DRAFT

AMENDMENT 3 TO THE CONSOLIDATED ATLANTIC HIGHLY MIGRATORY SPECIES FISHERY MANAGEMENT PLAN

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

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Highly Migratory Species Management Division
Office of Sustainable Fisheries
National Marine Fisheries Service
1315 East-West Highway
Silver Spring, Maryland 20910

Amendment 3 to the Consolidated Atlantic Highly Migratory Species Fishery Management Plan

Actions: Implement management measures consistent with recent stock assessments for small coastal sharks (SCS) and shortfin mako sharks; establish a rebuilding plan for blacknose sharks; implement commercial quota limits consistent with stock assessment recommendations to prevent overfishing and rebuild overfished stocks; modify commercial gear restrictions to reduce fishing mortality of overfished/overfishing stocks; modify recreational measures or prohibit the retention of overfished stocks; and, modify the Atlantic HMS management unit to include smooth dogfish.

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

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Abstract: The National Marine Fisheries Service (NMFS) is amending the 2006 Consolidated Atlantic Highly Migratory Species Fishery Management Plan based on several stock assessments that were completed in 2007 and 2008. Assessments for finetooth, Atlantic sharpnose, and bonnethead sharks indicated that these species are not overfished with no overfishing occurring. The assessment for blacknose sharks indicated that this species is overfished and experiencing overfishing. The assessment for shortfin mako sharks indicated that this species is not overfished, but is approaching an overfished status and is experiencing overfishing. Section 301(a) (National Standard 1) and Section 304(e) of the Magnuson-Stevens Fishery Conservation and Management Reauthorization Act (Magnuson-Stevens Act) requires the Agency to implement management measures that prevent overfishing and rebuild overfished stocks, as necessary. Section 304(i) applies in place of Section 304(e) to fisheries in or approaching an overfished condition due to excessive international fishing pressure. Based on the new stock assessments, and after considering comments received during scoping and on a Predraft document, NMFS is proposing measures that will reduce fishing mortality and effort in order to rebuild overfished Atlantic shark species while ensuring that a limited shark fishery can be maintained. Additionally, NMFS is proposing adding smooth dogfish under NMFS management due to growing concerns regarding the status of this unmanaged species.

EXECUTIVE SUMMARY

The National Marine Fisheries Service (NMFS) is proposing management measures that would reduce fishing mortality and effort in order to rebuild overfished Atlantic shark species while ensuring that a limited shark fishery can be maintained and establishing federal management of smooth dogfish.

Atlantic Highly Migratory Species (HMS) are managed under the dual authority of the Magnuson-Stevens Fishery Conservation and Management Reauthorization Act (Magnuson-Stevens Act) and the Atlantic Tunas Convention Act (ATCA). Under the Magnuson-Stevens Act, NMFS must manage fisheries to maintain optimum yield (OY) on a continuing basis while 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). The measures proposed in this amendment and associated rulemaking are taken under the authority of the Magnuson-Stevens Act. Currently, Atlantic sharks, tunas, swordfish, and billfish are managed under the 2006 Consolidated Atlantic HMS Fishery Management Plan (FMP), and its amendments.

Based on the 2007 stock assessment, NMFS determined that blacknose sharks are overfished with overfishing occurring. As a result, NMFS announced its intent to prepare an Environmental Impact Statement on May 7, 2008 (73 FR 25665). In this notice, NMFS asked for comments on existing commercial and recreational shark management measures that would assist the Agency in determining options for conservation and management of Atlantic sharks consistent with relevant federal statutes. On July 2 (73 FR 37932) and September 13 (73 FR 53407), NMFS announced the availability of a scoping document and five scoping meetings that would be held from July through September 2008. During the scoping meetings, NMFS described the results of recent stock assessments, issues that need to be addressed concerning shark management, options or alternatives that may be implemented to achieve objectives, and consulted with the five Atlantic Fishery Management Councils (New England, Mid-Atlantic, South Atlantic, Gulf of Mexico, and the Caribbean) and the two Atlantic interstate Marine Fisheries Commissions (Atlantic States and Gulf States), and the HMS Advisory Panel (AP). The comment period ended on November 14, 2008. NMFS released a Predraft of Amendment 3 to the 2006 Consolidated HMS FMP and a summary of the scoping comments to the HMS AP in February 2009. NMFS requested that the HMS AP and consulting parties (New England, Mid-Atlantic, South Atlantic, Gulf, and Caribbean Fishery Management Councils, Marine Fisheries Commissions, U.S. Coast Guard, and other State and Federal Agency representatives) submit comments on the Predraft by March 16, 2009. While some of the options considered in the Predraft have changed in this draft Amendment 3 to the 2006 Consolidated HMS FMP (hereafter referred to as Amendment 3), the overall list of issues to be addressed has not changed. A summary of the comments received during scoping (May 7, 2008 to November 14, 2008) can be found on the HMS website:
http://www.nmfs.noaa.gov/sfa/hms/newslist/2009/02-12-09_Predraft_for_Amendment_3.pdf.
The summaries and the transcripts of the September 2008 and February 2009 AP meetings can also be found on the HMS website at http://www.nmfs.noaa.gov/sfa/hms/.

To achieve the purpose and need, NMFS considered a range of alternative management measures from several different topics including SCS commercial quotas (Alternatives A1 through A5), commercial gear restrictions (Alternatives B1 through B3), pelagic shark effort controls (Alternatives C1 through C6), recreational measures for SCS (Alternatives D1 through D4) and pelagic sharks (Alternatives E1 through E5), and smooth dogfish management measures (Alternatives F1 through F3). For NEPA purposes, NMFS considered a full range of alternatives and carried forward those considered to be reasonable for full consideration in the DEIS. Consistent with the regulations published by the Council on Environmental Quality, 40 C.F.R. 1501-1508 (CEQ Regulations), NMFS has identified its preferred alternatives. The alternatives in this document considered the comments received from the public and consulting parties during the scoping and Predraft stages. A full description and analysis of the different alternatives can be found in Chapters 2 and 4 of this document. NMFS has identified preferred alternatives within each of the lettered topics, and believes that the preferred alternatives in this document should, consistent with the Magnuson-Stevens Act and other domestic laws, rebuild overfished Atlantic shark stocks, end overfishing of Atlantic sharks, balance the needs of the fishermen and communities with the needs of the resource and scientists, and maximize sustainable fishing opportunities. Based on public comments, NMFS will consider and reassess all alternatives, including those suggested by the public, before making a final decision.

The CEQ regulations direct Federal agencies to the full extent possible to integrate the requirements of NEPA with other planning and environmental review procedures required by law or by agency practice so that all procedures run concurrently rather than consecutively. To that end, this document integrates the Draft Environmental Impact Statement (DEIS) required by NEPA with the fisheries planning and management requirements associated with proposed amendment to a FMP under the Magnuson-Stevens Act, the Initial Regulatory Flexibility Analysis (IRFA) required under the Regulatory Flexibility Act (RF), 5 U.S.C. §§601-603; and the Regulatory Impact Review (RIR) prepared in accordance with Executive order 12866, "Regulatory Planning and Review."

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List of Commonly Used Abbreviations and Acronyms

AA	Assistant Administrator for Fisheries
ABC	Allowable biological catch
ACCSP	Atlantic Coastal Cooperative Statistics Program
ACS	Angler consumer surplus
ACL	Annual Catch Limit
ACTs	Allowable catch targets
ALRS	Automated Landings Reporting System
ALS	Accumulative Landings System
ALWTRP	Atlantic Large Whale Take Reduction Plan
ALWTRT	Atlantic Large Whale Take Reduction Team
AMs	Accountability Measures
ANPR	Advanced Notice of Proposed Rulemaking
AOCTRP	Atlantic Offshore Cetacean Take Reduction Plan
AOCTRT	Atlantic Offshore Cetacean Take Reduction Team
AP	Advisory Panel
APA	Administrative Procedure Act
ASA	American Sportfishing Association
ASMFC	Atlantic States Marine Fisheries Commission
ATCA	Atlantic Tunas Convention Act
AVHRR	Advanced Very High Resolution Radiometer
B	Biomass
B_{MSST}	Biomass of the minimum stock size threshold
B_{MSY}	Biomass expected to yield maximum sustainable yield
B_{OY}	Biomass expected to yield optimum yield
BAYS	Bigeye, albacore, yellowfin, skipjack tunas
BDTRP	Bottlenose Dolphin Take Reduction Plan
BDTRT	Bottlenose Dolphin Take Reduction Team
BET	Bigeye tuna
BETYP	Bigeye Tuna Year Program
BFT	Bluefin tuna
BiOp	Biological Opinion
BLL	Bottom Longline
BSD	Bluefin Tuna Statistical Document
BTF	By the fish
BUM	Blue marlin
CAR	Caribbean Statistical Area
CBP	Customs and Border Protection
Census Bureau	U.S. Bureau of the Census

CFDBS	Commercial Fisheries Database System
CFMC	Caribbean Fishery Management Council
CFL	Curved fork length
CFR	Code of Federal Regulations
CHB	Charter/Headboat
CHRA	Cape Hatteras Special Research Area
CIAT	Spanish for IATTC
CIE	Center for Independent Experts
CITES	Convention on International Trade in Endangered Species of Wild Fauna and Flora
CL	Carcass length
COASTSPAN	Cooperative Atlantic States Shark Pupping and Nursery Survey
COE	Certificate of Eligibility
COFI	Committee on Fisheries
COSEWIC	Committee on the Status of Endangered Wildlife in Canada
CPI	Consumer Price Index
CPUE	Catch per unit effort
CSFOP	Commercial Shark Fishery Observer Program (run by University of Florida)
CSR	Center for Shark Research
CSTP	Cooperative Shark Tagging Program
CV	Coefficient of Variation
CZMA	Coastal Zone Management Act
DEA	Data Envelopment Analysis
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
EFC	East Florida Coast closed area
EFH	Essential fish habitat
EFP	Exempted fishing permit
EIS	Environmental Impact Statement
EO	Executive Order
ERA	Ecological Risk Assessments
ESA	Endangered Species Act
F	Instantaneous fishing mortality
F_{MSY}	Instantaneous fishing mortality rate expected to yield maximum sustainable yield
F_{OY}	Fishing mortality rate expected to yield optimum yield

FAD	Fish aggregating device
FAO	Food and Agriculture Organization
FAS	Free Alongside Ship
FCZ	Fishery Conservation Zone
FEC	Florida East Coast Statistical Area
FEIS	Final Environmental Impact Statement
FL	Fork length
FMP	Fishery management plan
FMU	Fishery management unit
FR	Federal Register
FRFA	Final regulatory flexibility analysis
GDP	Gross Domestic Product
GIS	Geographic Information System
GLM	Generalized Linear Models
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
GulfFIN	Gulf of Mexico commercial Fishery Information Network
HACCP	Hazard Analysis Critical Control Point
HAPC	Habitat Area Of Particular Concern
HB	Hierarchical-Bayesian
HBS	Headboat Survey, Southeast
HMS	Highly migratory species: Atlantic sharks, tunas, swordfish, and billfish
HPTRP	Harbor Porpoise Take Reduction Plan
HPTRT	Harbor Porpoise Take Reduction Team
HTS	Harmonized Tariff Schedule
IATTC	Inter-American Tropical Tuna Commission
ICCAT	International Commission for the Conservation of Atlantic Tunas
IDL	Interdorsal length
IFQ	Individual Fishing Quota
ILAP	Initial limited access permit
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
kg	Kilogram
LAP	Limited access permit
LAPP	Limited access privilege program
LCS	Large coastal sharks
LJFL	Lower jaw fork length
LOA	Letter of Acknowledgment
LOF	List of Fisheries
LPS	Large Pelagic Survey
M	Mortality
MAB	Mid-Atlantic Bight Statistical Area
MAFMC	Mid-Atlantic Fishery Management Council
Magnuson-Stevens Act	Magnuson-Stevens Fishery Conservation and Management Act
MDMF	Massachusetts Division of Marine Fisheries
MFMT	Maximum fishing mortality threshold
MMPA	Marine Mammal Protection Act
MMS	Minerals Management Service
MPA	Marine protected area
MRFSS	Marine Recreational Fishing Statistics Survey
MSL	Mississippi Laboratories, SEFSC, NMFS
MSRA	Magnuson-Stevens Fishery Conservation and Management Reauthorization Act
MSST	Minimum stock size threshold
MSY	Maximum sustainable yield
mt	Metric tons
NAS	National Academy of Sciences
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, NMFS
NEPA	National Environmental Policy Act
NERO	Northeast Regional Office, NMFS
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
NS 1	National Standard 1 Guidelines
NWGB	National Working Group on Bycatch
NYB	New York Bight
OFL	Overfishing limit
OPR	Office of Protected Resources
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
PLTRP	Pelagic Longline Take Reduction Plan
PLTRT	Pelagic Longline Take Reduction Team
PMP	Preliminary Fishery Management Plan
POP	Pelagic observer program
PPI	Producer price index
PRA	Paperwork Reduction Act
PRD	Protected Resources Division
PRM	Post-release mortality
PSA	Productivity and Susceptibility Analysis
PSAT	Pop-up satellite archival tag
RBS	Recreational Billfish Survey
RFA	Regulatory Flexibility Act
RIR	Regulatory Impact Review
RFMC	Regional Fishery Management Council
RFMO	Regional Fishery Management Organizations
RPAs	Reasonable and Prudent Alternatives
RPMs	Reasonable and Prudent Measures
RUM	Random utility model
S&T	NMFS's Science and Technology
SAB	South Atlantic Bight
SAFE Report	Stock Assessment and Fishery Evaluation Report
SAFMC	South Atlantic Fishery Management Council
SAI	Sailfish
SAR	Sargasso Sea
SARA	Species at Risk Act

SBR	Spawning Stock Biomass Ratio
SBRM	Standardized Bycatch Reporting Methodology
SCRS	Standing Committee for Research and Statistics
SCS	Small coastal sharks
SCUBA	Self contained underwater breathing apparatus
SD	Statistical document
SEAMAP	Southeast Are Monitoring and Assessment Program
Secretary	Secretary of Commerce
SEDAR	Southeast Data, Assessment, and Review
SEFSC	Southeast Fisheries Science Center, NMFS
SEIS	Supplemental Environmental Impact Statement
SEN	Seines
SERO	Southeast Regional Office, NMFS
SEW	Stock evaluation workshop
SFA	Sustainable Fisheries Act
SFL	Straight fork length
SFM	Shortfin mako
SK Program	Saltonstall-Kennedy Program
SPOT	Smart position or temperature transmitting
SRP	Scientific research permit
SSB	Spawning stock biomass
SSF	Spawning Stock Fecundity
SSN	Spawning Stock Number
SWFSC	Southwest Fisheries Science Center
T-NB	Truncated negative binomial
TAC	Total allowable catch
TAG	Tag-A-Giant
TAL	Total allowable landings
TCs	Terms and Conditions
TEDs	Turtle exclusion devices
TDRs	Temperature-depth recorders
TL	Total length
TRP	Take Reduction Plan
TUNS	Tuna North and Tuna South
TWL	Trawls
TXPWD	Texas Parks and Wildlife Department
UNK	Unknown
USFWS	United States Fish and Wildlife Service
USVI	U.S. Virgin Islands

VIMS	Virginia Institute of Marine Science
VMS	Vessel monitoring system
VTR	Vessel Trip Report, NMFS NER
WHM	White marlin
WPFMC	Western Pacific Fishery Management Council
WTP	Willingness to pay
ww	Whole weight
WWF	World Wildlife Fund
YFT	Yellowfin tuna
YOY	Young of the year
ZINB	Zero-inflated negative binomial
ZIP	Zero-inflated Poisson
ZMRG	Zero Mortality Rate Goal

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1.0 INTRODUCTION

Atlantic Highly Migratory Species (HMS[1]) are managed under the dual authority of the Magnuson-Stevens Fishery Conservation and Management Reauthorization 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) on a continuing basis while 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). The management measures proposed for this Fishery Management Plan (FMP) amendment and associated rulemaking, which address Atlantic sharks, are taken under the authority of the Magnuson-Stevens Act. In addition to the Magnuson-Stevens Act, any management measures must also be consistent with other applicable 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). This document is prepared, in part, to comply with NMFS' responsibilities under NEPA, as implemented by the regulations published by the Council on Environmental Quality, 50 C.F.R. Parts 1501-1508 (CEQ Regs), and NMFS Administrative Order 216-6 (NAO 216-6).

