline

As described in Chapter 2, the alternatives for defining handline are:

I5(a) Retain the current definition of "handline" at § 635.2 (No Action)

I5(b) Amend the definition of "handline" at § 635.2 by requiring that they be attached to, or in contact with, all vessels – Preferred Alternative

I5(c) Require that handlines remain attached to all vessels when fishing recreationally and allow unattached handlines when fishing commercially

Ecological Impacts

Alternative I5(a) would retain the current definition of "handline" at § 635.2 (No Action). This definition does not specify that handlines must remain attached to a vessel, and there is no limit on the number of unattached handlines that may be deployed. There would be no additional ecological impacts, either positive or negative, associated with this alternative. However, it has been brought to the Agency's attention through public comment that some vessel operators, both commercial and recreational, may be deploying numerous handlines that are not attached to their vessel, essentially fishing with miniature, hand-operated longlines, in areas that are closed to pelagic longlines and elsewhere. While these vessel operators are technically compliant with current regulations, the No Action alternative may be inconsistent with the traditional concept that handline gear is relatively benign with minimal ecological impacts. Uncontrolled expansion of this gear sector, especially in areas that are closed to pelagic longlines to protect juvenile and sub-adult fish, could potentially diminish NMFS' ability to accomplish this objective.

Under the current handline definition, most HMS commercial permit holders may legally deploy an unrestricted number of unattached handlines. These include: Atlantic Tunas General (5,057 permittees); Shark Directed (241 permittees); Shark Incidental (348 permittees); Swordfish Directed (195 permittees); Swordfish Incidental (99 permittees); Swordfish Handgear (96 permittees); and Charter/Headboat (except when fishing for billfish where rod and reel is the only authorized gear) (3,820 permittees). Also, except when fishing for billfish, all HMS Angling category permit holders (20,245 permittees) may deploy an unlimited number of unattached handlines. Because vessel owners may possess more than one permit, the actual number of affected entities is less than the sum of the permittees enumerated above. Nevertheless, a large proportion of HMS permit holders could potentially participate in this activity. Based upon public comment, this practice does not appear to be widespread, but it may be growing among a small number of vessel operators, principally those targeting swordfish in the East Florida Coast closed area.

There are no data indicating exactly how many vessels are fishing with unattached handlines, because the HMS logbook does not differentiate between "attached" and "unattached" handlines, and recreational data are limited. Table 4.69 indicates that the number of commercial fishing trips that reported using handline gear has decreased quite significantly from 2000 to 2003. However, the average number of hooks fished per trip and the number of swordfish kept per trip has shown some increase. Swordfish kept per hook (CPUE) has also increased from 0.02/hook in 2000 to 0.04/hook in 2003. This could be because of greater swordfish abundance, or due to the use of more effective fishing techniques. It is likely a combination of both of these factors. While the 2002 SCRS North Atlantic swordfish stock assessment showed signs of substantially improved recruitment and increased spawning biomass, the increased number of

hooks fished per trip would indicate either longer trips and/or the use of more effective fishing techniques, including unattached handlines. Although it is not possible to conclusively determine that the HMS handline fishery is becoming more efficient through the use of unattached handlines, the increased number of hooks fished and the higher numbers of swordfish landed may indicate that this is occurring. The No Action alternative could continue the trend of using more hooks and landing more fish with handline gear. Overall, the HMS handline fishery has relatively few discards. All of the reported commercial discards were released alive, and similar results would be expected for the recreational sector. There is a possibility that discards of swordfish, billfish, tunas, sharks, and other species could increase if overall effort in the handline fishery were to increase. Also, if more unattached handlines were deployed, there is a greater likelihood that more gear could get lost with unknown consequences on fish mortality.

Table 4.69 Average Catch Per Trip from Vessels that Reported Using Handline Gear in the HMS Logbook. Source: HMS Logbook.

	2000	2001	2002	2003
Number of trips	115	83	74	7
Hooks	394	475	428	545
Swordfish kept	7.8	3.7	13.7	20.6
YFT kept	0.7	4.4	1.3	0.0
BET kept	0.0	2.2	3.9	2.0
LCS kept	0.7	0.2	0.3	0
Pelagic shark kept	0.1	0.1	0.3	0.1
Non-HMS kept	8.3	12.0	9.0	1.4
Swordfish discarded alive	0.4	0.0	0.0	0.0
YFT discarded alive	0.5	0.2	1.1	1.0
BET discarded alive	0.0	0.0	0.0	0.0
LCS discarded alive	3.9	4.5	2.2	2.4
Pelagic shark discarded alive	1.2	0.9	0.8	1.8
Non-HMS discarded alive	0.2	0.1	0.0	0.4
Swordfish discarded dead	0.0	0.0	0.0	0.0
YFT discarded dead	0.0	0.0	0.0	0.0
BET discarded dead	0.0	0.0	0.0	0.0
LCS discarded dead	0.0	0.0	0.0	0.0
Pelagic shark discarded dead	0.0	0.0	0.0	0.0
Non-HMS discarded dead	0.0	0.0	0.0	0.0

Alternative I5(b), a preferred alternative, would amend the definition of "handline" by requiring that handlines remain attached to all vessels. However, preferred alternative H5 would define unattached handlines as "buoy gear," and authorize their use only in the commercial swordfish handgear fishery with a more refined definition and additional restrictions. Therefore, in conjunction with preferred alternative H5, this alternative (I5(b)) would primarily impact recreational fishery participants and commercial permittees that do not possess a swordfish handgear permit. By itself (*i.e.*, not in conjunction with alternative H5), this alternative could restrict or limit fishing effort, although there are no data indicating exactly how many vessels are fishing with unattached handlines, or how many handlines they are deploying. Depending upon

the size of the vessel and the number of passengers onboard, the number of attached handlines that could be fished could range from one to, possibly, as many as fifty. In contrast, under the No Action alternative, a vessel could potentially fish with more than fifty unattached handlines and cover a much larger geographic area. Public comment suggests that, among active fishery participants, a requirement for handlines to remain attached to all vessels would reduce the number of handlines that could be fished or deployed. Operationally, it may also be less efficient to fish with attached handlines as they may be more prone to entanglement. Because this alternative could restrict or limit fishing effort, it is projected to produce unquantifiable positive ecological impacts, including a reduction in the bycatch of undersized swordfish, other undersized species, protected species, and target species catches. However, recreational catches of target species are not expected to significantly decrease, as the recreational sector is largely governed by bag limits, quotas, and minimum size limits. Positive ecological benefits could also be realized by a reduction in the amount of gear that could get lost.

Alternative I5(c) would require that handlines remain attached to all vessels possessing an HMS Angling category permit, an HMS Charter/headboat permit when fishing on a for-hire trip, or an Atlantic Tunas General category permit when fishing in a registered HMS tournament. Under alternative I5(c), commercial permit holders would be allowed to fish with unattached handlines. The effect of this alternative could be to restrict or limit recreational fishing effort, although there are no data indicating exactly how many recreational vessels are fishing with unattached handlines, or how many unattached handlines they are deploying. If few recreational vessels are currently fishing with unattached handlines, then any ecological benefits associated with this alternative, including a reduction in discards or target species catch, would be minimal. Conversely, if fishing with unattached handlines is a common recreational practice, then the ecological benefits associated with this alternative would be greater. Because this alternative could restrict or limit recreational fishing effort, it is projected to produce unquantifiable positive ecological impacts, including a reduction in the bycatch of undersized swordfish, other undersized species, and protected species. Catches of target species are not expected to significantly decrease however, as the recreational sector is largely governed by bag limits and minimum size limits. Positive ecological benefits could also be realized by a reduction in amount of gear that could get lost.

Social and Economic Impacts

Alternative I5(a) would retain the current definition of “handline” at § 635.2 (No Action). This definition does not require that handlines remain attached to a vessel, and there is no upper limit on the number that may be deployed. There would be no additional social or economic impacts, either positive or negative, associated with this alternative. Under the current definition, most HMS commercial permit holders may legally deploy unattached handlines, as described under ecological impacts. Based upon public comment the practice does not appear to be widespread, but it may be growing among a small number of vessel operators primarily targeting swordfish in the East Florida Coast closed area. Under the No Action alternative, the ability to deploy unattached handlines represents a positive social and/or economic opportunity for commercial and recreational fishery participants who choose to, or may want to, fish in this manner. Conversely, commercial and recreational fishery participants who do not participate in this activity may feel that the No Action alternative diminishes the quality of fishing by increasing the amount of deployed gear, particularly in areas that are closed to pelagic longlines.

As noted above, alternative I5(b), a preferred alternative, if implemented in conjunction with preferred alternative H5, would primarily impact recreational fishery participants and commercial permittees that do not possess a swordfish handgear permit. By itself (*i.e.*, not in conjunction with alternative H5), a large proportion of HMS permit holders could potentially be affected by this alternative. However, based upon public comment, this practice does not appear to be widespread, but may be growing among a small number of vessel operators. The effect of this alternative could be to restrict or limit such fishing effort. Depending upon the size of the vessel and the number of passengers onboard, under alternative I5(b), the approximate number of attached handlines that could be fished from a vessel could range from one to as many as fifty. In contrast, under the No Action alternative, a vessel could potentially fish with over fifty unattached handlines and cover a much larger geographic area. Operationally, it may also be less efficient to fish with attached handlines as they may be more prone to entanglement. Therefore, this alternative could result in an unquantifiable reduction in the number of handlines that could be fished. Because this alternative could restrict or limit fishing effort, it could potentially produce adverse social and economic impacts, including an unquantifiable reduction in catches of target species for vessels that participate in this fishery. During the scoping process, some commenters indicated that a requirement to attach handlines to vessels would render the commercial handline fishery unprofitable. This could reduce opportunities for the United States to fully utilize its ICCAT swordfish quota, which has had consistent underharvests in recent years. Authorizing buoy gear in the swordfish handgear fishery under alternative H5 would mitigate this impact, however. Recreational catches of target species could be impacted, but are not be expected to significantly decrease as the recreational sector is largely governed by bag limits, quotas, and minimum size limits. If few recreational vessels currently fish with unattached handlines, then any social or economic impacts associated with this alternative would be minimal. Conversely, if fishing with unattached handlines is a common recreational practice, any social and economic impacts associated with this alternative, including impacts on charter/headboat operators and gear suppliers, would be greater. Commercial and recreational fishery participants who do not participate in this activity, and do not intend to, may feel that the alternative I5(b) would improve the quality of fishing by reducing the amount of deployed gear.

Alternative I5(c) would require that handlines remain attached to all vessels that possess an HMS Angling category permit, an HMS Charter/headboat permit when fishing on a for-hire trip, or an Atlantic Tunas General category permit when fishing in a registered HMS tournament. Commercial permit holders would be allowed to use unattached handlines. The effect of this alternative could be to restrict or limit recreational fishing effort, although there are no data indicating exactly how many recreational vessels are fishing with unattached handlines, or how many they are deploying. Because this alternative could restrict or limit recreational fishing effort, it is projected to produce unquantifiable adverse social and economic impacts on affected recreational HMS fishing vessels, including a potential reduction in target species catches if operational efficiency is reduced. However, recreational catches of target species would not be expected to significantly decrease under this alternative, as the recreational sector is largely governed by bag limits, quotas, and minimum size limits. According to public comment, recreational swordfish catches would most likely be affected, as that is the primary target species. If few recreational vessels are currently fishing with unattached handlines, then any social or economic impacts associated with this alternative would be minimal. Conversely, if

fishing with unattached handlines is a common recreational practice, any social and economic impacts associated with this alternative would be greater for those vessel operators who participate in this activity. Similar to alternative I5(b), commercial and recreational fishery participants who do not participate in this activity, and do not intend to, may feel that the alternative I5(c) would improve the quality of fishing by reducing the amount of deployed gear.

Conclusion

NMFS prefers alternative I5(b). This alternative would require that handlines remain attached to all vessels. However, preferred alternative H5 would define unattached handlines as "buoy gear," and authorize their use only in the commercial swordfish handgear fishery with additional restrictions. Therefore, in conjunction with preferred alternative H5, alternative I5(b) would primarily impact recreational fishery participants and commercial permittees that do not possess a swordfish handgear permit. This alternative is not expected to create significant adverse social or economic impacts for fishery participants. Recreational catches of target species could be impacted, but they are not be expected to significantly decrease as the recreational sector is largely governed by bag limits, quotas, and minimum size limits. Relative to the No Action alternative, alternative I5(b) is expected to provide some minor positive ecological benefits by limiting the potential future expansion of the handline sector, and possibly reducing the amount of lost gear. If this were to occur, there may be an unquantifiable future reduction in the bycatch of undersized swordfish, other HMS species, protected species, and target catches. Alternative I5(c) would impose similar social, economic, and ecological impacts as the combination of preferred alternatives H5 and I5(b).

Issue 6: Possession of Billfish on Vessels Issued Commercial Permits

As described in Chapter 2, the alternatives being considered to ensure consistency in HMS regulations and to better clarify the recreational nature of the billfish fishery are:

I6(a) Retain current regulations regarding the possession of Atlantic billfish (No Action)
I6(b) Prohibit vessels issued commercial permits and operating outside of a tournament from possessing, retaining, or taking Atlantic billfish from the management unit – Preferred Alternative

Ecological Impacts

Under alternative I6(a), HMS fishermen on a commercial vessel with pelagic longline gear onboard may not retain billfish, regardless of the gear used, but other commercial fishermen may retain billfish caught on rod and reel. Thus, General Category fishermen, who are commercial fishermen that use rod and reel to catch BFT, could keep Atlantic billfish. Similarly, fishermen using bottom longline gear, who happen to catch a billfish on rod and reel, could potentially keep the Atlantic billfish. These billfish could not be sold. Both white and blue marlin are overfished, and white marlin is a candidate for listing under ESA. Under an ICCAT recommendation, as noted by alternative E6 in Section 4.2.3, the United States is limited to 250 recreational billfish landings per year. While NMFS is not aware of any billfish that have been retained by commercial fishermen, due to the inconsistent nature of the current regulations, some commercial fishermen could legally keep billfish. Depending upon how many fish are harvested

by the commercial fishermen, this could have an adverse impact on the rebuilding of blue and white marlin. Given that the United States can keep only 250 marlin at this time under an ICCAT recommendation, any additional fish landed could have an impact.

Under the preferred alternative, I6(b), any fishermen issued a commercial permit that are not participating in a registered tournament (*e.g.*, General Category fishermen) would not be allowed to fish for, retain, or possess Atlantic billfish. This is consistent with current regulations in regard to PLL gear. To the extent that this regulation may reduce Atlantic billfish mortality, this alternative could have positive ecological benefits.

Neither alternative would be likely to have impacts on protected species or essential fish habitat.

Social and Economic Impacts

Neither alternative should have any significant economic or social impacts. These alternatives could affect fewer than 10,000 commercial permit holders. Currently, Atlantic billfish cannot be bought or sold. Thus, limiting the number of billfish landed by commercial fishermen should not reduce profits and should not result in any impacts on communities. There could, however, be some very minor social impacts as would be expected from any additional limitations on commercial fishermen. However, almost 9,000 commercial permit holders could land billfish if they are charter/headboat fishermen on a for-hire trip, or General category fishermen fishing in a registered tournament. The preferred alternative could have some positive economic impacts to the recreational fishing community if it results in enhanced fishing opportunities for recreational fishermen (see Section 4.2.3).

Conclusion

Alternative I6(b) is the preferred alternative because it may have a small ecological benefit, would have no adverse economic impacts, and would clarify the regulations regarding the retention of billfish by commercial fishermen.

Issue 7: BFT Dealer Reporting

To provide additional flexibility for electronic BFT dealer reporting, it would be necessary to amend the HMS regulations to specify that BFT dealers may submit these reports over the Internet. NMFS is considering the following alternatives:

I7(a) Retain the current regulations regarding BFT dealer reporting (No Action)
I7(b) Amend the HMS regulations to provide an option for Atlantic tunas dealers to submit required BFT reports using the Internet – Preferred Alternative
I7(c) Amend the HMS BFT dealer reporting regulations to require that Atlantic tunas dealers submit BFT reports electronically, with specific exceptions

Ecological Impacts

All of the alternatives for BFT dealer reporting are administrative in nature. Therefore, none of them have any significant ecological impacts. Some minor positive ecological impacts

are anticipated with improved data collection under alternatives I7(b) and I7(c), however. If using the Internet improves the quality or timeliness of dealer reporting, this could improve quota monitoring, stock assessments, and compliance with ICCAT requirements.

Social and Economic Impacts

Under alternative I7(a), the No Action alternative, dealers are required to submit the reports in the mail or via fax and agency personnel enter the data into a database. In some cases dealers are required to enter the same or similar data on several different forms, and the data are then re-entered by agency staff electronically. This imposes time costs on both industry and government.

Alternative I7(b), the preferred alternative, may reduce the amount of paperwork for the dealers by providing them an option to access one-stop data entry systems on the Internet when such a system is developed. This alternative may also reduce the dealer burden by reducing the number of times the same data is entered by dealers, although initially there may be some additional burden associated with learning the new software. The government's burden may also change from data entry to quality control and oversight of the data that has been provided. This alternative would provide dealers with the flexibility to use electronic reporting, but would not require them to do so. As such, it is not possible to accurately quantify specific changes in paperwork burdens without knowing which dealers may choose to use this option.

Alternative I7(c) may further reduce burdens in the long-term by requiring most dealers, with some limited exceptions, to use electronic reporting. However, this alternative may impose initial economic costs to dealers who do not already have electronic access to the Internet, although some of the exceptions being considered may alleviate these costs (*i.e.* dealers of limited size and/or magnitude of reporting). Some social costs may be incurred by dealers who would have to learn and adapt to electronic reporting under alternative I7(c), although most dealers are expected to have already transitioned to similar type electronic data systems as a part of modern business practice.

Conclusion

NMFS prefers alternative I7(b). This alternative would provide an option for BFT dealers to submit certain reports electronically over the Internet when such a system is developed, but would not require it. Although unquantifiable, this alternative is expected to produce positive social and economic impacts for both industry and government, as a result of time-savings incurred when such a system is developed. None of the alternatives have any significant ecological impacts, as reporting is primarily administrative in nature.

Issue 8: No Fishing and Cost-Earnings Reporting Forms

I8(a) Maintain the existing regulations regarding submission of logbooks (No Action)
I8(b) Require submission of "No Fishing" reporting forms for selected vessels if no fishing trips occurred during the preceding month, postmarked no later than seven days after the end of the month – Preferred Alternative

I8(c) Require submission of the trip "Cost-Earnings" reporting form for selected vessels 30 days after a trip and the annual "Cost-Earning" report form by January 31st of each year – Preferred Alternative

Ecological Impacts

Under all of the alternatives, fishermen would continue to submit logbooks consistent with the current regulations. None of the alternatives would have any ecological impact, unless the fishermen submitted false reports.

Social and Economic Impacts

Under all of the alternatives, fishermen would continue to submit logbooks consistent with the current regulations. None of the alternatives would have any economic impact, unless the fishermen submitted false reports.

However, there could be some social impacts as a result of all the alternatives. Under the No Action alternative I8(a), numerous fishermen have been confused regarding the times involved in submitting certain reports. This has caused delays in permit renewal. Under both the preferred alternatives, the timeframes involved for submitting reports would be clarified in the regulations, resulting in fewer permit renewal delays. There could be an increased reporting burden for some fishermen who currently submit all of their "no fishing" reports only once a year, when renewing their permits. Under both alternatives, failure to report or falsifying reports could result in penalties, fines, and/or permit sanctions including the loss of a permit.

Conclusion

Alternatives I8(b) and I8(c) are preferred because they would clarify the regulations and would have no ecological or economic impacts.

Issue 9: Non-Tournament Recreational Landings Reporting

As described in Chapter 2, the alternatives to remove regulatory inconsistencies and to clarify NMFS' intent that the vessel owner, rather than the angler, be responsible for reporting non-tournament recreational landings of Atlantic billfish and swordfish are:

I9(a) Retain existing regulations at § 635.5(c)(2) requiring anglers to report non-tournament recreational landings of North Atlantic swordfish and Atlantic billfish (No Action)

I9(b) Require vessel owners to report non-tournament recreational landings of North Atlantic swordfish and Atlantic billfish – Preferred Alternative

Ecological Impacts

Alternative I9(a) (No Action) would retain the current regulatory language at § 635.5(c)(2), which specifies that anglers, rather than vessel owners, are required to report all non-tournament landings of Atlantic blue marlin, Atlantic white marlin, Atlantic sailfish, and North Atlantic swordfish by calling NMFS. There are no direct ecological impacts associated with this alternative, because HMS recreational reporting is primarily an enforcement and

administrative function involving a toll-free call to NMFS when a billfish or swordfish is landed. Thus, there would be no change in fishing effort as a result of retaining the *status quo*. However, compliance with recreational reporting requirements and data collection are compromised under the No Action alternative, because individual anglers, especially on charterboats, may be less familiar with the regulations and less inclined to report. Furthermore, punitive permit sanctions issued on behalf of NMFS for a failure to report landings are unable to be imposed because HMS fishing permits are issued to vessel owners, not to individual anglers. For this reason, the collection of accurate recreational HMS landings data may be compromised under the No Action alternative. This information is vital for stock assessments, quota monitoring, and determining compliance with ICCAT recommendations.

Alternative I9(b) would amend the current regulatory language at § 635.5(c)(2), by specifying that vessel owners must report all non-tournament landings of Atlantic blue marlin, Atlantic white marlin, Atlantic sailfish, and North Atlantic swordfish by calling NMFS. For the same reasons discussed above, there would be no direct ecological impacts or change in fishing effort associated with this alternative. There would, however, be some positive ecological impacts associated with increased compliance and improved recreational data collection by linking non-reporting to permit sanctions. Compliance and recreational data collection could be further enhanced because vessel owners (*i.e.*, permittees) are likely to be more familiar with the regulations governing their fishery. Improved recreational reporting information is vital for stock assessments, quota monitoring, and determining compliance with ICCAT recommendations.

Social and Economic Impacts

Under alternative I9(a), the current reporting process involves anglers placing a toll-free call to NMFS and a follow-up telephone call from NMFS to issue a confirmation number. As such, there are no significant social or economic impacts associated with this alternative. However, there are some adverse social impacts and compliance issues associated with the current regulations because they are inconsistent with regulations for BFT, which specify that vessel owners are required to report recreational landings regulated under the HMS Angling category. This inconsistency may cause confusion regarding reporting responsibilities for both vessel owners and anglers. Furthermore, since vessel owners are the permit holders, they are likely to be more familiar with the regulations governing their fishery as opposed to an angler who may be onboard, possibly for just a day. Because permits are issued to vessel owners, not anglers, the recreational reporting requirement should logically, and for compliance purposes, be incumbent upon vessel owners. Also, if several fish were landed on a vessel by different anglers, the current regulations would require that each angler report their fish as opposed to just the vessel owner reporting all of the fish. Finally, the current regulations are inconsistent with the original intent of the requirement. In response to a comment on the proposed rule implementing the requirement (January 7, 2003, 68 FR 711), NMFS stated that, "Owners of HMS Angling permitted vessels and Charter/Headboat operators are responsible for reporting all non-tournament billfish/swordfish landings because not all CHB vessels are selected to submit logbooks as specified under 50 CFR 635(a)."

Alternative I9(b) would amend the current regulations at § 635.5(c)(2) by specifying that vessel owners must report all non-tournament landings of Atlantic blue marlin, Atlantic white

marlin, Atlantic sailfish, and North Atlantic swordfish by calling NMFS at a toll-free number. In 2004, 20,245 HMS Angling category permits and 3,881 HMS CHB permits were issued. All of these permit holders could potentially be affected by this alternative if they land HMS. However, there would be no significant adverse social or economic impacts associated with this alternative, because HMS recreational reporting simply involves placing a toll-free call to NMFS when a billfish or swordfish is landed. Reporting would only minimally increase administrative costs to these businesses. In 2004, 363 recreational landings of HMS were reported, of which 302 came from Florida. It is estimated that at least 95 percent of these were reported by the vessel operator (Fairclough, pers. comm.), so this alternative is not expected to dramatically alter current reporting practices. There could be some minor positive social impacts because recreational reporting responsibilities would be consistent for all HMS. Also, because permits are issued to vessel owners, linking non-reporting to permit sanctions would enhance enforcement and compliance. Compliance would be further enhanced because vessel owners (*i.e.*, permittees) are likely to be more familiar with the regulations governing their fishery. Enhanced compliance with this requirement is expected to improve recreational data collection, which could enhance the analysis and selection of recreational management measures. It is possible that this alternative could also reduce the number of reporting calls to be made if, for example, several fish are landed on a vessel by different anglers.

Conclusion

NMFS prefers alternative I9(b). This alternative would amend the current regulations at § 635.5(c)(2) by specifying that vessel owners, rather than anglers, must report all non-tournament landings of Atlantic billfish and North Atlantic swordfish. This alternative is not expected to create significant adverse social or economic impacts. Compared to the No Action alternative, alternative I9(b) would achieve consistency among HMS recreational reporting requirements, improve compliance with the reporting requirements, and improve recreational fishery data collection. Any negative social or economic impacts associated with the preferred alternative are expected to be minimal, primarily because vessel owners currently submit most reports.

Issue 10: Pelagic Longline 25 mt NED Incidental BFT Allocation

As described in Chapter 2, the alternatives being considered to clarify the amount of available incidental BFT quota for PLL fishing activity in the vicinity of the NED are:

I10(a) Retain the current regulations specifically referring to 25 mt (ww) (No Action)
I10(b) Modify the HMS regulations to state that "In addition, each year, 25 mt (ww) will be allocated for incidental catch by pelagic longlines" in the NED – Preferred Alternative
I10(c) Conduct additional discussions at ICCAT regarding quotas allocated to account for bycatch related to directed longline fisheries in the vicinity of the management area boundary

Ecological Impacts

Consistent with the 2002 ICCAT BFT quota recommendation, all of the alternatives would continue to allocate an annual 25 mt (ww) set-aside of BFT to account for the incidental

catch of BFT by longline fisheries directed on other species "in the vicinity of the management boundary area" for the eastern and western BFT stocks. (*i.e.*, the NED). As the mortality of BFT caught and landed under this set-aside is accounted for in the BFT stock assessments under the ICCAT-recommended 20-year rebuilding program, NMFS anticipates there would be no additional mortality or ecological impacts that have not already been analyzed pursuant to the BFT stock from any of the alternatives. There would be no additional impacts to other species either, as these alternatives would not alter existing fishing patterns or effort of pelagic longline vessels. However, current regulatory text associated with alternative I10(a) is unclear with regard to the total amount of quota available under the NED set-aside. Specifically, current regulations would not carry forward any underharvested set-aside quota. This alternative could have some positive ecological effects by accelerating somewhat the rebuilding plan for western Atlantic BFT, as the United States would not fully utilize its ICCAT-allocated TAC. However, because the BFT quotas are TACs recommended by ICCAT, it is possible that any unused portion of the U.S. TAC could be reallocated to another member nation. Therefore, this alternative may have some potential adverse ecological impacts, in the long-term, that would be associated with a reallocation of unutilized U.S. BFT quota to an ICCAT member nation that does not have comparable conservation measures to the United States. For instance, a portion of the U.S. BFT TAC could be reallocated to a member nation that has a higher level of interaction with protected resources or has not taken equivalent steps to minimize bycatch.

Alternative I10(b) would deduct prior years landings against the set-aside quota and apply any under or over-harvests to the following year's quota calculation, consistent with ICCAT recommendations.

Alternative I10(c) considers the process that may be necessary to address impacts if excessive rollovers of unharvested quota continue over an extended period of time. For example, there is a potential that this set-aside could increase to a level that makes it more attractive for pelagic longline vessels to target BFT, which could result in some possible negative impacts to BFT stocks. Capping the NED set-aside quota at 25 mt (ww), (*i.e.*, enforcing the current regulatory text of alternative I10(a)) may reduce incentives to target BFT and conserve any unharvested quota by not applying it to the subsequent fishing year's quota. However, if activity trends change dramatically, discards could potentially increase if incidentally caught BFT in the NED exceeded 25 mt (ww).

Social and Economic Impacts

Under the No Action alternative, the current regulations would not take into account any unharvested set-aside quota from the prior fishing year. Unharvested quota would be restricted from rolling over from the previous fishing year, and it would not be transferred or allocated to other domestic fishing categories. If incidental landings of BFT by pelagic longline vessels operating in the NED exceed the 25 mt (ww) annual set-aside, the necessary quota adjustments would have to be accounted for in the subsequent fishing year, either from the Longline or Reserve quota categories.

Under alternative I10(b), the preferred alternative, unharvested quota from the NED set-aside would be rolled over to subsequent fishing years and vice versa. This may provide some positive economic impacts. Excessive rollovers may provide an incentive for pelagic longline

vessel operators to target BFT in the NED, although regulations regarding longline vessel operations have been developed with the intent of avoiding such an incentive. Slight positive social impacts could accrue to those vessels and their homeports, or offloading ports, as a result of this rollover as well. Finally, under the alternative I10(b), the set-aside and any rollover from that set-aside cannot be transferred to other quota categories. Thus, there may be a perceived negative social and economic impact among other fishery sectors if they are closed after achieving their allocated quota and are unable to access available quota, via in-season transfers, from the NED set-aside.

Alternative I10(c) is intended to partially address the aforementioned incentive and perceived equity concerns regarding quota transferability within the 25 mt (ww) NED pelagic longline set-aside by explicitly raising with ICCAT the issues of rolling-over large amounts of unharvested quota between fishing years. Depending upon whether the issue is raised and ICCATs subsequent actions, possible outcomes include capping the available NED set-aside quota at a maximum each fishing year or redistributing the quota. However, pelagic longline vessels may experience negative economic impacts with a cap if incidentally caught BFT in the NED exceeded 25 mt (ww), because fishery participants would not be allowed to retain and sell BFT after the quota was exceeded.

Conclusion

NMFS prefers alternative I10(b), which would clarify that unharvested quota from the NED set-aside is to be rolled over to subsequent fishing years and vice versa, and prohibit any rollover from that set-aside to be transferred to other quota categories. This alternative allows the pelagic longline fishery to retain its unharvested quota. There would not be any additional mortality or ecological impacts that have not already been analyzed pursuant to the BFT stock in the alternatives

Issue 11: Permit Condition for Recreational Trips

As described in Chapter 2, the alternatives being considered to reduce confusion regarding state and Federal recreational regulations include:

I11(a) No permit condition for recreational trips (No Action)
I11(b) *Require recreational vessels with a Federal permit to abide by Federal regulations, regardless of where they are fishing, unless a state has more restrictive regulations - Preferred Alternative*

Ecological Impacts

Under the status quo**,** recreational anglers fishing for HMS must comply with state regulations when fishing in state waters, or comply with Federal regulations when fishing in Federal waters. This has caused some confusion on behalf of anglers when there are differences between state and Federal regulations (*e.g.*, Florida and Georgia). Additionally, some state regulations are consistent with Federal regulations for some HMS, but different for other HMS (*e.g.*, Alabama and South Carolina). In other instances, states do not have regulations for Atlantic HMS (*e.g.*, Connecticut and Rhode Island), so under the status quo Federal fishermen

could fish without bag or size limits in these state's waters. The regulations for each state are outlined in Table 3.1 (Section 3.1).

These differences between state and Federal regulations also raise concerns regarding enforcement. If the state bag or size limit is higher than the Federal bag or size limit, maintaining the status quo could have negative ecological impacts because more fish, or smaller fish, could be landed than what is allowed for under Federal and, in some cases, international rebuilding plans. Additionally, if fishermen land HMS caught in Federal waters in a state with less restrictive regulations, they may be able to illegally land fish above the Federal bag or size limit due to ambiguities between state and Federal regulations. In cases where the state regulations are more restrictive than Federal regulations, the status quo, and the preferred alternative, could have positive ecological benefits. For example, the State of Georgia has a number of regulations regarding shark bag and size limits that are different from the one shark per vessel per day and 54 inch minimum size for Federal waters. This inconsistency (and inconsistencies in other states) could hinder the rebuilding of large coastal sharks and could hinder enforcement efforts regarding shark regulations. However, the State of Georgia also bans the possession of billfish, except for catch-and-release. Thus, under the status quo, the rebuilding of billfish is aided.

Under the preferred alternative, anglers fishing for HMS with an HMS permit would need to abide by Federal regulations even if they were fishing in state waters, unless the state had more restrictive regulations. This alternative would have positive ecological benefits. For instance, under this alternative, in Georgia state waters, anglers fishing for sharks who have a Federal HMS permit would need to abide by Federal regulations. This would enhance the rebuilding plan for large coastal sharks. Similarly, fishermen possessing a Federal HMS permit and fishing in Georgia state waters for billfish would need to catch-and-release any billfish. While this goes beyond the Federal regulations, it would enhance the rebuilding of Atlantic billfish. For states that do not have regulations for HMS, such as Connecticut, this alternative would have positive ecological benefits by limiting fishermen with an HMS permit to the Federal regulations.

Neither alternative is expected to have any impact on EFH or protected species.

Social and Economic Impacts

The social and economic impacts of both the No Action and the preferred alternative would be minimal. In either case, recreational fishermen would be able to continue fishing and would continue to use the existing infrastructure (*e.g.*, hotels, supply shops) to do so. Additionally, states would be able to continue to implement their own regulations and regulate fishermen who fish only in state waters. Under the status quo, states would continue to regulate Federally-permitted fishermen who are fishing for HMS in their waters at that time. Under the preferred alternative, states would lose their ability to regulate Federally-permitted fishermen, unless their state regulations are more restrictive. This may be problematic for states that require fishermen to have a Federal recreational permit, but have regulations that are different from Federal regulations. However, at this time, NMFS is not aware of any state that fits this situation. In the case of Georgia, both the State of Georgia and the South Atlantic Fishery

Management Council have requested that NMFS implement this type of regulation to facilitate enforcement of Georgia's billfish catch-and-release only regulation.

To the extent that the preferred alternative clarifies regulations for Federally-permitted vessels, there may be some social and economic benefits because fishermen would be at less risk in determining which regulation to follow, and when.

Conclusion

Alternative I11(b) is the preferred alternative. This alternative is expected to achieve increased consistency between state and Federal regulations for Federally-permitted HMS recreational fishermen, and result in less confusion on behalf of fishermen and improved compliance. Compared with the No Action alternative, the preferred alternative will produce greater ecological benefits with few resulting adverse social and economic impacts. Both the State of Georgia and the South Atlantic Fishery Management Council have requested that NMFS implement this recreational permit condition.

4.4 Impacts on Essential Fish Habitat

The Magnuson-Stevens Act requires NMFS to evaluate the potential adverse effects of fishing activities on EFH. If NMFS determines that fishing gears are having an adverse affect on HMS EFH, or other species' EFH, then NMFS must include management measures that minimize adverse effects to the extent practicable. At this time, there is no evidence to suggest that any of the preferred alternatives or proposed management measures in this FMP are adversely affecting EFH to the extent that detrimental effects can be identified on the habitat or fisheries. As described in detail in Chapter 10, no HMS gear other than bottom longline gear, is considered to have an adverse affect on EFH. New information presented in the Gulf of Mexico and Caribbean Fishery Management Council EFH FEIS's (2004) suggest that bottom longline gear may have an adverse affect on coral reef habitat, which serves as EFH for certain, reef fishes. As a result, NMFS has made a preliminary determination that bottom longline gear may have an adverse affect on EFH for other Federally-managed species. An assessment of whether HMS bottom longline gear used primarily to target LCS is fished in coral reef areas, and if so, the intensity, extent, and frequency of such impacts, including any measures to minimize potential impacts, will be addressed in a subsequent rulemaking.

The following measures considered in this FMP are not expected to adversely impact HMS EFH, or EFH from other Federal or non-Federally managed species, for the reasons described below.

4.4.1 Workshops

The proposed measures for implementing workshops on safe release, disentanglement, and identification of protected resources are not expected to have any impacts on EFH. Furthermore, workshops on HMS identification are also not expected to have any impacts on EFH. These workshops do not modify or expand the authorized gears permitted for harvest of HMS. In addition, these workshops will not result in an increase, or a redistribution of fishing

effort. These workshops are being held to maintain compliance with the October 2003 and June 2004 Biological Opinions and to improve identification skills and shark dealer reporting.

4.4.2 Time/Area Closures

The preferred alternatives to establish complementary HMS regulations in the Madison-Swanson, Steamboat Lumps Marine Reserve, and criteria and a framework mechanism for implementation or modification of future time/area closures are not expected to have any negative impacts on EFH. Analysis of HMS observer and logbook data indicate that there has been minimal HMS fishing effort in the reserve in recent years, and closing the area to HMS gears should result in very little redistribution of fishing effort, and minimal or no associated impacts to EFH. From 1997 to 2003, only one pelagic longline set and two bottom longline sets were reported in the HMS logbook in these areas. Criteria for establishing new or modifying existing closures are designed to improve transparency in the decision-making process and allow fishermen more ability to plan for future changes. The criteria themselves would not be expected to have any impact on EFH.

4.4.3 Northern Atlantic Albacore Tuna

The preferred alternative to establish the foundation for development of an international rebuilding plan for Northern Atlantic albacore tuna is not expected to have any adverse effect on EFH as it does not modify or expand the authorized gears already permitted for harvest of albacore. Furthermore, this measure should not result in an increase or a redistribution of fishing effort. A rebuilding plan would not be implemented until after the next ICCAT stock assessment in 2007.

4.4.4 Finetooth Sharks

The proposed measure to reduce fishing mortality of finetooth sharks is not expected to have any impacts on EFH as it does not modify or expand the authorized gears already permitted for harvest of finetooth sharks. Furthermore, this measure should not result in an increase or a redistribution of fishing effort. Eighty percent of finetooth shark landed in the commercial fishery are harvested with gillnet gear that does not touch the bottom. Recreational fisheries (*i.e.*, rod and reel gear) for finetooth sharks also do not have any deleterious effects on EFH for HMS or non-HMS fish species.

4.4.5 Atlantic Billfish Management Measures

The preferred billfish management measures consider additional restrictions on recreational fishing gears, including tournaments, to reduce bycatch of blue and white marlin. The primary gear used in recreational billfish fishing is rod and reel, which is not considered to have a negative impact on EFH. As such, none of the preferred management measures are expected to have an adverse effect on EFH.

4.4.6 Bluefin Tuna Management Measures

Management measures that consider modification to bluefin tuna seasonal allocations of quota among user groups are not expected to adversely affect EFH to the extent that detrimental

effects can be identified on the habitat or fisheries. The preferred alternatives would not alter fishing gears or practices and it is anticipated that this action would not have any adverse impacts on EFH.

4.4.7 Calendar Year/ Fishing Year

The preferred alternative to adjust the annual management year for HMS to a calendar year from the current fishing year is designed to provide consistency in timing of domestic and international management programs which would help to reduce complexity of U.S. reports to ICCAT, and is not expected to alter fishing practices or result in redistribution of fishing effort. Furthermore, this change is not expected to have any impact on EFH.

4.4.8 Authorized Fishing Gears

The preferred alternatives, H2, H4, H5, and H7, would authorize speargun fishing gear in the recreational Atlantic tunas fishery, authorize green-stick gear for the commercial harvest of Atlantic BAYS tunas, authorize buoy gear in the commercial swordfish handgear fishery, and would clarify the allowance of secondary hand-held cockpit gears in HMS fisheries, respectively. None of these gears are considered to have a negative impact on EFH because they do not contact the bottom.

4.4.9 Regulatory Housekeeping

A number of regulatory housekeeping measures are being considered to clarify and improve the enforcement of HMS regulations. The preferred alternatives in Section 4.3.4 (Regulatory Housekeeping) will have no direct impact on EFH. Most of the proposed amendments are administrative in nature, including corrections, clarifications, and technical changes. Other proposed measures would strengthen or reinforce existing regulations. The remaining proposed measures that would implement new regulations are expected to have only minor ecological impacts.

4.5 Impacts on Protected Species

NMFS does not believe that any of the proposed actions would trigger reinitiation of consultation under 50 C.F.R. 402.16. The workshops are being held to maintain compliance with October 2003 and June 2004 BiOps. Release, disentanglement and identification workshops are intended to help further reduce the mortality of sea turtles, smalltooth sawfish, and other protected resources captured incidentally in the HMS longline (pelagic and bottom longline) and gillnet fisheries. The purpose of HMS identification workshops is to train individuals involved in the HMS fisheries to improve their HMS identification skills. Accurate species identification is important for compliance with HMS fishery regulations, including the avoidance of prohibited species and maintaining quota limits, and also for accurate data collection. These workshops are not expected to alter existing fishing effort or practices, and therefore, should not result in increased interactions with protected resources. Additionally, to the extent interactions are not avoided, these workshops should result in increased survival of protected resources.

The primary goal of establishing complementary HMS regulations for the Madison-Swanson and Steamboat Lumps marine reserves is to provide consistency between the Gulf of Mexico Fishery Management Council and HMS regulations. Thus, prohibiting all HMS gears, other than trolling gear from May through October, in the existing reserve should not result in increased interactions with protected resources. Analysis of HMS observer and logbook data indicate that there has been minimal HMS fishing effort in the reserve in recent years, and closing the area to HMS gears should not have a major impact on redistribution of fishing effort, increased effort in other areas, or additional impacts on protected resources.

Regarding northern albacore tuna, the preferred alternative would not cause an increase in interactions with protected species. Any impact on protected species would depend upon any shift in fishing practices as a result of ICCAT's conservation and management measures developed under an international rebuilding plan. Because of low albacore tuna catch and landings in both of the current U.S. commercial and recreational fisheries, it is unlikely that any recommendations by ICCAT would result in a change in domestic fishing practices.

Regarding the finetooth shark preferred management measures, protected resources, such as marine mammals, sea turtles, and smalltooth sawfish, can be of concern in gillnet fisheries. However, the preferred management measure would not modify or increase existing fishing effort. Expanded observer coverage would improve the accuracy of extrapolated take estimates and increase knowledge of interactions between protected resources and shark gillnet fisheries. Adding finetooth sharks to the select species list for bycatch sampling would improve information collected on the interactions between HMS, protected resources, and the Shrimp Trawl Fishery in the Gulf of Mexico. Any future rulemaking on finetooth sharks would include analyses and impacts on protected species.

Some of the preferred alternatives pertaining to Atlantic billfish, including mandatory use of circle hooks with natural baits in recreational billfish tournaments, may have a minor positive ecological impact on protected resources, such as Atlantic sea turtles, by potentially reducing interactions and possibly decreasing post-release mortality of any interactions that may occur.

The preferred alternatives pertaining to adjust BFT inseason management and annual specifications processes are procedural and administrative in nature and are expected to have negligible ecological impacts. The specific alternatives proposing to adjust the General category allocation scheme to provide for a formal winter BFT fishery would not alter current impacts on threatened or endangered species, as they conform to current BFT quota recommendations and the gear used in the General category generally has a low interaction rate with protected species.

There may be slight positive impacts to protected species under the preferred alternative for changing the fishing year back to a calendar year when considered in combination with the preferred alternative for directed billfish regarding the 250-marlin landings. In combination, there is a small potential that if a management threshold was reached to reduce or halt marlin landings, it would occur earlier in the season than under the other alternatives considered for fishing year. This could slightly reduce fishing effort and any resultant bycatch. These potential positive impacts are expected to be small because the likelihood of a management action under

the 250-marlin landings limit is projected to be small based on prior year's landings data, and the interaction rates of protected species with handgear are small.

The alternatives to authorize green-stick, speargun, buoy gear, and secondary cockpit gears are not anticipated to result in increased interactions with protected resources. It is unlikely that a speargun fisherman would mistake a sea turtle or other protected species for a tuna. Thus, NMFS does not expect that gear type to increase protected species or marine mammal interactions. Further, both green-stick and buoy gear have been in use in HMS fisheries. Because green-stick gear is a trolling gear, it is unlikely to catch a protected species. In the case of buoy gear, this action would essentially rename an existing gear type (handline) for the commercial swordfish fishery and would limit the number of buoys that are allowed to be deployed by a vessel. Buoy gear, as it is currently used, does not have many interactions with protected species. Limiting its use, as is proposed, would further reduce the interactions. Furthermore, NMFS is proposing to require handlines to be attached to the vessel. While this may not reduce interactions with protected species (interactions in the handline fishery currently are minimal), it would reduce any mortality because the fishermen would know immediately if an animal were caught on the gear.

Some of the proposed regulatory housekeeping actions, including a requirement that handlines remain attached to vessels, may have a minor positive ecological impact on protected resources, such as Atlantic sea turtles, by potentially limiting interactions and reducing the amount of gear that could get lost. Other actions would strengthen, reinforce, or clarify existing regulations, including prohibitions on the sale or purchase of HMS in excess of retention limits, a minor modification of the East Florida Coast closed area, a prohibition on all commercial vessels from possessing billfish, facilitation of electronic submittal of BFT dealer reports, clarification of reporting requirements, and clarification of procedures for annual allocation of a 25 mt BFT incidental allowance for PLL vessels in the vicinity of the NED. The remaining issues are either administrative or would not appreciably change fishing effort.

In addition to the impacts of the preferred alternatives in this document, NMFS continues to monitor impacts to protected species from the ongoing operation of HMS fisheries through various logbook and observer programs as described in Sections 3.4 and 3.8.2. For example, extrapolated annual take estimates of sea turtles and marine mammals for 2004 recently became available for the pelagic longline fishery in addition to data on observed interactions for the first quarter of 2005 (January through March). NMFS monitors observed interactions with marine mammals and sea turtles in the pelagic longline fishery on a quarterly basis and reviews the data in conjunction with extrapolated annual take estimates for appropriate action, if any, as necessary. Should additional management measures be deemed necessary to reduce bycatch or bycatch mortality of protected species in the pelagic longline or other HMS fisheries, NMFS would take appropriate action in a separate rulemaking.

4.6 Environmental Justice

Executive Order 12898 requires agencies to identify and address disproportionately high and adverse environmental effects of its regulations on the activities of minority and low-income populations. To determine whether environmental justice concerns exist, the demographics of the affected area should be examined to ascertain whether minority populations and low-income

populations are present. If so, a determination must be made as to whether implementation of the alternatives may cause disproportionately high and adverse human health or environmental effects on these populations.

The communities of Dulac, Louisiana and Fort Pierce, Florida have significant populations of Native Americans and Black-Americans, respectively. These two communities also have significant populations of low-income residents. In addition to Dulac and Fort Pierce, there is a diffuse Vietnamese-American population in Louisiana, actively participating in the pelagic longline fishery, and commuting to fishing ports, but not living in "fishing communities" as defined by the Magnuson Stevens Act and identified in Chapter 9 of this document. None of the preferred alternatives for proposed management measures are expected to have a disproportionate impact on these minority and low-income populations. Available demographic data show that coastal counties where fishing communities are located are variable in terms of social indicators like income, employment, and race and ethnic composition.

The proposed alternatives for Finetooth sharks, Authorized Gear, Northern Albacore, and Regulatory Housekeeping are not anticipated to have any significant negative social or economic impacts on HMS-related communities and are not anticipated to have an impact on minority or low-income populations. The following alternatives could have negative social or economic impacts on various communities involved with HMS fisheries, but none of the proposed alternatives in this document are anticipated to have high or adverse human health or environmental effects on any of the HMS-related communities. In addition, most of the potential negative impacts can be mitigated or are not likely to occur.

The preferred alternatives for Workshops (see Section 2.1.1) are not likely to negatively impact the HMS-related communities identified as having a significant minority and low-income population; Dulac, Louisiana and Fort Pierce, Florida. The preferred alternatives would apply to longline and shark gillnet permit holders and the operators of these vessels, as well as shark dealer permit holders. There are a relatively low number of longline, gillnet, and HMS dealer permit holders residing in Dulac and Fort Pierce. NMFS does not maintain information about vessel operators' residences if they do not possess an HMS permit, so it is difficult to evaluate the impact of the Workshop alternatives on the vessel operators. While it may be difficult for some permit holders and operators to attend these workshops, the agency intends to hold several workshops in regional fishing hubs. The workshop alternatives are not anticipated to have a negative socio-economic impact on any other HMS-related community.

The BFT tuna permit holders in Venice, Louisiana; Dulac, Louisiana; and Fort Pierce, Florida possess less than one percent of the commercial tuna, angler, CHB, and tuna dealer permits; therefore the proposed BFT alternatives are not anticipated to have a high or adverse environmental or social impact on these communities. The redistribution of the BFT General category time period subquota allocation could result in a slight adverse economic and social impact on the northern BFT fisheries, however NMFS does not anticipate that these effects will fall disproportionately on minority or low-income populations. Some of the negative impacts may be minimized if fishermen are willing and able to fish during the winter quota periods where the tuna are available.

Shifting all HMS species to a calendar year management cycle is not anticipated to have a disproportionate impact on minority or low-income populations. The calendar year preferred alternative would not change the management cycle for the shark fishery, but would shift the management cycle for tunas, billfish, and swordfish from a fishing year to a calendar year. No impact on the swordfish and tuna fisheries is expected to result from this alternative because the tuna fishery is managed on a finite scale, whereas the swordfish fishery has not harvested the entire annual quota for several years. The billfish recreational fishery is not likely to be impacted by shifting to a calendar year because the ICCAT billfish limit may not be fully harvested within a calendar year. There is the potential for some billfish tournaments to be negatively impacted by the calendar year management cycle, plus the proposed triggers and ICCAT billfish landing limits. The impacts associated with these management measures could be mitigated by changing the tournament date to occur earlier in the fishing year when the billfish landing limit has not been caught. In addition to mitigating any potential negative impacts, none of the tournaments are held in low-income or minority communities.

The preferred alternatives to establish complementary HMS regulations in the Madison-Swanson, Steamboat Lumps marine reserve, and establish criteria and a framework mechanism for implementation of new or a modification to an existing time/area closures are not expected to have a disproportionate impact on minority or low-income populations. Analyses of HMS observer and logbook data indicate that there has been minimal HMS fishing effort in the Madison-Swanson and Steamboat Lumps marine reserve in recent years, and closing the area to HMS gears, other than trolling gear from May through October, should not have a major impact on fishing effort or gross revenues for the fishery. In particular, it is not expected to have a negative impact on minority or low-income populations. Establishing criteria and a framework mechanism for the implementation or modification of future time/area closures is intended to provide greater transparency in the decision-making process for implementing new or modifying existing time/area closures. As such, the criteria and framework mechanism are not expected to have any social or economic impacts.

Generally, the preferred alternatives are intended to improve compliance with ICCAT recommendations, improve data quality and collection, improve information dissemination, and improve NMFS' efficiency in enforcing and implementing specifications and management measures. See Chapter 2 for a more detailed description of the alternatives, Chapter 4 for additional discussion of the impacts related to the alternatives, and Chapter 9 for further description of communities.

4.7 Coastal Zone Management Act

The Coastal Zone Management Act (CZMA, 1972, reauthorized 1996) requires that Federal actions be consistent to the extent practicable, with the enforceable policies of all state coastal zone management programs. NMFS has determined that the suite of preferred alternatives for all issues would be implemented in a manner consistent to the maximum extent practicable with the enforceable policies of the coastal states in the Atlantic, Gulf of Mexico, and Caribbean that have Federally approved coastal zone management programs. NMFS will ask for states' concurrence with this determination during the proposed rule stage. NMFS has worked closely with states in the past and will continue to work with the states to ensure consistency between state and Federal regulations.

4.8 Cumulative Impacts

Cumulative impact is the impact on the environment, which results from the incremental impact of the action when added to other past, present, and reasonably foreseeable future actions. Cumulative impacts can result from individually minor but collectively significant actions taking place over a period of time (40 CFR § 1508.7). A cumulative impact includes the total effect on a natural resource, ecosystem, or human community due to past, present, and future activities or actions of Federal, non-Federal, public, and private entities. Cumulative impacts may also include the effects of natural processes and events, depending on the specific resource in question. Cumulative impacts include the total of all impacts to a particular resource that have occurred, are occurring, and will likely occur as a result of any action or influence, including the direct and reasonably foreseeable indirect impacts of a Federal activity. The goal of this section is to describe the cumulative ecological, economic and social impacts of past, present and reasonably foreseeable future actions with regard to the management measures presented in this document. Table 4.70 describes the overall impacts anticipated from each of the alternatives considered.

4.8.1 Past, Present, and Reasonably Foreseeable Actions

As discussed in Chapter 1, NMFS has taken a number of actions in the past in order to, among other things, rebuild overfished and prevent overfishing of HMS. These actions have included FMPs, FMP amendments, and framework actions. The goals and objectives of these past rules are summarized in Chapter 1. NMFS is proposing to take similar actions in this document, and can reasonably expect to implement additional regulations in the future to address the management and conservation of Atlantic HMS. The need and objectives of this document are described in earlier sections, particularly Chapter 1, and are not repeated here.

In general, the preferred alternatives for workshops would implement a series of protected species and HMS identification workshops to be held at various site locations throughout the range of Atlantic HMS. These workshops would incorporate recertification, proposed to be every three-years, into the mandatory requirements. This recertification timetable would allow the Agency the ability to incorporate new information and technology into its training curriculum and allow fishery participants to stay abreast of the these techniques for enhanced protected resource release and safe handling as well as species identification over time. The preferred alternatives for time/area closures, finetooth sharks, and northern albacore should help NMFS prevent overfishing and reduce bycatch. The preferred alternatives for billfish are intended to decrease recreational landings and/or mortalities of Atlantic billfish, as appropriate, and ensure consistency with international obligations, given the current status of billfish. The preferred alternatives proposed in this rule making are intended primarily to streamline and simplify the administrative process governing BFT annual and inseason management and ensure consistency with international obligations. The preferred alternative for fishing year is administrative in nature and should aid NMFS in meeting international reporting obligations and clarifying how they were met. The preferred alternatives for authorized fishing gear are designed to meet the changing needs of the fisheries. The regulatory housekeeping actions would facilitate and improve the HMS management regime. The public, law enforcement, port agents, and others often bring these types of management measures to the Agency's attention. As such, it is difficult to accurately predict reasonably foreseeable regulatory housekeeping

measures that NMFS may consider in the future to improve HMS administration, facilitate enforcement, or clarify regulations.

In Chapter 1, NMFS describes some actions that could happen in the reasonable future including: changes to bluefin tuna size limits and tolerances; filleting of tunas at-sea; modifications to the current shark quotas; changes to the LCS trip limits; limited access permit reform; changing how observer coverage is paid for and the level of coverage; modifying recordkeeping and reporting; and improving the current billfish COE program. Additional actions could include annual specifications for all fisheries with quotas; establishing shark fishing season opening and closing dates; and actions taken to reduce sea turtle interactions in HMS fisheries, particularly the pelagic longline fishery.

4.8.2 Cumulative Ecological Impacts

The cumulative long-term ecological impacts of the preferred alternatives for workshops (A2, A3, A5, A6, A9, and A16) are anticipated to be positive. Workshops for PLL, BLL, and gillnet vessel owners and operators would result in positive ecological impacts by reducing the mortality of protected resources. These workshops are essential for complying with BiOps by reducing the post-hooking mortality of sea turtles and other protected resources. Involving vessel owners would provide a link with the vessels' permit, ensuring that workshops are well attended. Including operators would ensure that at least one person on board the vessel during fishing activities is adept at the safe handling and release protocols. Mandatory HMS identification workshops, required for all Federally permitted shark dealers, would improve the accuracy of dealer reports and reduce the number of sharks listed as unclassified.

In general, the cumulative impact of implementing a number of time/area closures since 1999, in addition to other measures to reduce bycatch and bycatch mortality, has been positive ecologically, but negative economically, particularly for the pelagic longline industry. As described under the environmental impacts of the time/area closure no-action alternative to maintain existing closures, when comparing pre- and post-time/area closure data from the pelagic longline logbook, the existing time/area closures have resulted in a substantial reduction in the bycatch of all non-target HMS and protected species. In addition to time/area closures, other actions have been taken to reduce the bycatch of protected species in HMS fisheries including requirements to post safe handling and release guidelines for incidentally captured sea turtles and marine mammals, new gear requirements to reduce sea turtle bycatch and bycatch mortality (*e.g.*, circle hooks and bait), requiring non-stainless steel corrodible hooks, line cutters, dipnets, and dehooking devices to mitigate impacts on incidentally caught sea turtles. Measures have also been taken to reduce interactions with endangered right whales during calving season by requiring 100 percent observer coverage. However, with all of the new regulations designed to reduce bycatch, there has also been a substantial decline in the landings of targeted HMS. A number of potential causes for the decline in landings were discussed in the preceding section on economic impacts of time/area closures. In general, additional restrictions have caused an overall decline in fishing effort (number of hooks set) across nearly every region except the Gulf of Mexico.

Given that the preferred alternative to establish complementary HMS regulations in the Madison-Swanson, Steamboat Lumps Marine Reserve would impact a small area and a very

small proportion of the total number of vessels permitted to fish for HMS that have actually fished in the area, NMFS considers the cumulative impact of adding this new closure to the existing closures to be minor. Furthermore, trolling would still be allowed from May through October for HMS and other species managed by the GOMFMC. The other preferred alternative to establish criteria for regulatory framework adjustments to implement new closures or modify existing time/area closures is not expected to have any ecological or economic impacts, even when considered in the context of other closures implemented in recent years. This is because the criteria are designed to enhance the transparency of the decision-making process with regard to new or modifications to existing time/area closures. If, in the future, NMFS decides to implement new closures or modify existing closures, NMFS would need to evaluate the ecological, economic, and cumulative impacts of the specific action being considered at that time.

For northern albacore tuna, past actions that NMFS has taken include maintaining compliance with U.S. TAC allocations and limiting vessel capacity, consistent with ICCAT recommendations, advocating international TAC levels less than current replacement yield at ICCAT meetings, and working to establish the foundation with ICCAT for developing an international rebuilding program. Due to the fact that the United States has not taken its entire annual allocation and that U.S. landings are minor compared to other ICCAT countries, cumulative actions to date have had little ecological impact. However, if ICCAT does implement a rebuilding plan with target stock levels, a time table, and reference points, the long-term cumulative impacts should be positive as northern albacore tuna stocks rebuild. If NMFS took unilateral action, there could be adverse economic impact on U.S. fishermen without any noticeable ecological benefit for northern albacore tuna.

The cumulative long-term impacts of the proposed measure for finetooth sharks are expected to be positive. In 2002, it was determined that finetooth sharks were experiencing overfishing, however, the biomass was still above the level at which it would be considered overfished. Since that time, NMFS has launched efforts to determine what Federal and state fisheries may be interacting with finetooth sharks by informal and formal consultations with other management bodies. NMFS has also started a pilot program to expand the DSGFOP coverage to include vessels fishing with gillnets who may be catching finetooth sharks incidentally to other species. The proposed measure would continue to gather information on other sources of finetooth shark fishing mortality. These data can be employed to increase the catch series available for the upcoming SCS assessment and concurrently implement effective management measures targeting those fisheries responsible for the majority of finetooth shark fishing mortality. The next SCS stock assessment is anticipated to be completed in 2007, by which time NMFS will have a better understanding as to what measures would effectively reduce fishing mortality, if it is determined that overfishing continues to occur on finetooth sharks or they are deemed overfished.

Past management actions pertaining to Atlantic billfish, as described above and in Chapter 1 of this document, have had some positive ecological benefits for Atlantic billfish by limiting mortalities attributable to U.S. fishermen. However, given overall U.S. catches and landings of billfish relative to aggregate international catches, the impacts of these benefits on Atlantic-wide populations are likely limited. The preferred alternatives identified in this

document are anticipated to provide additional positive ecological benefits for overfished Atlantic billfish populations by reducing mortalities associated with landings and releases in the U.S. recreational billfish fishery; however, for the same reasons noted above, their effect on the status of Atlantic-wide populations will likely be limited. Actions NMFS may consider in the future for both the recreational and commercial sectors include additional measures to reduce or mitigate billfish landings and mortalities, such as additional size increases, landings prohibitions, landing limits, possession limits, tagging requirements, gear and/or bait restrictions, time/area closures, handling and release requirements, effort restrictions, seasonal closures, regional or seasonal allocations, or others as appropriate. These measures, if considered, would be designed to address specific needs of the fishery, and as such, would be intended to have positive ecological impacts. Presently, there are no known third party actions that may affect target species, however, ICCAT is scheduled to meet and take action, if necessary, on Atlantic billfish in November 2006. Further, NMFS anticipates initiating and completing an ESA Listing Status review for Atlantic white marlin by the close of 2007. Pending the outcome of the ICCAT stock assessment and meeting as well as the ESA Listing review, additional management measures may or may not be warranted.

Since 1999, management actions pertaining to Atlantic bluefin tuna have had minor positive ecological impacts by continuing to limit BFT mortality by U.S. fishermen in accordance with the strict quota limits set by ICCAT and established under the approved rebuilding plan. Domestic regulatory actions have also been consistent with international efforts and recommendations regarding conservation of the BAYS tunas. The preferred BFT alternatives are primarily administrative in nature and are anticipated to provide negligible or minor additional positive ecological benefits for overfished Atlantic bluefin tuna. Actions NMFS may consider in the future for both the recreational and commercial sectors include additional measures to rationalize bluefin tuna fishing effort, adjustment of size tolerance limits, discard reduction, landing limits, possession limits, tagging requirements, gear and/or bait restrictions, time/area closures, handling and release requirements, effort restrictions, seasonal closures, regional or seasonal allocations, or others as appropriate. These measures, if considered, would be designed to address specific needs of the resource, and as such, would be intended to have positive ecological impacts. Presently, there are no known third party actions that may affect target species, however, ICCAT is scheduled to meet and take action, if necessary, on Atlantic bluefin tuna in November 2006. Pending the outcome of the ICCAT stock assessment and meeting, additional management measures may or may not be warranted.

When considering this action in the context of past actions, most of the impacts of the preferred alternative for fishing year, both positive and negative, would be fully mitigated. Since both the swordfish and BFT fisheries and quotas were initially managed on a calendar year and were switched to a fishing year within the last decade, any ecological impacts as a result of this preferred alternative should be mitigated by the impacts that occurred when they were switched to a fishing year (*e.g.*, the impacts of a compressed 6 month fishing year under this preferred alternative would be mitigated by the impacts of a fishing year that was stretched to cover 18 months during the previous action). For billfish, the cumulative ecological impacts attributed to the implementation of a calendar year management program in combination with a 250-marlin landings limit preferred alternative would be neutral to slightly positive. Marlin landings will be monitored and appropriate actions taken as necessary to maintain compliance with the ICCAT-

recommended landings limit regardless of whether the fishery is managed on a fishing year or a calendar year. However, there is a small potential that if a management threshold was reached to reduce or halt marlin landings, it would occur earlier in the season than under the other alternatives considered for fishing year, which could slightly reduce fishing effort and potentially have positive ecological impacts. The cumulative impacts of these two alternatives in combination are discussed in detail in Sections 4.2.3 and 4.3.2. Cumulative impacts of the calendar year preferred alternative in combination with the specifications processes for BFT and swordfish are also expected to be neutral because BFT fisheries are tightly monitored and controlled under quotas and current regulations afford protections for sensitive size classes and swordfish fisheries have not landed the full quota in recent years.

The revised list of authorized fisheries (LOF) and associated fishing gears became effective December 1, 1999 (64 FR 67511). The LOF is updated periodically and can be found at 50 CFR § 600.725. Amendment 1 to the 1999 FMP specified that only rod and reel and handline gears be allowed in the recreational shark fishery. In this document, the preferred alternatives for authorized fishing gear are not anticipated to dramatically increase effort and therefore would likely not result in significant increases in landings or landings rates of HMS or other finfish, protected, or threatened species with which HMS fishermen interact. NMFS does not expect the use of these gears to increase interactions with protected resources. As described in Section 4.3.3, other alternatives analyzed could have had potentially fewer or greater ecological impacts because authorizing different gears in different segments of the HMS fisheries could result in varying degrees of increases in target catches, as well as interactions with other HMS and other species.

The suite of preferred alternatives in Section 4.3.4, entitled Regulatory Housekeeping, include alternatives I1(b), I1(c), I2(b), I3(b), I3(c), I4(b), I5(b), I6(b), I7(b), I8(b), I8(c), I9(b), I10(b), and I11(b). All of these alternatives are projected to have minor positive conservation benefits for HMS, bycatch species, and protected resources consistent with the MSA, ESA, and other applicable law. Several of these alternatives, including I7(b), I8(b), I8(c), and I9(b) are predominantly administrative in nature. As such, any positive ecological benefits derived from these preferred alternatives would be realized primarily through improvements in data collection. Many other alternatives, including I1(b), I1(c), I2(b), I3(b), I3(c), I6(b), and I11(b) are intended to facilitate enforcement. Therefore, any positive ecological benefits derived from these preferred alternatives would be realized through improved compliance with HMS regulations. Alternative I4(b), which would modify the East Florida Coast closed area, would likely relocate effort; however, the cumulative impacts are expected to be negligible because the area affected is so small and catches and catch rates in adjacent areas are similar. Alternative I5(b), which would require that handlines remain attached to vessels, could reduce fishing effort, but that is not expected to be likely. Rather, alternative I5(b) would prevent the potential future expansion of effort. Alternative I10(b) deals with the ICCAT 25 mt NED BFT allocation. As such, it clarifies how the set-aside will be allocated, and is not expected to alter fishing effort. Actions that NMFS may consider in the future to improve administration of the existing HMS management regime, facilitate enforcement, or clarify regulations would similarly be expected to produce minor positive ecological impacts.

The cumulative ecological impacts on HMS stocks and fisheries due to potential actions under consideration by Regional Fishery Management Councils, Interstate Marine Fisheries Commissions, or other management bodies may be slightly positive. The Caribbean Fishery Management Council is considering management measures including time/area closures that may have some impacts on HMS fisheries although NMFS expects that any ecological impacts would be minor due to the small size and amount of HMS fishing effort in the areas under consideration. HMS Advisory Panel members have raised concerns about the impacts of herring management on bluefin tuna stocks and the New England Fishery Management Council intends to consider a ban on midwater and pair trawling for herring in upcoming rulemaking to address concerns about impacts on bluefin tuna, cod, and whales. To the extent that herring trawl fisheries may be impacting bluefin tuna stocks, such a ban would likely have positive ecological impacts. Regarding shark management, the Atlantic States Marine Fisheries Commission may develop an interstate shark fishery management plan, which would likely have positive ecological impacts because many shark nursery areas are located in state waters.

4.8.3 Cumulative Economic and Social Impacts

The cumulative long-term economic and social impacts of the preferred alternatives for workshops are not expected to be excessive as these workshops will be scheduled at numerous locales along the Atlantic coast, minimizing travel, lost fishing time, and time spent away for places of business, to the extent practicable. Initially NMFS intends to delay effectiveness until January 1, 2007, to help fishermen, vessel owners, and shark dealers plan for attending these workshops. Over the long-term, alternatives to in-person workshops (*i.e.*, internet-based, web-cast, DVD-based) may be considered to mitigate or reduce some of the anticipated social and economic impacts associated with the preferred alternatives for workshops.

As described above, the implementation of time/area closures has had cumulative economic and social impacts including putting fishermen out of business and causing some vessels to change fishing areas. The current preferred alternatives are not expected to have large economic or social impacts, and, to the extent that the criteria give NMFS the flexibility to do so, could, in the future, help relieve some of the economic stress by reopening or modifying existing closures.

The preferred alternatives for northern albacore tuna and finetooth sharks are not expected to have any significant economic or social impacts in the near future. The measures taken when ICCAT enacts a rebuilding plan for northern albacore tuna or when NMFS has collected additional data for finetooth sharks could have economic or social impacts, and would be analyzed at that time.

For billfish, the cumulative economic and social impacts of actions taken since 1978 have been to eliminate domestic commercial fisheries for those species, resulting in negative economic and social impacts for the commercial sector. In eliminating commercial retention and sale of Atlantic billfish, the pelagic longline fishery was forced to adapt to the loss of an increasing portion of their income in the late 1980s. However, it is likely that in doing so, previous billfish regulations have allowed for larger overall social and economic benefits to the nation given the substantial number of recreational fishermen who participate in Atlantic billfish

fisheries. Thousands of recreational billfish trips are taken each year, each worth hundreds of dollars, as discussed in more detail in Section 3.5.2 and Chapter 4 of this document.

As discussed in Chapter 4 of this document, the preferred alternatives for billfish are anticipated to have generally minor adverse socio-economic impacts in the short-term as a result of a potential decrease in the availability of fish for landing and costs associated with purchasing new hooks. Adverse socio-economic impacts associated with the preferred alternatives are anticipated to be greatly constrained given high participation rates in catch and release fishing for Atlantic marlin, the fact that recent landings have rarely reached the ICCAT recommended 250-fish limit, and other factors discussed in Section 4.2.3. Impacts on individual tournaments that may cease operating as a result of catch and release requirements could be substantial; however, the aggregate impacts on the fishery are anticipated to be limited and may be slightly higher under a calendar year management cycle. Hooks represent a minor capital cost in relation to other expenditures related to billfishing, including the purchase, outfitting, maintenance, and running of vessels. Healthy Atlantic billfish populations could lead to increased angler satisfaction, participation, and expenditures if the possibility of interacting with a billfish improves as a result of the measures identified in this rulemaking. As a result, the preferred alternatives pertaining to directed Atlantic billfish fishing could result in positive long-term cumulative socio-economic benefits if they assist in reversing declines in billfish populations.

Since the 1999 FMP, the majority of regulatory actions regarding BFT have been designed to improve BFT management and provide positive social and economic impacts to the fishery. For example, past adjustments to the target catch tolerance limits in both the harpoon and purse seine BFT fisheries and changes to the pelagic longline BFT incidental catch allowance were conducted to provide marginal increases in social and economic impacts and to respond to changing conditions in the environment and market place. Annual management measures and inseason actions are analyzed and implemented to fully maximize the utilization of available quota and fishing opportunities for all fishery sectors.

As discussed in Chapter 4 of this document, the preferred alternatives are anticipated to continue to improve domestic bluefin tuna management by streamlining and simplifying the administrative processes governing bluefin tuna rulemaking and inseason actions. The preferred alternatives are expected to have positive socio-economic impacts in the short and long-term by responding to changed fishery conditions and needs within the BFT General category and increasing the ability of the agency to affect timely annual rulemaking and respond to inseason management issues. In the future, it is expected that the agency will continue to explore ways to improve domestic management including, for example, further streamlining and rationalization of the commercial permit program.

As described above, the change to a calendar year is mainly administrative and is not expected to have significant economic or social impacts. Any short-term confusion on the part of fishery participants due to the change to a calendar year would be offset by increased transparency in monitoring and compliance with international obligations. To the extent that switching back to a calendar year would offset any impacts from the original switch to a fishing year, this alternative could also provide some positive benefits.

The preferred alternatives for authorized fishing gear (H2, H4, H5, and H7) could potentially increase the number of fishery participants. As discussed in Section 4.3.3, the preferred alternatives may have both positive and negative socio-economic impacts, with impacts varying by sector. This proposed action is expected to result in positive social and economic impacts for spearfishermen (ability to fish with a previously unauthorized gear type), fishermen wishing to employ the green-stick fishing gear (clarification on use of gear and potential for increased catches and catch rates of target species), commercial swordfish handgear fishermen (clarification on use of gear type), and all HMS fishermen choosing to utilize handheld cockpit gears (clarification on allowable use of secondary gears and reduced confusion on regulations). Some negative social and economic impacts may occur if competition for fishing grounds causes gear conflicts, however, public comments indicate that this is unlikely due to recent experiences where spearfishermen have fished in close proximity to rod and reel fishermen without incident. Additionally, the BFT Angling category season could possibly be shortened with slight potential adverse social and economic impacts for all Angling category participants due to speargun landings.

The suite of preferred alternatives in Section 4.3.4, entitled Regulatory Housekeeping, are projected to have minimal social or economic impacts on HMS fishery participants. Several of the alternatives are predominantly administrative in nature. As such, any additional costs would be minor. Other alternatives to facilitate enforcement would impose no additional costs on vessels that are currently compliant with HMS regulations. Alternatives I1(b), which would establish a minimum and maximum number of floats and I1(c), which would limit species composition of the catch, could potentially increase short-term social and economic impacts for those bottom or pelagic longline fishermen that fish in pelagic or bottom longline closed areas. However, NMFS expects that any cumulative impacts would be minor because the preferred alternatives accommodate the vast majority of commercial fishing operations, based on logbook data, and would only affect a small proportion of longline fishermen. Alternative I4(b), which would modify the East Florida Coast closed area, and alternatives I5(b), which would require that handlines remain attached to vessels, could reduce fishing effort, but that is not expected to be likely. Rather, fishery participants are expected to either move to nearby areas with similar catch rates (I4(b)), or to fish with attached handlines (I5(b)). Alternative I10(b) clarifies how the NED BFT set-aside will be allocated, and is not expected to alter fishing effort. Actions of this nature that NMFS may consider in the future to improve administration of the existing HMS management regime, facilitate enforcement, or clarify regulations would similarly be expected to have minimal economic impacts.

The cumulative social and economic impacts on HMS stocks and fisheries due to potential actions under consideration by Regional Fishery Management Councils, Interstate Marine Fisheries Commissions, or other management bodies are not expected to be significant. The Caribbean Fishery Management Council is considering management measures including time/area closures that may have some impacts on HMS fisheries although NMFS expects that any social or economic impacts would be minor due to the small size and amount of HMS fishing effort in the areas under consideration. HMS Advisory Panel members have raised concerns about the impacts of herring management on bluefin tuna stocks and the New England Fishery Management Council intends to consider a ban on midwater and pair trawling for herring in upcoming rulemaking to address concerns about impacts on bluefin tuna, cod, and whales. To

the extent that herring trawl fisheries may be impacting bluefin tuna stocks, such a ban would likely have positive social and economic impacts, especially in New England areas where herring trawl fisheries operate. Regarding shark management, the Atlantic States Marine Fisheries Commission may also develop an interstate shark fishery management plan, which may have positive social and economic impacts if state measures facilitate large coastal shark rebuilding.

Table 4.70 **Impacts of alternatives considered.** The symbols +, -, and 0 refer to positive, negative, and zero impacts respectively. See preceding section for details of impacts of each alternative.

Alternative Number	Alternative Description	Ecological Impacts	Social Impacts	Economic Impacts
Workshops				
Alternative A1	Voluntary workshops for longline fishermen (No Action)	-	0	0
Alternative A2	*Mandatory workshops and certification for all HMS pelagic and bottom longline vessel owners – Preferred Alternative*	+	- / +	-
Alternative A3	*Mandatory workshops and certification for vessel operators actively participating in HMS pelagic and bottom longline fisheries – Preferred Alternative*	+ +	- / +	- -
Alternative A4	Mandatory workshops and certification for all HMS longline vessel owners, operators, and crew	+ + +	- / +	- - -
Alternative A5	*Mandatory workshops and certification for shark gillnet vessel owners and operators – Preferred Alternative*	+ +	- / +	- -
Alternative A6	*Certification Renewal Timetable (Certification renewal every 3-years) – Preferred Alternative*	+ +	- / +	-
Alternative A7	No Identification Workshops (No Action)	0	0	0
Alternative A8	Voluntary HMS identification workshops for dealers, all commercial vessel owners and operators, and recreational fishermen	+	0	0

Alternative Number	Alternative Description	Ecological Impacts	Social Impacts	Economic Impacts
Alternative A9	*Mandatory HMS identification workshops for all shark dealers – Preferred Alternative*	+ +	- / +	-
Alternative A10	Mandatory HMS identification workshops for all swordfish, shark, and/or tuna dealers	+ + +	- / +	- -
Alternative A11	Mandatory HMS identification workshops for all commercial longline vessel owners	+ +	- / +	-
Alternative A12	Mandatory HMS identification workshops for all commercial longline vessel operators	+ +	- / +	-
Alternative A13	Mandatory HMS identification workshops for all commercial vessel owners (longline, CHB, General category, and handgear/ harpoon)	+ +	- / +	- -
Alternative A14	Mandatory HMS identification workshops for all commercial vessel operators (longline, CHB, General category, and handgear /harpoon)	+ +	- / +	- -
Alternative A15	Mandatory HMS identification workshops for all HMS Angling permit holders	+ +	- / +	- - -
Alternative A16	*Certification Renewal Timetable (Certification renewal every 3-years) – Preferred Alternative*	+ +	+	-
Time/Area Closures				
Alternative B1	Maintain existing closures; no new closures (No Action)	+	0	0
Alternative B2(a)	Prohibit the use of pelagic longline gear in HMS fisheries in the central portion of the Gulf of Mexico from May through November (7 months)	+/-	-	-

Alternative Number	Alternative Description	Ecological Impacts	Social Impacts	Economic Impacts
Alternative B2(b)	Prohibit the use of pelagic longline gear in HMS fisheries in an area of the Northeast during the month of June (1 month)	+/-	-	-
Alternative B2(c)	Prohibit the use of pelagic longline gear in HMS fisheries in the Gulf of Mexico from April through June (3 months)	+/-	-	-
Alternative B2(d)	Prohibit the use of pelagic longline gear in HMS fisheries in the Gulf of Mexico west of 86 degrees west longitude year-round	+/-	-	-
Alternative B2(e)	Prohibit the use of pelagic longline gear in HMS fisheries in an area of the Northeast to reduce sea turtle interactions	+/-	-	-
Alternative B3(a)	Modify the existing Charleston Bump time/area closure to allow the use of pelagic longline gear in all areas seaward of the axis of the Gulf Stream	0/-	+/-	+
Alternative B3(b)	Modify the existing Northeastern U.S. time/area closure to allow the use of pelagic longline gear in areas west of 72º 47' west longitude during the month of June	0	+/-	+
Alternative B4	*Implement complementary HMS management measures in Madison-Swanson and Steamboat Lumps Marine Reserves from November through April (6 months) – Preferred Alternative*	+	0	0/-

Alternative Number	Alternative Description	Ecological Impacts	Social Impacts	Economic Impacts
Alternative B5	*Establish criteria to consider when implementing new time/area closures or making modifications to existing time/area closures – Preferred Alternative*	0	0	0
Alternative B6	Prohibit the use of bottom longline gear in an area southwest of Key West to protect endangered smalltooth sawfish	+	0	-
Alternative B7	Prohibit the use of pelagic longline gear in HMS fisheries in all areas	++	---	---
Northern Albacore Tuna				
Alternative C1	Maintain compliance with the current ICCAT recommendation (No Action)	0	0	0
Alternative C2	Unilateral proportional reduction of United States northern albacore fishing mortality	+	-	--
Alternative C3	*Establish the foundation with ICCAT for developing an international rebuilding program – Preferred Alternative*	0/+	0	0
Finetooth Sharks				
Alternative D1	Maintain current regulations for recreational and commercial fisheries (No Action)	-	0	0
Alternative D2	Implement commercial management measures to reduce fishing mortality of finetooth sharks	0	-	-
Alternative D3	Implement recreational management measures to reduce fishing mortality of finetooth sharks	0/+	-	-

Alternative Number	Alternative Description	Ecological Impacts	Social Impacts	Economic Impacts
Alternative D4	*Identify sources of finetooth shark fishing mortality to target appropriate management actions – Preferred Alternative*	0/+	0	0
Directed Billfish Fishery				
Alternative E1	Retain existing regulations regarding recreational billfish fishing, including permit requirements, minimum size limits, prohibited species, landing form, allowable gear, and reporting requirements (No Action)	+	0	0
Alternative E2	Effective January 1, 2007, limit all participants in Atlantic HMS recreational fisheries to using only non-offset circle hooks when using natural baits or natural bait/artificial lure combinations	++	-	-
Alternative E3	*Effective January 1, 2007, limit all Atlantic billfish tournament participants to using only non-offset circle hooks when using natural baits or natural bait/artificial lure combinations – Preferred Alternative*	+	-	-
Alternative E4 (a)	Increase the minimum size limit for Atlantic white marlin to a specific size between 68 and 71'' LJFL	+	-	-
Alternative E4 (b)	Increase the minimum size limit for Atlantic blue marlin to a specific size between 103 and 106'' LJFL	+	-	-
Alternative E5	Implement a recreational bag limit of one Atlantic billfish per vessel per trip	+	-	-
Alternative E6	*Effective January 1, 2007, implement ICCAT Recommendations on Recreational Marlin Landings Limits – Preferred Alternative*	+	-	-

Alternative Number	Alternative Description	Ecological Impacts	Social Impacts	Economic Impacts
Alternative E7	*Effective January 1, 2007 - December 31, 2011, allow only catch and release fishing for Atlantic white marlin – Preferred Alternative*	+	--	--
Alternative E8	Effective January 1, 2007 - December 31, 2011, allow only catch and release fishing for Atlantic blue marlin	++	-	-
Atlantic Bluefin Tuna				
Alternative F1	Maintain the time-periods, subquota allocations, and geographic set asides for the General and Angling categories as established in the 1999 FMP (No Action)	0	+/- -	+/- -
Alternative F2	Establish General category time-periods, subquotas, and geographic set asides annually via framework actions	0	+/-	+/-
Alternative F3	*Amend the management procedures regarding General category time-periods, subquota, as well as geographic set-asides to allow for future adjustments to take place via a regulatory framework action – Preferred Alternative*	*0*	+ +	+ +
Alternative F3 (a)	Establish monthly General category time-periods and subquotas (June-Jan, 12.5% each)	0	+/-	+/-
Alternative F3 (b)	Revise General category time-periods and subquotas to allow for a formalized winter fishery (June-Aug, 54%; Sept, 26.5%; Oct-Nov, 9%; Dec, 5.2%; and Jan, 5.3%)	0	+/-	+/-

Alternative Number	Alternative Description	Ecological Impacts	Social Impacts	Economic Impacts
Alternative F3 (c)	*Revise General category time-periods and subquotas to allow for a formalized winter fishery (June-Aug, 50%; Sept, 26.5%; Oct-Nov, 13%; Dec, 5.2% and Jan, 5.3%) – Preferred Alternative*	0	+/-	+/-
Alternative F3 (d)	Revise General category time-periods and subquotas to allow for a formalized winter fishery (June-Aug, 38.7%; Sept, 26.6%; Oct -Nov, 13%; Dec, 10.8%; and Jan, 10.9%)	0	+/-	+/-
Alternative F4	*Clarify the procedures for calculating the Angling category school size-class BFT subquota allocation and remove the Angling category north/south dividing line – Preferred Alternative*	*0*	+ +	+ +
Alternative F5	Maintain the annual BFT specification process and the under/overharvest procedures within individual domestic quota categories and individual vessels in the Purse seine category (No Action)	-	-	-
Alternative F6	*Revise the annual BFT specification process to refer back to the supporting analytical documents of the consolidated HMS FMP and include seasonal management measures in annual framework actions – Preferred Alternative*	*0*	+	+
Alternative F7	Eliminate unharvested quota carryover provisions and return unharvested quota to the resource, while maintaining status quo overharvest provisions	+/-	- - -	- - -

Alternative Number	Alternative Description	Ecological Impacts	Social Impacts	Economic Impacts
Alternative F8	*Establish an individual quota category carry-over limit of 100 percent of the baseline allocation (i.e., no more than the annual baseline allocation may be carried forward), except for the Reserve category, and authorize the transfer of quota exceeding the 100 percent limit to the Reserve or another domestic quota category, while maintaining status quo overharvest provisions – Preferred Alternative*	+	+/-	+/-
Alternative F9	Maintain inseason action procedures (No Action)	0	+/-	+/-
Alternative F10	*Revise and consolidate criteria considered prior to performing inseason and some annual BFT management actions – Preferred Alternative*	0	++/-	++/-
Alternative F11	Eliminate BFT inseason actions	- -	+/- -	+/- -
Timeframe for Annual Management of HMS Fisheries				
Alternative G1	Maintain the current fishing year for all HMS (No Action)	0	-	-
Alternative G2	*Shift the fishing year to January 1 – December 31 for all HMS – Preferred Alternative*	0	++	+/-
Alternative G3	Shift the fishing year to June 1-May 31 for all HMS	0	+	-
Authorized Fishing Gear				
Alternative H1	Maintain current authorized gears in Atlantic HMS fisheries (No Action)	0	-	0

Alternative Number	Alternative Description	Ecological Impacts	Social Impacts	Economic Impacts
Alternative H2	*Authorize speargun fishing gear as a permissible gear type in the recreational Atlantic tuna fishery - Preferred Alternative*	-	++	+
Alternative H3	Authorize speargun in the commercial tuna handgear and recreational tuna fisheries	-	++	+
Alternative H4	*Authorize green-stick for the commercial harvest of Atlantic BAYS tunas - Preferred Alternative*	-	+	+
Alternative H5	*Authorize buoy gear in the commercial swordfish handgear fishery, and limit vessels employing buoy gear to possessing and deploying no more than 35 individual buoys, with each having no more than two hooks or gangions attached - Preferred Alternative*	0	+	+
Alternative H6	Authorize buoy gear in the commercial swordfish handgear fishery, and limit vessels employing buoy gear to possessing and deploying no more than 50 individual buoys, with each buoy having no more than 15 hooks or gangions attached	-	-	+
Alternative H7	*Clarify the allowance of hand-held cockpit gears used at boat side for subduing HMS captured on authorized gears - Preferred Alternative*	0	++	+
Regulatory Housekeeping				
Issue 1 – Definitions of Pelagic and Bottom Longlines				
Alternative I1(a)	Retain current definitions for PLL and BLL gear (No Action)	-	-	0

Alternative Number	Alternative Description	Ecological Impacts	Social Impacts	Economic Impacts
Alternative I1(b)	*Establish additional restrictions on longline gear in HMS time/area closures by specifying a maximum and minimum allowable number of commercial fishing floats to qualify as a BLL and PLL vessel, respectively – Preferred Alternative*	+	0	0
Alternative I1(c)	*Differentiate between PLL and BLL gear based upon the species composition of the catch onboard or landed – Preferred Alternative*	+	0	0
Alternative I1(d)	Require time/depth recorders (TDRs) on all HMS longlines	+	-	-
Alternative I1(e)	Base HMS time/area closures on all longlines (PLL & BLL)	+ +	- -	- -
Issue 2 – Shark Identification				
Alternative I2(a)	Retain current regulations regarding shark landing requirements (No Action)	-	0	0
Alternative I2(b)	*Require that the 2nd dorsal fin and the anal fin remain on all sharks through landing – Preferred Alternative*	+	-	-
Alternative I2(c)	Require that the 2nd dorsal fin and the anal fin remain on all sharks through landing, except for lemon and nurse sharks	+	-	-
Alternative I2(d)	Require all fins remain on all sharks through landing	+ +	- -	- -
Issue 3 – HMS Retention Limits				
Alternative I3(a)	Retain current regulations regarding retention limits, with no new prohibitions (No Action)	-	0	0

Alternative Number	Alternative Description	Ecological Impacts	Social Impacts	Economic Impacts
Alternative I3(b)	*Add new prohibition at § 635.71(a)(48) making it illegal for any person to, "Purchase any HMS that was offloaded from an individual vessel in excess of the retention limits specified in §§ 635.23 and 635.24" – Preferred Alternative*	+	+	0/-
Alternative I3(c)	*Add new prohibition at § 635.71(a)(49) making it illegal for any person to, "Sell any HMS that was offloaded from an individual vessel in excess of the retention limits specified in §§ 635.23 and 635.24" – Preferred Alternative*	+	+	0/-
Issue 4 – Definition of East Florida Coast Closed Area				
Alternative I4(a)	Retain current coordinates for the East Florida Coast closed area (No Action)	-	0	0
Alternative I4(b)	*Amend the second coordinate of the East Florida Coast closed area so that it corresponds with the EEZ – Preferred Alternative*	+	-	-
Issue 5 – Definition of Handline				
Alternative I5(a)	Retain the current definition of "handline" at § 635.2 (No Action)	-	0	0
Alternative I5(b)	*Amend the definition of "handline" at § 635.2 by requiring that they be attached to, or in contact with, all vessels – Preferred Alternative*	+ +	-	-
Alternative I5(c)	Require that handlines remain attached to all vessels when fishing recreationally and allow unattached handlines when fishing commercially	+	-	-
Issue 6 – Possession of Billfish on Vessels Issued Commercial Permits				

Alternative Number	Alternative Description	Ecological Impacts	Social Impacts	Economic Impacts
Alternative I6(a)	Retain current regulations regarding the possession of Atlantic billfish (No Action)	-	0	0
Alternative I6(b)	*Prohibit vessels issued commercial permits and operating outside of a tournament from possessing, retaining, or taking Atlantic billfish from the management unit – Preferred Alternative*	+	-	0
Issue 7 – BFT Dealer Reporting				
Alternative I7(a)	Retain the current regulations regarding BFT dealer reporting (No Action)	0/-	-	-
Alternative I7(b)	*Amend the HMS regulations to provide an option for Atlantic tunas dealers to submit required BFT reports using the Internet – Preferred Alternative*	+/0	+	+
Alternative I7(c)	Amend the HMS BFT dealer reporting regulations to require that Atlantic tunas dealers submit BFT reports electronically, with specific exceptions	+/0	+	+
Issue 8 – "No-Fishing" and Cost-Earnings" Reporting Forms				
Alternative I8(a)	Maintain the existing regulations regarding submission of logbooks (No Action)	0	-	0
Alternative I8(b)	*Require submission of "No Fishing" reporting forms for selected vessels if no fishing trips occurred during the preceding month, postmarked no later than seven days after the end of the month – Preferred Alternative*	0	+/-	0

Alternative Number	Alternative Description	Ecological Impacts	Social Impacts	Economic Impacts
Alternative I8(c)	*Require submission of the trip "Cost-Earnings" reporting form for selected vessels 30 days after a trip and the annual "Cost-Earning" report form by January 31 of each year – Preferred Alternative*	0	+/-	0
Issue 9 – Non-Tournament Recreational Landings Reporting				
Alternative I9(a)	Retain existing regulations at § 635.5(c)(2) requiring anglers to report non-tournament recreational landings of North Atlantic swordfish and Atlantic billfish (No Action)	-	-	0
Alternative I9(b)	*Require vessel owners to report non-tournament recreational landings of North Atlantic swordfish and Atlantic billfish – Preferred Alternative*	+	+	0
Issue 10 – Pelagic Longline 25 mt NED Incidental BFT Allocation				
Alternative I10(a)	Retain the current regulations specifically referring to 25 mt (ww) (No Action)	0	0/-	0/-
Alternative I10(b)	*Modify the HMS regulations to state that "In addition, each year, 25 mt (ww) will be allocated for incidental catch by pelagic longlines" in the NED – Preferred Alternative*	0	+	+
Alternative I10(c)	Conduct additional discussions at ICCAT regarding quotas allocated to account for bycatch related to directed longline fisheries in the vicinity of the management area boundary	0	?	?
Issue 11 – Permit Condition for Recreational Trips				
Alternative I11(a)	No permit condition for recreational trips (No Action)	-	-	0

Alternative Number	Alternative Description	Ecological Impacts	Social Impacts	Economic Impacts
Alternative I11(b)	*Require recreational vessels with a Federal permit to abide by Federal regulations, regardless of where they are fishing, unless a state has more restrictive regulations - Preferred Alternative*	+	+	0

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5.0 MITIGATION AND UNAVOIDABLE IMPACTS

None of the preferred alternatives in this draft HMS FMP are likely to have significant adverse ecological impacts. The alternatives for workshops were designed to reduce mortality of sea turtles and other protected species. The alternatives for time/area closures were chosen to help protect spawning aggregations of gag grouper and to provide greater transparency to the affected public regarding the use of time/area closures to reduce bycatch. While the preferred alternative for finetooth sharks may not reduce fishing mortality in the short-term, more direct management measures could exacerbate the situation and increase fishing mortality because, at this time, the sources of mortality are unclear. It is important to obtain more comprehensive information on finetooth shark landings from observers and other management entities in order to implement actions that ensure conservation benefits for finetooth shark stocks and minimize any associated negative economic or social impacts.