In accordance with the requirements of NEPA, NMFS announced its intent to prepare an Environmental Impact Statement (EIS) for Amendment 3 to the 2006 Atlantic Consolidated HMS FMP on May 7, 2008 (73 FR 25665). In that notice, NMFS announced that blacknose sharks (*Carcharhinus acronotus*) are overfished with overfishing occurring and asked for comments on existing commercial and recreational shark management measures that would assist the Agency in determining options for conservation and management of blacknose sharks consistent with relevant federal statutes. NMFS announced the availability of a scoping document and details of five scoping meetings that were held from July through September 2008 (73 FR 37932, July 2, 2008; 73 FR 53407, September 13, 2008). NMFS also released a scoping presentation in conjunction with the Federal Register notice. In the presentation and at scoping meetings, in addition to presenting options for management of blacknose sharks, NMFS described the results of recent stock assessments for small coastal sharks (SCS), issues that need to be addressed concerning shark management, and options or alternatives that may be implemented to achieve objectives. Specifically, NMFS noted that the amendment would consider potential issues and options for blacknose sharks, pelagic sharks, and smooth dogfish (*Mustelus canis)*. At the time of the release of that presentation, the shortfin mako (*Isurus oxyrinchus*) and blue shark (*Prionace glauca*) stock assessments were not completed. As such, at the scoping meetings, NMFS did not present specific issues and options regarding shortfin mako sharks and blue sharks. Additionally, NMFS was just beginning to consider adding smooth dogfish under NMFS management and while NMFS presented the idea during scoping, specific issues and options for smooth dogfish were not identified at that time.

[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*).

NMFS released a Predraft of Amendment 3 to the 2006 Consolidated HMS FMP, which incorporated comments received during scoping, and a summary of the scoping comments to the HMS Advisory Panel (AP) on February 11, 2009, and was made available on the HMS website. The Predraft included, among other things, the outcome of the shortfin mako, blue shark, and SCS stock assessments as well as potential management measures for SCS, shortfin mako, smooth dogfish, and deepwater sharks. NMFS requested that the AP and consulting parties (Atlantic, Gulf, and Caribbean Fishery Management Councils, Marine Fisheries Commissions, U.S. Coast Guard, and other State and Federal Agency representatives) submit comments on the Predraft by March 16, 2009.

Based on comments received during scoping and on the Predraft, NMFS determined the significant issues of concern that would be addressed in this draft amendment. Some issues in the draft amendment are driven by statutory mandates under the Magnuson-Stevens Act, such as rebuilding overfished blacknose sharks and ending overfishing of blacknose and shortfin mako sharks. Other issues are being addressed due to concerns raised by constituents, such as implementing federal management for smooth dogfish. While some of the options considered in preparing this Predraft were modified in this draft amendment, the overall list of issues to be addressed has not changed. In this draft amendment, NMFS considers a range of alternatives for several different issues including quota limits, commercial gear restrictions, establishing a rebuilding plan for overfished stocks, recreational measures, and management measures for smooth dogfish. The specific issues are:

- SCS Commercial Quotas (alternatives A1-A5): NMFS considers modifying the SCS and species-specific quotas for SCS in order to rebuild blacknose sharks and end overfishing of this species. The range of alternatives could have a variety of impacts on the human environment from no impact (the No Action alternative) to significant impacts (alternative A5). The preferred alternative, A4, would likely have significant impacts on the human environment;
- Commercial Gear Restrictions (alternatives B1-B3): NMFS considers modifying the authorized gears that can be used to retain sharks in order to rebuild blacknose sharks and end overfishing of this species. The range of alternatives could have a variety of impacts on the human environment from no impact (the No Action alternative) to significant impacts (alternative B2). The preferred alternative, B3, would likely have significant impacts on the human environment;
- Commercial Pelagic Shark Effort Controls (alternatives C1-C6); NMFS considers modifying commercial regulations for shortfin mako sharks to end overfishing of this species. The range of alternatives could have a variety of impacts on the human environment from no impact (the No Action alternative) to significant impacts (alternative C3). The preferred alternatives, C5 and C6, would likely have minor impacts on the human environment;
- Recreational SCS Measures (alternatives D1-D4): NMFS considers modifying recreational regulations for SCS, including blacknose shark and Atlantic sharpnose sharks, to rebuild blacknose sharks and end overfishing of this species. The range of alternatives could have a variety of impacts on the human environment from no impact

(the No Action alternative) to moderate impacts (alternative D4). The preferred alternative, D4, would likely have moderate impacts on the human environment;

- Recreational Pelagic Shark Measures (alternatives E1-E5); NMFS considers modifying recreational regulations for shortfin mako sharks to end overfishing of this species. The range of alternatives could have a variety of impacts on the human environment from no impact (the No Action alternative) to significant impacts (alternative E5). The preferred alternatives, E3 and E4, would likely have minor impacts on the human environment; and,
- Smooth Dogfish Measures (alternatives F1-F3); NMFS considers implementing federal management measures for smooth dogfish based on concerns from constituents that smooth dogfish may require conservation and management. The range of alternatives could have a variety of impacts on the human environment from no impact (the No Action alternative) to moderate impacts (alternative F2 and sub-alternative F2a1). The preferred alternative, F2, and sub-alternatives F2a3 and F2b1, would likely have minor impacts on the human environment.

The Magnuson-Stevens Act subsection 303(a)(9) requires any FMP to include a fishery impact statement which shall assess, specify, and analyze the likely effects, if any, including the cumulative conservation, economic, and social impacts, of the conservation and management measures on, and possible mitigation measures for:

- Participants in the fisheries and fishing communities affected by the plan or amendment;
- Participants in the fisheries conducted in adjacent areas under the authority of another Council, after consultation with such Council and representatives of those participants; and,
- The safety of human life at sea, including whether and to what extent such measure may affect the safety of participants in the fishery.

A similar analysis using much of the same economic and social data is necessary to ensure consistency with of the Magnuson-Stevens Act National Standard 8, which requires that conservation and management measures, including those developed to end overfishing and rebuild fisheries:

- Take into account the importance of fishery resources to fishing communities in order to provide for their sustained participation; and,
- To the extent practicable, minimize the adverse economic impacts on such communities.

The mandates of subsections 303(a)(9) and 301(a)(8) are consistent with the requirements under NEPA for NMFS to identify and evaluate the direct, indirect and cumulative impacts of the proposed action on the social and economic elements of the human environment. This amendment, therefore, meets these multiple requirements with an integrated analysis focusing on the existing social and economic condition of the fisheries and affected fishing communities, determining the potential direct, indirect, and cumulative effects, and developing alternatives to mitigate adverse effects to the greatest extent practicable. The data and analyses necessary to support the foregoing requirements can be found in the following chapters. Chapter 3 provides a description of the fisheries that interact with blacknose, shortfin mako, and smooth dogfish

sharks and participants in the fisheries conducted in adjacent areas under the authority of another Council. Chapter 3 also describes safety of human life at sea issues. Chapter 4 of this document provides the ecological, socio-economic impacts, and cumulative impacts of the conservation and management measures on participants in the fisheries and fishing communities affected by this amendment. Finally, Chapter 5 discusses any mitigating measures regarding the preferred alternatives, and Chapter 9 provides the community profiles and social impact analysis for this amendment. This amendment also includes Chapter 2, which gives a description of the different alternatives for each issue, and Chapters 6, 7, and 8, which analyze the economic impacts of the alternatives and address the requirements of a Regulatory Impact Review (RIR) and Initial Regulatory Flexibility Analysis (IRFA). Chapter 10 describes consistency with the National Standards, other requirements of the Magnuson-Stevens Act, and other applicable laws, and Chapter 11 describes essential fish habitat for smooth dogfish. Several appendices are also included to provide more information on specific calculations for different issues (Appendix A), a response by the NMFS Southeast Fisheries Science Center (SEFSC) on technical comments received during scoping (Appendix B), and a formal response to the Mid-Atlantic Fishery Management Council regarding smooth dogfish management (Appendix C).

1.1 Brief Management History

This section provides a brief overview of HMS management. More detail regarding the history of Atlantic shark management can be found in Section 3.1.

In 1989, the Regional Fishery Management Councils (RFMCs) requested that the Secretary of Commerce (Secretary) manage Atlantic sharks. 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 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)). At this time, the Secretary delegated authority to manage Atlantic HMS to NMFS. NMFS finalized a shark FMP in 1993. In 1999, NMFS revised the 1993 FMP and included swordfish and tunas in the 1999 FMP for Atlantic tunas, swordfish, and sharks (1999 FMP). The 1999 FMP was amended in 2003, and in 2006, NMFS consolidated the Atlantic tunas, swordfish, and shark FMP and its amendments and the Atlantic billfish FMP and its amendments in the 2006 Consolidated Atlantic HMS FMP. This amendment amends the 2006 Consolidated HMS FMP.

Under the Magnuson-Stevens Act, NMFS is responsible for managing HMS and must comply with all applicable provisions of the Magnuson-Stevens Act when it prepares and amends its FMP and implementing regulations (16 U.S.C.§1852(a)(3)). NMFS must maintain OY of each fishery while preventing overfishing (16 U.S.C.§1851(a)(1)). Where a fishery is determined to be in or approaching an overfished condition, NMFS must include in its FMP conservation and management measures to prevent or end overfishing and rebuilding the fishery, stock or species (16 U.S.C. §§1853(a)(10); 1854(e)). If NMFS determines that a fishery is

overfished or approaching an overfished condition due to excessive international fishing pressure and there are no management measures to end such overfishing in an international agreement to which the United States is a party, it must take action at the international level to end overfishing (16 U.S.C. §§1854, 1854 note). In preparing and amending an FMP, NMFS must, among other things, consider the National Standards, including using the best scientific information as well as the potential 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 that addresses 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:

- 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.

1.2 Rebuilding and Preventing Overfishing of Atlantic Sharks

Under National Standard (NS) 1 of the Magnuson-Stevens Act , as implemented by the National Standard 1 Guidelines (NSG1) (50 CFR 600.310), NMFS is required to "prevent overfishing while achieving, on a continuing basis, the OY from each fishery for the U.S. fishing industry." In order to accomplish this, NMFS must determine the maximum sustainable yield (MSY) and specify status determination criteria (*i.e.*, maximum fishing mortality threshold and minimum stock size threshold) to allow a determination of the status of the stock. In cases where the fishery is overfished, NMFS must take action to rebuild the stock (by specifying rebuilding targets). In the 1999 FMP, and maintained in the 2006 Consolidated HMS FMP, NMFS outlined these status determination criteria and a set of rebuilding targets for all HMS. As described below, this amendment does not change these criteria or targets. In addition, Congress amended the Magnuson-Stevens Act in 2007 to require that each FMP establish a mechanism for specifying Annual Catch Limits (ACLs) at a level that will prevent overfishing and include Accountability Measures (AMs) to ensure ACLs are not exceeded (16 U.S.C. 1853(a)(15)). NMFS must amend its HMS FMP to address these requirements for stocks currently experiencing overfishing by 2010, and for all other stocks beginning 2011 onward. This document will amend the plan to include a mechanism to specify ACLs for stock complexes and certain specific shark species. It will also identify AMs. The regulations necessary to adjust ACLs as needed and apply AMs already exist. No additional regulations would be necessary to implement these requirements.

On January 16, 2009, NMFS published NSG1 providing guidance for implementing the ACL and AM requirements of the Magnuson-Stevens Act (74 FR 3178). Per the January 2009 final rule, ACLs and AMs apply to all fisheries "unless otherwise provided for under an international agreement in which the United States participates." While, SCS, large coastal sharks (LCS), and pelagic sharks are predominately managed through domestic management measures, in recent years ICCAT has issued a number of recommendations regarding sharks (*e.g*., ICCAT recommendations 2004-10, 2005-05, 2007-06, and 2008-07. Nevertheless, ACLs and AMs will apply, as required, to all Atlantic shark species managed by NMFS.

According to the NSG1, ACLs and AMs are related to other reference points, including an overfishing limit (OFL) and Allowable Biological Catch (ABC). OFL is greater than or equal to the ABC limit, which is greater than or equal to the ACL. As such, NMFS is establishing for all Atlantic sharks the following mechanism to use when establishing ACLs and applying AMs. NMFS considers the OFL to be the annual amount of catch that corresponds to the estimate of maximum fishing mortality threshold (MFMT) applied to the stock abundance. The ABC would be established to account for uncertainty in the assessment. Ideally, the actual ABC would be established as part of the stock assessment reports, results, and/or conclusions. However, because the SCS assessment predates NSG1 and until new stock assessments for HMS incorporate the new ACL and AM guidance, for sharks, NMFS is establishing the ABC equal to the ACL. This would ensure that the ABC is below the OFL, which is required under NSG1.

In general, the ACL is equivalent to the total allowable catch (TAC) for all fisheries that interact with a given shark species. The TAC, or ACL, is provided as part of the stock assessment report, results, and/or conclusions and is the level of mortality that is acceptable given the biological characteristics of the species that would allow a stock to rebuild or remain sustainable during a given timeframe. If the OFL can be estimated, then the ABC and corresponding ACL would be set at a level of catch less than the OFL to account for scientific uncertainty and at a level that is acceptable given the biological characteristics of the species. Future stock assessments would provide an ABC consistent with the NSG1. For overfished stocks, the ACL is equal to the stock assessment's projection that shows rebuilding with a 70-percent change of success. NMFS uses the 70 percent probability of rebuilding for sharks given their life history traits, such as late age of maturity and low fecundity (*i.e*., instead of 50 percent, which is commonly used for other species). Additionally, NMFS may establish "sector-ACLs," which would include landings and discards, and "commercial landings components of the sector ACL," which would be the commercial landings quota for specific shark fisheries.

A number of shark stocks have not been individually assessed. Additionally, a number of shark stocks are managed in a complex as some species have not been individually assessed, such as oceanic whitetip and common thresher sharks. As such, NMFS is establishing some exceptions to the above mechanism for establishing ACLs and AMs. For example, MSY, OY, and the status determination criteria for pelagic sharks have been defined in the 1999 FMP (see below) and do not change in this amendment. Additionally, quotas have been established for the pelagic shark complex and for blue and porbeagle sharks. For example, the original pelagic shark quota (which was comprised of common thresher, oceanic whitetip, blue, shortfin mako, and porbeagle sharks) was based on mean landings from 1986-1991 (580 mt dw). In the 1999 FMP, the current pelagic quota was established by subtracting the porbeagle quota of 92 mt dw

from the pelagic sharks quota, resulting in an annual quota of 488 mt dw (a separate set-aside was also established for blue shark discards under the 1999 FMP). The porbeagle quota has since been reduced to 1.7 mt dw per year, and a TAC has been established at 11.3 mt dw, which would be equivalent to the ACL for porbeagle sharks. NMFS believes that these levels of catch for pelagic sharks are acceptable given the biological characteristics of the stocks or stock complex. As such, given that the current commercial quotas and recreational bag limits serve as limits on catch and prevent overfishing, in the absence of a specific TAC, NMFS considers these quotas to be equivalent to the ACL, ABC, and TAC for pelagic sharks. As needed and required, NMFS can adjust these ACLs and apply AMs.

For sharks, the quotas are generally for the commercial fishery, not the recreational fishery. NMFS has not established quotas for the recreational shark fishery due to the difficulty in estimating recreational catches in real time but may consider doing so in the future. While the shark recreational fishery does not have a formal quota, catches within the recreational shark fishery are considered when stock assessments are conducted and are taken into account when NMFS establishes the OFL, ABC, ACL, and TAC. NMFS also takes the recreational catches, along with discards from the commercial sector, into account when establishing the commercial quota or "commercial landings components of the ACL." Because sector ACLs are being used, sector AMs would also be used. This action would change the quotas for SCS and establish a commercial quota for smooth dogfish. It does not change the quotas that were previously established for LCS and pelagic sharks.

NSG1 also requires NMFS to establish AMs. NMFS already has AMs along with measures analogous to allowable catch targets (ACTs) in place in commercial Atlantic shark fisheries. Specifically, overharvests of the commercial quotas are removed from the next fishing year's quota. In addition, underharvests for shark species that are not overfished or are not experiencing overfishing are added to the base quota the following year and capped at 50 percent of the base quota. There is no carryover of underharvests for species that are unknown, overfished, or experiencing overfishing. In addition, NMFS closes the quota for each shark species/complex with five days notice upon filing in the Federal Register when 80 percent of a given quota is filled or projected to be reached. Eighty percent of the shark quota is, therefore, the ACT. The measures proposed in draft Amendment 3 to the Consolidated HMS FMP do not change these AMs.