The preferred alternative for northern albacore tuna would not have any impact until ICCAT implements a rebuilding plan. To reduce mortality of northern albacore tuna, such a plan could include measures like restricting size of fish retained or total landings. In this instance, the rebuilding plan could result in some dead discards because fishermen may continue to target other species and have to discard albacore bycatch. For this to occur the mortality reduction would have to be greater than 25 percent per year on average, since the current fishery averages about 25 percent below the existing allocation.

None of the preferred alternatives for reducing Atlantic billfish mortality from directed fishing are anticipated to have adverse ecological impacts. No significant changes in angler behavior are expected given the current high levels of participation in catch-and-release activities by Atlantic billfish fishermen. However, NMFS cannot predict angler behavior. If anglers shift their effort to other species or change their behavior significantly in reaction to catch-and-release only of white marlin or the use of circle hooks in tournaments (with natural bait or natural/artificial bait combinations), this shift or change could potentially result in adverse ecological impacts to other species by possibly increasing discards and retention of those species.

The BFT management measures are not expected to have significant adverse ecological impacts. The General category time-period subquotas would not alter the level of mortality, but would shift where and when it occurs. Effort may increase in some areas and decrease in others, but overall it should remain the same because the quota is finite. Interaction rates with protected species and other marine life may shift with localized effort shifts, but are unquantifiable due to data limitations. However, handgear have low interactions rates in comparison to other gears and so any shifts in interaction rates are expected to be minimal. Clarifying the procedures for calculating the Angling category school size-class BFT subquota allocation would result in a slight increase (2 mt) in the school BFT baseline quota allocation (0.02 percent); however, any increase in effort or changes in fishing practices are anticipated to be small. The slight increase in mortality is covered under ICCAT quota recommendation as well as the rebuilding plan. The small orders of change, quantified in either numbers of fish or in weight (mt), or time and/or location of harvest, compared to overall U.S. harvest levels, as recommended by ICCAT, equate to ecological impacts that are unlikely to be measurable in terms of variability in the data used to

conduct stock assessments. Changes in inseason actions and specifying the season are administrative in nature and should not have any significant ecological impacts.

Changing to a calendar year fishing year is administrative in nature and should have no adverse ecological impacts. As described earlier, there is a small potential for negative economic and social impacts to billfish fisheries/tournaments at the end of a calendar year if the ICCAT 250-marlin limit threshold for catch/release fishing is reached.

The preferred alternatives for authorized fishing gear are not anticipated to dramatically increase effort, and therefore would likely not result in significant increases in landings or landings rates of HMS or other species with which HMS fishermen interact. The Agency does not expect the use of these gears to increase interactions with protected resources but would monitor the use of these gears, as appropriate.

The preferred alternatives in the regulatory housekeeping section, as a suite of management measures, are projected to have minor positive conservation benefits for HMS, bycatch species, and protected resources with minimal social or economic impacts on HMS fishery participants.

5.1 Mitigation Measures

No mitigation measures were considered for the preferred alternatives of the time/area closures, northern albacore tuna, finetooth sharks, or authorized gear sections. NMFS would monitor the impacts of the preferred alternatives for these issues and would consider mitigation measures in the future as necessary.

The preferred workshop alternatives are likely to result in some negative economic impacts as a result of participants having to travel to attend workshops, incurring travel costs and lost fishing time. To mitigate this potential impact, the Agency intends to host a number of workshops in regional fishing hubs and to provide a delay in effective date to give participants a chance to plan on attending certain workshops. Additionally, the Agency would strive to coordinate these workshops in order to reduce the time required away from fishing, work, and family responsibilities. In the future, NMFS may consider ways to reduce travel time by expanding workshops to include Internet or video-based training opportunities.

As described in Chapter 4, the adverse socio-economic impacts of the preferred alternatives for Atlantic billfish would likely be minor, with possibly heightened local impacts in some instances. Consistent with public comment, to mitigate potential adverse impacts, NMFS is proposing to delay the effective date of new management measures until January 1, 2007. The delayed effective date should allow anglers, tournament operators, tackle dealers, and hook manufacturers to adjust for new regulations prior to implementation. Anglers and charter headboat operators would have the opportunity to become comfortable and proficient in the use of new gear and adjust practices to reflect new catch-and-release requirements. Tournaments operators would have time to adjust tournament rules and formats to accommodate new regulations in ways that could minimize decreases in participation. Shoreside businesses would have time to reduce existing stockpiles of J-hooks. Further, allowing continued use of J-hooks outside of tournaments and within tournaments on artificial lures would substantially mitigate

any minor potential adverse impacts from circle hook requirements by allowing anglers to use existing quantities of J-hooks; tackle dealers to reduce existing inventories and adjust purchasing patterns, if necessary; and allow hook manufacturers to adjust production as appropriate. Additionally, NMFS is proposing to limit the length of time that the catch-and-release only regulation would be in place for white marlin.

No specific mitigating measures were considered for any of the preferred alternatives for BFT management. While shifting the General category time-periods may result in less quota during some months, the regulations do not constrain fishermen to fishing in any one particular month. Provided they have the capability, fishermen can travel to where the fish are available regardless of the time of the year.

Changing to a calendar-based fishing year would require a transition period of some type. Currently, NMFS is considering allowing for a seven-month transition where vessels participating in the billfish, tuna, and swordfish fisheries could catch an entire year's worth of quota in seven months. The actual impacts of such a transition would be analyzed in a future rulemaking.

As described earlier in the document, the ecological, social and economic impacts associated with the preferred alternatives in the regulatory housekeeping section are expected to be minor. This is because the preferred alternatives were specifically selected to mitigate any potential adverse impacts, yet still accomplish the objectives of this rulemaking. For example, in differentiating between PLL and BLL gear, the preferred definitions were selected because they would accommodate the current practices of the overwhelming majority of commercial HMS fishery participants, yet still provide a quantifiable method to differentiate between the gear types. Similarly, in requiring that handlines remain attached to the vessel, NMFS has preferred alternatives to cap the future expansion of this gear sector while still allowing current participants in the swordfish commercial fishery a reasonable opportunity to harvest their allocated quota by authorizing the use of buoy gear for that sector. The alternatives to facilitate reporting and improve administration would provide clarity and eliminate ambiguities in current regulations and practices. In the case of regulatory housekeeping Issue 7, NMFS would facilitate the electronic submittal of BFT dealer reports, while still maintaining current methodologies. Requiring the submission of negative reports would eliminate ambiguities by implementing a standard practice in most regions and a requirement that is already approved under the current PRA submission. A prohibition on the possession of billfish on commercial vessels (Issue 6) provides clarity and consistency with other HMS regulations, but is not expected to impose any economic costs as the sale of billfish is already prohibited. Extending the East Florida Coast closed area to the EEZ is not expected to reduce fishing effort, as vessels would likely relocate to nearby areas with similar catch rates, but would better comply with the original intent of the closure. Implementing a recreational permit condition is being considered at the request of the State of Georgia and the South Atlantic Fishery Management Council. It is expected to facilitate enforcement, provide conservation benefits for HMS, and provide better clarity between state and Federal fishing regulations. Finally prohibiting the sale and purchase of HMS in excess of retention limits reinforces existing possession limits and prohibitions, thus further discouraging this illegal activity.

5.2 Unavoidable Adverse Impacts

In general, there are no unavoidable adverse impacts as a result of the preferred alternatives for the finetooth shark, northern albacore, BFT management, and fishing year issues. NMFS would continue to monitor the impact of the preferred alternatives of all issues and would propose additional management measures, as necessary, to avoid any unanticipated adverse impacts.

The preferred alternatives identified for workshops are necessary to meet the requirements of the October 2003 and June 2004 BiOps, thereby, minimizing the impacts on protected resources, consistent with the Magnuson-Stevens Act, ESA, and MMPA.

The preferred alternatives for time/area closures would not, at this time, implement closures to reduce bycatch of Atlantic billfish, BFT, or sea turtles. This is because, in part, none of the alternatives considered would reduce bycatch of all of those species and many of the closures would result in only minimal impacts on one or more of those species while also having large social and economic impacts. However, NMFS would continue to monitor bycatch and would consider these and other closures to reduce bycatch, to the extent practicable, as necessary.

As previously discussed, the preferred alternatives for billfish are not anticipated to have adverse ecological impacts on target species, non-target species, or protected resources, but some may have minor socio-economic impacts, which could be heightened at a local level in some instances. Furthermore, while the preferred alternatives are not anticipated to have adverse ecological impacts, NMFS cannot predict angler behavior. If implementation of the preferred alternatives results in substantial changes in angler effort or behavior, then there could be minor adverse ecological impacts for species with which billfish angler interact by possibly increasing discards and retention of those species. In considering the alternatives, NMFS preferred alternatives that would minimize the adverse impacts while maximizing the positive impacts. Thus, any resulting economic or social impacts are unavoidable.

Given the quota system in place for BFT, the preferred alternatives for authorized gear would not result in additional BFT landings. There is a potential for BAYS tunas landings to increase. The proposed handgears generally target YFT and SWO, however any potential increases would likely be minor, and in the case of swordfish, U.S. fishermen do not currently catch the U.S. allocation of the TAC. Additionally, because green-stick gear has been used in HMS fisheries for several years, it is not anticipated that authorizing it would increase effort. Thus, authorizing green-stick gear would likely not result in significant increases in landings or landings rates.

As described above, in aggregate, the preferred alternatives in the regulatory housekeeping section are expected to have minor positive conservation benefits for HMS, bycatch species, and protected resources with minimal social or economic impacts on HMS fishery participants. This is because the preferred alternatives were specifically selected to mitigate any potential adverse impacts, yet still accomplish the objectives of this rulemaking. Any resulting economic or social impacts, beyond those described above, are unavoidable.

5.3 Irreversible and Irretrievable Commitment of Resources

The preferred alternatives identified for all the issues in this draft HMS FMP are not expected to result in any irreversible and irretrievable commitment of resources.

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6.0 ECONOMIC EVALUATION

This section assesses the economic impacts of the alternatives presented in this document. Additional economic and social considerations and information are discussed in Chapters 3, 4, 7, 8 and 9 of this document.

6.1 Number of Fishing and Dealer Permit Holders

In order to examine the baseline universe of entities potentially affected by the proposed alternatives, a detailed analysis of the number of permits that were issued in conjunction with HMS fishing activities was conducted. This analysis of the permits issued as of April 2005 is detailed further in Section 3.9 and summarized here.

6.1.1 HMS Commercial Fishing Permits

The program implemented in the 1999 Tunas, Swordfish, and Shark FMP set up six different limited access permit types: 1) directed swordfish, 2) incidental swordfish, 3) swordfish handgear, 4) directed shark, 5) incidental shark, and 6) tuna longline. These permits were designed so that the swordfish directed and incidental permits are valid only if the permit holder also holds both a tuna longline and a shark permit. Similarly, the tuna longline permit is valid only if the permit holder also holds both a limited access swordfish (directed or incidental, not handgear) and a shark permit. Swordfish handgear and shark permits are valid without another limited access permit. As of April 2005, there were 1,144 total HMS commercial fishing permits (189 directed swordfish, 90 incidental swordfish, 93 handgear, 229 directed shark, 321 incidental shark, and 222 tuna longline). However, there are only a total of 611 permit holders, since permit holders may have more than one type of permit. A detailed break down of the shark, swordfish, and tuna longline limited access permits by category and state is provided in Table 3.92. In addition to the 222 tuna longline permits, there are also 49 harpoon, two trap, 5,267 general, and five purse seine Atlantic tuna permit holders as of April 2005.

6.1.2 Dealer Permits

Dealer permits are required for any person that receives, purchases, trades for, or barters Atlantic tuna, swordfish, and sharks, from a fishing vessel of the United States or, in the case of tunas and swordfish, imports or exports regardless of ocean of origin. There were 310 Atlantic swordfish, 230 Atlantic shark, and 364 Atlantic tunas dealer permit holders as of April 2005. The geographic distribution of these dealer permit holders is detailed in Table 3.95.

6.1.3 HMS Recreational Permits

There are two types of permits issued with activities associated with HMS recreational fishing activity. These permits are the HMS Angling category permit and the HMS CHB permit, which is actually a commercial permit that that also allows recreational fishing activity. The Atlantic HMS tournament registration is not a permit *per se,* but is required for recreational activities.

Owners of charter boats or headboats that are used to fish for, take, retain, or possess Atlantic tunas, sharks, swordfish, or billfish must obtain an HMS CHB permit. As of April 2005, there were 4,029 HMS CHB permit holders. Unlike the HMS angling permit, CHB permit holders can sell some of their tuna catch.

The HMS Angling category permit allows all recreational anglers aboard permitted vessels to fish for HMS and is required to fish for, retain, or possess, including catch-and-release fishing, for any federally regulated HMS. As of April 2005, there were 21,735 HMS Angling category permit holders.

Since 1999, Federal regulations have required that each HMS tournament operator register their tournaments with the NMFS at least four weeks prior to the commencement of tournament fishing activities. In 2004, 215 HMS tournaments registered. This number is lower than the actual number of HMS tournaments that registered in the previous year, which may indicate non-compliance with the registration requirement by some tournament operators. However, tournament operations are variable from year to year. Section 3.9 provides more detailed information on HMS tournaments including a detailed geographic breakdown of registered HMS tournaments.

6.2 Gross Revenues of Fishermen

Table 6.1 summarizes the 2003 average annual revenues of the Atlantic HMS fishery based on average ex-vessel prices and the weight reported landed as per the United States National Report (NMFS, 2004), information given to ICCAT (Cortes, 2005), as well as price and weight reported to NMFS Northeast Regional Office by Atlantic bluefin tuna dealers. The overall gross revenues generated from the HMS fishery totaled $73.7 million in 2003. The largest portion of which came from yellowfin tuna, generating $31.7 million in gross revenue.

The highest average ex-vessel price per lb dw across all regions in the Atlantic HMS fishery was $5.91 for bluefin tuna. In addition, average ex-vessel price for shark fins, all grades combined, was approximately $17.09 per lb in 2003.

Table 6.1 Estimates of the total ex-vessel annual revenues of Atlantic HMS fisheries. Sources: NMFS 2004a; Cortes, 2005; and bluefin tuna dealer reports from the Northeast Regional Office.

Species	2003		
	Ex-Vessel Price ($/lb dw)	Weight (lb dw)	Revenue
Bigeye tuna	$3.19	846,191	$2,697,233
Bluefin tuna	$5.91	2,519,345	$14,889,328
Yellowfin tuna	$2.34	13,556,340	$31,721,836
Other tuna*	$0.75	900,522	$673,140
Swordfish**	$3.13	4,668,466	$14,600,627
Large coastal sharks	$0.78	4,421,249	$3,437,521
Pelagic sharks	$1.04	616,967	$643,188
Small coastal sharks	$0.43	549,799	$236,414
Shark fins (weight = 5% of all sharks landed)	$17.09	279,401	$4,774,959
Total HMS		**28,358,280**	**$73,674,245**

Note: Average ex-vessel prices may have some weighting errors, except for bluefin tuna which is based on a fleet-wide average.
* Other tunas includes skipjack and albacore.
** Swordfish estimates do not include dead discards.

6.3 Variable Costs and Net Revenues

In 2003, NMFS initiated mandatory cost-earnings reporting for selected vessels to improve the economic data available for all HMS fisheries. In the past, most of the studies regarding pelagic longline variable costs and net revenues available to NMFS analyzed dated data from 1996 and 1997. Initial analysis of the 2003 cost-earnings data has recently been conducted and is incorporated below. Where noted, NMFS has converted 1996 and 1997 dollars to 2003 dollars using the consumer price index provided by the Bureau of Labor Statistics.

Larkin *et al.* (2000) examined 1996 logbooks and the 1996 voluntary economic forms and found that net returns to a vessel owner varied substantially depending on the vessel size and the fishing behavior (*i.e.,* sets per trip, fishing location, season, target species). They found that out of 3,255 pelagic longline trips reported in 1996, 642 pelagic longline trips provided the voluntary economic information. Larkin *et al.* (2000) suggest using median values (half of the fleet is less than this value and half is above) instead of mean values (the average of all vessels) given the high degree of skewness to the data. For example, the mean owner's share of a trip is $4,412, while the median is $2,242. Larkin *et al.* (2000) suggest that the median values identify the characteristics of the majority of the fleet better than the mean, which can be influenced by outliers (a few vessels that may not be similar to the rest of the fleet). The mean supply costs per trip for the vessels sampled was $5,959 and median was $3,666. This changed depending on area fished, with the median ranging from $1,928 in the area between North Carolina and the east coast of Florida (FEC to MAB) and $10,100 in the Caribbean. Vessels in the NED area (Maine to Virginia region in Larkin *et al.* (2000)) had a median supply cost per trip of $2,831 or $3,320 in 2003 dollars. For the entire fleet, Larkin *et al.* (2000) found that the average net revenues per vessel per trip was $7,354 ($8,624 in 2003 dollars). Vessels fishing in the Caribbean and Maine to Virginia areas had the largest average net returns to the vessel owner per trip at $12,188 and $6,672, respectively ($14,297 and $7,826, respectively, in 2003 dollars). Generally, Larkin *et al.* (2000) found that vessels between 46 and 64 feet in length that had between 10 and 21 sets per trip, fished in the second quarter, fished in the Caribbean, or had more than 75 percent of their gross revenues from swordfish had the highest net return to the owner (ranging from $3,187 to $13,097 per trip) while vessels less than 45 feet in length that had between one and three sets per trip, fished in the first quarter, fished between North Carolina and Miami, Florida, or had between 25 and 50 percent of their gross revenues from swordfish had the lowest net return to the owner (ranging from $642 to $1,885 per trip).

Porter *et al.* (2001) conducted a survey of 147 vessels along the Atlantic and Gulf of Mexico (110 surveys were completed) in 1998 regarding 1997 operations. Survey information was combined with trip tickets and logbook data. They found that on average, vessels received approximately $250,000 annual gross revenues, annual variable costs were approximately $190,000, and annual fixed costs were approximately $50,000. Thus, vessels were left with approximately $8,000 to cover depreciation on the vessel and the vessel owner lost approximately $3,500 per year. On a per trip level, gross revenues averaged $22,000 and trip

expenses, including labor, were $16,000. Labor cost the owner the most (43 percent), followed by gear. Generally, trip returns were divided so the vessel owner received 43 percent and the captain and crew 57 percent. Porter *et al.* (2001) noted that 1997 was probably a financially poor year due to a reduction in swordfish quota and a subsequent closure of the fishery (this fishery has not been closed since). Similar to Larkin *et al.* (2000), Porter *et al.* (2001) noted differences between region, vessel size, and target species. While all vessels had an average net return per trip of $5,556 ($6,371 in 2003 dollars), vessels that fished in the New England or Caribbean regions had much higher net returns per trip at $20,772 and $18,940, respectively ($23,819 and $21,717, respectively in 2003 dollars).

In general, both Larkin *et al*. (2000) and Porter *et al*. (2001) found that the average net return to a vessel is fairly low after all variable costs including labor were accounted for. This was true even of vessels fishing in the northeast region or Caribbean (*i.e.*, regions with relatively high gross revenues). This corresponds with the results of Ward and Hanson (1999) who found that fifty percent of the fleet earns $10,000 or less annually and that, each year, 20 percent of the fleet actually has a loss. Additionally, as suggested by Larkin *et al*. (2000) in their discussion of mean versus median values, Ward and Hanson (1999) found there were a number of vessels that earned much higher net revenues than the average vessel with 19 percent of the fleet earning $50,000 or more annually and seven percent earning more than $100,000 annually.

A summary analysis of the 2003 HMS logbook cost-earnings information provides updated information regarding the costs and revenue of a cross section of vessels operating in the HMS fisheries. A total of 579 trips taken by 51 different vessels were analyzed. For reasons mentioned above, median values are reported. Median gross revenues per trip for 2003 were approximately $12,112. Median total costs per trip were $4,345 (compared to $3,320 in the Larkin *et al*. (2000) study), with fuel costs making up $567 of those costs. Median net revenue in this sample was $6,728 per trip (compared to $8,624 in the Larkin *et al*. (2000) study). The typical trip was nine days long and involved six sets. The median number of crew was three and the average share paid to crew was 11 percent of net revenue ($740 per trip). The captain share of net revenue was 20 percent ($1346) and the owner share was reported to be 50 percent ($3,364). The 2003 cost earnings information is similar to the findings of the 1996 study, but revenues appear to be lower than the 1997 study.

6.4 Expected Economic Impacts of the Alternatives

6.4.1 Bycatch Reduction

6.4.1.1 Workshops

NMFS considered six alternatives (A1-A6) for workshops focusing on protected species release, disentanglement, and identification workshops for pelagic longline, bottom longline, and gillnet fishermen. In addition, 10 alternatives (A7-A16) were considered for HMS species identification workshops.

The economic impacts of the various workshop alternatives primarily focuses on the opportunity costs associated with fishermen attending workshops. Opportunity cost is the cost of passing up the next best choice when making a decision. In this document, NMFS assumes that fishermen who may have to attend workshops, the next best choice of using their time would likely be fishing. Other opportunities exist (*e.g.*, attending family events or other jobs) however NMFS feels this assumption most reasonably reflects that fishing is often the most valuable activity engaged in by most fishermen. In order to estimate the value of their opportunity cost, in this case a day of fishing, an analysis of HMS logbook cost-earnings data was conducted to estimate daily earnings per day at sea for individual HMS fishery participants.

Alternative A1 considers continuing voluntary workshops for longline fishermen. This alternative may result in some negative short-term economic impacts related to workshop travel costs and lost fishing time that may be incurred by fishery participants who choose to attend. Poor attendance at voluntary workshops due to competing demands for fishermen's time, however, may result in insufficient improvements in post-release mortality of threatened and endangered species. This may result in the fishery not achieving the post release mortality targets issued for protected resources by 2007, and thus, may result in future closures that would result in extensive long-term negative economic impacts to the pelagic and bottom longline fisheries.

Alternative A2, the preferred alternative, considers mandatory workshops and certification for all HMS pelagic and bottom longline vessel owners. This alternative will likely result in some short-term negative economic impacts, as a result of the cost of traveling to workshops and the opportunity cost of earnings foregone for the lost fishing and business time that may be incurred by participants that would be required to attend these mandatory workshops. It is estimated that 576 vessel owners permitted to fish for HMS with longline gear would participate in these workshops. Based on 2003 HMS logbook data, it is estimated that an owner's share of their vessel's revenue for bottom and pelagic longline vessel owners is approximately $565 and $504 per day, respectively. The total opportunity cost for this alternative is thus estimated to be between $290,304 and $325,440 in the first year for all vessel owners combined. After the first year, the subsequent costs will depend on how any people enter the fishery. In addition, travel costs would be incurred that would be specific for each workshop location and distance traveled.

These estimates of opportunity cost per day at sea, along with additional estimates that follow, are likely to be high since they do not take into consideration the time the owners, operators (*i.e.*, captains), and crew spend preparing for a trip at the dock and the time it takes to offload and other activities that occur at the dock that require labor time. Therefore, the estimates provided are likely to overestimate opportunity costs since crew share per day is estimated here by dividing a fisherman's share per trip by the number of days at sea, and not by the total number of days worked to earn their share since the Agency lacks this information. Also, note that owners incur costs outside of costs directly associated with a trip, such as capital costs, that reduce their earnings/profit. The revenue share to owner per day at sea might not accurately reflect an owner's true opportunity cost. This is even more evident when owners own multiple vessels. In addition, an owner's participation in a workshop may not disrupt their vessel's ability to go out fishing depending the owner's roll in vessel operations.

Alternative A3, a preferred alternative, considers mandatory workshops and certification for vessel operators actively participating in the HMS pelagic and bottom longline fisheries. This alternative would have similar economic impacts to alternative A2, except this alternative would impact operators. It is estimated that 1,152 operators, assuming two operators per vessel, would participate in workshops under this alternative. Based on 2003 HMS logbook data, it is estimated that an operator's share for bottom and pelagic longline vessel operators is $353 and $166 per day at sea, respectively. The total opportunity cost for this alternative is thus estimated to be between $191,232 and $406,656 in the first year for all vessel operators combined. In addition, travel costs would be incurred.

Alternative A4 considers mandatory workshops and certification for all HMS longline vessel owners, operators, and crew. NMFS estimates that this alternative would result in 4,032 participants attending the workshops. Of this amount, 2,304 are estimated to be crewmembers. Based on 2003 HMS logbook data, it is estimated that a crewmember's share for bottom and pelagic longline vessel crewmembers is $157 and $110 per day at sea, respectively. Combining the total crewmember opportunity cost with the total owner and operator opportunity costs discussed above for alternatives A2 and A3, the total opportunity cost for this alternative is estimated to be between $734,976 and $1,093,824 in the first year. In addition, travel costs would be incurred that would be specific for each workshop location and distance traveled.

Alternative A5, a preferred alternative, considers mandatory workshops and certification for shark gillnet vessel owners and operators in the safe handling and release of protected resources, including sea turtles, smalltooth sawfish, and marine mammals. Individual opportunity costs are not available for gillnet vessel owners and operators due to confidentiality concerns, however the median opportunity cost for vessel owners and operators of all gear types combined, including gillnets, to participate in a one-day workshop would be $677 ($508 owner's share plus $169 captain's share). The costs incurred by the vessel owners and operators would be related to travel and the opportunity costs of time to attend the workshop. Of the estimated 20 gillnet owners and operators who land sharks, approximately, 80 percent are located in Florida and 20 percent are in North Carolina and New Jersey.

Alternative A6 proposes a renewal timeline for workshop certifications. NMFS considered three different recertification timelines: every two years, three years, and five years. Recertification every two years would likely have the greatest economic impacts on participants and five years would result in the least negative economic impacts to the fishing community, because it would result in the most infrequent recertification schedule. Using the range opportunity costs estimated for preferred alternatives A2 and A3, the estimated net present value (using the Office of Management and Budget's recommend seven percent discount rate) of the opportunity costs associated with recertification ten years after initial certification would be between $1.4 and $2.1 million for recertification every two years, $1.0 and $1.5 million for recertification every three years, and $0.6 and $0.9 million for recertification every five years. A recertification frequency of three years appears to be an appropriate compromise of ecological and economic impacts. This period would allow for sufficient retraining to maintain proficiency and update fishermen on new research and development related to the subject matter while not placing an excessive economic burden on the participants due to lost fishing time and travel

resulting from attending a recertification workshop in person. The extent of the impacts would depend on the mechanism for recertification. In addition, the Agency is also considering alternative media for recertification in order to reduce costs.

In addition to the workshops focusing on protected species release, disentanglement, and identification workshops for pelagic longline, bottom longline, and gillnet fishermen, NMFS considered several alternatives for HMS identification workshops. The No Action alternative (A7) is not anticipated to result in any change, either positive or negative, in economic impacts, primarily because current activities related to the dissemination of information to assist in identifying HMS would remain the same.

Voluntary workshops (A8) are not anticipated to result in any substantial economic changes, either positive or negative, primarily because attendance would be voluntary and at the discretion of the participants. Any associated travel costs may be considered a minimal economic impact, as it is not likely that participants would go to substantial expense and trouble for this type of voluntary training. In the long-term, misidentification could result in unquantifiable economic costs if sharks do not rebuild as a result of stock assessment data not being accurate.

Under alternatives A9 through A15, social and economic impacts on each individual would be similar in nature, the main difference being the number of attendees and the associated overall total costs, taking all individuals into consideration. Under alternative A9, the preferred alternative, mandatory workshops and certification for federally permitted shark dealers, it is estimated that there would be over 230 workshop participants. Under alternative A10, mandatory workshops for all shark, swordfish, and tuna dealers, it is estimated that there would be over 980 participants. Information regarding HMS dealer earnings is not available therefore the expected opportunity costs of alternatives A9 and A10 are unquantified at this time.

Under alternative A11, mandatory workshops and certification would include all commercial longline vessel owners, which currently total 576. Alternative A11 would result in opportunity costs equivalent to alternative A2 of between $290,304 and $325,440 for the first year. Under alternative A12, mandatory identification workshops would include all commercial longline vessel operators, which would include approximately 1,152 participants. Alternative A12 would result in opportunity costs equivalent to alternative A3 of between $734,976 and $1,093,824 for the first year. Under alternative A13, mandatory workshops and training certification for all commercial vessel owners (longline, CHB, General category, and handgear/harpoon), which includes approximately 10,022 participants. Under alternative A14, mandatory workshops and certification would be required for all commercial vessel operators, which is estimated to be 11,174. Under alternative A15, mandatory workshops and certifications would be required for all HMS angling permit holders, total approximately 21,735.

On an individual basis, the only costs anticipated to be incurred by fishermen or dealers would be those related to travel and time to attend the workshops. The opportunity cost to all commercial vessel owners is estimated to be $508 per day in net revenue for all gear types based on HMS logbook cost earnings data for 2003. The opportunity cost to all commercial operators is estimated to be $169 per day for all gear types and $116 per day for crewmembers. Using

these estimates of opportunity cost, alternative A13 would result in a total of approximate $5,091,176 in opportunity costs in the first year. The total opportunity cost for alternative A14 is estimated to be $1,871,506 in the first year. Daily opportunity cost estimates for dealers, anglers, and CHB owners and operators are not currently known. The administrative costs to NMFS for the workshops is high, but may be exceeded by the benefits associated with the possible impacts from increased education, as well as, the benefit of avoiding future management actions if BiOp takes are exceeded.

Under alternative A16, social and economic impacts would vary depending on the frequency of recertification workshop attendance required – every two, three, or five years. Furthermore, economic impacts would be dependent on the type of recertification selected by the agency. Hands-on, in-person recertification workshops would result in additional travel costs and lost fishing time. However, the Agency may consider alternative media for recertification, including: DVDs, printed materials, and/or web-based recertification. Negative economic impacts would be greater for shorter recertification frequencies due to more frequent travel costs and potential down time from fishing, although NMFS intends to schedule recertification workshops so as to minimize these factors, to the extent possible.

6.4.1.2 Time/Area Closures

Alternative B1, the no action alternative to maintain existing closures has, and would likely continue to have, negative economic impacts on the pelagic longline industry. Existing closures may have contributed to the reported 15 percent decline in fishing effort, a 31 percent decline in the number of directed and incidental permits, and a decline to 130 active pelagic longline permits from 2000 to 2004. Chapter 4 details the economic impacts and analyzes conducted to estimate the impacts of the various time/area closure alternatives.

Alternative B2(a) would potentially impact a total of 61 vessels and potentially result in an 11 percent decline in fishing effort, and reductions in landings of target species ranging from a minimum of one percent for bigeye tuna to a maximum of 14.3 percent for yellowfin tuna. The combined total loss in gross revenues for alternative B2(a) without redistribution of effort would be approximately $2,299,018 annually. With redistribution of effort, alternative B2(a) is predicted to result in an increase in all targeted species landings and gross revenues except yellowfin tuna, which are predicted to decrease by one percent for a loss of approximately $138,204 annually. The combined total gain in gross revenues for alternative B2(a) with redistribution of effort would be approximately $1,204,883 annually. If, on the other hand, effort is displaced into open areas of the Gulf of Mexico only, gross revenues are predicted to decrease by $5,003,298 (6.8 percent of total 2003 HMS fisheries revenues), or $108,767 per vessel annually with no redistribution of effort. With redistribution of effort, there would be a predicted increase in gross revenues of $679,212. The predicted economic impacts to gross revenues for the fleet could range from a loss of approximately $5.0 million to a gain of approximately $1.2 million (6.8 to 1.6 percent of total 2003 HMS fisheries revenues).

Alternative B2(b) would potentially impact a total of 20 vessels. The combined total loss in gross revenues for the alternative B2(b) closure without redistribution of effort would be approximately $299,120 annually. Specifically, swordfish landings would potentially decrease

by $231,252 annually. However, with redistribution of effort, the combined total loss in gross revenues for alternative B2(b) would be approximately $72,675 annually.

Alternative B2(c) would potentially impact a total of 75 vessels. The combined total loss in gross revenues for the alternative B2(c) closure without redistribution of effort would be approximately $3,136,229 annually. The combined total loss in gross revenues for the alternative B2(c) closure without redistribution of effort would be approximately $3,136,229 annually. Specifically, yellowfin tuna gross revenues, the most lucrative species affected by alternative B2(c) and also the most lucrative HMS species, could decrease by $2,483,678 annually. However, with redistribution of effort, the combined gain in gross revenues for alternative B2(c) would be approximately $1,651,023.

Alternative B2(d) would potentially impact a total 78 vessels. The combined total loss in gross revenues for the alternative B2(d) closure without redistribution of effort would be approximately $10,683,133 annually. Yellowfin tuna gross revenues would be the most impacted, with estimated loss of $8,035,791 annually. However, with redistribution of effort, it is predicted that an overall increase in gross revenues of approximately $6,079,756 annually primarily due to potential increases in swordfish and bigeye tuna landings as effort redistributes.

Alternative B2(e), a 46,956 nm^2 closure in the Northeast, would potentially impact a total of 49 vessels. The combined total loss in gross revenues for alternative B2(e) without redistribution of effort would be approximately $3,234,660 annually. However, with redistribution of effort, gross revenue losses are predicted to total only $820,132 annually (1.1 percent of total 2003 HMS fisheries revenues).

Modifications to two closed areas, alternatives B3(a) and B3(b), would potentially result in positive economic impacts. Re-opening areas of either closure would allow fishermen access to previously closed fishing grounds, resulting in increased landings of targeted species. However, this may create gear conflicts between recreational and commercial fishermen. Conversely, the modified area of B3(a) would be along the axis of the Gulf Stream, which would afford recreational fishermen closed portions inshore and allow pelagic longline vessels to fish in re-opened areas offshore.

Alternative B3(a), the Charleston Bump modification, would result in approximately a total increase in landings worth $234,460 annually with approximately $220,806 annually for swordfish alone. Alternative B3(b), the NEC modification, would potentially increase gross revenues by approximately $550 annually.

Alternative B4, the preferred alternative to implement complementary HMS management measures in Madison-Swanson and Steamboat Lumps Marine Reserve, could potentially impact commercial and recreational HMS fishery participants. However, the impact is likely to be low considering that between 1997 - 2003 only one pelagic longline set and two bottom longline sets were reported in the HMS logbook in these areas. Because the proposed closure areas are relatively small, any HMS fishing activity that otherwise would have occurred in these areas would likely relocate to nearby open areas with similar catch rates. The impact of this alternative on HMS recreational and charter/headboat fishing is unknown. However, because

this alternative includes the seasonal surface trolling allowance, it is not expected to substantially impact the HMS recreational and charter/headboat sector.

Alternative B5, which establishes criteria for regulatory framework adjustments for implementing new time/area closures or making modifications to existing time/area closures, would have no direct economic impacts. However, the ultimate implementation of new, or modification of existing closures could have variable economic impacts depending on whether time/area closures are modified, removed or added. Future modifications to time/area closures will be analyzed for their social and economic effects on fishermen, recreational anglers, businesses, and communities.

Alternative B6, the closure off the southwest tip of Key West to bottom longline gear to protect smalltooth sawfish, would be expected to have minimal negative economic impacts. It is estimated that this alternative could affect 1.3 percent of commercial bottom longline sets based on the number of sets in this area between 1994 – 2003. This alternative would help reduce the number of interactions with smalltooth sawfish, and thereby help the bottom longline industry stay below their Incidental Take Statement (ITS) for smalltooth sawfish. Staying below the ITS will have positive economic and social impacts by keeping the entire bottom longline fishery open and operating.

Alternative B7, prohibiting longlining in all areas, would potentially impact a total of 177 active vessels reporting landings in the Pelagic Longline Logbook. This alternative would have significant economic impacts on the longline vessel owners, operators and crew that would need to re-rig their vessels to continue fishing for HMS, find alternative fisheries, or discontinue fishing. It would also negatively impact dealers that purchase fish from pelagic longliner vessels and also other onshore business that support the industry. The closure of the pelagic longline fishery would result in, at a minimum, a loss of $25.8 million in gross revenues (35 percent of total 2003 HMS fisheries revenues). This estimate does not include the potential loss in revenues from sharks, tunas, and other finfish landings. This alternative would also likely have adverse impacts on shoreside support businesses and dealers.

6.4.2 Rebuilding and Preventing Overfishing

6.4.2.1 Northern Albacore

None of the alternatives considered to address northern albacore would result in impacts different from alternative C1, status quo, as the U.S. fleets are currently fishing below their ICCAT allocation for northern albacore. The impact of alternative C2, unilateral action for the U.S. fleet to reduce landings, would be a reduction in income, but this reduction would be small on the HMS fishery since the level of landings for albacore is two orders of magnitude smaller than swordfish and shark landings. For the recreational fishery, alternative C2 would result in target species shifts to other opportunistic target species as well as catch-and-release of albacore. Economic impacts would be difficult to evaluate for the recreational fishery since there is such a high variation in the catch from year to year. Alternative C3, which would establish the foundation for developing an international rebuilding program, itself has no economic impact. As ICCAT has not yet adopted a rebuilding program for northern albacore tuna, an analysis of

the social and economic impacts from any international rebuilding program resulting from alternative C3 cannot be conducted at this time. If the ICCAT Rebuilding Program involves a substantial reduction in allowable catch, there would likely be a short-term reduction in economic benefits to the longline fishery until the stock recovers. Since recreational fishermen target northern albacore tuna at certain times of the year and in certain areas, it is difficult to estimate the effect that a reduction in allowable landings of northern albacore would have on angler consumer surplus. It might be reduced, but to an unknown extent, since many recreational trips targeting northern albacore tuna often target other tuna species.

6.4.2.2 Finetooth Sharks

Alternative D1, the status quo, would not likely result in any adverse economic or social impacts since this alternative would not substantially modify or alter commercial or recreational fishing practices for finetooth or other species of shark. In the long-term, if finetooth sharks become over fished, there could be larger economic impacts.

Alternative D2, commercial management measures, considers the use of trip limits, modifying gillnet size, specifying maximum soak times, prohibiting the use of gillnet for targeting sharks, and reducing the quota for small coastal sharks (SCS). These commercial management measures may impose negative economic impacts on a limited number of gillnet vessels that land sharks and potentially other operations. Implementing a trip limit for finetooth sharks would increase the amount of travel to and from port resulting in lost fishing time and increased expenditures for fuel. The trip limit may also impact directed shark permit holders targeting other finfish species if they end up catching enough finetooth sharks during a trip to reach the limit, and thus reducing the number of sets that could be conducted per trip. However, the impact to directed shark permit holders targeting other finfish is likely to be to a lesser degree since it is assumed that finetooth sharks would comprise a smaller proportion of their landings. In addition, some fishermen targeting finfish species might discard some of the finetooth sharks that they catch to avoid having trips shortened as a result of reaching a trip limit. Modifying gillnet mesh size requirements may impact a small number of gillnet vessels that direct on sharks, causing them to potentially replace existing gear in order to comply with any new requirements. Specifying maximum soak times for gillnet vessels targeting sharks may impose a negative economic effect as vessels would have to work longer hours and make more sets in order to maintain their current catch levels. Alternatively, reducing the quota for SCS may have a negative impact depending on the amount of the reduction. The SCS quota reduction would have to be more than 25 percent to cause economic impacts on the shark gillnet fishery given historical landings. Closing the directed the directed shark gillnet fishery would result in negative economic impacts for the five vessels actively participating in the shark gillnet fishery, but minimal economic impacts on the shark fishery as a whole.

Alternative D3, considers management measures to reduce recreational fishing mortality of finetooth sharks including requiring circle hooks and increasing the existing size limit for finetooth sharks. The potential impacts that could result from requiring circle hooks are unknown. Requiring circle hooks when recreationally targeting SCS may result in negative impacts to the shark recreational anglers as a result of adjusting to this new gear, but those costs are not likely to be significant especially given the potentially lower cost of circle hooks (see discussion below regarding billfish and circle hooks). NMFS is also proposing limiting billfish

tournament participants to using only circle hooks; further information regarding this issue is available in that section below. Increasing the existing size limit for finetooth may result in some negative economic impacts. However, the economic impact may be variable depending on the willingness of anglers to release finetooth sharks caught and/or substitute harvested fish with other similar species. In addition, finetooth sharks only comprise less than two percent of the overall SCS recreational harvest, so the impact is likely to be low.

The preferred alternative (D4), identifying sources of finetooth shark fishing mortality to target appropriate management actions, would have minor economic impacts (*e.g.*, food costs for observer on board and potential safety compliance costs). In the long-term, gaining knowledge as a result this preferred alternative could minimize economic impacts while sustaining the population. Increasing observer coverage to include additional vessels with an incidental or directed shark permit is covered under the existing observer program since any vessel with an HMS permit can be selected for observer coverage. Other efforts to expand data that is currently collected on shrimp trawl vessels would not result in any economic impacts as the percentage of observer coverage would not be expanded, only the selected species of bycatch that are sampled.

6.4.2.3 Atlantic Billfish

Eight alternatives are being considered for the management of the directed Atlantic billfish fishery. Alternative E1, the No Action alternative, would likely have no positive or negative short-term economic impacts. In the long-term, the No Action alternative could result in large adverse economic impacts if billfish are put on the endangered species list or if billfish populations do not recover and continue to decline.

Alternative E2, requiring the recreational fishery to use circle hooks when using natural baits or natural bait/artificial lure combinations, would likely have limited adverse social and economic impacts. There are an estimated 7,915 billfish anglers in the U.S. Atlantic and 1,627 billfish anglers in Puerto Rico (Ditton and Stoll, 2003). The universe of vessels that could be impacted by circle hook requirements are the 21,735 Angling, 4,039 CHB, and 5,268 valid General category permits as of April 20, 2005. A comparison of current J-hooks and circle hook prices indicates that anglers would, on average, likely experience a minor economic cost reduction of approximately $0.46 for every circle hook purchased for use in place of a J-hook if a shift in demand for circle hooks do not significantly effect prices. The delay in implementation of this alternative is anticipated to allow hook manufacturers, retailers, and anglers adequate time to utilize current inventories of J-hooks, thereby minimizing adverse economic impacts associated with alternative E2. This alternative may result in a temporary decrease in angler consumer surplus given anticipated or real loss of fish as fishermen adjust to and become more proficient with the use of circle hooks, but some studies of circle hook effectiveness indicate that there could be increased catches, and therefore angler consumer surplus associated with circle hooks. While unlikely, it is possible that there could be a decrease in tournament participation and demand for CHB trips, as well as trips taken by individuals based on real or perceived declines in catch. Overall, alternative E2 may provide long-term positive benefits with regard to increased angler consumer surplus and willingness to pay if circle hooks contribute to rebuilding efforts and result in increased encounter rates.

Alternative E3, a preferred alternative limiting all Atlantic billfish tournament participants to using only non-offset circle hooks when using natural baits or natural bait/artificial lure combinations, is similar in economic impact to alternative E2, but reduced given the smaller universe of effected individuals. NMFS is not able to quantify the exact number of anglers or vessels participating in tournaments that may be impacted. However, it is known that in 2003 and 2004, there were 244 and 215 registered HMS tournaments, respectively, and that the average number of vessels participating in a tournament is 50. It is possible, but unlikely, that this alternative will result in decreased tournament participation. The impacts to hook manufacturers, retailers, and anglers would likely be limited given that J-hooks would continue to be permitted outside of tournaments, and in tournaments with artificial lures. Angler recreational consumer surplus impacts would be similar to that of alternative E2, but would impact a smaller universe.

Alternatives E4(a) and E4(b) would increase the minimum size for blue and white marlins. It is uncertain if these measures would or would not affect angler participation rates. High current catch-and-release rates, tournaments that establish minimum sizes greater than the current limit, and past surveys indicate that minimum sizes have not affected billfish fishing activity. Thus, NMFS expects that any resultant negative economic impacts of these alternatives would be minor.

Alternative E5, recreational bag limit of one Atlantic billfish per vessel per trip, would likely have minor impacts. Given that the recreational billfish fishery has low CPUE rates and the chances of landing more than white or blue marlin on a single trip is low, it is reasonable to assume that anglers would maintain current levels of participation based on the opportunity of catching and possibly landing one trophy-sized fish. It is possible that there will be an unquantified decrease in demand for CHB trips if not all individual anglers on a given trip would have the opportunity to land a billfish. Furthermore, tournament participation would not be expected to decrease in a substantial manner as tournament rules often prohibit participants from entering more than one marlin per day.

Alternative E6, which would implement the ICCAT recommendation for a recreational marlin landings limits, is anticipated to result in minimal to moderate adverse economic impacts depending on catch rates, angler response, and which of the available management actions become necessary. Historical data suggest that it is unlikely that the United States will achieve the 250 marlin landing limit. Three scenarios were analyzed regarding whether certain thresholds for in-season management action are achieved to estimate the potential impacts of this alternative. If the threshold for inseason management action is not achieved, then alternative E6 would not be expected to result in impacts to the recreational marlin fishery. If the threshold for an inseason minimum size increase is achieved, NMFS believes it is unlikely that there would be a substantial decrease in demand for charter/headboat trips, trips by individual anglers, or participation in billfish tournaments given the catch-and-release ethic of billfish anglers. On the other hand, if the threshold for implementing catch-and-release only fishing is achieved, there could be some economic impacts. In a worst case scenario, marlin anglers may reduce their demand for charter fishing trips by between 0.6 and 13 percent of the available trips remaining during a given season, and the average cost of a CHB trip was $1,026 in 2003. Private marlin vessel owners may also reduce participation by between 0.6 and 13 percent; however, the

economic impact for this is unquantifiable at this time. In addition, NMFS estimates that between 0.8 and 10.1 percent of tournaments may cease to operate in a worse case scenario during a catch-and-release only time period. If the threshold were reached in May under a fishing year schedule, 16 tournaments, between 6.5 and 7.5 percent of registered tournaments, could be impacted and between zero and two tournaments (less than one percent of registered tournaments) may cease to operate. However, even these low numbers may be an overestimate given the recent evidence that anglers may be willing to pay more for catch-and-release tournaments. A reduction in one to two tournaments could result in an estimated adverse direct economic impact of $1,339,800 to $2,679,600 and result in some small decrease in consumer surplus for anglers participating in those tournaments. Impacts on shoreside businesses would likely be minor, but could be increased or decreased depending on angler response and when in the season a shift to catch-and-release only fishing might occur. Alternative E6 could have smaller long-term adverse economic impacts than alternative E1, if landing rates increase in the future, since E6 allows NMFS more flexibility on when and if action should be taken to remain consistent with international standards.

Alternative E7, which would allow only catch-and-release fishing for Atlantic white marlin for a five-year period, could potentially lead to negative economic impacts, although the magnitude is difficult to assess. The short-term social impacts of not being able to land trophy or record category fish is difficult to assess, however NMFS anticipates that this alternative could lead to a decrease in angler willingness-to-pay and angler consumer surplus. The long-term impacts of alternative E7 may result in an increase in net benefits as stocks rebuild and recreational encounters with white marlin become more frequent. The Agency estimates that alternative E7 could result in between $70,794 and $1,244,538 in lost revenues to CHB vessels. The loss of revenues of this magnitude would likely result in minor to moderate negative social and economic impacts to the CHB sector; however, considering the catch-and-release ethic of billfish anglers (23 white marlin reported landed in 2003), NMFS anticipates that negative impacts under this alternative would be less severe than those calculated above. Under alternative E7, negative social and economic impacts could occur if General category vessels that normally participate in HMS tournaments cease participating in tournaments. Any negative impacts would likely be reduced if these vessels already practice catch-and-release fishing for white marlin and participate in catch-and-release tournaments. In 2004, there were 129 registered tournaments that awarded points or prizes for white marlin (see Chapter 3). Assuming that one to four tournaments cease operations, the Agency estimates that alternative E7 could result in negative economic impacts ranging from $1,339,800 to $5,359,200. However, considering the catch-and-release ethic of billfish anglers, NMFS anticipates that negative impacts under this alternative would be of a lesser magnitude than those calculated above. The delayed effective date is anticipated to allow tournament operators sufficient time to alter tournament rules to provide for a catch-and-release format and allow anglers to adjust to new requirements. Angler willingness-to-pay and consumer surplus would likely remain high, given the currently high release rate of white marlin, which is reinforced by the low number of verified landings that occurred in recent years. However, it is possible that angler consumer surplus may decrease given the inability to land white marlin. Further, under alternative E7, anglers would still have the ability to land other billfish, including trophy-sized sailfish and blue marlin.

Alternative E8, which would allow only catch-and-release fishing for Atlantic blue marlin, is similar to E7 and could potentially lead to negative economic impacts, although the magnitude is difficult to assess. Angling category fishermen may reduce the number of trips targeting blue martin under this alternative. Estimating that between 446 and 1,488 trips may be canceled given the inability to retain blue marlin, this alternative could result in between $457,596 and $1,526,688 in lost revenues to CHB vessels annually. The loss of revenues of this magnitude would likely result in moderate negative social and economic impacts to the CHB sector, however considering the catch-and-release ethic of billfish anglers, NMFS anticipates that negative impacts under this alternative would be of a lesser magnitude than those calculated above. Negative economic impacts could occur if General category vessels that normally participate in HMS tournaments cease operations. In 2004, there were 142 registered tournaments that awarded points or prizes for blue marlin captures (see Chapter 3). NMFS estimates that 10 to 14 tournaments could cease operations, and therefore alternative E8 could result in negative economic impacts ranging from $13,398,000 to $18,757,200. Angler consumer surplus would likely remain high, given the currently high release rate of blue marlin, which is reinforced by the low number of verified landings that occurred in recent year. However, it is possible that angler willingness-to-pay, and thus angler consumer surplus, may decrease given the inability to land blue marlin. Further, under alternative E8 anglers would still have the ability to land other billfish, including trophy-sized sailfish and white marlin. To mitigate negative socio-economic impacts, alternative E8 would delay implementation of catch-and-release-only fishing requirements to allow the fishery time to adjusts to new measures, and would include a sunset provision five years from implementation of catch-and-release requirements.

6.4.3 Management Program Structure

6.4.3.1 Bluefin Tuna Quota Management

Alternative F1, the no action alternative, may have both positive and adverse economic impacts. The positive impacts are associated with the General category time-periods and associated subquota allocation percentages remaining consistent with those of prior years, as well as maintaining the General category New York set-aside allocation for those participants operating in that designated area. The adverse impacts associated with this alternative result from the Agency's inability to adapt BFT management measures to account for variations inherent to the fishery from one year to the next. This alternative would also have some adverse economic impacts on fishermen, dealers, and the support industries located in the south Atlantic region, due to the fact that BFT quota tends to be harvested prior to BFT arriving later in the season (Nov. - Jan.) off the southern Atlantic cost and current allocations do not provide for a formal winter fishery.

Alternative F2, the establishment of General category time-periods, subquotas, and geographic set-asides annually via regulatory framework adjustments, would provide NMFS with more flexibility to establish management measures more expeditiously. However, constituents would not be provided long-term certainty in the General category quota allocation scheme around which they could devise a business plan. There may also be positive social and economic impacts attributed to increases experienced in a domestic quota category, time-period

subquotas, or geographic set-aside quota in a given year; however, the likelihood of experienced negative social or economic impacts due to a decrease in any of these areas is equally the same.

Alternative F3, the preferred alternative, would blend aspects of alternatives F1 and F2 together to optimize the positive economic impacts associated with this alternative by enhancing NMFS' flexibility to adapt to the fisheries inherent variability by authorizing adjustments to the General category time-periods, associated subquotas, and geographic set-asides via a regulatory framework adjustment. This alternative would have positive economic impacts on the General category as a whole by providing reasonable fishing opportunities to General category BFT fishery participants throughout the range or the time of year that BFT are readily available to them.

There are four subalternatives associated with alternative F3. F3(a) would distribute the coastwide General category quota equally among the eight months that currently make up the General category BFT season (June-January), by allocating in 12.5 percent shares to each month. This subalternative would have both positive and negative social and economic impacts as it would provide some stability to the constituency by establishing a known amount of quota that would be available at the first of each month , but if catch rates tend to be high, these quotas could be harvested rapidly and could lead to derby style fisheries on the first of each month, which is contrary to NMFS' intent. This subalternative would formalize the recent General category winter BFT fishery, but would do little to recognize historical General category BFT allocations. Therefore, this subalternative would result in positive social and economic impacts for those General category participants located in the south Atlantic region attributed to a 40 percent increase in available quota, compared to the no action alternative, during the time frame of October through January. This increase in quota would equate to approximately four million dollars in additional gross revenue for the later part of the General category season. However, those General category participants in the New England area or those participants which pursue BFT in the summer months may experience some adverse social and economic impacts due to the shift in quota to the later portion of the season. For instance under this alternative, the status quo June through August time-period subquota allocation would be reduced by approximately 22.5 percent and the September time-period allocation would be reduced by approximately 17.5 percent. These reductions in allocation would result in decreased gross revenues of approximately 2.5 and two million dollars respectively. This subalternative would also reduce the need for specific geographic set-asides because quota allocation would be made on a monthly basis and would be evenly distributed. This subalternative would assist in distributing the General category BFT catch, temporally and geographically, which is beneficial for the collection of CPUE data and could assist in avoiding large scale landings in a constrained time frame, thus reducing market gluts.

Subalternative F3(b) would implement General category time-periods, and associated subquota allocation percentages similar to those contained in the 1999 FMP, but would separate the October through January time-period into three distinct time-periods of October through November, December, and January, and establish a formal General category winter BFT fishery on which fishermen, dealers, and supporting industries could depend and plan. The General category time-period subquota allocation percentages would be adjusted slightly to incorporate

the allocations in the winter months, but would still recognize the historical General category allocations during the summer and fall months.

This subalternative would have positive social and economic impacts to those General category participants located in the south Atlantic region attributed to a 9.5 percent increase in available quota, compared to the no action alternative, during the time from of October through January. This increase in quota would equate to approximately 1.2 million dollars in additional gross revenue for the later part of the General category season. However, those General category participants in the New England area or to those participants which pursue BFT in the summer months may experience some adverse social and economic impacts due to the shift in quota to the later portion of the season. For instance under this alternative, the status quo June through August time-period subquota allocation would be reduced by approximately six percent and the September time-period allocation would be reduced by approximately 3.5 percent. These reductions in allocation would result in a decrease of early season gross revenues of approximately 0.8 and 0.3 million dollars respectively. These negative impacts may be mitigated by individuals traveling to where the BFT are located at any time of the season. However, NMFS has little specific information at this time regarding the costs that would be incurred due to this travel.

Subalternative F3(c) (preferred) would implement the same time-periods as mentioned in Subalternative F3(b), but would implement slightly different subquota allocation percentages for the June through August and October through November time-periods. This subalternative was designed to redistribute the quota from the early time-periods to provide a winter General category BFT fishery to during the months of December and January. This subalternative would reduce the allocation to the June through August time-period to a higher degree, than subalternative F3(b) and increase the suballocation to the October through November time period, thus shifting more of the potentially adverse social and economic impacts to the earliest portion of the season.

This subalternative would enhance equity among regional General category participants, given that access to fish available at different times of the year in different locations is likely to occur. Because this alternative would allocate General category quota based on a balance between historical General category BFT allocations, recent BFT landing trends, and the NCDMF Petition for Rulemaking, there would be no significant social or economic impacts to the fishery as a whole. However, this subalternative would have similar positive and adverse social and economic impacts as outlined in Subalternative F3(b). The adverse social and economic impacts would be slightly shifted to the earliest portion of the fishery, where the General category subquota allocations have traditionally been the highest. This subalternative would have positive social and economic impacts to those General category participants fishing in the later portion of the season due to a 13.5 percent increase in available quota, compared to the no action alternative, during the time from of October through January. This increase in quota would equate to approximately 2.6 million dollars in additional gross revenue for the later part of the General category season. However, those General category participants who pursue BFT in the summer months may experience some adverse social and economic impacts due to the shift in quota to the later portion of the season. For instance under this alternative, the status quo June through August time-period subquota allocation would be reduced by approximately

ten percent and the September time-period allocation would be reduced by approximately 3.5 percent. These reductions in allocation would result in a decrease of gross revenues of approximately 1.2 and 0.3 million dollars respectively for each of these time periods.

Reallocating more quota from the June through August time-period to the later time-periods would slightly mitigate some of these adverse social and economic impacts because the amount of quota being reallocated would equate to a smaller percentage of the June through August subquota relative to the other time-period subquotas. This subalternative is preferred due to the balance it strikes between providing all General category BFT fishery participants an equitable opportunity to harvest a portion of the coastwide General category quota, while still recognizing the historical participation in this fishery. Any adverse social or economic impacts associated with this alternative would be minimized and may even be mitigated as fishermen are allowed to travel to the geographical location of where the BFT are located at any give time. However, NMFS has little specific information at this time regarding the costs that would be incurred due to this travel.

Subalternative F3(d) would implement the same time-periods as described in Subalternatives F3(b) and F3(c), but would allocate the General category time-period subquota in accordance with the NCDMF's Petition for Rulemaking (*i.e.*, 150 mt total for the months of December and January or approximately 21.7 percent of the coastwide General category quota). This alternative would have a greater positive social and economic impact to General category participants in the south Atlantic region, region due to a 24.7 percent increase in available quota, compared to the no action alternative, during the time from of October through January. This increase in quota would equate to approximately 2.9 million dollars in additional gross revenue for the later part of the General category season. However, those General category participants in the New England area or to those participants which pursue BFT in the summer months may experience greater adverse social and economic impacts due to the shift in quota to the later portion of the season. For instance under this alternative, the status quo June through August time-period subquota allocation would be reduced by approximately 21.3 percent and the September time-period allocation would be reduced by approximately 3.4 percent. These reductions in allocation would result in decrease gross revenues of approximately 2.5 and 0.3 million dollars respectively. These negative impacts may be mitigated by individuals traveling to where the BFT are located at any time of the season. However, NMFS has little specific information at this time regarding the costs that would be incurred due to this travel.

Alternative F4 would clarify the procedures NMFS uses in calculating the ICCAT recommendations regarding the eight percent tolerance for BFT under 115 cm. This alternative would have slightly more positive economic impacts as it would slightly increase the school size-class BFT quota by approximately two mt, or 0.02 percent of the status quota allocation.

Alternative F5 would maintain the status quo process currently used in allocating the ICCAT-recommended U.S. BFT TAC domestically, the accounting for annual under/overharvest, and establishing General category effort controls. This alternative would not likely have any substantial economic impacts.

Alternative F6 would have slightly more positive economic impacts, in comparison to F5, as each baseline domestic quota category allocation, quantified in metric tons, would be codified in the regulatory text implementing the consolidated HMS FMP. This alternative would have positive economic impacts to the domestic BFT fishery as a whole by allowing BFT fishery participants, either commercial or recreational in nature, to make better informed decisions on how to best establish a business plan for the upcoming season.

Alternative F7, which would not allow carry forward of unharvested quota from one fishing year to the next, would likely have the most adverse economic impact of all the annual BFT management measure alternatives. This alternative could lead to derby style fishing where vessels may operate in less than optimal conditions to harvest the quota before the season is closed. This alternative could also result in a domestic quota category not receiving a quota transfer from another domestic quota category with large amounts of underharvest to assist in covering an overharvest situation, which could result in that category having quota deducted from the following year. This could result in reduced fishing opportunities, income, and angler consumer surplus for the commercial and/or recreational fleet, as well as the businesses that support those BFT fisheries.

Alternative F8, which would limit the amount of unharvested BFT quota in each category that could be carried forward, would have both slightly positive and negative economic impacts on the BFT participants. This would limit the maximum amount of revenue each domestic quota category could generate to no more than double the value of the baseline allocation. These potential negative economic impacts would be mitigated, overall, by reallocation of tonnage that exceeds the cap to the Reserve or to another domestic quota category.

Alternative F9 maintains inseason action procedures. When catch rates are low, a liberalized retention limit of two or three BFT may have positive economic impacts on a vessel that is able to harvest multiple fish especially if ex-vessel prices are high during a low catch rate period. However, if catch rates were to increase dramatically over a short period while retention limits were set at the upper end of the allowable range, large numbers of BFT could be landed in a short time period, thus flooding the market and depressing ex-vessel prices.

Alternative F10 would have slightly more positive economic impacts, as the criteria NMFS must consider when making inseason action determinations would be consolidated and consistent, regardless of what type of inseason action is being considered.

Alternative F11, which would eliminate BFT inseason actions, would constrain NMFS' ability to adjust management actions that help spread the maximum utilization of BFT quota over the longest period of time. The positive economic aspect of this alternative would be that quota allocations and daily retention limits would remain stable throughout the entire season, which would aid in planning fishing activities.

6.4.3.2 Timeframe for Annual Management of HMS Fisheries

Three alternatives were considered for changing the annual management timeframes for HMS fisheries. Alternative G1, maintaining the current fishing year for all HMS species, would not result in any anticipated disruptions to any of the HMS markets.

Alternative G2, which would manage all HMS species on a calendar year cycle, would not have any economic impacts on the shark fishery, since this is the status quo for that fishery. For the bluefin tuna fisheries, the economic impacts of alternative G2 are expected to be minimal given the current measures used to distribute quota throughout the year. The economic impacts to the Atlantic billfish fisheries could vary slightly depending upon whether thresholds for taking restrictive action are achieved and the management measures subsequently implemented. Minor to moderate impacts as a result of the ICCAT billfish landings limit (E6) could be shifted to the tail end of the calendar year, beginning in late summer, under this alternative. This temporal shift in impacts would result in some geographic shift to include New England and Mid-Atlantic regions. If the threshold for implementing catch-and-release-only fishing is achieved to comply with the ICCAT limit, it is estimated that an average of 50 tournaments occurring from August to December could be impacted, and up to five tournament cancellations could occur resulting in an annual economic impact of $6,699,000.

Alternative G3, which would establish a June 1 – May 31 fishing year management cycle for all HMS species, could result in some short-term negative economic impacts as shark wholesale and retail markets adjust to the potential disruption in catch rates resulting from the shift to a fishing year and new trimesters.

6.4.3.3 Authorized Gears

Seven alternatives have been considered to address issues with authorized gear. Alternative H1, the No Action alternative, would not be expected to have any additional economic impacts because fishermen are already operating under these measures.

Alternative H2, which would authorize speargun fishing gear as a permissible gear-type in the recreational Atlantic tuna fishery, could have positive economic impacts for spearfishermen. The charter/headboat sector may also experience positive economic impacts as spearfishermen may increase their use of for-hire vessels. However, potential competition for fishing grounds and speargun fishing landings under the BFT Angling category may result in negative economic impacts for rod and reel fishermen.

Alternative H3, which would authorize speargun fishing in both the commercial tuna handgear and recreational fisheries, would have similar economic impacts to alternative H2 except that there would be potential economic benefits for CHB and General category fishermen from the sale of commercially speared tunas. However, it is not anticipated that many commercial tuna fishermen would utilize this gear type.

Alternative H4 would authorize green-stick gear for the commercial harvest of Atlantic BAYS tunas. This alternative would likely have positive economic impacts for those fishermen who wish to employ green-stick gear to target Atlantic BAYS tunas commercially. The higher landing rates and higher quality of meat landed using green-stick gear could provide positive economic impacts to commercial fishermen, as well as benefit fish houses, gear supply houses, and other associated business. The economic benefits of this alternative, however, would likely be small since some vessels are already utilizing this gear type. There could be negative

economic impacts from the prohibition on the possession or retention of BFT when possessing commercial configurations of green-stick since this practice may already be occurring.

Alternative H5 would allow the commercial swordfish handgear fishery to continue utilizing unattached handlines, redefined as "buoy gear", and would likely continue affording positive economic benefits to current fishery participants. If any vessels are currently fishing with more than 35 free-floating buoyed handlines, this alternative could limit effort, and there could be some unquantified adverse economic impacts. This alternative would also require that fishermen using this gear type affix gear monitoring equipment to each buoy to aid in recovery. NMFS anticipates that most swordfish handgear fishermen using unattached handlines likely already possess and utilize some or all of this gear monitoring equipment. If not, minimum compliance costs for the least expensive equipment (*e.g.* reflective tape and spotlight) could be incurred.

Alternative H6 is similar to H5, except under alternative H6, each buoy would be allowed to have no more than 15 hooks or gangions attached. This alternative could provide additional positive economic impacts stemming from the ability to increase the number of hooks attached to each buoy gear. Additionally, this alternative would allow vessels in the swordfish handgear fishery to possess and deploy up to 50 buoys.

Alternative H7, which would clarify the allowance of hand-held cockpit gears used at boat side for subduing HMS, would likely have positive economic impacts by reducing confusion over the allowance of these gears and increased retention rates for those fishermen who target large HMS and wish to use these secondary gears. The use of these hand-held cockpit gears can be dangerous and lead to adverse economic impacts if injuries occur, but they would help subdue fish and are already being used.

6.4.3.4 Regulatory Housekeeping

Twelve regulatory housekeeping issues were address with several alternatives for each issue. The first issue, the definition of pelagic and bottom longlines, was addressed with five different alternatives. Alternative I1(a), the No Action alternative, would likely produce the fewest additional adverse economic impacts on fishing vessels, though it could result in compliance issues and longer periods of interruption during compliance inspections at sea.

Alternative I1(b), the preferred alternative that would establish additional restrictions on longline gear in HMS time/area closures by requiring that BLL vessels in closed areas possess no more than 70 commercial fishing floats, and that PLL vessels in BLL closed areas possess at least 71 commercial fishing floats, would not be expected to produce adverse economic impacts. This alternative would potentially impact less than five percent of all PLL sets and less than 10 percent of all BLL sets. This alternative would also likely improve inspections at sea.

Alternative I1(c), is another preferred alternative that would differentiate between PLL and BLL gear based upon the species composition of the catch onboard or landed. A five percent incidental allowance of "indicator" species is higher than both the average and single highest year, and therefore this alternative would not be expected to produce adverse economic impacts. This alternative, however, could adversely impact those longline vessels that regularly

target both demersal and pelagic species on the same trip and that fish in closed areas. The time required to conduct an enforcement inspection at sea under this alternative could create an adverse economic impact in terms of lost opportunity cost, and possibly reduce net revenues associated with re-icing the fish and reduced quality of the catch, but it could also have a positive economic impact if these inspections are quicker than under the No Action alternative.

Alternative I1(d), which would require time/depth recorders on all HMS longlines, would result in direct economic costs associated with the purchase of these devices. It is estimated that equipment costs per vessel could be approximately $1,400 to $6,500, and there could be costs associated with a loss of efficiency due to attaching the devices to longlines, and downloading and recording the information. Some positive economic benefits could be realized if this alternative would minimize the disruption of enforcement inspections.

Alternative I1(e) would implement HMS longline time/area closures for both pelagic and bottom longline HMS permitted vessels. This alternative is expected to produce the most significant negative economic impacts, primarily on HMS-permitted BLL vessels that would be prohibited from fishing year-round in the DeSoto Canyon and Florida East Coast closed areas, in the Charleston Bump closed area from February 1 through April 30 each year, and in the Northeastern U.S. closed area from June 1 through June 30 each year.

Four alternatives were considered for enhancing shark identification. Alternative I2(a), which retains the current regulations, is not expected to result in economic impacts in the short-term. In the long-term, data issues resulting from poor shark identification could result in less than optimal fishery management.

Under alternative I2(b), fishermen could experience, in the short-term, some adverse economic impacts associated with keeping the second dorsal and anal fins on the shark. In the long-term, the improved quota monitoring and stock assessment data as a result of this alternative could result in a larger quota, and therefore larger net revenues for both fishermen and dealers. Alternative I2(c) is similar, but would allow fishermen to remove all the fins of lemon and nurse sharks while at sea. Since so few lemon and nurse sharks are landed, NMFS believes that any economic benefits gained would be marginal.

Alternative I2(d), which would require all fins to remain on all sharks through landing, would have the largest economic impact of any of the shark identification alternatives. It is unlikely that the ex-vessel price of the fins that were packed in ice with the rest of the shark would be as high as the fins that had begun to dry if they were removed. Additionally, if the shark cannot be packed in ice properly due to maintaining the fin on the shark, the quality of the meat, and therefore its value, could also decrease.

Three alternatives were considered for addressing compliance with HMS retention limits. Under alternative I3(a), the No Action alternative, individual vessel owner/operators, and/or dealers may experience some positive economic benefits from the sale or purchase of HMS exceeding the commercial retention limits; however, there would be economic impacts from noncompliance with retention limits. Under I3(b) and I3(c) it would be illegal to purchase or sell any HMS from an individual vessel in excess of the retention limits, and therefore there could be

slightly less revenue by vessels exceeding the retention limits. However, there would be slightly positive economic impacts with enhanced compliance with the retention limits, but there may be increased dealer administrative/information costs with insuring that they are not purchasing more than the commercial retention limits from a particular vessel.

Two alternatives were considered for defining the Florida East Coast closed area. The No Action alternative I4(a) would not result in any additional economic impacts. Alternative I4(b) would extend the closed area and could potentially reduce HMS catches and associated landings revenues by a small amount.

Five alternatives were considered for revising the definition of handline. Alternative I5(a), which would retain the current definition, would not add any additional economic impacts. Alternative I5(b), which would amend the definition of "handline" by requiring that they remain attached to all vessels, would potentially impact a large portion of HMS permit holders and result in negative economic impacts by potentially reducing operational efficiency. However, this practice does not appear to be widespread. Alternative I5(c), which would require handlines remain attached to all vessel when fishing recreationally, could impact recreational fishing activity but there is currently no data indicating how many recreational vessels are fishing this way.

Alternative I6(a) and I6(b) focus on clarifying the recreational nature of the billfish fishery. Neither the No Action alternative (I6(a)) nor the alternative to prohibit the possession of taking of billfish by commercial permit holders (I6(b)) would be expected to have any adverse economic impacts since Atlantic billfish cannot be bought or sold by commercial vessels. There could be some positive economic impacts to the recreational fishing community if alternative I6(b) results in enhanced fishing opportunities for recreational fishermen.

Three alternatives were considered for BFT dealer reporting. Alternative I7(a), the No Action alternative, would not change the current economic impacts of reporting, but it could continue to impose time costs associated with the entry of similar data on several different forms for reporting. Alternative I7(b) would allow the option to do one-stop data entry on the Internet, and thus provide flexibility that could reduce economic impacts associated with reporting. Alternative I7(c) would require most dealers to use electronic reporting, which might benefit some, but could also impose additional Internet access costs and training costs in learning the new system.

Alternatives to address no fishing and cost-earnings reporting forms (I8(a-c)) clarify the current practices in submitting these forms and are not likely to increase economic costs associated with these activities. However, the clarification of the timeframes involved for submitting reports may result in fewer permit renewal delays.

Maintaining the current non-tournament recreational landings reporting requirements for North Atlantic swordfish and Atlantic billfish under alternative I9(a) would not result in any significant economic impacts. Alternative I9(b), which would require vessel owners to report non-tournament recreational landing, would not cause any significant adverse economic impacts since 95 percent of past reports were reported by vessel owners. Linking non-reporting to permit

sanctions would enhance enforcement and compliance that is expected to improve recreational data collection. In addition, the overall number of calls needed to report landings might be reduced if operators report landings for several anglers' landings.

Under the No Action alternative I10(a), current regulations could be interpreted to potentially limit the NED set-aside to 25 mt due to the way the regulatory text is drafted, and thus cause adverse economic impacts if underharvest set-aside quota from the prior fishing year is not taken into account. Alternative I10(b) would allow underharvested quota from the set-aside to be rolled-over to subsequent fishing years, and thus provide a potential positive economic impact. There may be a perceived negative economic impact among other fishery sectors if they are closed after achieving their allocated quota and are unable to access available quota, via in-season transfers, from the NED set-aside. Alternative I10(c) would address this issue by explicitly raising with ICCAT the issues of rolling-over large amounts of unharvested quota between fishing years. If the outcome of this is capping the available NED set-aside quota, the pelagic longline vessels may experience negative economic impacts.

Alternatives I11(a-b) examine whether or not recreational vessels with Federal permits should be required to abide by Federal regulations regardless of where they are fishing. If Federal regulations always apply unless state regulations are more restrictive, as in alternative I11(b), there could be some decreases in recreational satisfaction as a result of potentially increasing regulatory requirements to the Federal standards.

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7.0 REGULATORY IMPACT REVIEW

The Regulatory Impact Review (RIR) is conducted to comply with Executive Order 12866 (E.O. 12866) and provides analyses of the economic benefits and costs of each alternative to the nation and the fishery as a whole. Certain elements required in an RIR are also required as part of an environmental impact statement (EIS). Thus, this section should be considered only part of the RIR, the rest of the RIR can be found throughout this document.

7.1 Description of the Management Objectives

Please see Chapter 1 for a description of the management objectives associated with these management actions.

7.2 Description of the Fishery

Please see Chapter 3 for a description of the fisheries that could be affected by these management actions.

7.3 Statement of the Problem

Please see Chapter 1 for a description of the problem and need for these management actions.

7.4 Description of Each Alternative

Please see Chapter 2 for a summary of each alternative and Chapter 4 for a complete description of each alternative and its expected ecological, social, and economic impacts. Chapters 6 and 8 provide additional information related to the impacts of the alternatives.

7.5 Economic Analysis of Expected Effects of Each Alternative Relative to the Baseline

Alternatives for nine major issues have been analyzed in the preceding chapters. Table 7.1 indicates the possible net economic benefits and costs of each alternative for the nine major issues. It is likely that the implementation of the preferred alternatives could incur moderate economic costs. However, the benefits of these actions, in particular preventing closures of the fishery due to exceedance of protected species targets and BiOp requirements, rebuilding billfish stocks, maintaining compliance with ICCAT, increasing the flexibility of bluefin tuna management, adding more authorized fishing gears, and addressing a wide variety of regulatory issues, will likely outweigh the costs.

Several alternatives were considered for workshops for protected species release and species identification. The preferred alternatives that would require owners and operators of longline and gillnet gear vessels to attend workshops and renew their certifications every three years addresses the BiOp recommendations while avoiding excessive costs associated with certifying crew (A4) or shorter renewal cycles. In addition, the preferred alternative for species identification workshops, alternative A9, would target training to shark dealers who are likely to face the greatest challenges in proper species identification since they are inspecting landed

carcasses, rather than whole specimens. In combination with alternative I2(b), there could be significant improvements in proper shark species identification and therefore reporting.

The examination of additional time/area closures revealed that is difficult to target closures to prevent impacts on a particular species without impacting other species that are overfished, experiencing overfishing, threatened or endangered. Redistribution of effort, as a result of a closure alternative targeting a particular species interaction, often resulted in the potential for significant impacts on other species that are overfished, experiencing overfishing, threatened or endangered. The potential redistribution of effort with the analyzed time/area closure alternatives often revealed that the economic impact of time/area closures is very dependent on the extent of effort redistribution. The preferred alternative proposing criteria for regulatory framework adjustments for closures would have minimal economic impacts and would likely lead to enhanced future fishery management planning.

The analysis of the northern albacore tuna alternatives reveals that economic costs can be caused by unilateral restrictions on effort, however, the benefits from implementing management measures now are likely to be negligible without coordinated international management of this highly migratory species. Pursuing an international rebuilding plan at ICCAT would likely have the best economic return for the potential costs involved in managing northern albacore.

In a similar vein, the management of finetooth sharks within just the HMS fishery would not produce enough ecological benefits to warrant the potential high costs on a small number of HMS permit holders. The preferred alternative would lead to identification of mortality of finetooth sharks in other fisheries that should reveal lower marginal cost opportunities to reduce finetooth shark mortality and thus maximize net benefits.

Incremental management measures, such as those under alternative E3, would achieve many of their ecological benefits with the minimum amount of economic impacts. Requiring tournament participants to adopt circle hooks would likely encourage other recreational billfish fishery participants to also adopt circle hooks and result in a low regulatory cost and high ecological benefit outcome. Alternative E6 also would utilize an incremental approach to achieve compliance with ICCAT catch/landing limits while having the low impact on billfish tournaments and billfish recreational anglers.

Authorizing recreational tuna spearfishing would also likely enhance the HMS recreational fishery by introducing a new dedicated user group into the tuna recreational fishing community. The benefits of this alternative would likely exceed any associated costs. In general, providing the flexibility to use various technologies allows opportunities to find greater efficiencies. This would likely also be the case with green-stick and buoy gear alternatives.

The alternatives considered for bluefin tuna management focus on enhancing regulatory flexibility to address a constantly changing and dynamic resource. Allowing flexibility while maintaining consistency to allow businesses to plan is key in maximizing net benefits.

Finally, several regulatory issues have been considered. The potential shift from a "fishing year" to a calendar year to manage the HMS fishery has impacts on several of the

regulatory alternatives being considered. The largest impact of this potential shift would likely be on billfish fishery participants, however, the benefits of a consistent and easily understood management timeframe would likely have net benefits to the businesses associated with the fishery in the long term. Other regulatory issues being considered address a variety of definitional issues and clarifications that are not likely to have much of an overall impact on net benefits and costs.

7.6 Conclusion

Under E.O. 12866, a regulation is a "significant regulatory action" if it is likely to: 1) have an annual effect on the economy of $100 million or more or adversely affect in a material way the economy, a sector of the economy, productivity, competition, jobs, the environment, public health or safety, or state, local, or tribal governments or communities; 2) create a serious inconsistency or otherwise interfere with an action taken or planned by another agency; 3) materially alter the budgetary impact of entitlements, grants, user fees, or loan programs or the legal mandates, the President's priorities, or the principles set forth in the Executive Order. The preferred alternatives described in this document do not meet the above criteria. Therefore, under E.O. 12866, the preferred alternatives described in this document have been determined to be not significant for the purposes of E.O. 12866. A summary of the expected net economic benefits and costs of each alternative, which are based on supporting text in Chapters 4 and 6, can be found in Table 7.1.

Table 7.1 Net Economic Benefits and Costs of Alternatives

Alternative	Net Economic Benefits	Net Economic Costs
	Workshops	
A1 Voluntary workshops for longline fishermen (No Action)	Minimal	Short-term cost of traveling for fishermen who attend voluntary workshops. In the long-term, if targets are not met, could result in closures and significant economic impacts to pelagic and bottom longline fisheries.
A2 *Mandatory workshops and certification for all HMS pelagic and bottom longline vessel owners – Preferred Alternative*	Long-term benefit from preventing the fishery from being closed and, if fishery is perceived as being environmentally responsible, from increasing ex-vessel prices.	Travel costs for approximately 576 owners and an estimated $290,304 - $325,440 in annual opportunity costs. Costs associated with recertification (See A6).
A3 *Mandatory workshops and certification for vessel operators actively participating in HMS pelagic and bottom longline fisheries – Preferred Alternative*	Long-term benefit from preventing the fishery from being closed and, if fishery is perceived as being environmentally responsible, from increasing ex-vessel prices.	Travel costs for approximately 1,152 captains and an estimated $191,232 - $406,656 in annual opportunity costs. Costs associated with recertification (See A6).
A4 Mandatory workshops and certification for all HMS longline vessel owners, operators, and crew	Long-term benefit from preventing the fishery from being closed and, if fishery is perceived as being environmentally responsible, from increasing ex-vessel prices.	Travel costs for 4,032 participants and an estimated $734,976 - $1,093,824 in annual opportunity costs. Costs associated with recertification (See A6).
A5 *Mandatory workshops and certification for shark gillnet vessel owners and operators – Preferred Alternative*	Long-term benefit from preventing the fishery from being closed and, if fishery is perceived as being environmentally responsible, from increasing ex-vessel prices.	Travel and the opportunity cost for approximately 20 participants. Costs associated with recertification (See A6).
A6 *Certification Renewal Timetable (Certification renewal every 3-years) – Preferred Alternative*	Long-term benefit from preventing the fishery from being closed and, if fishery is perceived as being environmentally responsible, from increasing ex-vessel prices.	Costs associated with renewing certification.
A7 No Identification Workshops (No Action)	No travel costs. If enough fishermen attend, then the LCS fishery could rebuild faster and quotas might be increased.	Inaccuracies in data could result in longer rebuilding timeframes and lower quotas for the fishery.
A8 Voluntary HMS identification workshops for dealers, all commercial vessel owners and operators, and recreational fishermen	Minimal. If enough fishermen attend, then the LCS fishery could rebuild faster and quotas might be increased.	Cost of travel for fishermen who attend voluntary workshops.

Alternative	Net Economic Benefits	Net Economic Costs
A9 Mandatory HMS identification workshops for all shark dealers – Preferred Alternative	Long-term the LCS fishery could rebuild as a result of improved information. The LCS quota could then be increased and result in higher benefits.	Travel and the opportunity cost for approximately 230 participants. Costs associated with recertification (See A16).
A10 Mandatory HMS identification workshops for all swordfish, shark, and/or tuna dealers	Long-term the LCS fishery could rebuild as a result of improved information. The LCS quota could then be increased and result in higher benefits.	Travel and the opportunity cost for approximately 980 participants. Costs associated with recertification (See A16).
A11 Mandatory HMS identification workshops for all commercial longline vessel owners	Long-term the LCS fishery could rebuild as a result of improved information. The LCS quota could then be increased and result in higher benefits.	Travel costs for approximately 576 owners and an estimated $290,304 - $325,440 in annual opportunity costs. Costs associated with recertification (See A16).
A12 Mandatory HMS identification workshops for all commercial longline vessel operators	Long-term the LCS fishery could rebuild as a result of improved information. The LCS quota could then be increased and result in higher benefits.	Travel costs for approximately 1,152 operators and an estimated $191,232 - $406,656 in annual opportunity costs. Costs associated with recertification (See A16).
A13 Mandatory HMS identification workshops for all commercial vessel owners (longline, CHB, General category, and handgear/ harpoon)	Long-term the LCS fishery could rebuild as a result of improved information. The LCS quota could then be increased and result in higher benefits.	Travel costs for approximately 10,022 vessel owners and an estimated $5,091,176 in annual opportunity costs. Costs associated with recertification (See A16).
A14 Mandatory HMS identification workshops for all commercial vessel operators (longline, CHB, General category, and handgear /harpoon)	Long-term the LCS fishery could rebuild as a result of improved information. The LCS quota could then be increased and result in higher benefits.	Travel costs for approximately 11,074 vessel operators and an estimated $1,871,506 in annual opportunity costs. Costs associated with recertification (See A16).
A15 Mandatory HMS identification workshops for all HMS Angling permit holders	Long-term the LCS fishery could rebuild as a result of improved information. The LCS quota could then be increased and result in higher benefits.	Travel and the opportunity costs for approximately 21,735 participants. Costs associated with recertification (See A16).
A16 Certification Renewal Timetable (Certification renewal every 3-years) – Preferred Alternative	Long-term the LCS fishery could rebuild as a result of improved information. The LCS quota could then be increased and result in higher benefits.	Costs associated with renewing certification.
Time/Area Closures		
B1 Maintain existing closures; no new closures (No Action)	Current closures have reduced bycatch and should be aiding in rebuilding. In long-term, stock may rebuild leading to greater quotas.	Continued negative impacts on pelagic longline industry from existing closed areas, including loss of participants and supply infrastructure base.

Alternative	Net Economic Benefits	Net Economic Costs
B2(a) Prohibit the use of pelagic longline gear in HMS fisheries in the central portion of the Gulf of Mexico from May through November (7 months)r	There could be benefits to protected species, and thus increase total existence value of these species. Additional reduction in bycatch of HMS and other fisheries should aid in rebuilding. If fishery is perceived as being environmentally responsible then additional benefits could be realized.	Estimated decrease in annual revenues potentially range from (-) $2.9 million to (+) $1.2 million.
B2(b) Prohibit the use of pelagic longline gear in HMS fisheries in an area of the Northeast during the month of June (1 month)	There could be benefits to protected species, and thus increase total existence value of these species. Additional reduction in bycatch of HMS and other fisheries should aid in rebuilding. If fishery is perceived as being environmentally responsible then additional benefits could be realized.	Estimated decrease in annual revenues potentially range from (-) $299,120 to (-) $72,675.
B2(c) Prohibit the use of pelagic longline gear in HMS fisheries in the Gulf of Mexico from April through June (3 months)	There could be benefits to protected species, and thus increase total existence value of these species. Additional reduction in bycatch of HMS and other fisheries should aid in rebuilding. If fishery is perceived as being environmentally responsible then additional benefits could be realized.	Estimated decrease in annual revenues potentially range from (-)$3.1million to (+) $1.7 million.
B2(d) Prohibit the use of pelagic longline gear in HMS fisheries in the Gulf of Mexico west of 86 degrees west longitude year-round	There could be benefits to protected species, and thus increase total existence value of these species. Additional reduction in bycatch of HMS and other fisheries should aid in rebuilding. If fishery is perceived as being environmentally responsible then additional benefits could be realized.	Estimated decrease in annual revenues potentially range from (-)$10.7 million to (+)$6.1 million.
B2(e) Prohibit the use of pelagic longline gear in HMS fisheries in an area of the Northeast to reduce sea turtle interactions	There could be benefits to protected species, and thus increase total existence value of these species. Additional reduction in bycatch of HMS and other fisheries should aid in rebuilding. If fishery is perceived as being environmentally responsible then additional benefits could be realized.	Estimated decrease in annual revenues potentially range from (-)$3.2 million to (-) $820,132.
B3(a) Modify the existing Northeastern U.S. time/area closure to allow the use of pelagic longline gear in areas west of 72º 47’ west longitude during the month of June	Estimated increase in annual revenues of $234,460	Perceptions of gear conflict may result in loss of recreational fishery income in infrastructure base.
B3(b) Modify the Northeastern U.S. closure	Estimated increase in annual revenues of $550	Perceptions of gear conflict may result in loss of recreational fishery income in infrastructure base.

Alternative	Net Economic Benefits	Net Economic Costs
B4 *Implement complementary HMS management measures in Madison-Swanson and Steamboat Lumps Marine Reserves from November through April (6 months) – Preferred Alternative*	There could be benefits to protected species, and thus increase total existence value of these species. May result in increased revenue for gag grouper fishery.	Minimal impact on commercial revenues and recreational activity
B5 *Establish criteria to consider when implementing new time/area closures or making modifications to existing time/area closures – Preferred Alternative*	Variable	Variable
B6 Prohibit the use of bottom longline gear in an area southwest of Key West to protect endangered smalltooth sawfish	Staying below smalltooth sawfish ITS may keep fishery open. If fishery is perceived as being environmentally responsible then additional benefits could be realized.	Minimal impacts on bottom longline fleet
B7 Prohibit the use of pelagic longline gear in HMS fisheries in all areas	There could be benefits to protected species, and thus increase total existence value of these species. If fishery is perceived as being environmentally responsible then additional benefits could be realized.	Minimum loss of revenue of $25.8 million in revenue annually.
Northern Albacore Tuna		
C1 Maintain compliance with the current ICCAT recommendation (No Action)	None	None
C2 Unilateral proportional reduction of United States northern albacore fishing mortality	If the fishery is rebuilt, there could be an increase in ecological benefits and long-term increase in commercial and recreational benefits.	Possible reduction in income from northern albacore tuna depending on restrictions needed per rebuilding plan.
C3 *Establish the foundation with ICCAT for developing an international rebuilding program – Preferred Alternative*	If the fishery is rebuilt, there could be an increase in ecological benefits and long-term increase in commercial and recreational benefits.	Potential short-term reductions in catch and recreational consumer surplus.
Finetooth Sharks		

Alternative	Net Economic Benefits	Net Economic Costs
D1 Maintain current regulations for recreational and commercial fisheries (No Action)	In short-term, business arrangements would remain the same. In long-term, none	In the long-term, there could be a decrease in finetooth shark population and result in a decrease in commercial revenues from finetooth shark harvest.
D2 Implement commercial management measures to reduce fishing mortality of finetooth sharks	None	Negative impacts on limited number of gillnet vessels.
D3 Implement recreational management measures to reduce fishing mortality of finetooth sharks	None	Potential negative economic impacts to shark recreational fishery and related industries.
D4 *Identify sources of finetooth shark fishing mortality to target appropriate management actions – Preferred Alternative*	Long-term, the alternative would have positive ecological impacts by addressing finetooth mortality in HMS and other fisheries and positive economic impacts if the fishery is sustained.	If action as result of information collection does not happen in time to prevent the stock from becoming overfished, then the alternative could reduce quotas and cause more restrictive management measures to be implemented.
Atlantic Billfish		
E1 Retain existing regulations regarding recreational billfish fishing, including permit requirements, minimum size limits, prohibited species, landing form, allowable gear, and reporting requirements (No Action)	None	Continued overfishing could potentially lead to ESA listing and close of recreational fishery.
E2 Effective January 1, 2007, limit all participants in Atlantic HMS recreational fisheries to using only non-offset circle hooks when using natural baits or natural bait/artificial lure combinations	Long-term benefits to angler consumer surplus from rebuilding efforts. Circle hooks cost less so there is some minor benefit associated with this alternative.	Temporary decrease in angler consumer surplus from adjustment to using circle hooks.
E3 *Effective January 1, 2007, limit all Atlantic billfish tournament participants to using only non-offset circle hooks when using natural baits or natural bait/artificial lure combinations – Preferred Alternative*	Long-term benefits to angler consumer surplus from rebuilding efforts. Long-term benefits to angler consumer surplus from rebuilding efforts. Circle hooks cost less so there is some minor benefit associated with this alternative.	Temporary decrease in angler consumer surplus from adjustment to using circle hooks. Unlikely potential decrease in tournament participation.

Alternative	Net Economic Benefits	Net Economic Costs
E4(a) Increase the minimum size limit for Atlantic white marlin to a specific size between 68 and 71'' LJFL	Long-term potential benefits as Atlantic white marlin stocks rebuild and recreational encounter with white marlin increase.	Uncertain impact on angler participation rates.
E4(b) Increase the minimum size limit for Atlantic blue marlin to a specific size between 103 and 106'' LJFL	Long-term potential benefits as Atlantic blue marlin stocks rebuild and recreational encounter with blue marlin increase	Uncertain impact on angler participation rates.
E5 Implement a recreational bag limit of one Atlantic billfish per vessel per trip	Long-term potential benefits as stocks rebuild and recreational encounter with marlin increase.	Minor reductions in billfish angler consumer surplus.
E6 *Effective January 1, 2007, implement ICCAT Recommendations on Recreational Marlin Landings Limits – Preferred Alternative*	Long-term potential benefits as stocks rebuild and recreational encounter with marlin increase.	None to moderate adverse impacts to anglers depending on whether thresholds for action are met. Potential reduction in CHB trips by 0.6 and 13 percent. Potential loss of $1.3 million to $2.7 million worth of tournament activity annually under a worst case scenario. Potential impacts on shoreside businesses.
E7 *Effective January 1, 2007 - December 31, 2011, allow only catch and release fishing for Atlantic white marlin – Preferred Alternative*	Long-term potential benefits as stocks rebuild and recreational encounter with marlin increase.	Potential decrease in angler consumer surplus. Potential decrease in CHB revenue of $70,794 to $1,244,538 annually. Potential negative economic impact to tournaments from $1.3 to $5.4 million annually.
E8 Effective January 1, 2007 - December 31, 2011, allow only catch and release fishing for Atlantic blue marlin	Long-term potential benefits as stocks rebuild and recreational encounter with marlin increase.	Potential to reduce CHB revenue from $457,596 to $1,526,688 annually. Economic impacts from $13.3 to $18.8 million on tournaments annually. Angler consumer surplus may decrease.
Bluefin Tuna Quota Management		
F1 Maintain the time-periods, subquota allocations, and geographic set asides for the General and Angling categories as established in the 1999 FMP (No Action)	None	Economic impacts to fishermen, dealers, and support industries associated with timeliness of required FMP amendment.

Alternative	Net Economic Benefits	Net Economic Costs
F2 Establish General category time-periods, subquotas, and geographic set asides annually via framework actions	Framework actions would result in overall positive economic impacts to the General category by allow fishing in locations and times when BFT are most available.	Uncertainty regarding General category quota allocation, from one year to the next, could increase difficulty of business planning. Potential short-term decreases in quota available.
F3 *Amend the management procedures regarding General category time-periods, subquota, as well as geographic set-asides to allow for future adjustments to take place via a regulatory framework action – Preferred Alternative*	Framework actions would result in overall positive economic impacts to the General category by allow fishing in locations and times when BFT are most available. Minor benefits to the South Atlantic region.	Minor impacts to New England General category due to reallocation of time period sub-quotas from the no action alternative.
F3(a) Establish monthly General category time-periods and subquotas (June-Jan, 12.5% each)	By formalizing the winter fishery, there would be positive economic impacts for General category participants in the South Atlantic region.	Minor impacts to New England General category. If catch rates tend to be high, these quotas could be harvested rapidly and could lead to derby style fisheries on the first of each month.
F3(b) Revise General category time-periods and subquotas to allow for a formalized winter fishery (June-Aug, 54%; Sept, 26.5%; Oct-Nov, 9%; Dec, 5.2%; and Jan, 5.3%)	By formalizing the winter fishery, there would be positive economic impacts for General category participants in the South Atlantic region.	Minor impacts to New England General category. Minor impacts to those who would pursue BFT in the summer months as other time-period subquotas would be reduced.
F3(c) *Revise General category time-periods and subquotas to allow for a formalized winter fishery (June-Aug, 50%; Sept, 26.5%; Oct-Nov, 13%; Dec, 5.2% and Jan, 5.3%) – Preferred Alternative*	By formalizing the winter fishery, there would be positive economic impacts for General category participants in the South Atlantic region.	Minor impacts to New England General category. Minor impacts to those who would pursue BFT in the summer months as other time-period subquotas would be reduced.
F3(d) Revise General category time-periods and subquotas to allow for a formalized winter fishery (June-Aug, 38.7%; Sept, 26.6%; Oct -Nov, 13%; Dec, 10.8%; and Jan, 10.9%)	Greater positive economic impacts to General category participants in the South Atlantic region	Would have increased negative economic impacts to those General category participants in northern areas.

Alternative	Net Economic Benefits	Net Economic Costs
F4 *Clarify the procedures for calculating the Angling category school size-class BFT subquota allocation and remove the Angling category north/south dividing line – Preferred Alternative*	Minimal positive impacts by slightly increasing school size-class quota (2 MT).	Minimal
F5 Maintain the annual BFT specification process and the under/overharvest procedures within individual domestic quota categories and individual vessels in the Purse seine category (No Action)	None	None
F6 *Revise the annual BFT specification process to refer back to the supporting analytical documents of the consolidated HMS FMP and include seasonal management measures in annual framework actions – Preferred Alternative*	Minor positive economic impacts by allowing for better planning.	None
F7 Eliminate unharvested quota carryover provisions and return unharvested quota to the resource, while maintaining status quo overharvest provisions	None	Could result in derby-style fishing where vessels may operate in less than optimal conditions to harvest the quota before the season is closed. Could reduced fishing opportunities, income, and angler consumer surplus for the commercial and/or recreational fleet, as well as the businesses that support those BFT fisheries.

Alternative	Net Economic Benefits	Net Economic Costs
F8 *Establish an individual quota category carry-over limit of 100 percent of the baseline allocation (i.e., no more than the annual baseline allocation may be carried forward), except for the Reserve category, and authorize the transfer of quota exceeding the 100 percent limit to the Reserve or another domestic quota category, while maintaining status quo overharvest provisions – Preferred Alternative*	Reallocation of tonnage that exceeds the cap to the Reserve or to another domestic quota category could result in economic benefits by increasing total allowable catch for those quota categories.	Slight negative impacts as a result of limiting maximum amount of harvest available from carry forward for a category.
F9 Maintain inseason action procedures (No Action)	None	None
F10 *Revise and consolidate criteria considered prior to performing inseason and some annual BFT management actions – Preferred Alternative*	Consistent criteria for inseason actions could lead to positive economic benefits	None
F11 Eliminate BFT inseason actions	Quota allocations and daily retention limits would remain stable and help facilitate planning.	Prevents maximum utilization of BFT quota over longest time period.
Timeframe for Annual Management of HMS Fisheries		
G1 Maintain the current fishing year for all HMS (No Action)	Minimal	Minimal
G2 *Shift the fishing year to January 1 – December 31 for all HMS – Preferred Alternative*	Would establish consistent timing between U.S. domestic and international management programs. Would improve international reporting, and thus potentially improving international management of fisheries.	Could result in up to $6.7 million in impacts to billfish tournaments, but not likely.
G3 Shift the fishing year to June 1-May 31 for all HMS	None	Short-term negative economic impacts to shark wholesale and retail markets.
Authorized Gears		
H1 Maintain current authorized gears in Atlantic HMS fisheries (No Action)	Minimal, if any	Minimal, if any

Alternative	Net Economic Benefits	Net Economic Costs
H2 *Authorize speargun fishing gear as a permissible gear type in the recreational Atlantic tuna fishery - Preferred Alternative*	Positive economic impacts to recreational speargun fishermen and CHB sector	Competition for fishing grounds and speargun fishing landings under the BFT Angling category may result in negative economic impacts for rod and reel fishermen.
H3 Authorize speargun in the commercial tuna handgear and recreational tuna fisheries	Positive economic impacts to recreational speargun fishermen and CHB sector. Potential economic benefits for CHB and General category fishermen from the sale of commercially speared tunas	Competition for fishing grounds and speargun fishing take under the BFT Angling and General categories may result in negative economic impacts for rod and reel fishermen
H4 *Authorize green-stick for the commercial harvest of Atlantic BAYS tunas - Preferred Alternative*	Potentially higher landing rates and higher quality of meat landed using green-stick gear could provide positive economic impacts to commercial fishermen, as well as benefit fish houses, gear supply houses, and other associated business.	Minor negative economic impacts from the prohibition on the possession or retention of BFT when utilizing commercial configurations of green-stick
H5 *Authorize buoy gear in the commercial swordfish handgear fishery, and limit vessels employing buoy gear to possessing and deploying no more than 35 individual buoys, with each having no more than two hooks or gangions attached - Preferred Alternative*	Continue affording positive economic benefits to current fishery participants	Negative economic impacts to vessels employing more than 35 free-floating buoyed handlines.
H6 Authorize buoy gear in the commercial swordfish handgear fishery, and limit vessels employing buoy gear to possessing and deploying no more than 50 individual buoys, with each buoy having no more than 15 hooks or gangions attached	Additional positive economic impacts from the ability to increase the number of hooks attached to each buoy gear	None
H7 *Clarify the allowance of hand-held cockpit gears used at boat side for subduing HMS captured on authorized gears - Preferred Alternative*	Positive economic impacts by reducing confusion over the allowance of these gears and increased retention rates with the use of this gear and the allowance for up to 50 buoys deployed.	None
Regulatory Housekeeping		

Alternative	Net Economic Benefits	Net Economic Costs
I1(a) Retain current definitions for PLL and BLL gear (No Action)	None	Could continue compliance issues and longer periods of interruption during compliance inspections at sea
I1(b) ***Establish additional restrictions on longline gear in HMS time/area closures by specifying a maximum and minimum allowable number of commercial fishing floats to qualify as a BLL and PLL vessel, respectively – Preferred Alternative***	Could reduce periods of interruption during compliance inspections at sea.	More restrictive gear definitions could potentially impact ~ 5 percent of all PLL and 10 percent of BLL sets.
I1(c) *Differentiate between PLL and BLL gear based upon the species composition of the catch onboard or landed – Preferred Alternative*	None	Could adversely impact longline vessels that regularly target both demersal and pelagic species on the same trip. Potentially longer enforcement inspections could cause operating costs.
I1(d) Require time/depth recorders (TDRs) on all HMS longlines	Could minimize disruption of enforcement inspections.	Could costs vessels $1,400 to $6,500 in equipment costs, efficiency losses having the devices on the line, and labor costs associated with recording the information.
I1(e) Base HMS time/area closures on all longlines (PLL & BLL)	None	Primarily would impact BLL vessels by making some PLL time/area closures also apply to all longline vessels resulting in more significant economic impacts than other alternatives considered for this issue.
I2(a) Retain current regulations regarding shark landing requirements (No Action)	None	None
I2(b) *Require that the 2nd dorsal fin and the anal fin remain on all sharks through landing – Preferred Alternative*	Increased accuracy in identification could improve stock assessments and lead to faster rebuilding.	Potential small reduction in income from retaining second dorsal and anal fins on sharks.
I2(c) Require that the 2nd dorsal fin and the anal fin remain on all sharks through landing, except for lemon and nurse sharks	Increased accuracy in identification could improve stock assessments and lead to faster rebuilding.	Potential small reduction in revenues from retaining second dorsal and anal fins on sharks, except lemon and nurse shark fins can be removed.

Alternative	Net Economic Benefits	Net Economic Costs
I2(d) Require all fins remain on all sharks through landing	Increased accuracy in identification could improve stock assessments and lead to faster rebuilding.	Reduction in revenues from sale of removed shark fins. Value of shark meat could decrease if retaining fins causes packing problems.
I3(a) Retain current regulations regarding retention limits, with no new prohibitions (No Action)	None	Non-complying vessels may be landing and selling HMS in excess of the commercial retention limits, thus circumventing the conservation benefits derived from those limits
I3(b) *Add new prohibition at § 635.71(a)(48) making it illegal for any person to, "Purchase any HMS that was offloaded from an individual vessel in excess of the retention limits specified in §§ 635.23 and 635.24" – Preferred Alternative*	Increased compliance could lead to faster rebuilding.	Increase dealer administrative/information costs with insuring that they are not purchasing more than the commercial daily retention limits from a particular vessel
I3(c) *Add new prohibition at § 635.71(a)(49) making it illegal for any person to, "Sell any HMS that was offloaded from an individual vessel in excess of the retention limits specified in §§ 635.23 and 635.24" – Preferred Alternative*	Increased compliance could lead to faster rebuilding.	None
I4(a) Retain current coordinates for the East Florida Coast closed area (No Action)	None	None
I4(b) *Amend the second coordinate of the East Florida Coast closed area so that it corresponds with the EEZ – Preferred Alternative*	None	Minor impact on landings revenue
I5(a) Retain the current definition of "handline" at § 635.2 (No Action)	None	None

Alternative	Net Economic Benefits	Net Economic Costs
I5(b) *Amend the definition of "handline" at § 635.2 by requiring that they be attached to, or in contact with, all vessels – Preferred Alternative*	Decreased opportunity to lose gear may lead to ecological benefits.	Could impact large portion of HMS permit holders. Potentially reduce operational efficiency.
I5(c) Require that handlines remain attached to all vessels when fishing recreationally and allow unattached handlines when fishing commercially	None	Could impact recreational anglers
I6(a) Retain current regulations regarding the possession of Atlantic billfish (No Action)	None	None
I6(b) *Prohibit vessels issued commercial permits and operating outside of a tournament from possessing, retaining, or taking Atlantic billfish from the management unit – Preferred Alternative*	Minor potential enhancement of billfish recreational fishing	None
I7(a) Retain the current regulations regarding BFT dealer reporting (No Action)	None	Could continue extra time costs of entering similar data on multiple forms
I7(b) *Amend the HMS regulations to provide an option for Atlantic tunas dealers to submit required BFT reports using the Internet – Preferred Alternative*	Could increase data entry efficiency	None
I7(c) Amend the HMS BFT dealer reporting regulations to require that Atlantic tunas dealers submit BFT reports electronically, with specific exceptions	Could increase data entry efficiency	Could result in additional Internet access costs and training costs

Alternative	Net Economic Benefits	Net Economic Costs
I8(a) Maintain the existing regulations regarding submission of logbooks (No Action)	None	None
I8(b) *Require submission of "No Fishing" reporting forms for selected vessels if no fishing trips occurred during the preceding month, postmarked no later than seven days after the end of the month – Preferred Alternative*	Potentially decreases permit renewal delays and their associated costs.	None
I8(c) *Require submission of the trip "Cost-Earnings" reporting form for selected vessels 30 days after a trip and the annual "Cost-Earning" report form by January 31 of each year – Preferred Alternative*	Potentially decreases permit renewal delays and their associated costs.	None
I9(a) Retain existing regulations at § 635.5(c)(2) requiring anglers to report non-tournament recreational landings of North Atlantic swordfish and Atlantic billfish (No Action)	None	None
I9(b) *Require vessel owners to report non-tournament recreational landings of North Atlantic swordfish and Atlantic billfish – Preferred Alternative*	Minor – could reduce number of overall calls for reporting.	Minor cost increase since almost all owners currently report.
I10(a) Retain the current regulations specifically referring to 25 mt (ww) (No Action)	None	None

Alternative	Net Economic Benefits	Net Economic Costs
I10(b) *Modify the HMS regulations to state that "In addition, each year, 25 mt (ww) will be allocated for incidental catch by pelagic longlines" in the NED – Preferred Alternative*	Potential increased revenue from increased quota from NED set-aside roll-overs	Potential impacts to other fishery sectors if they are closed after reaching their quota and cannot access available quota from the NED set-aside.
I10(c) Conduct additional discussions at ICCAT regarding quotas allocated to account for bycatch related to directed longline fisheries in the vicinity of the management area boundary	None	If access to the NED set-aside quota is capped, there could be economic impacts
I11(a) No permit condition for recreational trips (No Action)	None	None
I11(b) *Require recreational vessels with a Federal permit to abide by Federal regulations, regardless of where they are fishing, unless a state has more restrictive regulations - Preferred Alternative*	Reduced confusion may lead to greater fishery participant satisfaction.	Potential minor decrease in recreational fishing satisfaction.

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8.0 INITIAL REGULATORY FLEXIBILITY ANALYSIS

The Initial Regulatory Flexibility Analysis (IRFA) is conducted to comply with the Regulatory Flexibility Act (5 USC 601 et. seq.) and provides a description of the economic impacts of the various alternatives on small entities. Certain elements required in an IRFA are also required as part of an environmental impact statement (EIS). Therefore, the IRFA incorporates the economic impacts identified in the EIS.

8.1 Description of the Reasons Why Action is Being Considered

Please see Chapter 1 for a description of the need for action.

8.2 Statement of the Objectives of, and Legal Basis for, the Proposed Rule

Please see Chapter 1 for a description of the objectives of the proposed rule.

8.3 Description and Estimate of the Number of Small Entities to Which the Proposed Rule Will Apply

NMFS considers all permit holders to be small entities as reflected in the Small Business Administration's (SBA) size standards for fishing entities. All permit holders are considered to be small entities because they either had gross receipts less than $3.5 million for fish-harvesting, gross receipts less than $6.0 million for charter/party boats, or 100 or fewer employees for wholesale dealers. These are the SBA size standards for defining a small versus large business entity in this industry. A description of the fisheries affected, the categories and number of permit holders, and registered tournaments can be found in Chapter 3.

The alternatives considered for requiring attendance at workshops on protected species release, disentanglement, and identification for pelagic longline, bottom longline, and gillnet owners and operators (A2, A3, and A5) are estimated to apply to 576 vessels permitted to fish for HMS with longline gear and 20 shark gillnet vessels. The alternatives for shark identification workshops (A9) would impact approximately 230 Federally permitted shark dealers. Other alternatives considered, but not preferred, for species identification could apply to up to 980 shark, swordfish, and tuna dealers; 10,022 HMS commercial vessel owners; and 21,735 HMS angling permit holders.

The preferred time/area closure alternative (B4) to implement complementary HMS time/area closures in the Madison-Swanson and Steamboat Lumps Marine Reserve would apply to 576 pelagic and bottom longline permitted vessels, but would likely only impact one pelagic longline and two bottom longline sets based on past observer and logbook data. This preferred alternative would also apply to 4,029 permitted HMS charter/headboat businesses and 21,735 HMS angling permit holders. However, the impacts to charter/headboat businesses and recreational fishermen are not expected to be substantial since this alternative includes a seasonal surface trolling allowance. In addition, many of these business have already been impacted by the previously implemented Madison-Swanson and Steamboat Lumps Marine Reserves established by the GOMFMC, and therefore are not likely to face further economic impacts as a result of the proposed complimentary HMS closure in the same area. Other non-preferred

time/area closure alternatives would apply to 576 permitted pelagic and bottom longline vessels primarily. The approximate number of vessels impacted by these different alternatives varies from as few as 20 to as many as all 177 active longline vessels (See Chapters 4 and 6 for the specific number of vessels estimated to be impacted by each time/area closure considered).

The preferred alternative considered for northern albacore management (C3), which would establish the foundation for developing an international rebuilding program through ICCAT, would apply to all tuna categories, a total of 31,308 permit holders. However, the proposed alternative does not have any direct impacts on small entities in the short term because it does not require any changes to direct management measures at this time.

The preferred alternative for finetooth sharks, a strategy for preventing overfishing (D4), also would not have any direct impacts on small entities but could affect 20 commercial vessels and potentially some of the 21,735 HMS angling permit holders. The non-preferred commercial management alternative, however, would apply to the estimated 20 shark gillnet vessels that are permitted and could apply to all commercial shark permit holders depending on what the management measures would be. The non-preferred recreational management alternative would apply to the 21,735 HMS angling permit holders; however, a small percentage of these recreational anglers target small coastal sharks or finetooth sharks.

Both the preferred (E3, E6, and E7) and non-preferred (E1, E2, E4, E5, and E8) Atlantic billfish alternatives would apply to 21,735 Angling, 4,029 CHB, and up to 5,267 valid General (those participating in tournaments) category permits. In addition, there are currently 215 registered HMS tournaments that would be impacted by the proposed Atlantic billfish alternatives.

The alternatives being considered for bluefin tuna management for time-periods and subquota allocations would primarily apply to the 5,267 General category tuna permit holders. However, other bluefin tuna alternatives to streamline management processes would apply to all tuna categories, a total of 31,308 permit holders (Section 3.9.4).

The alternatives that consider changing the timeframe for annual management of HMS fisheries from a fishing year to a calendar year would essentially apply to all HMS permit holders and tournament registrants. Under the preferred alternative (G2), only the shark fishery would not be impacted by the shift in annual management timeframe because it is already managed on a calendar year basis at this time.

Several alternatives allowing or defining authorized gears would apply to small entities. The proposed authorization of recreational speargun fishing for Atlantic tunas (H2) would apply to an unknown number of speargun users. This preferred alternative may also positively impact the 4,029 CHB permit holders by potentially increasing charter revenues, and it may negatively impact the current 21,735 Angling category permit holders due to potential increases in competition for the BFT Angling category quota. The non-preferred alternative to allow speargun in both recreational and commercial tuna fisheries (H3) would also apply directly to the 5,267 General category and 4,029 CHB permit holders. In addition, the preferred alternative (H4) that authorizes green-stick gear for the commercial harvest of Atlantic BAYS tunas would

apply to the Atlantic Tunas Longline, General, and CHB (on non for-hire trips) category vessels, approximately 221, 5,267, and 4,029 vessels respectively. Alternatives H5 and H6, which address the utilization of unattached handlines, would apply to 282 permit holders (93 swordfish handgear and 189 swordfish directed). The preferred alternative clarifying the authorized use of secondary cockpit gears (H7) would apply to all HMS permit holders.

Finally, a variety of regulatory housekeeping proposals would apply to small entities. Specifically, the preferred changes to the definitions of pelagic and bottom longline (alternatives I1(b) and I1(c)) would apply to the 576 permitted pelagic and bottom longline vessels. The preferred alternative requiring smaller second dorsal and anal fins would need to remain attached to the shark (alternative I2(b)) would apply to the 229 directed shark and 321 incident shark permit holders. The proposed HMS retention limit requirements (I3) would apply to the 540 permitted shark and swordfish dealers and the 365 permitted Atlantic tuna dealers. The change in the definition of the East Florida Coast Closed Area (I4) is unlikely to directly impact any small entities but could affect any commercial permit holders fishing in that area. The preferred alternative prohibiting the retention of Atlantic billfish by vessels issued commercial permits and operating on a non-for-hire trip or outside of a tournament (I6(b)) would apply to General category, bottom longline, and shark gillnet vessels utilizing rod and real gear, but it is unlikely that many would be impacted by this proposed regulation. The preferred alternative to amend the HMS regulations to provide an option for Atlantic tunas dealers to submit required BFT reports using the Internet (I7(b)) would apply to the 364 Atlantic tuna permit dealer holders. The preferred alternative requiring vessel owners to report non-tournament recreational landings of North Atlantic swordfish and Atlantic billfish (I9(b)) would apply to 4,029 CHB permit holders and 21,735 Angling permit holders, but it is not expected that this proposal would impact many entities. Finally, the preferred alternative requiring recreational vessels with a Federal permit to abide by Federal regulations (I11(b)), regardless of where they are fishing, would potentially apply to 21,735 Angling, 4,029 CHB, and up to 5,267 valid General (those participating in tournaments) category permits.

Other sectors of the HMS fisheries such as dealers, processors, bait houses, and gear manufacturers, some of which are considered small entities, might be indirectly affected by the proposed alternatives, particularly time/area closures, Atlantic billfish, and authorized gear alternatives. However, the proposed rule does not apply directly to them, unless otherwise noted above. Rather, it applies only to permit holders and fishermen. As such, economic impacts on these other sectors are discussed in Chapters 4, 6, and 7.

8.4 Description of the Projected Reporting, Record-keeping, and Other Compliance Requirements of the Proposed Rule, Including an Estimate of the Classes of Small Entities Which Will Be Subject to the Requirements of the Report or Record

None of the preferred alternatives in this document would result in additional reporting, record-keeping, and compliance requirements that would require new Paperwork Reduction Act filings. However, some of the preferred alternatives could modify existing reporting and record-keeping requirements. These include workshops, coordination efforts directed at gathering additional information about finetooth shark mortality, and bluefin tuna dealer reporting.

The preferred alternatives for workshops (A2, A3, A5, A6, A9, and A16) would require record-keeping by NMFS to record attendance at workshops and the certification status of pelagic and bottom longline vessel owners and operators, as well as shark gillnet owners and operators. This Agency record keeping would not have an impact on small entities although small entities will need to keep their own certificates and may decide to keep copies of certificates for their own records. Attending workshops would also be a change in compliance.

In addition, the finetooth shark preferred alternative (D4) may expand the coverage of the current HMS observer programs. In addition, this preferred alternative would result in efforts to expand data that are currently collected by NMFS observers on shrimp trawl vessels to include finetooth shark and other HMS species of interest. Fishermen themselves would not need to change reporting.

Finally, under regulatory housekeeping, the preferred alternative to allow bluefin tuna dealers the option to report electronically (I7(b)) once a system is developed and is made available would modify current reporting requirement, but would not result in additional reporting or burden. In fact, this option may reduce the potential need to report the same data on multiple reports for those some small entities that chose this option.

In addition to the reporting and record-keeping requirements of the preferred alternatives, there are also proposed compliance requirements associated with the preferred alternatives. These compliance requirement include limiting billfish tournament participants to using only non-offset circle hooks when using natural baits or natural bait/artificial lure combinations (E3), requiring the retention of shark second dorsal and anal fins (I2(b)), and establishing the minimum and maximum number of floats for bottom longline and pelagic longline gear definitions (I1(b)).

The other preferred alternatives, which are outlined in Chapter 2, would change quota allocations, timeframes, authorized gear types, definitions, and other management measures, but would not likely change reporting or compliance in the fishery.

8.5 Identification of All Relevant Federal Rules Which May Duplicate, Overlap, or Conflict with the Proposed Rule

Fishermen, charter/headboat operators, dealers, and managers in these fisheries must comply with a number of international agreements, domestic laws, other FMPs, and Take Reduction Plans (TRPs). Other FMPs could include Dolphin-Wahoo, Coastal Migratory Pelagics, and Snapper-Grouper Reef Fish. Domestic laws include, but are not limited to, the Magnuson-Stevens Act, the Atlantic Tunas Convention Act, the High Seas Fishing Compliance Act, the Marine Mammal Protection Act, the Endangered Species Act, the National Environmental Policy Act, the Paperwork Reduction Act, and the Coastal Zone Management Act. TRPs affecting the HMS Fisheries include Atlantic Large Whale, Bottlenose Dolphin, and Pelagic Longline plans. NMFS strives to ensure consistency among the regulations with fishery management councils and other relevant agencies. NMFS does not believe that the new regulations proposed to be implemented would conflict with any relevant regulations, Federal or otherwise.

The proposed HMS Madison-Swanson and Steamboat Lumps Marine Reserves time/area closure overlaps with the geographic area covered by the Gulf of Mexico Fishery Management Council regulations that also implement a time/area closure in this area. However, the Gulf Council's regulations do not cover HMS permitted gear types. Therefore, the proposed HMS Madison-Swanson time/area closure regulation that affects vessels utilizing HMS gear types complements the GOMFMC regulation and would help with compliance and enforcement of this time/area closure by backstopping the GOMFMC's regulations to cover all Federally regulated gear types.

The proposed Federal HMS permit condition requiring Federal permit holders participating in recreational trips to abide by Federal regulations in state waters, unless the state has more restrictive regulations, could overlap and/or duplicate State regulations. However, this proposed regulation would not overlap, duplicate, and/or conflict with any other Federal regulations and may reduce conflict with state regulations.

8.6 Description of Any Significant Alternatives to the Proposed Rule That Accomplish the Stated Objectives of Applicable Statutes and That Minimize Any Significant Economic Impact of the Proposed Rule on Small Entities

One of the requirements of an IRFA is to describe any alternatives to the proposed rule which accomplish the stated objectives and which minimize any significant economic impacts. These impacts are discussed below and in Chapters 4 and 6 of this document. Additionally, the Regulatory Flexibility Act (5 U.S.C. § 603 (c) (1)-(4)) lists four general categories of "significant" alternatives that would assist an agency in the development of significant alternatives. These categories of alternatives are:

1. Establishment of differing compliance or reporting requirements or timetables that take into account the resources available to small entities;
2. Clarification, consolidation, or simplification of compliance and reporting requirements under the rule for such small entities;
3. Use of performance rather than design standards; and,
4. Exemptions from coverage of the rule for small entities.

As noted earlier, NMFS considers all permit holders to be small entities. In order to meet the objectives of this proposed FMP and the statutes (*i.e*. Magnuson-Stevens Act, ATCA, ESA) as well as address the management concerns at hand, NMFS cannot exempt small entities or change the reporting requirements for small entities. Among other things, this proposed FMP would set quotas for the fishing season, retention limits for the recreational fishery, and gear restrictions, all of which would not be as effective with differing compliance and reporting requirements. Thus, there are no alternatives discussed which fall under the first and fourth categories described above. Alternatives under the second and third categories are discussed below with the alternatives that were considered but not preferred.

As described below, NMFS considered a number of alternatives that could minimize the economic impact on small entities, particularly those pertaining to workshops, time/area closures, northern albacore tuna, finetooth sharks, Atlantic billfish, bluefin tuna quota

management, timeframe for annual management, authorized fishing gears, and regulatory housekeeping measures.

8.6.1 Bycatch Reduction

8.6.1.1 Workshops

The preferred alternatives for longline release, disentanglement and identification workshops, which require mandatory workshops and certification on a three year renewal timeline (A6) for all HMS pelagic and bottom longline vessel owners (A2) and operators (A3) and shark gillnet vessel owners and operators (A5), were designed to minimize the economic impacts on fishermen, while simultaneously complying with 2003 BiOp, Shark Amendment, and the post-release mortality targets for protected resources established in the June 2004 BiOp. Alternative A2 is estimated to have an economic impact to each bottom and pelagic longline vessel owner of up to $565 and $504 in potentially lost revenue share based on 2003 logbook data, as well as unquantified travel costs to attend a workshop. The aggregate economic impact is estimated to be between $290,304 and $325,440 in the first year. Longline vessel operators would also be impacted by the preferred alternative, but it might not impact the economic well-being of the small business for which they work. In addition, the estimated twenty shark gillnet owners that would be participating in required workshops would each have an economic impact of up to $508 in lost revenue share based on 2003 logbook data, as well as unquantified travel costs to attend a workshop.

Specifically, under these alternatives, NMFS would strive to host a number of workshops in regional fishing hubs in order to minimize travel and lost fishing time. Besides the costs of travel and lost time, there would be no additional costs for workshop participants. NMFS would attempt to hold workshops during periods when the fishery is typically inactive, effectively minimizing lost fishing time. To minimize the overall economic cost of these workshops, the preferred alternatives would limit required participation in these workshops to owners and operators. It is likely that owners and operators would pass information and appropriate direction to their crew concerning release, disentanglement, and identification of protected resources. NMFS would also select a recertification period that would allow for sufficient retraining to maintain proficiency and update fishermen on new research and development related to the subject matter while not placing an excessive economic burden on the participants due to lost fishing time and travel resulting from attending a recertification workshop in person. Two, three, and five year recertification period are being considered, with a three-year period currently being preferred. In addition, to lower the costs of recertification, NMFS is considering the use of alternative sources of media including CD-ROM, DVDs, or web-based media that would not result in travel costs or lost fishing time, as well as allowing private certified trainers to provide training at tailored times and locations to minimize any costs.

Other alternatives considered were voluntary workshops for longline fishermen (A1) and mandatory workshops that would include crewmembers in addition to owners and operators (A4). Several alternatives would have less onerous economic impacts to small businesses relative to the preferred alternatives. These include: the No Action alternative (A1) and

mandatory workshops for only owners or only operators. These alternatives would not satisfy RPA under a BiOp issued pursuant to ESA.

The preferred alternative for identification workshops, which would require mandatory workshops for all Federally permitted shark dealers (A9), is preferred because species-specific identification of offloaded shark carcasses is much more difficult than other HMS as evidenced by the large proportion of "unclassified" sharks listed on shark dealer logbooks. The Agency would attempt to minimize economic impacts to shark dealers by holding workshops at fishing ports to minimize travel costs and during non-peak fishing times to minimize perturbations to business activity, to the extent possible. Similar measures as those being considered for disentanglement and identification recertification are being considered for the identification workshops for shark dealers in order to minimize the economic impacts caused by this measure.

Other alternatives in addition to the No Action alternative were voluntary HMS identification workshops (A8), mandatory identification workshops for swordfish and tuna dealers (A10), mandatory identification workshops for all commercial longline vessel owners (A11) and operators (A12), mandatory identification workshops for all commercial vessel (longline, CHB, General category, and handgear/harpoon) owners (A13) and operators (A14), and mandatory identification workshops for all HMS Angling permit holders (A15). The economic impacts of these alternatives are detailed in Chapter 6. The No Action (A7) and voluntary HMS identification workshop alternative (A8) would have less onerous economic impacts relative to the preferred alternative. However, these alternatives would not address the persistent problems with species-specific shark identification in dealer reports nor satisfy the requirements and goals of the NMFS bycatch program nor of the FMP.

In addition to the type of workshops, NMFS considered two additional renewal timetables of two and five years. A renewal timetable of five years would have a less adverse impact than the proposed timetable of three years. However, recertification every five years for bycatch release and disentanglement workshops would allow a more extensive period of time to lapse between certification workshops than necessary to maintain proficiency and provide updates on research and development of handling and dehooking protocols. In a similar fashion, recertification every five years for HMS identification workshops would also allow a more extensive period of time to lapse between certification workshops than necessary to maintain proficiency in species identification.

8.6.1.2 Time/Area Closures

The preferred alternatives for time/area closures, which would implement complementary measures in Madison-Swanson and Steamboat Lumps closures (B4) and establish criteria to be considered when implementing new time/area closures or making modifications to existing time/area closures (B5), were designed to minimize economic impacts incurred by fishermen, while simultaneously reducing the bycatch of non-target HMS and protected species such as sea turtles in Atlantic HMS fisheries. Alternative B4 would establish complementary HMS regulations in the Madison-Swanson and Steamboat Lumps closures with minimal economic impacts. Creating these complementary HMS regulations would consolidate and simplify requirements for fishermen, and therefore simplify compliance. This alternative would also implement compatible regulations that would provide for a seasonal allowance (May – October)

for surface trolling to partially alleviate any negative economic impacts associated with the closures or the HMS recreational and charter/headboat sector.

Other alternatives considered in addition to the No Action alternative were a closure of 11,191 nm^2 in the central Gulf of Mexico to pelagic longline gear (B2(a)), a closure of 2,251 nm^2 in the Northeast to pelagic longline gear (B2(b)), a closure of 101,670 nm^2 in bluefin tuna spawning areas in the Gulf of Mexico (B2(c)), a closure west of 86º W Longitude in the Gulf of Mexico to pelagic longline gear (B2(d)), a closure of 46956 nm^2 in the Northeast to pelagic longline gear (B2(e)), a prohibition on the use of bottom longline gear in an area off the Florida Keys to protect endangered smalltooth sawfish (B6), and a prohibition on the use of pelagic longline gear in HMS fisheries in all areas (B7). These closures alternatives were not preferred due to large economic impacts with conflicting ecological benefits between species. The details of the economic impacts associated with these other alternatives are detailed in Section 4.1.2 and Chapter 6. In addition to the closure alternatives, modifications to existing closures were also considered for the Charleston Bump closure (B3(a)) and the Northeastern U.S. closure (B3(b) which provided some economic relief but did not meet ecological needs.

Alternative B5 would establish criteria that would guide future decision-making regarding implementation or modification of time/area closures. This would provide enhanced transparency, predictability, and understanding of HMS management decisions. The time/area closure criteria would not have immediate impacts. Any ecological, social, or economic impacts of a specific closure or modified closure would be analyzed in the future when that specific action is proposed.

8.6.2 Rebuilding and Preventing Overfishing

8.6.2.1 Northern Albacore Tuna

The preferred alternative for northern albacore management, which would establish the foundation for developing an international rebuilding program (C3), was designed to address rebuilding of the northern albacore tuna fishery while simultaneously minimizing economic impacts incurred by fishermen. This alternative would have minimal economic impacts, because it is not proposing additional restrictions at this time. Even under an international plan, the United States is a small participant in this fishery and only has a small allocation that it does not even fully harvest at this time.

Other alternatives considered were No Action (C1) and taking unilateral proportional reductions in northern albacore tuna harvest (C2). Taking unilateral action to address northern albacore tuna on the part of the United States would likely not be effective in rebuilding the stock because the United States is a small participant in this fishery, and would have larger economic impacts than the preferred alternative.

The No Action alternative would have the same economic impacts as the preferred alternative because NMFS has been promoting an international rebuilding plan at ICCAT. In a prior rulemaking, NMFS addressed the same northern albacore tuna alternatives but did not

incorporate them into the HMS FMP. The No Action alternative is rejected, because it would not include the rebuilding strategy in the FMP.

8.6.2.2 Finetooth Sharks

The preferred alternative for finetooth shark management (D4) was designed to address overfishing while minimizing economic impacts incurred by fishermen. This alternative would be expected to have minimal to no economic impacts, because no new restrictions are being proposed at this time. Long-term, the alternative would have positive ecological impacts by addressing finetooth mortality in HMS and other fisheries and positive economic impacts if the fishery is sustained.

Other alternatives considered were No Action (D1), commercial management measures (D2), and recreational management measures (D3). Only the No Action alternative would have less economic impact relative to the preferred alternative. However, this alternative was not preferred because it would not facilitate efforts to address overfishing of finetooth sharks.

8.6.2.3 Atlantic Billfish

The preferred alternatives for Atlantic billfish management, which include requiring the use of non-offset circle hooks when using natural baits in tournaments (E3), implementing the ICCAT marlin landings limits (E6), and allowing only catch-and-release fishing for Atlantic white marlin from 2007-2011 (E7), were designed to minimize economic impacts incurred by recreational fishing sector, while simultaneously enhancing the management of the directed Atlantic billfish fishery. Specifically, alternative E3 would likely have a minimal economic impact, since it would not affect all billfish recreational anglers, only tournament participants. Therefore, the impacts on hook manufactures, retailers, and anglers would likely be limited given that J-hooks would continue to be permitted outside of tournaments and within tournaments with artificial lures. In addition, delayed implementation to 2007 would help lower any potential economic impacts due to supply and demand changes. Impacts on tournaments would also likely be minimal, given the increase in the number of tournaments that provide special award categories or additional points for billfish captured and released on circle hooks. Alternative E3 would also likely have high compliance rates given the self-policing that is likely to occur among tournament participants competing for prizes, as well as the increasing use of tournament observers.

Several measures were also considered to minimize the economic impacts of alternative E6. The use of three separate levels of management measures based upon marlin landing thresholds diminishes the economic impacts of this alternative. When it is not expected that marlin landings will approach the threshold for action, then no in-season actions would occur and there would not be any economic impacts. If the threshold for action were achieved, minimum size requirements for Atlantic marlins would increase to a level sufficient to curtail landings. Finally, if the ICCAT landing limits were achieved in any one year, the fishery would shift to a catch-and-release only fishery for the remainder of that year. This last scenario would be unlikely given historical landings and minimum size requirements that would occur at the action threshold. Alternative E6 would allow the response to be tailored to the needs of a given fishing year to ensure maximum utilization of the ICCAT landing limit. Under the calendar year

management alternative that is currently preferred (G2), alternative E6 also would help reduce any disproportionate economic impacts to CHB operators, tournaments, and anglers who fish for marlin late in the fishing year or in late season tournaments by providing anglers the greatest opportunity to land marlin over the entire length of the fishing year. Alternative E6 is estimated to potentially result in $1.3 to $2.7 million in economic impacts as compared to the $13.4 to $20.0 million in impacts for catch-and-release only for Atlantic blue and white marlin (Alternatives E7 and E8 combined) resulting in an estimated one to two tournament cancellations and unquantified impacts on CHB businesses.

Alternative E7 could result in some potential economic impacts as result of allowing only catch-and-release fishing for Atlantic white marlin. Any negative impacts would likely be reduced if vessels targeting white marlin already practice catch-and-release fishing and participate in catch-and-release tournaments. To mitigate negative socioeconomic impacts, alterative E7 would delay implementation of catch-and-release-only fishing requirements to allow the fishery time to adjust to new measures, and includes a sunset provision five years from implementation of catch-and-release requirements. The Agency estimates that alternative E7 could result in between $70 thousand and $1.2 million in lost revenues to CHB vessels and $1.3 to $5.5 million in negative economic impacts (in comparison to $13.4 to $18.8 million for Alternative E8, catch-and-release only for Atlantic blue marlin) resulting from potentially cancelled HMS tournament cancellations.

Other alternatives considered were No Action (E1), limiting all participants in the Atlantic HMS recreational fishery to using only non-offset circle hooks when using natural baits or natural bait/artificial lure combinations in all HMS fisheries (E2), increasing the minimum size limit for Atlantic white and/or blue marlin (E4), implementing recreational bag limits of one Atlantic billfish per vessel per trip (E5), and allowing only catch-and-release fishing for Atlantic blue marlin (E8). Only the No Action alternative would have less onerous economic impacts relative to the preferred alternatives. However, the No Action alternative would not satisfy the requirements and goals of implementing the ICCAT recommendations under ATCA, rebuilding the Atlantic blue and white marlin fishery under the Magnuson-Stevens Act, or the objectives of the FMP.

8.6.3 Management Program Structure

8.6.3.1 Bluefin Tuna Quota Management

The preferred alternatives for bluefin tuna quota management include revised General category time-periods and subquotas to allow for a formalized winter fishery (F3(c)), clarified procedures for calculating the Angling category school size-class subquota allocation (F4), modification of the bluefin tuna specification process and streamlining annual under/overharvest procedures (F6), an individual quota category carryover limit and authorization of the transfer of quota exceeding limit (F8), and revised and consolidated criteria that would be considered prior to performing a BFT inseason action (F10). These preferred alternatives were designed to minimize economic impacts incurred by fishermen, while simultaneously enhancing and clarifying bluefin tuna quota management and inseason actions.

Alternative F3(c) would strike a balance between providing consistent quota allocations and having the flexibility to amend them in a timely fashion. This alternative would slightly reduce General category quota from early time periods, thereby allowing for a formal winter General category bluefin tuna fishery to take place during the months of December and January, and therefore would increase regional access. By shifting the allocated quota from the June through August time-period, which has an overall higher allocation, to a later time-period any adverse impacts would be mitigated by the increased revenue generated in the later time-period. In addition, the fishermen from the Northeast are not precluded from fishing in southern areas during winter bluefin tuna season.

Alternative F4 would clarify the procedures NMFS uses in calculating the ICCAT recommendation regarding the eight percent tolerance for BFT under 115 cm. It would also simplify the regulations by removing the north/south dividing line that separates the Angling category. Due to the lack of real-time data currently, the north/south dividing line has not been effective in recent years, and therefore it would be removed under this preferred alternative. This alternative is not likely to have an economic impact.

Alternative F6 would simplify quota allocations by eliminating the need to allocate each domestic quota categories' baseline allocation each year, as the allocation percentages and the actual quota equivalents (measured in metric tons) would be codified in the regulations implementing the consolidated FMP at least until ICCAT alters its BFT TAC recommendation. This alternative would have positive economic impacts to the domestic BFT fishery as a whole by allowing BFT fishery participants, either commercial or recreational in nature, to make better informed decisions on how to best establish a business plan for the upcoming season.

Alternative F8 would have some economic impacts as a result of limiting the amount of underharvest of the bluefin tuna quota that could be rolled over from one year to the next within a category. However, this alternative was designed to mitigate any impacts by allowing NMFS to redistribute quota exceeding the proposed 100 percent rollover cap to the Reserve or to other domestic quota categories, provided the redistributions are consistent with ICCAT recommendations and the redistribution criteria.

Alternative F10 would result in slightly more positive economic impacts as the criteria NMFS must consider when making an inseason action determination would be consolidated and consistent regardless of what type of inseason action is being considered. This would minimize confusion and provide additional transparency to the management process.

Other alternatives considered in addition to the No Action (F1, F5, and F9) alternatives were establishing General category time-periods, subquotas, and geographic set asides annually via framework actions (F2); establishing monthly General category time-periods and subquotas (F3(a)); revising the General category time-periods and subquotas to allow for a formalized winter fishery with different time-period allocations (F3(b) and (d)); eliminating the underharvest quota carryover provisions (F7), and eliminating the BFT inseason actions (F10). These additional alternatives would not likely reduce overall impacts to the fishery as a whole further relative to the preferred alternatives.

8.6.3.2 Timeframe for Annual Management of HMS Fisheries

The preferred alternative for the timeframe for annual management of HMS fisheries, which would shift the time frame to a calendar year (January 1 to December 31 (G2)), was designed to minimize economic impacts on HMS fisheries and simplify HMS fishery management and reporting to ICCAT. This alternative would not impact the shark fishery, since that fishery is already operating under a calendar year. The shift in the other HMS fisheries' timeframe for annual management would establish consistent timing between U.S. domestic and international management programs, reducing the complexity of U.S. reports to ICCAT and creating more transparent analyses in the U.S. National Report. Setting an annual quota and other fishery specifications on a multi-year basis for bluefin tuna as discussed above could mitigate any potential negative impacts associated with reduced business planning periods that may result from a calendar year timeframe. The flexibility established in alternative E6 for billfish could partially mitigate any negative regional economic impacts to marlin tournaments, charters, and other related recreational fishing businesses. To facilitate the transition to a calendar year management timeframe for bluefin tuna and swordfish, the 2006 fishing year would be abbreviated from June 1, 2006 through December 31, 2006, which could provide slightly higher quotas during that time period and slight positive impacts for fishermen. The specifics of this abbreviated season would be implemented under a separate action.

Other alternatives considered were to maintain the current fishing year (G1) and to shift the fishing year to June 1 - May 31 for all HMS species (G3). These alternatives are not likely to result in economic impacts substantially different than the preferred alternative; however, they would not meet the objectives of this action.

8.6.3.3 Authorized Fishing Gears

The preferred alternatives for authorized gears, which would authorize speargun fishing in the recreational Atlantic tuna fishery (H2), authorize green-stick gear for the commercial harvest of Atlantic BAYS tunas (H4), authorize buoy gear for the commercial swordfish fishery (H5), and clarify the allowance of hand-held cockpit gear (H7), were designed to reduce the economic impacts to fishermen and even enhance economic opportunities in recreational and commercial fishing. Specifically, alternative H2 would enhance economic opportunities in the tuna recreational fishery by including a new authorized class of recreational fishing, speargun fishing.

Alternative H4 would clarify current requirements by specifically authorizing the use of green-stick gear. This gear is currently being utilized, however, there is uncertainty under current regulations as to whether this gear type is authorized. The preferred alternative would eliminate this uncertainty and enhance economic opportunities by authorizing this gear type.

The swordfish handgear fishery may currently utilize individual handlines attached to free-floating buoys, however, a preferred alternative in this document (I5b) would require that handlines used in HMS fisheries be attached to a vessel. Alternative H5 would change the definition of individual free-floating buoyed lines, that are currently considered to be handlines, to "buoy gear," allowing the commercial swordfish handgear fishery to continue utilizing this gear type. Alternative H5 would explicitly authorized this gear type but limit vessels to

possessing and deploying no more than 35 individual buoys with each having no more than two hooks or gangions attached. The economic impact of this alternative would likely be minimal, since the upper limit on the number of buoys is based on information obtained about the fishery though public comment, and based on what NMFS has identified as the manageable upper limit for the commercial sector.

Finally, alternative H7 would also likely reduce confusion over the allowable use of secondary cockpit gears to subdue HMS captured on authorized gears. The use of these secondary gears might result in positive economic benefits from anticipated increases in retention rates.

Other alternatives considered in addition to No Action were to authorize speargun in both the commercial tuna handgear and recreational tuna fisheries (H3) and authorizing buoy gear in the commercial swordfish handgear fishery with 50 buoys with 14 hooks each (H6). None of the non-preferred alternatives would have less economic impacts than the preferred alternatives.

8.6.3.4 Regulatory Housekeeping

The preferred alternatives for regulatory housekeeping items were designed to minimize economic impacts, while also clarifying regulatory definitions and requirements, facilitating species identification, and enhancing regulatory compliance.

The preferred alternatives I1(b) and I1(c), which would differentiate between BLL and PLL gear by using the number of floats and the species composition of catch landed, would more clearly define the difference between BLL and PLL gear using a combination of gear configuration and performance standards based on the composition of catch landed. This would clarify the difference between these two gear types and enhance compliance with time/area closures that place restrictions on these two gear types. There could be some, but likely limited, economic impacts to vessels that may currently fish in gear restricted time/areas closures that do not conform to the proposed BLL and PLL gear specifications and performance standards. This performance based standard could adversely impact those longline vessels that regularly target both demersal and pelagic species on the same trip. Other alternatives considered in addition to the No Action alternative were to require time/depth recorders on all HMS longlines (I1(d)) and base closures on all longline vessels (I1(e)). Only the No Action alternative could have less onerous economic impacts relative to the preferred alternatives. However, the No Action alternative would not address the Agency's concerns with differentiating between bottom and pelagic longline gear.

The preferred alternative for shark identification, which would require that the second dorsal fin and anal fin remain attached on all sharks (I2(b)), addresses issues associated with shark species identification, but would be flexible enough to still allow fishermen to remove the most valuable fins in order to minimize the economic impacts of this alternative. Fishermen could experience, in the short-term, some adverse economic impacts associated with lower revenues associated with keeping the second dorsal and anal fins on sharks. Other alternatives considered in addition to the No Action alternative (I2(a)) were to require the dorsal and anal fin on all sharks except lemon and nurse sharks (I2(c) and to require all fins on all sharks be retained (I2(d)). Some alternatives could have less economic impacts relative to the preferred alternative.

These include the No Action alternative and the alternative requiring the dorsal and anal fin on all sharks except lemon and nurse sharks (I2(c)). These alternatives, however, would not satisfy enforcement and species identification needs.

The preferred alternatives I3(b) and I3(c), which would prohibit the purchase or sale of HMS from vessels in excess of retention limits, would enhance compliance with current regulations by consolidating the requirement for both vessels and dealers. These alternatives would have minimal economic impact on dealers and vessels following the current retention limits. The only additional alternative considered was No Action, which would have less economic impact than the preferred alternatives but would not satisfy the enforcement or monitoring objectives.

The preferred alternative I4(b), which would amend the Florida East Coast closed area, would clarify the regulations regarding this closed area and make them consistent with the boundary of the EEZ. The only additional alternative considered was No Action. Neither alternative is expected to have any economic impact since fishing activity is likely to be limited in this small area.

The preferred alternative I5(b), which would amend the definition of handline gear to require that they be attached to a vessel, would clarify the definition of handline. The economic impact of this new definition would be minimal since unattached handline gear would be defined as "buoy gear" under alternative H5. Other alternatives considered were No Action (I5(a)) and to require handlines be attached to recreational vessels only (I5(c)). These two alternatives could have less economic impacts relative to the preferred alternative, but they would not meet the ecological objectives of this document.

The preferred alternative I6(b), which would prohibit commercial vessels from retaining billfish, would not have any economic impacts because current regulations do not allow these vessels to sell the billfish that are landed. This alternative would clarify and consolidate the requirements for commercial vessels to make them consistent with the regulations prohibiting vessel with pelagic longline gear from retaining billfish. The only other alternative considered was No Action, which could have less social impacts than the preferred alternative but it would not satisfy ecological needs of rebuilding billfish stocks.

The preferred alternative I7(b), which would allow Atlantic tuna dealers to submit reports using the Internet, would simplify reporting and potentially reduce costs. The other alternatives considered were No Action and providing BFT dealers the option to report online (with specific exceptions) would not result in less economic burden than the preferred alternative.

The preferred alternatives I8(b) and I8(c), which would require the submission of no fishing and cost-earnings reporting forms, would clarify current regulations and potentially enhance compliance. The other alternative considered was No Action; that alternative would not meet the NMFS' objectives to collect quality data to manage the fishery. Neither alternative is expected to have any economic impacts.

The preferred alternative I9(b), which would require vessel owners to report non-tournament recreational landings, would clarify and simplify the reporting process by codifying the current prevalent practice of recreational landings being reported by vessel owners versus individual anglers. The other alternative considered, No Action (I9(a)), might result in less economic burden to small businesses but would not satisfy the goal of improving reporting or other objectives of the FMP.

The preferred alternative I10(b) would clarify current regulatory language regarding the roll-over of unharvested quota from the NED pursuant to an ICCAT recommendation. Other alternatives considered include No Action and further discussions at ICCAT. There could be potential economic impacts associated with these two alternatives, if current regulatory text is misinterpreted as capping the set aside quota at 25 metric tons versus allocating 25 metric tons of BFT each year per the ICCAT recommendation. Retaining the current regulatory text under either alternative I10(a) or I10(c) would not reflect the intent of the ICCAT recommendation.

Finally, the preferred alternative I11(b), which would require recreational vessels with a Federal permit to abide by Federal regulations regardless of where they are fishing, would standardize compliance with HMS regulations for vessels possessing a federal HMS permit. This would likely simplify compliance with regulations, except in cases where a state has more restrictive regulations. The other alternative considered was No Action, which could have marginally less economic impact than the preferred alternative, but it would not result in simplified compliance with regulations, and therefore would not meet the objectives of the FMP.

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9.0 COMMUNITY PROFILES

This Chapter identifies and describes the HMS fishing communities as required under the MSA and other laws. This Chapter consolidates all of the communities profiled in previous HMS management plans or amendments and updates the community information where possible. The communities profiled in this chapter were originally selected due to the proportion of HMS landings in the town, the relationship between the geographic communities and the fishing fleets, the existence of other community studies, and input from the HMS and Billfish Advisory Panels. After reviewing the HMS permit databases, additional HMS-related community profiles should be developed in the future. Recommendations for these new profiles are included at the end of this chapter (Section 9.5).

9.1 Introduction

The Magnuson-Stevens Act requires, among other things, that all FMPs include a fishery impact statement intended to assess, specify, and describe the likely effects of the measures on fishermen and fishing communities (§303(a)(9)).

The National Environmental Policy Act (NEPA) also requires federal agencies to consider the interactions of natural and human environments by using a "systematic, interdisciplinary approach which will ensure the integrated use of the natural and social sciences...in planning and decision-making" (§102(2)(A)). Moreover, agencies need to address the aesthetic, historic, cultural, economic, social, or health effects, which may be direct, indirect, or cumulative. Consideration of social impacts is a growing concern as fisheries experience increased participation and/or declines in stocks. The consequences of management actions need to be examined to better ascertain and, if necessary and possible, mitigate regulatory impacts on affected constituents.

Social impacts are generally the consequences to human populations resulting from some type of public or private action. Those consequences may include alterations to the ways in which people live, work or play, relate to one another, and organize to meet their needs. In addition, cultural impacts, which may involve changes in values and beliefs that affect people's way of identifying themselves within their occupation, communities, and society in general are included under this interpretation. Social impact analyses help determine the consequences of policy action in advance by comparing the status quo with the projected impacts. Community profiles are an initial step in the social impact assessment process. Although public hearings and scoping meetings provide input from those concerned with a particular action, they do not constitute a full overview of the fishery.

The Magnuson-Stevens Act outlines a set of National Standards (NS) that apply to all fishery management plans and the implementation of regulations. Specifically, NS 8 notes that:

> "Conservation and management measures shall, consistent with the conservation requirements of this Act (including the prevention of overfishing and rebuilding of overfished stocks), take into account the importance of fishery resources to fishing communities in order to: (1) provide for the sustained participation of such communities;

and, (2) to the extent practicable, minimize adverse economic impacts on such communities." (§301(a)(8)). See also 50 CFR §600.345 for National Standard 8 Guidelines.

"Sustained participation" is defined to mean continued access to the fishery within the constraints of the condition of the resource (50 CFR §600.345(b)(4)). It should be clearly noted that NS 8 "does not constitute a basis for allocation of resources to a specific fishing community nor for providing preferential treatment based on residence in a fishing community" (50 CFR §600.345(b)(2). The Magnuson-Stevens Act further defines a "fishing community" as:

> " ... a community that is substantially dependent upon or substantially engaged in the harvest or processing of fishery resources to meet social and economic needs, and includes fishing vessel owners, operators, crew, and fish processors that are based in such communities." (§3(16))

NMFS (2001) guidelines for social impact assessments specify that the following elements are utilized in the development of FMPs and FMP amendments:

1. The size and demographic characteristics of the fishery-related work force residing in the area; these determine demographic, income, and employment effects in relation to the work force as a whole, by community and region.

2. The cultural issues of attitudes, beliefs, and values of fishermen, fishery-related workers, other stakeholders, and their communities.

3. The effects of proposed actions on social structure and organization; that is, on the ability to provide necessary social support and services to families and communities.

4. The non-economic social aspects of the proposed action or policy; these include life-style issues, health and safety issues, and the non-consumptive and recreational use of living marine resources and their habitats.

5. The historical dependence on and participation in the fishery by fishermen and communities, reflected in the structure of fishing practices, income distribution and rights.

9.2 Methodology

9.2.1 Previous community profiles and assessments

NMFS contracted with Dr. Doug Wilson, from the Ecopolicy Center for Agriculture, Environmental and Resource Issues at Rutgers, the State University of New Jersey, to help develop the community profiles and social impact assessments for the 1999 HMS FMP and Amendment 1 to the FMP for Atlantic Billfish. Dr. Wilson and his colleagues completed their fieldwork in July 1998. This study covered four species groups (tunas, swordfish, sharks and billfishes) that have important commercial and recreational fisheries extending along the Atlantic and Gulf coasts from Maine to Texas and in the Caribbean. The study investigated the social and

cultural characteristics of fishing communities in five states and one U.S. territory: Massachusetts, New Jersey, North Carolina, Florida, Louisiana, and Puerto Rico. These areas were selected because they each had important fishing communities that could be affected by the 1999 HMS FMP and Atlantic Billfish Amendment, and because they are fairly evenly spread along the Atlantic and Gulf coasts and the Caribbean. The study compiled basic sociological information from at least two coastal communities for each state or territory. These locations were visited for further analysis. In the 1998 study, towns were selected based on HMS landings data, the relationship between the geographic communities and the fishing fleets, and the existence of other community studies. The information in this document incorporates by reference the Wilson *et al.*, (1998) study of the HMS fishery and the work of McCay and Cieri (2000) for the Mid-Atlantic Fishery Management Council, "The Fishing Ports of the Mid-Atlantic".

Additionally, this Chapter uses the information gathered under the contract with the Virginia Institute of Marine Science (VIMS) at the College of William and Mary to re-evaluate several of the baseline communities (Kirkley, 2005). The VIMS study gathered a profile of basic sociological information for the principal states involved with the Atlantic shark fishery. From the 255 communities identified as involved in the 2001 commercial fishery, Amendment 1 to the 1999 HMS FMP focused on specific towns based on shark landings data, the size of the shark fishing fleet, the relationship between the geographic communities and the fishing fleets, and the existence of other community studies. While the recreational fishery is an important component in the overall shark fishery, participation and landings are not documented in a manner that permits community identification. Wilson, *et al.*, selected only the recreational fisheries found within the commercial fishing communities for a profile due to the lack of community-based data for the sport fishery.

9.2.2 Information Used in this Assessment

To ensure continuity with the 1999 HMS FMP and previous amendments, if a community was selected and described as being involved with an HMS fishery, the same community was included in this assessment. The HMS permit data support the need to include the previously profiled communities as communities that continue to be active in HMS fisheries. The communities selected for detailed study are Gloucester and New Bedford, Massachusetts; Barnegat Light and Brielle, New Jersey; Wanchese, and Hatteras Township, North Carolina; Pompano Beach, Fort Pierce, Madeira Beach, Panama City Beach, and Islamorada, Florida; Boothville/Venice and Dulac, Louisiana; and Arecibo, Puerto Rico. These communities are not intended to be an exhaustive list of every HMS-related community in the United States; rather the objective is to give a broad perspective of representative areas. The demographic profile tables in this chapter were modified from previous documents to include the same baseline information for each community profiled; as a result, most of the tables include more information than portrayed in previous HMS FMPs and amendments. The demographic tables still use both 1990 and 2000 Bureau of the Census data for comparative purposes. The descriptive community profiles include the same information provided by the Wilson, *et al.* (1998) and Kirkley (2005) analyses with some new information provided by Impact Assessment, Inc (2004) on the Gulf of Mexico communities. Unlike the Wilson, *et al.* (1998) study used in the 1999 HMS FMP, it was not possible to undertake field research for this assessment. The community descriptions included in this Chapter are organized by state.

This assessment also reviewed the available information on location of HMS permit holders to provide information about residence and to identify additional HMS-related fishing communities that may be profiled in the future. Six GIS maps were generated to identify the communities where angler, charter/headboat, HMS dealers (tunas, shark, and swordfish combined), commercial tuna (all gear categories combined), directed and incidental shark, and swordfish (directed, incidental, and handgear combined) permit holders reside. In past community profile and social impact analyses, it was difficult to identify where HMS recreational fishermen were located because no data were available for the number of recreational fishermen and their landings by community. So the previous assessments report on charter fishing operations, fishing tournaments, and related activities to identify the scope of recreational fishing for each of the communities described. The permit holder information should assist in identifying future recreational industry community profiles.

While geographic location is an important component of a fishing community, the transient nature of HMS may cause the permitted fishermen to shift location in an attempt to follow the fish. Because of this characteristic, management measures for HMS often have the most identifiable impacts on fishing fleets that use specific gear types. The geographic concentrations of HMS fisheries may also fluctuate from year to year, as the behavior of these migratory fish is variable. The relationship between these fleets, gear types, and geographic fishing communities is not always a direct one; however, they are important variables for understanding social and cultural impacts. As a result, the inclusion of typical community profiles in HMS management decisions is somewhat difficult, as geographic factors and use of a specific gear type have to be considered.

Several other chapters in this FMP include information that addresses the requirements described Section 9.1 and that is an integral part of this social impact assessment and fishery impact statement. Please refer to the Description of the Fisheries in Chapter 3, the Economic Evaluation in Chapter 6, the Regulatory Impact Review (RIR) in Chapter 7, and the Draft Regulatory Flexibility Analysis (DRFA) in Chapter 8. Furthermore, each of the management alternatives in Chapter 4 includes an assessment of the potential social and economic impacts associated with the proposed alternatives. The preferred alternatives are selected to minimize economic impacts and provide for the sustained participation of fishing communities, while taking the necessary actions to rebuild overfished fisheries as required by the Magnuson-Stevens Act.

9.3 United States Demographic Profile

In 1990, the United States had a total population of 248.7 million (Table 9.1). The population increased to 281.4 million in 2000. Throughout the previous decade, the population was roughly half female and half male. Individuals between 20 and 44 years of age comprised the largest proportion of the population in both 1990 and 2000. The dominant race was white. Ninety-two million total households, in 1990, grew to 105.5 million households in 2000. The average household and family size remained about the same between the two decades. The number of high school graduates, ages 25 and older, increased between 1990 and 2000 by about five percent (Table 9.1). Between 1990 and 2000, the total number of business establishments in the United States increased from 6.2 to 7.1 million. While unemployment decreased by half in 2000, the individuals below the poverty line decreased by less than one percent. In 1990,

employment in farming, fishing, forestry, and mining industries accounted for 3.3 percent collectively. Whereas in 2000, collective employment in these industries accounted for less than two percent.

Table 9.1 Demographic Profile of the United States. Source: U.S. Census, 1990 and 2000.

Demographics	1990	2000
Total Population	248,709,873	281,421,906
Sex		
Male	48.7%	49.1%
Female	51.3%	50.9%
Age		
< 20	25.6%	28.6%
20 - 44	43.2%	36.9%
45 - 64	18.6%	22.0%
> 65	12.6%	12.4%
Race		
White	80.3%	75.1%
Black or African American	12.1%	12.3%
American Indian and Alaska Native	0.8%	0.9%
Asian	2.8%	3.6%
Native Hawaiian and Other Pacific Islander	0.1%	0.1%
Other	3.9%	5.5%
Household		
Total	**91,947,410**	**105,480,101**
Family households	70.2%	68%
Nonfamily households	29.8%	32%
Average household size	3	2.59
Average family size	3.16	3.14
Housing Occupancy		
Total housing units	102,263,678	115,904,641
Vacant housing units	10.1%	9.0%
Housing Tenure		
Owner-occupied housing units	64.2%	66.2%
Renter-occupied housing units	35.8%	33.8%

UNITED STATES	1990
Population:	281,421,906
Education:	
High school graduates (25 years or older)	75.2%
Economic Characteristics	
Labor force (16 years and over)	65.3%
Unemployed	6.3%
Median Household Income	$ 30,056
Individuals below the poverty line*	13.1%
Employment in some industry sectors:	
Managerial/professional	26.4%
Technical, Administrative, & Sales	31.7%
Construction, Production, Maintenance, & Transportation	26.2%
Farming, fishing, forestry, & mining	2.5%
Industry	
Farming, fishing, forestry & mining	3.3%
Construction	6.2%
Manufacturing	17.7%
Wholesale trade	4.4%
Retail	16.8%
Education, health & social services	23.3%
Arts, recreation, lodging & food services	1.4%

9.4 State and Community Profiles

9.4.1 Maine

Between 1990 and 2000, the population in the state of Maine increased by about 4.6 percent (Table 9.2). The number of high school graduates, ages 25 years and older, has increased over the past decade. The unemployment rate decreased, while the percentage of individuals below the poverty line remained the same. Employment in the farming, fishing, forestry, and mining industries remained about the same with education, health, and social services industries providing the greatest source of employment for the state's residents.

As of April 2005, Maine has six commercial vessels with shark and swordfish fishing permits (Table 9.38 and Table 9.39). Maine also has nineteen licensed dealers for tunas, sharks, and swordfish; seven of the dealers reside in Portland (Table 9.37 and Figure 9.4). There are 592 commercial tuna permit holders that reside in the state of Maine (Figure 9.3 and Table 9.36). In fact, Maine has the third greatest number of commercial tuna permit holders with 10.7 percent of the total (Table 9.36).

Despite having only six shark permits issued to Maine residents in 2005, there were several communities involved with the commercial shark fishery in 2003, such as Cape

Elizabeth, Harpswell, and Portland (Cumberland County); Southwest Harbor and Winter Harbor (Hancock County); Owls Head and Rockland (Knox County); and Kittery, Milbridge, and Old Orchard Beach (York County) (NMFS 1999a). Many of the vessels homeported in Maine participate in the shark fisheries in southern waters and make landings in Florida and other states; therefore, landings are not always indicative of a community's involvement in a fishery. The incidental nature of shark catches off Maine for the commercial fishery is also true for the recreational fishery; sharks are often taken during tuna fishing trips. There is, however, a small group of anglers who fish with light tackle for blue shark, mako, and porbeagle in the Gulf of Maine. To date, no HMS-related community profiles have been developed for the State of Maine, as there are no significant concentrations of HMS-related fisheries in any particular community.

Table 9.2 Maine Demographic Profile. Source: U.S. Census, 1990 and 2000.

Maine	1990	2000
Population:	**1,227,928**	**1,274,923**
Education:		
High school graduates (25 years or older)	78.8%	85.4%
Employment:		
Labor force (16 years and over)	65.6%	65.3%
Unemployment Rate	6.6%	4.8%
Median Household Income	$27,854	$37,240
Individuals below the poverty line*	10.8%	10.9%
Employment in some industry sectors:		
Farming, fishing, forestry & mining	2.8%	2.6%
Construction	7.3%	6.9%
Manufacturing	19.7%	14.2%
Wholesale trade	3.6%	3.4%
Retail	18.4%	13.5%
Education, health & social services	24.8%	23.2%
Arts, recreation, lodging & food services	0.9%	7.1%

*U.S. Census uses data from 1989 and 1999 to estimate these values.

In 2003, an estimated 358,000 sportfishermen made 919,000 fishing trips in marine waters off Maine (NMFS, 2004). Of these anglers, about 48 percent were from out of state. About one percent of the HMS angling permit holders live in the state of Maine (Table 9.34 and Figure 9.1). The American Sportfishing Association (ASA) estimated that all saltwater recreational fishing in Maine in 2001 generated some $67.8 million in direct and indirect retail sales. Employment in marine recreational fishing services was estimated to be 1,287 jobs (ASA, 2002). An indication of recreational interest in shark fishing is the charterboats advertise for shark fishing trips from York Harbor, Sheepscot, Casco Bay, Saco Bay, Bath, Damariscotta, and Old Orchard Beach. Forty-eight charter/headboats in Maine held HMS permits in 2005 (Table 9.35). These Maine charter operations are seasonal, typically from Memorial Day to Labor Day, and some of the operators advertise that they move to Florida, or the Caribbean, to run charters during the Florida season from November to May.

9.4.2 New Hampshire

New Hampshire's population increased by about 10.3 percent between 1990 and 2000 (Table 9.3). The number of high school graduates, ages 25 years and older, increased slightly. The unemployment rate decreased, while the percentage of individuals below the poverty line remained the same. Employment in the farming, fishing, forestry, and mining industries declined by 6 percent with education, health, and social services industries continued to provide the greatest source of employment for the state's residents.

Table 9.3 **New Hampshire Demographic Profile.** Source: U.S. Census, 1990 and 2000

New Hampshire	1990	2000
Population:	**1,109,252**	**1,235,786**
Education:		
High school graduates (25 years or older)	82.2%	87.4%
Employment:		
Labor force (16 years and over)	71.9%	70.5%
Unemployment Rate	6.2%	3.8%
Median Household Income	$36,329	$49,467
Individuals below the poverty line*	6.4%	6.5%
Employment in some industry sectors:		
Farming, fishing, forestry & mining	1.5%	0.9%
Construction	7.1%	6.8%
Manufacturing	22.5%	18.1%
Wholesale trade	4.0%	3.6%
Retail	17.6%	13.7%
Education, health & social services	22.6%	20.0%
Arts, recreation, lodging & food services	1.2%	6.9%

*U.S. Census uses data from 1989 and 1999 to estimate these values.

New Hampshire's commercial shark fishery is very small and largely incidental to the take of other species. The local shark fishery involves two vessels (Table 9.38). The communities involved with the fishery are Hampton Falls, Portsmouth and Rye (Rockingham County), and Dover (Strafford County). There are five HMS dealers in the state of New Hampshire (Table 9.37). New Hampshire has the sixth greatest number of commercial tuna permit holders (Table 9.36). Less than one percent of the angling permit holders reside in New Hampshire (Table 9.34). Because of the relatively small size of the HMS fisheries, community profiles were not developed for New Hampshire ports.

The recreational fishery for sharks in New Hampshire waters is largely incidental, on a very small scale, and similar to that of Maine. Occasionally caught close to shore, most makos are taken in water reaching depths over 20 fathoms. New Hampshire is home to 203 HMS angling permit holders in 2005 (Table 9.34). There are 58 charterboat operators in Portsmouth, Rye, New Castle, Dover, Seabrook and Hampton who held HMS permits in 2005 (Table 9.35). Many of these charterboats advertise shark fishing trips offshore from June through September, with the best fishing in June and July. Target species for these trips are mako, blue, thresher and porbeagle sharks.

In 2003, 182,000 anglers made 416,000 fishing trips to the marine waters off New Hampshire (NMFS, 2003). Of these saltwater anglers, 41 percent were visitors from out-of-state. It is estimated that these saltwater anglers generated some $59.3 million in direct and indirect retail sales related to their fishing in New Hampshire in 2001 (ASA, 2002). The marine recreational fishing services sector provided some 1,103 jobs in the state in 2001.

9.4.3 Massachusetts

Commercial fisheries in Massachusetts are diverse, and range from small-scale inshore small-boat fisheries for lobster and clams, to offshore scallops, groundfish dragging, and longline fishing for HMS species. In 2003, New Bedford, Massachusetts ranked eighth in the United States for the weight of fish landed, and first for value with ex-vessel sales, bringing in 176.2 million dollars (NMFS, 2004). In the same year, Gloucester ranked twelfth in weight of fish landed and thirteenth in ex-vessel value. Due to the number of HMS permit holders and the relative importance of commercial and recreational fisheries to the Commonwealth, community profiles for both New Bedford and Gloucester were originally developed for the 1999 HMS FMP and have been included below.

The population in the Commonwealth of Massachusetts increased from 6 million people to 6.3 million people over the past decade (Table 9.4). The majority of individuals 25 years and older have a high school diploma and/or a graduate level degree. The percentage of employed individuals and individuals below the poverty line has remained about the same in the past decade, but there has been a slight decline in the unemployment rate, almost two percent. Employment in the farming, fishing, forestry, and mining industries has declined over the last decade. The arts, recreation, lodging, and food services industries are the only industries that expanded.

Massachusetts holds the greatest number of commercial tuna permits with 1,740 vessels permitted as of May 2005 (Table 9.36). In addition, Gloucester has the greatest concentration of commercial tuna permit holders with 114 vessels permitted (Figure 9.3). Massachusetts is ranked fourth in the greatest number of swordfish permit holders with almost 10 percent of the total swordfish permit holders residing in Massachusetts (Table 9.39). In addition to swordfish, there are nineteen directed and incidental shark permit holders (Table 9.38). Boston has the greatest concentration of HMS permitted dealers with New York City a close second (Table 9.37 and Figure 9.4).

In 2003, marine recreational fishing in Massachusetts attracted an estimated 852,000 anglers making 4,085,000 fishing trips in both state and Federal waters (NMFS, 2004b). Approximately, 306,000 (36 percent) of the anglers were from out of state. Direct and indirect retail sales generated by marine recreational fishermen in Massachusetts in 2001 were estimated to be $320.7 million (ASA, 2002). The marine recreational fishing industry generated 5,423 jobs in the Commonwealth in 2001. Shark fishing, largely catch-and-release using light tackle, takes place in offshore waters (NMFS, 2003). Recreational vessels often travel 50 - 100 miles out to their fishing grounds and most shark trips are 10 - 12 hours in duration, with some extending to an overnight trip, or even two- or three-day trips. Massachusetts residents held 332 charter/headboat permits in 2005. Sharks are usually taken incidental to bluefin tuna fishing, but

a number of charterboat operators advertise shark fishing trips. The target shark species South and East of Cape Cod are mako, blue and porbeagle sharks and these species, as well as thresher, dusky, and tiger sharks are found throughout the Gulf of Maine.

Table 9.4 **Massachusetts Demographic Profile.** Source: U.S. Census, 1990 & 2000

Massachusetts	1990	2000
Population:	**6,016,425**	**6,349,097**
Education:		
High school graduates (25 years or older)	80.0%	84.8%
Employment:		
Labor force (16 years and over)	67.8%	66.2%
Unemployment Rate	6.7%	4.6%
Median Household Income	$36,952	$50,502
Individuals below the poverty line*	8.9%	9.3%
Employment in some industry sectors:		
Farming, fishing, forestry & mining	1.2%	0.4%
Construction	5.5%	5.5%
Manufacturing	18.1%	12.8%
Wholesale trade	4.1%	3.3%
Retail	16.2%	11.0%
Education, health & social services	28.0%	23.7%
Arts, recreation, lodging & food services	1.1%	6.8%

*U.S. Census uses data from 1989 and 1999 to estimate these values.

Shark fishing tournaments are promoted, and participated in, by some charterboat operators (NMFS 2003). Examples of these tournaments include Boston Big Game and Monster Shark Tournaments (Oak Bluffs); Nantucket Angler's Club (Nantucket); Fisherman Outfitter's Cutty Hunk Shootout (Cutty Hunk); and Giant Bluefin Tournament (Hyannis). Charterboat operations advertising shark fishing trips are based in Newburyport, Rockport, Gloucester, Boston, Quincy, Chatham, Harwich Port, South Yarmouth, Hyannis, Mashpee, East Falmouth, Oak Bluffs, Edgartown, Vineyard Haven, Menemsha, Mattapoisett, Fairhaven, New Bedford, and Westport Point.

9.4.3.1 Gloucester, Massachusetts

In 1990, the population of Gloucester was 28,716. There was a minimal population increase of approximately 1,500 individuals between 1990 and 2000 (Table 9.5). Forty percent of the population was between the ages 20 – 44 years old in 2000. The median age of the Gloucester population has gotten older by five years, rising to 40 years old in 2000. There is a slightly larger percentage of females in the Gloucester population, 48 percent males to 52 percent females. In 2000, the number of households is two and half times greater than in 1990, but the total number of housing units increased only slightly, from 13,125 to 13,958.

A greater percentage of the 16 years and older population was an active part of the labor force during 2000 (Table 9.5). While the percentage of unemployed declined, the percentage of

individuals below the poverty line increased in the last decade. The greatest source of employment in 1990 was the technical and administrative industries. In 2000, 36 percent of the population was employed in the managerial and professional industries. The number of businesses engaged in the forestry, fishing, hunting, mining, and agriculture industries declined over the last decade from 3.9 percent to 2.5 percent. The greatest percentage of businesses was engaged in education, health, and social service.

Gloucester residents hold the largest number of commercial tuna permits with 114 permits issued in 2005 (Table 9.36 and Figure 9.3). The Atlantic bluefin tuna purse seine fishery lasts for a short period of time each year and is limited by regulation to five vessels. One purse seine vessel operates out of Gloucester. The economic health of the purse seine fishery is heavily dependent on bluefin tuna prices and, concomitantly, on the value of the Japanese yen. Finding crew is not a problem; many of the current crew members have had their berths for years. The owner and many of the crew of purse seine vessels, even some who do not reside in the community, are well-integrated through kinship ties into the fishing community. They see themselves as responsible for creating the bluefin tuna fishery and the fleet enjoys the respect of the extended fishing communities in Gloucester (Wilson *et al*., 1998).

Table 9.5 Demographic Profile of Gloucester, Massachusetts. Source: U.S. Census, 1990 and 2000.

Demographics	1990	2000
Total Population	28,716	30,273
Sex		
Male	48.2%	47.9%
Female	51.8%	52.1%
Age		
Median Age	**35.5**	**40.2**
< 20	25.2%	23.9%
20 - 44	39.3%	34.4%
45 - 64	20.2%	26.1%
> 65	15.4%	15.6%
Race		
White	99.4%	97.0%
Black or African American	0.2%	0.6%
American Indian & Alaska Native	0.1%	0.1%
Asian	0.2%	0.7%
Other	0.1%	0.5%
Household		
Total	**11,550**	**29,913**
Family households	66.1%	62.7%
Nonfamily households	33.9%	37.3%
Average household size	2.49	2.38
Average family size	3.11	3.00
Housing Occupancy		
Total housing units	13,125	13,958
Vacant housing units	11.8%	9.8%
Housing Tenure		
Owner-occupied housing units	57.8%	59.7%
Renter-occupied housing units	42.2%	40.3%

Gloucester, Massachusetts	1990	2000
Population:	28,716	30,273
Education:		
High school graduates (25 years or older)	75.6%	85.7%
Economic Characteristics		
Labor force (16 years and over)	62.6%	66.1%
Unemployed	4.5%	3.2%
Median Household Income	$ 32,690	$ 47,722
Individuals below the poverty line	7.5%	8.8%
Employment in some industry sectors:		
Managerial/professional	26.8%	36.1%
Technical/administrative	28.0%	25.4%
Construction, Production, Maintenance, & Transportation	2.8%	21.4%
Farming, fishing, forestry, & mining	13.0%	2.0%
Industry		
Forestry, fishing, hunting, mining, and agriculture	3.9%	2.5%
Construction	5.5%	7.1%
Manufacturing	22.1%	16.7%
Wholesale trade	4.7%	3.6%
Retail trade	16.2%	10.8%
Education, health & social services	14.1%	20.2%
Arts, recreation, lodging & food services	1.4%	9.2%

There are also a large number of HMS dealers in the Gloucester area, licensed to purchase and sell tuna, sharks, and swordfish (Table 9.37 and Figure 9.4). Bluefin tuna dealers in Gloucester work with a large number of vessels of various types, including the one purse seine vessel. Most bluefin tuna are sold on consignment, and some dealers give a minimum guarantee on fish they take. Personal networks are very important and the competition can be intense. During the bluefin tuna season, some transient dealers come to Gloucester. The largest dealer

buys from the purse seine vessels because it is one of the few dealers that is able to finance the transaction. This business has only one full-time employee and up to seven seasonal employees, who may be fishermen seeking alternative employment. The dealer to whom the purse seine vessels sell their bluefin tuna heavily depends on those vessels to maintain its current profit margins. However, this dealer reports that the structure of its business is such that there would be no lost jobs even if the purse seine landings were significantly reduced, since BFT reallocated to another gear category likely be handled by the same dealer (Wilson *et al*., 1998).

Commercial rod and reel tuna fishing (with General category permits) as well as recreational rod and reel tuna fishing (with Angling category permits) drive a large shoreside economy, including the sale and repair of tackle, vessels, and engines, and the sale of supplies such as bait and ice. The rod and reel fishery also supports general tourist services such as restaurants and hotels. This community is competing with many other possible tourist destinations for tuna fishermen, increasing their dependence on the bluefin tuna as a prominent attraction. Vulnerabilities stem from the seasonal nature of tuna fishing in Gloucester and the general dependence of tuna fishing on the health of the economy. According to those interviewed, seasonality makes business planning, as well as finding and retaining trained employees, more difficult (Wilson, *et al*., 1998).

The bluefin tuna rod and reel fishery attracts wealthier fishermen than the fisheries for many other species. The bluefin tuna fishing experience is not always a family activity, but it is often the attraction that brings an adult, and hence the rest of the family, to the community. It attracts experienced and amateur fishermen alike, as well as adventure seekers who are often outdoors enthusiasts in other arenas. Gloucester used to have an annual bluefin tuna tournament organized by the largest of the recreational marinas. However, limited availability of fish has canceled the tournament in past years (Wilson *et al*., 1998). Most fishing tourists who come to Gloucester are from the northeastern United States. These “weekend warrior” bluefin tuna fishermen have an important impact on the community’s economy, particularly weekend fuel sales (Wilson, *et al*., 1998)

The Gloucester charter fleet follows a standard policy that, when a bluefin tuna is landed, the fish belongs to the vessel and the charter for the day is free, since the vessel operator may sell the fish to the dealer (Wilson *et al*., 1998). Serious customers want to target bluefin tuna, even though there is a low probability that they will catch them. Very often when the General category is open, charter captains will take an extra mate and fish for bluefin tuna without paying passengers. They feel that having no amateurs on board enhances their chances of actually landing a fish.