In summary, this proposed amendment and associated rulemaking establishes the mechanism for specifying ACLs as required by Section 303(a)(15) of the statute and is consistent, to the greatest extent practicable with NSG1; establishes new quotas for SCS and smooth dogfish following these methods; and maintains the current quotas for LCS and pelagic sharks, consistent with these methods. Quotas, or landings component of the sector ACL, would be adjusted annually for over- and underharvests from the previous fishing year. ACLs are adjusted based on the result of stock assessments, which are usually done through a FMP amendment. In short, for all HMS managed sharks, with the exceptions noted above, the methods are:

- OFL>ABC≥ACL (until estimates of ABC are available);

- OFL = the annual amount of catch that corresponds to the estimate of MFMT applied to a stock's abundance relative to the level of fishing mortality (F);
- ABC = to be determined by future stock assessments; in the interim, NMFS assumes ABC=ACL;
- ACL = TAC; for overfished stocks this will be the projection that shows 70 percent probability of rebuilding;
- Commercial quota = landings component of the sector ACL; and
- AMs = restrictions on use of over- and underharvests and closing the fishery when commercial landings are at or projected to be at 80 percent of the quota.

Stock Status and Status Determination Criteria

According to the definition in 50 C.F.R.§ 600.310(e)(2)(i)(B) of NSG1, overfishing occurs whenever a stock or stock complex is subjected to a level of fishing mortality or annual total catch that jeopardizes the capacity of a stock or stock complex to produce MSY on a continuing basis. The 1999 FMP established the maximum fishing mortality threshold (MFMT) as F_{MSY}. F_{MSY} is defined as the fishing mortality level necessary to produce MSY on a continuing basis. If the MFMT exceeds F_{MSY} for more than one year, then the stock is considered to be subject to overfishing, and remedial action must be taken. This is the current situation for blacknose and shortfin mako sharks.

The 1999 FMP established the minimum stock size threshold (MSST) as $(1\text{-}M)B_{MSY}$ when natural mortality (M) is less than 0.5. Most species of sharks have M less than 0.5. When the stock falls below MSST, the stock is overfished and remedial action must be taken to rebuild the stock. This is the current situation for blacknose sharks.

Stocks are considered rebuilt when current B levels are equal to B_{MSY}. B_{MSY} is the level of stock abundance at which harvesting the resource can be sustained on a continual basis at the level necessary to support MSY. Stocks are considered healthy when F is less than or equal to 0.75 F_{MSY} and B is greater than or equal to B_{OY} (the biomass level necessary to produce OY on a continuing basis). Finetooth (*Carcharhinus isodon)*, bonnethead (*Sphyrna tiburo)*, Atlantic sharpnose (*Rhizoprinodon terraenovae*), and blue sharks are considered healthy; however, the 2007 assessments for finetooth, bonnethead, and Atlantic sharpnose sharks recommended cautious management measures for these three species based on trends of B_{MSY} and F_{MSY} for all species (NMFS, 2007). In summary, the thresholds used to calculate the status of Atlantic sharks are as follows:

- MFMT = $F_{limit} = F_{MSY}$;
- Overfishing is occurring when $F_{year} > F_{MSY}$;
- MSST = $B_{limit} = (1\text{-}M)B_{MSY}$ when $M < 0.5 = 0.5B_{MSY}$ when $M >= 0.5$;
- Overfished when $B_{year}/B_{MSY} <$ MSST;
- Biomass target during rebuilding = B_{MSY};
- Fishing mortality during rebuilding < F_{MSY};

- Fishing mortality for healthy stocks = $0.75F_{MSY}$;
- Biomass for healthy stocks = B_{OY} = ~1.25 to $1.30B_{MSY}$;
- Minimum biomass flag = $(1\text{-}M)B_{OY}$; and
- Level of certainty of *at least* 50 percent but depends on species and circumstances; for sharks, the level of certainty is 70 percent.
- For sharks, in some cases, spawning stock fecundity (SSF) or spawning stock number (SSN) is used as a proxy for biomass since biomass does not influence pup production in sharks.

The latest stock assessment of SCS in the U.S. Atlantic and Gulf of Mexico was completed in 2007 (72 FR 63888, November 13, 2007). This peer-reviewed assessment, which was conducted according to the Southeast Data, Assessment, and Review (SEDAR) process, provides an update from the 2002 stock assessment on the status of SCS stocks and projects their future abundance under a variety of catch levels in the U.S. Atlantic Ocean, Gulf of Mexico, and Caribbean Sea. The 2007 assessment includes updated catch estimates, new biological data, and a number of fishery-independent catch rate series, as well as fishery-dependent catch rate series, and is considered the best available science.

The peer reviewers determined that the data used in the 2007 stock assessment of the SCS complex and the individual species within the complex were the best available at the time, and the assessment was considered adequate. However, because the species were individually assessed, the peer reviewers recommended using species-specific results rather than the aggregated SCS complex results. This does not preclude NMFS from managing SCS as a complex. Therefore, NMFS is examining alternative options to managing the SCS complex as a whole as well as species-specific management for blacknose sharks, which are described in more detail in Chapters 2 and 4.

In addition, the NMFS SEFSC has been working with industry scientists to re-evaluate the shrimp bycatch models used in the 2007 SCS stock assessments. In particular, they have been evaluating the effect of turtle exclusion devices, or TEDs, on SCS bycatch in shrimp trawls. Once the SEFSC has finished their evaluation of those models, NMFS could revise blacknose shark bycatch estimates. Preliminary results suggest that the post-TED (*i.e.*, from 1990 on) reduction in bycatch from the model currently in development is approximately 50 percent. The NMFS SEFSC has also run sensitivity analyses to determine the effect of reduced blacknose bycatch in shrimp trawls on the stock status of blacknose sharks. Although stock status improves, despite reductions in shrimp trawl bycatch of 25, 50, and 75 percent, the stock continues to be overfished (N_{2005}/N_{MSY} = 0.66 to 0.74 versus 0.48 in the baseline assessment run from the 2007 blacknose shark stock assessment) with overfishing occurring (F_{2005}/F_{MSY} = 2.67 to 2.21 versus 3.77 in the baseline assessment run from the 2007 blacknose shark stock assessment) (see Appendix B). Depending on the results of these evaluations, NMFS may need to work with the Councils to reduce bycatch of blacknose sharks in shrimp trawls, as appropriate.

In 2008, the ICCAT's Standing Committee on Research and Statistics (SCRS) conducted an updated species-specific stock assessment for North Atlantic shortfin mako sharks. The

ICCAT stock assessment found that the North Atlantic shortfin mako sharks are experiencing overfishing and are not overfished but are approaching an overfished status; however, the assessment gave no biological benchmarks in terms of a TAC (or ACL) or ABC. NMFS has determined that the ICCAT assessment is the best available science and has determined domestically that shortfin mako sharks have overfishing occurring but are not overfished (June 19, 2009, 74 FR 21985). Based on this determination, NMFS is considering a range of alternatives to help stop overfishing of shortfin mako sharks and rebuilding the stock, if necessary, through efforts at the international level. These alternatives are described in more detail in Chapter 2 and 4.

National Standard 1 and Determining the Rebuilding Timeframe

Under the NSG1, if a stock is overfished, NMFS is required to "prepare an FMP, FMP amendment, or proposed regulations... to specify a time period for ending overfishing and rebuilding the stock or stock complex that will be as short as possible as described under section 304(e)(4) of the Magnuson- Stevens Act." (50 CFR 600.310(j)(2)(ii)). A rebuilding ABC must be set to reflect the annual catch that is consistent with the schedule of the fishing mortality rates in the rebuilding plan. The time frame to rebuild the stock or stock complex must specify a time period that is as short as possible taking into account a number of factors including:

- The status and biology of the stock or stock complex;
- Interactions between the stock or stock complex and other components of the marine ecosystem;
- The needs of the fishing communities;
- Recommendations by international organizations in which the United States participates; and
- Management measures under an international agreement in which the United States participates.

The rebuilding target may not exceed ten years, unless dictated otherwise by:

- The biology of the stock or complex of fish;
- Other environmental conditions; or,
- Management measures under an international agreement in which the United States participates.

The lower limit of the specified time frame for rebuilding is determined by the status and biology of the stock and is defined as "…the amount of time the stock or stock complex is expected to take to rebuild to its MSY biomass level in the absence of any fishing mortality" (50 CFR 600.310 (j)(3)(i)(A)).

The NSG1 specify two strategies for determining the rebuilding time frame depending on the lower limit of the specified time frame for rebuilding. The first strategy (50 CFR 600.310 (j)(3)(i)(C)) states that:

> "If T_{min} [minimum time for rebuilding a stock] for the stock or stock complex is 10 years or less, then the maximum time allowable for rebuilding (T_{max}) that stock to its B_{MSY} is 10 years."

The second strategy (50 CFR 600.310 (j)(3)(i)(D)), which is applicable for most species of sharks because the lower limit is generally 10 years or greater, specifies that:

> "If T_{min} for the stock or stock complex exceeds 10 years, then the maximum time allowable for rebuilding a stock or stock complex to its B_{MSY} is T_{min} plus the length of time associated with one generation time for that stock or stock complex. 'Generation time' is the average length of time between when an individual is born and the birth of its offspring."

The 1999 FMP established that management measures for Atlantic tunas, swordfish, and sharks should have at least a 50 percent chance of reaching the target reference points used in developing rebuilding projections. This target is consistent with the technical guidelines for NSG1. However, compared to other HMS and fish species, many shark species are slow growing, take a long time to mature, have few pups, and generally reproduce every two or three years (*e.g.*, the blacknose shark has an average of three pups every year in the Gulf of Mexico region and three pups every other year in the South Atlantic region). Due to these life history traits, many shark species have a low reproductive potential. Thus, as described in past FMPs regarding sharks, NMFS uses a 70-percent probability to determine the rebuilding plan for sharks to ensure that the intended results are actually realized.

2007 Stock Assessment and Rebuilding Timeframe for Blacknose Sharks

The 2007 stock assessment of SCS in the U.S. Atlantic and Gulf of Mexico consisted of assessments for blacknose sharks, finetooth sharks, bonnethead sharks, Atlantic sharpnose sharks, and the SCS complex. Results of the blacknose shark stock assessment determined that blacknose sharks are overfished (Spawning Stock Fecundity $(SSF)_{2005}$ / SSF_{MSY} = 0.48) and overfishing is occurring (F_{2005}/F_{MSY} = 3.77). The assessment recommended a blacknose shark specific TAC and a corresponding rebuilding timeframe. Because a separate TAC was recommended for blacknose sharks, NMFS is creating a separate rebuilding plan for blacknose sharks in this amendment. One objective of this amendment is to ensure that fishing mortality levels for blacknose sharks are maintained at or below levels that would result in a 70 percent probability of rebuilding in the timeframe recommended by the assessment.

The stock assessment discussed three rebuilding scenarios, including: 1) rebuilding timeframe under no fishing, 2) a TAC corresponding to a 50 percent probability of rebuilding, and 3) a TAC corresponding to a 70 percent probability of rebuilding. Under no fishing, the stock assessment estimated that blacknose sharks would rebuild in 11 years. Adding a generation time (8 years), as described under NS1 for species that require more than 10 years to rebuild even if fishing mortality were eliminated entirely, the target year for rebuilding the stock was estimated to be 2027 (8 years mean generation time + 11 years to rebuild if fishing mortality eliminated = 19 years including 2009). Since the assessment did not have estimates of fishing mortality for 2006 and beyond at the time of the assessment, NMFS assumed that fishing mortality in 2006 was the same as in 2005 and declined by 50 percent from 2005 levels in 2007-

2009 (to account for presumed reduction in effort due to Hurricane Katrina). NMFS determined that a constant TAC, or ACL (*i.e.*, ACL for all fisheries that interact with blacknose sharks), of 19,200 blacknose sharks per year would lead to rebuilding with a 70 percent probability by 2027. This is the shortest possible time necessary to rebuild the species as dictated by the species biology described above. Rebuilding with this same TAC would occur with a 50 percent probability by 2024. As described previously, NMFS is using the 70 percent probability of rebuilding to ensure that the intended results of a management action are actually realized given the life history traits of sharks.

According to the latest blacknose shark stock assessment, an average of 86,381 blacknose sharks were killed each year between 1999-2005 in different fisheries either as targeted catch or as bycatch (column H in Table 1.1). In order to attain the recommended blacknose shark TAC of 19,200, NMFS needs to reduce blacknose shark mortality by at least 78 percent (86,3810-19,200)/86,381) x 100 percent = 78 percent). Table 1.1 shows that based on data used in the 2007 blacknose shark stock assessment, approximately 45 percent of blacknose mortality occurs as bycatch in the Gulf of Mexico shrimp trawl fishery based on average mortality between 1999 and 2005 (Table 1.1), and the rest of the mortality occurs within the South Atlantic shrimp trawl fishery and the Atlantic commercial and recreational shark fisheries. Additional information on SCS and blacknose bycatch in the shrimp trawl fishery can be found in Chapter 3 in Section 3.4.10. However, since the Gulf of Mexico and South Atlantic Councils manage the shrimp trawl fisheries, NMFS is implementing measures in the this amendment to reduce the landings and discards in only the Atlantic shark fisheries. NMFS will continue to work with the Gulf of Mexico and South Atlantic Fishery Management Councils to establish bycatch reduction methods, as appropriate, to reduce mortality in the shrimp trawl fisheries. Changes in the shrimp trawl fisheries in the South Atlantic and Gulf of Mexico regions would be done through the Council-process in those regions. NMFS will also work to reduce mortality of blacknose sharks in Atlantic shark fisheries through the implementation of management measures, as analyzed in this document.

In order to attain the needed mortality reductions within the Atlantic shark fisheries, NMFS would establish a commercial allowance for the Atlantic shark commercial fishery (or a sector-ACL). This commercial allowance would result in at least a 78-percent reduction in mortality shown in Table 1.1. The average annual commercial landings of blacknose sharks within the Atlantic shark fisheries from 1999-2005 was 27,484 blacknose sharks (columns A+B+C in Table 1.1), and average annual discards were 5,007 blacknose sharks over that time period (column D in Table 1.1). A 78-percent reduction in blacknose commercial landings would result in 6,046 blacknose sharks being commercially landed (27,484 x 78 percent = 21,438 blacknose sharks; 27484-21,438 = 6,046 blacknose sharks/year). Similarly, a 78 percent reduction in discards would result in blacknose shark discards of 1,102 sharks each year (5,007 x 78 percent = 3,905 blacknose sharks; 5,007 – 3,905 = 1,102 blacknose sharks/year). This would result in a total of 7,148 blacknose sharks taken per year (6,046 + 1,102 = 7,148) in the Atlantic shark fisheries, which is equivalent to 45,032 lb (pounds) dw (dressed weight) (34 mt [metric tons] dw), assuming the average commercial blacknose weight across all commercial gears is 6.3 lb dw (7,148 blacknose sharks x 6.3 lb dw = 45,032 lb dw). In addition, on average, 54 blacknose sharks are taken (*i.e.*, kept or discarded dead) under the exempted fishing program. Given the average weight of blacknose sharks taken under the exempted fishing program is 3.3

lb dw, this equals approximately 178.2 lb dw of blacknose sharks taken under the exempted fishing program. Thus, no more than 44,853.8 lb dw (20.3 mt dw) (45,032 lb dw - 178.2 lb dw = 44,853.8 lb dw) or 7,094 blacknose sharks (7,148 blacknose sharks – 54 blacknose sharks taken in the EFP program = 7,094 blacknose sharks) could be taken by the Atlantic shark commercial fishery.

In addition, on average, the recreational fishery landed 10,408 blacknose sharks per year. A 78-percent reduction in recreational landings would result in 2,290 blacknose sharks landed per year (10,408 x 78 percent = 8,118 blacknose sharks; 10,408-8,118= 2,290 blacknose sharks). This results in an overall allowance of 9,384 blacknose sharks per year in all HMS fisheries (7,094 commercial blacknose sharks + 2,290 recreational blacknose sharks = 9,384 blacknose sharks for the Atlantic shark fisheries).

Measures considered for blacknose sharks in this amendment include removing blacknose sharks from the SCS quota, reducing commercial quotas of blacknose sharks and non-blacknose SCS (*i.e.*, finetooth, Atlantic sharpnose, and finetooth sharks), removing gillnet gear, and prohibiting the landing of blacknose sharks in the recreational fishery. Such measures are necessary to ensure that the rebuilding timeframe of 2027 is met for blacknose sharks with a 70 percent probability of success.