Of the three retail tackle shops in Gloucester, only one specializes in offshore fishing. Eighty-five percent of its business is related to both commercial and recreational bluefin tuna fishing. Bluefin tuna and shark fishing gear is very expensive; reels cost $800 to $1,000 and are useful for shark and bluefin tuna only. Fishermen in Gloucester often choose high quality gear and show little concern about price (Wilson *et al*., 1998).

In the HMS rod and reel fishery of Gloucester, sharks are usually not the primary target species, but they are encountered incidentally to tunas. Most sharks caught in Gloucester

recreational fisheries are released (Wilson *et al*., 1998). Researchers noted tension and distance between the recreational and commercial fishing communities, as recreational fishermen tend to believe that commercial fishing is to blame for the decline in local shark populations.

9.4.3.2 New Bedford, Massachusetts

New Bedford is a long and narrow city along the coast of southern Massachusetts, facing the city of Fairhaven across the water. New Bedford faces problems associated with its urban setting, such as low education levels and high unemployment. The working waterfront and its industry have become increasingly important economically as the manufacturing base of the city has declined. With multiplier effects, the city's economy may benefit from the fishing industry by $500 million (Wilson *et al*., 1998). Thousands of people are employed in supporting services such as processing, manufacturers of equipment, transport companies, supply houses, oil companies, welders, pipe fitters, stores, settlement houses, *etc*. Once the "whaling capital of the world," New Bedford still possesses one of the largest fishing fleets in the eastern United States (NOAA, 1996). New Bedford ranked eighth in the United States for the weight of fish landed in 2003, and first for value with ex-vessel sales bringing in 176.2 million dollars (NMFS, 2004).

New Bedford has learned a great deal about how to survive crises in fisheries. Many of the members of this fishing community are descended from Portuguese fishing families and kinship networks are an extremely important influence on employment patterns in the fishing industry (NMFS, 1999a). The Portuguese families are very close and many trace their families back to fishermen in Portugal. The Fishermen's Family Assistance Center opened in 1994 with help from the Federal government in response to the collapse in the groundfish fishery. Thirty-two vessels in New Bedford were removed through the buyback program. With help from the Center, ex-fishermen are finding jobs, particularly in the marine trade, computer, and trucking industries. The marine trade jobs tend to be in New York, New Jersey, and Massachusetts. Other industries in New Bedford have been supportive of the fishermen through the crisis and extended family networks have helped minimize social impacts (Wilson, *et al*., 1998).

Between 1990 and 2000, New Bedford experienced a decrease in its population of over 6,000 individuals — 99,922 in 1990 to 93,768 in 2000 (Table 9.6). The median age of the population increased slightly, from 33 to 36 years old. The 2000 age distribution remains relatively similar to the age distribution in 1990 with the greatest percentage of individuals in the 20 to 44 years age group. The percentage of females in the population outweighs the percentage of males in both 1990 and 2000 by 6 percent. The number of total households increased by 42 percent in the last decade, probably attributable to an increase in the number of non-family households.

The number of high school graduates increased by almost 8 percent in the 1990s (Table 9.6). The size of the 16 years and older labor force increased, and the percentage of unemployed declined, but the percentage of individuals below the poverty line increased by almost 4 percent. A large percentage of New Bedford residents are employed in the construction, production, maintenance, and transportation industries. This was a significant increase over the last decade in this sector, where the greatest percentage of employment was in the technical, administrative, and sales industries throughout the 1990s. The percentage of businesses engaged in the forestry,

fishing, hunting, and agriculture industries declined by almost a third throughout the 1990s. In 2000, the major industries were manufacturing and education, health, and social services.

Table 9.6 Demographic Profile of New Bedford, Massachusetts. Source: U.S. Census, 1990 and 2000.

Demographics	1990	2000
Total Population	99,922	93,768
Sex		
Male	46.7%	47.1%
Female	53.3%	52.9%
Age		
Median Age	**32.6**	**35.9**
< 20	29.1%	27.4%
20-44	35.4%	35.6%
45- 64	18.0%	20.1%
> 65	17.4%	16.7%
Race		
White	87.8%	78.9%
Black or African American	3.8%	4.4%
American Indian and Alaska Native	0.4%	0.6%
Asian and Pacific Islander	0.3%	0.7%
Other	7.6%	9.5%
Household		
Total	**38,646**	**91,782**
Family households	69.0%	63.1%
Nonfamily households	31.0%	39.9%
Average household size	2.59	2.40
Average family size	3.15	3.01
Housing Occupancy		
Total housing units	41,760	41,511
Vacant housing units	7.1%	8.0%
Housing Tenure		
Owner-occupied housing units	43.8%	43.8%
Renter-occupied housing units	56.2%	56.2%

New Bedford, Massachusetts	1990	2000
Population:	99,922	93,678
Education:		
High school graduates (25 years or older)	49.7%	57.6%
Economic Characteristics		
Labor force (16 years and over)	52.1%	57.7%
Unemployed	7.2%	5.0%
Median Household Income	$ 22,647	$ 27,569
Individuals below the poverty line	16.8%	20.2%
Employment in some industry sectors:		
Managerial/professional	17.0%	20.8%
Technical, Administrative, & Sales	27.2%	23.6%
Construction, Production, Maintenance, & Transportation	2.6%	34.9%
Farming, fishing, forestry, & mining	11.9%	1.0%
Industry		
Forestry, fishing, hunting, mining, and agriculture	3.16%	1.1%
Construction	6.1%	7.1%
Manufacturing	27.8%	20.7%
Wholesale trade	4.3%	4.4%
Retail trade	17.0%	12.1%
Education, health & social services	15.4%	20.9%
Arts, recreation, lodging & food services	0.7%	7.4%

New Bedford also has a large number of residents with a commercial tuna permit (Table 9.36 and Figure 9.3). All pelagic longline vessels that land HMS in New Bedford are large "distant water" vessels. The fleet consists of large vessels that follow swordfish throughout their migrations. These vessels make long trips, are relatively expensive to operate, and are highly specialized to distant water fishing (*i.e*., they have large holds and additional fuel capacity). Respondents to the Wilson *et al*. study report that these large distant water vessels have developed a minimal history in other U.S. fisheries, though it is fairly easy for both the vessels and captains to find work in foreign longline fisheries. Many of these vessels already moved from the Atlantic Ocean to the Pacific Ocean, and others are currently for sale (Wilson *et al*., 1998). In summer months, the remaining large distant water vessels fish on the Grand Banks and land swordfish in New England and Canadian ports. During winter months, their product is initially landed in San Juan, Puerto Rico and transhipped to New Bedford and other destinations. San Juan, Puerto Rico is the only international airport in the Caribbean with the necessary lift capacity to tranship their product. Long storage time at sea means that this fleet produces relatively lower quality swordfish, so they compete directly with cheaper imports for the low-end markets. Participants report concern over expenses and the decreased price of swordfish.

Because of these problems and the pressures brought about by increased regulation and several decreasing fish stocks, the distant water fleet has responded staying out at sea for longer

periods (Wilson *et al*., 1998). This has affected family life; wives of fishermen do not want to raise children essentially alone. While some members of this fleet, their suppliers, and their customers live in the New Bedford area, the distant water fleet is not attached to a geographical community in the same sense of other fleets. Participants in this fleet tend to be fairly isolated within the communities where they live, even when those communities are strongly integrated fishing communities like New Bedford. The wives of captains and crew who participate in the distant water fishery generally do not know each other well. New Bedford has a fishermen's wives association but it is mainly for older Portuguese women whose husbands are scallopers and draggers "who do only 14-day trips" (Wilson *et al*., 1998). New Bedford respondents not associated with the distant water fleet report that they see it as socially distant from the rest of the community. This isolation from other fishing people, and the length of the trips, has placed a strain on the family life of participants.

The distant water fleet has used its longer reach to recruit crew members from overseas, particularly the West Indies, thus avoiding crew supply problems typical of other sectors of the longline fleet. The range of these vessels over many different waters makes them particularly dependent on the skill and experience of their captains. New Bedford does not offer these captains alternative employment outside of the fishing industry at comparable income levels (Wilson, *et al*., 1998).

A dealer in the New Bedford area who purchases from the distant water fleet does $15 million to $20 million worth of business each year, including imports. About half of the dealer's purchases are domestic. Overall, his business consists of 60 percent swordfish, 15 percent tunas (yellowfin, bigeye, bluefin), ten percent lobster, and 15 percent other (sharks, bait, *etc*.). The dealer employs 40 to 65 people depending on supply conditions (Wilson *et al*., 1998). There are also a large number of HMS dealers in Gloucester licensed to purchase and sell tunas, sharks, and swordfish (Figure 9.4).

When fishing is disrupted through closures, the dealers experience large labor fluctuations. Even the increased reliance on imports has not completely solved this problem. When they make an effort to buy from U.S. vessels in distant waters, special arrangements and timing are required to get the fish to market and maintain vessels. The fishermen have to unload close to an international airport with lift capacity, which in the Caribbean means San Juan. The dealers have to hire people to unload any vessel landings in San Juan, and send supervisors so that the fish is kept cold, weighed properly and counted correctly. Then they need to arrange for cargo departure and negotiate freight weight. These activities can be easily disrupted by short notice of seasonal closures and other regulatory decisions.

Of the five vessels that hold permits to fish in the bluefin tuna purse seine fishery, four are associated with New Bedford. One of these vessels is owned by a resident while the three other vessels are owned by non-residents. All four land their catch in New Bedford and have crew members who live in the city. The owners and many of the crew of the purse seine vessels, even some who do not reside in the community, are well integrated through kinship ties into the fishing community. They are generally thought of as being responsible for creating the bluefin tuna fishery, and the fleet enjoys the respect of extended fishing communities in New Bedford (Wilson *et al*., 1998). Three of these vessels do nothing else but fish for bluefin tuna and are tied

up at the dock for the rest of the year. The fourth vessel holds a scallop permit as well. Many of the current crew members have had their berths for years. In 1998, these vessels employed 26 crew members combined, 24 percent less than they did at the height of this fishery in the 1980s. Many of these crew members are family and almost all have been with these vessels for a long time. The average age is considerably older than that of most fishing crews. When the vessels are tied up, the crew members collect unemployment and do odd jobs. A greater percentage of the crew members' wives worked outside the home in the 1990's compared to the 1980s (Wilson *et al*., 1998).

The purse seine fleet's economic health is heavily dependent on bluefin tuna prices and, concomitantly, on the value of the Japanese yen. The New Bedford dealer who buys bluefin tuna from the purse seine fleet has been in business since the early 1960s. This dealer currently depends on the purse seiners to maintain profit margins. However, he reports that the structure of his businesses is such that there would be no lost jobs even if the purse seine landings were to be significantly reduced, since any bluefin tuna reallocated to other commercial categories would likely be handled by the same dealer. The business employs 200 people and would not lay off workers if the bluefin tuna quota were cut. While bluefin tuna currently makes up only 1.25 percent of their gross dollars, it accounts for 25 percent or more of their net profit.

The recreational tuna fishing industry in New Bedford is a highly diverse one, with an increasing emphasis on providing an enjoyable fishing experience for all ages. Fishery participants feel that bluefin tuna fishing is an adventure, and the prize is an important aspect of the experience. It attracts experienced and amateur fishermen alike, as well as adventure seekers who are often outdoors enthusiasts in other arenas. Most charterboats in the New Bedford area are owner-operated. Respondents report that it can be hard to find suitable crew members because the business is seasonal and they are unwilling to hire unemployed commercial fishermen (Wilson *et al*., 1998).

Recreational fishing in these communities drives a much larger economy, including the marine trades (tackle, vessels, engines, *etc.*), suppliers of bait and ice, and general tourist services such as restaurants and hotels. These communities are competing with many other possible tourist destinations, increasing their dependence on large, well-known fish that act as prominent attractions. Economic vulnerabilities stem from the seasonal nature of recreational fishing in these communities and recreational fishing's general dependence on the health of the economy. The seasonality of this fishery makes business planning, as well as training and keeping employees, more difficult. Respondents emphasized that these communities depend on potential customers' expectation that they will have a reasonable chance to land a fish (Wilson *et al*., 1998).

Shark tournaments are also an important component in promoting business in the New Bedford area, attracting numerous repeat customers. They bring in curious people because sharks are considered a dangerous and exciting fish. Recreational shark fishing in New Bedford is mainly catch-and-release (Wilson *et al*., 1998). However, respondents argue that New Bedford is not the appropriate area for catch-and-release tournaments, because the length of the trip (100 miles) makes taking observers impractical. Although shark fishing is comparatively less important to recreational fishermen in this community, some customers are attracted by the

particular challenge of shark fishing. Recreational fishermen throughout the area tend to believe that commercial fishing is to blame for the decline in shark populations.

9.4.4 Rhode Island

Rhode Island's population increased from just over one million people in 1990 to 1.1 million people in 2000 (Table 9.7). The percentage of individuals 25 years and older with a high school diploma and/or some graduate level degree has increased by three percent. The percentage of employed individuals and the unemployment rate declined slightly, but the number of individuals below the poverty line increased from 9.6 percent to almost 12 percent. Employment in the farming, fishing, forestry, and mining industries has declined with the education, health, and social services industries providing the greatest employment opportunities in 2000. Due to the relatively low involvement in the HMS fisheries, to date there are no community profiles describing the relationship of HMS fisheries to any Rhode Island communities.

Table 9.7 Rhode Island Demographic Profile. Source: U.S. Census, 1990 and 2000

Rhode Island	1990	2000
Population:	**1,003,464**	**1,048,319**
Education:		
High school graduates (25 years or older)	72.0%	78.0%
Employment:		
Labor force (16 years and over)	66.1%	64.6%
Unemployment Rate	6.6%	5.6%
Median Household Income	$32,181	$42,090
Individuals below the poverty line*	9.6%	11.9%
Employment in some industry sectors:		
Farming, fishing, forestry & mining	1.3%	0.5%
Construction	5.7%	5.4%
Manufacturing	22.7%	16.4%
Wholesale trade	3.7%	3.4%
Retail	17.5%	12.1%
Education, health & social services	25.0%	23.0%
Arts, recreation, lodging & food services	1.2%	8.6%

*U.S. Census uses data from 1989 and 1999 to estimate these values.

Four percent of the commercial tuna permit holders reside in Rhode Island (Table 9.36) with a significant concentration of permit holders residing in Wakefield (Figure 9.1). Ten shark permit holders and 30 swordfish permit holders are located in the state of Rhode Island (Table 9.38 and Table 9.39). Communities involved with the commercial fisheries are Warwick, Little Compton, Newport, Tiverton, Block Island, Narragansett, Peace Dale, Point Judith, South Kingstown, Wakefield and West Kingstown. Rhode Island is also home to the 34 HMS dealers, tied with New Jersey for fifth (Table 9.37 and Figure 9.4). Dealers operated in Little Compton, Newport, Tiverton, Point Judith, and South Kingstown. In the future, NMFS may want to consider developing a HMS-related community profile for Wakefield, Rhode Island due to the number of residents involved in the commercial tuna and swordfish fisheries.

In 2003, some 400,000 anglers took 1,595,000 saltwater fishing trips for all species of fish (NMFS, 2004b). Of these marine anglers, 63 percent were from out-of-state. As of May 2005, Rhode Island had 297 residents holding an HMS angling permit (Table 9.34). Retail sales generated by marine anglers in Rhode Island in 2001 are estimated to total $86.2 million and 1,382 jobs were generated in the marine recreational fishing industry (ASA, 2002). Recreational shark fishing from Rhode Island is seasonal between late June and October, with a peak in late August (NMFS 2003). A variety of shark species is available with the most common being mako sharks between 60 - 100 pounds. After mako, thresher, blue, dusky and sandbar sharks are the most common species caught by anglers. Light tackle is the gear preferred for shark fishing by the charter operators and most private boat fishermen, and catch-and-release is normal in the fishery.

In Rhode Island, the number of charter/headboat permit holders increased from 94 in 2003 to 123 in 2005 (Table 9.35). Charter operators offering shark fishing trips are based in Block Island, Point Judith, Little Compton, Warwick, West Greenwich, Newport, and Westerly. Charter trips for sharks are usually to the deep waters South of Rhode Island and the eastern tip of Long Island, last at least 10 hours and, in August, are often overnight trips. On the ten-hour trips with five anglers onboard, the average fee was on the order of $800 in 2003 (NMFS, 2003). This fee is comparable to those charged in the other New England states. Fees for participation in a five-day fishing tournament are on the order of $4,500 for a fully rigged and provisioned boat with skipper and mate (the angler is responsible for the payment of the tournament fees, which can be in excess of $5,000 per angler).

9.4.5 Connecticut

Connecticut's population has increased by 3.5 percent between 1990 and 2000 (Table 9.8). The percentage of individuals 25 years and older with a high school diploma and/or a graduate level degree has increased by about five percent. The percentage of employed individuals has declined, and correspondingly, the unemployment rate and individuals below the poverty line have increased over the past decade. Employment in the farming, fishing, forestry, and mining has declined with the education, health, and social services industries providing the greatest employment opportunities in 2000.

In general, Connecticut's involvement in the commercial fishery has been minimal. There are 174 commercial tuna permit holders living in the state (Table 9.36) with only one permit holder for the shark and swordfish permits (Table 9.38 and Table 9.39). Only two HMS permitted dealers are located in Connecticut (Table 9.37). The communities involved in the commercial shark fishery are New London and Old Lyme. Due to the relatively minimal involvement with HMS fisheries, there are no community profiles for the state of Connecticut.

In 2003, some 473,000 anglers took 1,564,000 saltwater fishing trips for all species of fish (NMFS, 2004b). Of these marine anglers, about 24 percent were from out-of-state. As of May 2005, 696 Connecticut resident held an HMS angling permit (Table 9.34). Recreational shark fishing is conducted throughout Long Island Sound, but primarily from the eastern ports in the state from which offshore waters can be easily reached. The number of charter/headboats permit holders in Connecticut has increased from 62 in 2003 to 102 in 2005 (Table 9.35).

Charterboats advertising shark fishing trips operate from Milford, New London, Norwalk, Old Lyme, Saybrook, Stonington and Westport. The recreational fishery is principally a catch-and-release fishery using light tackle.

Table 9.8 Connecticut Demographic Profile. Source: U.S. Census, 1990 and 2000

Connecticut	1990	2000
Population:	**3,287,116**	**3,405,565**
Education:		
High school graduates (25 years or older)	79.2%	84.0%
Employment:		
Labor force (16 years and over)	69.0%	66.6%
Unemployment Rate	5.4%	5.3%
Median Household Income	$41,721	$53,935
Individuals below the poverty line*	6.8%	7.9%
Employment in some industry sectors:		
Farming, fishing, forestry & mining	1.3%	0.4%
Construction	5.9%	6.0%
Manufacturing	20.5%	14.8%
Wholesale trade	4.2%	3.2%
Retail	15.4%	11.2%
Education, health & social services	24.8%	22.0%
Arts, recreation, lodging & food services	1.1%	6.7%

*U.S. Census uses data from 1989 and 1999 to estimate these values.

9.4.6 New York

The state of New York's population increased by nearly one million people in the decade between 1990 and 2000 (Table 9.9). The percentage of individuals 25 years and older with a high school diploma and/or some graduate level degree has increased by about five percent. The percentage of employed individuals has declined slightly, while both the unemployment rate and individuals below the poverty line have increased over the past decade. Employment in the farming, fishing, forestry, and mining industries has declined with the education, health, and social services industries providing the greatest employment opportunities in 2000.

Twenty individuals holding an HMS shark permit and 32 individuals holding a swordfish permit reside in New York (Table 9.38 and Table 9.39). In addition to the shark and swordfish permit holders, there are also 380 commercial tuna permit holders in New York (Table 9.36). New York has the third greatest number of HMS dealer permit holders (74 total) with a large concentration of dealers located in New York City and the surrounding areas (Table 9.37 and Figure 9.4). The communities that particpate in the commercial and recreational fisheries for sharks include Freeport, Lawrence, Ammagansett, Brightwaters, East Hampton, East Quogue, Greenport, Hampton Bays, Islip, Montauk, Oakdale, Brooklyn, Riverhead, Seaford, Port Jefferson, Babylon, Hauppauge, Staten Island, Southold, and Wantagh. While no HMS community profiles have been developed for New York, a profile should be developed for Montauk due to the residents' significant participation in the commercial tuna, charter/headboat and the number of shark permit holders.

Table 9.9 **New York Demographic Profile.** Source: U.S. Census, 1990 and 2000

New York	1990	2000
Population:	**17,990,455**	**18,976,457**
Education:		
High school graduates (25 years or older)	74.8%	79.1%
Employment:		
Labor force (16 years and over)	63.6%	61.1%
Unemployment Rate	6.9%	7.1%
Median Household Income	$40,927	$43,393
Individuals below the poverty line*	13.0%	14.6%
Employment in some industry sectors:		
Farming, fishing, forestry & mining	1.3%	0.6%
Construction	5.2%	5.2%
Manufacturing	14.7%	10.0%
Wholesale trade	4.2%	3.4%
Retail	14.9%	10.5%
Education, health & social services	27.9%	24.3%
Arts, recreation, lodging & food services	1.5%	7.3%

*U.S. Census uses data from 1989 and 1999 to estimate these values.

In 2003, some 700,000 anglers took 5,525,000 saltwater fishing trips for all species of fish in both state and Federal waters (NMFS, 2004b). The majority of these anglers are residents of New York State, with about 12 percent were from out-of-state. As of May 2005, New York had the third greatest number of HMS angling permit holders with 1,945 permitted vessels (Table 9.34) and a large concentration of these anglers residing in Islip, New York (Figure 9.1). The ASA estimated that, in 2001, saltwater angling generated some $389.3 million in New York State in retail sales and some 5,122 jobs in the marine recreational fishing industry (ASA, 2003). Shark fishing by anglers appears to be largely catch-and-release, using light tackle, and tends to be incidental to tuna and billfish fishing offshore. In New York State, there are 342 charter/headboats were permitted for HMS fishing in 2005 (Table 9.35). A number of charterboat operators advertise shark fishing as part of their offerings. A large percentage of the 39 charterboats operating out of Montauk advertise shark fishing either as an occasional exciting catch or offering shark fishing trips offshore. Montauk is positioned well for offshore trips as it lies only 20 – 40 miles from the edge of deep water and Gulf Stream eddies. Connecticut and Rhode Island boats on the other hand have to travel at least 60-100 miles to reach the prime fishing waters for tunas and sharks. Another 20 charterboats at ports on Long Island advertise shark fishing opportunities.

9.4.7 New Jersey

Between the 1990 Census and the 2000 Census, New Jersey's population increased from 7.7 million people to 8.4 million people, respectively (Table 9.10). The percentage of individuals 25 years and older with a high school diploma and/or some graduate level degree has increased by about five percent. The percentage of employed individuals has declined slightly,

while the unemployment rate remained about the same and individuals below the poverty line increased over the past decade. As with many of the other states, employment in the farming, fishing, forestry, and mining industries has declined, whereas the education, health, and social services industries provided the greatest employment opportunities in 2000.

While both Barnegat Light and Brielle have already been profiled for HMS fisheries, NMFS may want to also consider an HMS profile for Cape May due to the level of involvement in HMS angling, charter/headboat, shark and swordfish fisheries.

Table 9.10 New Jersey Demographic Profile. Source: U.S. Census, 1990 and 2000

New Jersey	1990	2000
Population:	**7,730,188**	**8,414,350**
Education:		
High school graduates (25 years or older)	76.9%	82.1%
Employment:		
Labor force (16 years and over)	67.4%	64.1%
Unemployment Rate	5.7%	5.8%
Median Household Income	$40,927	$55,146
Individuals below the poverty line*	7.6%	8.5%
Employment in some industry sectors:		
Farming, fishing, forestry & mining	1.2%	0.3%
Construction	6.0%	5.6%
Manufacturing	16.9%	12.0%
Wholesale trade	5.4%	4.4%
Retail	15.2%	11.3%
Education, health & social services	23.4%	19.8%
Arts, recreation, lodging & food services	1.7%	6.9%

*U.S. Census uses data from 1989 and 1999 to estimate these values.

In 2005, there were 397 commercial tuna permit holders in the state of New Jersey (Table 9.36). New Jersey has the second greatest number of shark permit holders living within the state, second to Florida (Table 9.38) with significant concentrations of shark permit holders living in Barnegat Light and Cape May (Figure 9.5). New Jersey is also home to a large number of swordfish permit holders, 53 in 2005 (Table 9.39). Many of these permit holders live in Barnegat Light and Cape May (Figure 9.6). Forty-two HMS dealers are also located in New Jersey (Table 9.37).

Marine recreational fishing attracted 1,074,000 participants to New Jersey in 2003 (NMFS, 2004b). These anglers, collectively, made 6,779,000 saltwater fishing trips during the year. Of these anglers, 43 percent were from out-of-state, and about two percent from non-coastal counties in New Jersey. As of May 2005, New Jersey was home to 2,772 HMS angling permit holders, again, second to only Florida (Table 9.34) with a large concentrations of these anglers residing in Point Pleasant Beach, Brick, Cape May, Berlin, and Ocean City, New Jersey (Figure 9.1). The ASA estimated that saltwater angling-related retail sales in New Jersey were

some $448.7 million in 2001. The marine recreational fishing industry provided some 7,762 jobs in New Jersey in 2001 (ASA, 2002).

The recreational fishery for sharks is primarily incidental to fishing for tuna and billfish. New Jersey is also second to Florida in the number of HMS charter/headboats permit holders with 516 permitted vessels in 2003 (Table 9.53). Many of the angling communities are also home to the charter/headboat permit holders: Point Pleasant Beach, Cape May, and Ocean City, in addition to Toms River (Figure 9.1). Of these party and charterboats some advertise shark trips using light tackle during the summer and early fall (July-October) (NMFS, 2003). These trips go offshore between 25 and 60 miles to the heads of the canyons, and thus are full-day or overnight trips.

9.4.7.1 Barnegat Light, New Jersey

Barnegat Light is one of eleven municipalities on Long Beach Island, a large "barrier beach" island that helps form the seaward boundary of Barnegat Bay. This small town measures less than one square mile and is located on the northern end of the barrier island. The town is named after its famous lighthouse that guided ships for generations along the New Jersey coast. This lighthouse was replaced in 1855 with the second-tallest lighthouse in the United States operating until 1927 (NMFS, 2003). The building continues as both a community landmark and a navigation mark. The name Barnegat originates from "Barende-gat," a Dutch name meaning "inlet of breakers" (NMFS, 1999a). Prior to 1820, fishing operations and maritime trade were conducted in the small settlements on the mainland inside the chain of islands and sand bars fringing the New Jersey Coast (NMFS, 2003). Barnegat Inlet was one of the important channels to the open ocean, with a sheltered anchorage immediately inside the inlet, and ample resource for a fishing community. A lighthouse was built in 1824 to mark the entrance to the inlet. In 1995, the infamous inlet's fierce currents were tamed by a $45 million Army Corps of Engineers project that constructed a South jetty along with a three-quarter-mile beach and a fishing pier (NMFS, 1999a).

Barnegat Light has grown and changed in the decade between the 1990 and 2000 Censuses. The changes are reflected in two demographic dimensions. The first is a shift to higher education and higher qualification occupations and the second is a continued shift to an older, retired population. The change in age structure also signifies a change in the workforce and the source of household earnings. In 2000, there were 371 households with an average size of 2.05 persons per household (Table 9.11). Of these households, 233 (62.8 percent) received income in the form of earnings, while 202 households (54.4 percent) received income from Social Security (NMFS, 2003). One hundred and thirty households received retirement income (35.0 percent). For households receiving income from earnings, the average income was $63,373 in 1999[1]. The average Barnegat Light household with retirement income received $22,168 (plus appropriate Social Security payments). In comparison with New Jersey as a whole, employment earnings were less than the state average, while retirement income was above the state average. However, the median household income in Barnegat Light ($52,361) in 1990 was some $2,800 lower than the statewide median household income.

[1] Income and earnings data reported in the decennial Censuses is for the previous year, *i.e.* the income reported in the 1990 Census is for 1989, for the 2000 Census it is for 1999.

Table 9.11 Demographic Profile of Barnegat Light. Source: U.S. Census, 1990 and 2000.

Demographics	1990	2000
Total Population	681	764
Sex		
Male	52.0%	50.9%
Female	48.0%	49.1%
Age		
Median Age	**50.9**	**54.9**
< 20	12.8%	15.4%
20-44	29.8%	20.9%
45-64	27.0%	29.4%
> 65	30.4%	34.3%
Race		
White	99.6%	98.3%
Black or African American	0.4%	0.5%
American Indian and Alaska Native	0.0%	0.0%
Asian and Pacific Islander	0.0%	0.6%
Other	0.0%	0.4%
Household		
Total	**342**	**371**
Family households	62.0%	62.0%
Nonfamily households	38.0%	38.0%
Average household size	1.99	2.05
Average family size	2.42	2.60
Housing Occupancy		
Total housing units	1,167	1,207
Vacant housing units	71.0%	69.3%
Housing Tenure		
Owner-occupied housing units	82.6%	87.9%
Renter-occupied housing units	17.4%	12.1%

Barnegat Light, New Jersey	1990	2000
Population:	681	764
Education:		
High school graduates (25 years or older)	84.9%	92.1%
Economic Characteristics		
Labor force (16 years and over)	52.6%	46.9%
Unemployed	0.5%	1.2%
Median Household Income	$ 37,955	$ 52,361
Individuals below the poverty line	7.2%	4.7%
Employment in some industry sectors:		
Managerial/professional	32.4%	40.8%
Technical, Administrative, & Sales	31.4%	23.3%
Construction, Production, Maintenance, & Transportation	10.4%	16.4%
Farming, fishing, forestry, & mining	13.9%	6.5%
Industry		
Forestry, fishing, hunting, mining, and agriculture	12.6%	8.2%
Construction	12.6%	10.3%
Manufacturing	7.4%	4.8%
Wholesale trade	1.3%	1.7%
Retail trade	21.0%	9.2%
Education, health & social services	7.4%	16.8%
Arts, recreation, lodging & food services	2.9%	11.0%

Barnegat Light is a vacation and retirement destination. Of the 1,207 housing units available in 2000, 64.3 percent (781 units) were vacation homes, and 371 homes were occupied year-round (NMFS, 2003). Some 69.3 percent of the homes were unoccupied at the time of the 2000 census. About one-quarter of the resident population had lived in Barnegat Light for less than five years in 2000, and most of the new residents moved to the town from other parts of New Jersey. Of the population of Barnegat Light in 2000, 55 percent (430 persons) had been born in New Jersey, while 41 percent were born elsewhere in the United States. There is a "community stickiness" factor among persons resident in Barnegat Light, since 70 percent had lived there prior to 1995, but there is also evidence of change that could affect life-style and the culture of the community. One of the elements of "community stickiness" is that many of the "new" residents are retirees who have converted their former vacation homes to year-round residences.

In 1881, the Barnegat City Improvement Company was formed and developed the present-day town as a resort and recreation area, with the town owning all the beaches and dunes (NMFS, 2003). The mix of tourism and fishing has continued to the present. Fishing operations are now linked to their markets by road and there is a tight mesh between the winter and summer economies. Local shops and services are sustained by the fishing activities in the winter months, and it is estimated that the direct employment in fisheries and fishing services was on the order of 52 percent of the 300 persons civilian workforce in 2000. This number does not agree with the Census Bureau's data of fisheries employment of 6.5 percent, probably due to failure of respondents to complete census forms or undercounting because fishermen were at sea.

There are four full service marinas in Barnegat Light in addition to 44 municipal boat slips and a municipal ramp (NMFS, 2003). The marinas and slips are on the bayside of Long Beach Island and extend southwards some 18 blocks from the inlet. Commercial fishing docks and fishhouses also line Bayview Avenue, but are clustered towards the southern end of the street. Five bait and tackle shops, three of which also provide boat rentals, provide services to local and visiting fishermen. The charter fleet working from Barnegat Light is estimated to be 20 boats, including eight vessels with HMS permits. About half this fleet is active year-round in Barnegat Light, while the other vessels at least fish elsewhere in the winter months. Some of the boat fish for tuna off North Carolina in the winter and spring, while others fish from November through April from ports in Florida.

One dock is completely occupied by privately-owned, commercial vessels, including seven scallopers, ten longliners that fish for tunas, swordfish, and tilefish, and about nine inshore net vessels. Three offloading stations are part of this dock. Five or six locally hired full-time employees, the vessel captain, and the crew perform the offloading. Additional dock hands are hired locally for the busy season. The owners of the dock sell some of the catch to fresh fish markets in Boston, Philadelphia, Maryland, and New York with the remaining being sold to local restaurants, retailers, wholesalers or at their own fish market, which is open from April to October (McCay, 1993).

Some of the fisheries organizations in Barnegat Light include Blue Water Fishermen's Association; Forked River Tuna Club; Jersey Devils Fishing Club; Beach Haven Marlin and Tuna Club; Long Beach Island Fishing Club; and United National Fishermen's Association.

The Barnegat Light port is known for its pelagic longline fishery. Today, the fleet targets yellowfin and bigeye tunas for most of the year and swordfish for part of the year. Pelagic and large coastal sharks are important incidental catches and some species like mako, porbeagle, and sandbar sharks are usually kept and sold. There are a large number of residents that hold a commercial permit for sharks (20 permits; Table 9.38) and swordfish (18 permits; Table 9.39). During the winter, a few vessels continue to bottom longline for tilefish in the deep waters of the outer continental shelf and canyons. Some captains from this port have begun to fish off the coasts of other countries. Pelagic longline crews are increasingly from other regions, such as Nova Scotia and some of the southern states. Some of the pelagic longline fishermen from Barnegat Light have become distant-water operators, going to the Grand Banks off Newfoundland, the waters off Greenland, as well as the Caribbean, Brazil, and other distant fishing grounds. The owner of one major fleet (six longline vessels) has left Barnegat Light to fish for HMS in the Pacific Ocean (Wilson *et al*., 1998).

Other captains of pelagic longline vessels strongly prefer to work closer to home or to take shorter trips. The options of those who resist going to other ports are far more restricted. Distant water fishing is very disruptive to families and the community. Some local vessels are now converting from pelagic longline fishing to monkfishing, although many who have tried to convert to other fisheries have failed to meet deadlines for limited entry. Another concern of local residents is that the demise of commercial fisheries is likely to transform the use of the

waterfront, bringing in condominium development where marinas are now located, an outcome that many long-term residents find undesirable.

The recession in Japan has had immediate and serious repercussions for the longline fishery, severely depressing export markets for high quality tunas and other export species (Wilson *et al*., 1998). Foreign suppliers of tunas and swordfish are filling the U.S. market niche for additional swordfish and tunas. A local importer said that the share of overseas fish in the domestic market for swordfish and tunas has gone from ten percent to 90 percent in just a few years. The pelagic longline fleet is under considerable strain due to increasingly stringent regulations, market difficulties, and problems in securing and retaining trained crew members. Numerous vessels are operating on very thin profit margins. Measures that further restrict this fishery, through large quota reductions or closures, will affect more than just the marginal vessels.

9.4.7.2 Brielle, New Jersey

Brielle is located in the southernmost region of Monmouth County, and borders the Manasquan River of central New Jersey. For the purposes of this document, the community will include Brielle/Point Pleasant. This is an area where recreational fishermen are as traditional as commercial fishermen, and recreational fishermen have been distressed about the management of tunas and sharks.

Brielle experienced a modest population increase between 1990 and 2000 from 4,406 to 4,893 individuals (Table 9.12). The percent of males and females remained virtually unchanged between 1990 and 2000 with 48 percent of the population comprised of males and 52 percent females. The age distribution of the Brielle population remained virtually the same for the past decade. The age distribution is fairly even between the under 20 years old, 20 – 44, and 45 – 64 years old. The over 65 year olds are the smallest age group with about 19 or 18 percent. Whites accounted for approximately 93 percent of the population in both 1990 and 2000. The percent of other races, however, declined between 1990 and 2000. The largest industry in 1990 was retail trade, which dropped significantly by 2000 (7.3 percent). In 2000, the largest industries in Brielle were education, health, and social services. In both 1990 and 2000, the greatest source of employment was managerial and professional related jobs. Employment in the farming, fishing, forestry, and mining declined from 6.8 percent in 1990 to 0.7 percent in 2000.

The Brielle/Point Pleasant port is one of the most important of the inlet ports along the barrier beach complex that makes up the New Jersey coast. It has been a center of both recreational and commercial fishing since the early 1800s. It is estimated that up to 100 working charterboats used this port historically. Today, Brielle has nine charter/headboats, and there are 20 charter/headboats in Point Pleasant. The majority of vessels that fish offshore are private vessels. It is reported that although these vessels actively fish for tunas and are thus required to have an Atlantic tunas permit, many of these vessels do not hold the necessary permit.

New Jersey, and in particular Brielle, recreational fishermen (private and charter/headboats) have historically targeted school bluefin tuna (measuring 27 inches to less than 47 inches). There is documentation back to the 1890s regarding the recreational fishery for

bluefin tuna. According to respondents in the Wilson *et al.*, study, New Jersey vessels landed nearly 20,000 bluefin tuna in one month of 1939. The 1998 annual coastwide Angling category quota was 269 mt, or about 19,000 fish.

Table 9.12 Demographic Profile of Brielle, New Jersey. Source: U.S. Census, 1990 and 2000.

Demographics	1990	2000
Total Population	4,406	4,893
Sex		
Male	48.2%	47.4%
Female	51.8%	52.6%
Age		
Median Age	**42.7**	**42.9**
< 20	23.2%	25.2%
20 - 44	28.6%	27.9%
45 - 64	29.1%	29.1%
> 65	19.2%	17.8%
Race		
White	93.8%	93.1%
Black or African American	5.4%	3.5%
American Indian and Alaska Native	0.8%	0.1%
Asian and Pacific Islander	0.0%	0.7%
Other	0.0%	2.7%
Household		
Total	**1,735**	**1,938**
Family households	74.6%	73.0%
Nonfamily households	25.4%	27.0%
Average household size	2.54	2.52
Average family size	3.00	3.00
Housing Occupancy		
Total housing units	1,986	2,123
Vacant housing units	12.6%	8.7%
Housing Tenure		
Owner-occupied housing units	82.3%	83.4%
Renter-occupied housing units	17.7%	16.6%

Brielle, New Jersey	1990	2000
Population:	4,406	4,893
Education:		
High school graduates (25 years or older)	91.3%	94.8%
Economic Characteristics		
Labor force (16 years and over)	58.6%	59.4%
Unemployed	4.4%	2.1%
Median Household Income	$ 53,485	$ 68,368
Individuals below the poverty line	2.3%	3.9%
Employment in some industry sectors:		
Managerial/professional	44.7%	56.0%
Technical, Administrative, & Sales	31.5%	21.8%
Construction, Production, Maintenance, & Transportation	0.9%	11.3%
Farming, fishing, forestry, & mining	6.8%	0.7%
Industry		
Forestry, fishing, hunting, mining, and agriculture	1.6%	0.7%
Construction	5.9%	7.4%
Manufacturing	11.7%	8.4%
Wholesale trade	6.7%	2.5%
Retail trade	21.4%	7.3%
Education, health & social services	18.7%	23.1%
Arts, recreation, lodging & food services	2.1%	7.8%

Here, as elsewhere in New York and New Jersey, HMS fisheries often take place in the "canyons" and around eddies and at the edge of the continental shelf. In the past, bluefin tuna could be caught on day trips in coastal waters, rather than the canyons, and they were the major source of profit for the charter/headboat fleet here (and elsewhere in New Jersey and the larger Mid-Atlantic). Today, the canyon fisheries for tunas are thought of as additional opportunities for most charter/headboat captains, who regularly take clients fishing for bluefish, fluke, or other tunas.

At one time, the full-time canyon fishermen included hundreds of inshore bluefin tuna vessels, and "six-pack" boats (smaller vessels certified to carry no more than six passengers; also known as uninspected vessels). Respondents to the 1998 Wilson *et al*. study indicated that they must steam 80 miles offshore to reach the canyons, and are therefore limited by weather. A similar trend is found in Cape May, New Jersey, where anglers fish in the Baltimore Canyon. The Hudson Canyon offshore fishery started 15 to 20 years ago, and the Brielle/Point Pleasant fleet rely heavily on the canyon for the fall fishery. This fishery has diminished, and the smaller, less powerful vessels are gone. Recent improvements in the U.S. economy have once again fueled investment in expensive offshore fishing vessels, and this is a major contribution to New

Jersey's economy. For example, the majority of the private vessels purchased in the Cape May area are built in New Jersey. There are eight tackle shops in the Brielle/Point Pleasant area.

Charter/headboat captains indicate that in 1998, they were generally unable to book tuna trips, because passengers do not like to take trips when the bluefin tuna retention limit is low or when retention is prohibited. One of the charterboat owners said that in 1991, the four busiest captains averaged 30 to 35 tuna trips each, but that the average number trips dropped approximately 12 in 1996 (Wilson *et al*., 1998). The argument for more liberal retention limits includes the idea that it is necessary to keep people interested in the gambling aspect of the fishery. Although people may not actually land more fish, customers are attracted by the possibility. Charterboat captains emphasize that reasonable recreational retention limits are important to their clients, who wish to bring fish home to eat and share with others.

Due to landings restrictions on bluefin tuna, bluefish generally replaced the tunas as the important inshore/offshore fishery in northern New Jersey. The Brielle/Point Pleasant charter/headboat fishermen, like most other people involved in the sport fisheries, would like to see the economic value of their fisheries documented. In this light, a recent study done in Virginia found that 30 percent of the fisheries income in the state came from the offshore recreational fisheries. Respondents emphasized that the figure is likely to be much larger for New Jersey (Wilson *et al*., 1998).

Adding to the general problems of the bluefin tuna fishery in New Jersey is the effect of the "North-South line." This line (38° 47' N), roughly at Delaware Bay, is used to separate the Angling category fishery into a northern and a southern area. Recreational bluefin tuna fishermen from Brielle fish in the northern area whereas fishermen from Cape May and other southern ports have historically fished in the southern area. However, because it is unlawful to possess bluefin tuna in excess of the daily retention limit in the respective area, those who fish in the southern zone and return to a New Jersey port with their catch must abide by northern area regulations. One of the proposed alternatives in Section 2.3.1 is to remove the Angling category's "North-South line". Removal of the North-South line would mean consistent regulations in the EEZ off of New Jersey; making it easier for New Jersey anglers to comply with the daily retention limits and allowing them to land in any New Jersey port.

Sharks are comparatively less important to recreational fishermen in Brielle than bluefin tuna. Sharks play an important role in the fishing industry, and, while other fish may be available, some customers are attracted by sharks in particular. Makos are the sharks with the greatest economic importance to the recreational fishery in New Jersey. Respondents are concerned that there has been a decline in population and that makos need protection. Mako tournaments are popular and several impose catch restrictions on participants. They have recently canceled some traditional shark tournaments out of concern for the stock, and two recent shark tournaments in New Jersey did not catch a single mako above the tournament's minimum size. Researchers reported that the shark fishery in Brielle is being strongly affected by a decrease in its historical tuna fishery and is therefore more vulnerable to negative impacts.

9.4.8 Delaware

Between 1990 and 2000, Delaware's population increased by 15 percent (Table 9.13). The percentage of individuals 25 years and older with a high school diploma and/or a graduate level degree has increased by about five percent. The percentage of employed individuals has declined slightly, while both the unemployment rate and individuals below the poverty line increased over the past decade. As with many of the other states, employment in the farming, fishing, forestry, and mining industries has declined, whereas the education, health, and social services industries provided the greatest employment opportunities in 2000.

Table 9.13 Delaware Demographic Profile. Source: U.S. Census, 1990 and 2000

Delaware	1990	2000
Population:	**666,168**	**783,600**
Education:		
High school graduates (25 years or older)	77.50%	82.60%
Employment:		
Labor force (16 years and over)	68.3%	65.7%
Unemployment Rate	4.0%	5.2%
Median Household Income	$34,875	$47,381
Individuals below the poverty line*	8.7%	9.2%
Employment in some industry sectors:		
Farming, fishing, forestry & mining	2.3%	1.1%
Construction	8.0%	7.4%
Manufacturing	18.8%	13.2%
Wholesale trade	3.5%	2.6%
Retail	2.1%	11.6%
Education, health & social services	23.0%	19.4%
Arts, recreation, lodging & food services	10.4%	7.7%

*U.S. Census uses data from 1989 and 1999 to estimate these values.

Fifty-eight commercial tuna permit holders lived in Delaware during 2005 (Table 9.36). There are two HMS dealers for tuna located in Delaware, one in Rehoboth and the other in Harrington (Table 9.37 and Figure 9.4). There were three shark and two swordfish permit holders in the state of Delaware during 2005 (Table 9.38 and Table 9.39).

The recreational fishery in Delaware Bay and offshore is popular because of the diversity of species and habitats available to anglers. In 2003, Delaware's recreational fisheries attracted 326,000 saltwater anglers of whom 61 percent were from out-of-state. In total, the anglers made 1,104,000 fishing trips in 2003 (NMFS, 2004b). As of May 2005, Delaware was home to 719 HMS angling permit holders (Table 9.34) with a significant concentration of anglers in Millsboro, Delaware. The retail sales generated by the Delaware anglers were estimated to be $48.9 million in 2001 and the marine recreational fishing service sector provided some 724 jobs in Delaware (ASA, 2002). Ninety-seven charter/headboats with HMS permits were operating from Delaware communities in 2005. Communities where these HMS-permitted charter/headboats are registered include Bethany Beach, Cedar Creek, Dagsboro, Dewey Beach,

Dover, Fenwick Island, Georgetown, Indian River, Lewes, Long Neck, Middletown, Milford, Millsboro, Ocean View, Rehoboth Beach, and Wilmington (NMFS, 2003). To date, no HMS community profiles have been developed for any Delaware communities due to the relatively low level of involvement with HMS fisheries.

9.4.9 Maryland

Maryland's population increased from 4.8 million people in 1990 to 5.3 million people in 2000 (Table 9.14). The percentage of individuals 25 years and older with a high school diploma and/or some graduate level degree has increased by about five percent. The percentage of employed individuals, ages 16 and older, has declined slightly, while the both unemployment rate and individuals below the poverty line remain approximately the same over the past decade. As with many of the other states, employment in the farming, fishing, forestry, and mining industries has declined, whereas the education, health, and social services industries provided the greatest employment opportunities in 2000.

In Maryland, there are 58 commercial tuna permit holders (Table 9.36). In addition, nine shark permit holders and six swordfish permit holders reside in Maryland (Table 9.38 and Table 9.39). To support these HMS fisheries, there are nine dealers permitted for tuna, sharks and swordfish (Table 9.37).

Table 9.14 Maryland Demographic Profile. Source: U.S. Census, 1990 and 2000

Maryland	1990	2000
Population:	**4,781,468**	**5,296,486**
Education:		
High school graduates (25 years or older)	78.4%	83.8%
Employment:		
Labor force (16 years and over)	70.6%	67.8%
Umemployment Rate	4.3%	4.7%
Median Household Income	$39,386	$52,868
Individuals below the poverty line*	8.3%	8.5%
Employment in some industry sectors:		
Farming, fishing, forestry & mining	1.7%	0.6%
Construction	7.9%	6.9%
Wholesale trade	3.8%	2.8%
Retail	15.0%	10.5%
Manufacturing	10.3%	7.7%
Education, health & social services	25.8%	20.6%
Arts, recreation, lodging & food services	1.2%	6.8%

*U.S. Census uses data from 1989 and 1999 to estimate these values.

In 2003, some 579,000 Maryland residents were marine recreational fishermen (NMFS, 2004b). Another 418,000 out-of-state marine anglers also fished in Maryland. Between them these two groups made some 3.3 million fishing trips for saltwater species (NMFS, 2004b). As of May 2005, Maryland was home to 1,451 HMS angling permit holders (Table 9.34). The ASA

estimated that saltwater anglers generated $335.9 million in retail sales, and the marine recreational fishing industry provided some 6,981 jobs in Maryland in 2001 (ASA, 2002).

The recreational fishery for sharks is largely offshore, although sharks are found in the lower reaches of the Chesapeake Bay. The offshore fishery takes place at least 15 miles out to sea and charterboats often run 60 to 70 miles offshore to areas of deep water. In Maryland, the number of HMS charter/headboat permit holders increased from 155 in 2003 to 174 in 2005 (Table 9.35). Most of these vessels are registered in Ocean City. Other communities involved with the HMS charter/headboat industry include Annapolis, Baltimore, Cambridge, Chesapeake City, Chester, Conowingo, Edgewater, Glen Burnie, Ocean Pines, Pasadena, Pocomoke, Salisbury, Severna, St. Michaels, Stevensville, Tilghman, White Hall, and White Haven.

9.4.10 Virginia

Virginia's population increased from 6.2 million people in 1990 to 7.1 million people in 2000 (Table 9.15). The percentage of individuals 25 years and older with a high school diploma and/or some graduate level degree has increased by six percent. The percentage of employed individuals, ages 16 and older, has declined slightly, while the both unemployment rate and individuals below the poverty line remain approximately the same over the past decade. Employment in the farming, fishing, forestry, and mining industries has declined, whereas the education, health, and social services industries provided the greatest employment opportunities in 2000.

Virginia ranked third for the quantity of commercial fishery landings at its Reedville port and fourth for the value of the commercial landings in the Hampton Roads area in 2003 (NMFS, 2004b). Virginia has 126 commercial tuna permit holders (Table 9.36). The Virginia commercial HMS fisheries have 19 licensed dealers, with two or more dealers operating in Chincoteague, Hampton, Newport News, Norfolk, and Virginia Beach (Table 9.37 and Figure 9.4). Seven shark and swordfish permit holders live in the Commonwealth of Virginia (Table 9.38 and Table 9.9). Communities involved in these fisheries, in addition to those noted above, include Bloxom, Chesapeake, Great Falls, Norfolk, Oyster, Sanford, and Wachapreague. The commercial landings of tuna, sharks, and swordfish are not as significant as the total commercial landings coming into the state; therefore, HMS fisheries are not significantly tied to any particular Virginia community and no HMS-specific community profiles have been developed for Virginia.

In 2003, the Virginia recreational saltwater fishery attracted 724,000 anglers, of whom just over 39 percent were from out-of-state (NMFS, 2004b). Collectively, these anglers made 3.1 million recreational fishing trips in 2003. In 2005, Virginia was home to 1,236 HMS angling permit holders (Table 9.34) with a large concentration of angling permit holders living in Virginia Beach (Figure 9.1). It is estimated that these saltwater anglers generated some $246.8 million in retail sales in Virginia in 2001 and their activity provided 4,251 jobs in the marine recreational fishing industry (ASA, 2002). Principal species sought were striped bass, flounder, bluefish, weakfish (sea trout) and drum. Offshore fishing was principally for mackerels, tuna, dolphin fish, and billfish.

Table 9.15 Virginia Demographic Profile. Source: U.S. Census, 1990 and 2000

Virginia	1990	2000
Population:	**6,187,358**	**7,078,515**
Education:		
High school graduates (25 years or older)	75.2%	81.5%
Employment:		
Labor force (16 years and over)	68.9%	66.8%
Unemployment Rate	4.5%	4.2%
Median Household Income	$33,328	$46,677
Individuals below the poverty line*	10.2%	9.6%
Employment in some industry sectors:		
Farming, fishing, forestry & mining	2.6%	1.3%
Construction	7.8%	7.3%
Wholesale trade	3.4%	2.7%
Retail	16.1%	11.4%
Manufacturing	15.1%	11.3%
Education, health & social services	23.2%	18.3%
Arts, recreation, lodging & food services	1.1%	7.2%

*U.S. Census uses data from 1989 and 1999 to estimate these values.

The Virginia recreational fishery for sharks is similar to that of Delaware and Maryland. There is a very small directed shark fishery in the private boat sector, but most sharks are taken incidentally to the catch of other species. There are 162 charter/headboats in Virginia with HMS permits (Table 9.35). The communities with the greatest number of charterboats with HMS permits were Virginia Beach, Norfolk, Chincoteague, Wachapreague, and Portsmouth. The principal shark fishing season for recreational anglers is June through October.

9.4.11 North Carolina

The population in North Carolina increased by nearly 18 percent between 1990 and 2000 (Table 9.16). The percentage of individuals 25 years and older with a high school diploma and/or some graduate level degree has increased by eight percent. The percentage of employed individuals, ages 16 and older, has remained roughly the same, while the unemployment rate increased and the individuals below the poverty line declined slightly over the past decade. As with many of the other states, employment in the farming, fishing, forestry, and mining industries has declined, whereas the manufacturing industry provided the greatest employment opportunities in 2000.

North Carolina's commercial fishery has a distinctive split between the North and South with Cape Hatteras as the dividing point as a result of the local oceanographic conditions. The Gulf Stream, as it skirts the Cape Hatteras shoals, is twenty miles offshore. This is the closest it approaches land after leaving the Cape Canaveral area. The cold Labrador Current influences the waters North of Cape Hatteras. The area off Dare and Hyde Counties, North Carolina is where these two water bodies mix and provides very rich fishing grounds. South and West of Cape Hatteras, the coast curves away to the West forming the relatively shallow Carolina Bight. Vessels operating in this area have further to travel from shore to the Gulf Stream and do not

have the same diversity and richness found in the fisheries immediately to the North of Cape Hatteras.

Table 9.16 Demographic Profile of North Carolina. Source: U.S. Census, 1990 and 2000

North Carolina	1990	2000
Population:	**6,628,637**	**8,049,313**
Education:		
High school graduates (25 years or older)	70.0%	78.1%
Employment:		
Labor force (16 years and over)	67.6%	65.7%
Unemployment Rate	4.8%	5.3%
Median Household Income	$26,647	$39,184
Individuals below the poverty line*	13.0%	12.3%
Employment in some industry sectors:		
Farming, fishing, forestry & mining	2.9%	1.6%
Construction	7.0%	8.2%
Wholesale trade	4.2%	3.4%
Retail	16.1%	11.5%
Manufacturing	26.7%	19.7%
Education, health & social services	20.3%	19.2%
Arts, recreation, lodging & food services	1.0%	6.9%

*U.S. Census uses data from 1989 and 1999 to estimate these values.

North Carolina has the fourth largest number of HMS angling permit holders with 1,885 permits issued to its residents (Table 9.34). In 2003, NMFS estimated that 2,103,000 anglers fished in North Carolina's marine waters making a total of 6,733,000 million recreational fishing trips (NMFS, 2004b). Of these fishermen, 1,298,000 anglers (62 percent) were from out-of-state and 13 percent were from non-coastal counties in North Carolina. Marine recreational fishing is thus an important element in the life and economies of coastal counties. In 1996, expenditures by saltwater anglers in North Carolina were approximately $673 million, accounting for nearly eight percent of the total U.S. expenditures by saltwater anglers. Saltwater fishing in North Carolina incurred expenditures of nearly $1.3 billion (about five percent of the U.S. total), generated wages and salaries of approximately $357 million and created over 19,000 jobs (ASA, 1997 cited by Wilson, 1998). In 2001, ASA estimated that saltwater recreational fisheries generated about $388 million in retail sales and the marine recreational fishing industry provided 8,551 jobs (ASA, 2002).

The marine recreational fisheries in North Carolina fall into three groups by species, gear and access. First, the recreational fishery in the Sounds and behind the barrier islands is typically a small, open boat fishery for flounder, croaker and drum, spot and sea trout. Striped bass (rockfish) forms an important fishery in Albemarle Sound and around the northern inlets. Second, the inshore and ocean beach fisheries target the same species but also include striped bass, bluefish, and king and spanish mackerel. These inshore fisheries require larger boats and heavier gear, but the boats operate within sight of land. Third, the offshore recreational fisheries target billfish, tunas (bluefin, yellowfin and blackfin), mackerels, dolphin fish (mahi mahi),

wahoo, and, in the southwestern area, shark. In the area North of Hatteras and around Cape Lookout, recreational fishermen view sharks as a nuisance in their pursuit of other fish, particularly tuna, marlin, and swordfish. Typically, the boats are 22 feet long or longer, have electronic navigation systems, and are powered by an inboard engine. Generally, heavy tackle is used, and fighting chairs are usually installed for the billfish and giant tuna fishing. The offshore boats normally fish 15 to 60 miles offshore. North Carolina marine recreational fisheries are seasonal, but fishing is year-round as fish species move through the area.

In 2005, North Carolina had the fourth largest fleet of charter/headboats holding HMS permits with a fleet of 446 (Table 9.35). A significant percentage of these boats operated from communities North of Cape Hatteras. Some of these charterboats were highly specialized, for seeking only billfish for example. The vessels specializing in tunas usually began the year fishing off Dare or Hyde counties, and then moved North to operate off New Jersey and then later off Cape Cod. Vessels specializing in billfish fisheries, would fish off North Carolina in the summer months and then head to the Caribbean for the winter season. Other charterboats, and some headboats, would fish in North Carolina waters from April through November, and then travel South to Florida to fish from December through March. From the advertising materials distributed by charter operations it would appear that from 12 to 15 percent of the fleet changed their operating base during the fishing year.

An unusual feature of the North Carolina charter and headboat fleet is the number of boats built locally. This appears to be particularly true for vessels over 35 feet in length and fishing offshore. Similarly, information about captains and crew of the charter fleet emphasized their local connections, and often relatives of different generations fished together. While this information has not been gathered systematically, it appears that community linkages between North Carolina captains and crews are stronger than those in many of the other states.

In addition to recreational and for-hire industries, North Carolina residents hold the second largest number of commercial tuna permits with 696 permitted vessels (Table 9.36). Thirty-seven North Carolina residents hold shark permits and 18 residents hold swordfish permits (Table 9.38 and Table 9.39). In addition to these commercial permit holders, there are 44 dealers authorized to purchase and sell tunas, sharks, and swordfish. North Carolina is fourth in HMS dealers behind Florida, Massachusetts, and New York (Table 9.37).

9.4.11.1 Hatteras

Hatteras Township is located in the "Outer Banks" of North Carolina, and includes the villages of Avon, Buxton, Frisco and Hatteras. Hatteras Village is a rural community at the southern end of Hatteras Island on North Carolina's Outer Banks. Hatteras Island is a dynamic barrier island, bordered by the Atlantic on the East and Pamlico Sound on the West. In the 18th century, Hatteras established itself as a seaport community, where activities included whaling and exporting/importing. Since World War II, the economy of the Hatteras community has depended on charter and commercial fishing (Wilson *et al*., 1998).

According to the 1990 and 2000 Census data, the population decreased from 2,675 in 1990 to 2,596 in 2000 (Table 9.17) The population decline can be attributed to mortality and out-migration exceeding births and in-migration. The number of males and females were

approximately equal in 1990 and 2000. The age structure of the population has changed; the population has aged markedly, with consequences for educational attainment and other demographic indicators. In 1990, 37 percent of the population was 45 years or older, while in 2000 some 57 percent of the year-round residents were aged 45 years or older. The racial composition of the township has not changed significantly between the 1990 and 2000 censuses with the majority of the township Caucasian and European ancestry predominant. The number of households has increased from 1,078 in 1990 to 1,171 in 2000, while the average size of households has dropped from 2.46 persons to 2.20 persons/household. These trends are consistent with an aging and declining population as "empty-nesters" and retirement couples and widows/widowers make up a higher proportion of households. The farming, fishing, forestry, and mining industries employed about 34 percent of the Hatteras population, a significant increase from 1990, and the greatest sources of employment (Table 9.17). One of the most prominent fishing organizations is the Hatteras-Ocracoke Auxiliary of the North Carolina Fishermen's Association (Wilson *et al*, 1998).

Table 9.17 Demographic Profile of Hatteras, North Carolina Source: U.S. Census, 1990 and 2000

Demographics	1990	2000
Total Population	2,675	2,596
Sex		
Male	51.6%	49.2%
Female	48.4%	50.8%
Age		
Median Age	**35.1**	**42.1**
< 17	23.9%	20.4%
18 - 44	39.6%	33.7%
45 - 64	25.4%	39.6%
> 65	11.1%	17.2%
Race		
White	98.8%	97.1%
Black or African American	0.4%	0.0%
American Indian and Alaska Native	0.8%	0.0%
Asian and Pacific Islander	0.0%	0.0%
Other	0.0%	2.3%
Household		
Total	**1,078**	**1,171**
Family households	69.7%	78.1%
Nonfamily households	30.3%	21.4%
Average household size	2.46	2.20
Average family size	2.97	2.73
Housing Occupancy		
Total housing units	1,919	2,156
Vacant housing units	43.4%	45.7%
Housing Tenure		
Owner-occupied housing units	72.3%	79.1%
Renter-occupied housing units	27.7%	20.9%

Hatteras Township, North Carolina	1990	2000
Population:	2,675	2,596
Education:		
High school graduates (25 years or older)	74.4%	68.1%
Employment:		
Labor force (16 years and over)	67.3%	83.1%
Unemployed	2.80%	4.6%
Median Household Income	$ 24,667	$ 39,881
Individuals below the poverty line	6.4%	4.7%
Employment in some industry sectors:		
Managerial/professional	28.4%	23.2%
Technical, Administrative, & Sales	29.9%	23.3%
Construction, Production, Maintenance, & Transportation	16.6%	10.8%
Farming, fishing, forestry, & mining	6.7%	33.8%
Industry		
Forestry, fishing, hunting, mining, and agriculture	6.4%	10.4%
Construction	16.2%	15.5%
Manufacturing	3.4%	2.4%
Wholesale trade	2.7%	4.0%
Retail trade	26.1%	14.9%
Education, health & social services	11.3%	14.0%
Arts, recreation, lodging & food services	1.2%	13.4%

Fishing from Hatteras is a year-round activity, subject to weather conditions. The cycle of the offshore fishery begins in December, when giant bluefin tuna are passing through the area through March. This catch-and-release fishery is followed by the availability of yellowfin tuna, dolphin, and wahoo from March through December. In the summer months, a catch-and-release fishery for blue and white marlin, swordfish and sailfish takes place between May and September. If ocean conditions are poor, fishermen are able to fish in the sheltered waters behind the barrier islands and in Pamlico Sound for striped bass, drum, sea trout and redfish.

Commercial fishing is a major occupation on Hatteras Island, where there are approximately 500 to 600 part-time and full-time commercial and charterboat fishermen (Wilson *et al*., 1998). The 2000 Census indicates that 34% of the population is employed in the farming, fishing, forestry and mining industry (Table 9.17). Since fishermen are customarily self-employed either as owner-operators of vessels or as crew/independent contractors receiving a share of the catch or tips as payment for their services, Wilson's estimate of 500-600 part-time and full-time commercial and charterboat fishermen is considered to be accurate for 2003 (NMFS, 2003).

Tourism and recreational fishing are also major industries in Hatteras in terms of seasonal employment. There are three economic "seasons" in Hatteras (NMFS, 1999a). In the spring, weekend and holiday travelers cause an increase in revenue; several vessels from the commercial fleet become active in charter fishing beginning in April. During the second season, June through August, family vacations provide tourist income. The third season is the fall, when fishing, surfing and windsurfing are the dominant activities.

There are five seafood wholesalers, one retail market, and three marinas (Wilson *et al*., 1998). The three marinas in Hatteras provide dockage for as many as 56 offshore charter/headboats, some 15 inshore boats that can fish along the coast, and six charterboats that fish only in the Sounds. In addition, there are approximately 210 berths for private boats. Some commercial boats use the marinas during the late fall and winter months, but otherwise dock at fish houses and the fishermen's private docks.

The three marinas each have a charterboat fleet of independent owner/operators, and each maintains a booking and information system for its fleet. The charterboats operate with a captain and mate or crewman, and often have a second relief captain available for peak seasons when the boat will be making trips every day. The captain takes his profits (pay) from the revenues earned by the boat, and the mate customarily receives a tip of 15 - 20 percent of the charter fee from the client. In many cases, the boat will retain the sale rights to fish caught by clients and if the right is exercised, the ex-vessel price is apportioned between boat, captain, and mate (crew). At the height of the summer season, the recreational fisheries and fishing services (marinas, bait and tackle, *etc*) in Hatteras provide employment for approximately 205 persons.

The recreational rod and reel fishery for pelagic fish flourishes in Hatteras. A bluefin tuna fishery during winter months is intense but somewhat unpredictable. Early in the spring, fishermen target offshore yellowfin tuna, dolphin, and wahoo, followed by marlin and sailfish fishing in the summer. Other species caught seasonally include king mackerel and striped bass. Fly-fishing has become more popular, although it still comprises a small number of offshore trips from Hatteras. Captains say it is very hard to find a year-round mate because college students work summers only and most skilled fishermen want their own vessels (Wilson *et al*., 1998).

About half of fishing parties are all male and the other half are families, some of which participate in other tourist activities while the others fish. "Make-up charters", where marinas organize the parties, are becoming increasingly common (Wilson *et al*., 1998). One captain estimated that his marina did 140 make-up charters in the past year. The majority of the charter customers want to fish offshore. Customers are often willing to accept retention limits imposed

by the captain, although the possibility of landing at least one fish is important to many anglers. Changes in fishing conditions including weather conditions and the availability of fish affect charter bookings almost instantly, and there is not much customer loyalty to Hatteras. Clients cancel trips when they hear a species has moved out of the area. Because Hatteras attracts top sport fishermen from around the world, the issues of minimum sizes and trophy fish take on special significance. Many fishermen are interested in setting records by catching smaller bluefin tuna on fly rods.

In 2005, there were 42 HMS charter/headboat permit holders from Hatteras, North Carolina, but many of the charterboats operating in Hatteras are from other areas. They come for the winter bluefin tuna fishery but stay year-round. Researchers report tension between the local charterboats and the transient charterboats because of increased competition for both fish and customers. There is also tension with private recreational fishermen who follow the charter/headboats to see where they fish (Wilson *et al*., 1998). Eighteen HMS angling permit holders were from Hatteras, North Carolina in 2005.

Perhaps the most pressing issue for HMS fishermen in Hatteras is the status of the relatively new winter fishery for bluefin tuna. In their study of the 1997 bluefin tuna fishing season, Ditton *et al*. (1998) found that bluefin tuna anglers spent $3.6 million dollars in Hatteras in two and one-half months in the 1997 winter season. They estimate that this meant a $7.6 million impact on the output of the Hatteras area economy and supported 170 jobs. Dare County unemployment estimates indicate that the bluefin tuna fishery may have reduced unemployment by eight percent during the first quarter of 1997. Unemployment in Dare County in March 1998, a year when the bluefin tuna did not show up in numbers anywhere near the 1997 level, was 29 percent higher than in March 1997.

Respondents view and respond to the winter fishery very differently, even disagreeing on the year it started. Because of the unpredictability of the appearance of bluefin tuna and the duration of their stay, there is uncertainty among local businesses about whether or not to invest further and stay open during winter months. Those who now have winter jobs, and those who hire them, have a different perspective. Businesses are generally pleased to retain year-round employees rather than hiring and training seasonally. Finding a place to live on Hatteras Island is already difficult for low wage workers. Many people, especially fishermen, did not think the winter fishery would last (Ditton *et al*., 1998).

9.4.11.2 Wanchese, North Carolina

Wanchese is located on the southern part of Roanoke Island, in the northern Outer Banks. The village continues to revolve around fishing and fish processing. Wanchese's first seafood dealership was opened in 1936 by a family that still operates two seafood businesses in the community. The Wanchese Seafood Industrial Park was constructed in 1980 by the state. It has 30 acres of leasable land, a 15-acre deep-water harbor, and 1,500 feet of commercial-style concrete docks, and seven seafood-related businesses (CNCSS, 1993). The industrial park is also the scene of the annual blessing of the fleet, which is organized by the Oregon Inlet Users Association. Although commercial fishing has historically been a major industry, there has been an increasing emphasis on recreational angling and tourism.

Between 1990 and 2000, the population increased from 1,374 to 1,527 individuals (Table 9.18). The population is roughly divided between males and females. The population of Wanchese is about 98 percent Caucasian, and mostly of European ancestry. The largest age group is the 18 - 44 year old individuals and continues to remain about the same over the past two decades. The most dramatic shafts in the population distribution have been the decline in the percent of individuals under 20 and increase in the 45 - 64 year old group. In 1990, there were 503 households in Wanchese, with an average of 2.73 persons per household. The number of households had grown to 614 in 2000, with an average of 2.49 persons per household.

Table 9.18 Demographic Profile of Wanchese, North Carolina Source: U.S. Census 1990 & 2000

Demographics	1990	2000
Total Population	1,374	1,527
Sex		
Male	51.2%	50.7%
Female	48.8%	49.3%
Age		
Median Age	**27.7**	**37.2**
< 20	36.8%	25.9%
20 - 44	35.7%	37.9%
45 - 64	20.2%	24.1%
> 65	7.2%	12.0%
Race		
White	98.5%	98.1%
Black or African American	0.0%	30.0%
American Indian and Alaska Native	1.5%	0.6%
Asian and Pacific Islander	0.0%	0.1%
Other	0.0%	0.5%
Household		
Total	**503**	**614**
Family households	76.1%	70.5%
Nonfamily households	23.9%	29.5%
Average household size	2.73	2.49
Average family size	3.25	2.96
Housing Occupancy		
Total housing units	574	690
Vacant housing units	10.8%	11.0%
Housing Tenure		
Owner-occupied housing units	72.1%	89.0%
Renter-occupied housing units	27.9%	11.0%

Wanchese, North Carolina	1990	2000
Population:	1,374	1,527
Education:		
High school graduates (25 years or older)	67.3%	76.5%
Employment:		
Labor force (16 years and over)	70.7%	66.6%
Unemployed	7.8%	1.8%
Median Household Income	$ 25,977	$ 39,250
Individuals below the poverty line	9.3%	8.1%
Employment in some industry sectors:		
Managerial/professional	17.0%	24.3%
Technical, Administrative, & Sales	24.6%	21.9%
Construction, Production, Maintenance, & Transportation	18.8%	36.0%
Farming, fishing, forestry, & mining	12.6%	9.5%
Industry		
Forestry, fishing, hunting, mining, and agriculture	19.7%	8.2%
Construction	5.0%	9.9%
Manufacturing	9.5%	13.1%
Wholesale trade	6.6%	6.9%
Retail trade	19.1%	11.7%
Education, health & social services	8.5%	22.0%
Arts, recreation, lodging & food services	2.9%	7.2%

In 1990, the largest industries in Wanchese were forestry, fishing, hunting, mining, and agriculture with retail trade as a close second (Table 9.18). The 2000 Census data show a significant decline in the forestry, fishing, hunting, mining, and agriculture industry and a marked increase in the education, health and social services industries. The decline in the farming, fishing, forestry, and mining industry is also noticeable in the employment estimates. Some of these declines can be attributed to difficulties in hiring and managing crew for pelagic longline vessels, especially for the larger vessels that need people to stay on for longer trips (Wilson *et al*., 1998). There is a lot of turnover in fishing crews, particularly when vessels shift to other fisheries and revenue drops. Many of the larger vessels have already left, and experienced fishermen are finding work overseas and other captains and vessel owners are searching for alternatives to commercial fishing. Some have switched to carpentry and building and others have gone into the charter fishing business. Finding alternative permanent work may prove difficult for many fishermen who are highly skilled in their profession but have less formal education than the average worker (Wilson *et al*., 1998).

Fishing related associations include the Oregon Inlet Users Association and the North Carolina Fisheries Association. The former is involved with supporting the plans for jetties at Oregon Inlet and are responsible for organizing both the Wanchese Seafood Festival and the Blessing of the Fleet. The latter is a trade organization of seafood dealers and commercial fishermen from the state; two members of the 18-member Board of Directors are from Wanchese (CNCSS, 1993).

Recent growth in tourism and recreational fishing has sparked competition for a restricted resource. However, commercial and recreational fishermen still see themselves as being part of the same fishing-based community and many come from the same families. Members of the non-fishing public are generally supportive of the fishing industry. Unlike the surrounding communities, and in distinct contrast to Hatteras Township, Wanchese has very little seasonal variation in employment resulting from tourism; what seasonal fluctuations do exist are caused by the availability of the fisheries resources and are countered by the flexibility and opportunistic nature of the Wanchese fishermen (CNCSS, 1993).

Wanchese is not a community linked to tourism in the way that most other Outer Banks and Dare County communities are. Of the housing stock, only eleven percent was rental properties in 2000 (Table 9.18). The marinas and boatyards in Wanchese cater to transient boats and the charterboat fleets, but recreational fishing from Wanchese is more likely to be done by local fishermen in the Albemarle, Currituck, or Pamlico Sounds, rather than by tourists fishing offshore in private or charterboats. The reason for this is the distance to Oregon Inlet, and the presence of the Oregon Inlet Fishing Center with extensive recreational boat docks, facilities for charterboats, and launching ramps with large parking areas close to the inlet.

A large number of commercially important marine fish are landed in Wanchese, including inshore and offshore species. Many fishermen emphasized that they have to be versatile due to quick changes in water temperature and therefore in availability of species in the area (Wilson *et al*., 1998). The species that longline fishermen target off the mid-Atlantic coast include swordfish, sharks, and tunas (primarily, yellowfin and bigeye). Although targeting bluefin tuna with longline gear is prohibited, there is an incidental catch allowance of bluefin tuna as part of other fishing operations. Fishermen aboard large longline vessels fish for swordfish, tunas, and dolphin. Because of the weather, tunas and swordfish are accessible to the medium-sized vessels that gillnet for other species and longline in the summer. Respondents explained that they also gillnet for dogfish, bluefish, and Spanish mackerel (in spring and fall), and trout and croaker (in winter). They also bottom fish for bass and grouper. There are a number of vessels that gillnet in some seasons and then switch over to charterboat fishing in the summer. Other fishing activities in Wanchese include trawling trips for squid in the summer, and fishing for weakfish, croaker, and flounder in the winter. Market considerations are crucial in deciding which species should be targeted by longline vessels (Wilson *et al*., 1998).

Researchers found pressure on this sector of the longline fishery to be substantial. Hiring and managing crew for pelagic longline vessels is increasingly difficult, especially for the larger vessels that need people to stay on for longer trips. There is a lot of turnover in fishing crews, particularly when vessels shift to other fisheries and revenue drops. Many of the larger vessels

have already left, and experienced fishermen are finding work overseas and other captains and vessel owners are searching for alternatives to commercial fishing. Some have switched to carpentry and building and others have gone into the charter fishing business. Finding alternative permanent work may prove difficult for many fishermen who are highly skilled in their profession but have less formal education than the average worker (Wilson *et al*., 1998).

9.4.12 South Carolina

The population in South Carolina has increased by 13.1 percent between 1990 and 2000 (Table 9.19). The number of individuals with a high school diploma or greater has increased from 68.3 percent in 1990 to 76.3 percent in 2000. The unemployment rate has remained about the same and the number of individuals below the poverty line declined by just over one percent. Employment in the farming, fishing, forestry, and mining industries has declined slightly with the only significant increase in employment taking place in the arts, recreation, lodging, and food services industries, from 1.1 percent in 1990 to 8.3 percent in 2000.

Table 9.19 South Carolina Demographic Profile. Source: U.S. Census, 1990 and 2000

South Carolina	1990	2000
Population:	**3,486,703**	**4,012,012**
Education:		
High school graduates (25 years or older)	68.3%	76.3%
Employment:		
Labor force (16 years and over)	66.0%	63.4%
Unemployment Rate	5.6%	5.9%
Median Household Income	$26,256	$37,082
Individuals below the poverty line*	15.4%	14.1%
Employment in some industry sectors:		
Farming, fishing, forestry & mining	2.3%	1.1%
Construction	7.9%	8.3%
Wholesale trade	3.6%	3.3%
Retail	16.6%	11.9%
Manufacturing	25.7%	19.4%
Education, health & social services	19.9%	18.6%
Arts, recreation, lodging & food services	1.1%	8.3%

*U.S. Census uses data from 1989 and 1999 to estimate these values.

South Carolina has 100 commercial tuna permit holders, holding 1.8 percent of the total commercial tuna permits (Table 9.36). Additionally, there are 26 dealers for tunas, shark, and swordfish in the state of South Carolina. With 24 shark permits (directed and incidental), South Carolina holds the fifth greatest number of shark permits. Due to the relatively small number of HMS permit holders and landings in South Carolina, no community profiles have been developed at this time.

As of May 2005, South Carolina was home to 820 HMS Angling permit holders (Table 9.34). Some 571,000 marine anglers fished in South Carolina's waters making 2.1 million

recreational fishing trips in 2003 (NMFS, 2004b). Of these recreational fishermen, 270,000 (47 percent) were from out-of-state and 79,000 (14 percent) were from non-coastal counties within South Carolina. Estimated retail sales generated by the saltwater fishery in South Carolina in 2001 were some $264 million and the marine recreational fishing industry created 5,498 jobs (ASA, 2002). Anecdotal information suggests that the shark fishery is incidental to other fisheries, and is primarily catch-and-release.

As of May 2005, South Carolina has a fleet of 142 charter/headboats with HMS permits, many of which fish the Gulf Stream for tuna and billfish, dolphin and wahoo, and take shark as incidental catch (Table 9.35). There is a directed fishery by charter/headboats for sharks in South Carolina. Shark fishing trips, including night fishing, are offered by a number of charter operators. Shark are taken, in the directed fishery, from near-shore waters, inlets, and from around breakwaters and jetties. Shark fishing is said to be particularly good from May to December, but sharks are available year-round. Principal species targeted are blacktip, hammerhead, lemon, and tiger shark. The IGFA world-record tiger shark was caught off Cherry Grove Beach, SC, near Myrtle Beach. Charterboat operators advertising shark fishing as special trips or part of general near-shore fishing are found in the communities of Myrtle Beach, North Myrtle Beach, Hilton Head, Georgetown, Pawley's Island, Murrell Inlet, Edisto Beach, Isle of Palms, Seabrook Island, Charleston, Mount Pleasant, Beaufort, and Little River.

9.4.13 Georgia

The population in Georgia has increased quite a bit in the last decade, from 6.5 million people in 1990 to 8.2 million people in 2000 (Table 9.20). The labor force (ages 16 and older) and unemployment has remained the same over the past decade, but there was a slight decline in the percentage of individuals below the poverty line. Employment in the farming, fishing, forestry, and mining industries has declined slightly since 1990; there has been only a slight employment increase in the art, recreation, lodging, and food services industries, from one percent to seven percent.

Commercial shark fishing in Georgia has traditionally been only a very small segment of the commercial fisheries in the state. There are only four vessels that hold shark permits in Georgia (Table 9.38). Both Darien and Townsend, in McIntosh County, have been involved with the commercial shark fishery. There are two dealers permitted to sell HMS such as tunas, sharks, and swordfish (Table 9.37). Eighteen vessels are permitted to participate in the commercial tuna fisheries (Table 9.36). The number of HMS charter/headboat permits operating in Georgia increased from 27 in 2003 to 43 in 2005 (Table 9.35). Some of the active charter/headboat communities are Brunswick, Jekyll Island, Marietta, Savannah, Sea Island, Skidaway Island, and St. Simons Island.

As of May 2005, Georgia residents held 249 HMS angling permits (Table 9.34). In 2001, marine recreational fishing in Georgia attracted 267,000 anglers, of whom 16 percent (42,000) were from out-of-state, and 42 percent from non-coastal counties (NMFS, 2004b). Collectively, these anglers made 971,000 recreational fishing trips in 2001. Saltwater angling is estimated to have generated some $57.8 million in retail sales in Georgia in 2001 and about 10,649 jobs in the marine recreational fishing service sector (ASA, 2002). Principal recreational fisheries are for

tarpon and snook inshore, and billfish and tunas offshore. Sharks are taken incidental to these fisheries but there are targeted shark fisheries inshore on spinner, sandbar, and lemon sharks.

Table 9.20 Georgia Demographic Profile Source: U.S. Census, 1990 and 2000

Georgia	1990	2000
Population:	**6,478,216**	**8,186,453**
Education:		
High school graduates (25 years or older)	70.9%	78.6%
Employment:		
Labor force (16 years and over)	66.1%	66.1%
Unemployment Rate	5.5%	5.5%
Median Household Income	$29,021	$42,433
Individuals below the poverty line*	14.7%	13.0%
Employment in some industry sectors:		
Farming, fishing, forestry & mining	2.7%	1.4%
Construction	6.9%	7.9%
Wholesale trade	5.1%	3.9%
Retail	16.5%	12.0%
Manufacturing	18.9%	14.8%
Education, health & social services	20.4%	17.6%
Arts, recreation, lodging & food services	1.0%	7.1%

*U.S. Census uses data from 1989 and 1999 to estimate these values.

9.4.14 Florida

Florida's population increased by more than 3 million people between 1990 and 2000 (Table 9.21). The percentage of individuals 25 years and older with a high school diploma and/or a graduate level degree has increased by almost five percent in the last decade. The percentage of employed individuals has declined slight, whereas the unemployment rate and percentage of individuals below the poverty line remained about the same through the nineties. As with many of the other states, employment in the farming, fishing, forestry, and mining industries has declined, whereas the education, health, and social services industries provided the greatest employment opportunities in 2000. Employment in the arts, recreation, lodging, and food services industries has been on the rise in the last decade.

Florida's fishing industry is one of the largest and most diverse in the region. Florida residents hold half of the commercial shark permits with 278 permit holders residing in the state (Table 9.38). Some of the large concentrations of permit holders are in Fort Pierce, St. Petersburg, and Panama City, Florida (Figure 9.5). Florida is also home to the greatest number of swordfish permit holders with 114 permitted vessels (Table 9.39). The large numbers of swordfish permit holders are found in Pompano Beach, St. Petersburg, and Panama City. Florida residents hold about five percent of the commercial tuna permits, and are generally out along the entire coast of Florida (Table 9.36 and Figure 9.3). Florida residents also have the greatest number of HMS dealer permits with 137 dealers permitted to purchase and sell tunas, sharks, and

swordfish (Table 9.37). A large number of these dealers can be found in Miami, Fort Lauderdale, and St. Petersburg.

Florida has the largest marine recreational fisheries in the United States. In 2003, approximately 6,489,000 saltwater anglers fished in the waters off Florida and made 27,453,000 fishing trips during that year (NMFS, 2004b). Of these fishermen, 3,111,000 (48 percent) were from out-of-state. More specifically, Florida has the greatest number of HMS angling permits in the United States, with 3,157 permitted individuals (Table 9.34). A very large concentration of HMS anglers resides in Pompano Beach, Florida (Figure 9.1). Other communities with significant numbers of HMS anglers are Boca Raton, Fort Lauderdale, Marathon, and Destin. The retail sales generated by saltwater anglers in Florida in 2001 were estimated to be $2,987.2 million and the marine recreational fishing industry provided 59,418 jobs (ASA, 2002). Sharks are an incidental catch for many fishermen, but some private boat fishermen have a directed fishery for sharks, including lemon, hammerhead, sandbar, blacktip and tiger sharks.

Table 9.21 Florida Demographic Profile. Source: U.S. Census, 1990 and 2000

Florida	1990	2000
Population:	**12,937,926**	**15,982,378**
Education:		
High school graduates (25 years or older)	74.0%	79.9%
Employment:		
Labor force (16 years and over)	60.4%	58.6%
Unemployment Rate	5.8%	5.6%
Median Household Income	$27,483	$38,819
Individuals below the poverty line*	12.7%	12.5%
Employment in some industry sectors:		
Farming, fishing, forestry & mining	3.1%	1.3%
Construction	7.8%	8.0%
Wholesale trade	4.6%	3.9%
Retail	19.6%	13.5%
Manufacturing	10.5%	7.3%
Education, health & social services	21.4%	18.1%
Arts, recreation, lodging & food services	2.3%	10.5%

*U.S. Census uses data from 1989 and 1999 to estimate these values.

As with the recreational anglers, Florida is also the number one state for HMS charter/headboat permit holders with 684 permitted vessels (Table 9.35). Many of these charter/headboat operators are from Key West, Islamorada, Summerland Key, Tavernier, and Marathon (Figure 9.2). It should be noted that the 684 charterboats/headboats permit holders in Florida do not include transient vessels that travel to Florida for the winter and spring fishing seasons.

9.4.14.1 Pompano Beach, Florida

Pompano Beach is a small city directly adjacent to Fort Lauderdale. The Fort Lauderdale area is known as the "Yachting Capital of the World" and the "Venice of America" because of the vast canal system, which extends throughout Broward County and creates 165 miles of waterfront in the region. Recreational fishing is a very important activity in Pompano Beach, mainly targeting billfish. In contrast to many Florida communities, local people in addition to tourists support a substantial amount of the recreational fishing industry. Many small fishing tournaments attract about 75 percent local people and 25 percent tourists. Pompano Beach is also a globally important manufacturing center for commercial longlining equipment with its own small commercial longline fleet (Wilson *et al.*, 1998). As a community, Pompano Beach owes its current infrastructure and social and economic lifestyle to the arrival of the railroad in 1896 to a small coastal settlement. The proximity of good fishing and other natural resources encouraged the town and region's development as tourism and retirement center. The local chamber of commerce sponsors three marine festivals every year.

Between 1990 and 2000, the population increased from 72,411 to 78,191 individuals (Table 9.22). The male to female ratio in the Pompano population changed only slightly in the past decade with a slight decrease in the number of females (48:52 to 49:51). The percent of the total population by each age group remained relatively constant between 1990 and 2000. Since the 1990 Census, the ethnic and racial population of Pompano Beach has shifted to increase the number of 'other' ethnicities in the population. In 1990, the population was 70 percent Caucasian and 29 percent Black-American. Twenty percent of the population was of Hispanic ancestry. In 2000, the population consisted of 67 percent Caucasians, 25 percent Black-Americans, and eight percent of people of other ethnicities. The proportion of the population with Hispanic ancestry had dropped to ten percent.

Table 9.22 Demographic Profile of Pompano Beach, Florida. Source: U.S. Census 1990 and 2000.

Demographics	1990	2000
Total Population	72,411	78,191
Sex		
Male	48.2%	49.3%
Female	51.8%	50.9%
Age		
Median Age	**39.8**	**42.2**
< 20	19.8%	19.7%
20 - 44	35.0%	34.5%
45 - 64	19.9%	22.5%
> 65	25.3%	23.4%
Race		
White	70.1%	67.8%
Black or African American	28.6%	25.4%
American Indian and Alaska Native	0.1%	0.2%
Asian and Pacific Islander	0.3%	0.8%
Other	0.9%	2.0%
Household		
Total	**31,981**	**35,197**
Family households	57.9%	52.4%
Nonfamily households	42.1%	47.6%
Average household size	2.26	2.13
Average family size	2.90	2.85
Housing Occupancy		
Total housing units	42,179	44,496
Vacant housing units	24.7%	20.9%

Pompano Beach, Florida	1990	2000
Population:	72,411	78,191
Education:		
High school graduates (25 years or older)	73.7%	77.2%
Employment:		
Labor force (16 years and over)	52.1%	53.8%
Unemployed	3.5%	3.6%
Median Household Income	$ 29,683	$ 36,073
Individuals Below the Poverty Line	16.0%	17.0%
Employment in some industry sectors:		
Managerial/professional	24.8%	28.6%
Technical, Administrative, & Sales	31.8%	30.0%
Construction, Production, Maintenance, & Transportation	3.2%	11.4%
Farming, fishing, forestry, & mining	11.6%	0.5%
Industry Code Description		
Forestry, fishing, hunting, mining, and agriculture	3.1%	0.5%
Construction	10.4%	9.8%
Manufacturing	8.5%	7.1%
Wholesale trade	5.4%	4.7%
Retail trade	18.6%	13.6%
Education, health & social services	13.2%	14.9%
Arts, recreation, lodging & food services	2.3%	11.0%

The number of households increased from 31,891 in 1990 to 35,197 in 2000 (Table 9.22). The average household size in Pompano Beach decreased from 2.2 persons/household in 1990 to 2.1 persons/household in 2000. Of the households in 2000, some 69 percent were in receipt of earned income. Some 36 percent of the households received Social Security payments, while 16 percent of households were in receipt of retirement income from pensions (NMFS, 1999a). This suggests that some 30 percent of households were retired and living on fixed incomes. The per capita income for Pompano Beach in 1989 was $17,382, and greater than the state average by $2,684 per annum. In 2000, per capita income in Pompano Beach was $23,938, and greater than the state average income by $2,381. The technical, administrative, and sales industries provide the greatest source of employment, with managerial and professional positions a close second. Employment in the farming, fishing, forestry and mining industries declined from almost 12 percent in 1990 to less than one percent in 2000.