Table 1.1 **Sources of blacknose shark mortality, 1999-2005.**
Source: NMFS, 2007. Estimates from the 'longline', 'nets', and 'lines' columns are derived from data reported in the Northeast and Southeast General Canvass data systems. Longline discards are derived from multiplying the longline landings by the ratio of dead discards observed in the commercial shark bottom longline fishery. The numbers in the shrimp bycatch columns are derived using a Bayesian model (Nichols, 2007).

A. Longline (number)	B. Nets (number)	C. Lines (number)	D. Bottom Longline Discards (number)	E. GOM Shrimp bycatch (number)	F. SA Shrimp bycatch (number)	G. Recreational Landings (number)	H. Total
8,091	19,041	352	5,007	38,626	4,856	10,408	86,381
9%	22%	<1%	6%	45%	6%	12%	100%

Smooth Dogfish

Smooth dogfish sharks are not currently managed at the federal level; however, NMFS is proposing adding smooth dogfish under NMFS management, establishing a commercial quota for this species, and implementing federal permitting requirements. Any management measures implemented for smooth dogfish would also apply to Florida smoothhounds (*Mustelus norrisi*). Emerging molecular and morphological research has determined that Florida smoothhounds have been misclassified as a separate species from smooth dogfish (Jones, pers. comm.). Because of this taxonomic correction, Florida smoothhounds would be considered smooth dogfish and would fall under all smooth dogfish management measures, such as permit requirements and quotas. Smooth dogfish were originally included in the 1999 FMP to prevent finning of smooth

dogfish. However, smooth dogfish were removed from NMFS management in 2003 since they were protected under the Shark Finning Prohibition Act (67 FR 6124, February 11, 2002). A stock assessment has not been conducted for smooth dogfish; however, constituents have requested that NMFS implement management measures for smooth dogfish. Therefore, NMFS has determined that smooth dogfish may require conservation and management and is thus proposing to add smooth dogfish back under NMFS management. However, since the stock has not been assessed, NMFS does not have the formal biological reference points to establish an OFL, ABC, or ACL for smooth dogfish. Therefore, under the preferred alternative, NMFS is using landings data to establish the landings component of the sector ACL for smooth dogfish as required under NSG1 by 2011 for stocks not determined to be undergoing overfishing per the Magnuson-Stevens Act. Given the lack of a stock assessment, NMFS is considering various ways of setting this quota, including reviewing the landings data available and any landings trends over recent years. NMFS believes that basing the landings component of the commercial sector ACL on recent landings is acceptable given the biological characteristics of the stocks or stock complex and given that it would serve as limit on catch and prevent overfishing. As needed, NMFS could adjust the landings component of the commercial sector ACL and add in a landings component for the recreational sector ACL. As outlined above for pelagic sharks, in the absence of a specific TAC, NMFS considers these quotas to be equivalent to the ACL, ABC, and TAC for smooth dogfish. As needed and required, NMFS can adjust these ACLs and apply AMs. More information on the alternatives considered to establish the quota can be found in Chapters 2 and 4 of this document.

2008 Stock Assessment for Shortfin Mako Sharks

In 2008, an updated stock assessment of shortfin mako sharks was conducted by ICCAT's SCRS. The SCRS determined that while the quantity and quality of the data available for use in the stock assessment had improved since the 2004 assessment, the data were still uninformative and did not provide a consistent signal to inform the models used in the 2008 assessment. The SCRS noted that if these data issues could not be resolved in the future, their ability to determine stock status for these and other species would continue to be uncertain. The SCRS assessed shortfin mako sharks as three different stocks, North Atlantic, South Atlantic, and Mediterranean. However, the Mediterranean data was considered insufficient to conduct the quantitative assessments for these species.

For North Atlantic shortfin mako sharks, multiple model outcomes indicated stock depletion to be about 50 percent of virgin biomass (1950s levels) and levels of F above those resulting in MSY, whereas other models estimated considerably lower levels of depletion and no overfishing. The SCRS determined that there is a "non-negligible probability" that the North Atlantic shortfin mako stock could be below the biomass that could support MSY (B_{2007}/B_{msy} = 0.95-1.65) and above the fishing mortality rate associated with MSY (F_{2007}/F_{msy} = 0.48-3.77). Similar outcomes were determined by the SCRS from the 2004 assessment; however, recent biological data show decreased productivity for this species. Therefore, given the results of this assessment, NMFS has determined that North Atlantic shortfin mako is not overfished, but is approaching an overfished status and is experiencing overfishing (June 19, 2009, 74 FR 21985).

Since shortfin mako sharks have been determined to not be overfished, NMFS is not implementing a rebuilding plan at this time. NMFS considered several alternatives to end overfishing of shortfin mako sharks. Those alternatives are described in Chapters 2 and 4.

1.3 Purpose and Need

NMFS published updated determinations for the SCS shark species/complex that were assessed in conjunction with a Notice of Intent (May 7, 2008, 73 FR 25665) to prepare an EIS. The Agency published a separate notice that determined shortfin mako sharks are not overfished, but are approaching an overfished status and are experiencing overfishing (June 19, 2009, 74 FR 21985). An issues and options presentation was released on July 2, 2008, followed by five scoping hearings and a public comment period that closed on November 14, 2008. A Predraft document describing potential alternatives that might be included in the DEIS and proposed rule for Amendment 3 to the 2006 Consolidated HMS FMP was released to HMS consulting parties (which includes the HMS AP) on February 11, 2009, and presented to the HMS AP at the HMS AP meeting on February 19, 2009. The HMS AP and consulting parties submitted comments on the Predraft prior to March 16, 2009.

1.3.1 Need

As described above, based on the results of the 2007 SCS stock assessment and 2008 ICCAT assessment for shortfin mako sharks, NMFS has determined that blacknose sharks are overfished and blacknose sharks and shortfin mako sharks are experiencing overfishing. In addition, NMFS has determined that smooth dogfish may need conservation and management. The Magnuson-Stevens Act also requires establishment of a mechanism in each FMP to specify ACLs and develop AMs. For these reasons, NMFS has identified the following needs for the proposed action to amend the HMS FMP:

- The Magnuson-Stevens Act requires each fishery to be managed to achieve OY while preventing overfishing. Shortfin mako is experiencing overfishing. NMFS needs to consider both domestic and international measures for ending the overfishing of the species;
- The Magnuson-Stevens Act requires NMFS to end overfishing and rebuild fisheries determined to be in an overfished condition. NMFS has determined blacknose shark to be in an overfished condition and experiencing overfishing and must amend the 2006 Consolidated HMS FMP to include management measures and propose corresponding implementing regulations to end overfishing and rebuild the fishery in the shortest time possible;
- The Magnuson-Stevens Act gives NMFS (on behalf of the Secretary) has authority to manage HMS, including oceanic sharks that it determines are in need of conservation and management. NMFS has determined that smooth dogfish, an oceanic shark, may need conservation and management and needs to amend the 2006 Consolidated HMS FMP and propose implementing regulations to provide for its management.
- The Magnuson-Stevens Act requires FMPs to include a mechanism for specifying ACLs and AMs for all fisheries. ACLs and AMs must be effective for species or complexes subject to overfishing by 2010 and for all other species or complexes no later than 2011. The 2006 Consolidated HMS FMP does not presently include such a mechanism or a

practice of specifying annual ACLs. Therefore, the 2006 Consolidated HMS FMP needs to be amended to meet this requirement by the statutory deadline for species and complexes it manages. It must also consider whether it needs to propose or amend implementing regulations to specify ACLs annually and apply AMs.

1.3.2 Purpose and Objectives

The proposed action is intended to achieve the following purposes and objectives in a manner that minimizes, to the greatest extent possible, the economic impact on affected fisheries. Consistent with the 2006 Consolidated HMS FMP objectives, the Magnuson-Stevens Act, and other relevant federal laws and the corresponding need set forth above, the specific purposes and objectives of this action are to:

- Implement a rebuilding plan for blacknose sharks to ensure that fishing mortality levels for blacknose sharks are maintained at or below levels that would result in a 70 percent probability of rebuilding in the timeframe recommended by the assessment;
- End overfishing for blacknose and shortfin mako sharks;
- Provide an opportunity for the sustainable harvest of finetooth, bonnethead, and Atlantic sharpnose sharks and other sharks, as appropriate;
- Prevent overfishing of Atlantic sharks;
- Consider smooth dogfish management measures for smooth dogfish sharks in federal waters, as appropriate.
- Develop an appropriate mechanism for specifying ACLs to prevent and end overfishing within the constraints of existing data and annually set ACLs and apply AMs to ensure that ACLs are not exceeded.

1.4 Other Considerations

Administrative amendments

As described in the proposed rule, in addition to the management measures described in this document, NMFS is also proposing some administrative actions to clarify, correct, and update the existing regulations at the following citations: clarifying §635.5 (b) regarding the reporting of fin weight and dressed weight separately on dealer reports; modifying language at §635.20 (e) to clarify that only one shark per vessel per trip can be taken along with one bonnethead and one Atlantic sharpnose shark per person per trip; propose to rename the closure "South Carolina A" as "Northern South Carolina" at §635.21 (d); proposing language at §635.27 (b) to allow the take of dusky sharks under EFPs, based on Agency's discretion; removing the word "intact" at §635.30 (c) and clarifying that sharks cannot be cut up and used as bait on vessels issued a federal commercial shark permit; updating a reference from the previous Billfish and Tunas, Swordfish, and Shark FMPs to the current Consolidated HMS FMP at §635.32 (e); and updating the species names to match the most recent scientific naming determinations at Table 1 of Appendix A, in addition to adding smooth dogfish to this list. None of these administrative actions are expected to have any economic, social, or ecological impacts.

Specific requests for public comment

NMFS is also seeking public comment the following items: the potential accuracy of the landings used to calculate the commercial quota for the smooth dogfish fishery; the potential accuracy of the landings used to calculate the smooth dogfish quota for EFPs, SRPs, and display permits; a request for any additional smooth dogfish data that could be used to designate smooth dogfish EFH and the accuracy of the proposed smooth dogfish EFH; the boundary for the use of gillnets; the VMS requirement for shark gillnet vessels; the requirement to tend gillnet gear for smooth dogfish fishermen; whether or not NMFS should implement a specific bag limit for recreational anglers for smooth dogfish; and whether or not NMFS should allow smooth dogfish to be retained when caught with trawl gear.

Circle Hooks

The Agency compiled the results of several studies examined the use of circle hooks in various bottom longline (BLL) fisheries. The results of these BLL studies were inconclusive regarding the impact of circle hooks on protected resources as well as target species caught in BLL fisheries. The efficacy of using circle hooks to reduce bycatch and post-hooking mortality of sea turtles is well-documented in other fisheries, including the HMS pelagic longline (PLL) fishery. Circle hooks are required for the Atlantic HMS PLL fishery consistent with the June 2004 Biological Opinion. The Agency is not proposing that circle hooks be required for BLL fisheries targeting shark at this time for several reasons: 1) lack of data demonstrating conservation benefits in BLL fisheries, 2) potential inconsistencies between Council-managed and HMS BLL fisheries that may occur as a result of requiring circle hooks, and 3) observer data indicating that circle hooks are already the most frequently used type of hook on trips targeting sharks in the South Atlantic and Gulf of Mexico regions. Because of this, NMFS did not implement any circle hook requirements in the BLL fishery under Amendment 2 to the Consolidated HMS FMP and is not considering circle hook requirements in the BLL fishery under this amendment. NMFS is unaware of any recent studies regarding circle hooks in the BLL fishery, but NMFS continues to monitor the effectiveness and bycatch associated with circle and J hooks through the shark BLL observer program both inside and outside of the Atlantic shark research fishery.

Catch Shares

A catch share is the allocation of the available fishery quota among participants within the fishery. Limited Access Privilege Programs (LAPPs) are one type of catch share program. These programs may be implemented to address numerous issues, including but not limited to: ending the race for fish, reducing overcapitalization, and improving efficiency and safety, while still addressing the biological needs of a stock. These programs can be designed specifically to meet the needs of a fishery for which they are designed, provided they meet the requirements outlined in the Magnuson-Stevens Act. Catch shares were not considered for the shark fishery in this amendment because of the ramifications this type of program would have for the existing permit structure and the time required for implementing these programs.

To properly design a catch share program that appropriately considers the views and interests of all stakeholders and then implements such a system would have take NMFS several

years, and therefore, catch shares were not considered a reasonable alternative for this action given the mandate in § 304(e) of the Magnuson-Stevens Act to have ACLs in place for stocks experiencing overfishing by 2010. However, NMFS is considering revisions to the existing permit structure within HMS fisheries. This could include a catch share program for sharks as well as other HMS as was discussed during the September/October 2008 HMS Advisory Panel. NMFS published an Advanced Notice of Proposed Rulemaking (ANPR) on June 1, 2009 (74 FR 26174), to initiate broad public participation in considering catch shares for HMS fisheries.

Literature Cited

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NMFS. 2007. SEDAR 13 Stock Assessment Report: Small Coastal Sharks, Atlantic Sharpnose, Blacknose, Bonnethead, and Finetooth Shark. Highly Migratory Species Management Division, 1315 East West Highway, Silver Spring, MD 20910. 375 pp.

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2.0 SUMMARY OF THE ALTERNATIVES

As described in Chapter 1, NMFS is considering various shark management measures to meet the objectives of the Magnuson-Stevens Act and the 2006 Consolidated HMS FMP based on the 2007 stock assessments for SCS, and the 2008 ICCAT pelagic shark stock assessment. NMFS conducted scoping, including five public hearings (73 FR 37932, July 2, 2008; 73 FR 53407, September 13, 2008), from July to September 2008. NMFS received a number of comments in regard to the assessment and potential management measures. Based in part on these comments, NMFS produced a Predraft of Amendment 3 to the Consolidated HMS FMP (Predraft), which was presented to the HMS AP in early February 2009, and asked for written comments on the Predraft by March 16, 2009. A summary and transcript of the February 2009 AP meeting, including copies of the written comments received on the Predraft, are available from the HMS Management Division. While some of the alternatives considered in the Predraft were modified in the draft stage of Amendment 3 to the 2006 Consolidated HMS FMP, the overall list of issues to be addressed has not changed. This document includes a full range of reasonable alternatives designed to meet the purpose and need for action described in Chapter 1 and address public comments received during the scoping process. Table 2.1 gives an overview of all the alternatives considered. The preferred alternatives in this document considered all of the comments received from the general public during the scoping and Predraft stages. The environmental, economic, and social and socio-economic impacts of these alternatives are discussed in later chapters.