Pompano Beach has a proud longlining heritage and there are several successful businesses that are still involved to some degree with the fleet (Wilson *et al*., 1998). This gives the current small vessel fleet and other longline business some networks of support. At the same time, Pompano Beach is now increasingly a recreational fishing community. In fact, Pompano Beach has the largest concentration of HMS angling permit holders with 249 residents participating in the HMS recreational fishery (Figure 9.1). There is a great deal of tension between the recreational fishermen and the longliners. At the present time, researchers found that the longline fleet is not receiving community support beyond that supplied from within their own industry. Both sides acknowledge a problem with overfished stocks, but each often blames the other side.

Pompano Beach has a small pelagic longline fleet, remnant of a much larger fleet, which mainly targets tunas and swordfish. A large number of swordfish permit holders reside in Pompano Beach (Figure 9.6). There is also some shark fishing farther North along the coast. There are five HMS longline permit holders residing in Pompano Beach, Florida. The most intensive local fishing takes place December through April. The longline fleet conducts business with three Pompano Beach dealers permitted for shark and swordfish and one Dania shark and swordfish permitted dealer. The development of the Pompano Beach area for yachting and recreational fishing has made dockage and access to the water more expensive (NMFS, 1999b).

Wilson *et al.* (1998) noted that commercial respondents reported increased difficulty in getting quality crew. The smaller vessels take two crew plus the captain. Owner-operators often try to have at least one consistent crew member, and then find anyone they can for particular trips. The end result of all of these factors has been a substantial reduction of the Pompano Beach longline fleet. Pompano Beach's remaining pelagic and bottom longline fleet is considered, by both its owners and suppliers, to be in major trouble (Wilson *et al*., 1998). Skilled captains were seeking employment in the Bahamas, as well as with the growing longline fleets in South Africa and South America, while the longline supply business has shifted its emphasis to supplying foreign fleets. In the urban economy of Pompano Beach, non-fishing alternatives for fishermen do exist. However, the work force is fairly well-educated, so finding

employment could be competitive (Table 9.22). Commercial fishing employment alternatives for vessels and crew are minimal because of limited entry programs in other fisheries.

9.4.14.2 Fort Pierce, Florida

Fort Pierce is located in St. Lucie County, a rapidly developing area in South Florida. St. Lucie County is known as a center for citrus growing, particularly grapefruit. Fort Pierce is on the site of an Army fort built in 1838, and remained an isolated outpost until the railroad reached the town in 1900. Fort Pierce was incorporated in 1901, and soon developed as a center for industry and agribusiness. At the junction of the Florida Turnpike and Interstate 95, Fort Pierce is a thriving intermodal transportation center, distribution point, and tourist stopover point.

Fort Pierce is a community in transition. The community grew rapidly between 1960 and 1990, from a population of 24,857 to 36,830 (Table 9.23). Between 1990 and 2000, the population grew by only two percent, increasing by about 800 people. Changing from a predominantly white community in 1950, the white portion of the population declined to less than half the total in 2000. The black or African American population made up just over 40 percent of the Fort Pierce population. No other ethnic or racial groups dominate the remaining 11 percent of the population. About 30 percent of the population is under 20 years old, whereas another 33 percent is between 20 and 44. The median age in 2000 was 35.4 years old.

Table 9.23 Demographics of Fort Pierce, Florida. Source: U.S. Census 1990 and 2000.

Demographics	1990	2000
Total Population	36,830	37,516
Sex		
Male	47.1%	49.3%
Female	52.9%	50.7%
Age		
Median Age	**34.2**	**35.4**
< 20	30.4%	30.3%
20 - 44	30.8%	32.7%
45 - 64	18.8%	19.6%
> 65	20.0%	17.5%
Race		
White	53.8%	49.5%
Black or African American	42.5%	40.9%
American Indian and Alaska Native	0.2%	0.3%
Asian and Pacific Islander	0.4%	0.9%
Other	3.1%	5.4%
Household		
Total	**14,283**	**14,407**
Family households	64.4%	61.2%
Nonfamily households	35.6%	38.8%
Average household size	2.58	2.56
Average family size	3.21	3.19
Housing Occupancy		
Total housing units	17,250	17,170
Vacant housing units	17.8%	16.6%
Housing Tenure		
Owner-occupied housing units	53.3%	53.2%
Renter-occupied housing units	46.7%	46.8%

Fort Pierce, Florida	1990	2000
Population:	36,830	37,516
Education:		
High school graduates (25 years or older)	56.9%	59.7%
Employment:		
Labor force (16 years and over)	48.2%	55.1%
Unemployed	6.8%	4.9%
Median Household Income	$ 18,913	$ 25,121
Individuals Below the Poverty Line	29.2%	30.9%
Employment in some industry sectors:		
Managerial/professional	16.8%	19.9%
Technical, Administrative, & Sales	28.0%	20.5%
Construction, Production, Maintenance, & Transportation	9.7%	9.0%
Farming, fishing, forestry, & mining	10.4%	31.3%
Industry		
Forestry, fishing, hunting, mining, and agriculture	9.8%	7.8%
Construction	8.2%	12.6%
Manufacturing	7.1%	8.0%
Wholesale trade	4.1%	4.8%
Retail trade	21.0%	12.5%
Education, health & social services	17.1%	16.9%
Arts, recreation, lodging & food services	1.1%	10.8%

There were 14,407 households in Fort Pierce, with an average household size of 2.56 persons, in 2000. The population is relatively mobile, since only 46 percent lived in the same house in 2000 as they did in 1995. It is also a relatively poor community, with median

household income of $25,121 in 2000, and 31 percent of the population living below poverty level. Per capita income in Fort Pierce in 2000 was $14,345, compared to the statewide average per capita income of $21,557, and $9,593 less than the per capita income in Pompano Beach. These earnings data reflect the unskilled and seasonal nature of jobs in agribusiness, packing plants and transportation businesses in and around Fort Pierce.

Locals refer to Fort Pierce as the "gateway to the Bahamas" because of the number of sport fishing and other vessels which use Fort Pierce as their departure point for the Bahamas and its associated Gulf Stream fisheries for HMS and other species of fish, including shark. In 2003, Fort Pierce hosted 15 fishing tournaments and related marine activities. The city's marina, in conjunction with other marinas and docks along the Indian River, Indian River Lagoon, and Intracoastal Waterway, provides sufficient dockage for recreational boaters and fishermen and for a commercial fishing fleet, principally longliners, but also the shark gillnetters. Seventeen shark and nine swordfish permit holders reside in Fort Pierce (Figure 9.5 and Figure 9.6).

The commercial fishing fleet in Fort Pierce has grown in the past decade due to lost dock space for commercial fleets in nearby ports. With the exception of the gillnet fleet unique to Fort Pierce, the commercial fishery is similar to the commercial fishery of Pompano Beach and is principally conducted during the fall and winter seasons. Smaller vessels switch gears and target species throughout the year, while larger vessels move with the fish stocks and retain the same gear configurations. Dealers and fish processors have also consolidated buying and packing operations in Fort Pierce because of the high cost of doing business in the tourism-related coastal communities North and South of Fort Pierce.

9.4.14.3 Madeira Beach, Florida

Madeira Beach is part of the Tampa Bay urban complex, one of several beach suburbs of St. Petersburg. The area is the home of the West-central Florida shark bottom longline fleet. Madeira Beach is also home to a thriving recreational HMS fishery. In terms of revenue, tourism is the number one industry in Pinellas County. Annually, four million visitors contribute about two billion dollars to the economy. The tourism industry also employs almost 60,000 of the residents either directly or indirectly, adding up to $720 million in wages (St. Petersburg-Clearwater Visitors Bureau brochure, 1998). The state of the economy since September 2001 has dampened the tourism industry, and Pinellas County Chamber of Commerce reported that the 2002 visitor and expenditure statistics were similar to those of 1998 (PCCC Report, March, 2003).

Madeira Beach's economy has changed with the changing tourism industry. A sign of the times is the renovation of much of the waterfront along St. John's Pass from a working waterfront of docks, fish houses and chandleries to a boardwalk lined with restaurants and boutiques. Many of the slips remaining are assigned to recreational vessel docking and storage. The once-dominant fishing industry is now a shadowy presence in much of Madeira Beach.

The population in Madeira Beach increased by about six percent over the last decade (Table 9.24). In 2000, 97 percent of the population was Caucasian. During the decade, the number of people in the population claiming German ancestry rose from 11 percent to 19.7 percent in 2000, although 92 percent of the population of Madeira Beach was born in the United

States. The Madeira Beach population aged during the decade. The median age increased from 34.2 in 1990 to 47.6 in 2000. The number of households in Madeira Beach increased from 2,230 in 1990 to 2,523 in 2000, but the average number of persons in a household declined from 1.88 persons in 1990 to 1.78 in 2000. In 2000, almost 28 percent of the housing units in Madeira were seasonal or recreational units vacant at the time of the Census.

Per capita income in Madeira Beach in 1989 was $17,301; in 1999, per capita income had risen to $30,097, some $8,000 more than the state average per capita income and $15,752 more than the average per capita income in Fort Pierce. Individuals living at or below poverty level comprised 9.8 percent of the Madeira Beach population. Some 72 percent of Madeira Beach's households received earnings from wages or salaries. Twenty-three percent of the households were in receipt of retirement funds or pensions, while 31 percent of the households received income from Social Security. The jobs in farming, fishing, forestry, and mining industries declined over the last decade from just over ten percent to less than one percent (Table 9.24). The industry itself also declined, whereas the arts, recreation, lodging and food services related industries increased from 2.5 percent to over 21 percent.

Table 9.24 Demographic Profile for Madeira Beach, Florida. Source: U.S. Census 1990 and 2000.

Demographics	1990	2000
Total Population	4,225	4,500
Sex		
Male	50.9%	52.0%
Female	49.1%	48.0%
Age		
Median Age	**34.2**	**47.6**
< 20	11.2%	9.5%
20 - 44	35.3%	32.5%
45 - 64	28.0%	36.0%
> 65	25.6%	21.9%
Race		
White	99.8%	97.4%
Black or African American	0.0%	0.0%
American Indian and Alaska Native	0.0%	0.8%
Asian and Pacific Islander	0.2%	0.0%
Other	0.0%	1.8%
Household		
Total	**2,230**	**2,523**
Family households	50.5%	59.8%
Nonfamily households	49.5%	40.2%
Average household size	1.89	1.78
Average family size	2.49	2.39
Housing Occupancy		
Total housing units	3,788	3,971
Vacant housing units	41.1%	36.5%

Madiera Beach, Florida	1990	2000
Population:	4,225	4,500
Education:		
High school graduates (25 years or older)	83.8%	87.3%
Employment:		
Labor force (16 years and over)	56.9%	61.5%
Unemployed	1.6%	2.7%
Median Household Income	$ 24,748	$ 36,671
Individuals Below the Poverty Line	8.4%	9.8%
Employment in some industry sectors:		
Managerial/professional	35.3%	30.4%
Technical, Administrative, & Sales	31.2%	28.9%
Construction, Production, Maintenance, & Transportation	1.4%	17.8%
Farming, fishing, forestry, & mining	10.3%	0.7%
Industry		
Forestry, fishing, hunting, mining, and agriculture	1.4%	0.0%
Construction	8.8%	7.0%
Manufacturing	7.5%	11.3%
Wholesale trade	4.5%	4.1%
Retail trade	30.7%	11.4%
Education, health & social services	11.4%	7.9%
Arts, recreation, lodging & food services	2.5%	21.6%

The offshore fishing industry in Madeira Beach started as a bandit (reel fixed to transom) fishery before it shifted to bottom longlining. Grouper is the traditional fishery for the community. In the 1960s, there were two dealers supported by charterboats selling fish and a small commercial fleet targeting kingfish and grouper. Many species that are now sold in Madeira Beach, such as amberjack, were considered junk fish in earlier years. As demand for seafood began to grow, higher prices accompanied by investment programs led to substantial investment in commercial fishing within this community.

Longline vessels began to target swordfish in the 1970s, using cloth and nylon line before monofilament longlining was commonly used. Local availability of swordfish declined quickly and a group of vessels went North to look for fish. On their way back they set longline gear in deep water and caught a significant amount of shark, tilefish and yellowedge grouper; this was how the bottom longline fishery in Madeira Beach began (Wilson *et al*., 1998). Marginal swordfish vessels began to experiment with various techniques such as straight hooks, auto-baiters and circle hooks. The Madeira Beach fleet is currently 95 percent bottom longline vessels. There are three seafood dealers in this community, two of which were permitted to sell HMS species in 2005. One dealer estimated that before restrictions on shark fishing his business used to be 45 percent grouper, 45 percent shark, and ten percent swordfish and tuna; now it is 75 percent grouper, ten percent shark and 15 percent swordfish and tuna (Wilson *et al.,* 1998). With the imposition of the live-bait ban in 2000, the swordfish and tuna landings have decreased appreciably.

Sharks and grouper are both caught with bottom longline gear. For this reason, the majority of longline fishermen hold permits for multiple fisheries. Due to the various regulations for all of the fisheries, the maximum number of trips fishermen can make is about 15 trips a year, as a bottom longline trip lasts some seven to fourteen days. Grouper fishermen are subject to limited access, a minimum size, area restrictions, seasonal closures, and a quota.

Overall, the Madeira Beach bottom longliners are becoming fewer and more isolated from the rest of the fishing community (Wilson *et al*., 1998). Respondents say that antagonism and competition among dealers has gotten worse in recent years as vessels drop out of fishing, often being sold outside of the country. Many of these crews are living trip to trip and often need credit for engine repair, ice, fuel and even household and personal items. Both the fishermen and an engine supplier reported that the commercial fleet is spending more on maintaining existing gear and vessels rather than buying new equipment. Traditional patterns of dealers building relationships by extending services and credit to vessels are giving way to price-based competition to gain access to vessels (NMFS, 1999a).

Fishermen in this community have experienced restrictions on gear, harvest, and capacity in many of its important fisheries. Wilson *et al.* found that alternative employment outside of the fishery is available through expanding opportunities in the tourism and recreational fishing industries. However, this relatively ready supply of alternative employment threatened the stability of the labor pool for the fishing industry. Some reported that the best captains are leaving the country or moving on to other jobs. Like many other fishing communities, the longline fleet in Madeira Beach is experiencing market competition from imports of their target species (Wilson *et al*., 1998; NMFS, 1999a).

When the shark bottom longline fishery began in Florida, it was easy to catch sharks, but the catch from the bottom longline fishery has become marginal due to restrictions and increased steam time to fishing grounds (Wilson *et al*., 1998). Members of the fishing and supply industries reported price fluctuations in the shark fishery, which they attributed to the difficulty in maintaining steady supplies under derby-style quota management. The fins bring the most money and are exported to Asian nations. Shark trips have to be kept as short as possible to maintain good quality meat. Respondents suggest that regulations, particularly the 4,000-pound

shark commercial retention limit, have turned the fishery into a small vessel fishery. Even vessels measuring as small as 50 feet in length can have difficulty making a profit (Wilson *et al*., 1998). Some fishermen keep both grouper and shark gear on board (NMFS, 1999a).

Approximately 50 to 60 charter/headboats participated in the recreational fisheries of Madeira Beach during the 1990s, and more than 48,000 pleasure vessels were registered in Pinellas County (Florida Bureau of Vessel Titling and Registration, 1996 and 1997). Researchers found tension and distance between the recreational and commercial fishing communities to be high, and recreational fishermen tend to maintain that commercial fishing is to blame for the declining shark populations (Wilson *et al*., 1998). Shark fishing is comparatively less important to recreational fishing in Madeira Beach than other HMS, although researchers reported that the local recreational shark fisheries are very healthy (NMFS, 1999a).

The renewal and renovation of the town's waterfront, particularly on John's Pass, removed many of the berths and infrastructure, which supported both the charterboat fleet and the commercial fishing fleet. In 2005, there was one charter/headboat with HMS permits holders living in Madeira Beach. Additionally, the Madeira Beach shark tournaments, which were mostly sponsored by a vessel or engine manufacturer, are no longer held due to loss of this infrastructure. Stores sell very little shark tackle, but some maintain the industry is beginning to come back. The miles-long remainder of the old Sunshine Skyway bridge is now used as a pier for recreational shark fishing. It is estimated that recreational shark fishing in this community is 90 percent catch-and-release (NMFS, 1999a).

9.4.14.4 Panama City, Florida

Panama City is located on the Gulf of Mexico in the Florida Panhandle. Panama City is one of the Florida's top fishing centers offering surf fishing, pier fishing, and charter/headboat fishing, according to the Panama City Tour Guide (NMFS, 2003). According to the Florida Bureau of Vessel Titling and Registration, the county has a total of 16,865 registered vessels with 15,359 pleasure and 1,433 commercial vessels. Headboats are an important part of Panama City's tourism. People enjoy bringing children along since these trips are shorter than charterboat trips. Panama City is a summer resort, with little tourist activity in the winter, as well as an important commercial fishing port.

During the winter, recreational fishermen target bottom fish and bluefish. In March, the season begins for Spanish mackerel, cobia, snapper, bonito, little tunny, amberjack, snapper, red porgies, rudder fish, blue runner, bluefish, and redfish. By summer, they also fish for king mackerel, dolphin fish, wahoo, little tunny, and barracuda. White marlin, blue marlin, and sailfish are caught recreationally in late summer. Some charterboats will go shark fishing at night for extra income. In September, the fishery is very mixed, and in October, king mackerel and bonito are popular. Tourists are mainly interested in bottom fishing. Motivations have changed; people used to be interested in catching a lot of fish and taking it home to eat or sell, but now people are satisfied to catch anything (Wilson *et al*., 1998; NMFS, 1999a).

Between 1990 and 2000, Panama City experienced a modest increase in its population from 34,378 in 1990 to 36,417 in 2000 (Table 9.25). Since 1990, there has been an increase in the male population with a corresponding decrease in the female portion of the total population;

males: 47 to 49 percent and females: 53 to 51 percent. The Panama City population did get older in the past decade the median age increased from 34 years old to about 37 years old. Correspondingly, the greatest portion of the population in both decades was in the 20 – 44 years old age bracket.

Table 9.25 Demographic Profile for Panama City, Florida. Source: U.S. Census 1990 and 2000.

Demographics	1990	2000
Total Population	34,378	36,417
Sex		
Male	46.7%	48.6%
Female	53.3%	51.4%
Age		
Median Age	**33.9**	**37.2**
< 20	28.6%	25.6%
20 - 44	34.9%	36.8%
45 - 64	19.6%	21.7%
> 65	16.9%	16.0%
Race		
White	76.1%	73.6%
Black or African American	21.0%	21.5%
American Indian and Alaska Native	0.7%	0.6%
Asian and Pacific Islander	1.6%	1.6%
Other	0.6%	0.8%
Household		
Total	**14,033**	**14,819**
Family households	69.2%	61.0%
Nonfamily households	30.8%	39.0%
Average household size	2.37	2.30
Average family size	2.90	2.92
Housing Occupancy		
Total housing units	15,928	16,548
Vacant housing units	11.8%	10.4%
Housing Tenure		
Owner-occupied housing units	58.3%	57.8%
Renter-occupied housing units	41.7%	42.2%

Panama City Beach, Florida	1990	2000
Population:	34,378	36,417
Education:		
High school graduates (25 years or older)	70.3%	79.2%
Employment:		
Labor force (16 years and over)	54.0%	53.9%
Unemployed	4.6%	3.1%
Median Household Income	$ 21,881	$ 31,572
Individuals Below the Poverty Line	19.6%	17.2%
Employment in some industry sectors:		
Managerial/professional	25.9%	32.2%
Technical, Administrative, & Sales	32.2%	27.7%
Construction, Production, Maintenance, & Transportation	1.5%	19.0%
Farming, fishing, forestry, & mining	10.2%	0.4%
Industry		
Forestry, fishing, hunting, mining, and agriculture	1.6%	0.5%
Construction	7.0%	6.7%
Manufacturing	7.7%	7.0%
Wholesale Trade	3.3%	0.1%
Retail Trade	21.4%	13.8%
Education, health & social services	19.4%	22.2%
Arts, recreation, lodging & food services	1.5%	14.2%

Panama City had 14,033 households in 1990, and the number of households grew to 14,819 in 2000 (Table 9.25). The average household size decreased from 2.37 persons in 1990 to 2.30 persons in 2000, indicating that there might be an increase in “empty nesters” and retiree households. The percentage of individuals below the poverty line decreased slightly over the past decade from almost twenty to seventeen percent. In 1989, the per capita income in Panama City was $12,169 and was significantly lower than the state average per capita income of $14,698. This situation persisted in 1999, when the Panama City per capita income had increased to $17,830, but continued to be less than the Florida average of $21,557 per capita.

Like Fort Pierce, Panama City is a transportation hub and has an agricultural and industrial base in addition to its fisheries. Panama City’s commerce rests on a supply of unskilled labor able to service agribusiness, transportation services, and the tourism industry. Panama City has two city marinas in addition to private commercial operations. The Panama City marina is located downtown on the Intracoastal Waterway and provides 240 berths for recreational, commercial and charter/headboat vessels. The second municipal marina, St. Andrews, lies on St. Andrews Bay, closer to the Gulf of Mexico, and provides docking and other facilities for much of the commercial fishing fleet. This fleet is chiefly composed of shrimp boats. Seven charter/headboats are based in the city marinas. There are seventeen Panama City residents with an HMS charter/headboat permit (Figure 9.2). While the largest local employers

are hospitals and resort hotels, two shipyards between them employed 650 persons in 2003 (Panama City/Bay County Chamber of Commerce, 2003).

In the early 1980s, yellowfin tuna was the main commercial fishery for Panama City from April through December while bluefin tuna were targeted in the winter. Some of the longline vessels shifted from yellowfin tuna fishing to bottom longline fishing for grouper and sharks in 1998, since the latter required fewer crew members (Wilson *et al*., 1998). Some of these vessels targeted dolphin fish in the summer, and swordfish more rarely. In 1998, two of these vessels were owner operated, two were owned by a dealer, three were each owned by a single person who hired a captain, and two others were jointly owned and had hired captains (Wilson *et al*., 1998). In 2005, ten longline vessels held an HMS permit; nineteen shark permits and fourteen swordfish permits were issued to residents of Panama City.

Some pelagic longline fishermen also participated in the reef fish and bottom longline fishery. There were 16 to 19 grouper vessels operating out of Panama City in 1998. One fish trader interviewed by the researchers in 1998 reported that his current business was 87 percent yellowfin tuna and eight percent snapper, with the remainder being a mix of swordfish, bluefin tuna, dolphin, wahoo, sandbar shark, and escolar. He bought from about ten vessels in 1998, but had bought from 30 vessels a few years ago (Wilson *et al.*, 1998). The prohibition on the use of live bait in 2000 reduced the tuna and swordfish catches of the commercial fleet and increased use of bottom longline for grouper and shark.

While Panama City was developing tourist and recreational fishing industries, the commercial fishermen were becoming fewer and more isolated from the rest of the community. The competition among dealers was perceived as becoming more aggressive in 1997 - 1998. Traditional patterns of dealers building relationships by extending services and credit to vessels in the shrimp and longline fisheries were giving way to price-based competition to gain access to vessels. Fishermen in this community had experienced restrictions on gear, harvest, and capacity in many important fisheries. Researchers found in 1998 that alternative employment outside of the fishery was available in the developing tourism and recreational fishing industries. However, researchers concluded that this relatively ready supply of alternative employment threatened the stability of the labor pool for the fishing industry (Wilson *et al*., 1998).

9.4.14.5 Islamorada, Florida

Located in the Florida Keys, Islamorada calls itself the Sportfishing Capital of the World because of its proximity to the Florida Bay, the Everglades, bonefish flats, coral reefs and the Gulf Stream. Islamorada is famous for light tackle technique and many different rods have been developed in this community. It is now increasingly a recreational fishing community, with many charterboats that troll for yellowtail snapper, grouper, blackfin tuna, dolphin, wahoo and billfish in inshore waters. Recreational activities in the Keys consist of trophy fishing, catch-and-release, spear fishing, and fishing for food. In the past decade or so, there has been a growing interest in the guided fishing industry that promotes catch-and-release (NMFS, 1999a). According to the Florida Bureau of Vessel Titling and Registration, Monroe County has a total of 23,079 registered vessels, with 18,731 pleasure and 4,260 commercial vessels as of 1996. In 1998, there were eleven marinas in Islamorada (Wilson *et al*., 1998).

Tournaments are an important marketing device for tourism in this town. The majority of vessels in Islamorada tournaments are Florida vessels, but there are some out-of-state participants. The Tourist Development Council of the Florida Keys has a large marketing budget and gives grants and sponsorship to tournaments. One tackle shop employed 57 people in 1998 and planned to open a fishing school next year that would employ six teachers and teach 24 people at a time for three to four days. Other water-related tourist businesses include powerboat rentals, boat tours, cruises, kayak, wave runner and sailboat rentals, snorkel and dive shops, boat dockage, lifts and repair shops, and fishing supply shops.

The largest resort in Islamorada began as a fishing marina and sportfishing is a big part of their marketing. The resort has two sets of vessels offshore and "back country," the local term for the Florida Bay area. There are 19 "six-pack boats" which are charterboats and one headboat. In the winter, charter/headboats target sailfish, blackfin tuna, and bonito. Recreational fishermen in this community generally feel that retention limits, minimum sizes, voluntary catch-and-release, and other management measures are effective. Florida's ban on inshore net fishing is also considered a success. Sea trout, bonefish, pompano, and Spanish mackerel are plentiful as a result of the net ban. They are concerned with other commercial fishing activities, particularly driftnets and longlines.

According to the Monroe County Cooperative Extension Service, fishing is better as a result of regulations. However, some charter/headboat captains are pessimistic about the future. They feel that the overall fishing is not good, and they have lost customers because there are not as many fish to target (Wilson *et al*., 1998). There is a general concern in Islamorada that it would be devastating to the community if the fish stocks were depleted. There are a lot of concerns with habitat such as the loss of grass beds, destruction of mangrove shoreline, water quality, algae blooms, and coral reefs dying from ozone depletion and too much sunlight. Some people are concerned with runoff from the lower part of the peninsula including phosphates and exhaust. There is also a concern over an increasing number of fishermen in the area (Wilson *et al*., 1998).

Islamorada has been subject to considerable expansion. In 1990, the population was 1,220 individuals and in 2000, it was 6,846 - 429.5 percent increase over a ten-year period (Table 9.26). The population was roughly half male and half female in both census years. The pattern of age distribution, however, changed between 1990 and 2000. The population in Islamorada is older than Fort Pierce, Pompano, and Panama City. The median age increased from just over 42 years to just over 46 years old over the past decade. The dominant age group shifted from 20 – 44 years old to 45 – 64 years old. Islamorada has a very well educated population with almost 92 percent having at least graduated high school.

The labor force has declined over the past decade indicating that the population is aging (Table 9.26). While the median household income and the percentage of individuals above the poverty line increased, the employment rate also increased slightly. In both 1990 and 2000, the greatest source of employment is in the technical, administrative, and sales industry sectors. Employment in farming, fishing, forestry, and mining decreased by one half. Correspondingly, the forestry, fishing, mining, and agriculture industry decreased by one half. The largest industry in Islamorada was retail trade in 2000.

Due to limited range and safety concerns about venturing farther offshore, Islamorada has a small vessel longline fleet that fishes year-round in nearby waters. Dolphin fish is the primary alternative to HMS for pelagic longline vessels. While these vessels are experiencing increased difficulty with finding crew, this is significantly less of a problem for them than for larger pelagic longline vessels. Researchers found that the commercial fishing community has an increasingly smaller niche relative to recreational fisheries. They cited limited entry in the snapper, king mackerel, and crab fisheries; a ban on net use in inshore waters in Florida; and incidental catch limits for bluefin tuna as limiting factors for the commercial fisheries. Florida Keys National Marine Sanctuary has also proposed a "no take" zone policy, which will put many commercial fishermen out of business (NMFS, 1999a).

Table 9.26 Demographic Profile for Islamorada, Florida. Source: U.S. Census, 1990 and 2000.

Demographics	1990	2000
Total Population	1,293	6,846
Sex		
Male	54.2%	53.0%
Female	45.8%	47.0%
Age		
Median Age	**42.3**	**46.2**
< 20	13.3%	17.0%
20 - 44	40.8%	30.6%
45 - 64	26.7%	35.6%
> 65	19.2%	16.9%
Race		
White	95.3%	96.8%
Black or African American	0.9%	0.5%
American Indian and Alaska Native	0.0%	0.2%
Asian and Pacific Islander	0.0%	0.7%
Other	3.9%	0.8%
Household		
Total	**672**	**3,174**
Family households	51.6%	58.4%
Nonfamily households	48.4%	41.6%
Average household size	1.92	2.10
Average family size	2.54	2.63
Housing Occupancy		
Total housing units	966	5,461
Vacant housing units	32.4%	41.9%
Housing Tenure		
Owner-occupied housing units	65.9%	71.1%
Renter-occupied housing units	34.1%	28.9%

Islamorada, Florida	1990	2000
Population:	1,293	6,846
Education:		
High school graduates (25 years or older)	77.8%	91.7%
Employment:		
Labor force (16 years and over)	73.2%	62.9%
Unemployed	0.9%	2.3%
Median Household Income	$ 26,266	$ 41,522
Individuals Below the Poverty Line	9.1%	6.9%
Employment in some industry sectors:		
Managerial/professional	25.9%	28.0%
Technical, Administrative, & Sales	30.7%	30.0%
Construction, Production, Maintenance, & Transportation	7.8%	17.9%
Farming, fishing, forestry & mining	7.9%	3.9%
Industry		
Forestry, fishing, hunting, mining, and agriculture	6.8%	3.7%
Construction	3.8%	6.6%
Manufacturing	4.6%	1.9%
Wholesale trade	2.9%	1.2%
Retail trade	39.4%	20.2%
Education, health & social services	6.1%	12.7%
Arts, recreation, lodging & food services	3.2%	21.1%

Skilled captains were seeking employment in the Bahamas, as well as the growing longline fleets in South Africa and South America, while the longline supply business has shifted its emphasis to supplying foreign fleets. In Islamorada, a growing recreational fishing industry provides alternative employment opportunities for commercial fishermen familiar with charter/headboats and as fishing guides. In fact, there is a significant concentration of charter/headboat permits issued to Islamorada residents, 34 permitted vessels in 2005. However, the Islamorada work force is fairly well educated, so finding alternative employment could be competitive.

9.4.15 Alabama

The population in Alabama has increased by about 400,000 people between 1990 and 2000 (Table 9.27). The percentage of individuals 25 years and older with a high school diploma and/or some graduate level degree has increased by about eight percent. The percentage of employed individuals, unemployment rate, and percentage of individuals below the poverty line have declined slightly in the last decade. As with many of the other states, employment in the farming, fishing, forestry, and mining industries has declined, whereas the education, health, and social services industries provided the greatest employment opportunities in 2000. Also, the arts, recreation, lodging, and food services, and manufacturing industries have been the greatest source of employment Alabama residents over the past decade.

Table 9.27 Alabama Demographic Profile. Source: U.S. Census, 1990 and 2000.

Alabama	1990	2000
Population:	**4,040,587**	**4,447,100**
Education:		
High school graduates (25 years or older)	66.9%	75.3%
Employment:		
Labor force (16 years and over)	61.1%	59.7%
Unemployment Rate	6.9%	6.2%
Median Household Income	$23,597	$34,135
Individuals below the poverty line*	18.3%	16.1%
Employment in some industry sectors:		
Farming, fishing, forestry & mining	3.03%	1.90%
Construction	7.1%	7.6%
Wholesale trade	4.1%	3.6%
Retail	16.2%	12.2%
Manufacturing	22.9%	18.2%
Education, health & social services	21.6%	19.3%
Arts, recreation, lodging & food services	0.9%	6.4%

*U.S. Census uses data from 1989 and 1999 to estimate these values.

In 2005, Alabama residents held 23 commercial tuna permits (Table 9.36). There are four commercial shark permits allocated to Alabama residents and one swordfish permit (Table 9.38 and Table 9.39). The communities involved in the shark fishery are Andalusia, Bayou la Batre, Elba, Elberta, and Lillian. There are four licensed HMS dealers working in coastal Alabama (Table 9.37). Alabama residents hold less than one percent of the commercial tuna, shark, and swordfish permits, therefore no community profiles have been developed to date.

The marine recreational fishery off Alabama attracted 524,000 anglers in 2003, who made 1.5 million fishing trips (NMFS, 2004b). Of these recreational fishermen, 214,000 (41 percent) are from out-of-state and another 123,000 anglers (23.5 percent) are from non-coastal counties within Alabama. In 2005, there were 328 Alabama residents who held an angling permit to fish recreationally for HMS (Table 9.34). A large number of these anglers are in Orange Beach, Alabama. The estimated retail sales generated by saltwater anglers in Alabama in

2001 were valued at $235.9 million. Some 5,477 jobs were attributed to the marine recreational fishing industry in 2001 (ASA, 2002). Thus recreational fishing off Alabama also benefits the local tourist industry as it does in Florida. Shark fishing is largely incidental to recreational fishing for other fish species.

There are 81 vessels with an HMS charter/headboat permit in Alabama (Table 9.35). A significant number of these vessels are located in Orange Beach (34.5 percent). Some other communities with several charter/head boat permit owners are Mobile, Gulf Shores and Dauphin Island. There is a small, directed shark fishery advertized by some of the charter/headboats, but most take shark incidentally to other fish species throughout the year.

9.4.16 Mississippi

Between 1990 and 2000, Mississippi's population increased from 2.6 million people to 2.8 million people (Table 9.28). The percentage of individuals 25 years and older with a high school diploma and/or some graduate level degree has increased significantly by almost 24 percent. The percentage of employed individuals has remained the same over the past decade, while the unemployment rate declined slightly and percentage of individuals below the poverty line declined by almost five percent. As with many of the other states, employment in the farming, fishing, forestry, and mining industries has declined, whereas the education, health, and social services industries provided the greatest employment opportunities in 2000. Also, the arts, recreation, lodging, and food services industries has been growing source of employment in Mississippi over the past decade.

Table 9.28 Mississippi Demographic Profile. Source: U.S. Census, 1990 and 2000.

Mississippi	1990	2000
Population:	**2,573,216**	**2,844,658**
Education:		
High school graduates (25 years or older)	64.3%	87.9%
Employment:		
Labor force (16 years and over)	59.7%	59.4%
Unemployment Rate	8.4%	7.4%
Median Household Income	$20,136	$31,330
Individuals below the poverty line*	25.2%	19.9%
Employment in some industry sectors:		
Farming, fishing, forestry & mining	4.6%	3.4%
Construction	6.4%	7.6%
Wholesale trade	3.8%	3.4%
Retail	16.1%	11.8%
Manufacturing	23.4%	18.3%
Education, health & social services	22.5%	20.1%
Arts, recreation, lodging & food services	0.7%	8.3%

*U.S. Census uses data from 1989 and 1999 to estimate these values.

Fifteen Mississippi residents held a commercial tuna permit in 2005 (Table 9.36). As for other HMS-related permits, there are eight residents that held a shark permit and two that held a swordfish permit (Table 9.38 and Table 9.39). Communities involved in the commercial shark fishery are Biloxi and Pascagoula. Only one HMS permitted dealer resided in Mississippi during 2005 (Table 9.37).

Mississippi's saltwater recreational fisheries attracted approximately 260,000 anglers in 2003 (NMFS, 2004b). Forty-eight thousand (18 percent) of these anglers were from out-of-state, and 53,000 (20 percent) were from non-coastal counties within Mississippi. In 2005, there were 220 Mississippi residents with an HMS angling permit (Table 9.34). The ASA estimated that marine recreational fishing generated $50.5 million in retail sales in Mississippi in 2001 and some 1,003 jobs (ASA, 2002). There are 36 charter/headboats with HMS permits home-ported in Mississippi (Table 9.35). Communities involved in the charter and headboat fishery include Biloxi, Gautier, Gulfport, Long Beach, Pascagoula, Pass Christian, and Picayune. Biloxi and Gulfport are each homeport to about one-third of the charter and head boat fleet with HMS permits.

Marine recreational fishing in Mississippi has three modes: shoal water fishing along salt-water marshes, behind barrier islands, and in the sounds; near-shore fishing in relatively shallow water out to some 15 miles from shore, including trips to artificial reefs and oil platforms; and offshore fishing in deeper water with HMS species as a target. Sharks are, however, taken in all three modes and it is reported that some are retained for personal use by anglers.

9.4.17 Louisiana

The population of Louisiana has not changed by much in the past decade, 4.2 million people in 1990 and 4.5 million people in 2000 (Table 9.29). The percentage of individuals 25 years and older with a high school diploma and/or some graduate level degree has increased by almost seven percent. The percentage of employed individuals has remained the same over the past decade, while the unemployment rate and percentage of individuals below the poverty line have declined. As with many of the other states, employment in the farming, fishing, forestry, and mining industries has declined, whereas the education, health, and social services industries provided the greatest employment opportunities in 2000. Also, the arts, recreation, lodging, and food services industries has been growing source of employment over the past decade.

Louisiana was second only to Alaska in the quantity of its commercial fisheries in the United States in 2003 and fifth in value (NMFS, 2004b). Several of Louisiana's communities were in the top ten major U.S. ports for the greatest quantity of commercial fishery landings: Empire-Venice, Intracoastal, and Cameron. Two communities were ranked in the top ten for the value of the commercial fishery landings: Empire-Venice and Dulac-Chauvin, Louisiana. The menhaden fishery is based in Venice, while shrimping is the principal fishery in Dulac. Both of these fisheries have declined during the past two decades, from the peak year of Louisiana commercial landings in 1984 when 1,931,027,000 pounds of fish were landed in the state.

Ninety-six Louisiana residents held a commercial tuna permit in 2005 (Table 9.36). In addition to tuna permits, Louisiana was home to the third largest number of shark permit holders with 43 permitted vessels (Table 9.38). Twenty-three of those permit holders live in New

Orleans, LA (Figure 9.3). The largest concentrations of shark vessels were home ported in New Orleans, Houma, Dulac, and Gretna. There are also 38 swordfish permit holders in Louisiana (Table 9.39). To support these HMS fisheries, there are 21 dealers licensed to purchase and sell tunas, sharks, and/or swordfish in Louisiana.

Table 9.29 Louisiana Demographic Profile. Source: U.S. Census, 1990 and 2000.

Louisiana	1990	2000
Population:	**4,219,973**	**4,468,976**
Education:		
High school graduates (25 years or older)	68.0%	74.8%
Employment:		
Labor force (16 years and over)	59.3%	59.4%
Unemployment Rate	9.6%	7.3%
Median Household Income	$21,949	$32,566
Individuals below the poverty line*	23.6%	19.6%
Employment in some industry sectors:		
Farming, fishing, forestry & mining	5.7%	4.2%*
Construction	6.8%	7.9%
Wholesale trade	4.5%	3.5%
Retail	17.5%	11.9%
Manufacturing	12.5%	10.1%
Education, health & social services	25.3%	21.7%
Arts, recreation, lodging & food services	1.1%	9.1%

*U.S. Census uses data from 1989 and 1999 to estimate these values.

The recreational saltwater fisheries off Louisiana attracted some 524,000 anglers in 2003, collectively making 4,271,000 fishing trips (NMFS, 2004b). Of these anglers, 39 percent (204,000) were from out-of-state, while 15 percent were from non-coastal counties within Louisiana. There were 666 HMS angling permit holders residing in Louisiana during 2005 (Table 9.34). The ASA estimated that salterwater angling generated some $409.6 million in Louisiana in 2001, and 7,786 jobs in marine recreational fisheries (ASA, 2002). The center of fishing activity is off the Mississippi delta, and ports like Boothville-Venice, Port Fourchon and Grand Isle with good road access to the metropolitan areas of Baton Rouge and New Orleans, benefit from their access to good bottom-fishing areas and to “blue-water” areas offshore. Sharks are taken in both the bottom-fishery and in the blue-water fishery.

In 2005, there are 108 charter/headboats with HMS permits operating from Louisiana communities. The majority of websites sampled show that sharks are a component of most trips offered by these vessels. Communities involved in the charter and head boat fishery for sharks include Venice, New Orleans, Chauvin/Dulac, Houma, Baton Rouge, Golden Meadow, Belle Chase, Metaire, Grande Isle, Cut-Off, Chalmette, Lake Charles, and Monroe.

9.4.17.1 Venice, Louisiana

Venice is another Louisiana community with historical ties to the commercial fishing industry. Venice has a strong focus on commercial fisheries, and cites the large volume of local shrimp landings and numerous residents involved in the fishing industry as evidence. Many residents fish commercially, at least on a part-time basis (Impact Assessment, 2004). In the past 20 years, however, oil and recreational fishing have become increasingly important for the economy of Venice. Wilson *et al*. (1998) note, however, few if any, Venice residents commercially harvest highly migratory species. Boothville-Venice is a "census designated place" and the Bureau of the Census statistics includes both small communities. Similarly, NMFS links Empire and Venice as a single port. Thus, both the port and community are referred to as Venice in this document.

Like Dulac, the population of Venice has declined from 2,743 in 1990 to 2,220 in 2000 (Table 9.30). There is a slightly greater percentage of males compared to females in the population. The median age increased from about 26 to 32 between 1990 and 2000. The number of individuals under 20 declined by almost seven percent, while those 45 and older increased by almost seven percent in the last decade. Whites account for a majority of the resident population, but blacks or African Americans accounted for about 29 percent of the total population in both 1990 and 2000. Despite apparent overall out-migration, numerous families of Vietnamese and Cambodian ancestry have moved to the area over the last decade (Impact Assessment, 2004). While many initially went into the fishing industry, more recently, there has been an apparent shift among many new arrivals toward citrus farming.

In 1990, there were 836 households with an average size of 3.23 people. The number of households decreased to 746 in 2000 and the average household size had dropped to 2.96 people. The number of people employed in farming, fishing, forestry, and mining decreased over the last decade from 16.9 percent to 11 percent. The forestry, fishing, hunting, mining, and agriculture industries continued to make up twenty-two percent area's businesses. Retail trade is the second largest industry in the area.

In 1990, thirty-six percent of the population of Venice lived below the poverty level, but this figure dropped to 18 percent in 2000 (Table 9.30). In 1990, the median household income was $16,250. Eighteen percent of the households in Venice in 1990 received Social Security, averaging $5,433 per year, and 11 percent of the households received public assistance income, averaging $3,301 per year (NMFS, 1999a). In 2000, the per capita income of Venice residents was $13,123, while the per capita income for the state of Louisiana had increased to $16,912.

Venice is located about 30 miles South of the parish seat Point à la Hache, which is flanked by eroding wetlands and levees that border the Mississippi River. The unemployment rate is low compared to that of Dulac, perhaps because Venice has been the epicenter of oil industry activity in Louisiana. The main job opportunities in Venice are oil, seafood harvest and processing and, increasingly, recreational fishing (Wilson *et al*, 1998). Fishing infrastructure in Venice is extensive. There are several seafood dealers and docks; sale and repair facilities for commercial and recreational boats, bait shops, ice houses, boat launches, and several small marinas and marine suppliers (Impact Assessment, 2004). One of the marinas, the Cypress Cove Marina and Lodge, is a large facility offering boat storage, charter services, guided waterfowl

hunting with air boat transportation, hotel, restaurant, and various support services essential for recreational fishing and hunting (Impact Assessment, 2004). The majority of business is sport-recreational. Venice extends into the Gulf of Mexico close to billfish areas that are frequented by recreational fishermen. Recreational fishing increased steadily there during the 1990s (Wilson *et al*., 1998).

Table 9.30 Demographic Profile of Venice, Louisiana. Source: U.S. Census, 1990 and 2000.

Demographics	1990	2000
Total Population	2,699	2,220
Sex		
Male	51.4%	51.0%
Female	48.6%	49.0%
Age		
Median Age	**26.3**	**31.7**
< 20	42.0%	35.2%
20 - 44	35.1%	35.2%
45 - 64	18.3%	22.0%
> 65	4.6%	7.6%
Race		
White	63.9%	61.9%
Black or African American	31.3%	28.7%
American Indian and Alaska Native	3.3%	3.4%
Asian and Pacific Islander	1.4%	4.0%
Other	0.0%	0.3%
Household		
Total	**836**	**746**
Family households	84.7%	78.3%
Nonfamily households	15.3%	21.7%
Average household size	3.23	2.96
Average family size	3.58	3.38
Housing Occupancy		
Total housing units	960	933
Vacant housing units	14.0%	20.0%
Housing Tenure		
Owner-occupied housing units	87.5%	87.1%
Renter-occupied housing units	12.5%	12.9%

Boothville & Venice, Louisiana	1990	2000
Population:	2,699	2,220
Education:		
High school graduates (25 years or older)	43.5%	48.4%
Employment:		
Labor force (16 years and over)	48.1%	53.0%
Unemployed	3.3%	2.0%
Median Household Income	$ 16,250	$ 33,813
Individuals Below the Poverty Line	36.2%	17.3%
Employment in some industry sectors:		
Managerial/professional	13.8%	18.1%
Technical, Administrative, & Sales	20.7%	19.5%
Construction, Production, Maintenance, & Transportation	12.1%	40.8%
Farming, fishing, forestry, & mining	16.9%	11.0%
Industry		
Forestry, fishing, hunting, mining, and agriculture	22.5%	22.7%
Construction	10.8%	8.1%
Manufacturing	7.1%	4.8%
Wholesale Trade	9.4%	0.0%
Retail Trade	16.0%	13.1%
Education, health & social services	5.6%	14.4%
Arts, recreation, lodging & food services	0.0%	10.4%

Marina owners suggest that commercial fishing activity has declined over the last several years, and that Venice residents seem to be more focused on recreational fishing and oil field support. A local retail seafood dealer suggests that Louisiana's unpredictable weather and foreign shrimp imports are detrimentally affecting the local commercial fleet. Other informants suggest that the commercial fishing fleet is struggling in many ways, but that the involvement of the larger community in alternative industries, such as offshore oil field support and citrus, is keeping the local economy fairly dynamic (Impact Assessment, 2004).

Animosity regarding competition for fish extends to the political arena, as commercial and recreational fishermen oppose each other on regulatory issues. Commercial fishery participants claim that law enforcement agents harass them, while recreational fishery participants claim that regulations are not enforced in Venice because there are simply not enough agents to cover the area. Among local commercial fishermen, there is a sense that recreational fishermen have helped create a regulatory environment that is pushing commercial fishermen out of business (Wilson *et al*., 1998).

Most of the commercial vessels landing in Venice are home-ported in New Orleans or other Mississippi River towns further upriver from the Gulf of Mexico. Even Louisiana natives who fish for shark with nets in state waters live in neighboring towns, not in Venice. Shrimp is the largest commercial catch bought and sold in Venice, although this fishery has become less profitable since the late 1980s (Wilson *et al*., 1998). The longline fleet is not well integrated into the Louisiana community of Venice. The longline fishermen are mostly "commuters" from towns and cities further inland, such as New Orleans, and most of them are from a different ethnic background, including many Vietnamese-Americans. Due to the language barrier, many of these fishermen do not participate in public fisheries meetings (NMFS, 1999a).

In 1998, several dealers in Venice drew 40 percent of their business from the longline fleets. Another dealer drew only about 20 percent from longline vessels. A large wholesaler dealt only in longline catches and purchased fish from local dealers. In 1997, 60 percent of this business was tuna, 30 percent shark and ten percent swordfish. The competition between dealers in 1998 was perceived as becoming more aggressive (Wilson *et al*., 1998). Traditional patterns of dealers building relationships by extending services and credit to vessels are giving way to price-based competition to gain access to vessels.

While pelagic longline fishermen with large vessels work year-round, pelagic longlining in the area tends to intensify in May and ease up during the wintertime. There are four docks in Venice where longline vessels unload. Docks in Venice employ between five and 15 workers on a seasonal basis for unloading vessels and packing seafood, as well as five to eight people year-round. The docks purchase tuna year round, shrimp from May through December, bottom fish such as drum, catfish, and sheepshead, from January through May, mullet (for the roe) from October through December (NMFS, 1999a).

Researchers in 1998 found that alternative employment outside of the fishery was available. For instance, the oil industry hired unskilled labor from this area in recent years, and employed three percent of the civilian labor force in 2000. The agricultural sector also provides employment opportunities during the off-season for fishing, as reported by one Vietnamese-American captain. However, researchers found that this relatively ready supply of alternative employment threatened the stability of the labor pool for the fishing industry. The Vietnamese-American community has avoided such personnel problems to some extent by relying on tight kinship networks in both fishing and fish buying, although they did report some difficulty in finding captains. The Vietnamese-American community was the only one studied which reported recent investment in new longline vessels. Concerns cited by the fishermen in Venice included the safety of small vessels during winter openings, and the prospect of small vessels having to pay for observers and VMS (Wilson *et al*., 1998)

Other commercial fisheries in the area that could provide alternative employment include pompano in October, mullet from October to January, shrimp from May to December, and oysters from January to May (Wilson *et al*., 1998). Wilson *et al.* concluded that the overall effect of increased restrictions on this fleet would be increased pressure on grouper and yellowfin tuna, increased difficulty in finding and retaining employees, and an acceleration in the rate at which the fleet's vessels and experienced fishermen are moving overseas, especially to Mexico.

Recreational fishermen fish from Venice year-round, but are affected by inclement weather during the winter. The larger vessels can fish for yellowfin tuna year round, in addition to inshore species like redfish, snapper and speckled trout. Bluefin tuna are found too far away (100 miles offshore) and recreational fishermen are prohibited from directing effort on bluefin tuna anyway. They fish for billfish, particularly blue marlin, from May through November. Blacktip shark was once a popular catch, but recreational fishermen say they are now too small to be an enjoyable catch. There is some animosity between recreational and commercial fishermen, which seems to arise from competition for particular species. Charterboats regularly specify sharks as a species available to their clients.

There are only two marinas in Venice that cater to recreational fishermen, although a third parish-run marina offers vessel slips to both recreational and commercial fishermen. One opened in the mid-1980s and offers boat slips, launches, a hoist, a couple of condominiums, baitshop, fuel, and ice. The marina employs 13 people during peak summer months. Most of the marina's business comes from private vessels from New Orleans and border states. Less than one percent of this business consists of charterboats. The other marina opened only a few years ago, offering 120 pre-paid boat slips, a 64-room two-story hotel, condominiums, a dry dock storage facility, fuel, and ice. This second marina employs 12 to 15 people in its newly opened hotel and another 15 to 25 in the marina. Eight charterboats operate from the marina, and there is room for ten more.

Researchers in 1998 reported that the catch-and-release ethic for billfish was strong among recreational fishermen in Venice, but local billfishing tournaments require that trophy fish be brought to the dock and weighed. Sportfishermen prefer to catch and retain tunas, dolphin fish, and wahoo for consumption, although they voiced support for tag and release programs (NMFS, 1999a).

9.4.17.2 Dulac, Louisiana

Dulac is located in the center of Terrebonne Parish, about 15 miles South of Houma, Louisiana. Houma lies at the intersection of the Houma Navigational Canal and the Intercoastal Waterway and serves as the parish seat and a locale of employment opportunities in offshore equipment building for Dulac residents (Wilson *et al*., 1998). With easy access to Timbalier Bay and the Gulf of Mexico via the Houma Navigational Canal, many Dulac residents are deeply involved in commercial fishing, and many recreational fishers from Houma and distant Lafayette maintain camps in this area (Impact Assessment, 2004). Terrebonne Parish government is a consolidated government so most data are gathered on a parish-wide basis. According to the Terrebonne Parish Planning Department in 1998, the parish did not spend much time tracking the importance of the commercial fishing industry, but anecdotal evidence suggests that it is a long-standing and significant part of the community economy (Wilson et al., 1998). Landings of tunas, swordfish, and sharks indicate that Dulac is among the most important fishing ports in the state. However, many of the fishermen who target HMS are a commuter population; they land fish in Dulac or purchase fish in Dulac, but they live elsewhere. Three dealers purchase fish from longline vessels; two are owned and operated by first-generation Vietnamese immigrants, and the other is run by a New Orleans native whose father operates a large tuna wholesale company in Venice.

In 1990, the population was 3,273 individuals; it declined to 2,458 in 2000 (Table 9.31). Dulac reported the same number of males as females both 1990 and 2000. Individuals under 20 years old make up the greatest proportion of the population in both 1990 and 2000 with individuals between 20 and 44 comprising the second largest age group. Whites comprise the largest proportion of race — 49 and 54 percent in 1990 and 2000, respectively. American Indian and Native Alaskans accounted for 48 and 39 percent of the total population, respectively, in 1990 and 2000. As noted in Wilson *et al*. (1998), however, this latter category is made up mostly of the Houma Indians, which is a tribe not recognized by the U.S. government. Less than two percent of the population was Asian/Pacific Islander, despite the fact that most of the longline captains who sustain the Dulac commercial industry for tunas, swordfish, and sharks were Vietnamese.

Table 9.31 Demographic Profile of Dulac, Louisiana. Source: U.S. Census, 1990 and 2000.

Demographics	1990	2000
Total Population	3,273	2,458
Sex		
Male	49.3%	50.0%
Female	50.7%	50.0%
Age		
Median Age	**25.5**	**31.8**
≤ 20	41.8%	35.2%
20 – 44	35.2%	32.2%
45 – 64	17.0%	22.8%
≥ 65	6.0%	9.8%
Race		
White	49.4%	54.0%
Black or African American	2.3%	2.5%
American Indian and Alaska Native	48.1%	39.4%
Asian and Pacific Islander	0.0%	0.5%
Other	0.3%	0.5%
Household		
Total Households	**922**	**768**
Family households	85.8%	79.3%
Nonfamily households	14.2%	20.7%
Average household size	3.55	3.20
Average family size	3.93	3.55
Housing Occupancy		
Total housing units	1,182	1,063
Vacant housing units	33.0%	27.8%
Housing Tenure		
Owner-occupied housing units	80.1%	79.3%
Renter-occupied housing units	19.9%	20.7%

Dulac, Louisana	1990	2000
Population:	3,273	2,458
Education:		
High school graduates (25 years or older)	27.1%	39.1%
Employment:		
Labor force (16 years and over)	37.8%	44.9%
Unemployed	8.0%	3.0%
Median Household Income	$ 12,653	$ 22,900
Individuals Below the Poverty Line	49.3%	30.9%
Employment in some industry sectors:		
Managerial/professional	5.7%	12.4%
Technical, Administrative, & Sales	18.1%	17.7%
Construction, Production, Maintenance, & Transportation	17.2%	41.4%
Farming, fishing, forestry, & mining	12.3%	15.9%
Industry		
Forestry, fishing, hunting, mining, and agriculture	23.6%	25.9%
Construction	3.7%	3.1%
Manufacturing	14.0%	10.0%
Wholesale Trade	8.5%	5.7%
Retail Trade	17.7%	10.3%
Education, health & social services	9.7%	8.5%
Arts, recreation, lodging & food services	0.0%	10.7%

In 1990, Dulac had 922 households with an average size of 3.55 persons per household (Table 9.31). By 2000, the number of households had decreased to 768 and the average size of each household had dropped to 3.20 persons. At the time of the 1990 Census, nearly half of the individuals in Dulac were living below the poverty level, with a median household income of $12,653. In 2000, median household income in Dulac had increased to $22,900, but more than 30 percent of individuals continued to live below poverty level. Per capita income in Dulac in 1990 was $4,946; for the State of Louisiana, average per capita income was $10,635. By 2000, per capita income in Dulac had risen to $8,785, while for the state as a whole, per capita income had risen to $16,912. In 1990, the largest proportion of the Dulac population was employed in the technical, administrative, and sales industries. Whereas in 2000, the largest proportion of the

population was employed in construction, production, maintenance, and transportation. Sixteen percent of the population was employed in the farming, fishing, forestry, and mining industries in 2000. Forestry, fishing, hunting, mining, and agriculture were the largest industries in Dulac in both 1990 and 2000.

Pelagic longline fishermen in Dulac target yellowfin tuna all year. Dulac longline vessels do not target swordfish, and incidentally-caught sharks are often discarded (Wilson *et al*., 1998). The competition between dealers was perceived as becoming more aggressive in 1998. Traditional patterns of dealers building relationships by extending services and credit to vessels were giving way to price-based competition to gain access to vessels. Researchers reported, in 1998, that one dock in Dulac employed three to four people, but laid them all off in 1998. That dealer purchased tuna (50 percent), shark (30 percent), swordfish (20 percent), and dolphin, wahoo, and amber jack (20 percent combined). Another dealer employed six or seven people in 1998, all of whom lived in Dulac. Of this dealer's purchases, 60 percent were tuna, 20 percent were swordfish and 20 percent were divided among other pelagic species like shark, wahoo, amber jack. A third dealer employed six Mexican workers, supplemented by local residents on a seasonal basis (Wilson *et al.*, 1998). The pelagic longline fleet has seen reductions in its catches with the prohibition of the use of live-bait in 2000 causing a reduction in the community's employment rate. In 2005, HMS permit data show only one dealer in Dulac with several HMS dealer permits.

Researchers in 1998 found that alternative employment outside of the fishery was available. For instance, while unemployment in Louisiana fishing communities has been high in the past, the oil industry hired unskilled labor from this area in recent years. In 1990, 33 residents of Dulac worked in the oil fields and a similar number were employed by the oil industry in 2000. The agricultural sector also provides employment opportunities, as reported by one Vietnamese-American captain, particularly during the off-season for fishing. However, this supply of alternative employment threatened the stability of the labor pool for the fishing industry (Wilson *et al*., 1998). This was true for both captain and crew positions, particularly among the non-Vietnamese-American population. The Vietnamese-American community avoided such personnel problems to some extent by relying on tight kinship networks in both fishing and fish buying. The Vietnamese-Americans, however, did report some difficulty in finding captains. The Vietnamese-American community was the only one studied which reported recent investment in new longline vessels. In Louisiana, the Vietnamese-American may be impacted more intensely by changes in the regulations given the extent of their investment in this fishery (NMFS, 1999a).

Dulac was also a homeport for a limited inshore shark bottom longline fishery in Federal waters in 1998. Blacktip shark was the main catch in this fishery. These fishermen did not fish much during the winter because of the safety concerns associated with small vessels (Wilson *et al*., 1998). Typically, sharks are caught between five and 20 miles from shore. Almost all vessels that sell in Dulac are owner-operated. Owners are usually their own captains or they hire a close relative to captain their vessel. Good first mates try to acquire their own vessels. At least five bottom longline vessels were built in 1997 and have been added to the fleet in Dulac. Some participants in the bottom longline fishery for sharks also participated in the reef fish fishery.

The local fishermen, fishing for shark in state waters, use a gill net and fish under a special state licence because longlining for sharks in state waters is banned.

9.4.18 Texas

The population of Texas has increased by nearly 4 million people over the past decade, reaching 20.1 million in 2000 (Table 9.32). The percentage of individuals 25 years and older with a high school diploma and/or a graduate level degree has increased slightly. The percentage of employed individuals, the unemployment rate, and percentage of individuals below the poverty line, have all declined over the past decade. As with many of the other states, employment in the farming, fishing, forestry, and mining industries has declined, whereas the education, health, and social services industries provided the greatest employment opportunities in 2000.

Table 9.32 Texas Demographic Profile. Source: U.S. Census, 1990 and 2000.

Texas	1990	2000
Population:	**16,986,510**	**20,851,820**
Education:		
High school graduates (25 years or older)	72.1%	75.7%
Employment:		
Labor force (16 years and over)	66.0%	63.6%
Unemployment Rate	7.1%	6.1%
Median Household Income	$27,016	$39,927
Individuals below the poverty line*	18.1%	15.4%
Employment in some industry sectors:		
Farming, fishing, forestry & mining	4.9%	2.7%
Construction	6.7%	8.1%
Wholesale trade	4.9%	3.9%
Retail	17.4%	12.0%
Manufacturing	14.4%	11.8%
Education, health & social services	22.5%	19.3%
Arts, recreation, lodging & food services	1.2%	7.3%

*U.S. Census uses data from 1989 and 1999 to estimate these values.

In the state of Texas, seventeen residents possessed a commercial tuna permit (Table 9.36). In addition to the commercial tuna permit holders, thirteen individuals held a shark permit and eight individuals held a swordfish permit (Table 9.38 and Table 9.39). The commercial shark fishery generally tends to be a small portion of the commercial fisheries of Texas. There are licensed HMS dealers for tuna, shark, and swordfish operating in 12 different locations in coastal Texas (Table 9.37).

In 2005, there were 540 Texas residents that held an HMS angling permit (Table 9.34). The ASA estimated that saltwater angling generated some $622.2 million in retail sales in Texas in 2001 and that there were 13,322 jobs in Texas associated with the marine recreational fishing

industry (ASA, 2002). The number of charter/headboat permit holders from Texas has increased from 129 in 2003 to 162 in 2005 (Table 9.35) with a significant concentration of the 2005 permit holders in Port Aransas (Figure 9.2). Most of these take shark as an incidental catch to other near-shore and offshore fish. In addition to Port Aransas, Freeport, Galveston, Houston, Port Isabel, and Port O'Connor, as well as several other communities, are home to HMS angling permit holders.

9.4.19 Puerto Rico

The population in Puerto Rico increased by nearly 300,000 people in the last decade (Table 9.33). The percentage of individuals 25 years and older with a high school diploma and/or a graduate level degree has increased by over ten percent in the last decade. The percentage of employed individuals, unemployment rate, and percentage of individuals below the poverty line all declined through the nineties. Education, health, and social services provide the greatest sources of employment. The farming, fishing, forestry, and mining employed less than two percent of the population in 2000.

Table 9.33 Puerto Rico Demographic Profile. Source: U.S. Bureau of the Census, 1990 and 2000.

Puerto Rico	1990	2000
Population:	**3,522,037**	**3,808,610**
Education:		
High school graduates (25 years or older)	49.7%	60.0%
Employment:		
Labor force (16 years and over)	47.3%	40.7%
Unemployment Rate	20.4%	19.2%
Median Household Income		$ 14,412
Individuals below the poverty line*	58.9%	48.2%
Employment in some industry sectors:		
Farming, fishing, forestry & mining		1.7%
Construction		
Wholesale trade		4.4%
Retail		11.7%
Manufacturing		13.5%
Education, health & social services		19.3%
Arts, recreation, lodging & food services		6.5%

*U.S. Census uses data from 1989 and 1999 to estimate these values.

While Puerto Rico was home to 100 commercial tuna permit holders in 2005, there were no permit holders for sharks or swordfish (Table 9.36). A large number of the commercial tuna permit holders are in Aquadilla (44 percent) and another large group is located in Rincon (13 percent). There are six HMS dealer permit holders in Puerto Rico; four for tunas in Aquadilla; one for tunas in Aquada; and one for sharks and swordfish in San Juan (Table 9.37).

The recreational saltwater fisheries in Puerto Rico attracted 220,000 anglers in 2003, collectively making 1,111,000 fishing trips (NMFS, 2004b). Of these anglers, 16 percent of the anglers were not from Puerto Rico. In 2005, 850 HMS angling permit holders were residing in Puerto Rico (Table 9.34). The following communities have the largest concentrations of HMS anglers: San Juan (23.4%), Guaynabo (9.2%), Arecibo (6%), Mayaguez (5.5%), Vega Baja (4.9%), Ponce (4.1%), Carolina (3.9%), as well as several other communities with smaller concentrations of permit holders. Thirty vessels from Puerto Rico held an HMS charter/headboat permit in 2005, specifically several were located in San Juan and Rincon (Table 9.35). Due to the number of HMS permits issued to individuals located in San Juan, a community profile should be developed in the future.

Generally, the fishing industry of Puerto Rico is made up of private clubs for the upper and middle class and small, and poor artisanal fishing communities. There are approximately 2,500 licensed artisanal fishermen who are required to report their landings to the Office of Natural Resources' Fisheries Laboratory. However, interviews and informal conversation with artisanal fishermen suggest that the reported and actual landings differ widely (Wilson *et al.*, 1998). At the local level, there are artisanal fishermen's associations (villages) and recreational fishermen's membership clubs.

The fishing industry is not a prominent economic activity in Puerto Rico and variations in fishing incomes have little impact on the island's economy. Most of the recreational fishing activity centers around the capital city of San Juan. Artisanal fishing communities are found throughout the island. These communities are extremely poor and will likely be the communities most affected by changes in regulations. The extremely deep inshore waters off these areas make billfish and other highly migratory species accessible to the artisanal fishery.

9.4.19.1 Arecibo, Puerto Rico

The Arecibo population in 1990 was 93,385 people; approximately 99 percent of those people were born in Puerto Rico or in the United States (NMFS, 1999b). The majority of the population is classified as Hispanic or Latino. Naturalized citizens and non-citizens each make up less than one percent of the population of Arecibo, but their ethnicity is unknown. According to interviews with local government officials, the vast majority of immigrants in Arecibo are from the Dominican Republic; however, there is no way to confirm that information due to waves of illegal immigration. In 2000, the U.S. Census reported the Arecibo population grew by less than seven percent (101,131 people).

The number of households in Arecibo grew by almost ten thousand throughout the last decade, from 24,333 to 34,245 households. In 1990, the median household income is $7,520. By 2000, the median household income increased by $5,000 to $12,520. In the early nineties, thirty-two percent of the households are receiving some kind of public assistance; the average public assistance income is $1,939. The number of individuals below the poverty line did decrease over the past decade, from 73 percent to almost 51 percent. The unemployment rate also declined from 23 percent to eight percent in 2000. Of the population age 16 and older, 43.9 percent are in the civilian labor force in 1990, whereas this number declined to 38 percent in 2000. In 1990, the highest employing industries for men and women were manufacturing and services. In 2000,

the construction, production, maintenance, and transportation industries supplied the greatest number of employment opportunities.

Recreational fishing is the predominant mode of participation in the HMS fisheries in Arecibo, Puerto Rico. Fifty-one Arecibo residents hold an HMS angling permit, but none of 28 charter/headboat permit holders in Puerto Rico are from Arecibo. Two Arecibo residents hold a commercial tuna permit. Despite the lack of commercial shark and swordfish permit holders in Puerto Rico, there is one HMS permitted dealer for sharks and swordfish in San Juan, one for tunas in Aquada, and four for tunas in Aquadilla.

The Arecibo Yacht Club is a private club created by and for the local recreational fishermen. The members of the club formed the Association of Sport Fishing of Arecibo and its facilities. Members of the Arecibo Yacht Club organize marlin and inshore fishing tournaments. According to local government officials, the municipality does not get any economic benefit from those tournaments because all the profits go directly to the Club, which is a private business. The tournament does not affect the economy of the region even indirectly by promoting related business because the participants are mainly the same local fishermen. The marlin tournament is held in May. However, according to the commodore of the club, the tournaments are not always lucrative, even for the club (Wilson *et al*., 1998). The club has approximately 253 members, and among them, 82 are boat owners. The size of the vessels fluctuates between 18 and 50 feet. The larger boats, measuring 33 feet or more, have a crew consisting of a captain and a mate. The crew is in charge of the maintenance of the boats while in the marina and directing the fishing journeys. The facilities of the club and marina were constructed with private funds and are a very exclusive place for the middle-upper class of Arecibo. Although, the commodore reports that in the club's facilities there is an area available for the boats of the artisanal fishermen.

Among the members are part-time artisanal fishermen, but most of them are recreational fishermen. However, usually they come out on the weekends and use the money they obtain from the catch to pay for the trip expenses. The artisanal fishermen catch mostly red snapper and grouper by bottom fishing. This kind of fishing is done with a line that goes to the bottom of the sea, mostly in rocky areas. The rest of the fishermen mainly target dolphin and tuna. To catch these species, they use a hand line, or a single cord with one angle. From May through October, marlin, white needle, blue needle, and *EEZ Vella* are typically found seven to ten miles from the shore.

9.5 Future Assessments

In the future, the HMS permit databases, landings information, and HMS APs should be consulted to determine the most appropriate community profiles for HMS-related fisheries. The 2005 HMS permit data indicate that several new community profiles should be developed and some of the previously profiled communities may not have as significant an investment in the fishery as the community may have in the past (Figure 9.1 – Figure 9.6). Wakefield, Rhode Island should be considered due to the number of commercial tuna and swordfish permit holders in the area. Montauk, New York has a large concentration of charter/headboat, commercial tuna, and HMS dealers in the community. A large number of Cape May residents hold an HMS angling, charter/headboat, shark and/or swordfish permits. Morehead City, North Carolina is

home to a number of HMS angling, charter/headboat, and commercial tuna permit holders. Each of these towns are actively involved with more than one sector of HMS fisheries, and therefore changes to HMS regulations may have could have an impact on each of these communities. While the number of permit holders in Puerto Rico and the Virgin Islands are not as numerous as the permit holders on the U.S. mainland, HMS fisheries are active in these two area and several communities benefit from those activities. Future HMS actions should consider developing a community profile for Christiansted, St. Croix, as well as San Juan, Guaynabo, Aguadilla, Mayaguez, and/or Vega Baja Puerto Rico due to the number of HMS permit holders in these areas. While NMFS may have community profiles describing these areas, to best determine the impact of changes to HMS-related regulations, an HMS-specific community profile should be developed for these towns.

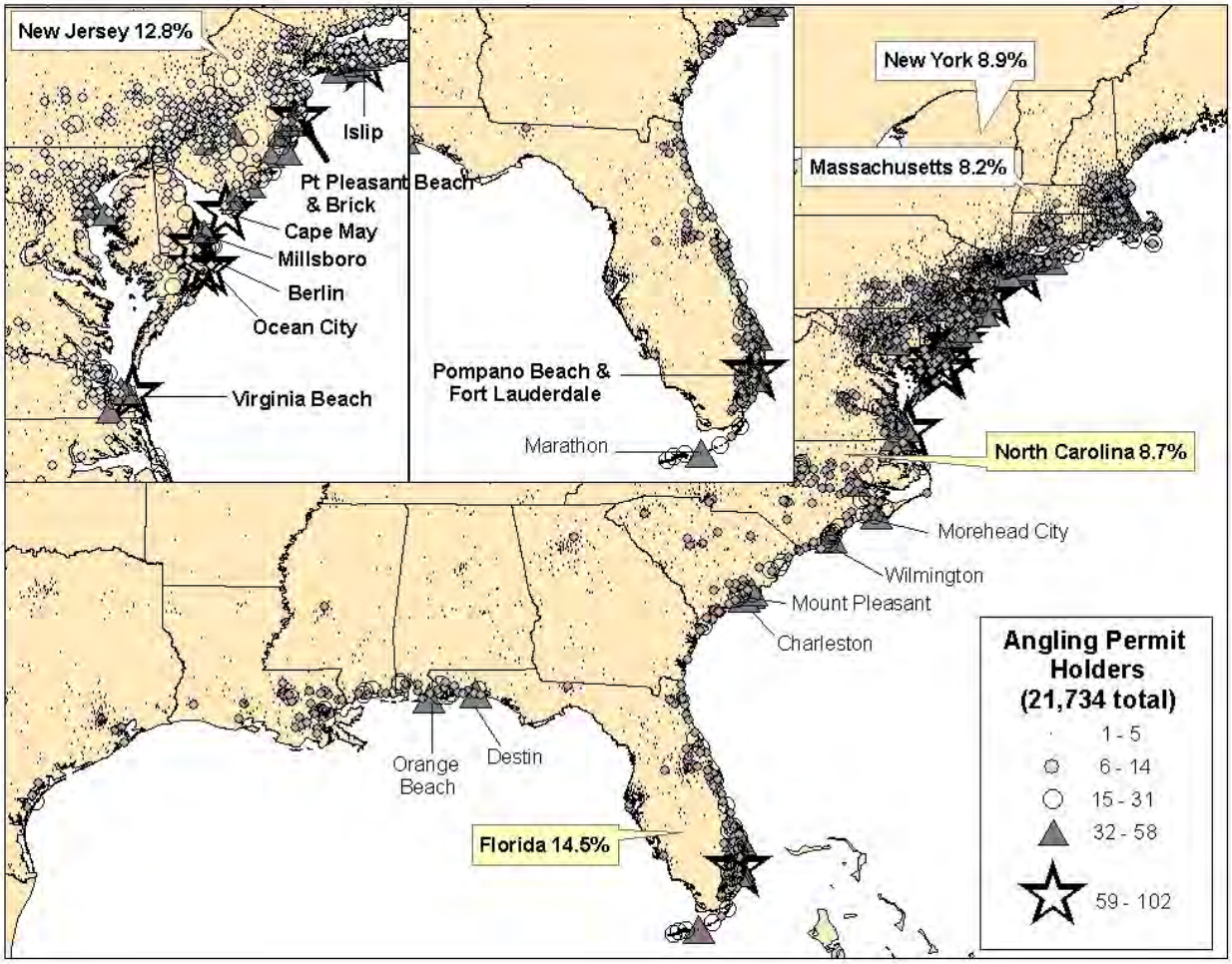

Figure 9.1 **Location of HMS Angling Permit Holders as of May 2005 and the percentage of Angling permit holders for the top five states.**

Table 9.34 **Number and Percentage of HMS Angling Permits by State and Country as of May 2005.**

Angling Permits		
State	**Total**	**%**
Florida	3,157	14.5%
New Jersey	2,772	12.8%
New York	1,945	8.9%
North Carolina	1,885	8.7%
Massachusetts	1,784	8.2%
Maryland	1,451	6.7%
Pennsylvania	1,386	6.4%
Virginia	1,236	5.7%
Puerto Rico	850	3.9%
South Carolina	820	3.8%
Delaware	719	3.3%
Connecticut	696	3.2%
Louisiana	666	3.1%
Texas	540	2.5%
Alabama	328	1.5%
Rhode Island	297	1.4%
Georgia	249	1.1%
Mississippi	220	1.0%
Maine	210	1.0%
New Hampshire	203	0.9%
Tennessee	60	0.3%
Ohio	29	0.1%
Virgin Islands	25	0.1%
Michigan	22	0.1%
Vermont	21	0.1%
Illinois	18	0.1%
Arkansas	15	0.1%
Missouri	11	0.1%
Wisconsin	11	0.1%
West Virginia	11	0.1%
California	10	0.0%
Kentucky	10	0.0%
Indiana	9	0.0%
Washington, DC	7	0.0%
Alaska	6	0.0%
Colorado	6	0.0%
Minnesota	6	0.0%
Iowa	5	0.0%
New Mexico	5	0.0%
Nevada	5	0.0%
Oklahoma	5	0.0%
Kansas	3	0.0%
Marshall Islands	3	0.0%
North Dakota	3	0.0%
South Dakota	3	0.0%
Arizona	2	0.0%
Fed. States of Micronesia	2	0.0%
Idaho	2	0.0%
British Virgin Islands	1	0.0%
Montana	1	0.0%
Nebraska	1	0.0%
Palau	1	0.0%
Wyoming	1	0.0%
Grand Total	**21,734**	

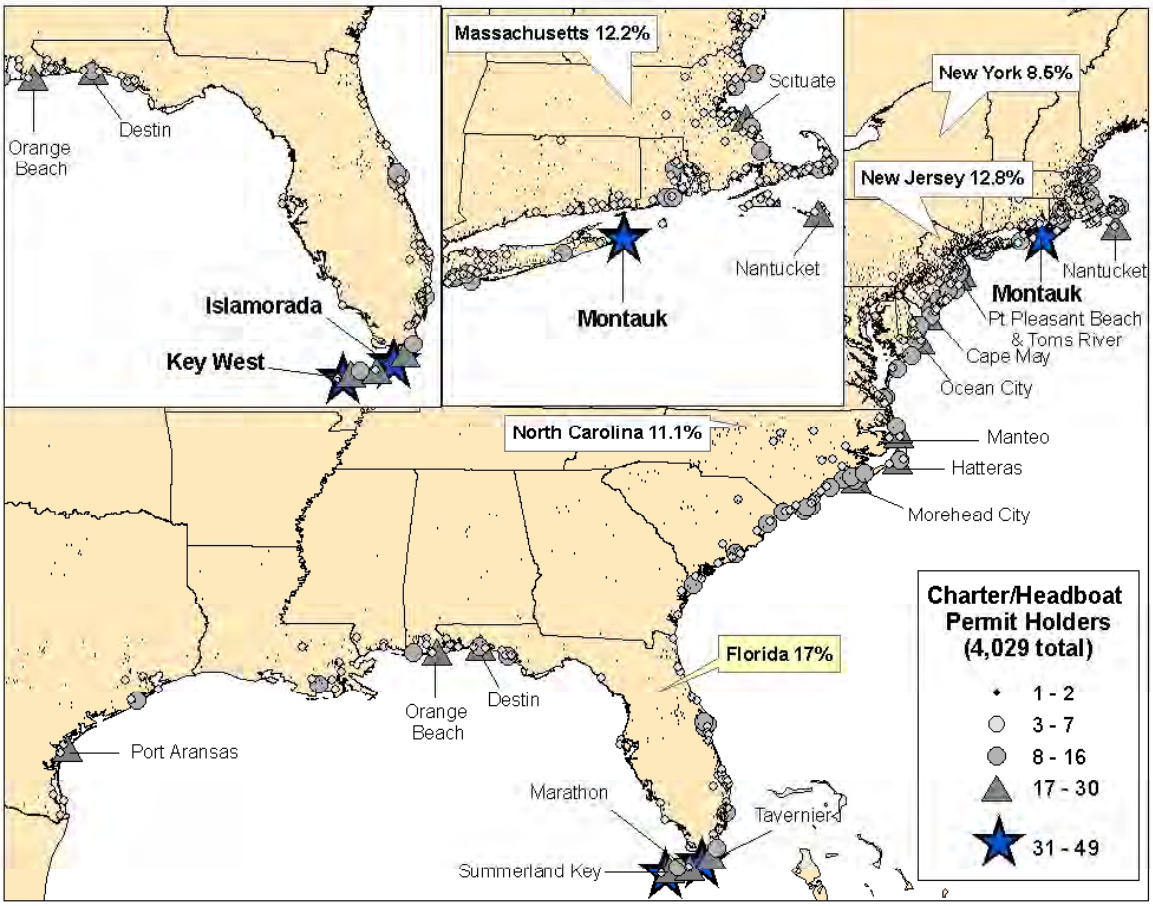

Figure 9.2 **Location of the HMS Charter/Headboat Permit Holders as of May 2005 and the percentage of HMS Charter/Headboat permit holders for the top five states.**

Table 9.35 **Number and Percentage of HMS Charter/Headboat Permits by State as of May 2005.**

Charter/Headboat Permits		
State	**Total**	**%**
Florida	684	17.0%
New Jersey	516	12.8%
Massachusetts	491	12.2%
North Carolina	446	11.1%
New York	342	8.5%
Maryland	174	4.3%
Texas	162	4.0%
Virginia	162	4.0%
South Carolina	142	3.5%
Pennsylvania	140	3.5%
Rhode Island	123	3.1%
Louisiana	108	2.7%
Connecticut	102	2.5%
Delaware	97	2.4%
Alabama	81	2.0%
New Hampshire	58	1.4%
Maine	48	1.2%
Georgia	43	1.1%
Mississippi	36	0.9%
Puerto Rico	30	0.7%
Virgin Islands	13	0.3%
Tennessee	6	0.1%
Ohio	5	0.1%
Michigan	4	0.1%
Nevada	3	0.1%
Illinois	2	0.0%
West Virginia	2	0.0%
Alaska	1	0.0%
California	1	0.0%
Washington, DC	1	0.0%
Guam	1	0.0%
Hawaii	1	0.0%
Indiana	1	0.0%
Kentucky	1	0.0%
Oklahoma	1	0.0%
Vermont	1	0.0%
Grand Total	**4,029**	

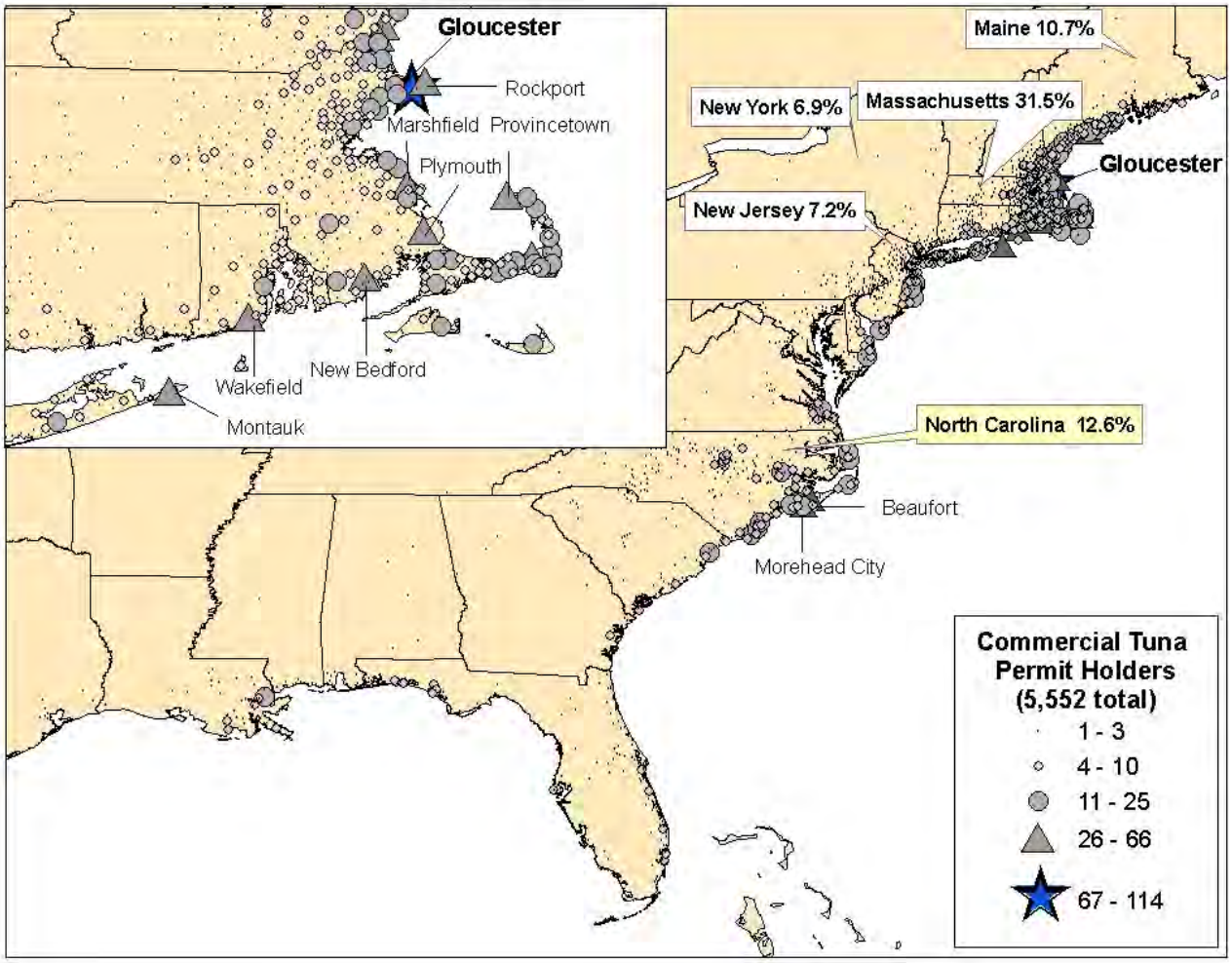

Figure 9.3 **Location of the Commercial Tuna Permit Holders of May 2005 (all gear categories -- harpoon, longline, purse seine, and trap) and the percentage of commercial tuna permit holders for the top five states.**

Table 9.36 **Number and Percentage of Commercial Tuna Permits by State and Country as of May 2005.**

Commercial Tuna Permits		
State	**Total**	**%**
Massachusetts	1,740	31.5%
North Carolina	696	12.6%
Maine	592	10.7%
New Jersey	397	7.2%
New York	380	6.9%
New Hampshire	318	5.8%
Florida	269	4.9%
Rhode Island	221	4.0%
Connecticut	174	3.2%
Virginia	126	2.3%
Puerto Rico	100	1.8%
South Carolina	100	1.8%
Louisiana	96	1.7%
Pennsylvania	59	1.1%
Delaware	58	1.1%
Maryland	58	1.1%
Virgin Islands	31	0.6%
Alabama	23	0.4%
Georgia	18	0.3%
Texas	17	0.3%
Mississippi	15	0.3%
Vermont	10	0.2%
Michigan	7	0.1%
California	3	0.1%
Tennessee	2	0.0%
Washington	2	0.0%
Alaska	1	0.0%
Arizona	1	0.0%
Colorado	1	0.0%
Hawaii	1	0.0%
Indiana	1	0.0%
Minnesota	1	0.0%
Missouri	1	0.0%
N. Mariana Islands	1	0.0%
Wisconsin	1	0.0%
West Virginia	1	0.0%
Grand Total	**5,522**	

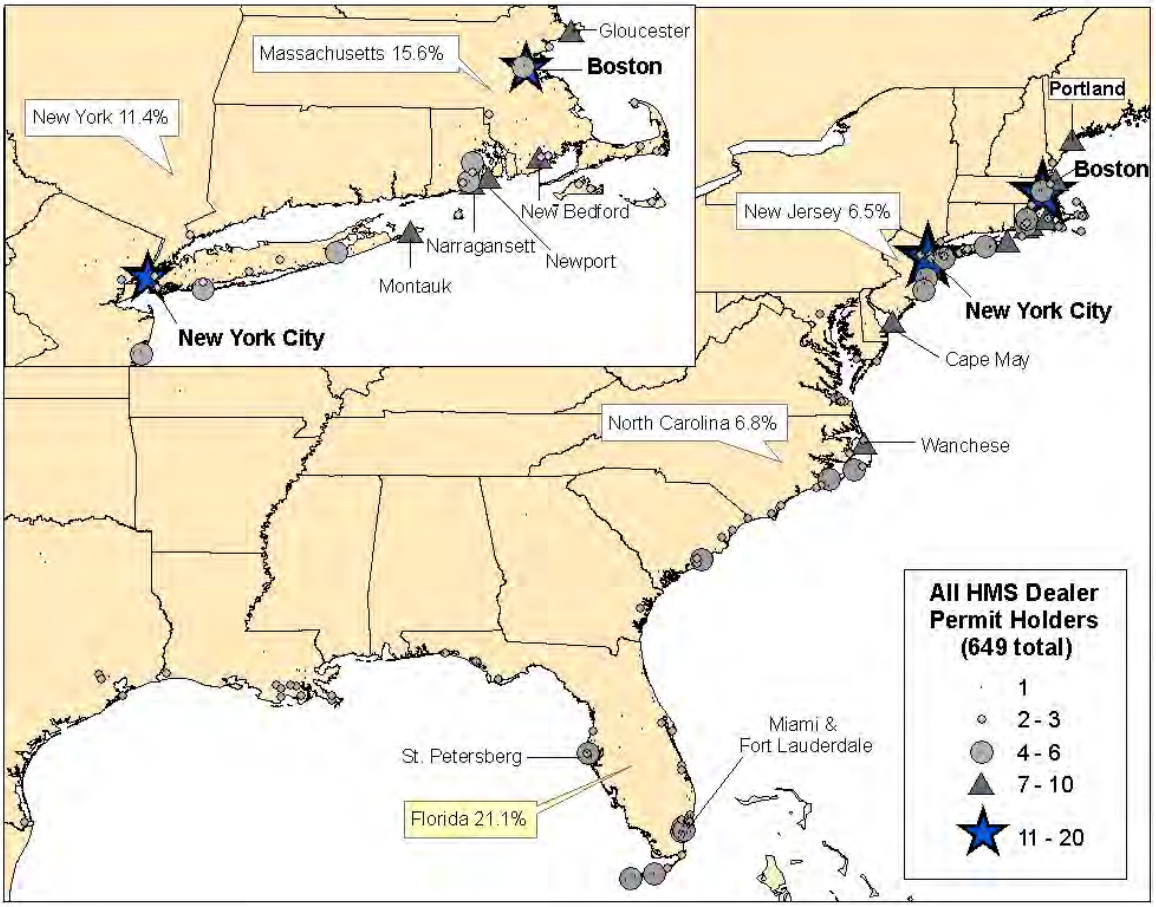

Figure 9.4 **Location of all HMS Dealer Permit Holders as of April (sharks and swordfish) and May 2005 (tunas) and the percentage of HMS dealer permit holders for the top five states.**

Table 9.37 **Number and Percentage of HMS Dealers by State and Country as of April 2005 (sharks and swordfish) and as of May 2005 (tunas).**

HMS Dealers		
State	**Total**	**%**
Florida	137	21.1%
Massachusetts	101	15.6%
New York	74	11.4%
North Carolina	44	6.8%
California	43	6.6%
New Jersey	42	6.5%
Rhode Island	34	5.2%
South Carolina	26	4.0%
Louisiana	21	3.2%
Maine	19	2.9%
Virginia	19	2.9%
Texas	12	1.8%
Washington	11	1.7%
Canada	10	1.5%
Hawaii	10	1.5%
Maryland	9	1.4%
Puerto Rico	6	0.9%
New Hampshire	5	0.8%
Virgin Islands	5	0.8%
Alabama	4	0.6%
Pennsylvania	4	0.6%
Connecticut	2	0.3%
Delaware	2	0.3%
Georgia	2	0.3%
Chile	1	0.2%
Ecuador	1	0.2%
Illinois	1	0.2%
Mississippi	1	0.2%
Montana	1	0.2%
Ohio	1	0.2%
Uraguay	1	0.2%
Grand Total	**649**	**100.0%**

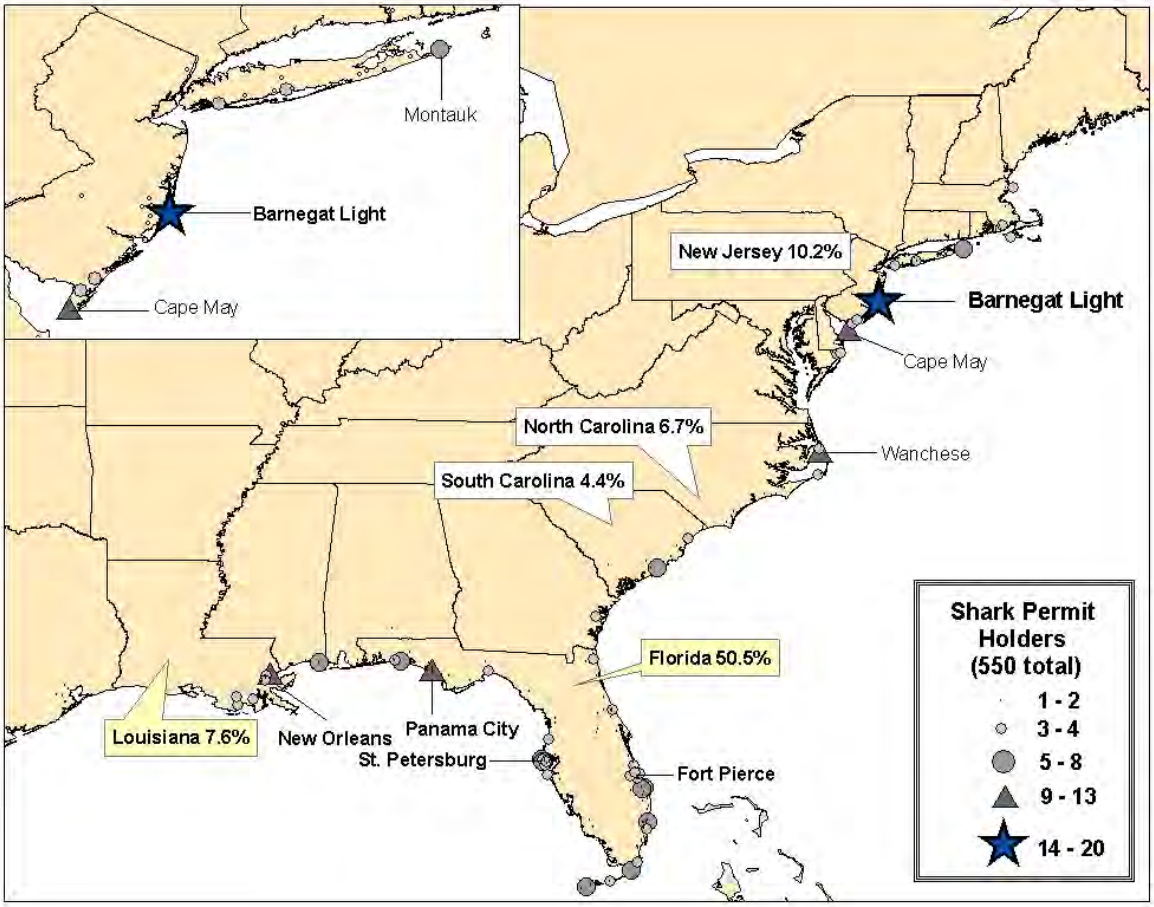

Figure 9.5 **Location of the Shark Directed and Incidental Permit Holders as of April 2005 and percentage of shark permit holders for the top five states.**

Table 9.38 **Number and Percentage of Directed and Incidental Shark Permit Holders by State as of April 2005.**

Shark Permits		
State	**Total**	**%**
Florida	278	50.5%
New Jersey	56	10.2%
Louisiana	42	7.6%
North Carolina	37	6.7%
South Carolina	24	4.4%
New York	22	4.0%
Massachusetts	19	3.5%
Texas	13	2.4%
Rhode Island	10	1.8%
Maryland	9	1.6%
Mississippi	8	1.5%
Virginia	7	1.3%
Maine	6	1.1%
Alabama	4	0.7%
Georgia	4	0.7%
Delaware	3	0.5%
Kentucky	2	0.4%
New Hampshire	2	0.4%
California	1	0.2%
Connecticut	1	0.2%
Indiana	1	0.2%
Virgin Islands	1	0.2%
Grand Total	**550**	**100.0%**

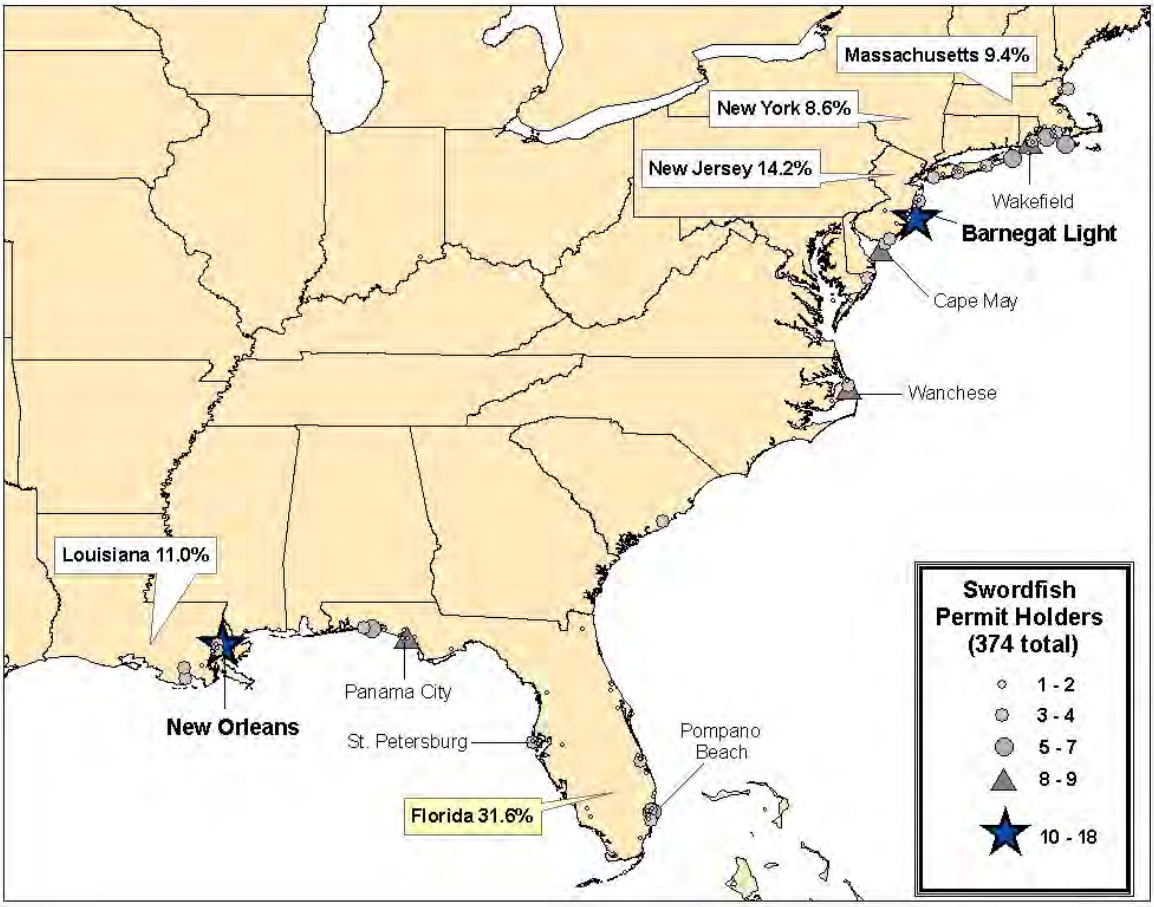

Figure 9.6 **Location of the Swordfish Permit Holders as of April 2005 and the percentage of swordfish permit holders for the top five states.**

Table 9.39 **Number and Percentage of Swordfish Permit Holders by State as of April 2005.**

Swordfish Permits		
State	**Total**	**%**
Florida	118	31.6%
New Jersey	53	14.2%
Louisiana	41	11.0%
Massachusetts	35	9.4%
New York	32	8.6%
Rhode Island	30	8.0%
North Carolina	20	5.3%
Texas	8	2.1%
South Carolina	7	1.9%
Virginia	7	1.9%
Maryland	6	1.6%
Maine	6	1.6%
Alabama	2	0.5%
Delaware	2	0.5%
Mississippi	2	0.5%
California	1	0.3%
Connecticut	1	0.3%
Indiana	1	0.3%
New Hampshire	1	0.3%
Virgin Islands	1	0.3%
Grand Total	**374**	**100.0%**

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10.0 ESSENTIAL FISH HABITAT

10.1 Introduction

In 1996 Congress reauthorized the Magnuson Steven Fishery Conservation and Management Act (Magnuson-Stevens Act), which required NMFS to describe and identify essential fish habitat (EFH) for the fishery based on the guidelines established by the Secretary under section 305(b)(1)(A), minimize to the extent practicable adverse effects on such habitat caused by fishing, and identify other actions to encourage the conservation and enhancement of EFH. In doing so, Congress recognized the importance of habitat in maintaining viable and sustainable fisheries. EFH is defined as those habitats necessary to the species for spawning, breeding, feeding, or growth to maturity. The EFH guidance published on January 17, 2002 (67 FR 2343) stated that EFH must be identified and described for each life stage and for all species in the fishery management unit (FMU), as well as the physical, biological, and chemical characteristics of EFH, and, if known, how these characteristics influence the use of EFH by each species and life stage. FMPs and FMP amendments must provide written descriptions of EFH and must also provide maps of the geographic locations of EFH or the geographic boundaries within which EFH for each species and life stage is found (Magnuson-Stevens Act, 16 U.S.C. 1801 *et seq*.).