Table 2.1 An overview of all the alternatives considered in draft Amendment 3 to the 2006 Consolidated HMS FMP

Issue	Alternative	Alternative Description
SCS Commercial Quotas	Alternative A1	No Action. Maintain the existing SCS quota and species complex
	Alternative A2	Establish a new SCS complex quota of 392.5 mt dw and a blacknose commercial quota of 13.5 mt dw
	Alternative A3	Establish a new SCS complex quota of 42.7 mt dw and a blacknose commercial quota of 16.6 mt dw; allow all current authorized gears for sharks
	Alternative A4	*Establish a new SCS quota of 56.9 mt dw and a blacknose commercial quota of 14.9 mt dw; remove shark gillnet gear as an authorized gear for sharks – Preferred Alternative*
	Alternative A5	Close the SCS fishery
Commercial Gear Restrictions	Alternative B1	No Action. Maintain current authorized gears for commercial shark fishing
	Alternative B2	Close shark gillnet fishery; remove gillnet gear as an authorized gear type for commercial shark fishing
	Alternative B3	*Close the gillnet fishery to commercial shark fishing from South Carolina south, including the Gulf of Mexico and the Caribbean Sea – Preferred Alternative*
Commercial Pelagic Shark Effort Controls	Alternative C1	No Action. Keep shortfin mako sharks in the pelagic shark species complex and do not change the quota
	Alternative C2	Remove shortfin mako sharks from pelagic shark species quota and establish a shortfin mako quota

Issue	Alternative	Alternative Description
	Alternative C3	Remove shortfin mako sharks from pelagic shark species complex and place this species on the prohibited shark species list
	Alternative C4	Establish a commercial size limit for shortfin mako sharks
	Alternative C4a	Establish a minimum size limit for shortfin mako sharks that is based on the size at which 50 percent of female shortfin mako sharks reach sexual maturity or 32 inches interdorsal length (IDL)
	Alternative C4b	Establish a minimum size limit for shortfin mako sharks that is based on the size at which 50 percent of male shortfin mako sharks reach sexual maturity or 22 inches IDL
	Alternative C5	*Take action at the international level to end overfishing of shortfin mako – Preferred Alternative*
	Alternative C6	*Promote the release of shortfin mako sharks brought to fishing vessels alive – Preferred Alternative*
Recreational Measures for SCS	Alternative D1	No Action. Maintain the current recreational retention and size limit for SCS
	Alternative D2	Modify the minimum recreational size limit for blacknose sharks based on their biology
	Alternative D3	Increase the retention limit for Atlantic sharpnose sharks based on current catches
	Alternative D4	*Prohibit retention of blacknose sharks in recreational fisheries - Preferred Alternative*
Recreational Measures for Pelagic Sharks	Alternative E1	No Action. Maintain the current recreational retention and size limits for shortfin mako sharks
	Alternative E2	Increase the recreational minimum size limit of shortfin mako sharks
	Alternative E2a	Establish a minimum size limit for shortfin mako sharks that is based on the size at which 50 percent of female shortfin mako sharks reach sexual maturity or 108 in FL
	Alternative E2b	Establish a minimum size limit for shortfin mako sharks that is based on the size at which 50 percent of male shortfin mako sharks reach sexual maturity or 73 inches FL
	Alternative E3	*Take action at the international level to end overfishing of shortfin mako sharks– Preferred Alternative*
	Alternative E4	*Promote the release of shortfin mako sharks brought to fishing vessels alive – Preferred Alternative*
	Alternative E5	Prohibit landing of shortfin mako sharks in recreational fisheries (catch and release only)
Smooth Dogfish	Alternative F1	No Action. Do not add smooth dogfish under NMFS management
	Alternative F2	*Add smooth dogfish under NMFS Management and develop management measures, such as a federal permit requirement - Preferred Alternative*
	Alternative F2 a1	Establish a smooth dogfish quota that is equal to the average annual landings from 1998-2007 (950,859 lb dw)
	Alternative F2 a2	Establish a smooth dogfish quota equal to the maximum annual landings from 1998-2007 (1,270,137 lb dw)
	Alternative F2 a3	*Establish a smooth dogfish quota equal to the maximum annual landings from 1998-2007 plus one standard deviation (1,423,727 lb dw) – Preferred Alternative*
	Alternative F2 b1	*Establish a separate smooth dogfish set-aside quota for the exempted fishing program of 6 mt ww– Preferred Alternative*

Issue	Alternative	Alternative Description
	Alternative F2 b2	Establish a smooth dogfish set-aside quota for the exempted fishing program and add it to the current 60 mt ww set-aside quota for the exempted fishing program
	Alternative F3	Add smooth dogfish under NMFS management and mirror management measures implemented in the ASMFC Interstate Shark FMP
Alternatives Considered But Not Further Analyzed	Alternative G1	Establish species-specific quotas for all species in the SCS complex based on average landings; close each quota individually, as needed
	Alternative G2	Establish new time/area closures in blacknose shark nursery areas for all HMS gears
	Alternative G3	Close waters inshore of 20 fathoms in the Gulf of Mexico to shark bottom longline gear
	Alternative G4	Close waters inshore of 50 fathoms in the Gulf of Mexico to shark bottom longline gear
	Alternative G5	Add deepwater sharks to the management unit and place these species on the prohibited list
	Alternative G6	Establish catch shares in the Atlantic shark fisheries

2.1 Commercial Measures

2.1.1 SCS Commercial Quotas

The 2007 blacknose shark stock assessment estimated that blacknose sharks would have a 70-percent probability of rebuilding by 2027 with a TAC of 19,200 individuals per year. To achieve this TAC, NMFS would need to reduce overall blacknose mortality by at least 78 percent. NMFS determined the amount of blacknose sharks that could be taken in the Atlantic commercial shark fishery to reduce mortality by at least 78 percent. This results in a commercial allowance of 44,853.8 lb dw or 7,094 blacknose sharks that could taken (landed and discarded) within the Atlantic commercial shark fishery in order to allow the blacknose shark to rebuild as outlined in Chapter 1.

Alternative A1 No Action. Maintain the existing SCS quota and species complex

Under alternative A1, the No Action alternative, NMFS would maintain the existing commercial quota for SCS of 454 mt dw. This quota would be used to account for landings of any of the four species in the SCS complex, finetooth, Atlantic sharpnose, bonnethead and blacknose sharks. Regulations regarding quota over and underharvests adjustments would not change under this alternative.

Alternative A2 Establish a new SCS quota of 392.5 mt dw and a blacknose commercial quota of 13.5 mt dw

Alternative A2 would remove blacknose sharks from the SCS quota and create a blacknose shark-specific quota and a separate “non-blacknose SCS” quota. The non-blacknose SCS would apply to finetooth, Atlantic sharpnose, and bonnethead sharks. Currently, the SCS quota is 454 mt dw, and the current annual average landings of blacknose sharks is 61.5 mt dw. This alternative would subtract the current annual average landings of blacknose sharks, 61.5 mt dw, from the overall SCS quota, which would result

in a new non-blacknose SCS complex quota of 392.5 mt dw. This alternative would also reduce the average annual landings of blacknose sharks by 78 percent, resulting in a blacknose shark specific annual commercial quota of 13.5 mt dw (61.5 mt dw x .78 = 47.9; 61.5 mt dw – 47.9 mt dw = 13.5 mt dw). The 78 percent reduction to current landings is based on the need to reduce blacknose shark mortality by 78 percent in order to rebuild the stock.

NMFS also considered various commercial retention limits corresponding with the blacknose quota of 13.5 mt dw. However, under all retention limit scenarios, the total mortality would be above the necessary allowance of 7,094 blacknose or 44,853.8 lb dw (see Appendix A). Mortality reductions would also be needed in non-HMS fisheries to achieve the overall TAC of 19,200 blacknose sharks/year that would allow this species to fully rebuild. Regulations regarding quota over and underharvest adjustments would not change under this alternative.

Alternative A3 Establish a new SCS quota of 42.7 mt dw and a blacknose commercial quota of 16.6 mt dw; allow all current authorized gears for sharks

Similar to alternative A2, alternative A3 would remove blacknose sharks from the SCS quota and create a blacknose shark-specific quota and a separate "non-blacknose SCS" quota. For alternative A3, the non-blacknose SCS would apply to finetooth, Atlantic sharpnose, and bonnethead sharks and would equal 42.7 mt dw (94,115 lb dw). The non-blacknose SCS quota would be an 82 percent reduction from the average current landings of finetooth, Atlantic sharpnose, and bonnethead sharks from 2004 through 2007. NMFS estimates that reducing the overall quota for the SCS fishery reduces the level of blacknose shark discards such that the total blacknose shark mortality would stay below the allowance for the commercial fishery (see Appendix A). Under this alternative, the blacknose shark quota would be 16.6 mt dw (36,526 lb dw), which is the amount of blacknose sharks that would be harvested while the non-blacknose SCS quota is harvested (see Appendix A); however, incidental fishermen would not be allowed to retain any blacknose sharks under alternative A3. This alternative assumes that directed fishermen with a directed shark LAP would fish for SCS in a directed fashion until the non-blacknose SCS quota and/or blacknose quota reached 80 percent. At that time, both the non-blacknose SCS fishery and the blacknose shark fishery would close, fishermen would fish for other fish species, and all SCS, including blacknose sharks, would be discarded. Fishermen with an incidental shark LAP would not be allowed to retain any blacknose sharks but could still retain non-blacknose SCS. The regulations regarding over and underharvest quota adjustments would not change under this alternative.

Alternative A4 *Establish a new SCS quota of 56.9 mt dw and a blacknose commercial quota of 14.9 mt dw; remove shark gillnet gear as an authorized gear for sharks – Preferred Alternative*

Alternative A4 would also remove blacknose sharks from the SCS quota and create a blacknose shark-specific quota and a separate "non-blacknose SCS" quota. Under this alternative, the non-blacknose SCS quota would be 56.9 mt dw (125,487 lb dw). This

quota results in a 76-percent reduction from the average current landings of finetooth, Atlantic sharpnose, and bonnethead sharks from 2004 through 2007. As with alternative A3, NMFS determined that by reducing the overall quota for the SCS fishery, NMFS could reduce the level of blacknose shark discards such that the total blacknose shark mortality would stay below the allowance for the commercial fishery (see Appendix A). Under this alternative, NMFS would establish a blacknose-specific quota of 14.9 mt dw (32,753 lb dw), which is the amount of blacknose sharks that would be harvested while the non-blacknose SCS quota is harvested (see Appendix A). As with alternative A3, under this alternative, fishermen with an incidental LAP would not be allowed to retain any blacknose sharks but could still retain non-blacknose SCS. In addition, this alternative assumes that gillnet gear would not be used to harvest sharks under either alternative B2 or B3, and that fishermen would fish for SCS in a directed fashion until the non-blacknose SCS quota and/or blacknose quota reached 80 percent (see Appendix A). At that time, both the non-blacknose SCS fishery and the blacknose shark fishery would close, fishermen would fish for other species, and all SCS, including blacknose sharks, would be discarded. The regulations regarding over and underharvest quota adjustments would not change under this alternative.

Alternative A5 Close the SCS fishery

Alternative A5 would close the SCS fishery in the Atlantic, Gulf of Mexico, and Caribbean Sea for all fishermen until reopening was warranted based on new stock assessments. Shark landings would be limited to pelagic sharks, non-sandbar LCS, sandbar sharks within the shark research fishery, and research and collection for public display within the HMS Exempted Fishing Permit Program. Under this alternative, if alternative F2 or F3 were implemented, shark landings could also include smooth dogfish.

2.1.2 Commercial Gear Restrictions

Alternative B1 No Action. Maintain current authorized gears for commercial shark fishing

Under alternative B1, NMFS would maintain the current authorized gears for the commercial shark fishery. These gears are BLL, gillnet, rod and reel, handline, and bandit gear. This alternative would also maintain all the restrictions for the various gear types. For example, BLL vessels must carry corrodible hooks and the required safe handling, release and disentanglement equipment, and sea turtle technical memorandum. In the shark gillnet fishery, gillnets must be less than 2.5 km and must remain attached to at least one vessel at one end. Net checks must be performed every 0.5 to 2 hours to look for and remove any entangled protected species. There are additional gillnet gear deployment restrictions for the southeast U.S. shark gillnet fishery in order to implement various Take Reduction Plan implemented consistent with the Marine Mammal Protection Act (MMPA).

Alternative B2 Close shark gillnet fishery; remove gillnet gear as an authorized gear type for commercial shark fishing

Under alternative B2, NMFS would remove gillnet gear as an authorized gear type for commercial shark fishing. As such, this alternative would close the shark gillnet fishery in the Atlantic, Gulf of Mexico, and Caribbean Sea. NMFS is considering this alternative because gillnet gear, and in particular, drift gillnet gear, is the predominant gear used to fish for the blacknose sharks in the South Atlantic region and removing this gear could reduce the mortality of blacknose sharks significantly. This alternative would allow shark directed and incidental permit holders to continue to use other commercially authorized gears, such as BLL, rod and reel, handline or bandit gear, to harvest sharks.

Alternative B3 Close the gillnet fishery to commercial shark fishing from South Carolina south, including the Gulf of Mexico and the Caribbean Sea – Preferred Alternative

Under alternative B3, NMFS would close the gillnet fishery to commercial shark fishing from South Carolina south, including the Gulf of Mexico and Caribbean Sea. This alternative would eliminate the predominant gear type used to harvest blacknose sharks in the South Atlantic region, and would help rebuild the blacknose shark stock by reducing gillnet mortality throughout their habitat range. Blacknose sharks are commonly found from North Carolina to Brazil, including the Gulf of Mexico and Caribbean Sea. This alternative would also help mitigate impacts of adding the smooth dogfish fishery (see alternatives F2 and F3), which uses gillnet gear predominately from North Carolina north. Under this alternative, NMFS would allow directed and incidental permit holders to use other authorized gear types besides gillnets to target sharks in the commercial shark fishery from South Carolina south.

2.1.3 Pelagic Shark Effort Controls

Alternative C1 No Action. Keep shortfin mako sharks in the pelagic shark species complex and maintain the quota.

Under Alternative C1, the No Action alternative, NMFS would maintain the current commercial shark fishing regulations that pertain to shortfin mako sharks established in the 2006 Consolidated HMS FMP. Shortfin mako sharks would remain in the pelagic shark species complex, which includes blue, common thresher, oceanic whitetip, and porbeagle sharks. The quota for pelagic sharks would remain the same, with 488 mt dw allocated for common thresher, oceanic whitetip, and shortfin mako sharks, 273 mt dw allocated for blue sharks, and 1.7 mt dw allocated for porbeagle sharks. Regulations regarding overharvest and underharvest of pelagic shark quota, and retention limits for pelagic sharks would remain the same.

Alternative C2 Remove shortfin mako sharks from pelagic shark species quota and establish a shortfin mako quota

Alternative C2 would remove shortfin mako sharks from the pelagic shark quota and would establish a species-specific quota for shortfin mako sharks based on current

landings. Currently, the annual quota for common thresher, oceanic whitetip, and shortfin mako is 488 mt dw. Based on the average commercial landings of shortfin mako sharks from 2004-2007, the species-specific quota for shortfin mako sharks would be 72.5 mt dw (NMFS, 2008). The common thresher and oceanic whitetip sharks would be allocated a quota of 415.5 mt dw after removal of the shortfin mako quota of 72.5 mt dw (488 mt dw – 72.5 mt dw = 415.5 mt dw). The quotas for blue and porbeagle sharks would not change under this alternative and would be 273 mt dw and 1.7 mt dw, respectively. Regulations regarding overharvest and underharvest of pelagic shark quota, and retention limits for pelagic sharks would remain the same.

Alternative C3 Remove shortfin mako sharks from pelagic shark species complex and place this species on the prohibited shark species list

Alternative C3 would remove shortfin mako sharks from the pelagic shark species complex and add them to the prohibited species list. Under the regulations, shark species can be added to the prohibited species list if two of the following four criteria are met: 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). Adding shortfin mako sharks to the prohibited species list would make it illegal to retain or land shortfin mako shark commercially or recreationally. If the shortfin mako shark is placed on the prohibited species list, the average annual landings of shortfin mako sharks from 2004-2007 (72.5 mt dw) would be subtracted from the current annual quota for the pelagic shark quota group (488 mt dw), creating a quota of 415.5 mt dw for common thresher and oceanic whitetip sharks. Regulations regarding overharvest and underharvest of pelagic shark quota, and retention limits for pelagic sharks would remain the same.

Alternative C4 Establish a commercial size limit for shortfin mako sharks

C4a) Establish a minimum size limit for shortfin mako sharks that is based on the size at which 50 percent of female shortfin mako sharks reach sexual maturity or 32 inches interdorsal length (IDL)

Currently, there are no minimum size limits for sharks caught in the commercial fishery. Under alternative C4a, a commercial minimum size limit would be established for shortfin mako sharks to correspond with the size at which 50 percent of female shortfin mako sharks reach sexual maturity, calculated from Natanson *et al.* (2006) as 32 inches IDL, which is the straight line measurement from the base of the trailing edge of the first dorsal fin to the base of the leading edge of the second dorsal fin. Shortfin mako sharks less than 32 inches IDL could not be retained and would have to be discarded. Shortfin mako sharks greater than the 32 inch IDL size limit would be able to be retained and all landings would be counted against the appropriate quota for common thresher, oceanic whitetip, and shortfin mako sharks.

C4b) Establish a minimum size limit for shortfin mako sharks that is based on the size at which 50 percent of male shortfin mako sharks reach sexual maturity or 22 inches IDL

Under alternative C4b, a commercial minimum size limit would be established for shortfin mako sharks to correspond with the size at which 50 percent of male shortfin mako sharks reach sexual maturity, calculated from Natanson *et al.* (2006) as 22 inches IDL. Currently, there are no minimum size limits for sharks caught in the commercial fishery. Shortfin mako sharks less than 22 inches IDL would be prohibited and could not be retained. All shortfin mako sharks greater than the 22 inch IDL limit would be available for commercial harvest and all landings would be counted against the appropriate quota.

Alternative C5 *Take action at the international level to end overfishing of shortfin mako sharks– Preferred Alternative*

Under alternative C5, NMFS would take action at an international level through international fishery management organizations to end overfishing of shortfin mako sharks. This plan would encompass the commercial fishery. ICCAT assumes there are three shortfin mako shark stocks for assessment purposes: northern and southern Atlantic stocks, separated at 5°N latitude and a Mediterranean stock. Based on the 2008 SCRS stock assessment on the North Atlantic shortfin mako population, NMFS independently determined that the North Atlantic stock of shortfin mako sharks is experiencing overfishing and approaching an overfished status.