EFH guidance published on January 17, 2002 (67 FR 2343), states that NMFS should periodically review and revise or amend the EFH provisions as warranted based on available information. The EFH regulations further state that NMFS should review all EFH information at least once every five years. EFH, including habitat areas of particular concern (HAPCs), for HMS were identified in the 1999 HMS FMP. This amendment constitutes the comprehensive five-year review of EFH for all HMS. The purpose of the EFH review is to gather any new information and determine whether modifications to existing EFH descriptions and delineation's are warranted. While NMFS has presented new information relative to HMS EFH in the annual Stock Assessment and Fishery Evaluation (SAFE) reports, this is the first comprehensive review of all new information related to EFH that has been completed since 1999.

NMFS does not intend to modify any of the existing EFH descriptions or boundaries in this FMP. Rather, NMFS is presenting new EFH information and data collected since 1999, and requesting public comment on any additional data or information that may need to be included in the five-year review. Based on an assessment of the data collected thus far, NMFS has made a preliminary determination that modification to existing EFH for some species and/or life stages may be warranted. Any modifications to existing EFH descriptions and boundaries would be addressed in a subsequent FMP action. In order to consolidate EFH descriptions and maps previously provided in separate documents, all of the EFH descriptions and maps from the 1999 FMP, Amendment 1 to the FMP, and Amendment 1 to the Billfish FMP are provided in this FMP. Maps in this FMP include data acquired through the review process, and will provide an opportunity for public comment on the need for any additional information to be considered. These maps can be found in Appendix B.

To further the conservation and enhancement of EFH, the EFH guidelines encourage FMPs to identify HAPCs. HAPCs are areas within EFH that meet one or more of the following criteria: they are ecologically important, particularly vulnerable to degradation, undergoing stress from development, or they are a rare habitat type. HAPCs can be used to focus conservation efforts on specific habitat types that are particularly important to the managed species. Currently, only three HAPCs for sandbar sharks have been identified, including: three separate areas off North Carolina; Chesapeake Bay, MD; and Great Bay, NJ (NMFS, 1999). Although no new HAPCs have been identified since the 1999 FMP, and none are proposed in the current Amendment, NMFS may consider alternatives for HAPC identifications in a subsequent FMP action, based upon information provided by experts in the field or from other information gathered during this review. Once additional information is compiled and analyzed for the five-year EFH review, additional HAPC alternatives may be proposed.

Additionally, FMPs are required pursuant to the EFH guidelines to identify fishing and non-fishing activities that may adversely affect EFH. Each FMP must include an evaluation of the potential adverse impacts of fishing on EFH designated under the FMP, including effects of each fishing activity regulated under the FMP; also the effects of other Federal FMPs and non-Federally managed fishing activities (*i.e.*, state fisheries) on HMS EFH. FMPs must describe each fishing activity and review and discuss all available relevant information such as the intensity, extent, and frequency of any adverse effects on EFH; the type of habitat within EFH that may be adversely affected; and the habitat functions that may be disturbed (§ 600.815(a)(2)). If adverse effects of fishing activities are identified, the MSA requires that these effects on EFH are minimized to the extent practicable (MSA § 303(a)(7)).

NMFS completed the original analysis of fishing and non-fishing impacts in the 1999 FMP, and is now presenting information gathered during the five-year review, including all fishing and non-fishing impacts. Considerable new information is available regarding gear impacts that have been incorporated into this review. For example, new information presented in the Gulf of Mexico and Caribbean Fishery Management Council EFH FEIS's (2004) suggest that bottom longline gear may have an adverse affect on coral reef habitat which serves as EFH for certain reef fishes. As a result, NMFS has made a preliminary determination that bottom longline gear may have an adverse affect on EFH for other Federally-managed species. An assessment of whether HMS bottom longline gear is fished in coral reef areas, and if so, the intensity, extent, and frequency of such impacts, including any measures to minimize potential impacts, will be addressed in a subsequent rulemaking.

10.2 EFH Five-Year Review Process

The original identification and description of EFH for HMS was completed for tunas, swordfish, and sharks in the 1999 FMP, and for billfish in the 1999 Amendment 1 to the Billfish FMP. Amendment 1 to the 1999 FMP included a review and update of EFH for five shark species. EFH for these species was updated based on either a change in management status (*e.g.* from overfished to not overfished or vice versa) or based on new information that had become available. Species for which management status had changed included the blacktip shark (*Carcharhinus limbatus*) (no longer overfished), sandbar shark (*C. plumbeus*) (overfishing is occurring), and finetooth shark (*C. isodon*) (overfishing is occurring). Species for which new information had become available included the dusky shark (*C. obscurus*) and nurse shark

(*Ginglymostoma cirratum*). As described above, these updated descriptions and maps are included in this Amendment.

As part of the five-year review process, a search of all new literature and information on HMS EFH was undertaken to assess habitat use and ecological roles of HMS EFH in the FMU. Published and unpublished scientific reports, fishery independent and fishery dependent datasets, and expert and anecdotal information detailing the habitats used by the managed species were evaluated and synthesized for inclusion in the five-year review process in this FMP Amendment (See Section 10.3). Ongoing research on the biology, ecology, and early life history of Atlantic HMS, and research and publications relating to HMS EFH, are described in greater detail below.

10.2.1 Descriptions of Datasets Used in the Review

A number of different data sets from state, Federal, and non-governmental organizations were compiled during the review process. For the most part, these are updated version of the same data sources that were used for the original 1999 EFH identifications. One new data set, from the Cooperative Atlantic States Shark Pupping and Nursery (COASTSPAN) program, was initiated in 1998 by the Northeast Fisheries Science Centers (NEFSC) Apex Predator Program (APP). Although several of the data sets described below appear to be focused on a particular species, there may be an overlap in the species that are documented, particularly in the tagging programs. For example, the Cooperative Shark Tagging Program (CSTP), described below, includes data on 114 adult white marlin tagged between 1964 and 2002, and 318 juvenile white marlin tagged between 1967 and 2003, even though the primary focus is on Atlantic sharks.

The CSTP, managed by the NEFSC APP, provides one of the most comprehensive, long-term data sets available on Atlantic sharks and, to a lesser degree, swordfish, tunas, and billfish. The CSTP data set has a continuous time series of observations dating back to 1962. Between 1962 and 2004, more than 171,000 sharks of 52 species have been tagged and more than 10,000 sharks of 33 species have been recaptured. Information is collected by distributing tags to scientists and commercial and recreational fishermen who record information on the species, capture or tagging location, date, gear, and size of the tagged fish prior to its release.

The Cooperative Tagging Center (CTC) operated by the Southeast Fisheries Science Center's (SEFSC) was established in 1992 in response to expansion of tag release and recapture activities, data requests from other tagging agencies, and domestic and international tagging research needs. The CTC runs the Cooperative Tagging System (CTS), and other projects aimed at tagging research and cooperative work with endangered species emphasizing highly migratory species such as tunas and billfishes. The CTC collects catch, effort, tagging, and bio-profile data on tunas and billfish to monitor trends in abundance.

The Commercial Shark Fishery Observer Program (CSFOP), also referred to as the Shark Observer Program (SOP), administered by the Florida Museum of Natural History, University of Florida, has been collecting information on the directed shark bottom longline fishery since 1994. A voluntary program for many years, it became mandatory in 2002. Trained observers collect fishery-dependent information on the location of each longline set, species composition, number of each species caught, disposition of the catch, and information on individual sharks such as length and sex. The coverage for this data set extends from the Atlantic east coast to the

Gulf of Mexico. Data from this program are essential to monitoring the fishery and providing distributional information for many different shark species.

The Pelagic Observer Program (POP), administered by SEFSC in Miami, has been monitoring the commercial pelagic longline fishery since 1992. The program places trained observers aboard commercial fishing vessels, monitoring the U.S. pelagic longline fleet in the Atlantic and Gulf of Mexico. Observers collect information on location, number of fish caught per set, species identification, sex, length, and weight for swordfish, sharks, tunas, and billfish. The POP targets approximately 10 percent of the vessels based on the fishing effort of the fleet, and supplies data on all species included in the 1999 FMP.

The COASTSPAN program, also administered by the NEFSC, APP, has been collecting information on shark nursery areas for several Atlantic east coast states since 1998. The purpose of these surveys is to assess the geographical and seasonal extent of shark nursery habitat, determine which shark species use these areas and gauge the relative importance of these coastal habitats. NOAA scientists, state and university researchers monitoring shark populations in Delaware, North Carolina, South Carolina, Georgia, and Florida collect the information. In 2002, a synthesis document of research including several other states bordering the Atlantic east coast and Gulf of Mexico was completed, resulting in additional information on shark EFH. The information included in this data set was derived through a variety of collecting methods including longline, gillnet and trawl surveys, and standardized to include information on location, species, length, and data source.

The Southeast Fishery Longline Shark Survey, administered by the SEFSC, Pascagoula Laboratory, has been conducting biological surveys to assess the relative abundance and distribution of coastal sharks since 1995. Biological data is collected from all captures and associated environmental data is recorded from each longline location. Most of the sharks captured are tagged and released. The longline surveys provide a useful fisheries independent database for sharks.

The Mote Center for Shark Research (CSR), operated out of the Mote Marine Laboratory (MML), includes data on sharks and any tuna and billfish bycatch. MML is an independent, nonprofit marine research institution with a nearly 50-year history of shark research, including: collecting angler tag data to provide basic biological information on shark migrations, age and growth studies, natural mortality studies, and investigations on behavior and habitats.

The Southern Atlantic SEAMAP Shallow Water Trawl Survey, administered by the South Carolina Department of Natural Resources is a state sponsored public tagging program. Over the past twenty-seven years, close to12,000 anglers have participated in the program. Over 100,000 fish have been tagged with an overall recovery rate of around 13 percent. Species tagged include sharks, tunas, and billfish. For example, a blue marlin tagged through SEAMAP became the first documented Atlantic blue marlin to cross the equator. This marlin was tagged off Georgetown, South Carolina and was recaptured several months later 750 miles off the coast of Brazil. It had traveled approximately 4,300 nautical miles from its original tagging location.

The Virginia Institute of Marine Science (VIMS) longline survey began in 1973 and is still continued today. This project allows VIMS scientists to assess the abundance of local shark stocks and to monitor changes in this abundance over time. The survey is a depth-stratified field survey of the Chesapeake Bay and Virginia coastal waters.

The Billfish Foundation (TBF) is a non-profit organization that has been collecting data on billfish tagging for a number of years, and providing the data to the NMFS SEFSC. TBF developed the widely used hydroscopic nylon tag head, which has been employed in offshore and inshore fisheries tagging efforts. In addition, TBF has contributed to the development and use of satellite tagging technology for marlin.

In addition to these data sets, data were obtained from individual researchers involved in shark, tuna, swordfish, and billfish research. For example, in 2002, a synthesis document of shark nursery research conducted along the U.S. Atlantic and Gulf of Mexico coasts was initiated, resulting in additional information on shark EFH. The data collected by the various researchers were synthesized into a single standardized data set to provide a comprehensive view of shark nursery and pupping areas in state waters. The information included in this data set was derived through a variety of collecting methods including longline, gillnet and trawl surveys, and standardized to include information on location, species, length, and data source.

The Pelagic Longline Logbook (PLL), a comprehensive fisheries dependent logbook reporting system, was also compiled during the review, but could not be included in the maps due to the lack of size information. The PLL data include, among other things, targeted species caught, bycatch, effort, and gear. However, since EFH descriptions are based on different lifestages of HMS, information on sizes is required for EFH mapping and analysis. Thus, NMFS was only able to use the PLL data to confirm the presence of HMS in areas that appeared to be outside of the normal distribution range of points from other data sets.

10.2.2 Methods Used to Map and Analyze EFH Data

The overall approach used to analyze data and identify EFH is described in the EFH regulations (§ 600.815(a)(1)) and was followed during the initial identification of HMS EFH in 1999, as well as during this five-year review. The regulations recommend using an organizational approach of categorizing data according to different levels. The regulations require that, at a minimum, distribution data (level 1 information) be used to identify EFH. This level 1 information is based on presence/absence data of the species or life stages in specific habitats used. Where possible, data sets and information on habitat-related densities of species (level 2), growth, reproduction and survival within habitats (level 3), and production rates by habitat (level 4), should be used to identify EFH. Distribution data (level 1) are the most common data available for HMS. As described in further detail below, the interpretation and application of these data are subject to certain limitations.

As part of the review process NMFS scientists who have expertise working with HMS were consulted to determine whether the data included in the updated maps for this amendment were appropriate, whether appropriate size ranges for species' individual life stages applied to the mapped data points, and whether modifications to existing EFH areas may need to be considered in the future. For mapping purposes, there were no changes to the size ranges for the

three lifestages of tunas, swordfish, or billfish from the 1999 FMP. However, the naming conventions for the life stages were modified slightly to provide clarity and help distinguish between them. Size ranges for each of the species' life stages are indicated on the bottom of each of the maps. Due to a lack of published literature on length-at-age data for several HMS, NMFS changed the 1999 categories for size classes of tunas, swordfish, and billfishes from juvenile/subadults to juveniles only. NMFS is aware of the inherent difficulties in accurately determining the size, sex, and in certain cases, species for classification purposes (described in more detail in section 10.3).

After reviewing published scientific reports and consulting with experts in the field, NMFS believes that several of the size ranges for various life stages of sharks may need to be changed from those described in the 1999 FMP. Identifications and descriptions of shark life stages by size are provided in Appendix B. The data points on the maps provided in this Amendment represent these new size ranges. The data points reflect a "neonate" life stage (where available) and do not contain an "early juvenile" life stage, as was the case in the 1999 FMP. The 1999 definition was modified to include primarily neonates and young-of-the-year sharks in the neonate category in order to better define and identify the life stage that occupies nursery habitat. The change in classification of "late juveniles/subadults," to "juveniles" was done to ensure that all immature sharks from young juveniles to older or late juveniles were included in the juvenile category. Finally, the "adult" size class still consists of mature sharks based on the size at first maturity (some variation from 1999) for females of the species. Similar modifications to other HMS species' size ranges may be undertaken in the future.

After careful screening to ensure standardization and quality of the data, all of the data points for each species were compiled in a Geographic Information Systems (GIS) program for mapping. By combining all of the data sets, the number of observations for an individual life stage for a single species ranged from several hundred to over 18,000. Each observation included at a minimum the species, size, life stage, latitude and longitude coordinates, date of collection, sex, and data source.

Identifying areas with the highest concentration of observations was determined by superimposing individual observations on a regional grid covering coastal waters in the U.S. Exclusive Economic Zone (EEZ). The grid was constructed of ten-minute squares that are all equal to 0.0279 square degrees or 100 square degree minutes[1]. The grid and individual data points were spatially joined and each square was given a summary of the numeric attributes and a count field of the points that fell inside it. Depending upon the species, the number of observations per 100 square degree minutes ranged from zero to several thousand. The squares containing observations were color-coded depending upon the number of observations per square, and scaled to reflect the frequency of occurrence.

[1]A minute of latitude equals a nautical mile, but the distance represented by a minute of longitude varies according to distance from the equator. Thus, ten minute "squares" are larger in size near the equator and get progressively smaller in size as you approach the poles.

A grid was used rather than individual data points so that reviewers could determine the relative concentration of fish in a given area, something that is difficult to determine with overlapping data points. However, the grid and associated scale are not meant to represent abundance or density estimates. In addition, the grid will be helpful in future efforts to revise existing boundaries by providing a scale that can be used as a guide for the inclusion or exclusion of given areas. For example, in Amendment 1 to the FMP, criteria (presented here for reference only) for including or excluding a given number of observations per square were established for each species based on the status of the stock, and used as a guide for identifying appropriate EFH areas. For a rebuilt species like blacktip shark, a criteria of greater than 10 observations per 100 nm^2 was used to help identify and map areas as EFH. For an overfished species such as finetooth shark, a more precautionary criteria of > 1 observation per 100 nm^2 was used to help identify and map EFH areas.

Due to natural variability in abundance for different species and lifestages, which is reflected by the variation in the number of observations per 100 nm^2, the relative concentrations were tailored to each species. NMFS adopted this approach because it made the data easier to view and analyze, but there may also be a benefit to a uniform scale for certain species and lifestages.

10.3 Summary of Review and Findings

As part of the review process, NMFS provided draft maps of the 1999 EFH boundaries overlayed both new and existing data for each HMS to technical reviewers for their feedback and comment. Several reviewers raised concerns regarding identification of EFH for a number of reasons described in further detail below. The comments ranged from questions regarding size classifications for various species' life stages to potential errors in species identification. NMFS is providing a summary of these comments and observations so that the public and others reviewing the current distributions and maps will have a better understanding of the issues involved in interpreting the data, and ultimately modifying EFH.

One of the overarching comments was the challenge of identifying EFH for tunas, swordfish, billfish, and sharks, and the limitations of relying too heavily on distribution data alone. By nature, these species are highly migratory and occupy a wide range of habitats including estuarine, coastal, and offshore pelagic environments. HMS are typically associated with oceanographic features such as fronts, current boundaries, temperature discontinuities, or water masses with particular physical characteristics, which may be ephemeral, difficult to map, and difficult to correlate with specific periods in which they are occupied by HMS. Other features such as shelf edges and sea mounts are more easily identified and may be sites of higher abundance for some HMS on a seasonal basis. In the past, areas with readily identifiable geographic or bathymetric features that coincided with, or overlapped with areas of HMS aggregations, were used to delineate the boundary, or a portion of the EFH boundary. Where expert opinion was available and data points were scarce, areas were identified as EFH based on the best interpretation of life history accounts.

Distribution data alone may not provide sufficient information on whether the habitat should be considered essential even if correlations can be drawn between the presence of HMS

in a given area and a particular habitat. For many HMS, additional information from surveys, or observations of feeding or spawning activity may be used to further confirm the importance of the habitat. Information about the life history of a particular species, such as the timing of the reproductive cycle, may also be used to correlate the presence of HMS in an area. However, as described in greater detail below, these types of correlations are difficult to confirm, are not well documented in the scientific literature, and should be viewed with caution. Due to difficulties in identifying EFH, a precautionary approach of selecting large areas has been used in the past.

EFH information for most of the data sets described above is based on distribution information (level 1) derived from systematic presence/absence sampling and relative abundance (CPUE) data. Level 2 density information (*i.e.*, number of sharks/m^3) is generally not available due to the types of gear used to collect HMS. For example, data from the McCandless *et al.* (2002) report on shark nursery areas in coastal waters were gathered using a wide variety of sampling techniques including gillnet, longline, and trawl surveys. Of the 15 separate research studies conducted from New York to Texas that contributed to the McCandless *et al.* report, only one provided trawl data that might have been used to generate habitat related densities. Additional equipment would have been needed to collect information on water volume sampled in order to estimate densities. The other sampling techniques (gillnet and longline) provide presence/absence or relative abundance through CPUE data (*e.g.* number of sharks/gillnet hour, or number of sharks/100 hooks), but not density data. Additionally, due to the differences in fishing effort, a cross comparison of CPUE among the different studies was not possible. Due to the types of gear used to sample other HMS (longline, rod and reel, handline, harpoon), similar difficulties are encountered for nearly all HMS. However, the information may nonetheless prove to be useful in providing a broad overview of the regional distributions, habitat requirements, and nursery areas for a wide variety of species.

Despite the lack of density information, other valuable information may be derived from studies such as these, including data on growth rates from recaptured tags and habitat utilization information through sampling, telemetry, and tagging efforts. By determining the life stage of a species at capture, through size measurements, additional information may be derived about habitat utilization. Information on where and when HMS are located in a given area, how long they may have been in the area, when migrations occur, and whether they return to the same area in subsequent years may be determined. In combination, all of these data help to determine habitat value and provide a more complete overview of habitat utilization than simple distribution data might suggest.

To the extent possible, these and other types of information from studies of life history dynamics of HMS, reports, and expert opinion are utilized to identify EFH. The sources that were used to identify EFH areas are referenced in the text. When environmental information was available, it was included in the EFH descriptions. The information included temperature, dissolved oxygen, salinity ranges, depths, seasons, and geographic locations. The textual accounts for each species serve as the legal description of EFH, and where environmental characterizations are known they have been included. Maps are provided as supplemental material to facilitate the description and identification of EFH.

Additionally, NMFS conducted a review of new publications related to HMS EFH and has provided a summary of ongoing EFH research efforts. For each of the HMS groups, the major issues involved with identifying and describing EFH are discussed in greater detail below. One of the major considerations for any future adjustments to existing EFH boundaries will be whether the existing areas can be refined. Currently, HMS EFH encompasses the entire U.S. EEZ from the U.S. Atlantic and Gulf coast to the border of Mexico. One of the objectives of the proposed modifications in the future would be to reduce the scope of HMS EFH while still providing the maximum amount of habitat protection. This may require additional research on HMS habitat use which could be related to landings and logbook data to establish definitive relationships between fish presence and what is deemed essential fish habitat.

10.3.1 Tunas

In recent years, archival tags and popup satellite tags (PSATs) have been used to successfully monitor ocean-wide movements of giant bluefin tuna as well as other HMS (Block *et al*., 2001, 2005, Lutcavage *et al*., 1999). This technology has greatly expanded the understanding of migratory patterns, reproductive behavior, and habitat use for bluefin tuna as well as other HMS such as blue and white marlin (NMFS, 2004). However, despite these advances, there are considerable gaps in the understanding of habitat requirements as they relate to identifying EFH for tunas. Accurate identification of certain species of tunas can be difficult unless one has sufficient knowledge to check for appropriate distinguishing characteristics. This is particularly true for planktonic larval stages of all tuna species and adult stages of bigeye and blackfin tuna. For example, bigeye tuna may easily be mistaken for blackfin tuna, and can only be positively distinguished from one another by examining the liver and gill rakers. Reviewers raised concerns regarding presence of a high number of bigeye tuna in the Gulf of Mexico, which are much more rare than blackfin tuna, and which may have been misidentified. The distribution maps for bigeye tuna indicate a significant number of observations in the Gulf of Mexico that may need to be reviewed and reanalyzed for accuracy prior to any modifications being made to existing boundaries (J. Lamkin pers. comm.).

The Tag A Giant (TAG) program is a collaborative effort among scientists from Stanford University, the Monterey Bay Aquarium, and NMFS which continues to place electronic tags internally and externally on Atlantic bluefin tuna in the North Atlantic to continuously record data. TAG deployed 201 archival and 37 pop-up satellite archival tags (PSATs) over the past two years, during which time 21 archival tags were recovered, more than a third of which were recaptured east of the 45 degree management line. The program has collected over 13,000 geopositions obtained from 330 bluefin tuna. It is now possible to examine data in relation to year class, season, and spawning grounds visited. Bluefin tuna tagged in the western Atlantic have migrated to both the Mediterranean and Gulf of Mexico spawning grounds. Most migration to spawning grounds in the Gulf of Mexico occurred in the spring months where spawning fish appear to prefer mesoscale cyclonic eddies in the western Gulf. Results indicate that spawning occurs in the Gulf of Mexico primarily during the months of April to June (Block *et al*., 2005).

The results attained from the TAG program detail the movements and behaviors of Atlantic bluefin tuna. These data answer questions about habitat preferences, spawning and feeding grounds, spawning site fidelity, the level of mixing between eastern and western stocks, and how movements are influenced by age class and season. Linking biological data with environmental

data can assist in understanding relationships between the bluefin's physical environment and its behavior, movements, abundance and distribution; leading to predictive models enabling researchers to estimate the abundance and distribution of bluefin based on oceanographic features, season, and year class. This information is being collected primarily for ICCATs consideration in updating management strategies and quotas that reflect the bluefin tunas life history in the Atlantic Ocean.

Data collected to date consistently show that spawning occurs primarily after the bluefin reach 10 years of age. Bluefin tuna that are 8.5 years and younger tend to remain near New England in the summer and fall whereas older fish move offshore, many traveling to the east of the 45 degree management zone to the Mid-Atlantic Bight and Flemish Cap. Seasonal patterns are also apparent. Bluefin tuna remained in the coastal and offshore waters of North Carolina and the South Atlantic Bight throughout the winter months, predominately over the shallow continental shelf. In the spring, most fish move north depending on age class, where they remain for the summer before returning to the south in the fall. The movements among regions appear to be dependent on temperature.

In 2002 and 2003, the TAG program expanded tagging efforts to New England, off the coast of Nantucket to spread efforts over a broader area. In 2003, efforts were expanded to the eastern Atlantic off the coast of Ireland where the program has obtained the first data on a new group of fish that have not yet been studied with this technology. Deploying tags off Ireland will also increase the likelihood of documenting the behaviors of fish spawning in the Mediterranean for comparison to those spawning in the Gulf of Mexico. The improved understanding of bluefin movements and behaviors has important applications for management, and can serve as the basis for necessary changes in current management strategies.

Beginning in 1997, studies led by the New England Aquarium have implanted pop-up and pop-up archival satellite tags (PSATs) on northern Atlantic bluefin tuna. Recent studies involved the implantation of PSATs into 68 Atlantic bluefin tuna in the southern Gulf of Maine and off the coast of North Carolina between July 2002 and January 2003 (Wilson *et al*., In Press). Most of the fish tagged in the southern Gulf of Maine in late summer/early fall remained in that area until late October, consistent with previous studies. Of the 33, 14 remained in northern shelf waters (between Maryland and Nova Scotia), 14 moved south to waters off the coasts of Virginia and North Carolina, and five were in offshore waters of the northwestern Atlantic Ocean. In the spring, six of the 11 fish either stayed in northern waters or moved to that area from Virginia and North Carolina waters, and the other five fish moved offshore into the Mid-Atlantic Ocean. Similar seasonal movement patterns have been shown by individuals tagged in coastal waters off North Carolina. During the winter months, these fish remained either on the Carolina shelf or in offshore waters of the northwestern Atlantic Ocean and moved offshore along the path of the Gulf Stream in spring. By summer, many were in northern shelf waters.

Swimming depth was significantly correlated with location, season, size class, time of day, and moon phase. The greatest depth recorded was 672 m (2,218 ft), and fish experienced temperatures ranging from 3.4° to 28.7°C (38° to 83.7° F). The data show that Atlantic bluefin tuna spend the majority of their time in the top 20 m (66 ft) of the water column, descending

occasionally to depths in excess of 500 m (1,650 ft). The vertical behavior of bluefin tuna differed among locations, with shallower swimming depths occurring when the fish were in inshore waters.

A recent study of the diet and trophic position of bluefin tuna in coastal Massachusetts and the Gulf of Maine used stable isotope analyses to investigate feeding habits of bluefin tuna. The results suggest that bluefin tuna feed on a variety of schooling fish, including silver hake, Atlantic mackerel, and Atlantic herring (Estrada *et al*., 2005). Juvenile bluefin tuna appear to have isotopic nitrogen signatures similar to those of suspension feeders, suggesting that nektonic crustaceans or zooplankton may contribute significantly to the diet of juvenile bluefin tuna (Estrada *et al*., 2005).

Combined, all of the studies and data are providing a higher resolution of potential spawning, feeding, and other important habitat areas for bluefin tuna. Given that there is a considerable and growing body of science on bluefin tuna, it may be one of the species for which NMFS may consider modifying the boundaries in the future. For example, although bluefin tuna spawning habitat has been described as encompassing nearly all of the Gulf of Mexico by Block *et al.* (2005), adult bluefin tuna EFH is limited to a smaller portion of the western Gulf of Mexico, and the adult EFH areas may not necessarily correspond to areas considered most likely as bluefin tuna spawning habitat (Block *et. al*., 2005). NMFS may need to reconsider these boundaries to account for new information being developed through PSAT technology and other means. Similarly, some of the highest individual counts of adult bluefin tuna (per 100 nm^2) have been observed off of North Carolina, yet these areas are not currently included as adult bluefin tuna EFH. Furthermore, the Southeast Fisheries Science Center is currently conducting a comprehensive review of larval distributions from 1984 to the present from ichthyoplankton collections in the northern Gulf of Mexico. Once larval movement due to local currents are accounted for these data may prove useful in the review of potential modification of EFH boundaries for other tunas as well.

In addition, the distribution and abundance of other tuna species (*i.e.*, albacore, bigeye, skipjack, and yellowfin tunas) have been attained through fishery data combined with other information such as remote sensing data. Many of these species have similar bioecological responses (*i.e.*, many species are specialized in high energy foraging strategies of sustained fast swimming, searching over large areas (Sharp and Dizon, 1978; Au 1986)) and therefore, have similar physiological responses to oceanographic conditions (Ramos *et al.*, 1996). Skipjack and albacore are highly migratory tunas with active thermic exchanges with the environment (Sharp and Dizon, 1978). Consequently, their distribution is influenced by changes in marine features at different spatial and temporal scales (Ramos *et al.*, 1996). For instance, both species are visual predators and are unable to efficiently capture small pelagic prey in colder turbid upwelled waters (Ramos *et al.*, 1996). Therefore, over small spatial and temporal scales, the most suitable areas based on the physiology and feeding strategies for these two species are the boundary between warm and cold water where food and other abiotic features are physiologically optimal (Ramos *et al.*, 1996). Over longer temporal and spatial scales, such as migration pathways, sea surface temperatures generated by the Intertropical Zone of Convergence play an important role (Ramos *et al.*, 1996). In addition, concentration of food and water quality (*i.e.*, higher temperature, high concentration of oxygen and low level of turbidity) lead to the concentration of

skipjack and albacore in their respective fishing grounds (the north-east Atlantic for albacore and Senegal waters 10 degrees North to the Canarian area 28 degrees North for skipjack; Ramos *et al.*, 1996).

Yellowfin tuna is a cosmopolitan species mainly distributed in the tropical and subtropical oceanic water of the three oceans. In the Atlantic Ocean, tagging and catch at size data analyses have shown that yellowfin tuna move at different scales in the whole tropical Atlantic Ocean (Maury *et al.*, 2001). Environmental conditions are probably the main causes driving migration phenomena and massive population movements (Mendelssohn and Roy, 1986; Lehodey *et al.*, 1997). Recent work by Maury *et al.* (2001) showed that on a large spatiotemporal scale (the whole ocean), low salinity was a good predictor of yellowfin habitat. Juveniles were mainly distributed in low-salinity waters (< 35 parts per thousand) whereas adults extend their range to water of 36 parts per thousand. This can be due to two reasons; for young tuna (<3 yrs old), salinity could be a marker of favorable feeding areas, such as low salinity levels in the Gulf of Guinea where freshwater runoff contains high levels of nutrients. Secondly, the metabolic cost of osmotic regulation could prevent young yellowfin tuna from reaching high salinity levels (Maury *et al.*, 2001). After breeding in the Gulf of Guinea, adults, however, disperse in an east-west fashion related to salinity and warmwater seasonal oscillations (Maury *et al.*, 2001). On a mesoscale (1000 km), north-south seasonal movements are clearly related to warmwater seasonal oscillations. Such seasonal migrations should be due to surface water temperatures where adults preferentially stay in zones of water temperature between 26 to 29 degrees C and where deeper waters are warmer than 15 degrees C. Juveniles stay in surface waters where the sea surface temperature is 27 degrees or higher (Maury *et al.*, 2001). Finally, at the local level (100 km), yellowfin tuna seem to be influenced by both local hydrological and biological features, such as tuna prey distribution and the spatial stability of water masses. For instance, the presence of floating objects, and the existence of small-scale hydrological events like local fronts or convergences can all be responsible for yellowfin concentrations (Bakun 1996).

Lastly, bigeye tuna are large epi-and mesopelagic fish that are found in surface waters ranging in temperatures from 13 to 29 degrees C (Collette and Nauen, 1983). However major concentrations coincide with the temperature range of the permanent thermocline, between 17 and 22 degrees C. Therefore, temperature and thermocline depth appear to be important environmental factors governing the vertical and horizontal distribution of bigeye tuna (Alvarado Bremer *et al.*, 1998). Such oceanographic features can have important implications for fisheries management; for instance, water temperature can prevent movement of fish between ocean basins, influencing stock structure (Alvarado Bremer *et al.*, 1998). On the basis of fisheries data, geographic distribution, tagging results, and the location of spawning and nursery areas, a single population is assumed to inhabit the Atlantic Ocean (ICCAT, 1997). For management purposes, both the Indian Ocean and Pacific populations are considered to be single units. Recent molecular work has indicated that the Atlantic and Indo-Pacific populations are two regions and genetically distinct (Alvarado Bremer *et al.*, 1998), confirming a single spawning stock of bigeye in the Atlantic and a single spawning stock in the Indo-Pacific. In the Atlantic Ocean, juvenile bigeye tuna have been observed only in the Gulf of Guinea (ICCAT, 1997). Tagging studies indicate trans-Atlantic movements of bigeye from the Gulf of Guinea to the central Atlantic

north of Brazil, and northerly migration from the Gulf of Guinea to the eastern Atlantic (ICCAT, 1997).

As with most other HMS, salinity and temperature appear to be primary factors influencing the distribution of tunas and may ultimately determine EFH. The challenge remains in identifying specific EFH areas based solely on environmental parameters; in most cases, distribution data may still provide the best indication of habitat preference of these different species. For additional EFH information on these tuna species, see Appendix B.

10.3.2 Swordfish

Based on a review of the swordfish maps and current distribution points, reviewers commented that additional research may be needed to validate the current size ranges for juvenile and adult swordfish. In addition, further analysis may be needed to determine whether certain areas have been used consistently over time. Analyzing spawning areas that are consistently used over a number of years may provide a better understanding of swordfish EFH. Several discrepancies in distribution points and EFH areas delineated in 1999 were noted, including a high concentration of observed occurrences of juvenile swordfish in an area north of Long Island Sound that was not defined as EFH in 1999. NMFS may consider modifying swordfish EFH boundaries in the future, particularly in the Long Island Sound area, and conversely, areas currently delineated as EFH that have few if any observed occurrences in the data sets being analyzed.

Pinpointing definitive EFH for spawning swordfish is difficult because research indicates that presence of larvae may not always be a sign that spawning occurred in the vicinity of the collection. Adult swordfish, and HMS in general, may move significant distances during spawning, and eggs and larvae may be transported substantial distances by currents as well. Govoni *et. al*. (2000) determined that since a swordfish egg's incubation period is 3 days at 24° C, with an additional 3 or 4 days for posthatch growth, along with an average velocity of the Gulf Stream of 1.5 m/s (Olson *et al*., 1994), larvae of 4 to 5 mm SL in the Atlantic could have been transported from as far away as 900 km. A similar trajectory was projected for small larvae of bluefin tuna (McGowan and Richards, 1989).

10.3.3 Billfish

Billfish do not associate with easily identifiable, relatively stable features such as a particular vegetation type or underwater structure. Rather, they show affinities for dynamic features in the water column such as temperature gradients. Because such water column features are dynamic, detailed delineation of billfish spawning, nursery, and feeding habitats are, for the most part, lacking. Adding to the difficulty of designating billfish EFH is that most of the literature on billfish larvae and juveniles mention them as incidental catches in studies that were directed at other species or that were concerned with characterizing ichthyofaunal or plankton communities as a whole (NMFS, 2004).

One of the key issues associated with delineating billfish EFH is the difficulty of accurately identifying billfish larvae. However, new molecular techniques are being developed that show promise (Luthy *et al.,* In Press). Without accurate identification of larvae, it is difficult

to draw conclusions on spawning areas, habitat associations, and requirements. Billfish larvae may be swept miles from actual spawning grounds before they are sampled. Thus, even though peak spawning periods for blue and white marlin are known to occur from May to June, there are significant issues related to positive identification of larvae that must be overcome to verify spawning locations. Research off Punta Cana, Dominican Republic, is one of the few instances on record where spawning by blue and white marlin was confirmed through simultaneous collections of both larvae and tracking of spawning adults using pop-up satellite tags (Prince *et al*., In Press).

Collaborative studies conducted by NMFS and University of Miami scientists using PSATs while simultaneously conducting adult and larval sampling off the Dominican Republic in the spring of 2003 have revealed important information concerning white and blue marlin spawning locations as well as horizontal and vertical movements. Co-occurrence of larval blue marlin and white marlin in samples suggest that the two species share a spawning location in the vicinity of Punta Cana, Dominican Republic. Adult white and blue marlin caught in the area appear to have similar vertical and horizontal movement patterns in terms of time at depth, time at temperature, average horizontal displacement per day, net horizontal displacement, and directional dispersion (compass heading).

Displacements of seven white marlin tagged with PSATs ranged from 31.7 to 267.7 nm (58.7 to 495.8 km), while displacement of one blue marlin was 219.3 nm (406.2 km). In general, all marlin spent a high proportion of the monitoring time in the upper 25 m (27 yd) and at temperatures at or above 28° C (82° F). Minimum and maximum depth and temperatures monitored show that on most days marlin visited depths of 100 m (330 ft) or more, but generally stayed at these depths less that 10 percent of the time. Minimum temperatures ranged from 16.8° to 20.6° C (62.2° to 69° F), while maximum temperatures ranged from 28.2° to 30.0° C (82.7° to 86° F). Additional research in other areas of the Gulf of Mexico and U.S. Atlantic coast would help improve understanding and delineation of billfish EFH (Prince *et al*., In Press).

The characterization of adult movements and larval distribution in a potentially important spawning area is paramount for establishing improved management and rebuilding strategies for depressed Atlantic billfish stocks. However, more information on the distribution of reproduction and nursery areas and on adult movement patterns is needed to help managers make more informed decisions regarding conservation of the resource.

Scientists at VIMS have been involved with electronic tagging of blue and white marlin since 1999, some of which has been conducted in conjunction with the NOAA SEFSC. More recently, VIMS has deployed over 60 pop-up satellite archival tags (PSATs) on white marlin during the past three years from both recreational sport boats and a commercial pelagic longline vessel to determine post-release survival (Prince *et. al*., In Press). In addition to this work, VIMS is also in the process of updating information regarding habitat preferences and vertical movements of white marlin using environmental data obtained from the PSAT work, as well as other environmental data. Most of the work at VIMS, however, remains focused on the interactions of billfish with the various fisheries (D. Kerstetter, pers. comm.).

There are a few considerations and limitations of these data that reviewers should keep in mind as they look at EFH determinations (E. Prince pers. comm.). Inaccurate EFH maps for billfish can be created because of boat side misidentification of billfish, sexual dimorphism, and criteria used in defining groups can result in both under and overestimates and ultimately impact the accuracy of the maps. The CTS is the main source of data for most for EFH billfish maps and it obtains size information of tagged, released, and recovered fish from constituents based mostly on boatside estimates of fish size. This approach introduces a significant amount of error. In addition, most size estimates are made when the fish is underwater and the reflective index biases these estimates upwards by as much as 30 percent (E. Prince, pers. comm.).

Istiophorids are sexually dimorphic (size difference between sexes), with this being most severe for blue marlin. The maps provided in this amendment do not include a consideration of sexually dimorphic differences in size and thus the characterization of juvenile size limits on the maps may be quite different for male and female marlin. The tagging data only infrequently have recoveries that include gender, so separating the maps into males and females would not likely be practical, even though it would probably be more accurate (E. Prince pers. comm.). Furthermore, the accuracy of the maps for defining juvenile marlin based on size could vary depending on the criteria used in this definition. For example, if the differences between juvenile and adult marlin were based on the full compliment of adult characteristics, then this would result in quite different sizes compared to a definition based on whether the fish at that "adult" size were sexually mature.

Data from the CTS, which account for a significant portion of the overall data points for billfish, were historically recorded only to the nearest degree, and did not include minutes or seconds. As a result, reviewers will notice that certain data points that reflect a high number of observations are lined up along major lines of latitude or longitude, both in the Gulf of Mexico and the Atlantic coast. This may be an artifact resulting from the way in which tagging locations were recorded rather than the true points of highest observed occurrence. Depending on reviewer comments received on this aspect of the data, NMFS may consider removing these data points during future considerations of EFH boundaries. Therefore, as a result of technical reviewer comments, several changes to EFH boundaries may be considered in the future. These include, but are not limited to, potential modifications of EFH boundaries for blue and white marlin for the reasons stated above (E. Prince, pers. comm.).

10.3.4 Sharks

Significant progress has been made in recent years in identifying habitat requirements and EFH for sharks. The proximity of nursery and pupping grounds to coastal areas has provided research opportunities that do not exist for other HMS that spawn much farther from shore. Sampling has increased in a number of different locations under the auspices of several different programs (Cooperative Atlantic States Shark Pupping and Nursery Survey (COASTSPAN), Cooperative Gulf of Mexico States Shark Pupping and Nursery Survey (GULFSPAN), and others). The HMS Management Division is currently funding the COASTSPAN and GULFSPAN surveys, which began in 1998 and 2003, respectively. Considerable research has been devoted to determining the size ranges of the different shark life stages (neonate, juvenile, and adult). The size ranges for each species' lifestage used in this review as well as size ranges used in the 1999 FMP are presented in Table B.1, Appendix B.

The table reflects new information and updates to the 1999 FMP size ranges. Based on these size ranges, the distribution data have been mapped for each species and life stage.

The 1999 FMP highlighted the importance of coastal nursery and pupping areas in maintaining viable shark populations. It also identified continued delineation of shark nurseries as a research priority. As a result, several studies and cooperative research projects aimed at improving NMFS' understanding of EFH and shark reproductive habitat requirements have been undertaken since the 1999 HMS FMP.

In 2002, the COASTPAN project initiated a synthesis document of information on shark nursery grounds along the U.S. Atlantic east coast and the Gulf of Mexico. Researchers from universities and state and Federal agencies in twelve different states from Massachusetts to Texas contributed information to the preliminary report (McCandless *et al*., 2002; McCandless et. al., 2005). This information was included in updates to EFH for several shark species in Amendment 1 to the FMP, and is being incorporated into the data for the current review. Results for the 2003 sampling year were compiled and synthesized, and the final report is currently under review. Participants in the 2003 COASTSPAN survey included the North Carolina Division of Marine Fisheries, the South Carolina Department of Natural Resources, Coastal Carolina University, the University of Georgia's Marine Extension Service and the University of Florida's Program for Shark Research. Researchers from the National Marine Fisheries Service's Apex Predators Program and the University of Rhode Island conducted the survey in Delaware Bay. A total of 3,698 sharks were sampled in the 2003 COASTSPAN survey. Juvenile sharks sampled, tagged and released during the survey were the Atlantic sharpnose, blacknose, blacktip, bonnethead, bull, dusky, finetooth, nurse, sandbar, sand tiger, scalloped hammerhead, silky, spinner, and tiger sharks, and also the smooth and spiny dogfish. Environmental parameters for each sampling location were also measured to indicate habitat preferences. There were a number of tag recaptures returned by fishery biologists and commercial and recreational fisherman in 2003 from sharks that were tagged by COASTSPAN cooperators in previous years.

A final synthesis document entitled "Shark Nursery Grounds of the Gulf of Mexico and the East Coast Waters of the United States" is currently under review for publication by the American Fisheries Society. It is a compilation of 17 individual papers documenting shark distributions in coastal habitats similar to the project described above, but expanded to include several new studies. This document provides valuable information for the possible modification or inclusion of additional shark EFH.

In 2003, NMFS initiated the Cooperative Gulf of Mexico States Shark Pupping and Nursery (GULFSPAN) Survey to expand upon the Atlantic COASTSPAN Survey. States involved in the program during 2004, the second year of the program, include Florida, Mississippi, Alabama, and Louisiana. Sharks sampled, tagged, and released during the surveys included the Atlantic sharpnose, blacknose, blacktip, bonnethead, bull, finetooth, great hammerhead, sandbar, scalloped hammerhead, and spinner sharks. In addition, environmental parameters were measured qualitatively. The most abundant sharks included the Atlantic sharpnose, blacktip, and bull shark. The results of this study have been submitted for inclusion in the AFS synthesis document as well.

In Florida waters, most species captured were juveniles and young-of-the-year. Among sharks for all areas combined, the Atlantic sharpnose shark, a member of the SCS management group, was the most abundant shark captured, while the blacktip shark was the most abundant species captured in the (LCS) management group. The bonnethead shark was the second most abundant species captured in the small coastal group and overall was the third most encountered species. The remaining species commonly captured in decreasing order of abundance were the finetooth, spinner, scalloped hammerhead, blacknose, and sandbar sharks. Other species infrequently caught were bull shark, great hammerhead shark, and the Florida smoothhound.

In Mississippi/Alabama waters 75 percent of the sharks captured were immature. The blacktip shark was the most abundant species caught, followed by the Atlantic sharpnose, finetooth, and bull sharks. In Louisiana, in the 2004 sampling season; most species captured were juveniles. The blacktip shark was the most abundant species caught, followed by the bull shark. A single adult specimen of the finetooth shark with a single healed-scar, in addition to young-of-the-year Atlantic sharpnose shark were also collected in 2004.

New information on habitat preferences is also emerging from this study. Juvenile bonnethead sharks appear to prefer habitat dominated by seagrass (in northwest Florida) or mangroves (Louisiana), although these areas have not yet been identified as EFH. In areas where neither of these habitat types is available, juvenile bonnetheads are in very low numbers or absent (*i.e.* Mississippi Sound). Adult bonnethead sharks, however, are found in diverse habitats ranging from areas with a mud or sand bottom to areas dominated by seagrass. Evidence indicates bull sharks are found among the most diverse environmental conditions with salinities ranging from 15 ppt (in Louisiana and Mississippi) to 33 ppt (in northwest Florida), and over all habitat types. Within the Gulf of Mexico, most juvenile sandbar sharks are still predominately caught in the northwest portion while blacktip, finetooth, and Atlantic sharpnose sharks are found throughout all areas. Although bull sharks can be found over a variety of habitats, the areas of highest abundance are those adjacent to freshwater inflow.

Obtaining information regarding trophic relationships and feeding habits of sharks, also critical to understanding essential fish habitat, is another goal of the GULFSPAN program. A quantitative examination of feeding ecology from different areas can assist in understanding how juvenile sharks use nursery habitats, and which habitats are more valuable as nursery areas than others.

Mote Marine Laboratory's Cooperative Shark Research (CSR) program is focusing on identifying and understanding shark nursery areas of the U.S. Gulf of Mexico and southeast Atlantic coasts. Through tagging studies, this program aims to characterize these nursery areas, obtain estimates of juvenile shark relative abundance, distribution, and growth rates, and reveal the movement patterns of these sharks. As of fall 2004, the CSR has collected data on 20,732 sharks of 16 species that utilize these coastal waters as pupping and nursery areas. More than half of the captured sharks (12,241) comprise neonate, young-of-the-year (YOY) or older juvenile sharks. The studies found that most pupping activity in the region occurs in the late spring and early summer, and the neonate and YOY animals inhabit the primary nurseries throughout the summer and into the fall. Typically, declining water temperatures in the fall are associated with the southward movement of sharks from these natal waters to warmer and in

some cases offshore, winter nurseries. Tag returns of Year-1 sharks have demonstrated travel distances to winter nursery areas of at least 500 km (311 mi). Tag return data have further demonstrated annual cycles of philopatric behavior whereby juveniles of both large and small coastal species migrate back to their natal nurseries in spring and summer (Hueter and Tyminski, In Review).

In the 1999 HMS FMP, the smallest size class of sharks was described as "neonates and early juveniles." This definition has been modified to include primarily neonates and only small young-of-the-year sharks in order to better define and identify nursery areas. The total length cutoff for this size class is determined as the maximum embryo size in term females plus 10 percent. This criteria was used because it helps to eliminate some of the small one-year-old sharks that fall within the young-of the-year size range, making it easier to identify primary nursery areas (where pupping occurs and young-of-the-year are present). This criteria can also be more easily applied to other species given the lack of published data on growth rates for many species, especially during the first year. This modification should also better represent the habitat shift between primary nursery areas and secondary nursery areas (occupied by age 1+ sharks), although many species do overlap habitat use between these two size classes.

The middle size class designated in the 1999 HMS FMP, "late juveniles and subadults," has been renamed "juveniles". This size class includes all immature sharks from young juveniles to older or late juveniles. Some overlap between the "neonate and early juveniles" and the "adult" EFH areas may occur, depending on the species, due to the return to primary nursery areas by many juveniles, age 1+, and the developing conformity to adult migration patterns by late juveniles. As in the 1999 HMS FMP, the largest size class, "adults," still consists of mature sharks based on the size at first maturity for females of the species. Changes to the size range of the adult size class for some species have been made based on new information on the size at first maturity for females of those particular species.

As a result of technical reviewer comments, several changes to EFH boundaries may be considered in the future. These include, but are not limited to, potential modification of EFH boundaries for basking, hammerhead, white, bull, Caribbean reef, lemon, spinner, tiger, Atlantic sharpnose, blacknose, longfin mako, shortfin mako, oceanic whitetip, and thresher sharks (J. Castro and J. Carlson, pers. comm.). In summary, based on the preliminary examination of new information acquired since the original EFH identifications in 1999, and on comments from technical reviewers, modifications to some of the existing EFH descriptions and boundaries may be warranted. Any proposed modifications to existing boundaries, as well as consideration of any new HAPC areas, would be addressed in a subsequent document.

10.4 Threats to Essential Fish Habitat

10.4.1 Regulatory Requirements and Fishing Activities That May Affect EFH

Regulatory Requirement

The EFH regulations and the Magnuson-Stevens Act require the fishery management councils (Councils) and NMFS, on behalf of the Secretary of Commerce, to minimize adverse effects on EFH from fishing activities to the extent practicable. Adverse effects from fishing may include physical, chemical, or biological alterations of the substrate, and loss of or injury to benthic organisms, prey species and their habitat, and other components of the ecosystem. Based on an assessment of the potential adverse effects of all fishing equipment types used within an area identified as EFH, NMFS must act if there is evidence that a fishing practice is having an a more than minimal and not temporary adverse effect on EFH.

The EFH regulations also require that FMPs and their amendments prevent, mitigate, or minimize management measures that that may have adverse effects on EFH from fishing, to the extent practicable. Deciding if minimization of an adverse effect from fishing is practicable, NMFS must consider: (1) whether, and to what extent, the fishing activity is adversely impacting EFH and the fishery; (2) the nature and extent of the adverse effect on EFH; and, (3) whether the management measures are practicable, taking into consideration the long and short-term costs as well as the benefits to the fishery and its EFH, along with other appropriate factors consistent with National Standard 7 of the Magnuson Stevens Act. The best scientific information available must be used, as well as other appropriate information sources, as available.

This section includes an assessment of fishing gears and practices that are used in the Highly Migratory Species (HMS) fisheries to describe impacts to EFH and conservation recommendations or mitigation measures, as necessary.

10.4.2 Potential Impacts of HMS Fishing Activities on HMS and non-HMS EFH

Adverse effects from fishing may include physical, chemical, or biological alterations of the substrate, and loss or injury to benthic organisms, prey species and their habitat, and other components of the ecosystem. However, the degree to which fishing will impact EFH also depends on the substrate that makes up the EFH; certain substrates, such as complex coral reef habitat, will be more susceptible to damage due to fishing gears than will mud and/sand substrates or even the water column because of the extended time for habitat recovery. Below is a brief overview of HMS EFH followed by an assessment of HMS fishing gear impacts on both HMS EFH and non-HMS EFH.

10.4.2.1 HMS EFH Overview

From the broadest perspective, fish habitat is the geographic area where the species occurs at any time during its life. Habitat can be described in terms of location, physical, chemical and biological characteristics, and time. Ecologically, habitat includes structure or

substrate that focuses distribution (*e.g.*, coral reefs, topographic highs, areas of upwelling, frontal boundaries, particular sediment types, or submerged aquatic vegetation) and other characteristics that are less distinct but are still crucial to the species' continued use of the habitat (*e.g.*, turbidity zones, salinity, temperature or oxygen gradients) (NMFS, 1999a).

Species use habitat for spawning, breeding, migration, feeding and growth, and for shelter from predation to increase survival. Spatially, habitat use may shift over time due to changes in life history stage, abundance of the species, competition from other species, and environmental variability in time and space. Species distributions and habitat use can be altered by habitat change and degradation resulting from human activities and impacts, or other factors. The type of habitat available, its attributes, and its function are important to species productivity, diversity and survival (NMFS, 1999a).

The role of habitat in supporting the productivity of organisms has been well documented in the ecological literature, and the linkage between habitat availability and fishery productivity has been examined for several fishery species. Because habitat is an essential element for sustaining the production of a species, the goals of FMPs must include maintaining suitable habitat for the considered species (NMFS, 1999a). However, the quantitative relationships between fishery production and habitat are very complex, and no reliable models currently exist. Accordingly, the degree to which habitat alterations have affected fishery production is unknown. In one of the few studies that have been able to investigate habitat fishery productivity dynamics, Turner and Boesch (1987) examined the relationship between the extent of wetland habitats in the Gulf of Mexico and the yield of fishery species dependent on coastal bays and estuaries. They found reduced fishery stock production following wetland losses, and stock gains following increases in the areal extent of wetlands. While most of the studies examined shrimp or menhaden productivity, other fisheries show varying degrees of dependence on particular habitats and likely follow similar trends. Accordingly, a significant threat facing fishery production is the loss of habitat due to natural and/or anthropogenic causes (NMFS, 1999a).

HMS utilize diverse habitats that have been identified as essential to various life stages. Some billfish use both offshore and inshore habitats (*e.g.*, sailfish spawning in coastal habitats off southeastern Florida) (NMFS, 1999b). Many of the shark species use bays, estuaries and shallow coastal areas as crucial pupping and nursery areas (NMFS, 1999a). In most cases the neonates (newborn) and juveniles occupy different habitats than the adults. For example, neonate blacktip sharks are found in very shallow waters, juvenile blacktip sharks inhabit a variety of coastal habitats, and adults are found in both coastal and oceanic waters (Castro, 1993). There is little published information correlating life stages and migratory movements, and there are few descriptions correlating shark habitat use to physical habitat characteristics (but see McCandless *et al*., 2002). Parameters that could describe shark habitat are temperature, salinity, depth, dissolved oxygen, light levels, substrate, and food availability, although there are probably other important factors or requirements that remain unknown. Unlike certain reef or benthic fishes, it is difficult to draw definitive links between presence of a given species of HMS and characteristics of marine substrate (*i.e.* sand, SAV, cobble) or types or marine ecosystems (*i.e.* mangroves, seagrass beds, and coral reefs). For example, Amendment 1 to the HMS FMP updated the EFH for juvenile (37-221 cm TL) nurse sharks as:

Shallow waters from the shoreline to the 25 m isobath off the east coast of Florida from south of Cumberland Island, GA (30.5 N) to the Dry Tortugas; also shallow waters from Charlotte Harbor, FL (26 N) to the north end of Tampa Bay, FL (28 N); also off Puerto Rico, shallow coastal waters out to the 25 m isobath from 66.5 W to the southwest tip of the island.

In only a few cases for HMS are there particular bottom types that can be attributed to influencing the choice of habitats, *e.g.*, the bonnethead shark juvenile stages are associated with seagrass (Section 10.3.4). More typically, pelagic species (or life stages), such as the pelagic sharks, tuna and swordfish, are most often associated with areas of convergence or oceanographic fronts such those found over submarine canyons, the edge of the continental shelf, or the boundary currents (edge) of the Gulf Stream. Some species aggregate at frontal boundaries in the ocean, with floating objects (such as *Sargassum* for swordfish and billfish), or at bottom features such as the continental shelf break, submarine canyons, and even shipwrecks (NMFS, 1999b).

Occasionally, the aggregations form where a front or boundary lies above one of these bottom features. These aggregations are most likely associated with prime feeding grounds and, as such, these areas are identified as EFH. Although there is no substrate or hard structure in the traditional sense, these water column habitats can be characterized by their physical, chemical and biological parameters (NMFS, 1999a). The water column can be defined by a horizontal and vertical component. Horizontally, salinity gradients strongly influence the distribution of biota. Horizontal gradients of nutrients, decreasing seaward, affect primarily the distribution of phytoplankton and, secondarily, the organisms that depend on this primary productivity. Vertically, the water column may be stratified by salinity, oxygen content, and nutrients (SAFMC, 1998). The water column is especially important to larval transport. While the water column is relatively difficult to precisely define in terms of habitat characteristics, it is no less important since it is the medium of transport for nutrients and migrating organisms between estuarine, inshore, and offshore waters (SAFMC, 1998).

10.4.2.2 Impact of HMS Federally regulated gear on HMS and non-HMS EFH

Generally, HMS are associated with hydrographic structures of the water column, e.g., convergence zones or boundary areas between different currents. Because of the magnitude of water column structures and the processes that create them, there is little effect expected from the HMS fishing activities undertaken to pursue these animals. There are, however, some impacts that can be manifest on the biological or chemical characteristics of some of these sites, e.g., excess dead discards causing increased biological oxygen demand (BOD) (NMFS, 1999a). For fisheries in which gear does contact the substrate, there is certainly the potential for disturbance of the habitat. An analysis of the effects and the impacts they may have on the associated fisheries is complicated by the fact that scientists are not certain of the particular characteristics that draw the fish to these habitats (NMFS, 1999a).

Impacts of HMS fishing gears and practices were analyzed by examining published literature and anecdotal evidence of potential impacts or comparable impacts from other fisheries. An assessment was made based on this literature review of the gears and practices

employed in HMS fisheries to determine whether these fishing activities cause adverse impacts on HMS EFH and non-HMS EFH (Table 10.1). The degree of impact from fishing activities depends in large part on the susceptibility of particular habitats to damage. EFH varies in its vulnerability to disturbance, as well as its rate of recovery. A variety of gears are used to target HMS species. Fishing gears that are only associated with the water column are expected to have no impact on the benthic environment and minimal to no impact to the pelagic environment (Table 10.1). However, fishing gears that interact with the benthic environment can have an impact, depending on the composition of the benthos. For example, due to its simple composition, sediments (*i.e.*, sand, mud) are impacted to a lesser degree than a complex coral reef under similar treatments. Coral reefs are composed of numerous structures forming species, with many that grow vertically into the water column (*e.g.*, sponges, stony corals, gorgonians) and create a greater surface area than sediments (Barnette, 2001). The vertical profile and increased surface area of coral reefs allow gear to easily become snagged or entangled, thus providing more opportunities for habitat to be impacted from fishing as compared to sediments (Barnette, 2001). While NMFS and the Fishery Management Councils have jurisdiction only in Federal waters of the exclusive economic zone under the Magnuson-Stevens Act, estuarine and nearshore waters are critical to various life stages of many organisms; numerous managed species utilize estuaries and bays for reproduction or during juvenile development (Barnette, 2001).

Since most HMS are pelagic species that are predominantly found in the mid- to upper water column of the neritic environments, most HMS gears are fished in the water column, as opposed to bottom tending gears such as trawls and dredges that are used to target bottom-dwelling or benthic species. The exception is bottom longline gear, which could potentially have adverse effects on HMS and non-HMS EFH (Table 10.1). Bottom longlines principally target large coastal sharks in the EEZ between Texas and Maine. Typically they are placed in sandy and muddy bottom habitats where expected impacts would be minimal to low (Barnette, 2001). The 1999 NMFS EFH Workshop categorized the impact of bottom longline gear on mud, sand, and hard-bottom as low (Barnett, 2001). Bottom longline may have some negative impact if gear is set in more complex habitats, such as hardbottom or coral reefs in the Caribbean or areas with gorgonians, or soft corals and sponges in the Gulf of Mexico (Barnette, 2001, NREFHSC, 2002; Morgan and Chuenpagdee, 2003). Bottom longline set with cable groundline or heavy monofilament with weights can damage hard or soft corals and potentially become entangled in coral reefs upon retrieval, resulting in coral breakage due to line entanglement. However, the extent to which bottom longline gear is fished in areas with coral reef habitat has not been determined. This gear type is similar to that employed in fisheries targeting reef fish in the Gulf of Mexico and South Atlantic regions.

One of the only studies available regarding the impact of bottom longline gears is from submersible observations of halibut longline gear off the southeast coast of Alaska (NPFMC, 1992). For example, halibut longline gear generally consists of 5/16- inch nylon or polyester rope as groundline with 3-4 foot long twine gangions (branch lines) spaced at 3-18 feet. To the degree that Caribbean, Gulf of Mexico, and Atlantic longlines differ in construction from the Alaska longlines, potential damage will also differ. Unlike Alaskan fisheries, Atlantic longlines can use cable or heavy monofilament with weights for groundline. In addition, the Alaskan marine ecosystem is much different from that in the Caribbean, Gulf of Mexico, and Atlantic

Ocean in that it does not have tropical coral reefs. However, the Alaskan marine ecosystem does have sponges and other vertical relief, which makes it somewhat analogous to the Gulf of Mexico conditions, and therefore, may give some insight to the type of damage bottom longlines can cause. For instance, the shearing action of the longlines under tension would have similar results on sensitive vertical structure (Barnette, 2001). However, in instances where target species are attracted to the habitat due to hydrographic characteristics (*i.e.*, up-welling, convergences, etc.), the scale of impact from careless placement of bottom longlines is probably not of sufficient magnitude to affect the characteristics of the habitat. Bottom longline gear may have a detrimental effect on non-HMS EFH if it is placed in coral reefs, hard bottom or SAV habitats. However, bottom longline gear in HMS fisheries is primarily used in sandy and/or muddy habitats where it is expected to have minimal to low impacts.

Other HMS gears that contact the bottom are tuna traps and anchored gillnets. However, these are either so few in number that their expected impact is low (*i.e.*, there were only two tuna trap permit holders in 2004), or they are usually set in sand or mud areas where there is minimal to low impact on the benthic substrate, as is the case with anchored gillnets. In some cases, rod and reel or handlines (*i.e.*, "vertical gear") are used in areas with coral reefs and/or hardbottom, and impacts from these gears may include entanglement and minor degradation of benthic species from line abrasion and the use of weights (sinkers). Schleyer and Tomalin (2000) noted that discarded or lost fishing line appeared to entangle readily on branching and digitate corals and was accompanied by progressive algal growth. This subsequent fouling eventually overgrows and kills the coral, becoming an amorphous lump once accreted by coralline algae (Schleyer and Tomalin, 2000). Lines entangled among fragile coral may break delicate gorgonians and similar species. Due to the widespread use of weights over coral reef or hardbottom habitat and the concentration of effort over these habitat areas from recreational and commercial fishermen, the cumulative effect may lead to significant impacts resulting from the use of these gear types (Barnette, 2001).

Since most of HMS gears are fished in the water column, the impacts on EFH are generally considered negligible, minimal, or low. In other words, HMS gears do not affect the physical characteristics that define HMS EFH such as salinity, temperature, dissolved oxygen, and depth. Similarly, most HMS gears are not expected to impact other fisheries' EFH, with the possible exception of bottom longline, depending on where it is fished. Each of the HMS gears, the means by which they are fished, and their potential impacts on HMS and other species' EFH are described in the following section. However, no new management measures, and therefore no regulations, are proposed in this document. Rather, this document serves as an evaluation of fishing impacts on EFH and could help identify areas appropriate for HAPC and/or time/area closures in the future. NMFS is, however, currently exploring potential alternatives that could minimize the impacts of bottom longline, especially in areas of with hardbottom, hard and soft coral structure and sponges. For instance, bottom longlines used in the Caribbean reef fish fishery are typically 700 feet long. Potentially shorter longlines will likely do less habitat damage than longer longlines (Barnette, 2001). In addition, avoiding or reducing bottom longline effort on corals, gorgonians, or sponge habitat will minimize risk of habitat damage to these areas. The two following conservation recommendations are meant as precautionary measures, and should be used whenever possible in the event that impacts to coral reef or other hard bottom EFH habitat may be occurring but unverified: (1) fishers should take appropriate

measures to identify bottom obstructions and avoid setting gear in areas where it may become entangled; and (2) if gear is lost, diligent efforts should be undertaken to recover the lost gear.

The Gulf of Mexico and Caribbean Fishery Management Councils (GOMFMC and CFMC, respectively) are evaluating the impacts of several gear types, including bottom longline, on EFH areas identified under their respective reef fish and coral reef fisheries (GOMFMC, 2004; CFMC, 2005). Specifically, both Councils are evaluating measures to minimize the impacts of bottom longline gear on coral reef habitat identified as EFH for several of their managed species in areas adjacent to the Dry Tortugas Marine Reserve in Florida and the Gramantic Banks off of Puerto Rico. However, NMFS would first need to assess the extent of HMS fishing effort, if any, in these areas. And, if those measures are finalized, NMFS will consider further rulemaking, as necessary, for the Atlantic shark fisheries, because there may be overlap in fishery participants (NMFS, 2003).

In summary, according to the best science available to NMFS, NMFS concludes that most HMS gears are having minimal to no impact on HMS EFH or to other species' EFH. Bottom longline gear is one of the only gear types that could have an adverse effect on the benthic environment, especially if placed in coral reef, hard bottom or SAV habitats. However, bottom longline gear in HMS fisheries is primarily used in sandy and/or muddy habitats where it is expected to have minimal to low impacts. NMFS will be investigating whether the effects of bottom longline gear is more than minimal and not temporary in nature; NMFS does not currently have the data to make this assessment. However, NMFS is aware of actions being taken by the Gulf and Caribbean Fishery Management Councils to minimize fishing impacts in specific habitat areas described earlier. To provide consistency between the Council regulations and HMS regulations, NMFS may consider similar alternatives to prohibit HMS gears in those areas in a subsequent rulemaking. Other gear types that contact the bottom, such as tuna traps or anchored gillnets, are either so few in number, as in the case of the tuna traps, or are also used in sand or mud habitats, as is the case of the anchored gillnets, that there is expected to minimal cumulative impacts to the benthic environment from these HMS gear types.

Table 10.1. **Impact assessment of HMS fishing gear on HMS and non-HMS EFH. '-' indicates that the gear type is not used in these habitat types. Habitat impacts are as follows: negligible = 0, low = +, medium = ++, high = +++, unknown=?, and a blank indicates not evaluated.** Source: Symbols before the slash are from the Caribbean FEIS, 2004 (Table 3.15a). The symbols after the slash are taken from Barnette, 2001.

		Interactions Between HMS Fishing Gears and HMS and Non-HMS EFH *Habitat Type*					
		Estuarine/Inshore					**Offshore**
HMS Gear Type	Contacts Bottom	SAV	Coral Reef	Hard Bottom	Sand/Shell	Soft Bottom	HMS EFH Water column
Bandit Gear				/+			0
Bottom Longline	X	0/	+/	+/+	0/+	0/+	0
Handline		0/	+/	+/+	0/	0/	0
Harpoon							0
Gillnet, Anchored	X	+/+	++/	+/+	+/+	0/+	0
Gillnet /Strikenet							0
Pelagic Longline		0/0	0/0	0/0	0/0	0/0	0
Purse Seine, Tuna		0/?	0/	0/	0/+	0/+	0
Rod and Reel		0/	+/	+/+	0/	0/	0
Tuna Trap/Fish Weir	X	++/++	-	-	0/?	0/?	0

10.4.3 Potential Impacts of non-HMS Fishing Activities on HMS EFH

At this time, only limited information exists to relate fishing activities to habitat damage (Rester, 2000; Hamilton, 2000; Barnette, 2001; Johnson, 2002; NRC, 2002; Stevenson *et al.*, 2004), and the degree to which habitat damage affect fishery production to date is unknown (NMFS, 1999b). Therefore only a speculative, qualitative evaluation of the degree of impairment of the function of the habitat from fishing impacts can be made. This section provides an overview of potential impacts of non-HMS fishing gears on HMS EFH.

Nearly all HMS EFH is similarly defined according to the geographic boundaries of a given area as opposed to specific benthic habitat types that might be affected by fishing gears. However, for some species of sharks (blacktip, spinner, blacknose and finetooth) certain substrates, such as mud bottom and seagrasses in a specific area of Apalachicola and Apalachee Bay, have been identified as EFH (see Appendix B). For these specific coastal and estuarine habitats, them may be an impact on benthic habitats from bottom tending gears in state waters. Trawl fisheries that scrape the substrate, disturb boulders and their associated epiphytes or epifauna, re-suspend sediments, flatten burrows and disrupt seagrass beds have the potential to alter the habitat characteristics that are important for survival of early life stages of many targeted and non-targeted species. According to the GOMFMC (2004), bottom tending gears in this area consist of shrimp trawls and stone crab pots. The fishing impact index for these gears

in this area was assessed as being low (based on habitat type and fishing effort from 2000-2001) (Figures 3.5.24 and 3.5.27b; GOMFMC, 2004). Thus, the adverse effects of these gears on these species' EFH are expected to minimal. No other benthic habitat types have been identified as EFH for neonate or juvenile sharks (*i.e*., neonate and juvenile shark EFH has been designated based on depth, and/or isobath; Appendix B). Therefore, until such habitat types are identified and the degree of overlap and the extent to which habitat is altered by various bottom tending gears is known, NMFS cannot assess the impact of such gears on neonate and juvenile shark EFH.

The degree of impact and long-term habitat modification depends on the severity and frequency of the impacts as well as the amount of recovery time between impacts (Auster and Langton, 1999; Barnette, 2001). The extent to which particular parameters are altered by trawl gear is somewhat dependent on the configuration of the gear and the manner in which the gear is fished. Additional efforts are required to study HMS EFH areas that are fished for non-HMS species and identify fishing gears that impact these habitats in a "more than minimal and not temporary in nature" (50 CFR 600.815(a)(2)(ii)). In this regard, coordination efforts should be undertaken with the respective Councils to identify potential common areas. Research into the spatial distribution of these activities, the frequency of disturbance, and the short and long-term changes induced in the habitat are of primary importance. A better understanding of specific habitat types for HMS (the highest, most refined level of information available with which to identify EFH, and which is currently not available for HMS), and the habitat characteristics that influence the abundance of managed species within those habitats, is also needed in order to better understand the effects of fishing activities on habitat suitability for sharks (NMFS, 2003). The potential impacts of different gears with different habitats types are given in more detail in Barnette (2001), the Caribbean FEIS (2004), and Stevenson *et al*., (2004). Nonetheless, until specific habitat types are associated with HMS EFH, the degree to which these impacts will affect HMS EFH is currently unknown.

Besides altering the physical characteristics of EFH, other fisheries may remove prey species that make up the necessary biological components of HMS EFH. Many of these impacts have been addressed in other fishery management plans (*e.g.*, SAFMC, 1998; GMFMC, 1998) that focus on restricting the removal of attached species such as corals or kelp that provide essential structure in their respective habitats; however, for pelagic species other biological components must be considered. Some tuna and swordfish life stages have been found to be associated, or to co-occur, with floating mats of the brown algae, *Sargassum* sp. The mats are pelagic and are moved extensively by winds and currents. They are frequently found in convergence zones, windrows, or at current boundaries - areas that are EFH for many of the HMS life stages. Whether the floating mats serve as shelter, act as a source of prey (because of the abundance of prey species associated with them), serve as a means of camouflage, or serve some other biological function is not entirely clear. It is a biological component that may focus, particularly on the small scale, the distribution of certain life stages of tuna and swordfish, and it should be maintained as essential fish habitat.

Other biological components include forage species such as herring. Herring are extremely sensitive to noise and schools are known to disperse when approached by vessels or when disturbed by mid-water nets or purse seines (NMFS, 2005). This disturbance could be

interpreted as a potential impact on the pelagic habitat of juvenile or adult herring. The effect, however, is known to be temporary: schools of herring that are dispersed by vessels or mid-water trawls re-form quickly after passage of the boat or the net, within a matter of minutes (NMFS, 2005 are references therein). This may adversely affect the pelagic habitat for juvenile and adult herring, but the effects are minimal and temporary in nature and do not need to be minimized.

In summary, there are few anticipated impacts from other (*i.e.*, non-HMS) Federally regulated and non-Federally regulated gears on HMS EFH. Since most HMS EFH is defined as the water column or attributes of the water column (*i.e.*, temperature gradients, frontal boundaries, etc.), there are anticipated to be minimal or no cumulative impacts from non-HMS fishing gears. The only exceptions are nearshore and estuarine shark pupping grounds in the specific area described above and the effect of bottom tending gears in this area. Since benthic habitats have not been identified as EFH for neonate and juvenile sharks (with the exception of blacktip, spinner, finetooth and blacknose sharks in Apalachee Bay; see above), NMFS cannot currently assess the impact of these gears. If specific benthic habitat types (*i.e.*, SAV, mud, coral reefs, etc.) were to be identified as EFH for other sharks species, and the degree of overlap and impact of various bottom tending gears is known in these areas, NMFS would assess whether those types of gear have negative impacts on HMS EFH and determine if these impacts are more than minimal and not temporary in nature.

10.4.4 Federally Managed Fishing Activities

The following tables describe the comprehensive set of gears managed by HMS and by the different Fishery Management Councils in each of the regions. A brief description of all gears is given below in Section 10.4.6.

Table 10.2. A comprehensive list of all gear types used in HMS fisheries.

	HMS Fishery			
HMS Gear Type	**Shark**	**Tuna**	**Swordfish**	**Billfish**
Bandit Gear	X	X	X	
Harpoon		X	X	
Gillnet, Drift/Strikenet	X			
Longline, Bottom	X	X	X	
Longline, Pelagic	X	X	X	
Purse Seine, Tuna		X		
Trap		X		
Vertical Gear				
Handline	X	X	X	
Rod and Reel	X	X		X

The Federally managed gears for the Northeast region and their potential effects on HMS EFH are outlined in Table 10.3. The Northeast region is comprised of the New England, Mid-Atlantic and South Atlantic Fishery Management Councils.

Table 10.3. **Fishing gear types regulated in Federal waters of the Northeast region and their effects on HMS EFH. Habitat impact is as follows: minimal/negligible = 0.** Source: Stevenson *et al*., 2004.

Northeast Region		***Effects of Fishing Gear on HMS EFH***
Gear Type	**Contacts Bottom***	**Water Column**
Bag Nets		0
Dredge, Clam	X	0
Dredge, Sea Scallop	X	0
Gill Nets, Drift		0
Gill Nets, Runaround		0
Gill Nets, Sink/Anchor	X	0
Gill Nets, Stake	X	0
Hand Harvest		0
Haul Seines, Long (Danish)	X	0
Longline (Bottom)	X	0
Longline (Pelagic)		0
Otter Trawl Bottom, Fish	X	0
Otter Trawl Bottom, Sea Scallop	X	0
Otter Trawl Bottom, Shrimp	X	0
Otter Trawl Midwater		0
Pots and Traps, Red Crab	X	0
Pots and Traps, Fish	X	0
Pots and Traps, Lobster Offshore	X	0
Purse Seine, Herring		0
Purse Seine, Tuna		0
Scottish Seine	X	0
Traps, Floating Fish		0
Trawl, Beam	X	0
Trawl Midwater, Paired		0
Troll Lines		0
Trot Lines		0
Vertical Gear		
Handline		0
Reel, Electric or Hydraulic		0
Rod and Reel		0

*At this time, there are no benthic habitats identified as HMS EFH that may be affected by bottom tending gears. In addition, there is insufficient evidence to indicate an impact of bottom tending gear on HMS EFH that is defined as the "water column."

The Federally managed gears for the Southeast region and their potential effects on HMS EFH are outlined in Table 10.4. The Southeast region is comprised of the Gulf of Mexico and the Caribbean Fishery Management Councils.

Table 10.4. **Fishing gear types regulated in Federal waters in the Southeast region and their effects on HMS EFH. Habitat impact is as follows: minimal/negligible = 0.** Source: Hamilton, 2000; Barnette, 2001; GOMFMC FEIS 2004.

Southeast Region		***Effects of Fishing Gear on HMS EFH***
Gear Type	**Contacts Bottom***	**Water Column**
Allowable Chemical	X	0
Bandit Gear		0
Dip Net		0
Gill/Trammel Nets		0
Hand Harvest		0
Longline (Bottom)	X	0
Slurp Gun		0
Snare		0
Spears/Powerheads		0
Trap, Lobster	X	0
Trap/Pots, Fish	X	0
[1]Trawl, Frame	X	0
[1]Trawl, Otter	X	0
Vertical Gear		0
Hook and Line		0
Rod and Reel		0

*At this time, there are no benthic habitats identified as HMS EFH that may be affected by bottom tending gears. In addition, there is insufficient evidence to indicate an impact of bottom tending gear on HMS EFH that is defined as the "water column."

[1]Not currently used in the Caribbean; however, potential exists for future use.

10.4.5 Non-Federally Managed Fishing Activities

The following tables describe the comprehensive set of gears that are not managed under fishery management plans. Table 10.5 and Table 10.6 outline allowable gears that are used in state waters of the Northeast and Southeast regions. A brief description of all gears is given below in Section 10.4.6.