Alternative C6 *Promote the release of shortfin mako sharks brought to fishing vessels alive – Preferred Alternative*

Under this alternative, NMFS would actively engage in an outreach program with PLL fishermen and request that they release all shortfin mako sharks that come to the vessel alive in order to help maintain the sustainability of the shortfin mako shark population. This action would not restrict commercial harvest of shortfin mako sharks that are alive at haulback, and quotas and retention limits would remain as described in the No Action alternative, alternative C1.

2.2 Recreational Measures

2.2.1 Small Coastal Sharks

Alternative D1 No Action. Maintain the current recreational retention and size limit for SCS

Under alternative D1, NMFS would maintain the existing recreational retention limits for SCS. Recreational anglers are currently allowed one authorized shark species, including SCS, per vessel per trip. This shark must have a fork length (FL) of at least 54 inches. Recreational fishermen are also able to retain one bonnethead shark and one Atlantic sharpnose shark per person per trip. There is no minimum size requirement for bonnethead and Atlantic sharpnose sharks.

Alternative D2 Modify the minimum recreational size limit for blacknose sharks based on their biology

Under alternative D2, NMFS would modify the minimum recreational size for blacknose sharks based on their biology. The current minimum retention size is 54 inches and is based on the biology of the sandbar shark. However, most blacknose sharks do not reach a maximum size of 54 inches FL. Under alternative D2, NMFS would reduce the minimum size limit for blacknose sharks to a minimum size of 36 inches FL, which is the size at which 50 percent of the female blacknose sharks reach sexual maturity.

Alternative D3 Increase the retention limit for Atlantic sharpnose sharks based on current catches

Under alternative D3, NMFS would increase the retention limit for Atlantic sharpnose sharks based on their current catches and stock status. Currently, recreational anglers are allowed to retain one Atlantic sharpnose shark per person per trip. Under alternative D3, NMFS would consider increasing this retention limit based on the stock status of the species and current catches.

Alternative D4 *Prohibit retention of blacknose sharks in recreational fisheries – Preferred Alternative*

Under the preferred alternative D4, NMFS would prohibit the retention of blacknose sharks in the recreational fishery. While recreational fishermen may still catch blacknose sharks when fishing for other species, they would not be permitted to retain blacknose sharks and would have to release them. Based on the latest stock assessment, this alternative would help rebuild blacknose sharks stock by reducing recreational landings in federal waters. However, since most blacknose sharks do not reach the current federal minimum size of 54 inches FL, presumably most recreational blacknose shark landings occur in state waters. Complementary measures in states waters would be important for reducing mortality of blacknose shark in recreational fisheries and ensuring the rebuilding plan is met for blacknose sharks.

2.2.2 Pelagic Sharks

Alternative E1 No Action. Maintain the current recreational retention and size limits for shortfin mako sharks.

Under the No Action alternative, NMFS would maintain the current recreational retention and size limits for shortfin mako sharks. Shortfin mako sharks would remain in the pelagic shark species complex, which includes blue, common thresher, oceanic whitetip, and porbeagle sharks. Recreational fishermen would continue to be limited to one authorized shark species, which include shortfin mako sharks, greater than 54 inches FL per vessel per trip, and one Atlantic sharpnose and one bonnethead shark per person per trip with no minimum size.

Alternative E2 Increase the recreational minimum size limit of shortfin mako

E2a) Establish a minimum size limit for shortfin mako sharks that is based on the size at which 50 percent of female shortfin mako sharks reach sexual maturity or 108 inches FL

Under Alternative E2a, NMFS would increase the recreational minimum size limit for shortfin mako sharks to correspond with the size at which 50 percent of female shortfin mako sharks reach sexual maturity, identified in Natanson *et al.* (2006) as 108 inches FL. Currently, the minimum size limit for all pelagic sharks caught in the recreational fishery is 54 inches FL. Under this alternative, the shortfin mako shark recreational minimum size would be increased to 108 inches FL to end overfishing of the stock. Shortfin mako sharks below this minimum size limit would be prohibited and could not be retained. Under this alternative, all shortfin mako sharks greater than the 108 inch FL minimum size limit would be authorized for retention. The 108 inch FL measurement is equivalent to the 32 inch IDL measurement used for implementing a commercial size limit in Alternative C4a, but the different measurements are used to accommodate the different fisheries. Recreational anglers would be limited to one shark greater than 54 inches FL or one shortfin mako greater than 108 inches FL per vessel per trip, and one Atlantic sharpnose and one bonnethead shark per person per trip.

E2b) Establish a minimum size limit for shortfin mako sharks that is based on the size at which 50 percent of male shortfin mako sharks reach sexual maturity or 73 inches FL

The recreational minimum size limit would be increased for shortfin mako sharks under Alternative E2b to correspond with the size at which 50 percent of male shortfin mako sharks reach sexual maturity, identified in Natanson *et al.* (2006) as 73 inches FL. Currently, the minimum size limits for all pelagic sharks caught in the recreational fishery is 54 inches FL. The shortfin mako shark recreational minimum size would be increased to 73 inches FL to end ovefishing of the stock. Shortfin mako sharks caught below this size limit would be prohibited and could not be retained. The 73 inch FL measurement is equivalent to the 22 inch IDL measurement used for implementing a commercial size limit in Alternative C4b, but the different measurements are used to accommodate the different fisheries. All shortfin mako sharks greater than 73 inches FL and all other pelagic sharks greater than 54 inches FL limit would be available for recreational harvest. Recreational anglers would be limited to one shark greater than 54 inches FL or one shortfin mako greater than 73 inches FL per vessel per trip, and one Atlantic sharpnose and one bonnethead shark per person per trip.

Alternative E3 Take action at the international level to end overfishing of shortfin mako sharks– Preferred Alternative

Under alternative E3, NMFS would take action at an international level through international fishery management organizations to end overfishing of shortfin mako sharks. As discussed under alternative C5, ICCAT assumes there are three shortfin mako shark

stocks for assessment purposes: northern and southern Atlantic stocks, separated at 5°N latitude and a Mediterranean stock.

Alternative E4 *Promote the release of shortfin mako sharks brought to fishing vessels alive – Preferred Alternative*

The promotion of the live release of shortfin mako sharks in the recreational shark fishery, as considered in alternative C6, would not result in any changes to the current recreational regulations regarding shortfin mako sharks. Under this alternative, NMFS would actively engage in an outreach program with recreational fishermen and request that they release all shortfin mako sharks that come to the boat alive in order to help maintain the sustainability of the shortfin mako shark population. This action does not restrict recreational harvest of shortfin mako sharks that are alive at haulback, and bag limits would remain as described in the No Action alternative, alternative E1.

Alternative E5 Prohibit retention of shortfin mako sharks in recreational fisheries (catch and release only)

Under alternative E5, NMFS would prohibit the retention of shortfin mako sharks in the recreational fishery by placing it on the prohibited species list. Under the regulations, shark species can be added to the prohibited species list if two of the following four criteria are met: 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). Adding shortfin mako sharks to the prohibited species list would make it illegal to land shortfin mako sharks recreationally or commercially and recreational fishermen would only be authorized to catch and release shortfin mako sharks.

2.3 Smooth Dogfish

NMFS currently manages sharks in four management units (small coastal sharks, pelagic sharks, large coastal sharks, and prohibited species). There are additional species of sharks that are HMS that fall outside of the current management units but remain under Secretarial authority should the Secretary determine the species is in need of conservation and management. One of these species, smooth dogfish, is not currently managed at the federal level. Although smooth dogfish were previously included in a fishery management unit (FMU) that included deepwater and other sharks, these species were removed from the FMU in the 2003 Amendment 1 to the Fishery Management Plan for Atlantic Tunas, Swordfish, and Sharks since they were protected under the Shark Finning Prohibition Act (67 FR 6124, February 11, 2002). The Magnuson-Stevens Act grants authority to manage oceanic shark species within the U.S. EEZ to the Secretary. NMFS has determined that smooth dogfish is an oceanic shark species. The Magnuson-Stevens Act further defines Secretarial authority for HMS that crosses the jurisdiction of more than one of the following five Councils: NEFMC, MAFMC, SAFMC, GMFMC, and CFMC. Smooth

dogfish range crosses the jurisdiction of all five of eastern United States Councils. Based on public comments and its independent review of the species, NMFS has determined that smooth dogfish are in need of conservation and management under NMFS authority. However, limited data regarding landings, effort, or participants in the fishery complicates new regulations. As noted in Section 1.2, all smooth dogfish management measures would also apply to Florida smoothhounds (*Mustelus norrisi*).

The following alternatives consider a range of possible management measures for smooth dogfish:

Alternative F1 No Action. Do not add smooth dogfish under NMFS management

Smooth dogfish are not currently managed at the federal level, and under Alternative F1, the No Action alternative, NMFS would not add smooth dogfish under NMFS management and would not implement management measures for smooth dogfish. Furthermore, essential fish habitat (EFH) for smooth dogfish would not be designated under the No Action alternative. While no federal action would be taken by NMFS, this alternative would not preclude state or interstate marine fisheries commission management measures.

Alternative F2 Add smooth dogfish under NMFS management and establish a federal permit requirement-Preferred Alternative

Alternative F2, the preferred alternative, would implement federal management of smooth dogfish and establish a permit requirement for commercial and recreational retention of smooth dogfish in federal waters. A federal permit requirement would allow NMFS to collect data regarding participants in the fishery. Placing smooth dogfish under NMFS management would require that fishermen fishing for smooth dogfish comply with current federal guidelines in the Atlantic, Gulf of Mexico, and Caribbean Sea, including the requirement that sharks be offloaded with their fins naturally attached. This alternative would also provide NMFS the ability to select vessels to carry an observer. This alternative would not require fishermen to attend the protected species release, disentanglement, and identification workshops. As NMFS gathers information about the fishery and the fishermen, NMFS may decide to require fishermen attend these workshops as is required in other HMS longline and gillnet fisheries. Over time, NMFS would likely implement logbook or other reporting for smooth dogfish fishermen. NMFS would not do this, however, until the universe of fishermen is known and until NMFS can determine the appropriate mechanism of reporting without duplicating current reporting requirements. Dealers would be required to report smooth dogfish on HMS dealer reports or through the Standard Atlantic Fisheries Information System (SAFIS). Recreational fishermen would need to obtain either an HMS Angling or Charter/Headboat permit. Gillnets are the primary gear type used in the smooth dogfish fishery and fishermen using gillnets to target smooth dogfish would be required to comply with federal marine mammal take regulations at 50 CFR 229.32 mandated by the Marine Mammal Protection Act including frequent net-checks (every 0.5-2 hours) and the requirement for gillnets to remain attached to the vessel. In the Northeast United States, trawl gear is occasionally used in the smooth dogfish fishery. This gear type, however, is currently not an authorized gear under federal shark

management regulations. NMFS is currently considering whether to incorporate trawl gear as an authorized gear within the smooth dogfish fishery.

As a statutory condition of establishing federal management of smooth dogfish, EFH for the species must be designated. Amendment 1 to the 2006 Consolidated HMS FMP extensively analyzed methods for determining EFH, and NMFS considers the conclusions in Amendment 1 to the 2006 Consolidated HMS FMP to be the best available science. As such, no alternatives were considered for designating EFH other than the No Action alternative and the method used in Amendment 1 to the 2006 Consolidated HMS FMP. Chapter 11 of this document summarizes this methodology used to designate smooth dogfish EFH and includes a map of the proposed smooth dogfish EFH boundaries.

On January 16, 2009, NMFS published the final rule for implementing the ACL and AM requirements of the Magnuson-Stevens Act (74 FR 3178). Per the January 2009 final rule, ACLs and AMs apply "unless otherwise provided for under an international agreement in which the United States participates." Given smooth dogfish are not managed under any international agreements, NMFS must follow National Standard 1 guidelines for smooth dogfish. The landings component of the sector-ACL, or commercial quota, would be based on historic landings data spanning 1998-2007 (the last 10 years with complete landings data). Table 2.2 shows the total annual landings by year as well as summary data spanning 1998-2007. The average annual landings during this time period was 950,859 lb dw and the following three alternatives consider a range of quotas based on this number. The landings data does not show any obvious trends and are likely an underestimate due to underreporting. Due to the lack of a stock assessment, there is no information regarding the stock status of smooth dogfish. Since reliable catch and stock status data is not available, NMFS would establish a quota that would not change current landings. NMFS would account for underharvest and overharvest of smooth dogfish as it does for other shark species and would close the smooth dogfish shark quota with five days notice upon filing in the Federal Register when the smooth dogfish shark quota reaches or is projected to reach 80 percent. This would help prevent overharvest from occurring while still giving the public 5 days notice that the fishery would close. The three following alternatives consider a range of quota options based on the current level of harvest.

Table 2.2 Total Annual Landings by Year and Summary Data spanning 1998-2007.
Source: ACCSP

Year	Total Annual Landings (lb dw)
1998	785,700
1999	954,606
2000	776,449
2001	880,425
2002	1,037,440
2003	1,068,279
2004	1,270,137
2005	888,017

Landings Summary	lb dw
Average Annual Landings	950,859
Maximum Landings	1,270,137
One Standard Deviation	153,591
Maximum Landings + One Standard Deviation	1,423,727

2006	821,300
2007	1,026,243

Alternative F2a1) Establish a smooth dogfish quota that is equal to the average annual landings from 1998-2007 (950,859 lb dw)

This alternative would set the annual quota equal to the historical average reported annual landings of 950,859 lb dw. Total reported annual catches between 1997 and 2007 had low variability, with a minimum of 776,448 lb dw in 2000 and a maximum of 1,270,137 lb dw in 2004. Assuming that the reported landings are accurate, this alternative should allow the fishery to operate at or near its current level of utilization.

Alternative F2a2) Establish a smooth dogfish quota equal to the maximum annual landings from 1998-2007 (1,270,137 lb dw)

This alternative would set the annual quota at the maximum historical reported annual landing of 1,270,137 lb dw. Assuming that the reported landings are accurate, this alternative would allow the fishery to operate at its current level, and accommodate for the fluctuation of landings. Any levels of utilization at or near the peak landing in 2004 would be permissible under this quota alternative.

Alternative F2a3) Establish a smooth dogfish quota equal to the maximum annual landings from 1998-2007 plus one standard deviation (1,423,727 lb dw) – Preferred Alternative

Alternative F2a3, the preferred alternative, would set the smooth dogfish quota equal to the maximum annual landings between 1998-2007 plus one standard deviation during the same time period (1,270,137 lb dw + 153,590 lb dw), for a total of 1,423,727 lb dw. Similar to alternative F2a2, this alternative would allow the fishery to continue to operate up to the maximum level of utilization between 1998-2007. However, this alternative also incorporates an added buffer of one standard deviation to account for under-reporting in the fishery. Since the fishery has not been previously managed, there have been no reporting requirements in the past. While the data from ACCSP used in this analysis likely included the vast majority of landings, the possibility exists of remaining unreported landings. Alternative F2a3 is preferred at this time because it would allow the fishery to continue to operate even if sources of dogfish mortality that were previously unknown start to be reported.

Within the quota established under this alternative, a set-aside quota must be considered for activities that collect dogfish for research or for public display. The current set-aside for all shark species under NMFS' jurisdiction is 60 mt ww. The two alternatives below consider a range of options for establishing a smooth dogfish set-aside quota for research and public display:

Alternative F2b1) *Establish a separate smooth dogfish set-aside quota for the exempted fishing program – Preferred Alternative*

Alternative F2b1 would establish a separate smooth dogfish set-aside quota for the exempted fishing program. Currently, there is a 60 mt ww set-aside quota for sharks for the exempted fishing program. However, as smooth dogfish have not been federally managed in the past, smooth dogfish were not included in this 60 mt ww set-aside. Thus, to allow fishermen to take smooth dogfish for research purposes and outside of any established regulations for smooth dogfish, NMFS would establish a separate set-aside for smooth dogfish based on the maximum yearly smooth dogfish takes during research over the past 10 years or 6 mt ww.