The non-Federally managed gears for the Northeast region and their potential effects on HMS EFH are outlined in. The Atlantic States Marine Fisheries Commission manages non-Federal fisheries in the New England, Mid-Atlantic and South Atlantic regions.

Table 10.5. **Non-FMP Fishing Gear in the Northeast region and their effects on HMS EFH. Habitat impact is as follows: minimal/negligible = 0.** Source: Stevenson *et al*., 2004.

Northeast Region ***Non-FMP*** (state waters)		***Effects of Fishing Gear on HMS EFH***
Gear Type	**Contacts Bottom***	**Water Column**
Cast Nets		0
Clam Kicking	X	0
Diving		0
Dredge, Conch	X	0
Dredge, Crab	X	0
Dredge, Mussel	X	0
Dredge, Oyster,	X	0
Dredge, Bay Scallop	X	0
Dredge, Sea Urchin	X	0
Fyke and Hoop Nets, Fish	X	0
Hand Hoes	X	0
Pots and Traps, Conch	X	0
Pots and Traps, Blue and Blue Peeler Crab	X	0
Pots and Traps, Eel	X	0
Pots and Traps, Lobster Inshore	X	0
Pounds Nets, Crab	X	0
Pound Nets, Fish	X	0
Purse Seines, Menhaden		0
Rakes	X	0
Scrapes	X	0
Seines, Haul-Beach	X	0
Seines, Haul-Long	X	0
Seines, Haul-Long (Danish)	X	0
Seines, Stop	X	0
Spears		0
Tongs and Grabs, Oyster	X	0
Tongs Patent, Clam	X	0
Tongs Patent, Oyster	X	0
Trawl, Otter-Crab	X	0
Weirs	X	0

*At this time, there are no benthic habitats identified as HMS EFH that may be affected by bottom tending gears. In addition, there is insufficient evidence to indicate an impact of bottom tending gear on HMS EFH that is defined as the "water column."

The non-Federally managed gears for the Southeast region and their potential effects on HMS EFH are outlined in Table 10.6. The Gulf States Marine Fisheries Commission manages non-federal fisheries in the Gulf of Mexico and the Caribbean regions.

Table 10.6. Non-FMP Fishing Gear in Southeast region: Effects of other fishing gear on HMS EFH. Habitat impact is as follows: minimal/negligible = 0. Source: Hamilton, 2000; Barnette, 2001; GOMFMC, 2004.

***Southeast Region Non-FMP* (state waters)**		***Effects of Fishing Gear on HMS EFH***
Gear Type	**Contacts Bottom***	**Water Column**
Barrier Net	X	0
Cast Net		0
Crab Scrapes	X	0
Dredge-Oyster	X	0
Drop Net		0
Lampara Net		0
Longline (Pelagic)	X	0
Purse Seine		0
Rakes and Tongs	X	0
Seine, Beach	X	0
Traps/Pots- Crab	X	0
Trawl, Skimmer	X	0
Vertical Gear		
Handline		0

*Currently the only benthic habitat types identified as EFH for neonate sharks are in Apalachee Bay off the Florida Panhandle. In this area, neonate blacktip, spinner, finetooth and blacknose sharks have been associated with mud or seagrass areas. The GOMFMC (2004) has determined that bottom tending gears (shrimp trawls and crab pots) have a low impact on these habitat types in this area. In addition, there is insufficient evidence to indicate an impact of bottom tending gear on HMS EFH that is defined as the "water column."

10.4.6 Description of Fishing Gears

Fishing gears that are dragged over the seabed or through the water column are called mobile gear (*e.g.*, trawls, dredges, and purse seines), whereas gear that remains stationary are called static gear (nets, traps, and longlines). Unless otherwise noted, gear descriptions were taken from Stevenson *et al*., (2004).

Bottom Tending, Mobile Gear

Trawls

Trawls are classified by their function, bag construction, or method of maintaining the mouth opening. Function may be defined by the part of the water column where the trawl operates (*e.g.*, bottom), by the species that it targets, or the composition of the bottom (smooth versus rough and soft versus hard) (Hayes, 1983). There is a wide range of otter trawl types used in the Northeast and Southeast as a result of the diversity of fisheries prosecuted and bottom types encountered in the region. For instance, trawls target flatfish, crabs scallops, lobsters, and

shrimp in the Northeast (Stevenson *et al.*, 2004), and shrimp, calico scallops, flounder and butterfish in both state and Federal waters of the Gulf of Mexico (GFMC FDEIS 2004).

Otter Trawls - Bottom trawls are towed at a variety of speeds, but average about 5.5 km/hr (3 knots or nmi/hr). There are three components of the otter trawl that come in contact with the sea bottom: the doors, the ground cables and bridles, which attach the doors to the wings of the net, and the sweep (or foot-rope) which runs along the bottom of the net mouth.

The traditional otter board door is a flat, rectangular wood structure with steel fittings and a steel "shoe" along the bottom that prevents the bottom of the door from damage and wear as it drags over the bottom. Other types include the V-type (steel), polyvalent (steel), oval (wood), and slotted spherical otter board (steel) (Sainsbury, 1996). It is the spreading action of the doors resulting from the angle at which they are mounted that creates the hydrodynamic forces needed to push them apart. Steel cables are used to attach the doors to the wings of the net. The ground cables run along the bottom from each door to two cables (the "bridle") that diverge to attach to the top and bottom of the net wing. The bottom portion of the bridle also contacts the bottom.

On smooth bottoms, the sweep may be a steel cable weighted with chain, or may be merely rope wrapped with wire. On rougher bottoms, rubber discs ("cookies") or rollers are attached to the sweep to assist the trawl's passage over the bottom (Sainsbury, 1996). There are two main types of sweep used in smooth bottom in New England (Mirarchi, 1998). In the traditional chain sweep, loops of chain are suspended from a steel cable, with only 2-3 links of the chain touching bottom. Streetsweeper gear is much heavier in the water due to the use of steel cores in the brush components. Roller sweeps and rockhoppers are used on irregular bottom (Carr and Milliken, 1998). Vertical rubber rollers rotate freely and are as large as 14.5 cm (36 inches) in diameter. In New England, the rollers have been largely replaced with "rockhopper" gear that uses larger fixed rollers and are designed to "hop" over rocks as large as 1 meter in diameter. Small rubber "spacer" discs are placed in between the larger rubber discs in both types of sweep.

In the Northeast, flatfish are primarily targeted with a mid-range mesh flat net that has more ground rigging and is designed to get the fish up off the bottom. A high rise or fly net with larger mesh is used to catch demersal fish that rise higher off the bottom than flatfish (NREFHSC, 2002). Crabs, scallops, and lobsters are also harvested in large mesh bottom trawls. Small mesh bottom trawls are used to capture northern and southern shrimp, whiting, butterfish and squid and usually employ a light chain sweep. Small-mesh trawls are designed, rigged, and used differently than large-mesh fish trawls and are used to catch northern shrimp in the Gulf of Maine. In the Southeast, bottom trawl fisheries target demersal species throughout the U.S. Atlantic Ocean (Barnette, 2001, National Academy of Sciences, 2002). These activities are managed under Federal fishery management plans.

Beam Trawls - The beam trawl is much like an otter trawl except the net is spread horizontally by a steel beam that runs the horizontal width of the net rather than with otter boards. The net is spread vertically by heavy steel trawl heads that generally have skid-type devices with a heavy shoe attached (Sainsbury, 1996). It is believed that beam trawls are not currently used in the Northeast United States (NREFHSC, 2002). A few beam trawls were used

in the 1970s to catch monkfish, but the fishery was unsuccessful. In the mid 1990's, a number of boats off New Bedford, MA used what were referred to as beam trawls, but the gear more closely resembled a scallop dredge rather than the traditional, European beam trawls. There are a few boats that are currently recorded as using beam trawls in the NMFS fishery landings database, but it is believed these were most likely mis-characterized and are actually otter trawls being deployed from the side of the vessels (NREFHSC, 2002). In the Southeast, beam trawls are used for monkfish, shrimp, and other demersal species. These trawls are also used for scientific sampling as the fixed mouth opening allows for consistent benthic sampling. In Florida, roller frame trawls are used to harvest bait shrimp primarily in state waters (National Academy of Sciences, 2002). These activities are managed under Federal fishery management plans.

Dredges

Most dredges are used for clams, oysters and scallops and are primarily used in the Northeastern region.

Hydraulic Clam Dredge - Hydraulic clam dredges have been used in the surfclam (*Spisula solidissima*) fishery and in the ocean quahog (*Arctica islandica*) fishery. These dredges are highly sophisticated and are designed to: 1) be extremely efficient (80 to 95% capture rate); 2) produce a very low bycatch of other species; and 3) retain very few undersized clams (NREFHSC, 2002). The typical dredge is 3.7 m (12 feet) wide and about 6.7 m (22 feet) long and uses pressurized water jets to wash clams out of the seafloor. Towing speed at the start of the tow is about 4.5 km/hr (2.5 knots or nmi/hr) and declines as the dredge accumulates clams. The water jets penetrate the sediment in front of the dredge to a depth of about 20 - 25 cm (8 - 10 inches), depending on the type of sediment and the water pressure. The water pressure that is required to fluidize the sediment varies from 50 pounds per square inch (psi) in coarse sand to 110 psi in finer sediments. The objective is to use as little water as possible since too much pressure will blow sediment into the clams and reduce product quality. The "knife" (or "cutting bar") on the leading bottom edge of the dredge opening is 14 cm (5.5 inches) deep for surfclams and 8.9 cm (3.5 inches) for ocean quahogs. This activity is managed under a Federal fishery management plan.

Dredges are not fished in clay, mud, pebbles, rocks, coral, large gravel greater than one half inch, or seagrass beds (NREFHSC, 2002). In the soft-clam (*Mya arenaria*) fishery, the dredge manifold and blade are located just forward of an escalator, or conveyor belt, that carries the clams to the deck of the vessel. These vessels are restricted to water depths less than one-half the length of the escalator and are typically operated from 15 m (49 ft) vessels in water depths of 2-6 m (6.6 - 20 ft) (DeAlteris, 1998). The escalator dredge is not managed under Federal fishery management plans.

Quahog Dredge - Ocean quahogs are also harvested in eastern Maine coastal waters using a non-hydraulic dredge that is essentially a large metal cage on skis with 15 cm (6 inch) long teeth projecting at an angle off the leading bottom edge. Maine state regulations limit the length of the cutter bar to 91 cm (36 inches). The teeth rake the bottom and lift the quahogs into the cage. This fishery takes place in small areas of sand and sandy mud found among bedrock outcroppings in depths of 9 to > 76 m (30 - 250 ft) in state and Federal coastal waters. These

dredges are used on smaller boats, about 9 - 12 m long (30 to 40 ft) and are pulled through the seabed using the boat's engine (NREFHSC, 2002). This fishery is managed under the MAFMC Surf Clam and Ocean Quahog FMP (MAFMC).

Sea Scallop Dredges - The New Bedford (or "chain sweep") dredge is the primary gear used in the Northeast U.S. sea scallop (*Placopecten magellanicus*) fishery and is very different than scallop dredges utilized in Europe and the Pacific because it is a toothless dredge. The forward edge of the New Bedford dredge includes the cutting bar, which rides above the surface of the substrate, creating turbulence that stirs up the substrate and kicks objects (including scallops) up from the surface of the substrate into the bag. Shoes on the cutting bar are in contact with and ride along the substrate surface (NREFHSC, 2002). A sweep chain is attached to each shoe and to the bottom of the ring bag (Smolowitz, 1998). The bag is made up of metal rings with chafing gear on the bottom and twine mesh on the top, and drags on the substrate when fished. Tickler chains run from side to side between the frame and the ring bag and, in hard bottom, a series of rock chains run from front to back to prevent large rocks from getting into the bag (Smolowitz, 1998). New Bedford dredges are typically 4.3 m (14 feet) wide; two of them are towed by a single vessel at speeds of 4 to 5 knots. Chain sweep dredges used along the Maine coast are smaller. In the Northeast region, scallop dredges are used in high and low energy sand environments, and high energy gravel environments. This activity is managed under a Federal fishery management plan.

Other Non-Hydraulic Dredges

Oyster or Crab Dredge/Scrape/Mussel Dredge - The oyster dredge is a toothed dredge consisting of a steel frame 0.5-2.0 m (1.6 -6.6 ft) in width, a tow chain or wire attached to the frame, and a bag to collect the catch. The bag is constructed of rings and chain-links on the bottom to reduce the abrasive effects of the seabed, and twine or webbing on top. The dredge is towed slowly (<1 m/sec) in circles, from vessels 7 to 30 m (23 - 98 ft) in length (DeAlteris, 1998). Crabs are harvested with dredges similar to oyster dredges. Stern-rig dredge boats (approximately 15 m (49 ft) in length) tow two dredges in tandem from a single chain warp. The dredges are equipped with 10 cm (4 inch) long teeth that rake the crabs out of the bottom. (DeAlteris, 1998). The toothed dredge is also used for harvesting mussels (Hayes, 1983). These dredging activities are not managed under Federal fishery management plans.

Bay Scallop Dredge - Bay scallops usually reside on the bottom. The bay scallop dredge may be 1 to 1.5 m (3.3 - 4.9 ft) wide and about twice as long. The simplest bay scallop dredge can be just a mesh bag attached to a metal frame that is pulled along the bottom. For bay scallops that are located on sand and pebble bottom, a small set of raking teeth are set on a steel frame, and skids are used to align the teeth and the bag (Sainsbury, 1996). This dredging activity is not managed under Federal fishery management plans.

Sea Urchin Dredge - Similar to a simple bay scallop dredge, the sea urchin dredge is designed to avoid damaging the catch. It has an up-turned sled-like shape at the front that includes several leaf springs tied together with a steel bar. A tow bail is welded to one of the springs and a chain mat is rigged behind the mouth box frame. The frame is fitted with skids or wheels. The springs act as runners, enabling the sled to move over rocks without hanging up. The chain mat scrapes up the urchins. The bag is fitted with a codend for ease of emptying. This

gear is generally only used in waters up to 100 m (330 ft) deep (Sainsbury, 1996). This dredging activity is not managed under Federal fishery management plans.

Clam "Kicking" - Clam kicking is a mechanical form of hard clam harvest practiced in North Carolina, which involves the modification of boat engines so that the propeller is directed downwards instead of backwards (Guthrie and Lewis, 1982). In shallow water the propeller wash is powerful enough to suspend bottom sediments and clams into a plume in the water column, which allows them to be collected in a trawl net towed behind the boat (Stephan *et al.*, 2000). This activity is not managed under a Federal fishery management plan.

Seines

Haul Seines - Haul seining is a general term describing operations where a net is set out between the surface and seabed to encircle fish. It may be undertaken from the shore (beach seining), or away from shore in the shallows of rivers, estuaries or lakes (Sainsbury, 1996). Seines typically contact the sea bottom along the lead line. Additionally the net itself may scrape along the bottom as it is dragged to shore or the recovery vessel. This activity is not managed under a Federal fishery management plan.

Beach Haul Seines - The beach seine resembles a wall of netting of sufficient depth to fish from the sea surface to the seabed, with mesh small enough that the fish do not become gilled. A floatline runs along the top to provide floatation and a leadline with a large number of weights attached ensures that the net maintains good contact with the bottom. Tow lines are fitted to both ends. The use of a beach seine generally starts with the net on the beach. One end is pulled away from the beach, usually with a small skiff or dory, and is taken out and around and finally back in to shore. Each end of the net is then pulled in towards the beach, concentrating the fish in the middle of the net. This is eventually brought onshore as well and the fish are removed. This gear is generally used in relatively shallow inshore areas (Sainsbury, 1996). This activity is not managed under a Federal fishery management plan.

Long Haul Seines - The long haul seine is set and hauled in shallow estuarine and coastal areas from a boat typically 15 m (49 ft) long. The net is a single wall of small mesh webbing less than 5 cm (2 inches), and is usually greater than 400 m (1440 ft) in length and about 3 m (9.8 ft) in depth. The end of the net is attached to a pole driven into the bottom, and the net is set in a circle so as to surround fish feeding on the tidal flat. After closing the circle, the net is hauled into the boat, reducing the size of the circle, and concentrating the fish. Finally, the live fish are brailed or dip-netted out of the net. (DeAlteris, 1998). This activity is not managed under Federal fishery management plans

Stop Seines - These are seines that are used in coastal embayments to close off the opening to a small cove or bight. This method is used in Maine to harvest schools of juvenile herring (Everhart and Youngs, 1981). This activity is not managed under a Federal fishery management plan.

Danish and Scottish Seines - The Danish seine is a bag net with long wings, that includes long warps set out on the seabed, enclosing a defined area. As the warps are retrieved, the enclosed area (a triangle) reduces in size. The warps dragging along the bottom herd the fish

into a smaller area, and eventually into the net mouth. The gear is deployed by setting out one warp, the net, then the other warp. On retrieval of the gear, the vessel is anchored. This technique of fishing is aimed at specific schools of fish located on smooth bottom. In contrast to Danish seining, if the vessel tows ahead while retrieving the gear, then this is referred to as Scottish seining or fly-dragging. This method of fishing is considered more appropriate for working small areas of smooth bottom, surrounded by rough bottom. This activity is managed under a Federal fishery management plan.

Bottom Tending, Static Gear

Pots

Pots are portable, rigid devices that fish and shellfish enter through small openings, with or without enticement by bait (Everhart and Youngs, 1981; Hubert, 1983). They are used to capture lobsters, crabs, black sea bass, eels and other bottom dwelling species seeking food or shelter (Everhart and Youngs, 1981; Hubert, 1983). Traps and pots are weighted to rest on the bottom, marked with buoys at the surface, and are sometimes attached to numerous other trap and one long line called a trot line. Pot fishing can be divided into two general classifications: 1) inshore potting in estuaries, lagoons, inlets and bays in depths up to about 75 m (250 ft) and; 2) Offshore potting using larger and heavier vessels and gear in depths up to 730 m (2400 ft) or more (Sainsbury, 1996).

In the Southeast region, pots are used for a number of fish and invertebrates. In certain areas of the Gulf of Mexico and Caribbean, due to their use to harvest species associated with coral and hardbottom habitat, traps and pots have been identified to impact and degrade habitat (Barnette, 2001).

Lobster Pots - Lobster pots are typically rectangular and are divided into two sections, the chamber and the parlor. The chamber has an entrance on both sides of the pot and is usually baited. Lobsters then move to the parlor via a tunnel (Everhart and Youngs, 1981). Escape vents are installed in both areas of the pot to minimize the retention of sub-legal sized lobsters (DeAlteris, 1998). Lobster pots are fished as either 1) a single pot per buoy (although two pots per buoy are used in Cape Cod Bay, and three pots per buoy in Maine waters), or 2) a “trawl” or line with up to 100 pots. According to NREFHSC (2002) important features of lobster pots and their use are the following:

- About 95% of lobster pots are made of plastic - coated wire.
- Floating mainlines may be up to 7.6 m (25 ft) off bottom.
- Sinklines are sometimes used where marine mammals are a concern – neutrally buoyant lines may soon be required in Cape Cod Bay.
- Soak time depends on season and location - usually 1-3 days in inshore waters in warm weather, to weeks in colder waters.
- Offshore pots are larger (more than 1 m (4 ft) long) and heavier (~ 100 lb or 45 kg), with an average of ~ 40 pots/trawl and 44 trawls/vessel. They have a floating mainline and are usually deployed for a week at a time.

- There has been a three-fold increase in lobster pots fished since the 1960's, with more than four million pots now in use.
- Although the offshore component of the fishery is regulated under Federal rules, American lobster is not managed under a Federal fishery management plan.

Fish Pots - Fish pots are similar in design to lobster pots. They are usually fished singly or in trot lines of up to 25 pots, in shallower waters than the offshore lobster pots or red crab pots. Pots may be set and retrieved 3-4 times/day when fishing for scup (NREFHSC, 2002). Wire-mesh fish traps are one of the principal fishing gears used in coral reef areas in the Caribbean (Appledorn *et al*., 2000). This activity is managed under a Federal fishery management plan.

Hagfish pots (40 plastic gallon barrels) are fished in deep waters, on mud bottoms. Cylindrical pots are typically used for capturing eels in Chesapeake Bay, however, half-round and rectangular pots are also used and all are fished in a manner similar to that of lobster pots (Everhart and Youngs, 1981). Hagfish and eel activities are not managed under a Federal fishery management plan.

Crab Pots - Crabs are often fished with pots consisting of a wire mesh. A horizontal wire partition divides the pot into an upper and lower chamber. The lower chamber is entered from all four sides through small wire tunnels. The partition bulges upward in a fold about 20 cm (8 inches) high for about one third of its width. In the top of the fold are two small openings that give access to the upper chamber (Everhart and Youngs, 1981).

Crab pots are always fished as singles and are hauled by hand from small boats, or with a pot hauler on larger vessels. Crab pots are generally fished after an overnight soak, except early and late in the season (DeAlteris, 1998). These pots are also effective for eels (Everhart and Youngs, 1981). This activity is not managed under a Federal fishery management plan.

Deepsea red crab pots are typically wood and wire traps 1.2 m by 0.75 m (48 by 30 inches) with top entry. Pots are baited and soak for about 22 hours before being hauled. Currently, vessels are using an average of 560 pots in trawls of 75- 180 pots per trawl along the continental slope at depths from 400 to 800 m (1300 - 2600 ft). These vessels are typically 25 - 41 m (90 - 150 ft) in length. Currently there are about 6 vessels engaged in this fishery (NEFMC, 2002). This activity is managed under a Federal fishery management plan.

Traps

A trap is generally a large-scale device that uses the seabed and sea surface as boundaries for the vertical dimension. The gear is installed at a fixed location for a season, and is passive, as the animals voluntarily enter the gear. Traps are made of a leader or fence, that interrupts the coast parallel migratory pattern of the target prey, a heart or parlor that leads fish via a funnel into the bay or trap section that serves to hold the catch for harvest by the fishermen. The non-return device is the funnel linking the heart and bay sections (DeAlteris, 1998).

Fish Pound Nets - Pound nets are constructed of netting staked into the seabed by driven piles (Sainsbury, 1996). Pound nets have three sections: the leader, the heart, and the pound.

The leader (there may be more than one) may be as long as 400 m (1300 ft) and is used to direct fish into the heart(s). One or more hearts are used to further funnel fish into the pound and prevent escapement. The pound may be 15 m (49 ft) square and holds the fish until the net is emptied. These nets are generally fished in waters less than 50 m (160 ft) deep. Pound nets are also used to catch crabs. This activity is not managed under a Federal fishery management plan.

Fyke and Hoop Nets - Constructed of wood or metal hoops covered with netting, hoop nets are 2.5 to 5 m (8.2 - 16 ft) long, "Y-shaped" nets, with wings at the entrance and one or more internal funnels to direct fish inside, where they become trapped. Occasionally, a long leader is used to direct fish to the entrance. Fish are removed by lifting the rear end out of the water and loosening a rope securing the closed end. These nets are generally fished to about 50 m (160 ft) deep (Sainsbury, 1996). A common fyke net is a long bag mounted on one or several hoops which keep the net from collapsing as well as provide an attachment for the base of the net funnels to prevent the fish from escaping. This gear is used in shallow water and extensively in river fisheries (Everhart and Youngs, 1981). This activity is not managed under a Federal fishery management plan.

Bag Nets – Bag nets are large nets that are kept vertically open by a frame, usually constructed of wood, and are held horizontally stretched by the water current. Bag nets are fished usually in deep water and are held in position by floats and anchors. This activity is not managed under a Federal fishery management plan.

Shallow Floating Traps - In New England, much of the shoreline and shallow subtidal environment is rocky and stakes cannot be driven into the bottom. Therefore, the webbing of these traps is supported by floats at the sea surface, and held in place with large anchors. These traps are locally referred to as "floating traps." The catch, design elements, and scale of these floating traps is similar to pound nets (DeAlteris, 1998). The floating trap is designed to fish from top to bottom, and is built especially to suit its location. The trap is held in position by a series of anchors and buoys. The net is usually somewhat "T-shaped," with the long portion of the net (the leader net) designed to funnel fish into a box of net at the top of the "T." The leader net is often made fast to a ringbolt ashore (Sainsbury, 1996). This activity is not managed under a Federal fishery management plan.

Weirs - A weir is a simple maze that intercepts species that migrate along the shoreline. Brush weirs are used in the Maine sardine/herring fishery. These are built of wooden stakes and saplings driven into the bottom in shallow waters. The young herring encounter the lead, which they follow to deeper water, finally passing into an enclosure of brush or netting. The concentrated fish are then removed with a small seine (Everhart and Youngs, 1981). This activity is not managed under a Federal fishery management plan. However, there are a few Federal permits for incidental catch of Bluefin Tuna using weirs in the Northeast. This activity is managed under a Federal fishery management plan.

<u>Sink Gill Nets and Bottom Longlines</u>

Sink/Anchor Gill Nets - Individual gill nets are typically 91 m (300 ft) long, and are usually fished as a series of 5-15 nets attached end-to-end. Gill nets have three components: leadline, webline and floatline. Fishermen are now experimenting with two leadlines. Leadlines

used in New England are ~65 lb (30 kg)/net, but in the Middle Atlantic leadlines may be heavier. Weblines are monofilament, with the mesh size depending on the target species. Nets are anchored at each end, using materials such as pieces of railroad track, sash weights, or Danforth anchors, depending on currents. Anchors and leadlines have the most contact with the bottom. Some nets may be tended several times/day, (*e.g.*, when fishing for bluefish in the Middle Atlantic). For New England groundfish, frequency of tending ranges from daily to biweekly (NREFHSC, 2002).

Trammel Net - A trammel net is made up of two or more panels suspended from a float line and attached to a single lead line. The outer panel(s) are of a larger mesh size than the inner panel. Fish swim through the outer panel and hit the inner panel, which carries it through the other outer panel, creating a bag and trapping the fish. Smaller and larger fish become wedged, gilled, or tangled (Barnette, 2001). Trammel nets are primarily used in state waters, though they are an authorized gear in the Caribbean for both the spiny lobster and shallow water reef fish fisheries.

Strikenets - Vessels fishing in a strikenet fashion used nets 364.8 meters long, 30.4 meters deep, and with mesh size 22.9 cm. Strikenetting consists of using an additional smaller, second vessel to actively set the net around a school of sharks. These nets are sometimes referred to runaround drift gillnets. Nets used for sharks in the southeast region are typically 456 to 2,280 meters long and 6.1 to 15.2 meters deep, with stretched mesh from 12.7 to 22.9 cm. This fishery is currently prohibited in the state waters off South Carolina, Georgia, and Florida, Texas and Louisiana thereby forcing some of these vessels to operate in deeper waters under Federal jurisdiction, where gillnets are less effective. The entire process (set to haulback) takes approximately 9 hours (Carlson and Baremore, 2002). These activities are managed under Federal fishery management plans.

Stake Gill Nets - Generally a small boat is used inshore so that a gill net is set across a tidal flow and is lifted at slack tide to remove fish. Wooden or metal stakes run from the surface of the water into the sediment and are placed every few meters along the net to hold it in place. When the net is lifted, the stakes remain in place. These nets are generally fished from the surface to about 50 meters deep (Sainsbury, 1996). These activities are not managed under Federal fishery management plans.

Runaround Drift Gillnet – see “Strikenets”.

Bottom Longlines - Longlining for bottom species on continental shelf areas and offshore banks is undertaken for a wide range of species including cod, haddock, dogfish, skates, and various flatfishes (Sainsbury, 1996). A 9.5 m (31 ft) vessel can fish up to 2,500 hooks a day with a crew of one and double that with two crew members. Mechanized longlining systems fishing off larger vessels up to 60 m (195 ft) can fish up to 40,000 hooks per day (Sainsbury, 1996).

In the Northeast, up to six individual longlines are strung together, for a total length of about 460 m (1500 ft), and are deployed with 20-24 lb (9 - 11 kg) anchors. The mainline is parachute cord or sometimes stainless steel wire. Gangions (lines from mainline to hooks) are 38 cm (15 inches) long and 1-2 m (3-6 ft) apart. The mainline, hooks, and gangions all come in

contact with the bottom. Circle hooks are potentially less damaging to habitat features than other hook shapes. These longlines are usually set for only a few hours at a time (NREFHSC, 2002). Longlines used for tilefish are deployed in deep water, may be up to 40 km (25 miles) long, are stainless steel or galvanized wire, and are set in a zig-zag fashion (NREFHSC, 2002).

The Southeast bottom longline fishery targets both large coastal sharks (LCS) and small coastal sharks (SCS) of sharks as well as reef fish. Bottom longline is the primary commercial gear employed in the LCS and SCS fisheries in all regions. Gear characteristics vary by region, but in general, an approximately ten-mile long bottom longline, containing about 600 hooks, is fished overnight. Skates, sharks, or various finfishes are used as bait. The gear typically consists of a heavy monofilament mainline with lighter weight monofilament gangions. Some fishermen may occasionally use a flexible 1/16 inch wire rope as gangion material or as a short leader above the hook. This activity is managed under a Federal fishery management plan.

Trot Lines – see "Pots" section

Pelagic Gear

Mid-Water Otter Trawl - The mid-water trawl is used to capture pelagic species that school between the surface and the seabed throughout the water column. The mouth of the net can range from 110 m to 170 m (360 - 560 ft) wide and requires the use of large vessels (Sainsbury, 1996). Successful mid-water trawling requires the effective use of various electronic aids to find the fish and maneuver the vessel while catching them (Sainsbury, 1996). This activity is managed under a Federal fishery management plan. This gear is not expected to have contact with or impacts upon bottom habitats.

Paired Mid-Water Otter Trawl - Pair-trawling is used by smaller vessels, which herd small pelagics such as herring and mackerel into the net (Sainsbury, 1996). Large pelagic species are also harvested with a huge pelagic pair trawl towed at high speed near the surface. The nets have meshes exceeding 10 m (33 ft) in length in the jibs and first belly sections, and reduce to cod-end mesh sizes of 20 cm (8 inches) (DeAlteris, 1998). This activity is managed under a Federal fishery management plan. This gear is not expected to have contact with or impacts upon bottom habitats.

Purse Seines - Purse seines are very efficient for taking pelagic schooling species. The purse seine is a continuous deep ribbon of web with corks on one side and leads on the other. Rings are fastened at intervals to the lead line and a purse line runs completely around the net through the rings (Everhart and Youngs, 1981). One end of the net is fastened to the vessel and the other end to a skiff. The vessel then encircles a school of fish with the net, the net pursed and hauled back to the vessel. Purse seines vary in size according to the vessel size, the size of the mesh, the species sought and the depth to be fished. Tuna seines are nearly one kilometer (0.6 miles) long and fish from 55 - 640 m (180 - 2100 ft) (Everhart and Youngs, 1981). Due to the large depth of the net for tuna purse seines, they have been shown to contact and interact with the sea bottom when fishing in some shallow water locations such as Massachusetts Bay and vicinity (NMFS, 2001). Purse seines are also utilized to harvest menhaden in the Gulf and South Atlantic. Purse seines in the Gulf menhaden fishery frequently interact with the bottom, resulting in sediment re-suspension (Barnette, 2001). Currently there are only five vessels

permitted to fish for tunas with purse seine gear. This activity is managed under a Federal fishery management plan.

Lampara Net - The lampara net has a large central bunt, or bagging portion, and short wings. The buoyed float line is longer than the weighted lead line so that as the lines are hauled, the wings of the net come together at the bottom first, trapping the fish. As the net is brought in, the school of fish is worked into the bunt and captured. In the Florida Keys, a modified lampara net is used to harvest baitfish near the top of the water column. The wing is used to skim the water surface as the net is drawn in and fish are herded into the pursing section to be harvested with a dip net. This activity is not managed under a Federal fishery management plan. This gear is not expected to have contact with or impacts upon bottom habitats.

Drift Gill Nets - Gillnets operate principally by wedging and gilling fish, and secondarily by entangling (DeAlteris, 1998). The nets are a single wall of webbing, with float and lead lines. Drift gillnets are designed so as to float from the sea surface and extend downward into the water column and are used to catch pelagic fish. In this case the buoyancy of the floatline exceeds the weight of the leadline. Drift gillnets may be anchored at one end or set-out to drift, usually with the fishing vessel attached at one end (DeAlteris, 1998). This activity is managed under a Federal fishery management plan. This gear is not expected to have contact with or impacts upon bottom habitats.

Pelagic Longline Gear - The pelagic or subsurface longline is a technique directed mostly towards tunas, swordfish, sailfish, dolphin (dorado), and sharks. The gear is typically set at depths from the surface to around 330 m (1100 ft). The gear can also be set with a main line hanging in arcs below the buoy droplines to fish a band of depths (Sainsbury, 1996). The gear is set across an area of known fish concentration or movement, and may be fished by day or night depending upon the species being sought (Sainsbury, 1996). The length of the mainline can vary up to108 km (67 miles) depending on the size of the vessel. If the mainline is set at a fixed depth, then the leader or gangion lengths vary from 2-40 m (6.6 - 130 ft), so as to ensure the hooks are distributed over a range of depths (DeAlteris, 1998). If a line-shooter is used to set the mainline in a catenary shape with regard to depth, then the gangions are usually a single minimal length, but are still distributed by depth (DeAlteris, 1998). Each gangion typically contains a baited hook and chemical night-stick to attract the fish. Traditional or circle hooks may be used. Swordfish vessels typically fish 20 to 30 hooks per 1.6 km (one mile) of mainline between 5 and 54 km (3 - 34 miles) in length (Sainsbury, 1996). This activity is managed under a Federal fishery management plan. This gear is not expected to have contact with or impacts upon bottom habitats.

Troll Lines - Trolling involves the use of a baited hook or lure maintained at a desired speed and depth in the water (Sainsbury, 1996). Usually, two to four or more lines are spread to varying widths by the use of outrigger poles connected to the deck by hinged plates. Line retrieval is often accomplished by means of a mechanized spool. Each line is weighted to reach the desired depth and may have any number of leaders attached, each with a hook and bait or appropriate lure. This gear is generally fished from the surface to about 20 meters (Sainsbury, 1996). This activity is managed under a Federal fishery management plan. This gear is not expected to have contact with or impacts upon bottom habitats.

Other Gear

Rakes - A bull rake is manually operated to harvest hard clams and consists of a long shaft with a rake and basket attached. The length of the shaft can be variable but usually does not exceed three times the water depth. The length and spacing of the teeth as well as the openings of the basket are regulated to protect juvenile clams from harvest (DeAlteris, 1998). Rakes are typically fished off the side of a small boat. This activity is not managed under a Federal fishery management plan.

Tongs - Tongs are a more efficient device than rakes for harvesting shellfish. Shaft-tongs are a scissor-like device with a rake and basket at the end of each shaft. The fisherman stands on the edge of the boat and progressively opens and closes the baskets on the bottom gathering the shellfish into a mound. The tongs are closed a final time, brought to the surface, and the catch emptied on the culling board for sorting. The length of the shaft must be adjusted for water depth. Oysters are traditionally harvested with shaft tongs in water depths up to 6 m (21 ft), with shaft tongs 8 m (29 ft) in length (DeAlteris, 1998).

Patent tongs are used to harvest clams and oysters and are opened and closed with a drop latch or with a hydraulic ram and require a mechanized vessel with a mast or boom and a winch (DeAlteris, 1998). Patent tongs are regulated by weight, length of teeth, and bar spacing in the basket. This activity is not managed under a Federal fishery management plan.

<u>Line Fishing/Handgear/Vertical Gear</u>

Handlines/Hook and Line - The simplest form of hook and line fishing is the hand line. It consists of a line, sinker, leader and at least one hook. The line is usually stored on a small spool and rack and can vary in length. The line varies in material from a natural fiber to synthetic nylon. The sinkers vary from stones to cast lead. The hooks are single to multiple arrangements in umbrella rigs. An attraction device must be incorporated into the hook, usually a natural bait and artificial lure (DeAlteris, 1998). Although not typically associated with bottom impacts, this gear can be fished in such as manner so as to hit bottom and bounce or be carried by currents until retrieved. This activity is managed under a Federal fishery management plan.

Electric or Hydraulic Reel - Mechanized line hauling systems have been developed to allow more lines to be worked by smaller crews and use electrical or hydraulic power to work the lines on the spools or jigging machines (Sainsbury, 1996). These reels, often termed bandits, are mounted on the vessel bulwarks and have a spool around which the mainline is wound (Sainsbury, 1996). Each line may have a number of branches and baited hooks, and the line is taken from the spool over a block at the end of a flexible arm. This gear is used to target several species of groundfish, especially cod and pollock, and it has the advantage of being effective in areas where other gears cannot be used. Jigging machine lines are generally fished in waters up to 600 m (2000 ft) deep (Sainsbury, 1996). This gear may also have the ability to contact the bottom depending upon the method selected to fish. This activity is managed under a Federal fishery management plan.

Bandit Gear – see “Electric or Hydraulic Reel.”

Rod and Reel – Rod and reel consists of a handheld fishing rod with a manually or electronically operated reel attached. This gear may have the ability to contact the bottom. This activity is managed under a Federal fishery management plan.

Hand Hoes - Intertidal flats are frequently harvested for clams and baitworms using hand-held hoes. These are short handled rake-like devices, which are often modified gardening tools (Creaser *et al.*, 1983). Baitworm hoes have 5 to 7 tines, 21 to 22 cm (8.3 - 8.7 ft) in length for bloodworms and 34 to 39 cm (13 – 15 inches) for sandworms. Clam hoes in Maine typically have 4 to 5 tines, 15 cm (6 inches) long (Wallace, 1997). This activity is not managed under a Federal fishery management plan.

Diving - By either free diving or using SCUBA, divers collect crustaceans, mollusks and some reef fish in shallow water. Most often a support vessel is used to transport the diver(s) to the fishing site and carry the landings to port. In deeper waters, helmet diving systems are used and the diver is tethered to the vessel with air pumped from the surface. This method is most often used by sea urchin divers and some lobster divers. Divers normally use small rakes or hoes to scrape creatures off rocks or dig them out of the seabed. Generally, the catch is placed in bags, which are either towed to the surface by the boat or floated to the surface using an air source and a lift bag. Divers rarely work deeper than about 20 m (66 ft) (Sainsbury, 1996). This activity is not managed under a Federal fishery management plan.

Spears/Powerheads - Spears were initially hand-held, then thrown, then placed in launching devices including cross-bows, spear guns for divers, etc. Spears with long shafts (gigs) are used by fishermen in small boats at night in the Carolina Sounds for flounder, through the ice for eels in New England bays, and by divers for fish in coastal waters (DeAlteris, 1998). In the Southeast, reef fish such as grouper and snapper, as well as pelagic species such as dolphin and mackerel, are targeted by divers (Barnette, 2001). Commercial divers sometimes employ a shotgun shell known as powerhead at the shaft tip. This method is commonly used to harvest large species such as amberjack (Barnette, 2001). This activity is not managed under a Federal fishery management plan.

Harpoon – A harpoon consists of a pointed dart or iron attached to the end of a line several hundred feet in length, the other end of which is attached to a flotation device. Harpoon gear is attached to a pole that is propelled only by hand and not by mechanical means. This activity is managed under a Federal fishery management plan.

Slurp Guns - Slurp guns are self-contained, handheld devices that capture tropical fish by pulling in seawater that contains target fish. These are typically used on hard bottom substrates and over coral reefs in state and Federal waters. This activity is not managed under a Federal fishery management plan.

Allowable Chemical - Collectors of live tropical reef fish commonly employ anesthetics such as quinaldine (Barnette, 2001). Quinaldine (2-methy quinoline, C10H9N) is the cheapest and most available of several substituted quinolines (Goldstein, 1973). This activity is not managed under a Federal fishery management plan.

Barrier Net - Barrier nets are used in conjunction with small tropical nets or slurpguns to collect tropical aquarium species. The net is deployed to surround a coral head or outcropping and may or may not have a pocket or bag that fish are "herded" into for capture. Barrier nets may be utilized by tropical fish collectors in both state and Federal waters (Barnette, 2001). This activity is not managed under a Federal fishery management plan.

Snare - Recreational divers pursuing spiny lobster often use a long, thin pole that has a loop of coated wire on the end called a snare. The loop is placed around a lobster that may be residing in a tight overhang or other inaccessible location, and then tightened by a pull toggle at the base of the pole in order to capture and extract the lobster (Barnette, 2001). This activity is managed under a Federal fishery management plan.

Dip net/Bully Net - Widely utilized to catch baitfish, crabs, or lobster, varieties of dip nets consist of a long pole with a bag of netting of varying mesh size that are lowered into the water. Dip nets may also be employed to capture tropical reef fish, though these utilize a short handle and very fine mesh. Additionally, landing nets or hand bully nets used to capture lobster can be considered a form of dip net. Varieties of dip nets may be used both in state and Federal waters (Barnette, 2001). This activity is managed under a Federal fishery management plan.

Cast Net - Used to capture baitfish and shrimp, cast nets are circular nets with a weighted skirt that is thrown over a schooling target. Cast nets are primarily used in shallow areas such as estuaries, though they may be used to catch baitfish offshore in Federal waters (Barnette, 2001). This activity is managed under a Federal fishery management plan.

Drop Net – Drop nets are closed-bottom square or circular nets having a square or circular frame attached to the open top of the net. A series of lines run from points on the frame to a single hand line. This allows the net to be lowered into the water to sit flat on the bottom. Bait can be attached to the bottom of the net or dropped onto the water's surface above the net to attract the target species. When the desired species is on or above the net, it is hauled up quickly, presumably capturing the organism. The drop net is also known by the name "lift net", which seems more appropriate. These nets are generally fished in calmer waters with relatively flat sand or mud bottoms in estuarine settings, and are used mostly to catch crabs (GULF FEIS, 2004). This activity is not managed under a Federal fishery management plan.

10.4.7 Summary

In summary, NMFS concludes that most HMS gears are having minimal to no impact on HMS EFH or to other species' EFH. Bottom longline gear is one of the only gear types that could have a detrimental effect on the benthic environment, especially if placed in coral reef, hard bottom or SAV habitats. However, bottom longline gear in HMS fisheries is primarily used in sandy and/or muddy habitats where it is expected to have minimal to low impacts. NMFS is aware of actions being taken by the Gulf and Caribbean Fishery Management Councils to minimize fishing impacts in specific habitat areas described earlier. To provide consistency between the Council regulations and HMS regulations, NMFS may consider similar alternatives to prohibit HMS gears in those areas in a subsequent rulemaking. In addition, NMFS will continue to collect the necessary data to determine if these potential adverse effects from bottom longline could be more than minimal and not temporary on non-HMS EFH in a future document.

In general, NMFS has not detected adverse effects from non-HMS fishing gears on HMS EFH. As outlined in Section 10.4.2.1, most HMS EFH is defined as the water column or attributes of the water column (*i.e.*, temperature gradients, frontal boundaries, etc.). Therefore, there are little anticipated cumulative impacts that rise above the threshold of more than minimal and not temporary from non-HMS fishing gears. The only exceptions are nearshore and estuarine shark pupping grounds where bottom tending gears (*i.e.*, trawls and dredges) that dramatically altered the benthic environment and overlap with the EFH of these species may have some negative impact on their EFH. However, habitat types associated with these species' EFH, the degree of overlap between the various bottom tending gears and these species' EFH, the extent to which the habitat is altered by these gears, and the impact these gears have on the EFH are all currently unknown. As data becomes available to NMFS, NMFS will make the determination of whether or not these gears have adverse effects on HMS EFH and if those effects are more than minimal and not temporary in nature.

10.5 Non-fishing Impacts to EFH

The EFH regulations require that FMPs identify non-fishing related activities that may adversely affect EFH of managed species, either quantitatively or qualitatively, or both. In addition, the regulations require that Federal agencies consult with NMFS on all actions, or proposed actions that are permitted, funded, or undertaken by the agency, and that may adversely affect EFH. NMFS must then recommend conservation measures to conserve and enhance EFH by avoiding, minimizing, mitigating, or otherwise offsetting the adverse effects to EFH.

Broad categories of activities that may adversely affect HMS EFH include, but are not limited to: 1) actions that physically alter structural components or substrate, *e.g.*, dredging, filling, excavations, water diversions, impoundments and other hydrologic modifications; 2) actions that result in changes in habitat quality, *e.g.*, point source discharges; 3) activities that contribute to non-point source pollution and increased sedimentation; 4) introduction of potentially hazardous materials; 4) or activities that diminish or disrupt the functions of EFH. If these actions are persistent or intense enough, they can result in major changes in habitat quantity as well as quality, conversion of habitats, or in complete abandonment of habitats by some species.

HMS EFH has been identified in estuarine, coastal, and offshore waters. Estuaries and coastal embayments have been identified as particularly important shark nursery areas, while offshore waters contain important spawning and feeding areas for HMS. All of these waters are at one time or another used by humans for a variety of purposes that often result in degradation of these and adjacent habitats, posing threats, either directly or indirectly, to the biota they support. These effects, either alone in combination with (cumulative) effects from other activities within the ecosystem, may contribute to the decline of some species or degradation of the habitat. In some cases such effects may be demonstrated, but they are often difficult to quantify.

Pollutants (*e.g.*, heavy metals, oil and grease, excess nutrients, improperly treated human and animal wastes, pesticides, herbicides and other chemicals) can be introduced into the aquatic environment through a number of routes, including point sources, non-point sources, and

atmospheric deposition. These contaminants have been demonstrated to affect finfish and invertebrates by altering the growth, visual acuity, swimming speed, equilibrium, feeding rate, response time to stimuli, predation rate, spawning seasons, migration routes, and resistance to disease and parasites. In addition to the introduction of contaminants that cause direct effects on animal physiology, point and non-point source discharges also affect essential habitat characteristics such as temperature, pH, dissolved oxygen, salinity, and other parameters that affect habitat suitability for individuals, populations, and communities. The synergistic effects of multiple discharge components such as heavy metals and various chemical compounds are not well understood but are increasingly the focus of research efforts. More subtle effects of contaminants, such as endocrine disruption in aquatic organisms and reduced ability to reproduce or compete for food, are also being identified and investigated (Hanson *et al*., 2003).

Non-point source runoff, which is often difficult to detect, may have a more significant impact on coastal water quality, resulting in tighter controls on point source discharges. Activities that tend to increase the input of contaminants to aquatic environments through non-point sources include coastal development, urbanization, certain agriculture and silviculture practices, marina and port development, commercial and recreational boating, and hydromodification. Related activities, such as the use of septic systems and improper disposal or treatment of wastes, can also contribute biological contaminants. Many of these activities can result in large quantities of pesticides, nutrients, and bacteria or pathogens in coastal waters. Excess nutrification is one of the greatest sources of coastal water contamination. Nutrient enrichment can lead to noxious algal blooms, fish kills, and oxygen depletion (as hypoxic or anoxic events). Researchers have found reduced or stressed fisheries populations to be common in areas where hypoxia occurs (Hanson *et al*., 2003).

As required under the EFH regulations, the following discussion identifies non-fishing activities that have the potential to adversely affect HMS EFH. In many cases these activities are regulated under particular statutory authorities. As long as they are regulated within those guidelines, their potential to adversely affect EFH may be reduced, although not necessarily eliminated. Many of the standards that are used to regulate these activities are based on human health needs and do not consider long-term impacts on fish and fish habitats. Additionally, if the activity fails to meet, or is operated outside of, its permitted standards, it may adversely affect EFH. The EFH regulations require NMFS and the Councils to identify actions with the potential to adversely affect EFH, including its biological, chemical and physical characteristics. The EFH regulations also recommend the examination of cumulative impacts to EFH, as it is possible that multiple permitted actions, while each is operating within its respective regulatory bounds, may, when combined with others, cause adverse impacts to EFH. The following sections encompass a broad range of activities so as to ensure that their potential to adversely affect HMS EFH has been identified.

The review of habitat use undertaken for HMS identified both benthic and water column habitats in coastal, estuarine and offshore areas as EFH, although in many cases the particular habitat characteristics that influence species habitat use are not clearly understood or identified. Many of these factors appear to be related to water quality (*e.g.*, temperature, salinity, dissolved oxygen). Therefore, water quality degradation has been a primary focus in this section. When analyzing the impacts that water quality changes can have on HMS EFH, it is important to

examine all habitats. EFH for HMS includes offshore areas, but even these distant habitats are affected by actions that originate in coastal habitats (both terrestrial and aquatic) and adjacent estuaries. Many of the HMS aggregate over submarine canyons or along river plumes; these physiographic features can serve as conduits for currents moving from inshore out across the continental shelf and slope, while carrying and redistributing contaminants from the nearshore realm to offshore habitats. Until the precise zones of influence from various river and coastal discharges can be delineated, a precautionary approach should be taken in order to protect the integrity of HMS EFH and the sustainability of the HMS fisheries.

10.5.1.1 Land-based Activities That May Impact HMS EFH

Coastal Development

Coastal development activities include urban, suburban, commercial, and industrial construction, along with development of corresponding infrastructure. These activities may result in erosion and sedimentation, dredging and filling (see following sub-section), point and non-point source discharges of nutrients, chemicals, and cooling water into streams, rivers, estuaries and ocean waters. Industrial point source discharges result in the contamination of water and degradation of water quality by introducing organics and heavy metals or altering other characteristics such as pH and dissolved oxygen. Improperly treated sewage treatment effluent has been shown to produce changes in water quality as a result of chlorination and increased contaminant loading, including solids, phosphorus, nitrogen and other organics, and human pathogens and parasites. Non-point source pollution - that which results from land runoff, atmospheric deposition, drainage, groundwater seepage, or hydrologic modification - results in the deposition of pathogens, nutrients, sediments, heavy metals, oxygen demanding substances, road salts, hydrocarbons and other toxics.

Coastal development can also lead to the destruction of coastal wetlands, resulting in the elimination of protective buffer zones that serve to filter sediments, nutrients, and contaminants - such as heavy metals and pesticides - that are transported to the coastal zone in ground and surface waters. In addition, hydrological modifications associated with coastal development alter freshwater inflow to coastal waters, resulting in changes in salinity, temperature, and nutrient regimes, and thereby contributing to further degradation of estuarine and nearshore marine habitats. The variety of pollutants and the severity of their effects from coastal development activities depend upon a number of factors, such as the nature of the construction, physical characteristics of the site involved, and proximity of the pollutant source to the coastline. However, all of these factors ultimately serve to degrade estuarine and coastal water quality to some degree in terms of dissolved oxygen levels, salinity concentrations, and contaminants. The result can be losses of important flora and fauna.

Agriculture (and Silviculture)

Cropland, livestock rangeland, and commercial nursery grounds can be connected to coastal waters and inland tributaries. Agricultural and silvicultural practices can affect estuarine, coastal and marine water quality through nutrient enrichment and chemical contamination from animal wastes, fertilizers, pesticides and other chemicals via non-point source runoff or via drainage systems that serve as conduits for contaminant discharge into natural waterways.

Pesticides can adversely affect EFH through direct toxicological impact on the health or performance of exposed fish, an indirect impairment of the productivity of aquatic ecosystems, and a loss of aquatic vegetation that provides physical shelter for fish. In addition, uncontrolled or improper irrigation practices can contribute to non-point source pollution, and may exacerbate contaminant flushing into coastal waters. Major impacts also include nutrient over-enrichment with subsequent deoxygenation of surface waters; algal blooms, which can also produce hypoxic or anoxic conditions and stimulation of toxic dinoflagellate growth. Excessively enriched waters often will not support fish, and may also not support food web assemblages and other ecological assemblages needed to sustain desirable species and populations. Agricultural activities also increase soil erosion and associated sediment transport in adjacent water bodies, resulting in high turbidity. Many of these same concerns may apply to silviculture as well.

10.5.1.2 Coastal and Offshore Activities That May Impact HMS EFH

Dredging and Disposal of Dredge Material

Dredging operations occur in estuaries, nearshore areas, and offshore in order to maintain certain areas for activities such as shipping, boating, construction of infrastructure (*e.g.*, offshore oil and gas pipelines), and marine mining. Disposal of the dredged material takes place in designated open water disposal areas, often near the dredge site. These operations result in negative impacts on the marine environment. Of particular concern regarding HMS EFH is the temporary degradation of water quality due to the resuspension of bottom materials, resulting in water column turbidity, potential contamination due to the release of toxic substances (metals and organics), and reduced oxygen levels due to the release of oxygen-consuming substances (*e.g.*, nutrients, sulfides). Even with the use of approved practices and disposal sites, ocean disposal of dredged materials is expected to cause environmental harm since contaminants will continue to be released, and localized turbidity plumes and reduced oxygen zones may persist.

Aquaculture and Mariculture

Aquaculture is an expanding industry in the United States, with most facilities located in farmland, tidal, intertidal and coastal areas. Aquaculture related impacts that adversely affect the chemical and biological nature of coastal ecosystems include the discharge of excessive waste products and the release of exotic organisms and toxic substances. Problems resulting from the introduction of food and fecal wastes may be similar to those resulting from certain agricultural activities. However, greater nutrient input and localized eutrophic conditions are currently the most probable environmental effects of aquaculture activities. Extremely low oxygen levels and fish kills, of both natural stocks and cultured fish, have been known to occur in impounded wetlands where tidal and wind circulation are severely limited and the enclosed waters are subject to solar heating. In addition, there are impacts related to the dredging and filling of wetlands and other coastal habitats, as well as other modifications of wetlands and waters through the introduction of pens, nets, and other containment and production devices.

Navigation

Navigation-related threats to estuarine, coastal, and offshore environments that have the potential to affect HMS EFH include navigation support activities such as excavation and

maintenance of channels (including disposal of excavated sediments) which result in the elevation of turbidity and resuspension of contaminants; construction and operation of ports, mooring and cargo facilities; construction of ship repair facilities; and construction of channel stabilization structures such as jetties and revetments. In offshore locations the disposal of dredged material is the most significant navigation related threat, resulting in localized burial of benthic communities and degradation of water quality. In addition, threats to both nearshore and offshore waters are posed by vessel operation activities such as the discharge and spillage of oil, other hazardous materials, trash and cargo, all of which may result in localized water quality degradation and direct effects on HMS, especially eggs, larvae and neonates that may be present. Wakes from vessel operation may also exacerbate shoreline erosion, effecting habitat modification and potential degradation.

Marinas and Recreational Boating

Marinas and recreational boating are increasingly popular uses of coastal areas. As marinas are located at the water's edge, there is often no buffering of associated pollutants released into the water column. Impacts caused by marinas include lowered dissolved oxygen, increased temperatures, bioaccumulation of pollutants by organisms, toxic contamination of water and sediments, resuspension of sediments and toxics during construction, eutrophication, change in circulation patterns, shoaling, and shoreline erosion. Pollutants that result from marina activities include nutrients, metals including copper released from antifouling paints, petroleum hydrocarbons, pathogens, and polychlorinated biphenyls. Also, chemicals commonly used to treat timber used for piers and bulkheads (*e.g.*, creosote, copper, chromium, and arsenic salts) are introduced into the water. Other potential impacts associated with recreational boating are the result of improper sewage disposal, fuel and oil spillage, cleaning operations, and disposal of fish waste. Propellers from boats can also cause direct damage to multiple life stages of organisms, including eggs, larvae/neonates, juveniles and adults; destratification; elevated temperatures, and increased turbidity and contaminants by resuspending bottom materials.

Marine Sand and Minerals Mining

Mining for sand (*e.g.*, for beach nourishment projects), gravel, and shell stock in estuarine and coastal waters can result in water column effects by changing circulation patterns, increasing turbidity, and decreasing oxygen concentrations at deeply excavated sites where flushing is minimal. Ocean extraction of mineral nodules is a possibility for some non-renewable minerals now facing depletion on land. Such operations are proposed for the continental shelf and the deep ocean proper. Deep borrow pits created by mining may become seasonally or permanently anaerobic. Marine mining also elevates suspended materials at mining sites, creating turbidity plumes that may move several kilometers from these sites. Resuspension of sediments can affect water clarity over wide areas, and could also potentially affect pelagic eggs and larvae. In addition, resuspended sediments may contain contaminants such as heavy metals, pesticides, herbicides, and other toxins.

Offshore Oil and Gas Operations

Offshore oil and gas operations (exploration, development, production, transportation and decommissioning) pose a significant level of potential threat to marine, coastal and estuarine

ecosystems. Exploration and recovery operations may cause substantial localized bottom disturbance. However, more pertinent to HMS is the threat of contaminating operational wastes associated with offshore exploration and development, the major operational wastes being drilling muds and cuttings and formation waters. In addition, there are hydrocarbon products, well completion and work-over fluids, spill clean-up chemicals, deck drainage, sanitary and domestic wastes, ballast water, and the large volume of unrefined and refined products that must be moved within offshore and coastal waters.

Potential major contaminants used in oil and gas operations may be highly saline; have low pH; contain suspended solids, heavy metals, crude oil compounds, and organic acids; or may generate high biological and chemical oxygen demands. Also, accidental discharges of oil - crude, diesel and other oil products - and chemicals can occur at any stage of exploration, development, or production, the great majority of these being associated with product transportation activities. Blowouts and associated oil spills can occur at any operational phase when improperly balanced well pressures result in sudden, uncontrolled releases of petroleum hydrocarbons. To remove fixed platforms, explosives are frequently used. All of these activities result in harmful effects on marine water quality as well as the biota in the vicinity.

In the Gulf of Mexico, Outer Continental Shelf (OCS) oil and gas operations are extending to deeper and deeper waters, throughout which HMS are known to range. Locations such as the De Soto Canyon area in the northern Gulf and the Blake Plateau north of the Bahamas repeatedly appear in the analysis of HMS EFH as highly productive areas important to many of these species. Oil and gas production in these areas should be discouraged because of the potential impact on HMS EFH in these areas.

Considerable documentation exists that highlights the benefits of offshore production platforms as artificial reefs that attract numerous species of fishes, including HMS. It is likely that the attraction of these species to the platforms increases the potential for exposure to contaminants they may release into the aquatic environment.

Liquid Natural Gas Development

Liquefied natural gas, or LNG, is natural gas in its liquid form. By cooling natural gas to minus 259 degrees Fahrenheit (-161 degrees Celsius), it becomes a clear, colorless, odorless liquid. LNG is neither corrosive nor toxic. Natural gas is primarily methane, with low concentrations of other hydrocarbons, water, carbon dioxide, nitrogen, oxygen and some sulfur compounds. During the process known as liquefaction, natural gas is cooled below its boiling point, removing most of these compounds. The remaining natural gas is primarily methane with only small amounts of other hydrocarbons. LNG weighs less than half the weight of water so it will float if spilled on water.

Ships unload LNG at specially designed terminals where the LNG is pumped from the ship to insulated storage tanks at the terminal. LNG is also converted back to gas at the terminal, which is connected to natural gas pipelines that transport the gas to where it is needed. Specially designed trucks may also be used to deliver LNG to other storage facilities in different locations. There has been an increase in the number of LNG terminals authorized for use in the Atlantic Ocean including the Gulf of Mexico (Federal Energy Regulatory Commission, 2005). Many of

the offshore proposals in the Gulf of Mexico propose the use of an open-loop, or once through, regasification technology that may utilize 100 – 200 million gallons of seawater per day. These facilities can subject early life stages of marine species to entrainment, impingement, thermal shock, and water chemistry changes. Mortality caused by open-loop LNG facilities could affect the health of some marine fisheries, including bluefin tuna.

Ocean Dumping

The disposal of dredged sediments and hazardous and/or toxic materials (*e.g.*, industrial wastes) containing concentrations of heavy metals, pesticides, petroleum products, radioactive wastes, pathogens, etc., in the ocean degrades water quality and benthic habitats. These effects may be evident not only within the immediate vicinity of the dumping activity, but also at farther locations, as well, due to current transport and the potential influence of other hydrographic features. The disposal of uncontaminated dredged material, including adverse effects on EFH and appropriate conservation measures are addressed in Section 6.6.2.4 of this chapter. Disposal of hazardous and toxic materials by U.S. flag vessels and vessels operating in the U.S. territorial sea and contiguous zone is currently prohibited under the Marine Protection Research and Sanctuaries Act (MPRSA), although under certain circumstances the Environmental Protection Agency may issue emergency permits for dumping industrial wastes into the ocean. Major dumping threats to the marine environment are therefore limited mostly to illegal dumping and accidental disposal of material in unauthorized locations. However, given the amount of debris that is deposited along the Nation's beaches every year, including hazardous materials such as medical wastes, it is evident that effects from such dumping may be substantial.

10.5.2 Cumulative Impacts

The EFH regulations suggest that cumulative impacts should be analyzed for adverse effects to EFH. Cumulative impacts on the environment are those that result from the incremental impact of actions added to other past, present and reasonably foreseeable future actions. Such cumulative impacts generally occur in inshore and estuarine areas, and can result from individually minor, but collectively significant, actions taking place over a period of time. These impacts include water quality degradation due to nutrient enrichment, other organic and inorganic contaminants associated with coastal development, activities related to marine transportation, and loss of coastal habitats, including wetlands and sea grasses. The rate and magnitude of these human-induced changes on EFH, whether cumulative, synergistic, or individually large, is influenced by natural parameters such as temperature, wind, currents, rainfall, salinity, etc. Consequently, the level of threat posed by a particular activity or group of activities may vary considerably from location to location. These multiple effects can, however, result in adverse impacts on HMS EFH.

Wetland loss is a cumulative impact that results from activities related to coastal development: residential and industrial construction, dredging and dredge spoil placement, port development, marinas and recreational boating, sewage treatment and disposal, industrial wastewater and solid waste disposal, ocean disposal, marine mining, and aquaculture. In the late 1970s and early 1980s the country was losing wetlands at an estimated rate of 300,000 acres per year. The Clean Water Act and state wetland protection programs have helped to decrease wetland losses to 117,000 acres per year, between 1985 and 1995. Estimates of wetlands loss

vary according to the different agencies. The USDA estimates attributes 57 percent wetland loss to development, 20 percent to agriculture, 13 percent to deepwater habitat, and ten percent to forest land, rangeland, and other uses. Of the wetlands lost to uplands between 1985 and 1995, the U.S. Fish and Wildlife Service estimates that 79 percent of wetlands were lost to upland agriculture. Urban development, and "other" types of land use activities were responsible for six percent and 15 percent, respectively.

Nutrient enrichment has become a major cumulative problem for many coastal waters. Nutrient loading results from the individual activities of coastal development, non-point source pollution, marinas and recreational boating, sewage treatment and disposal, industrial wastewater and solid waste disposal, ocean disposal, agriculture, and aquaculture. Excess nutrients from land based activities accumulate in the soil, pollute the atmosphere, pollute ground water, or move into streams and coastal waters. Nutrient inputs are known to have a direct effect on water quality. For example, in extreme conditions excess nutrients can stimulate excessive algal blooms or dinoflagellate growth that can lead to increased turbidity, decreased dissolved oxygen, and changes in community structure, a condition known as eutrophication. Examples of such dinoflagellates or algae include *Gymnodinium breve*, the dinoflagellate that causes neurotoxic shellfish poisoning, dinoflagellates of the genus *Alexandrium*, which causes paralytic shellfish poisoning, *Aureococcus anophagefferens*, the algae which causes "brown tides", and diatoms of the genus *Pseudo-nitzschia* which cause amnesic shellfish poisoning. *Pfiesteria piscicida* is a recently-described toxic dinoflagellate that has been documented in the water column in coastal areas of Delaware, Maryland, and North Carolina. Another *Pfiesteria*-like organism has been documented in St. John's River, FL. This organism has been associated with fish kills in some areas.

In addition to the direct cumulative effects incurred by development activities, inshore and coastal habitats are also jeopardized by persistent increases in certain chemical discharges. The combination of incremental losses of wetland habitat, changes in hydrology, and nutrient and chemical inputs produced over time, can be extremely harmful to marine and estuarine biota, resulting in diseases and declines in the abundance and quality of the affected resources.

Future investigations will seek to analyze cumulative impacts within specific geographic locations (certain estuarine, coastal and offshore habitats) in order to evaluate the cumulative impacts on HMS EFH. Information and techniques that are developed for this process will be used to supplement future revisions of these EFH provisions as the information becomes available.

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11.0 OTHER CONSIDERATIONS

11.1. National Standards

The analyses in this document are consistent with the National Standard (NS) guidelines set forth in the 50 CFR part 600 regulations. The following descriptions are a summary of how the preferred alternatives are consistent. More information can be found in Chapters 1, 2, 3, 4, 6, 7, 8, and 9.

The guidelines for NS 1 require NMFS to prevent overfishing while achieving, on a continuing basis, the OY from each fishery for the U.S. fishing industry. As summarized in Chapter 1, over the past years, NMFS has undertaken numerous management actions, including the 1999 FMP, Amendment 1 to the 1999 HMS FMP, and Amendment 1 to the Billfish FMP, to address overfishing and to rebuild HMS stocks. Proposed measures in this action will support those ongoing management efforts consistent with NS 1. While the preferred workshop alternatives do not directly impact fishing effort, the HMS identification workshops for shark dealers may improve the estimates of fishing mortality rates and MSY for sharks, and thus, enhance management efforts aimed at preventing overfishing and achieving OY. The preferred Madison-Swanson and Steamboat Lumps closures will support efforts aimed at achieving OY for gag grouper. The preferred alternative for northern albacore tuna should ensure that an international rebuilding plan is established that would achieve OY, consistent with the Magnuson-Stevens Act. The preferred alternative for finetooth sharks would identify sources of fishing mortality for the species in order to target management actions. As discussed in Chapter 4, this alternative is preferred because the five vessels targeting sharks with gillnet gear are contributing to only a small proportion of total finetooth shark landings, and further commercial restrictions are unlikely to prevent overfishing. Thus, this alternative would first determine which fisheries are contributing to the majority of the fishing mortality by expanding observer coverage and coordinating with other management bodies. NMFS would use this data for future stock assessments of finetooth sharks, and to target appropriate management strategies that would most effectively prevent overfishing while avoiding significant, and potentially unnecessary, economic and social impacts, consistent with NSs 5, 6, 7, and 8. The preferred alternatives for the directed Atlantic billfish fishery support international management efforts aimed at preventing overfishing and rebuilding billfish stocks by addressing the contribution of United States' anglers to Atlantic-wide landings and mortalities and implementing international recommendations. The preferred bluefin tuna alternatives would not increase overall fishing effort or the overall U.S. quota allocation from ICCAT and are consistent with ICCAT's western Atlantic BFT rebuilding program. The adjustment of the fishing year is largely administrative and would not likely impact fishing effort, catch, or age/size at harvest. The authorized fishing gear and regulatory housekeeping preferred alternatives would not increase fishing effort on target species beyond domestic and/or ICCAT-adopted quotas. Thus, these preferred alternatives are consistent with ongoing management efforts to rebuild, manage, and conserve target species and with the NS 1 guidelines.

The guidelines for NS 2 require that conservation and management measures be based on

the best scientific information available. One of the goals for the workshop alternatives is to improve the quality of the scientific information used in population assessments and in estimating bycatch and bycatch mortality. Pelagic and bottom longline and gillnet owners and operators would be trained to correctly identify protected species, thereby improving the quality of logbook data. HMS permitted shark dealers would be trained to identify sharks, either in whole or logged form, thereby improving the accuracy of dealer reports. The time/area closure alternatives are based on the up-to-date logbook and observer data and were analyzed using the most effective and appropriate models available to analyze the range of potential impacts. The preferred alternative for northern albacore tuna is based on the most recent stock assessment results and the most up-to-date landings data submitted to ICCAT. The preferred alternative for finetooth sharks is based on 2002 stock assessments, which constitute the best available scientific information. As reflected in Section 3.2.5.3, there are gaps or limitations in the currently available data, thus this alternative seeks to increase finetooth shark landings data. This information will be used in the next stock assessment scheduled for 2007 and will help NMFS target potential measures that may be needed in the HMS fisheries, recommend measures for other Federal fisheries, and seek collaborative efforts with Council or individual states' fisheries contributing to fishing mortality to prevent further overfishing. The analyses and proposed measures for Atlantic billfish contained in this document are based on the best available scientific information, including the latest information available on the post-release mortality of Atlantic white marlin and other species. For BFT, the proposed alternatives consider the most recent biological information to determine the availability of BFT both geographically and temporally. The alternatives also consider current and historical harvest rates and fishing patterns to establish the General category time periods and subquota allocations. The BFT quota allocation recommended by ICCAT is based on the most recent stock assessment (2002). The preferred alternative regarding the fishing year may slightly enhance the availability and utility of scientific information for international stock assessments and management reviews since it would be reported in a way that would be consistent with most other international information. The authorized fishing gear preferred alternatives are based on the best scientific information available on the specific gear issues being addressed, including a North Carolina Sea Grant gear paper, PLL logbook data, and the State of Hawaii commercial fishery landings. The preferred regulatory housekeeping alternatives use the best scientific information available including logbook data to analyze the potential impacts.

The guidelines for NS 3 require that, to the extent practicable, an individual stock of fish shall be managed as a unit throughout its range, and interrelated stocks of fish shall be managed as a unit or in close coordination. Many of the proposed alternatives – including the workshop, time/area closure, bluefin tuna, fishing year, authorized gear, and regulatory housekeeping alternatives – do not influence the HMS management units or the geographic scope of the fishery. The preferred alternative for finetooth sharks would ensure that finetooth sharks continue to be managed within the SCS complex throughout their range, which includes the south Atlantic, Gulf of Mexico, and Caribbean. NMFS intends to seek collaborative efforts with states and fishery management councils in these regions to address comprehensively finetooth shark fishing mortality throughout the species' range. The preferred alternatives for northern albacore tuna and the directed billfish fishery apply uniformly to albacore tuna and billfish stocks within those portions of their ranges over which the United States has jurisdiction, thereby facilitating management as a unit. In addition, the United States continues to participate at

ICCAT to further conservation and management of HMS species through international rebuilding efforts.

The guidelines for NS 4 require that conservation and management measures do not discriminate between residents of different states. Furthermore, if it becomes necessary to allocate or assign fishing privileges among various U.S. fishermen, such allocation should be fair and equitable to all fishermen; be reasonably calculated to promote conservation; and should be carried out in such a manner that no particular individual, corporation, or other entity acquires an excessive shark of such privileges. The workshop alternatives are consistent with NS 4 because they would apply to any individual that owns or operates an HMS permitted vessel that uses longline or gillnet gear and any HMS permitted shark dealers. While fishermen who live near a closure could be affected more by the closure than fishermen in other states, as explained in the NS 8 discussion below, the Madison-Swanson and Steamboat Lumps closures are not expected to have substantial economic impacts on HMS fishermen. Moreover, the closures are intended as a conservation measure to complement closures already established in the Gulf of Mexico. The preferred alternative to establish closure criteria would not have direct impacts on fishermen; potential impacts of specific closures would be evaluated as those closures are considered in the future. Under the preferred alternative for finetooth sharks, the current overall quota of 454 mt dw for SCS and the regional and/or trimester quota distributions would not be modified. The preferred alternatives for Atlantic billfish and northern albacore tuna do not discriminate between residents of different states or allocate or assign fishing privileges. Any reductions in the fishing mortality rates for these species are necessary throughout their ranges. The proposed BFT management measures do not discriminate between residents of different states and would not be considered a direct allocation of fishing privileges. The BFT measures would revise the General category time-period subquotas to reflect more recent trends in BFT availability and ensure more opportunity for fishermen in all of the states to have access to the resource when it is available in their area. Even if this action were to be considered an allocation, it is fair and equitable because the fishery is a coastwide fishery and the action would promote access to the resource throughout the BFT range. In addition, it is consistent with the BFT rebuilding program and ongoing conservation and management efforts. The other proposed BFT alternatives would implement overall improvements in the BFT management process with no differing impacts on residents of different states. The adjustment of the fishing year in conjunction with implementation of the ICCAT marlin landings limit could have minor indirect impacts that may be slightly greater in certain regions of the nation. However, none of the fishing year alternatives would directly allocate or assign fishing privileges among various U.S. fishermen, and all are intended to enhance conservation and management of the HMS fisheries. None of the authorized fishing gear and regulatory housekeeping preferred alternatives discriminate between residents of different states or allocate or assign fishing privileges.

The guidelines for NS 5 require that conservation and management measures should, where practicable, consider efficiency in the utilization of fishery resources with the exception that no such measure shall have economic allocation as its sole purpose. The preferred workshop alternatives would not directly impact the efficiency in the utilization of the fishery resources. To the extent that the workshops teach fishermen how to remove protected resources from fishing gear in an efficient manner that maximizes survival and improve species identification, the workshops could have some benefits. As noted in the NS 4 discussion above,

the preferred Madison-Swanson and Steamboat Lumps closures are not expected to have significant economic impacts, and no direct impacts are expected from the closure criteria. Thus, the closure alternatives are not expected to change efficiency in the utilization of fishery resources. The preferred alternatives for northern albacore tuna and finetooth sharks would have no impacts on efficiency in the short-term as they would not implement new regulatory requirements on the fishery at this time. The preferred billfish alternatives consider efficiency, where practicable, in conserving and managing the billfish fishery by trying to tailor the circle hook and bait requirements, as opposed to applying them across the whole fishery, and by proposing a mechanism for implementing inseason regulatory adjustments. The preferred fishing year alternative should not affect efficiency in the utilization of HMS resources but would improve efficiency and transparency of managing HMS fisheries. The proposed BFT inseason action alternative would consolidate criteria used for inseason and annual adjustments, and thus, could have some benefits in terms of increased consistency in the criteria and greater transparency in the management process. Having the flexibility to modify the regulations in response to variation in the fishery and the resource could also promote efficiency. One of the preferred BFT alternatives would ensure that excessive amounts of quota do not accumulate in any particular domestic quota category by limiting the amount of underharvest that can be carried forward. Excess quota would be rolled over to the Reserve or to other domestic quota categories. Thus, the alternative provides reasonable fishing opportunities, while ensuring efficient use of the resource. The authorized fishing gear preferred alternatives consider efficiency where practicable, and would allow fishermen some flexibility in rigging gears for speargun, green-stick, and buoy gear, as well as flexibility in their choices of cockpit gears. This flexibility should allow geographic segments of the HMS fisheries to choose or rig gears in ways that maximize their efficiency in their particular fishing areas. The preferred alternatives for regulatory housekeeping are not expected to impact the efficiency of using the fishery resources. Requiring that the dorsal and anal fins remain on the shark could alter the efficiency of the fishery slightly but should improve the data and conservation of the fishery and resource. Allowing fishermen to report electronically may increase efficiency for BFT fishermen, when such a system is developed.

The guidelines for NS 6 state that conservation and management measures shall take into account and allow for variations among, and contingencies in, fisheries, fishery resources, and catches. The workshop alternatives take into account NS 6 by providing that the workshop requirements could be adjusted through a regulatory framework adjustment. See Section 11.2 (listing actions that may be addressed through the framework process, consistent with the FMP, Magnuson-Stevens Act, and other applicable law). Allowing for such adjustments would help to account for any unexpected changes in the HMS fisheries attributable to fishing practices, gear, effort, or the improved knowledge of safe-handling and release methods. The preferred alternative for time/area closure criteria also specifically takes into account variations in fisheries and fishery resources by providing criteria to be applied in modifying or adding new closures either through the framework or FMP amendment process. The preferred alternatives for finetooth sharks and northern albacore tuna would not affect any previous measures implemented to protect against social, economic, or ecological uncertainties that may arise in HMS fisheries. The preferred alternatives for the directed Atlantic billfish fishery take into consideration variability in the fishery by providing needed flexibility in allowable hooks and baits, as well as in both the mechanism for implementing inseason regulatory adjustments, and

the measures considered for inseason adjustment. The proposed BFT management measures acknowledge the variation in the BFT fishery, resource, and catches, and improve NMFS' ability to account for these variations and make changes to the management actions to ensure a reasonable fishing opportunity throughout the management unit. The preferred management measures also provide the industry with consistent baseline annual quotas from year to year until ICCAT modifies the recommended U.S. BFT TAC. The proposed BFT management measures continue to provide a reserve to compensate for uncertainty in estimating domestic harvest, stock conditions, or environmental factors. Furthermore, one of the preferred alternatives allows for the transfer of unharvested quota or to cover the overharvest of another gear category, compensating for the uncertainties in these fisheries. The preferred inseason action criteria would continue to allow NMFS to account for variability in the fishery or resource and provide for greater consistency in the factors considered for all inseason actions. Changes in the management cycle timeframe would not impact existing regulations that have been implemented to protect against social, economic, or ecological uncertainties, consistent with ICCAT recommendations. The preferred authorized fishing gear alternatives would allow for variability in the fishery and resource by allowing fishermen some flexibility in rigging gears for speargun, green-stick, and buoy gear, as well as flexibility in their choices of cockpit gears. This flexibility would allow for segments of the HMS fisheries to choose or rig gears according to the current limits and season. The regulatory housekeeping alternatives clarify existing regulations and would not change any measures established previously to address variations or contingencies in the fishery. Some of the alternatives may allow for more flexibility and variation. For example, clarifying the definitions for pelagic and bottom longline fishing gear could alleviate some confusion regarding bottom longline fishing in pelagic longline closed areas, and the option of submitting dealer reports over the internet, once such a system is available, could provide a more efficient and flexible method of reporting.

The guidelines for NS 7 state that conservation and management measures shall, where practicable, minimize costs and avoid unnecessary duplication. The costs associated with the preferred workshop alternatives are lost fishing time and travel to the workshops, both of which would be mitigated by holding workshops when the fishing is not active and in locations near to the longline and gillnet communities, as well as location nearby shark dealers. The benefits of these management measures are improved data collection and reduced bycatch mortality of protected resources and, possibly, other non-target species. Linking the workshop certification to the permit renewal would facilitate enforcement of the requirements. The workshop alternatives are not anticipated to shift costs to another sector, such as a local government or private sector. NMFS considered the burden of training owners, operators, and crew of vessels using longline and gillnet gear in the analysis of alternatives. However, training the larger universe of owners, operators, and crew does not appear to provide enough of a bycatch mortality reduction benefit to outweigh the costs (*e.g.*, administrative burden, lost fishing, and time away from other responsibilities) of requiring everyone to attend. Thus, NMFS is proposing to require just the owners and operators of those vessels, not the crew, to attend the workshops. The same analyses were true for the HMS identification workshops. Training all of the HMS dealers, anglers, and commercial vessel owners and operators versus just the shark dealers would not improve the shark data collection enough to justify the costs. The preferred alternative for finetooth sharks minimizes costs and does not duplicate other regulations. This alternative would not implement new regulatory requirements at this time but would set forth a

plan to prevent overfishing. As described in the analyses, the preferred alternatives for the directed Atlantic billfish fishery may result in minor, short-term compliance costs, due to the initial purchase of circle hooks. But long-term, there may be minor economic benefits to recreational fishermen because circle hooks typically cost less than J hooks. Additionally, allowing the use of J hooks outside of tournaments and with artificial baits and delaying the effective date provides recreational fishermen a chance to replace J hooks with circle hooks over time. The preferred BFT alternatives take into consideration recent trends in BFT availability and attempt to provide greater fishing opportunities for all fishermen in this coastwide fishery. Further, the preferred alternatives are also aimed at improving the efficient utilization of the available quota by improving NMFS' ability to make inseason adjustments and allowing NMFS to be responsive to the annual and seasonal variability in the fishery. While there may be some costs associated with revising the General category time-period and subquota allocations (*e.g.*, less quota would be available for fishermen in northern states), as discussed further under NS 8, any economic impacts are expected to be only minor. The costs and benefits of adjusting the fishing year were analyzed, and the preferred alternative appears to minimize costs while maximizing benefits. The preferred alternatives for time/area closures, northern albacore tuna, authorized gears, and most of regulatory housekeeping do not impose any costs on the fishermen and do not duplicate other regulations. The requirement to leave the anal and second dorsal fin on the shark could have some minor impact on the cost of fishing but these impacts would be less than the impact of requiring all fins to remain on the shark.

The guidelines for NS 8 state that conservation and management measures shall, consistent with the conservation requirements of the Magnuson-Stevens Act (including the prevention of overfishing and rebuilding of overfished stocks), take into account the importance of fishery resources to fishing communities in order to provide for the sustained participation of such communities, and to the extent practicable, minimize adverse economic impacts on such communities. The preferred alternatives for workshops are not anticipated to have a negative impact on the sustained participation of any HMS fishing communities. Workshops would be held near these communities and at times when the fishing activities are slow in order to minimize, to the extent practicable, any negative economic or social impacts. The preferred time/area closure alternatives would not have significant, adverse economic impacts or impacts on fishing communities. The preferred alternatives for finetooth sharks and northern albacore tuna are not expected to result in any adverse social or economic impacts to fishing communities. While some communities may experience heightened localized impacts if angler behavior substantially changes, the preferred alternatives for the directed billfish fishery are anticipated to minimize any economic impacts on the fishery as a whole, as well as sustain participation in the directed Atlantic billfish fishery. The Atlantic bluefin tuna management measures are not anticipated to have a negative impact on the sustained participation of any bluefin tuna related fishing community. In fact the objectives of the preferred alternatives are to ensure a reasonable fishing opportunity is provided throughout the bluefin tuna range. There may be some negative economic impacts for fishermen in northern states, because this action would reduce the current General category time-period and subquota allocations for the early season (*e.g.*, when BFT are available for fishermen in the north) in order to provide for a winter fishery for fishermen in southern states. However, as reflected in the BFT analyses in Chapter 4, any such impacts are expected to be minor, and NMFS, in developing BFT alternatives, took into consideration traditional fishing patterns in New England as well as recent trends in BFT availability. The

other preferred alternatives would adjust BFT management procedures and would have no adverse economic or social impacts. Authorizing additional fishing gears, changing the fishing year for HMS fisheries to make them consistent with the calendar year, and the preferred regulatory housekeeping alternatives are not anticipated to have a negative impact on the sustained participation of any HMS fishing community.

The guidelines for NS 9 state that conservation and management measures shall, to the extent practicable, minimize bycatch, and to the extent that bycatch cannot be avoided, minimize the mortality of such bycatch. As described at the beginning of Chapter 4, the NS 9 guidelines provide that, when determining whether actions minimize bycatch and bycatch mortality to the extent practicable, several factors should be considered, consistent with other national standards and maximization of net benefits to the Nation. NMFS has taken those factors into consideration, and information relevant to those factors is provided throughout the DEIS, especially in Chapters 3, 4, 6, 7, 8, and 9. The protected species workshops for pelagic longline, bottom longline and gillnet fishermen are aimed at reducing the bycatch mortality of sea turtles, smalltooth sawfish, and other non-target species. These workshops would train the owners and operators of vessels using longline and gillnet gear in the safe release and disentanglement protocols, enabling the owners and operators to return these species to the sea alive, thus minimizing bycatch mortality, to the extent practicable. With regard to time/area closures, NMFS conducted extensive analyses of a wide range of alternatives to see if further closures or modifications of existing closures would provide ecological benefits to all bycatch species. However, as reflected in the time/area closure discussions in Chapters 2, 4, and Appendix A, the analyses indicated that additional or modified closures would not provide benefits for all bycatch species; closures or combinations of closures may benefit certain species with adverse impacts on others. Thus, at this time, NMFS is preferring the Madison-Swanson and Steamboat Lumps closures to complement existing measures in the Gulf of Mexico, and a closure criteria alternative that would provide greater transparency in the evaluation of new or modified closures The preferred alternative for northern albacore tuna is not expected to change bycatch rates of any species. The preferred alternative for finetooth sharks would not result in any significant modifications to fishing gear, effort, or practices currently employed for finetooth sharks. Furthermore, the alternative would identify other fisheries that may be contributing to bycatch of finetooth sharks, in which case the agency may recommend measures or seek collaborative efforts to reduce this bycatch. The preferred alternatives for the directed billfish fishery are not expected to increase bycatch of Atlantic billfish, as under the catch-and-release program established for Atlantic billfish, those that are released alive by anglers are not considered bycatch. The preferred alternatives may substantially reduce the discard mortality of Atlantic billfish in the directed billfish fishery, consistent with the intent of NS 9. To the extent that using circle hooks in tournaments reduces the bycatch of other species, the preferred alternatives may minimize the bycatch of other fish or marine life. The proposed management measures for BFT, for modifying the fishing year, and for authorizing additional gears are not expected to modify the interaction with bycatch, or to change the bycatch mortality associated with the Atlantic HMS fisheries. NMFS expects little to no bycatch in the recreational speargun tuna fishery. The little data available on green-stick gear indicate that there may be possible interactions with billfish (as used in the Pacific fisheries) but Atlantic-based data do not indicate a concern for the commercial fishery with billfish, marine mammals, or sea turtles. Additionally, available handline fishery data indicate that the buoy gear would likely have low bycatch and

that all reported handline discards were reported as released alive. None of the preferred alternatives for regulatory housekeeping are expected to increase or decrease bycatch rates substantially. The species composition requirement in the definition between pelagic and bottom longline could increase bycatch slightly if fishermen catch greater than five percent of a particular species that is not on the list for the gear they are using. NMFS expects this scenario is unlikely given reporting landings, but is requesting comments from fishermen to confirm the appropriateness of the species on the species composition lists.

The guidelines for NS 10 state that conservation and management measures shall, to the extent practicable, promote the safety of human life at sea. No impact to safety of life at sea is anticipated to result from the workshop proposed alternatives. While the preferred workshop alternatives do not require fishing vessels to carry additional gear, the owner and operator would be trained in the proper handling of the gear used for the safe-handling and disentanglement procedures for protected resources. The safe-handling and release gear is light enough that it should not have any impact on the stability of the vessel. The preferred alternatives for time/area closures, northern albacore tuna, finetooth sharks, the directed billfish fishery, the fishing year modifications, and the regulatory housekeeping items are not expected to have any effects on safety of human life at sea. None of those preferred alternatives would require fishermen to travel greater distances, fish in bad weather, or otherwise fish in an unsafe manner. The preferred management measures for Atlantic bluefin tuna are not anticipated to have an impact on safety of life. The BFT General category is managed by time-period subquotas in order to ensure that BFT is available according to traditional and historical fishing patterns and to allow for a winter fishery in the South Atlantic. The preferred alternatives provide an opportunity to fish throughout the BFT range when the tuna are present and available and do not require fishing vessels to carry additional gear. The preferred management alternative was designed to avoid "derby" style fishing and reflects the historical fishing patterns for the New England region and provides an opportunity of the South Atlantic tuna fishermen to participate in the fishery when the tuna have migrated into the area. The alternatives are not expected to have any affects on safety of human life at sea. None of the authorized fishing gear alternatives are expected to have an impact on the safety of life at sea. However, alternative H2 (authorizing speargun gear in the commercial and recreational tuna fisheries) may result in fishermen traveling greater distances to find productive tunas grounds. This would likely only happen if the speargun and the rod and reel sectors compete for fishing areas. In contrast, the preferred alternative H4 (authorizing speargun gear in the commercial BAYS fisheries) could allow PLL fishermen to target tunas in areas closed to PLL fishing, if they do not have PLL gear onboard, and may be able to fish closer to home. While AP members have expressed concern regarding the safety of speargun fishing, given the safety equipment the fishermen use and their ability to use this gear safely in other fisheries, including tuna fisheries around the world, NMFS does not expect safety implications by allowing fishermen the opportunity to use this gear. The preferred alternative that would clarify the allowable use of secondary cockpit gears (H5) would promote safety at sea by allowing fishermen to use implements specifically designed to gain control of and subdue large fish from safer distances.

11.2. Ongoing Management and the Procedure for Adjusting Management Measures

The 1999 FMP, Amendment 1 to the 1999 FMP, and Amendment 1 to the Billfish FMP outlined the process for amending or modifying regulations via regulatory framework adjustment or FMP amendment. The actions that can be done via framework adjustment are also listed in 50 CFR part 635.34, and currently the list includes:

- actions to implement ICCAT recommendations, as appropriate;
- domestic quotas;
- Atlantic tunas Purse Seine category cap on bluefin tuna quota;
- commercial retention limits;
- recreational retention limits;
- maximum sustainable yield or optimum yield levels based on the latest stock assessment or updates in the SAFE report;
- species size limits;
- permitting and reporting requirements;
- monitoring and tracking programs (*e.g.*, landing tag);
- composition of the species groups;
- fishing year or season;
- time/area restrictions;
- target catch requirements;
- gear prohibitions, modifications, or use restrictions;
- effort restrictions;
- essential fish habitat;
- any shark species management group based on additions to or removals from the prohibited species list;
- classification system within shark species groups;
- shark management regions and the regional quotas; and,
- quota allocations between shark fishing seasons.