Alternative F2b2) Establish a smooth dogfish set-aside quota for the exempted fishing program and add it to the current 60 mt ww set-aside quota for the exempted fishing program

Under alternative F2b2, NMFS would establish a smooth dogfish set-aside quota for the exempted fishing program and add it to the current 60 mt ww set-aside quota for the exempted fishing program. As explained under alternative F2b1, smooth dogfish are not included in the current 60 mt ww set-aside quota for sharks for the exempted fishing program. Thus, the inclusion of smooth dogfish under the exempted fishing program shark quota set-aside would allow fishermen to take smooth dogfish for research purposes and outside of any established regulations for smooth dogfish. NMFS would establish a set-aside for smooth dogfish based on the maximum yearly smooth dogfish takes during research over the past 10 years or 6 mt ww, and add it to the existing 60 mt ww research set-aside for a total quota for the exempted fishing program of 66 mt ww.

Alternative F3 Add smooth dogfish under NMFS management and mirror management measures implemented in the Atlantic States Marine Fisheries Commission (ASMFC) Interstate Shark FMP

This alternative would implement federal management of smooth dogfish and use the same methods and management tools implemented by the ASMFC Interstate Shark FMP. NMFS is cognizant of differences in mandates and missions between NMFS and ASMFC and would ensure that any federal measures would comply with federal standards.

Current ASMFC regulations in the Interstate Fishery Management Plan for Atlantic Coastal Sharks (August 2008) include smooth dogfish commercial measures. There are no minimum size limits and no commercial possession limits in the fishery, but recreational fishermen are limited to a maximum of two smooth dogfish per day (one federally permitted shark species or smooth dogfish plus one additional Atlantic sharpnose, one additional bonnethead, and one additional smooth dogfish). Smooth dogfish must have tails and fins naturally attached through offloading, and gillnet gear must be checked at least every two hours to minimize protected species impacts.

On May 6, 2009, the ASMFC approved a smooth dogfish Addendum to the Atlantic Coastal Sharks FMP for public comment. Included within this Addendum is an

exception for smooth dogfish to allow at-sea processing (*i.e.*, removal of shark fins while still onboard a fishing vessel), removal of recreational retention limits for smooth dogfish, and removal of the two hour net-check requirement for shark gillnets. The at-sea processing would require a 5 percent fins-to-carcass ratio and allow for the removal of fins. The allowance for the removal of shark fins while still onboard a fishing vessel and removal of the two hour net-check requirement differs from current federal regulations.

2.4 Alternatives Considered But Not Further Analyzed

Alternative G1 Establish species-specific quotas for all species in the SCS complex based on average landings; close each quota individually, as needed

While NMFS has been working towards species-specific management for many sharks, species-specific quotas for sharks in the small coastal shark complex could be challenging due to the small size of the individual quotas. Establishing species-specific SCS quotas would result in four small quotas, which could be difficult to monitor and effectively manage. These quotas would be based on average landings resulting in the following quotas: bonnethead = 21 mt; finetooth = 81.6 mt; Atlantic sharpnose = 124.4 mt; blacknose = 13.5 mt (78 percent reduction of average landings). Individual quotas based on average landings would result in a much lower overall SCS quota, which could have large, negative socioeconomic impacts on shark fishermen. In addition, small quotas would require accurate and timely reporting of landings data to ensure that overharvests do not occur. Given the current reporting frequency of bi-monthly reports from HMS dealers, and the ability to implement larger SCS quotas through other alternatives, NMFS does not believe implementing small species-specific quotas is feasible at this time. Therefore, alternative G1 was considered but not further analyzed at this time.

Alternative G2 Establish new time/area closures in blacknose shark nursery areas for all HMS gears

Time/area closures in blacknose shark nursery areas could potentially enhance recruitment of individuals to the stock by protecting neonates and juveniles from high fishing mortality. Identification of discrete nursery areas is essential to avoid non-specific, large closures. Identification of such areas requires catch and/or high catch-per-unit-effort data of neonate and/or juvenile animals within a distinct geographic area. However, catch data of neonate and juvenile blacknose sharks do not identify distinct geographic areas that can be identified as nursery areas for blacknose sharks (Figure 2.1 and Figure 2.2). Thus, time/area closures in areas where blacknose interactions have occurred could result in large closures in order to be effective. Large closure would likely also have large, negative socioeconomic impacts on shark fishermen as well as fishermen for other species that catch blacknose sharks as bycatch. Given these potentially large, negative impacts and the ability to rebuild blacknose sharks though other alternatives, alternative G2 was considered but not further analyzed at this time.

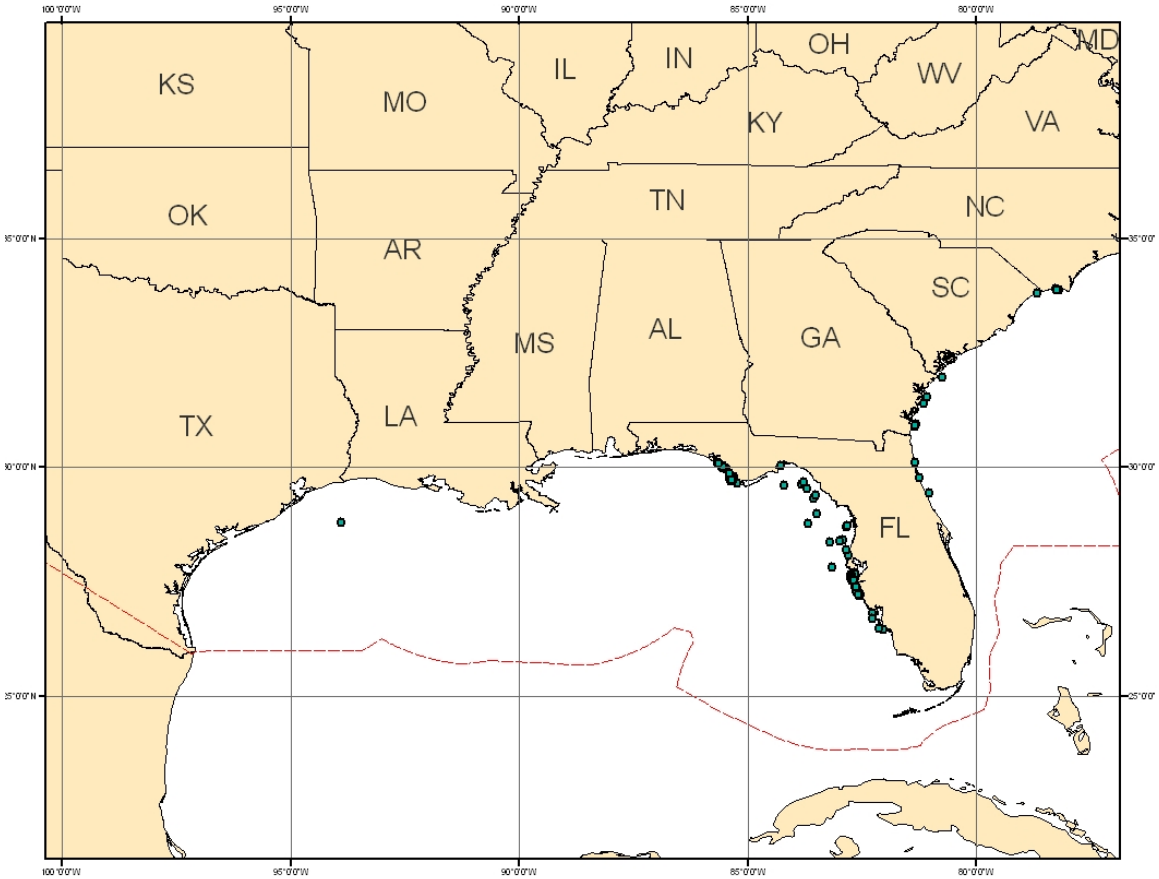

Figure 2.1 **Neonate blacknose shark interactions.**
The dotted line indicates the EEZ. Data sources are from Carlson, 2002; Cooperative Atlantic States Shark Pupping and Nursery Area Program (COASTSPAN); Cooperative Shark Tagging Program (CSTP); Mote Marine Laboratory (MOTE); SEAMAP; Southeast Gillnet Survey (SEGN); Southeast Longline Survey (SELL); and the Shark Observer Program (SOP).

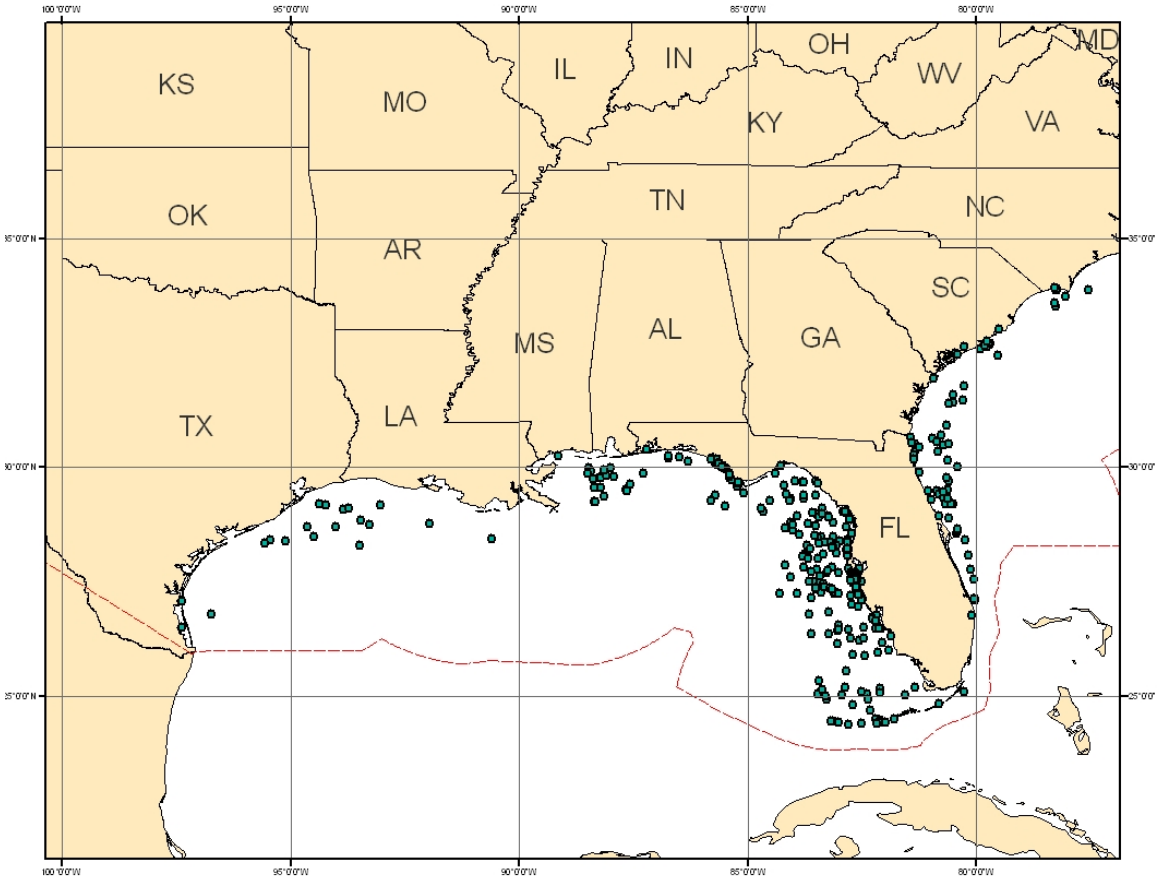

Figure 2.2 **Juvenile blacknose shark interactions.**
The dotted line indicates the EEZ. Data sources are from Carlson, 2002; Cooperative Atlantic States Shark Pupping and Nursery Area Program (COASTSPAN); Cooperative Shark Tagging Program (CSTP); Mote Marine Laboratory (MOTE); SEAMAP; Southeast Gillnet Survey (SEGN); Southeast Longline Survey (SELL); the Shark Observer Program (SOP); Jones and Grace, 2002; and Parsons, 2002.

Alternative G3 Close waters inshore of 20 fathoms in the Gulf of Mexico to shark bottom longline gear

NMFS considered closing waters inshore of 20 fathoms in the Gulf of Mexico to shark bottom longline gear as a way to reduce fishing pressure on young blacknose sharks. The majority of the recorded interactions with neonate and juvenile blacknose sharks have been recorded in waters inshore of 20 fathoms (Figure 2.3). Therefore, by closing waters inshore of 20 fathoms, NMFS would relieve fishing pressure on neonate and juvenile blacknose sharks. However, closing waters inshore of 20 fathoms could have a large, negative socioeconomic impact on the shark BLL fishery in the Gulf of Mexico, as the majority of the sharks sets from the observer program from 1994-2007 occurred inshore of 20 fathoms (Figure 2.4). Given these potentially large, negative impacts and the ability to rebuild blacknose sharks through other alternatives, alternative G3 was considered but not further analyzed at this time.

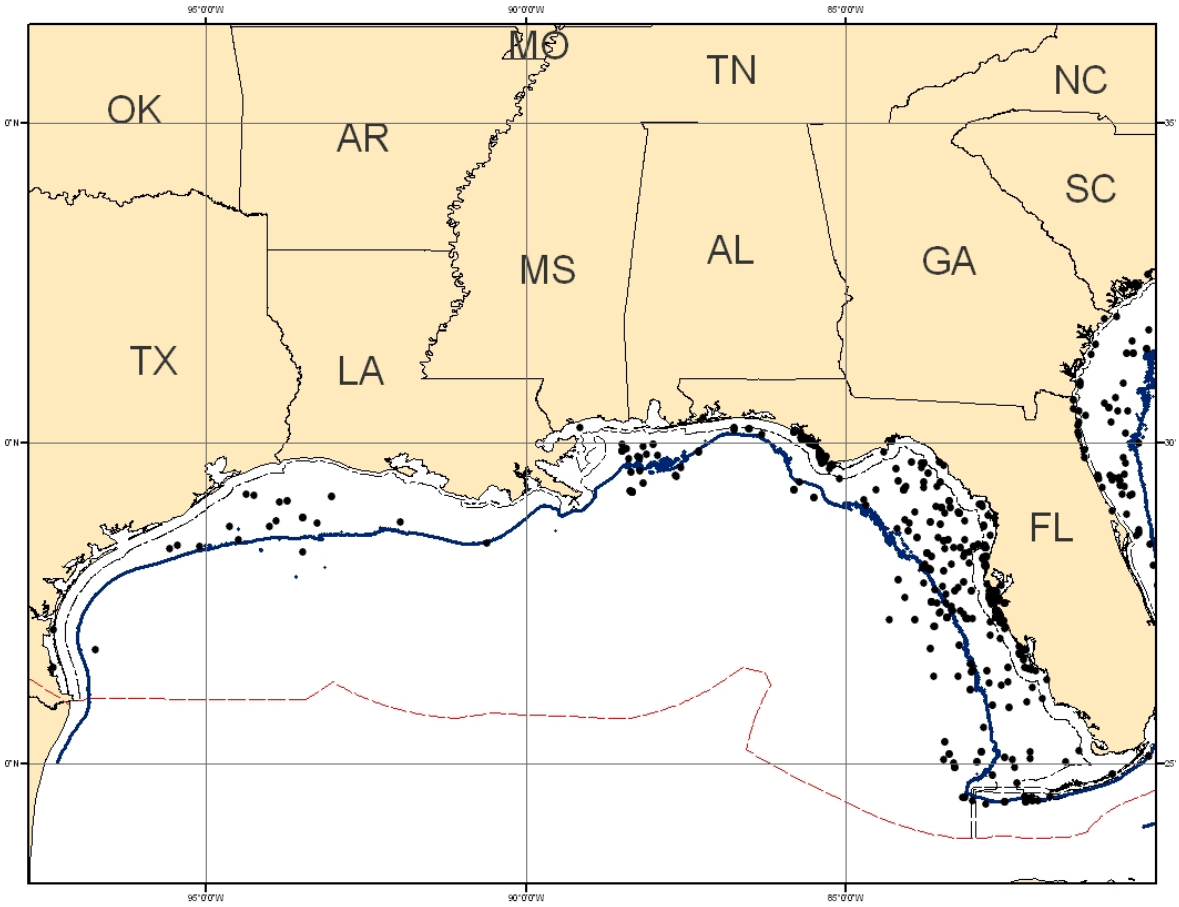

Figure 2.3 **Neonate and juvenile blacknose interactions relative to the 20 fathom line. The solid line indicates the 20 fathom line. The dotted line indicates the EEZ. The double dashed line off the tip of Florida is the Gulf of Mexico/South Atlantic Fishery Management Council boundary delineation.**