Additions to the list as a result of this draft HMS FMP could include:

- changes to the Atlantic blue and white marlin annual landings limit;
- additions, changes, or modifications to time/area closures; and
- workshop requirements.

11.3. Consideration of Magnuson-Stevens Act Section 304(g) Measures

Section 304(g) of the Magnuson-Stevens Act sets forth requirements specific to the preparation and implementation of an FMP or FMP amendment for HMS. See 16 U.S.C. 1854(g) for full text. In summary, Section 304(g) requires NMFS to:

1. Consult with and consider the views of affected Councils, Commissioners, and advisory groups;
2. Establish an advisory panel for each FMP;
3. Evaluate the likely effects, if any, of conservation and management measures on participants in the affected fisheries and minimize, to the extent practicable, any disadvantage to U.S. fishermen in relation to foreign competitors;
4. With respect to HMS for which the United States is authorized to harvest an allocation, quota, or fishing mortality level under a relevant international fishery agreement, provide fishing vessels with a reasonable opportunity to harvest such allocation, quota, or at such fishing mortality level;
5. Review, on a continuing basis, and revise as appropriate, the conservation and management measures included in the FMP;
6. Diligently pursue, through international entities, comparable international fishery management measures with respect to HMS; and
7. Ensure that conservation and management measures under this subsection
    a. Promote international conservation of the affected fishery;
    b. Take into consideration traditional fishing patterns of fishing vessels of the United States and the operating requirements of the fisheries;
    c. Are fair and equitable in allocating fishing privileges among United States fishermen and do not have economic allocation as the sole purpose; and
    d. Promote, to the extent practicable, implementation of scientific research programs that include the tagging and release of Atlantic HMS.

The impacts of each proposed management measure and how it meets these requirements are described in more detail in Chapters 2 and 4 of the draft HMS FMP. This section provides only a summary of how each of the requirements is met.

In regard to the first requirement, NMFS has provided the five Atlantic Fishery Management Councils, the Gulf and Atlantic States Marine Fisheries Commissions, and members of the HMS and Billfish Advisory Panels copies of the Issues and Options Paper (released in April 2004) and the Predraft of the HMS FMP (released in February 2005). Additionally, NMFS presented the Issues and Options paper to three of the Councils, the Atlantic States Marine Fisheries Commission, and the Advisory Panel and presented the Predraft to all five of the Atlantic Councils, both Commissions, and the Advisory Panels. Written comments and comments received during the presentations were considered when preparing this draft HMS FMP/DEIS and proposed rule. NMFS will send the draft HMS FMP/DEIS and proposed rule to consulting parties including all five of the Atlantic Councils, both Commissions, and the HMS and Billfish Advisory Panels. NMFS intends to present the draft HMS FMP/DEIS to the HMS and Billfish Advisory Panels and those Councils and Commissions that are having meetings

during the public comment period and that place the HMS FMP on their agenda.

In regard to the second requirement, NMFS established the HMS and Billfish Advisory Panels in 1997 as part of the process for drafting the 1999 FMP for Atlantic Tunas, Swordfish, and Sharks and Amendment 1 to the Atlantic Billfish FMP. As part of this draft HMS FMP, NMFS intends to combine those Advisory Panels into one group that would still provide representation between all user groups and from different geographic locations.

In regard to the third requirement, throughout this document, NMFS has described the effects of the management measures and any impacts on U.S. fishermen. None of the proposed management measures in this draft HMS FMP are expected to disadvantage U.S. fishermen in relation to foreign competitors. Some of the preferred alternatives could aid U.S. fishermen by providing a more open and flexible fishing period (*e.g.*, changes to BFT management adjustments) or authorizing additional gear types (*e.g.*, speargun or buoy gear). While some of the non-preferred alternatives may provide potential economic benefits (*e.g.*, modifying time/area closures) or, conversely, adverse economic impacts (*e.g.*, additional time/area closures or prohibition of pelagic longline gear) to U.S. fishermen, NMFS has described the reasons why it is not preferring those alternatives. If it becomes necessary to implement those alternatives or types of alternatives in the future, NMFS will minimize, to the extent practicable, any disadvantage to U.S. fishermen in relation to foreign competitors.

In regard to the fourth requirement, the proposed management measures should not prevent U.S. fishermen from a reasonably opportunity to harvest the quota allocated by ICCAT. In the case of Atlantic billfish, NMFS is proposing to implement the 250-marlin landing limit and require only catch-and-release fishing for white marlin. Because few white marlin are landed currently, NMFS does not believe that restricting the 250-marlin landing limit to blue marlin from 2007 until 2011 would prevent fishermen from the opportunity to land the full 250-marlin landing limit. For bluefin tuna, NMFS is proposing alternatives that would ensure more opportunity for fishermen in all of the states to have access to the resource and that would modify the manner in which inseason actions are taken to ensure the quota is taken in an equitable fashion throughout the Atlantic. Additionally, NMFS is proposing to authorize the use of speargun gear. This could allow fishermen an additional method of taking the quota. Regarding swordfish, NMFS is clarifying the definition of handline and authorizing the use of buoy gear for targeting swordfish. This could allow U.S. fishermen greater opportunities to harvest the available quota. Unless effort in the swordfish fishery increases, it is unlikely that, in the near future, the United States would fill the entire swordfish quota as adjusted for recent underharvests.

In regard to the fifth requirement, NMFS continues to review the need for any revisions to the existing regulations for HMS. This draft HMS FMP and related proposed rule are culminations of one of those reviews. In regard to the sixth requirement, NMFS continues to work with ICCAT, and other international entities such as CITES, to implement comparable international fishery management measures. To the extent that some of the management measures are exportable, NMFS works to provide foreign nations with the techniques and scientific knowledge to implement similar management measures or conduct experiments to test similar gear modifications.

In regard to the seventh and last requirement, all of the objectives of the draft HMS FMP, particularly 1, 2, 4, 5, 6, 8, 9, 12, 14, and 16 (see Section 1.3), indicate how NMFS promotes the international conservation of the affected fisheries in order to obtain optimum yield while maintaining traditional fisheries and fishing gear and minimizing economic impacts on U.S. fishermen. All of the combined management measures in this draft HMS FMP are expected to meet these goals.

12.0 LIST OF PREPARERS

The development of this draft consolidated HMS FMP involved input from many people within NMFS, NMFS contractors, and input from constituent groups including the HMS Advisory Panel. Staff from the Highly Migratory Species Management Division, in alphabetical order, who worked on this draft document or the documents resulting in this one include:

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- Gerry Hovis; and
- John Hansel.

13.0 LIST OF AGENCIES, ORGANIZATIONS, AND PERSONS CONSULTED AND TO WHOM COPIES OF THE EIS WILL BE SENT

Under 304(g)(1)(A) of the Magnuson-Stevens Act, NMFS is required to consult with affected Fishery Management Councils, ICCAT commissioners and advisory groups, and the Advisory Panels established under the Magnuson-Stevens Act regarding amendments to the HMS FMP. As such, NMFS sent the Issues and Options paper and a predraft document to all consulting parties and to the Atlantic and Gulf States Marine Fisheries Commissions. NMFS also requested time to present the issues in this document to the Regional Fishery Management Councils.

During the scoping process for this draft document, NMFS held ten scoping meetings along the Atlantic and Gulf of Mexico coasts, attended several Fishery Management Council meetings, and received numerous written comments. The scoping summary is available on the HMS Management Division's webpage at http://www.nmfs.noaa.gov/sfa/hms/.

At the predraft stage, NMFS presented the predraft document to all five Atlantic Fishery Management Councils, to both the Gulf and Atlantic States Marine Fisheries Commissions, and to the HMS and Billfish APs. A number of written comments were also received. The summary received on the predraft is also available on the HMS Management Division's webpage.

For this draft HMS FMP and accompanying proposed rule, NMFS will send the EIS and proposed rule to all consulting parties as defined by the Magnuson-Stevens Act and plans to hold 24 public hearings along the Atlantic and Gulf of Mexico coasts, including the Caribbean, plans to hold an HMS and Billfish Advisory Panel meeting, and to attend any Fishery Management Council and Marine Fisheries Commission meetings that occur during the comment period. NMFS will also send the EIS to the EPA regional coordinators for review. Anyone who would like to review this draft document and accompanying proposed rule can request a hard copy by calling (301) 713-2347 or by going to the HMS Management Divison's webpage. NMFS is also having the scientific information in this document peer reviewed per the OMB Information Quality Bulletin.

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A APPENDIX: TIME/AREA CLOSURES

The effectiveness of each of the time/area closure alternatives was evaluated by determining the percent reduction in bycatch of non-target HMS and protected species for each month and cumulatively for the year based on both observer and logbook data for the combined years 2001-2003. Data were also analyzed to determine the impact on catches of targeted species such as swordfish, yellowfin, bigeye, and BAYS tunas (which include bigeye).

As outlined in this and other sections, there were a number of alternatives that NMFS considered for time/area closures. However, only a subset of the alternatives were chosen for further analysis. This section contains summary tables and figures for all alternatives considered. A brief discussion of each alternative that was not selected for further analysis (alternatives B2(f) – B2(i) and B3(c) - B3(d)), can be found in Section 2.1.2. Section 4.1.2 discusses alternatives B2(a) – B2(e), B3(a), B3(b), and B4 - B7 in more detail. Alternatives in Chapter 4 were chosen for further analysis because of their greater ecological benefit in terms of bycatch reduction potential for all species considered.

This Appendix primarily serves as a summary of the potential benefits and impacts of the various alternatives considered. An overall summary of the reduction in the number of hooks set (fishing effort) and discards of white marlin, blue marlin, sailfish, spearfish, leatherback sea turtles, loggerhead sea turtles, and bluefin tuna based on the various time/area closure alternatives is given in Table A.1 and Table A.2. Similarly, Table A.3, Table A.4, Table A.5, and Table A.6 summarize swordfish, bluefin tuna, yellowfin tuna, bigeye tuna, and BAYS tuna (including yellowfin) kept and discarded under the different alternatives according to 2001 – 2003 pelagic logbook data. Table A.7 and Table A.8 provide a comparison of bycatch reduction based on pelagic longline logbook data and pelagic observer data. Table A.9 to Table A.20 give the temporal catch of bycatch and target species associated with each alternative that was not further analyzed. Similar tables for alternatives that were further analyzed can be found in Section 4.1.2. There are also summaries of bycatch and catch of target species associated with the modification of current time/area closures (*i.e.*, Table A.24 and Table A.25). A number of figures highlight the different time/area closure alternatives that have been considered (but have not been further analyzed; Figure A.1) as well as swordfish catch and modifications to current time/area closures (Figure A.2 and Figure A.3, and Figure A.4)

This section describes how the ecological effects of the redistribution of fishing effort were evaluated for all of the alternatives. The redistribution of fishing effort was used to determine the percent reduction in total reported bycatch of sea turtles, non-target HMS, and targeted species inside and outside of the time/area closure in the Atlantic and Gulf of Mexico. The method used to calculate percent changes in catch rates for each species with redistribution of effort is discussed below. The result of the redistribution of effort analysis for loggerhead sea turtles for alternative B2(d) is presented in a separate table (Table A.28) as an example. Similar tables were generated for each species under each alternative further analyzed in Section 4.1.2 but were not included here due to the large number of tables. Instead, summary tables of redistributed fishing effort were included in Section 4.1.2.

NMFS examined monthly catches (number of each species) and effort (number of hooks) in each of the time/area closures in comparison to all open areas of the Atlantic and Gulf of Mexico, excluding the NED, based on logbook data for the fishery. The number of each species caught in the open areas outside the considered time/area closures (column E in the example of redistribution of effort table, Table A.28), was calculated by subtracting the number caught in the potential closed area from the reported catch in the combined Atlantic and Gulf of Mexico (B-D in Table A.28). The catch-per-unit-effort (CPUE) for the species in the remaining open area was calculated by dividing the number of each species caught in the open area (E) by the number of hooks fished in the open area (calculated by subtracting the number of hooks in the closed area from those in the Atlantic and Gulf of Mexico; A-C in Table A.28). The number of hooks that were used in the closed area was multiplied by the open-area CPUE to determine the number of loggerhead sea turtles, in this case, that would be caught in the open fishing areas by the displaced effort (C*F). This was then added to the existing open area catch (E+G) to give a new open area total catch (I in Table A.28). The estimated total catch (I) was subtracted from the original total number caught in the Atlantic and Gulf (B-H) to estimate the change in number of each species that would be caught as a result of the relocated effort. Column J shows the cumulative number of individuals avoided by the time/area closure by adding each month's total to the preceding month's total. Columns K and L show the percentage reduction in overall catch by month and cumulatively as a result of the closure, respectively. The total percent reduction in catch was calculated by dividing the sum of column J (cumulative catch avoided by month) by the sum of column B (number of individuals caught in the Atlantic and Gulf of Mexico, excluding the NED). A positive result would indicate a decrease in discards, and a negative result would indicate an increase in discards.

In this example, the redistribution of fishing effort associated with alternative B2(d) would result in an increase in loggerhead sea turtle interactions of 65 percent, or 117 individuals, over three years (Table A.28). This large increase in loggerhead sea turtle interactions may be due to a number of factors. First, alternative B2(d) would be a large closure in an area that represents approximately 90 percent of the fishing effort in the Gulf of Mexico and approximately 50 percent of the total pelagic longline fishing effort (Table 4.11 in Section 4.1.2). Therefore, closing such an area in the Gulf of Mexico could displace a large amount of fishing effort to the Atlantic Ocean. Second, and more specific to loggerhead sea turtles, there are fewer loggerhead sea turtles interactions in the Gulf of Mexico compared to the Atlantic Ocean (Table 4.33 in Section 4.1.2); therefore, as effort increases in the Atlantic as a result of a large closure in the Gulf of Mexico, and since loggerhead sea turtle numbers are higher in the Atlantic Ocean compared to the Gulf of Mexico, the number of interactions would be expected to increase. Thus, it is important to consider the ecological impacts of the redistribution of fishing effort when considering time/area closures. Often the effects may be counter-intuitive and may differ for the various species considered.

Finally, it is worth noting how the redistribution of effort was calculated for different time/area closure combinations. When NMFS considered the redistribution of fishing effort associated with the combination of time/area closures (*e.g.*, B2(a) combined with B2(b) or B2(e) combined with B2(d)), the closures were considered to be closed simultaneously. It was assumed that all fishing effort within those areas would be redistributed to open areas, and the redistribution of fishing effort was calculated according to the description outlined above. Thus,

the end result, in terms of resulting bycatch when accounting for the redistribution of fishing effort, was not simply the sum of the bycatch associated with the individual closures. In cases where the time/areas closures were seasonal (*i.e.*, they were not year-round), then the time/area closures were considered to be simultaneously closed during months of overlap (*i.e.*, the month of June for alternative B2(a) and B2(b) combination). Otherwise, they were considered to be single time/area closures, and the redistribution of fishing effort was calculated as outlined above.

For the analyses of modifications to existing closed areas, NMFS analyzed PLL logbook and POP data from 1997 – 1999, the period prior to enactment of the closed areas. This time period was selected because the areas were open during this period, and observer and logbook data provide a record of the bycatch rates and species that were interacted with prior to implementation of the closures. There has been no pelagic longline fishing activity during all or part of the year in each of the closures since 1999, so post-1999 would not provide the data necessary to make modifications. A number of potential modifications to existing closures were examined, including the Florida East Coast (Table A.22), DeSoto Canyon (Table A.23), Charleston Bump (Table 4.29), and Northeastern U.S. closure (Table 4.30). Data from the PLL logbook and POP were mapped using GIS and oceanographic features such as the axis of the Gulf Stream, or natural breaks in areas between high and low bycatch rates within the existing closure, were used to establish a potential new boundary for the closed area. The total number and percent bycatch of non-target HMS and protected species, as well as catch of target HMS, were then calculated for the modified closure in comparison to all other areas of the Atlantic and Gulf of Mexico. This allowed NMFS to determine to potential impact on bycatch species in comparison to all bycatch in the pelagic longline fishery. Only after it was determined that the Charleston Bump and Northeastern U.S. closure modifications would result in minimal or no increase in bycatch of non-target HMS and protected species were these two areas further analyzed in Section 4.2.1. The remaining areas were not further analyzed, but the data for both the Florida East Coast and DeSoto Canyon modifications that resulted in increases in bycatch are presented in this Appendix.

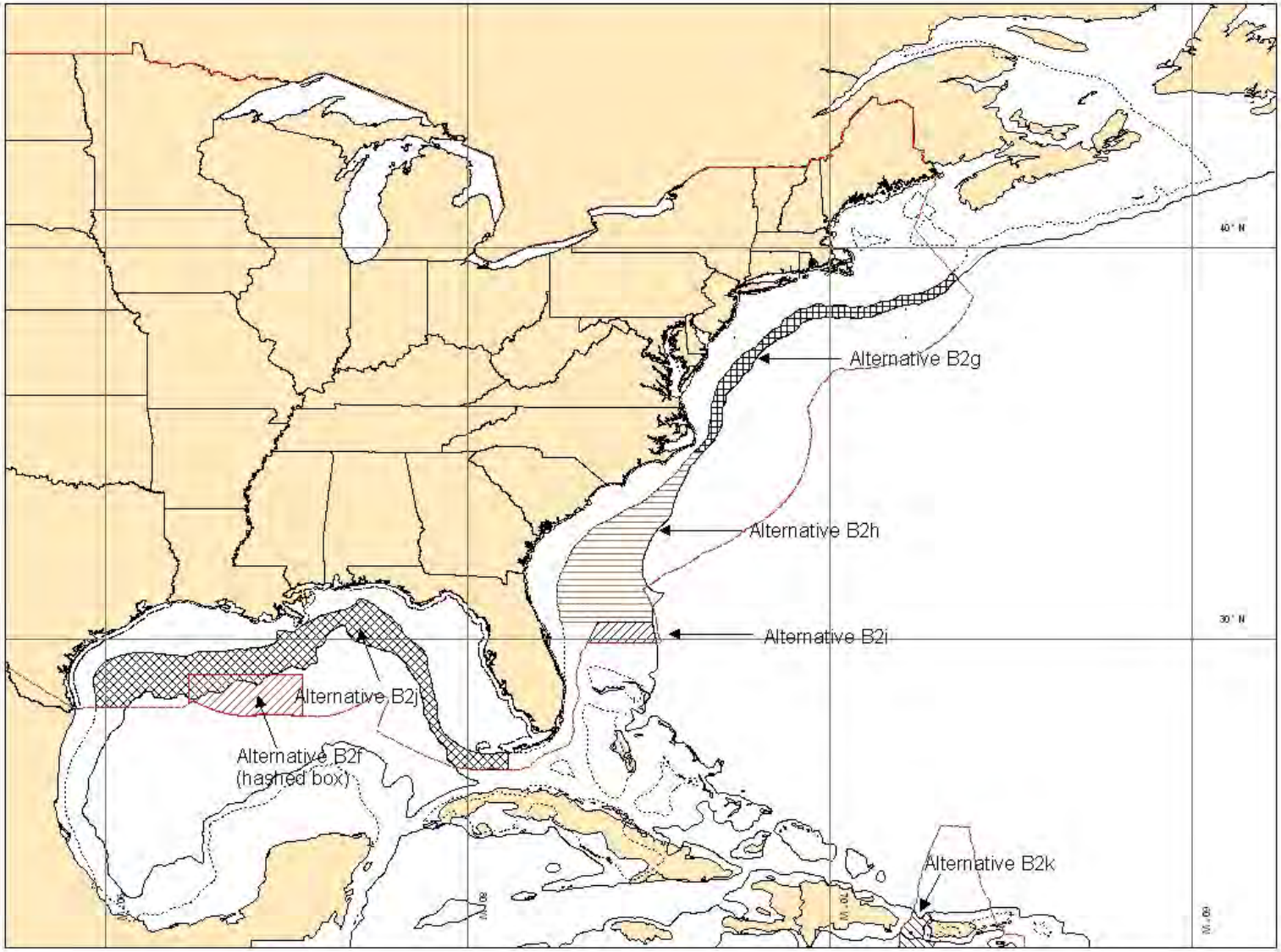

Figure A.1 **Map showing time/area closure alternatives considered but not further analyzed at this time (see Section 2.1.2) to reduce white marlin and other protected species interactions.**

Table A.1 **The decrease (-) or increase (+) in the number of discards of white marlin, blue marlin, sailfish, spearfish, leatherback and loggerhead sea turtles and bluefin tuna based on the various time/area closures**. Source PLL data 2001-2003.

Alternative	Number of Hooks Set	White Marlin discards	Blue Marlin discards	Sailfish discards	Spearfish discards	Leatherback	Loggerhead	Bluefin Tuna discards
WITHOUT REDISTRIBUTION OF EFFORT								
B2(a)								
Year-round	3,810,282	-503	-487	-163	-63	-171	-9	-198
May-Nov	2,347,180	-463	-432	-146	-48	-76	-6	-75
B2(b)								
Year-round	991,205	-124	-22	-1	-2	-28	-37	-461
June only	184,435	-12	-4	0	0	-10	-20	-365
B2(c) (April-June)	2,844,335	-325	-244	-124	-35	-55	-7	-348
B2(d) (Year-round)	10,020,757	-1,487	-1,397	-642	-354	-285	-18	-439
B2(e) (Year-round)	2,127,510	-274	-40	-3	-8	-49	-65	0
B2(f) (May-Nov)	2,998,571	-633	-559	-197	-62	-91	-7	-92
B2(g) (June-October)	2,985,688	-481	-49	-11	-7	-40	-40	-60
B2(h) (March-Nov)	1,179,865	-139	-138	-134	-27	-10	-3	-2
B2(i) (Year-round)	1,175,504	-232	-316	-59	-20	-10	-20	-11
B2(j) (Year-round)	5,182,880	-519	-528	-444	-108	-90	-12	-181
B2(k) (Jan-April)	22,321	-7	-14	0	0	0	0	0
Total From All Areas	21,148,706	3,143	2,449	1,029	424	494	179	1,617
WITH REDISTRIBUTION OF EFFORT								
B2(a)								
Year-round		27	-98	11	17	-99	27	128
(May-Nov)		-84	-178	-8	-9	-39	14	166

Alternative	Number of Hooks Set	White Marlin discards	Blue Marlin discards	Sailfish discards	Spearfish discards	Leatherback	Loggerhead	Bluefin Tuna discards
B2(b)								
Year-round		110	164	85	20	-8	-33	-437
June only		33	22	18	3	-7	-19	-354
B2(c) (April-June)		221	50	45	56	-13	42	158
B2(d) (Year-round)		10	-497	-276	-311	-105	117	614
B2(e) (Year-round)		189	360	182	38	-3	-60	-658
B2(f) (May-Nov)		-150	-240	-19	-12	-45	20	219
B2(g) (June-October)		71	494	239	62	29	-26	*
B2(h) (March-Nov)		54	-6	-73	-5	12	7	*
B2(i) (Year-round)		-118	-224	-27	7	21	-10	104
B2(j) (Year-round)		394	126	-241	-5	38	40	*
B2(k) (Jan-April)		-5	-12	0	0	1	0	*

Table A.2 **Percent reduction (-) or increase (+) in discards of white marlin, blue marlin, sailfish, spearfish, leatherback and loggerhead sea turtles and bluefin tuna based on the various time/area closure alternatives with and without redistribution of effort.** Source: Pelagic Longline Logbook data (2001-2003) (* = was not analyzed).

Alternative	Number of Hooks Set	White Marlin discards	Blue Marlin discards	Sailfish discards	Spearfish discards	Leatherback	Loggerhead	Bluefin Tuna discards
WITHOUT REDISTRIBUTION OF EFFORT								
B2(a)								
Year-round	-18.0%	-16.0%	-19.9%	-15.8%	-14.9%	-34.6%	-5.0%	-12.2%
May-Nov	-11.1%	-14.7%	-17.6%	-14.2%	-11.3%	-15.4%	-3.4%	-4.6%
B2(b)								
Year-round	-4.7%	-3.9%	-0.9%	-0.1%	-0.5%	-5.7%	-20.7%	-28.5%
June only	-0.9%	-0.4%	-0.2%	0.0%	0.0%	-2.0%	-11.2%	-22.6%
B2(c) (April-June)	-13.4%	-10.3%	-10.0%	-12.1%	-8.3%	-11.1%	-3.9%	-21.5%
B2(d) (Year-round)	-47.4%	-47.3%	-57.0%	-62.4%	-83.5%	-57.5%	-10.1%	-27.1%
B2(e) (Year-round)	-10.1%	-8.7%	-1.6%	-0.3%	-1.9%	-9.9%	-36.3%	-43.3%
B2(f) (May-Nov)	-14.2%	-20.1%	-22.8%	-19.1%	-14.6%	-18.4%	-3.9%	-5.7%
B2(g) (June-October)	-14.1%	-15.3%	-2.0%	-1.1%	-1.7%	-8.1%	-22.3%	-37.7%
B2(h) (March-Nov)	-5.6%	-4.4%	-5.6%	-13.0%	-6.4%	-2.0%	-1.7%	-0.12%
B2(i) (Year-round)	-5.6%	-7.4%	-12.9%	-5.7%	-4.7%	-2.0%	-11.2%	-0.7%
B2(j) (Year-round)	-24.5%	-16.5%	-21.6%	-43.1%	-25.5%	-18.2%	-6.7%	-11.1%
B2(k) (Jan-April)	-0.1%	-0.2%	-0.6%	0.0%	0.0%	0.0%	0.0%	0.0%
WITH REDISTRIBUTION OF EFFORT								
B2(a)								
Year-round		0.9%	-4.0%	1.1%	4.0%	-20.0%	15.0%	7.9%
(May-Nov)		-2.7%	-7.3%	-0.8%	-2.1%	-8.0%	7.9%	10.3%

Alternative	Number of Hooks Set	White Marlin discards	Blue Marlin discards	Sailfish discards	Spearfish discards	Leatherback	Loggerhead	Bluefin Tuna discards
B2(b)								
Year-round		3.5%	6.7%	8.3%	4.8%	-1.7%	-18.5%	-27.0%
June only		1.0%	0.9%	1.7%	0.8%	-1.3%	-10.3%	-21.9%
B2(c) (April-June)		0.3%	-20.3%	-26.8%	-73.3%	-21.3%	65.5%	-3.3%
B2(d) (Year-round)		6.0%	14.7%	17.7%	9.1%	-0.6%	-33.3%	5.7%
B2(e) (Year-round)		-4.8%	-9.8%	-1.8%	-2.9%	-9.1%	11.4%	13.6%
B2(f) (May-Nov)		7.0%	2.0%	4.4%	13.2%	-2.6%	23.5%	9.8%
B2(g) (June-October)		2.3%	20.2%	23.2%	14.5%	5.9%	-14.8%	*
B2(h) (March-Nov)		1.7%	-0.24%	-7.1%	-1.2%	2.4%	4.0%	*
B2(i) (Year-round)		-3.8%	-9.2%	-2.6%	1.6%	4.2%	-5.4%	9.5%
B2(j) (Year-round)		12.6%	5.1%	-23.4%	-1.2%	7.7%	22.1%	*
B2(k) (Jan-April)		-0.7%	-1.8%	0.3%	0.3%	0.3%	0.3%	*

Table A.3 **The decrease (-) or increase (+) in the number of each targeted species caught or discarded based on the various time/area closure alternatives without redistribution of effort.** Source: Pelagic Longline Logbook data (2001-2003).

Alternative	Number of Hooks Set	Swordfish kept	Swordfish discards	Bluefin tuna kept	Bluefin tuna discards	Yellowfin tuna kept	Yellowfin tuna discards	Bigeye tuna kept	Bigeye tuna discards	BAYS kept	BAYS discards
WITHOUT REDISTRIBUTION OF EFFORT											
B2(a)											
Year-round	3,899,124	-8,369	-5,445	-133	-198	-36,897	-1,310	-684	-5	-37,938	-1,586
May-Nov	2,403,012	-3,959	-2,988	-40	-75	-23,846	-952	-400	-2	-24,420	-1,152
B2(b)											
Year-round	991,921	-10,974	-1,997	-34	-461	-7,662	-81	-1,627	-5	-10,713	-97
June only	183851	-1,867	-256	-11	-365	-505	-11	-557	0	-1,337	-15
B2(c) (April-June)	2,844,335	-3,594	-3,621	-174	-348	-33,053	-1,480	-90	-2	-33,176	-1,677
B2(d) (Year-round)	10,020,757	-19,215	-11,579	-321	-439	-106,941	-3,641	-1,299	-19	-108,923	-4,661
B2(e) (Year-round)	2,127,510	-17,422	-4,054	-74	-700	-12,692	-200	-7,303	-139	-27,141	-748
B2(f) (May-Nov)	2,997,124	-4,792	-3,553	-49	-92	-30,165	-1,141	-480	-3	-30,865	-1,436
B2(g) (June-October)	2,986,428	-21,799	-7,378	-84	-609	-27,023	-544	-10,729	-243	-48,317	-1,623
B2(h) (March-Nov)	1,118,725	-24,297	-4794	-5	-2	-3,508	-124	-427	-18	-4,148	-152
B2(i) (Year-round)	1,175,504	-8,104	-1,704	-35	-11	-3,690	-297	-8,412	-417	-14,631	-725
B2(j) (Year-round)	5,186,190	-13,469	-6,433	-181	-179	-53,854	-1,622	-400	-11	-54,579	-1,913
B2(k) (Jan-April)	22,321	-321	-120	0	0	-4	0	-2	0	-8	0
Total From All Areas	21,148,706	127,500	36,748	599	1,617	167,203	5,486	37,133	1,006	226,156	8,990

Table A.4 **Percent reduction (-) or increase (+) in the target catch and discards based on the various time/area closure alternatives without redistribution of effort.** Source: Pelagic Longline Logbook data (2001-2003).

Alternative	Number of Hooks Set	Swordfish kept	Swordfish discards	Bluefin tuna kept	Bluefin tuna discards	Yellowfin tuna kept	Yellowfin tuna discards	Bigeye tuna kept	Bigeye tuna discards	BAYS kept	BAYS discards
WITHOUT REDISTRIBUTION OF EFFORT											
B2(a)											
Year-round	-18.4%	-6.6%	-14.8%	-22.2%	-12.2%	-22.1%	-23.9%	-1.8%	-0.5%	-16.8%	-17.6%
(May-Nov)	-11.4%	-3.1%	-8.1%	-6.7%	-4.6%	-14.3%	-17.4%	-1.1%	-0.2%	-10.8%	-12.8%
B2(b)											
Year-round	-4.7%	-8.6%	-5.4%	-5.7%	-28.5%	-4.6%	-1.5%	-4.4%	-0.5%	-4.7%	-1.1%
June only	-0.9%	-1.5%	-0.7%	-1.8%	-22.6%	-0.3%	-0.2%	-1.5%	0.0%	-0.6%	-0.2%
B2(c) (April-June)	-47.4%	-15.1%	-31.5%	-53.6%	-27.1%	-64.0%	-66.4%	-3.5%	-1.9%	-48.2%	-51.8%
B2(d) (Year-round)	-10.1%	-13.7%	-11.0%	-12.4%	-43.3%	-7.6%	-3.6%	-19.7%	-13.8%	-12.0%	-8.3%
B2(e) (Year-round)	-14.2%	-3.8%	-9.7%	-8.2%	-5.7%	-18.0%	-20.8%	-1.3%	-0.3%	-13.6%	-16.0%
B2(f) (May-Nov)	-13.4%	-2.8%	-9.9%	-29.0%	-21.5%	-19.8%	-27.0%	-0.2%	-0.2%	-14.7%	-18.7%
B2(g) (June-October)	-14.1%	-17.1%	-20.1%	-14.0%	-37.7%	-16.2%	-9.9%	-28.9%	-24.2%	-21.4%	-18.1%
B2(h) (March-Nov)	-5.3%	-19.1%	-13.0%	-0.8%	-0.1%	-2.1%	-2.3%	-1.1%	-1.8%	-1.8%	-1.7%
B2(i) (Year-round)	-5.6%	-6.4%	-4.6%	-5.8%	-0.7%	-2.2%	-5.4%	-22.7%	-41.5%	-6.5%	-8.1%
B2(j) (Year-round)	-24.5%	-10.6%	-17.5%	-30.2%	-11.1%	-32.2%	-29.6%	-1.1%	-1.1%	-24.1%	-21.3%
B2(k) (Jan-April)	-0.1%	-0.3%	-0.3%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%

Table A.5 **The decrease (-) or increase (+) in the number of each targeted species caught or discarded based on the various time/area closure alternatives with redistribution of effort.** Source: Pelagic Longline Logbook data (2001-2003) (* = was not calculated).

Alternative	Number of Hooks Set	Swordfish kept	Swordfish discards	Bluefin tuna kept	Bluefin tuna discards	Yellowfin tuna kept	Yellowfin tuna discards	Bigeye tuna kept	Bigeye tuna discards	BAYS kept	BAYS discards
WITH REDISTRIBUTION OF EFFORT											
B2(a)											
Year-round		19,485	2,001	-24	128	-7,615	-381	7,880	210	5,187	126
May-Nov		11,590	1,635	20	166	-1,881	166	4,393	117	5,897	-4
B2(b)											
Year-round		-6,993	-697	-21	-437	2,247	222	-170	57	1,480	407
June only		-1,033	-21	-7	-354	1,516	61	-449	3	859	77
B2(c) (April-June)		26,931	2,218	-110	158	-18,314	-1,001	4,240	18	-12,260	-1,064
B2(d) (Year-round)		79,633	11,718	-72	614	-49,789	-1,955	29,930	853	-1,259	-616
B2(e) (Year-round)		-8,623	-1,061	-45	-658	9,264	455	-4,417	-25	-723	369
B2(f) (May-Nov)		15,552	2,081	25	219	-3,126	-408	5,465	150	6,507	-29
B2(g) (June-October)		*	*	*	*	*	*	*	*	*	*
B2(h) (March-Nov)		*	*	*	*	*	*	*	*	*	*
B2(i) (Year-round)		*	*	*	90	*	*	*	*	*	*
B2(j) (Year-round)		*	*	*	*	*	*	*	*	*	*
B2(k) (Jan-April)		*	*	*	*	*	*	*	*	*	*
Total From All Areas	21,148,706	127,500	36,748	599	1,617	167,203	5,486	37,133	1,006	226,156	8,990

Table A.6 **Percent reduction (-) or increase (+) in the target catch and discards tuna based on the various time/area closure alternatives with redistribution of effort.** Source: Pelagic Longline Logbook data (2001-2003) (* = was not calculated).

Alternative	Number of Hooks Set	Swordfish kept	Swordfish discards	Bluefin tuna kept	Bluefin tuna discards	Yellowfin tuna kept	Yellowfin tuna discards	Bigeye tuna kept	Bigeye tuna discards	BAYS kept	BAYS discards
WITH REDISTRIBUTION OF EFFORT											
B2(a)											
Year-round		15.3%	5.4%	-3.9%	7.9%	-4.6%	-6.9%	21.2%	20.8%	2.3%	1.4%
May-Nov		9.1%	4.4%	3.4%	10.3%	-1.1%	3.0%	2.6%	11.6%	2.6%	-0.4%
B2(b)											
Year-round		-5.5%	-1.9%	-3.5%	-27.0%	1.3%	4.1%	-0.5%	5.6%	0.7%	4.5%
June only		-0.8%	-0.1%	-1.2%	-21.9%	0.9%	1.1%	-1.2%	0.3%	0.4%	0.9%
B2(c) (April-June)		21.1%	6.0%	-18.3%	9.8%	-11.0%	-18.3%	11.4%	1.7%	-5.4%	-11.8%
B2(d) (Year-round)		62.5%	31.9%	-12.1%	38.0%	-29.8%	-35.6%	80.6%	84.8%	-0.6%	-6.9%
B2(e) (Year-round)		-6.8%	-2.9%	-7.6%	-40.7%	5.5%	8.3%	-11.9%	-2.5%	-0.3%	4.1%
B2(f) (May-Nov)		12.2%	5.7%	4.2%	13.6%	-1.9%	-7.4%	14.7%	14.9%	2.9%	-0.3%
B2(g) (June-October)		*	*	*	*	*	*	*	*	*	*
B2(h) (March-Nov)		*	*	*	*	*	*	*	*	*	*
B2(i) (Year-round)		*	*	*	5.6%	*	*	*	*	*	*
B2(j) (Year-round)		*	*	*	*	*	*	*	*	*	*
B2(k) (Jan-April)		*	*	*	*	*	*	*	*	*	*

Table A.7 **Percent reduction (-) or increase (+) in the number of hooks set; discards of white marlin, blue marlin, sailfish, spearfish, leatherback, loggerhead, and other sea turtles based on various time/area closure alternatives without redistribution of effort.** Source: Pelagic Longline Logbook data (2001-2003).

Alternative	Number of Hooks Set	White Marlin discards	Blue Marlin discards	Sailfish discards	Spearfish discards	Bluefin Tuna discards	Leatherback	Loggerhead	Other Sea turtles
Alternative B2(a)	-18.0%	-16.0%	-19.9%	-15.8%	-14.9%	-12.2%	-34.6%	-5.0%	-45.5%
Alternative B2(a) (May-Nov)	-11.4%	-14.7%	-17.6%	-14.2%	-11.3%	-4.6%	-15.4%	-3.4%	0.0%
Alternative B2(b)	-4.7%	-3.9%	-0.9%	-0.1%	-0.5%	-28.5%	-5.7%	-20.7%	0.0%
Alternative B2(b) (June only)	-0.9%	-0.4%	-0.2%	0.0%	0.0%	-22.6%	-2.0%	-11.2%	0.0%
Alternative B2(c)	-13.4%	-10.3%	-10.0%	-12.1%	-8.3%	-21.5%	-11.1%	-3.9%	-18.2%
Alternative B2(d)	-47.4%	-47.3%	-57.0%	-62.4%	-83.5%	-27.1%	-57.5%	-10.1%	-45.5%
Alternative B2(e)	-10.1%	-8.7%	-1.6%	-0.3%	-1.9%	-43.3%	-9.9%	-36.3%	0.0%
Alternative B2(f)	-22.8%	-21.7%	-25.3%	-21.5%	-20.3%	-38.3%	-5.6%	-45.5%	-21.7%
Alternative B2(g)	-14.1%	-15.3%	-2.0%	-1.1%	-1.7%	-37.7%	-8.1%	-22.3%	0.0%
Alternative B2(h)	-5.6%	-4.4%	-5.6%	-13.0%	-6.4%	-2.0%	-1.7%	-5.6%	0.0%
Alternative B2(i)	-5.6%	-7.4%	-12.9%	-5.7%	-4.7%	-0.7%	-2.0%	-11.2%	0.0%
Alternative B2(j)	-24.5%	-16.5%	-21.6%	-43.1%	-25.5%	-11.1%	-18.2%	-6.7%	-9.1%
Alternative B2(k)	-0.1%	-0.2%	-0.6%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%

Table A.8 **Percent reduction (-) or increase (+) in discards of white marlin, blue marlin, sailfish, spearfish, leatherback, loggerhead, and other sea turtles, and bluefin tuna kept and discards combined, based on various time/area closure alternatives without redistribution of effort.** Source: Pelagic Observer Program data (2001-2003).

Alternative	White Marlin discards	Blue Marlin discards	Sailfish discards	Spearfish discards	Bluefin Tuna	Leatherback	Loggerhead	Other Sea turtles
Alternative B2(a) (year-round)	-14.6%	-11.1%	-20.9%	-4.5%	-12.2%	-18.9%	-7.0%	-25.0%
Alternative B2(a) (May-Nov)	-13.2%	-9.3%	-19.6%	-4.5%	-7.0%	-11.3%	-4.0%	0.0%
Alternative B2(b) (year-round)	-1.4%	-0.7%	0.0%	0.0%	-16.2%	-0.6%	-9.0%	0.0%
Alternative B2(b) (June only)	0.0%	0.0%	0.0%	0.0%	-15.4%	0.0%	-6.0%	0.0%
Alternative B2(c) (April-June)	-8.4%	-11.1%	-14.2%	-2.3%	-18.4%	-15.1%	-7.0%	-25.0%
Alternative B2(d) (year-round)	-38.8%	-26.8%	-52.0%	-15.9%	-24.3%	-52.8%	-14.0%	-75.0%
Alternative B2(e) (year-round)	-3.3%	-1.1%	0.0%	-2.3%	-44.3%	-6.9%	-16.0%	0.0%
Alternative B2(f)	-19.6%	-17.1%	-25.7%	-4.5%	-17.6%	-25.8%	-8.0%	-25.0%
Alternative B2(g)	-12.7%	-1.8%	-0.0%	-2.3%	-49.5%	-10.1%	-20.0%	-25.0%
Alternative B2(h)	-3.3%	-9.3%	-24.3%	-2.3%	-0.3%	-10.7%	-4.0%	0.0%
Alternative B2(i)	-16.0%	-34.3%	-8.8%	-45.5%	-1.1%	-6.9%	-17.0%	0.0%
Alternative B2(j)	-20.3%	-8.2%	-33.1%	-2.3%	-10.8%	-29.6%	-9.0%	-50.0%
Alternative B2(k)	-0.7%	-3.9%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%

Table A.9 **Alternative B2(f). Temporal variation in effectiveness of the Gulf of Mexico 3 time/area closure on white marlin, blue marlin, sailfish, spearfish, leatherback, loggerhead, and other sea turtle discards. A negative sign indicates an increase in bycatch.** Source: Pelagic Longline Logbook data (2001-2003).

Month	Number of hooks set	White Marlin discards	Blue Marlin discards	Sailfish discards	Spearfish discards	Leatherback	Loggerhead	Other Sea turtles
1	464,535	14	17	9	9	10	1	0
2	248,436	3	4	2	0	11	0	0
3	310,044	6	8	3	4	17	1	0
4	391,152	8	16	6	5	17	0	2
5	579,566	50	36	22	7	10	5	0
6	459,183	151	104	29	14	12	0	0
7	393,868	216	202	57	15	15	1	0
8	452,158	86	77	30	7	13	0	0
9	319,796	55	59	29	4	8	1	0
10	400,189	43	55	15	11	19	0	0
11	393,811	32	26	15	4	14	0	0
12	414,240	18	16	4	6	43	1	3
Total	4,826,978	682	620	221	86	189	10	5
All Areas	21,148,706	3,143	2,449	1,029	424	494	179	11
% Decrease **without** redistribution of effort	22.8%	21.7%	25.3%	21.5%	20.3%	38.3%	5.6%	45.5%
Discards with redistribution of effort		3	122	-4	-14	96	-39	3
% Decrease **with** redistribution of effort		0.1%	5.0%	-0.4%	-3.3%	19.4%	-21.8%	27.3%

Table A.10 **Alternative B2(g). Temporal variation in effectiveness of the Northeast time/area closure from June through October on white marlin, blue marlin, sailfish, spearfish, leatherback, loggerhead, and other sea turtle discards. A negative sign indicates an increase in bycatch.** Source: Pelagic Longline Logbook data (2001-2003).

Month	Number of hooks set	White Marlin discards	Blue Marlin discards	Sailfish discards	Spearfish discards	Leatherback	Loggerhead	Other Sea turtles
1	94,685	0	1	0	0	0	1	0
2	63,028	0	0	0	0	0	3	0
3	70,714	0	1	1	0	0	1	0
4	83,255	2	2	0	0	0	0	0
5	143,876	9	2	0	1	0	0	0
6	295,480	23	4	4	0	9	14	0
7	524,941	101	5	1	3	7	9	0
8	594,372	215	22	2	0	11	6	0
9	595,391	119	16	2	1	3	3	0
10	554,844	17	1	2	1	5	5	0
11	420,660	6	1	0	2	5	3	0
12	197,429	1	0	0	0	1	1	0
Total	3,638,675	493	55	12	8	41	46	0
June-Oct	2,985,688	481	49	11	7	40	40	0
All Areas	21,148,706	3,143	2,449	1,029	424	494	179	11
% Decrease **without** redistribution of effort	14.1%	15.3%	2.0%	1.1%	1.7%	8.1%	22.3%	0.0%
Discards with redistribution of effort		-71	-494	-239	-62	-29	26	-1
% Decrease **with** redistribution of effort	0.0%	-2.3%	-20.2%	-23.2%	-14.5%	-5.9%	14.8%	-12.5%

A negative sign indicates an increase

Table A.11 **Alternative B2(h). Temporal variation in effectiveness of the Southeast time/area closure on white marlin, blue marlin, sailfish, spearfish, leatherback, loggerhead, and other sea turtle discards. A negative sign indicates an increase in bycatch.** Source: Pelagic Longline Logbook data (2001-2003).

Month	Number of hooks set	White Marlin discards	Blue Marlin discards	Sailfish discards	Spearfish discards	Leatherback	Loggerhead	Other Sea turtles
1	125,740	2	9	7	0	4	0	0
2	110,101	10	3	3	0	3	2	0
3	72,215	10	6	0	3	0	0	0
4	66,124	12	11	0	1	2	0	0
5	418,879	66	44	29	12	5	2	0
6	263,124	48	19	31	6	1	0	0
7	98,264	2	26	20	1	1	0	0
8	82,603	0	20	41	3	0	0	0
9	55,952	0	7	5	0	0	0	0
10	58,866	1	2	4	0	0	1	0
11	63,838	0	3	4	1	1	0	0
12	68,986	6	3	1	2	1	1	0
Total	1,484,692	157	153	145	29	18	6	0
March-Nov	1,179,865	139	138	134	27	10	3	0
All Areas	21,148,706	3,143	2,449	1,029	424	494	179	11
% Decrease **without** redistribution of effort	5.6%	4.4%	5.6%	13.0%	6.4%	2.0%	1.7%	0.0%
Discards with redistribution of effort		-54	6	73	5	-12	-7	-1
% Decrease **with** redistribution of effort		-1.7%	0.24%	7.1%	1.2%	-2.4%	-4.0%	-5.4%

A negative sign indicates an increase

Table A.12 **Alternative B2(i). Temporal variation in effectiveness of the Florida East Coast time/area closure on white marlin, blue marlin, sailfish, spearfish, leatherback, loggerhead, and other sea turtle discards. A negative sign indicates an increase in bycatch.** Source: Pelagic Longline Logbook data (2001-2003).

Month	Number of hooks set	White Marlin discards	Blue Marlin discards	Sailfish discards	Spearfish discards	Leatherback	Loggerhead	Other Sea turtles
1	112,722	35	21	4	2	2	3	0
2	156,047	12	24	4	5	0	2	0
3	330,536	74	104	10	4	4	12	0
4	296,975	92	69	10	6	2	2	0
5	16,112	7	6	1	0	0	0	0
6	33,315	8	17	6	0	0	0	0
7	40,765	0	16	7	1	0	0	0
8	52,825	3	34	14	1	1	0	0
9	43,461	1	19	3	1	0	0	0
10	38,108	0	4	0	0	0	0	0
11	26,115	0	1	0	0	0	0	0
12	28,523	0	1	0	0	1	1	0
Total	1,175,504	232	316	59	20	10	20	0
All Areas	21,148,706	3,143	2,449	1,029	424	494	179	11
% Decrease **without** redistribution of effort	5.6%	7.4%	12.9%	5.7%	4.7%	2.0%	11.2%	0.0%
Discards with redistribution of effort		118	224	27	-7	-21	10	-1
% Decrease **with** redistribution of effort	0.0%	3.8%	9.2%	2.6%	-1.6%	-4.2%	5.4%	-9.5%

Table A.13 **Alternative B2(j). Temporal variation in effectiveness of the Gulf of Mexico time/area closure on white marlin, blue marlin, sailfish, spearfish, leatherback, loggerhead, and other sea turtle discards. A negative sign indicates an increase in bycatch.** Source: Pelagic Longline Logbook data (2001-2003).

Month	Number of hooks set	White Marlin discards	Blue Marlin discards	Sailfish discards	Spearfish discards	Leatherback	Loggerhead	Other Sea turtles
1	345,996	11	13	6	2	2	1	0
2	264,179	5	2	4	0	1	0	0
3	270,055	1	2	0	2	3	0	0
4	480,977	13	13	9	2	2	0	1
5	585,789	31	19	29	6	6	3	0
6	514,852	64	50	92	10	7	1	0
7	653,844	191	192	145	38	17	2	0
8	642,913	121	108	75	15	8	1	0
9	437,233	42	75	55	17	7	0	0
10	343,804	17	26	13	8	1	0	0
11	317,848	10	12	13	4	4	1	0
12	325,390	13	16	3	4	32	3	0
Total	5,182,880	519	528	444	108	90	12	1
All Areas	21,148,706	3,143	2,449	1,029	424	494	179	11
% Decrease **without** redistribution of effort	24.5%	16.5%	21.6%	43.1%	25.5%	18.2%	6.7%	9.1%
Discards with redistribution of effort		-394	-126	241	5	-38	-40	-2
% Decrease **with** redistribution of effort	0.0%	-12.6%	-5.1%	23.4%	1.2%	-7.7%	-22.1%	-17.0%

A negative sign indicates an increase

Table A.14 **Alternative B2(k). Temporal variation in effectiveness of the Caribbean time/area closure on white marlin, blue marlin, sailfish, spearfish, leatherback, loggerhead, and other sea turtle discards. A negative sign indicates an increase in bycatch.** Source: Pelagic Longline Logbook data (2001-2003). Landings were only reported for the four months listed.

Month	Number of hooks set	White Marlin discards	Blue Marlin discards	Sailfish discards	Spearfish discards	Leatherback	Loggerhead	Other Sea turtles
1	6,160	3	11	0	0	0	0	0
2	826	0	0	0	0	0	0	0
3	13,735	3	2	0	0	0	0	0
4	1,600	1	1	0	0	0	0	0
Total	22,321	7	14	0	0	0	0	0
All Areas	21,148,706	3,143	2,449	1,029	424	494	179	11
Decrease **without** redistribution of effort	0.1%	0.2%	0.6%	0.0%	0.0%	0.0%	0.0%	0.0%
Decrease **with** redistribution of effort	0.0%	0.7%	1.8%	-0.3%	-0.3%	-0.3%	-0.3%	-0.3%

Table A.15 Alternative B2(f). Temporal variation in effectiveness of the time/area closure. Source: Pelagic Longline Logbook data (2001-2003).

Month	Number of hooks set	Swordfish kept	Swordfish discards	Bluefin tuna kept	Bluefin tuna discards	Yellowfin tuna kept	Yellowfin tuna discards	Bigeye tuna kept	Bigeye tuna discards	BAYS kepts	BAYS discards
1	464,535	1,495	678	15	2	4,613	121	153	3	4,820	128
2	247,536	1,062	433	16	3	1,174	48	54	2	1,244	50
3	310,044	852	588	38	60	2,097	49	17	0	2,119	61
4	392,186	590	665	37	97	4,022	127	11	0	4,035	136
5	577,866	677	1,077	37	84	5,831	386	9	0	5,856	403
6	456,786	721	616	10	5	5,499	272	40	0	5,539	307
7	394,518	573	413	0	0	5,042	118	45	0	5,094	156
8	454,358	786	360	0	0	4,277	105	53	0	4,350	147
9	319,796	530	325	0	1	2,855	47	47	0	2,907	97
10	399,389	704	421	0	1	3,532	149	134	2	3,724	183
11	394,411	801	341	2	1	3,129	64	152	1	3,395	143
12	415,190	1,269	584	11	1	3,873	130	144	1	4,182	195
Total	4,826,615	10,060	6,501	166	255	45,944	1,616	859	9	47,265	2,006
All Areas	21,148,706	127,500	36,748	599	1,617	167,203	5,486	37,133	1,006	226,156	8,990
% Reduction	22.8%	7.9%	17.7%	27.7%	15.8%	27.5%	29.5%	2.3%	0.9%	20.9%	22.3%

Table A.16 **Alternative B2(g). Temporal variation in effectiveness of the time/area closure from June through October.** Source: Pelagic Longline Logbook data (2001-2003).

Month	Number of hooks set	Swordfish kept	Swordfish discards	Bluefin tuna kept	Bluefin tuna discards	Yellowfin tuna kept	Yellowfin tuna discards	Bigeye tuna kept	Bigeye tuna discards	BAYS kept	BAYS discards
1	94,685	1,156	790	0	2	126	25	14	0	164	31
2	63,028	734	369	1	0	31	0	6	0	40	0
3	70,714	561	212	0	79	148	4	11	0	164	13
4	83,255	576	219	0	40	912	52	61	1	977	55
5	143,876	615	134	1	18	2,084	41	185	3	2,270	44
6	294,380	1,617	284	12	233	2,814	20	486	3	3,461	29
7	525,481	3,711	654	16	66	3,089	63	549	5	4,033	80
8	596,472	3,613	963	5	8	4,252	79	1,270	60	6,543	165
9	596,671	4,788	1,360	2	46	6,364	190	2,651	76	10,530	308
10	551,664	4,489	2,244	16	61	6,388	110	2,894	71	13,721	415
11	421,760	3,581	1,873	33	195	4,116	82	2,879	28	10,029	626
12	197,429	1,773	847	3	14	1,029	20	1,368	6	3,532	227
Total	3,639,415	27,214	9,949	89	762	31,353	686	12,374	253	55,464	1,993
June-Oct	2,986,428	21,799	7,378	84	609	27,023	544	10,729	243	48,317	1,623
All Areas	21,148,706	127,500	36,748	599	1,617	167,203	5,486	37,133	1,006	226,156	8,990
% Reduction	14.1%	17.1%	20.1%	14.0%	37.7%	16.2%	9.9%	28.9%	24.2%	21.4%	18.1%

Table A.17 **Alternative B2(h). Temporal variation in effectiveness of the time/area closure from March through November.** Source: Pelagic Longline Logbook data (2001-2003).

Month	Number of hooks set	Swordfish kept	Swordfish discards	Bluefin tuna kept	Bluefin tuna discards	Yellowfin tuna kept	Yellowfin tuna discards	Bigeye tuna kept	Bigeye tuna discards	BAYS kept	BAYS discards
1	125,740	1,762	480	0	0	502	30	12	1	516	31
2	110,101	1,115	329	0	1	619	29	96	3	823	32
3	72,215	471	65	1	0	278	18	214	0	638	18
4	65,324	547	78	1	0	161	11	59	3	268	16
5	418,879	9,016	2,073	1	1	561	24	8	0	574	25
6	263,124	4,128	778	2	1	401	11	8	1	413	14
7	97,924	1,941	321	0	0	434	24	37	8	471	33
8	82,603	1,977	475	0	0	367	9	36	0	405	10
9	55,952	1,833	314	0	0	283	6	28	3	313	9
10	58,866	2,165	296	0	0	613	9	16	0	632	9
11	63,838	2,219	394	0	0	410	12	21	3	434	18
12	68,986	1,355	283	0	0	283	7	19	1	305	8
Total	1,483,552	28,529	5,886	5	3	4,912	190	554	23	5,792	223
March-Nov	1,118,725	24,297	4794	5	2	3,508	124	427	18	4,148	152
All Areas	21,148,706	127,500	36,748	599	1,617	167,203	5,486	37,133	1,006	226,156	8,990
% Reduction	7.0%	22.4%	16.0%	0.8%	0.2%	2.9%	3.5%	1.5%	2.3%	2.6%	2.5%
March-Nov	5.3%	19.1%	13.0%	0.8%	0.1%	2.1%	2.3%	1.1%	1.8%	1.8%	1.7%

Table A.18 **Alternative B2(i). Temporal variation in effectiveness of the Florida East Coast time/area closure.** Source: Pelagic Longline Logbook data (2001-2003).

Month	Number of hooks set	Swordfish kept	Swordfish discards	Bluefin tuna kept	Bluefin tuna discards	Yellowfin tuna kept	Yellowfin tuna discards	Bigeye tuna kept	Bigeye tuna discards	BAYS kept	BAYS discards
1	112,722	726	213	1	1	345	11	930	35	1,606	46
2	156,047	1,132	263	1	0	235	9	1,165	33	1,924	44
3	330,536	1,862	329	6	2	515	26	2,610	62	4,188	89
4	296,975	1,592	174	26	4	986	28	1,457	17	2,825	45
5	16,112	106	19	0	1	32	0	40	0	87	0
6	33,315	232	20	1	3	149	1	113	0	280	1
7	40,765	379	120	0	0	300	74	205	111	516	185
8	52,825	636	234	0	0	278	125	476	114	778	241
9	43,461	383	152	0	0	152	0	413	20	606	20
10	38,108	486	101	0	0	288	7	393	7	712	16
11	26,115	316	54	0	0	162	3	382	3	582	7
12	28,523	254	25	0	0	248	13	228	15	527	31
Total	1,175,504	8,104	1,704	35	11	3,690	297	8,412	417	14,631	725
All Areas	21,148,706	127,500	36,748	599	1,617	167,203	5,486	37,133	1,006	226,156	8,990
% Reduction	5.6%	6.4%	4.6%	5.8%	0.7%	2.2%	5.4%	22.7%	41.5%	6.5%	8.1%

Table A.19 Alternative B2(j). Temporal variation in effectiveness of the time/area closure. Source: Pelagic Longline Logbook data (2001-2003).

Month	Number of hooks set	Swordfish kept	Swordfish discards	Bluefin tuna kept	Bluefin tuna discards	Yellowfin tuna kept	Yellowfin tuna discards	Bigeye tuna kept	Bigeye tuna discards	BAYS kept	BAYS discards
1	346,896	1,302	571	14	0	3,765	79	76	3	3,914	97
2	264,179	2,226	765	15	1	1,072	29	23	1	1,104	34
3	270,055	1,989	749	18	7	1,454	73	3	0	1,464	74
4	482,677	1,615	689	52	92	4,114	236	15	0	4,131	237
5	587,439	1,305	892	47	69	5,807	187	9	0	5,819	220
6	512,512	885	588	7	4	7,171	170	12	1	7,183	207
7	653,044	754	436	3	0	9,096	261	26	0	9,129	294
8	643,863	793	462	0	5	7,948	191	23	1	7,991	213
9	437,233	536	316	19	1	4,550	101	28	0	4,600	118
10	344,604	747	340	0	0	3,295	108	49	5	3,375	134
11	318,248	608	283	1	0	2,441	78	86	0	2,588	122
12	325,440	709	342	5	0	3,141	109	50	0	3,281	163
Total	5,186,190	13,469	6,433	181	179	53,854	1,622	400	11	54,579	1,913
All Areas	21,148,706	127,500	36,748	599	1,617	167,203	5,486	37,133	1,006	226,156	8,990
% Reduction	24.5%	10.6%	17.5%	30.2%	11.1%	32.2%	29.6%	1.1%	1.1%	24.1%	21.3%

Table A.20 Alternative B2(k). Temporal variation in effectiveness of the time/area closure. Source: Pelagic Longline Logbook data (2001-2003).

Month	Number of hooks set	Swordfish kept	Swordfish discards	Bluefin tuna kept	Bluefin tuna discards	Yellowfin tuna kept	Yellowfin tuna discards	Bigeye tuna kept	Bigeye tuna discards	BAYS kept	BAYS discards
1	6,160	76	47	0	0	0	0	0	0	0	0
2	826	16	0	0	0	0	0	0	0	0	0
3	13,735	211	69	0	0	4	0	2	0	8	0
4	1,600	18	4	0	0	0	0	0	0	0	0
Total	22,321	321	120	0	0	4	0	2	0	8	0
All Areas	21,148,706	127,500	36,748	599	1,617	167,203	5,486	37,133	1,006	226,156	8,990
% Reduction	0.1%	0.3%	0.3%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%

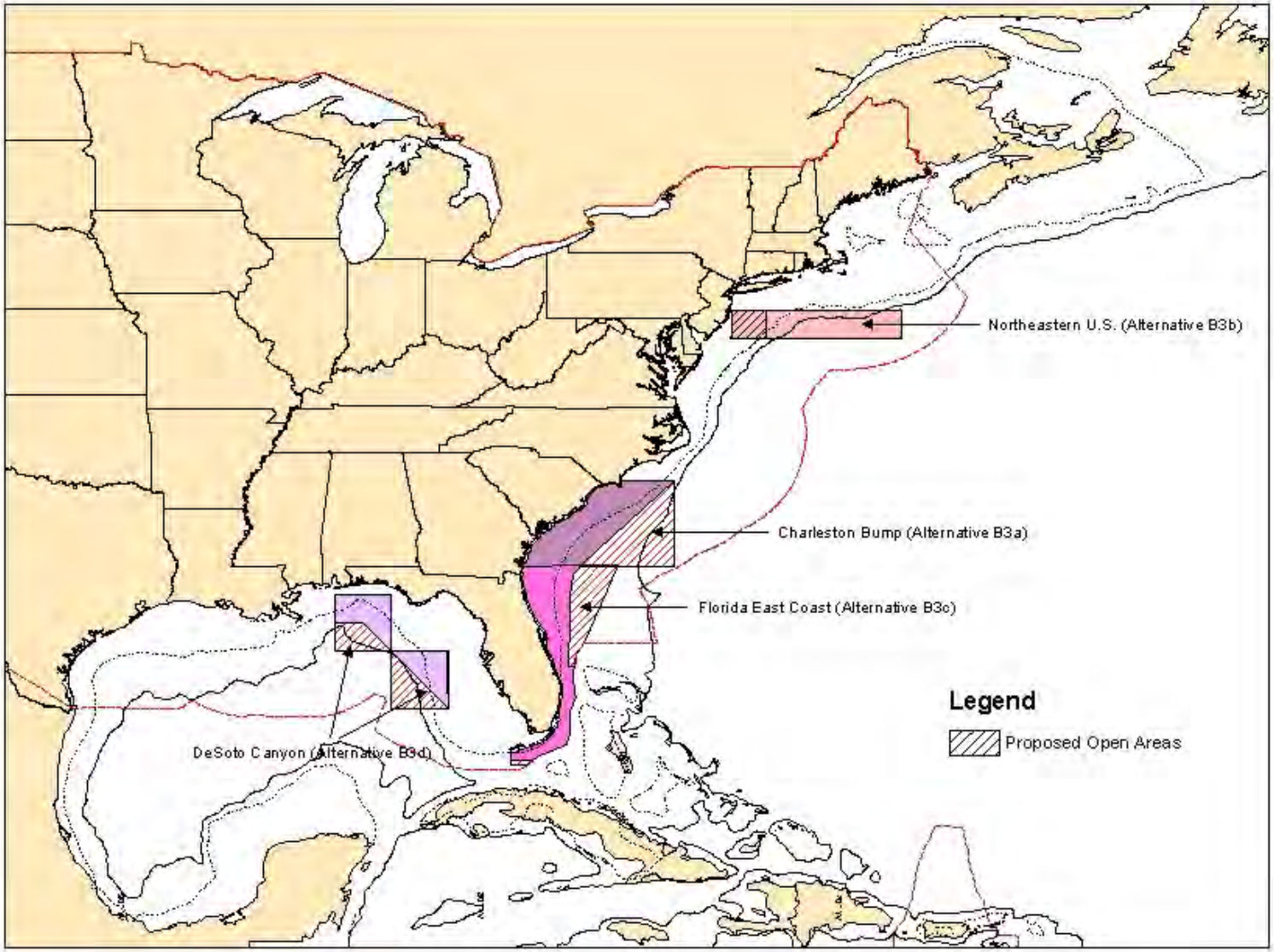

Figure A.2 **Map showing areas considered for modifications to existing closures. Note: only alternatives B3(a) and (b) were further analyzed.**

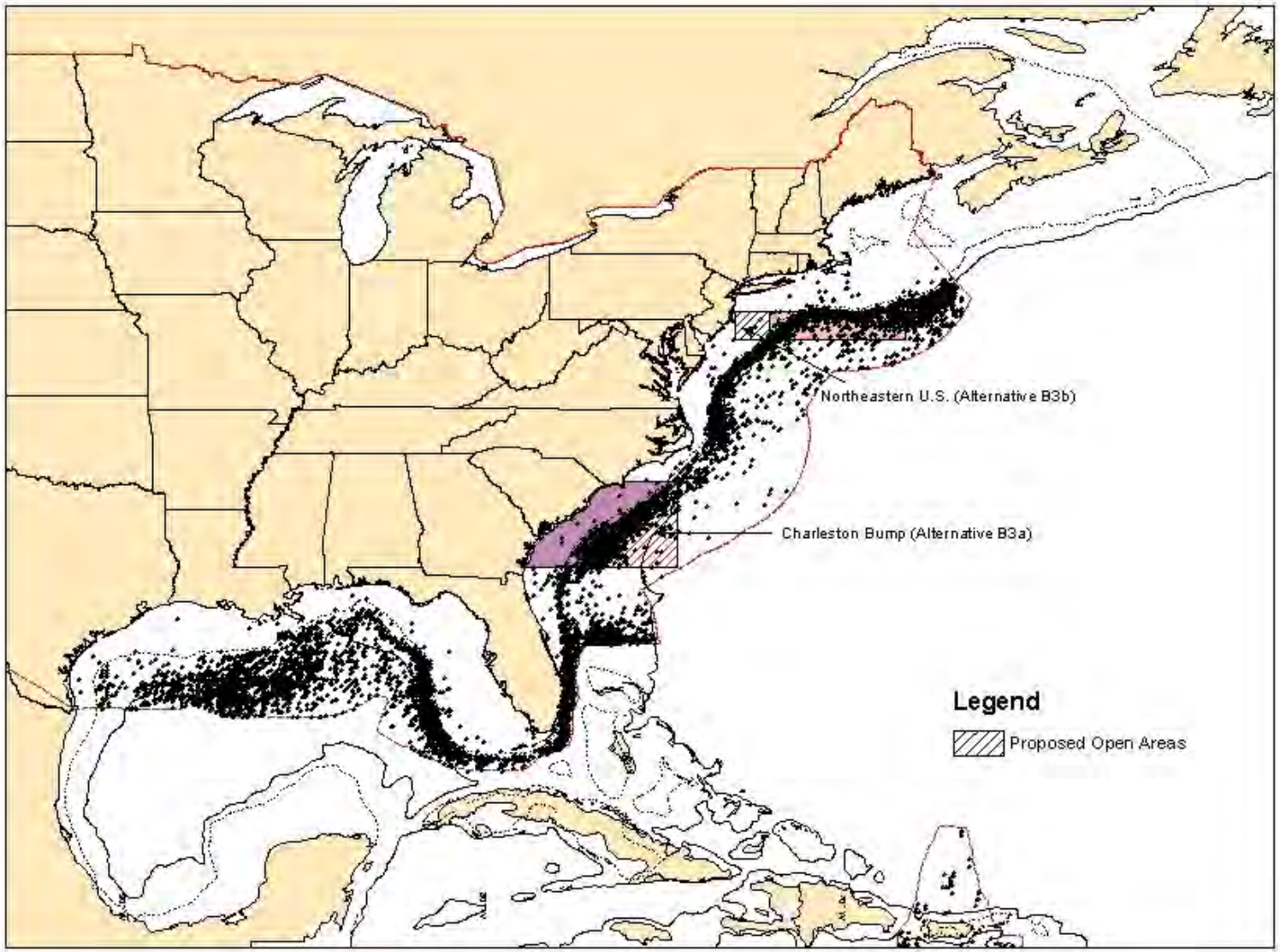

Figure A.3 **Map showing areas considered for modifications to existing closures and juvenile swordfish data. Note: only alternatives B3(a) and (b) were further analyzed.** Source Pelagic Observer Program 1997-1999.

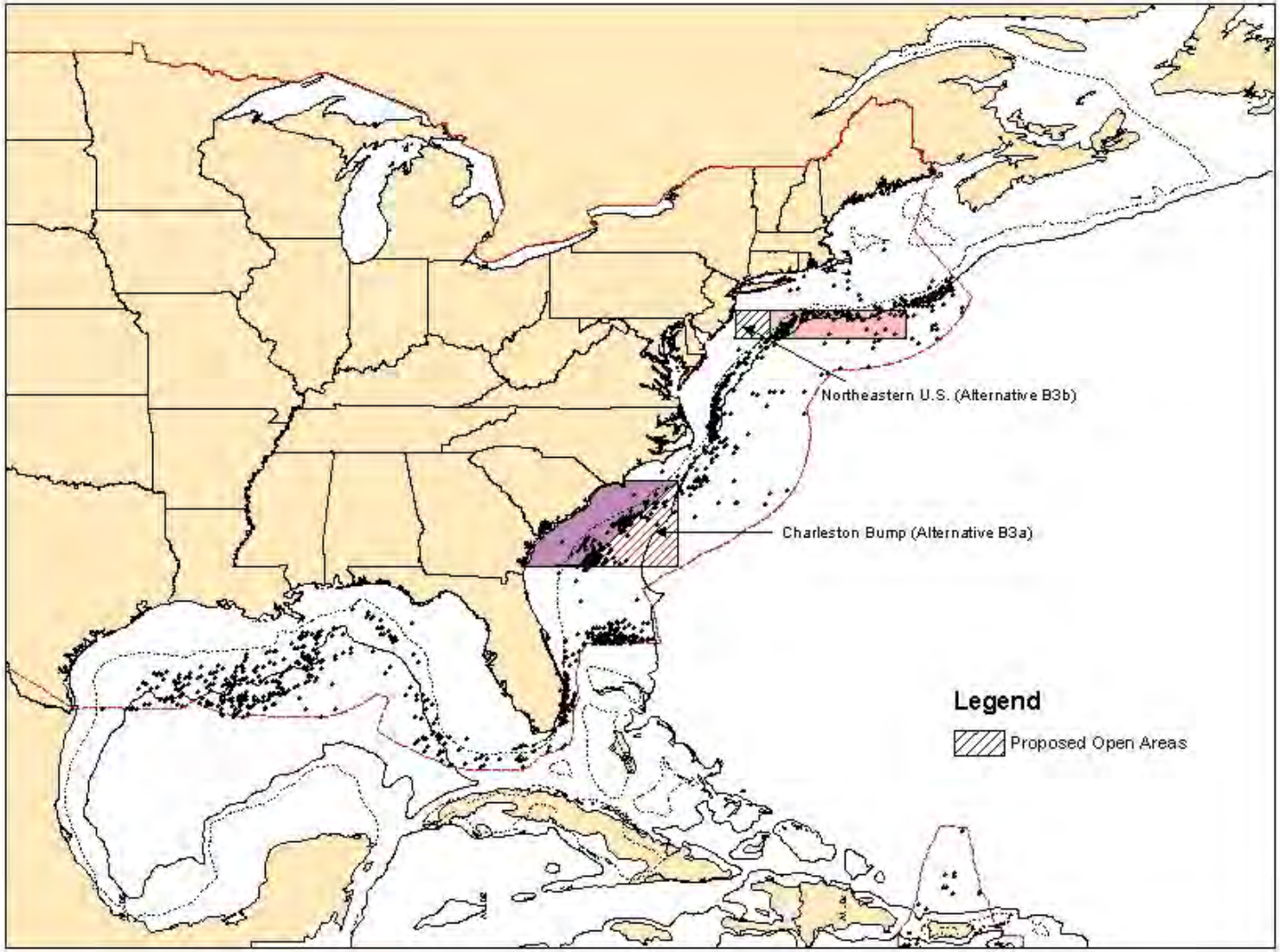

Figure A.4 **Map showing areas considered for modifications to existing closures and adult swordfish data from the Pelagic Observer Program. Note: only alternatives B2(a) and (b) were further analyzed.** Source Pelagic Observer Program 1997-1999.

Table A.21 **Swordfish lengths (cm lower jaw fork length) in closed areas (inside) and suggested modified areas (outside) of current time/area closures. Juvenile swordfish are ≤ 180 cm LJFL. Significant differences are shaded.** Source: Pelagic Observer Program 1992-1999.

Closed Area	Inside	Sample Size	Outside	Sample Size	*t*-test
	1992-1999				
B3(a) Charleston Bump	124	3,374	125	1,664	$P = 0.37$
B3(b) Northeastern U.S.	96	1695	71	2	$P = 0.34$
B3(c) Florida East Coast	119	2,744	124	679	$P < 0.0001$
B3(d) DeSoto Canyon	106	634	101	314	$P = 0.50$
	1997-1999				
B3(a) Charleston Bump	125	2,067	126	455	$P = 0.10$
B3(b) Northeastern U.S.	112	409	71	2	$P = 0.05$
B3(c) Florida East Coast	120	1,094	125	527	$P < 0.0001$
B3(d) DeSoto Canyon	116	152	108	55	$P = 0.03$

Table A.22 **Alternative B3(c) Florida East Coast modification. Discards of white marlin, blue marlin, sailfish, spearfish, leatherback, loggerhead and other sea turtles from the proposed closed and open areas.** Source Pelagic Longline Logbook 1997-1999.

Month	Number of hooks set	White Marlin discards	Blue Marlin discards	Sailfish discards	Spearfish discards	Leatherback	Loggerhead	Other Sea turtles
	CLOSED AREA							
1	81,708	4	20	16	1	1	1	0
2	68,328	4	12	11	4	0	0	0
3	107,962	5	14	41	0	1	0	0
4	134,487	16	12	24	0	0	1	0
5	161,558	34	41	129	2	1	0	0
6	100,117	4	13	61	2	0	0	0
7	100,942	9	16	62	1	1	1	0
8	74,005	7	16	41	3	0	0	0
9	43,040	4	7	15	3	1	0	0
10	62,900	3	4	8	1	0	0	0
11	79,128	5	8	16	2	0	0	0
12	101,843	21	23	33	1	0	0	0
Total	1,116,018	116	186	457	20	5	3	0
All Areas	21,148,706	3,143	2,449	1,029	424	494	179	11
% of All Areas	5.3%	3.7%	7.6%	44.4%	4.7%	1.0%	1.7%	0.0%
	MODIFIED AREA							
1	16,421	1	11	1	2	0	0	0
2	14,664	4	4	1	0	0	0	0
3	15,385	0	4	0	0	0	0	0
4	23,746	7	3	1	1	0	0	0
5	30,905	8	5	9	0	0	0	0
6	48,306	8	10	21	1	0	0	0
7	38,439	1	8	14	0	0	0	0
8	24,495	1	13	23	3	0	0	0
9	38,590	2	16	14	1	0	0	0
10	34,168	0	7	4	0	0	2	0
11	22,008	9	8	7	1	0	0	0
12	22,560	7	9	4	0	0	0	0
Total	329,687	48	98	99	9	0	2	0
All Areas	21,148,706	3,143	2,449	1,029	424	494	179	11
% of All Areas	1.6%	1.5%	4.0%	9.6%	2.1%	0.0%	1.1%	0.0%

Table A.23 **Alternative B3(d) Desoto Canyon modification. Discards of white marlin, blue marlin, sailfish, spearfish, leatherback, loggerhead and other sea turtles from the proposed closed and open areas.** Source Pelagic Longline Logbook 1997-1999.

Month	Number of hooks set	White Marlin discards	Blue Marlin discards	Sailfish discards	Spearfish discards	Leatherback	Loggerhead	Other Sea turtles
	CLOSED AREA							
1	20,270	3	2	0	0	0	0	0
2	18,321	0	2	0	0	0	0	0
3	41,625	3	4	1	0	0	0	0
4	7,592	3	3	2	0	0	0	0
5	15,324	0	0	0	0	0	1	1
6	25,752	3	7	6	0	0	0	0
7	22,582	8	6	3	0	0	0	0
8	10,235	3	0	3	0	0	0	0
9	8,860	2	0	0	0	0	0	0
10	18,185	12	2	3	0	0	0	0
11	8,040	1	0	1	0	0	0	0
12	10,290	2	0	0	0	0	0	0
Total	207,076	40	26	19	0	0	1	1
All Areas	21,148,706	3,143	2,449	1,029	424	494	179	11
% of All Areas	1.0%	1.3%	1.1%	1.8%	0.0%	0.0%	0.6%	9.1%
	MODIFIED AREA							
1	30,678	1	0	0	0	1	0	0
2	17,681	1	1	1	0	0	0	0
3	4,703	0	0	0	0	0	0	0
4	23,053	1	1	2	0	1	0	0
5	81,097	10	3	1	1	0	0	0
6	92,064	7	14	20	2	0	0	0
7	86,779	12	21	107	1	0	0	0
8	61,128	6	14	5	0	0	0	0
9	50,612	3	3	1	0	0	0	0
10	45,009	6	8	8	0	0	0	0
11	11,768	1	0	0	0	0	0	0
12	4,496	0	0	0	0	0	0	0
Total	509,068	48	65	145	4	2	0	0
All Areas	21,148,706	3,143	2,449	1,029	424	494	179	11
% of All Areas	2.4%	1.5%	2.7%	14.1%	0.9%	0.4%	0.0%	0.0%

Table A.24 **Comparison of discards of white marlin, blue marlin, sailfish, spearfish, leatherback and loggerhead sea turtles in modified areas.** Source Pelagic Longline Logbook 1997-2000. - = decrease + = increase.

Area	Number of hooks set	White Marlin discards	Blue Marlin discards	Sailfish discards	Spearfish discards	Leatherback	Loggerhead	Other Sea turtles
	MODIFIED AREAS							
B3(a) Charleston Bump (Feb-Apr)	108,403	19	17	10	4	0	1	0
B3(b) Northeastern U.S. (June)	2,400	0	0	0	0	0	0	0
B3(c) Florida East Coast	329,687	48	98	99	9	0	2	0
B3(d) Desoto Canyon	509,068	48	65	145	4	2	0	0
All Areas	21,148,706	3,143	2,449	1,029	424	494	179	11
	% of All Areas							
B3(a) Charleston Bump (Feb-Apr)	0.3%	0.6%	0.7%	1.0%	0.9%	0.0%	0.6%	0.0%
B3(b) Northeastern U.S.	0.01%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
B3(c) Florida East Coast	1.6%	1.5%	4.0%	9.6%	2.1%	0.0%	1.1%	0.0%
B3(d) Desoto Canyon	2.4%	1.5%	2.7%	14.1%	0.9%	0.4%	0.0%	0.0%

Table A.25 **Comparison of catch of swordfish, bluefin tuna, yellowfin tuna, bigeye tuna, and BAYS in modified areas.** Source Pelagic Longline Logbook 1997-2000.

Area	Number of hooks set	Swordfish kept	Swordfish discards	Bluefin tuna kept	Bluefin tuna discards	Yellowfin tuna kept	Yellowfin tuna discards	Bigeye tuna kept	Bigeye tuna discards	BAYS kepts	BAYS discards
	MODIFIED AREA										
B3(a) Charleston Bump (Feb-Apr)	108,403	1,371	548	0	0	275	19	8	1	297	21
B3(b) Northeastern U.S. (June)	2,400	3	0	0	1	1	0	0	0	1	0
B3(c) Florida East Coast	329,687	5,313	2,150	0	3	1,247	60	405	25	1,676	89
B3(d) DeSoto Canyon	509,068	985	647	12	22	8,091	206	45	1	8,170	287
All Areas	21,148,706	127,500	36,748	599	1,617	167,203	5,486	37,133	1,006	226,156	8,990
	% of All Areas										
B3(a) Charleston Bump (Feb-Apr)	0.51%	1.1%	1.5%	0.0%	0.0%	0.16%	0.35%	0.02%	0.1%	0.13%	0.23%
B3(b) Northeastern U.S. (June)	0.01%	0.002%	0.0%	0.0%	0.06%	0.001%	0.0%	0.0%	0.0%	0.0004%	0.0%
B3(c) Florida East Coast	1.6%	4.2%	5.9%	0.0%	0.19%	0.75%	1.1%	1.1%	2.5%	0.75%	0.01%
B3(d)Desoto Canyon	2.4%	0.8%	1.8%	2.0%	0.06%	4.8%	3.8%	0.12%	0.1%	3.6%	3.2%

Table A.26 **Alternative B3(c) modification of Florida East Coast time/area closure. Catch and discards of various species.** Source: Pelagic Longline Logbook data (1997-1999).

Month	Number of hooks set	Swordfish kept	Swordfish discards	Bluefin tuna kept	Bluefin tuna discards	Yellowfin tuna kept	Yellowfin tuna discards	Bigeye tuna kept	Bigeye tuna discards	BAYS kepts	BAYS discards
	CLOSED AREA										
1	81,708	1,535	922	1	0	14	0	1	0	15	1
2	68,328	1,222	801	0	0	7	0	3	1	10	1
3	107,962	1,870	1,188	0	0	37	1	10	5	55	8
4	134,487	1,802	979	1	0	32	4	46	0	91	6
5	161,558	2,485	976	5	18	157	6	60	0	229	6
6	100,117	2,096	740	4	1	150	1	19	1	172	3
7	100,942	1,833	823	0	0	106	1	23	0	129	1
8	74,005	1,561	777	0	0	68	0	24	0	92	0
9	43,040	1,305	666	0	0	33	0	19	0	52	0
10	62,900	1,776	936	0	0	54	2	6	0	60	2
11	79,128	2,245	819	0	0	52	2	11	0	63	3
12	101,843	2,340	1,052	0	0	38	1	9	2	47	3
Total	1,116,018	22,070	10,679	11	19	748	18	231	9	1,015	34
All Areas	21,148,706	127,500	36,748	599	1,617	167,203	5,486	37,133	1,006	226,156	8,990
% Reduction	5.3%	17.3%	29.1%	1.8%	1.2%	0.4%	0.3%	0.6%	0.9%	0.4%	0.4%
	MODIFIED AREA										
1	16,421	184	190	0	0	35	5	9	2	44	7
2	14,664	72	37	0	0	29	2	9	3	38	5
3	15,385	187	87	0	0	8	0	10	0	18	0
4	23,746	237	98	0	0	36	2	19	3	56	5
5	30,905	213	52	0	0	43	4	15	0	60	4
6	48,306	632	163	0	3	94	0	43	0	142	4
7	38,439	603	177	0	0	107	3	83	1	195	4
8	24,495	442	158	0	0	102	7	105	0	212	7
9	38,590	798	301	0	0	391	23	51	3	445	26
10	34,168	1,094	400	0	0	201	2	9	0	213	2
11	22,008	527	284	0	0	135	11	34	9	169	20
12	22,560	324	203	0	0	66	1	18	4	84	5
Total	329,687	5,313	2,150	0	3	1,247	60	405	25	1,676	89
All Areas	21,148,706	127,500	36,748	599	1,617	167,203	5,486	37,133	1,006	226,156	8,990
% Reduction	1.6%	4.2%	5.9%	0.0%	0.2%	0.7%	1.1%	1.1%	2.5%	0.7%	1.0%

Table A.27 **Alternative B3(d) modification of the DeSoto Canyon time/area closure. Catch and discards of various species.** Source: Pelagic Longline Logbook data (1997-1999).

Month	Number of hooks set	Swordfish kept	Swordfish discards	Bluefin tuna kept	Bluefin tuna discards	Yellowfin tuna kept	Yellowfin tuna discards	Bigeye tuna kept	Bigeye tuna discards	BAYS kepts	BAYS discards
	CLOSED AREA										
1	20270	278	63	0	0	2	0	0	0	4	2
2	16515	348	254	0	0	0	0	0	0	0	0
3	38760	497	216	0	0	10	0	0	0	10	0
4	6611	77	42	0	3	17	0	0	0	17	0
5	15324	165	123	1	0	372	16	1	0	373	16
6	25752	368	169	0	1	343	6	0	0	343	10
7	19832	189	107	0	0	75	5	1	0	76	5
8	10235	222	83	0	0	54	4	0	0	54	4
9	8860	40	35	0	0	118	0	0	0	118	4
10	18185	309	133	0	0	115	0	0	0	119	2
11	7415	101	36	0	0	28	0	0	0	28	0
12	10290	259	149	0	0	2	0	0	0	2	0
Total	198,049	2,853	1,410	1	4	1,136	31	2	0	1,144	43
All Areas	21,148,706	127,500	36,748	599	1,617	167,203	5,486	37,133	1,006	226,156	8,990
	0.9%	2.2%	3.8%	0.2%	0.2%	0.7%	0.6%	0.005%	0.0%	0.5%	0.5%
	MODIFIED AREA										
1	30,678	122	57	1	0	351	0	13	0	364	0
2	17,681	183	37	1	0	191	0	9	0	200	1
3	4,703	25	59	2	0	74	0	0	0	74	0
4	23,053	94	77	1	7	317	4	0	0	317	13
5	81,097	56	13	5	11	1,529	47	7	0	1,542	61
6	92,064	195	175	2	4	1,766	67	2	1	1,768	87
7	86,779	149	99	0	0	1,285	21	4	0	1,294	22
8	61,128	99	91	0	0	601	2	2	0	608	8
9	50,612	17	9	0	0	1,179	38	3	0	1,199	45
10	45,009	22	18	0	0	649	27	3	0	652	47
11	11,768	4	5	0	0	59	0	2	0	61	3
12	4,496	19	7	0	0	90	0	0	0	91	0
Total	509,068	985	647	12	22	8,091	206	45	1	8,170	287
All Areas	21,148,706	127,500	36,748	599	1,617	167,203	5,486	37,133	1,006	226,156	8,990
	2.4%	0.8%	1.8%	2.0%	1.4%	4.8%	3.8%	0.1%	0.01%	3.6%	3.2%

Table A.28 . **An example of how the redistribution of fishing effort is calculated. This example is calculating the number of discards of loggerhead sea turtles considering the redistribution of fishing effort for alternative B2(d). A negative sign indicates an increase in discards.**

	A	B	C	D	E	F	G	H	I	J	K	L
Month	**Number of hooks in the Atlantic & Gulf of Mexico**	**Number of discards in Atl.& Gulf of Mexico**	**Number of hooks in the time/area closure**	**Number of discards in the potential time/area closure**	**Number of discards in open Atl. & GOM (B-D)**	**CPUE in the open Atl. & Gulf of Mexico (E/(A-C))**	**Number of additional dicards in open Atl. & GOM by displaced effort (C*F)**	**Discards from open Atl. & GOM with displaced fishing effort (E+G)**	**Number of dicards avoided by area closure (B-H)**	**Cumulative discards avoided by month (Cumulative sum of I)**	**Percent of total discards by month (I/Sum of Column B)**	**Cumulative percent of total discards avoided by closure (J/Sum of Column B)**
1	1,647,194	9	739,191	1	8	8.81E-06	6.5	15	-6	-6	-3.1%	-3.1%
2	1,265,512	30	488,238	0	30	3.86E-05	18.8	49	-19	-24	-10.5%	-13.6%
3	1,632,848	21	546,944	1	20	1.84E-05	10.1	30	-9	-33	-5.1%	-18.7%
4	1,865,601	11	825,627	0	11	1.06E-05	8.7	20	-9	-42	-4.9%	-23.6%
5	2,000,083	15	1,085,255	6	9	9.84E-06	10.7	20	-5	-47	-2.6%	-26.2%
6	2,035,950	35	978,848	1	34	3.22E-05	31.5	65	-30	-77	-17.0%	-43.2%
7	2,253,513	13	1,136,250	3	10	8.95E-06	10.2	20	-7	-84	-4.0%	-47.2%
8	2,256,917	9	1,125,483	1	8	7.07E-06	8.0	16	-7	-91	-3.9%	-51.1%
9	1,707,630	7	820,167	1	6	6.76E-06	5.5	12	-5	-96	-2.5%	-53.6%
10	1,670,686	10	828,954	0	10	1.19E-05	9.8	20	-10	-106	-5.5%	-59.1%
11	1,528,728	11	725,772	1	10	1.25E-05	9.0	19	-8	-114	-4.5%	-63.6%
12	1,284,044	8	720,028	3	5	8.86E-06	6.4	11	-3	-117	-1.9%	-65.5%
Total	21,148,706	179	10,020,757	18	161	1.74E-04	135	296	-117			