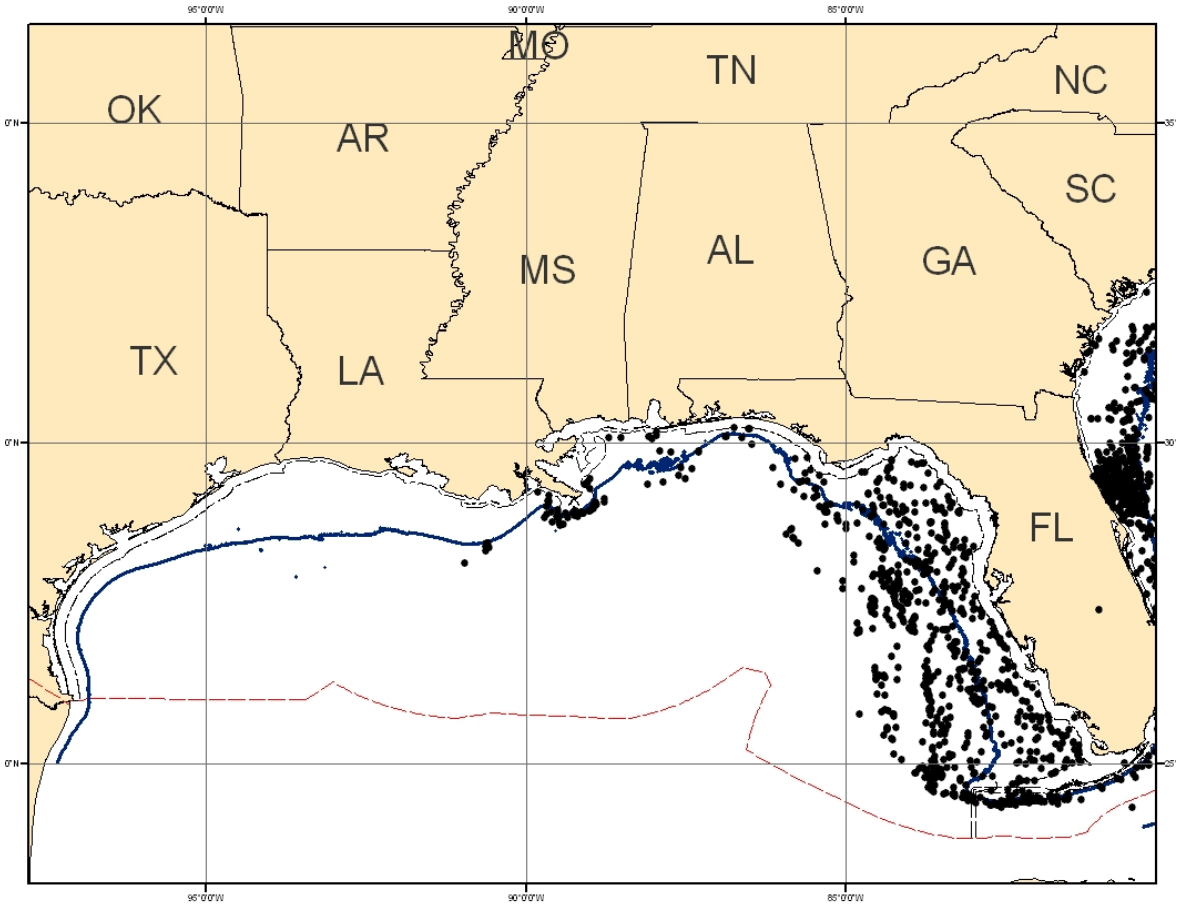

Figure 2.4 **Observed BLL sets from 1994-2007 relative to the 20 fathom line. The solid line indicates the 20 fathom line, and the dashed line is the EEZ. The double dashed line off the tip of Florida is the Gulf of Mexico/South Atlantic Fishery Management Council boundary delineation.** Source: Shark Observer BLL Program.

Alternative G4 Close waters inshore of 50 fathoms in the Gulf of Mexico to shark bottom longline gear

NMFS considered closing waters inshore of 50 fathoms in the Gulf of Mexico to shark BLL gear as a way to reduce fishing pressure on young blacknose sharks and to complement the Gulf of Mexico Fishery Management Council's emergency rule in the Gulf of Mexico region for reef fish BLL gear (74 FR 20229; May 1, 2009). The emergency rule prohibits the use of BLL gear for reef fish in waters less than 50 fathoms for the entire eastern Gulf of Mexico in order to reduce sea turtle interactions. However, closing waters inshore of 50 fathoms would have a large, negative socioeconomic impact on the shark BLL fishery in the Gulf of Mexico, as the majority of the sharks sets from the observer program from 1994-2007 occur inshore of 20 fathoms (Figure 2.5). Given these potentially large, negative impacts and the ability to rebuild blacknose sharks through other alternatives, alternative G3 was considered by not further analyzed at this time.

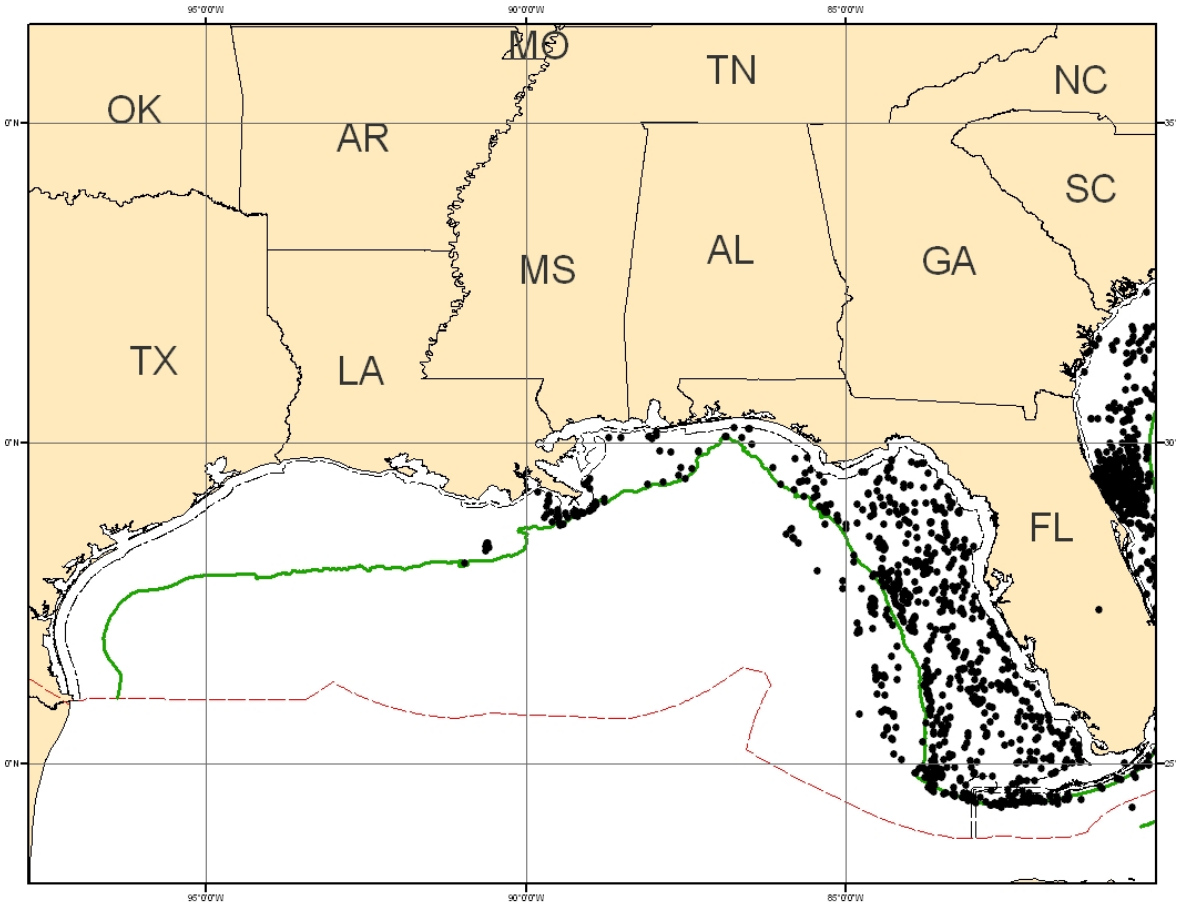

Figure 2.5 **Observed BLL sets from 1994-2007 relative to the 50 fathom line. The solid line indicates the 50 fathom line, and the dashed line is the EEZ. The double dashed line off the tip of Florida is the Gulf of Mexico/South Atlantic Fishery Management Council boundary delineation.** Source: Shark Observer BLL Program.

Alternative G5 Add deepwater sharks to the management unit and place these species on the prohibited list

This alternative would implement federal management of deepwater sharks by placing them on the prohibited list. This action, however, is not likely to have significant ecological benefits since deepwater sharks are not currently targeted in any fishery and are only caught as bycatch. Placing this group on the prohibited list would not prevent bycatch.

Additionally, prohibiting the landing of deepwater sharks would limit data gained from incidental catches. If prohibited, these rarely encountered species would have to be released and could not be landed and submitted for subsequent analysis. Therefore, alternative G5 was considered but not further analyzed at this time

Alternative G6 Establish catch shares in the Atlantic shark fisheries

A catch share is the allocation of the available fishery quota among participants within the fishery. LAPPs are one type of catch share program. These programs may be

implemented to address numerous issues, including but not limited to: ending the race for fish, reducing overcapitalization, and improving efficiency and safety, while still addressing the biological needs of a stock. These programs can be designed specifically to meet the needs of a fishery for which they are designed, provided they meet the requirements outlined in the Magnuson-Stevens Act. Catch shares were not considered for the shark fishery in this amendment because of the ramifications this type of program would have for the existing permit structure and the time required for implementing these programs.

To properly design a catch share program that appropriately considers the views and interests of all stakeholders and then implements such a system would have take NMFS several years, and therefore, catch shares were not considered a reasonable alternative for this action given the mandate in § 304(e) of the Magnuson-Stevens Act to have ACLs in place for stocks experiencing overfishing by 2010. However, NMFS is considering revisions to the existing permit structure within HMS fisheries. This could include a catch share program for sharks as well as other HMS as was discussed during the September/October 2008 HMS Advisory Panel. NMFS published an ANPR on June 1, 2009 (74 FR 26174), to initiate broad public participation in considering catch shares for HMS fisheries.

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3.0 DESCRIPTION OF AFFECTED ENVIRONMENT

This chapter serves several purposes. It describes the affected environment (the fishery, the gears used, the communities involved, *etc*.), and provides a view of the current condition of the fishery, which serves as a baseline against which to compare impacts of the different alternatives. This chapter also provides a summary of information concerning the biological status of shark stocks; the marine ecosystems in the fishery management unit; the social and economic condition of the fishing interests, fishing communities, and fish processing industries; and, the best available scientific information concerning the past, present, and possible future condition of shark stocks, ecosystems, and fisheries.

3.1 Introduction to Highly Migratory Species Management and Highly Migratory Species Fisheries

Atlantic HMS fisheries are managed directly by the Secretary of Commerce, who designated that responsibility to the NMFS. The HMS Management Division within NMFS is the lead in developing regulations for HMS fisheries, although some actions (*e.g.*, Large Whale Take Reduction Plan) are taken by other NMFS offices if the main legislation (*e.g.*, Marine Mammal Protection Act) driving the action is not the Magnuson-Stevens Act or Atlantic Tunas Convention Act (ATCA). Because of their migratory nature, HMS fisheries require management at the international, national, and state levels. NMFS manages HMS fisheries in federal waters (domestic) and the high seas (international) while individual states establish regulations for some HMS in their own waters. There are exceptions to this generalization. For example, federally-permitted commercial shark fishermen, as a condition of their permit, are required to follow federal regulations in all waters, including state water, unless the state has more restrictive regulations, in which case the state laws prevail. Additionally, in 2005, the Atlantic States Marine Fisheries Commission (ASMFC) agreed to develop an interstate coastal shark FMP. This interstate FMP coordinates management measures among all states along the Atlantic coast (Florida to Maine). NMFS participated in the development of this interstate shark FMP, which was effective in 2009.

Generally, on the domestic level, NMFS implements relevant international agreements and management measures that are required under domestic laws such as the Magnuson-Stevens Act. While NMFS does not generally manage HMS fisheries in state waters, states are invited to send representatives to Advisory Panel (AP) meetings and to participate in stock assessments, public hearings, or other fora. NMFS is working to improve its communication and coordination with state agencies. In 2006, NMFS reviewed the shark regulations of several states and has asked for some states to consider changing their regulations to become more consistent with federal regulations. This request resulted in changes and dialogues with certain states regarding the regulations such as the Commonwealth of Virginia and the State of Florida. Additionally, as a result of ASMFC's decision to develop an interstate FMP, the State of Maine opened a dialogue with NMFS regarding shark regulations. NMFS would share this draft FMP amendment with the states and will work with states, to the extent practicable, to ensure complementary regulations. Please see Section 3.1.4 for more information regarding regulations by state.

On the international level, NMFS participates in the stock assessments conducted by the International Commission for the Conservation of Atlantic Tunas' (ICCAT) Standing Committee on Research and Statistics (SCRS) and in the annual ICCAT meetings. In regard to sharks, ICCAT assesses two pelagic sharks only: the Atlantic blue and the shortfin mako. Stock assessments and management recommendations or resolutions are listed on ICCAT's website at http://www.iccat.es/. ATCA authorizes NMFS to promulgate regulations as may be "necessary and appropriate" to carry out ICCAT recommendations. NMFS also actively participates in other international bodies that could affect U.S. shark fishermen and the shark industry including Convention on International Trade in Endangered Species (CITES) and the Food and Agriculture Organization (FAO). More information on the current status of shark stocks and the dates of the next ICCAT stock assessments are provided in Section 3.2.

3.1.1 History of Domestic Shark Management

Sharks are managed along with other HMS species. Thus, management of the shark fishery is presented in FMPs along with Atlantic billfish, Atlantic tunas, and Atlantic swordfish. This section gives a relatively brief history of shark management of Atlantic sharks. This history is organized by previous FMPs. For more detail regarding the history of management and of other HMS species besides sharks, 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.

3.1.1.1 Pre-1999 Atlantic Shark Fisheries and Management

Recreational fishing for Atlantic sharks occurs in federal and state waters from New England to the Gulf of Mexico and Caribbean Sea. 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 the marine environment, with even large specimens available in the nearshore areas. Typically, most recreational shark fishing takes place on small to medium-size vessels. Some species such as 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 many active shore-based fishermen as well.

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 that time, shark fishing gear included gillnets, hook and line, anchored bottom longlines (BLL), 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).

The U.S. Atlantic shark fishery developed rapidly in the late 1970s due to increased demand for shark 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 conduct some directed fishing. 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. Catches accelerated through the 1980s, with peak commercial landings of large coastal and pelagic sharks 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 (1993 Shark FMP). At that time, NMFS identified large coastal sharks (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 the SCS complex to limit SCS fishing. Under the rebuilding plan established in the 1993 FMP, the LCS quota was expected to increase every year from 1993 to 1995 up to 3,787 mt dw, which was the maximum sustainable yield estimated in the 1992 stock assessment.

A number of difficulties arose in the initial year of implementation of the 1993 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 dw 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 implementing additional measures authorized by the FMP published on October 18, 1994 (59 FR 52453).

In 1994, under the rebuilding plan implemented in the 1993 Shark FMP, the LCS quota was increased to 2,570 mt dw. However, a new stock assessment was completed in March 1994 that indicated LCS rebuilding 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 [the] 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 (*Rhizoprinodon terraenovae*) 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 (sand tiger, bigeye sand tiger, whale, basking, and white sharks). 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 the 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 July 1999, the District Court for the Middle District of Florida enjoined implementation of the 1999 shark regulations, because of ongoing litigation on the 1997 quotas. A year later, on June 12, 2000, the case was settled and 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).

In addition to shark regulations, the 1999 FMP incorporated all existing management measures for Atlantic tuna and north Atlantic swordfish that have been issued previously under the authority of 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. South Atlantic swordfish and South Atlantic albacore tuna continued to be managed only under ATCA.

Some of the non-species specific management measures of the 1999 FMP included vessel monitoring systems for all pelagic longline (PLL) vessels; gear and vessel marking requirements; moving PLL 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 for biomass (B) and fishing mortality (F) 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.

3.1.1.2 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. 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 FMP began in September 1997 with the formation of the HMS 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 and 2006, ICCAT adopted recommendations for Atlantic sharks.

3.1.1.3 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 PLL fleet, the time/area closure for the PLL fleet, the pelagic shark quotas, the shark and yellowfin tuna recreational retention limits, the large and SCS 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.

3.1.1.4 Amendment 1 to the 1999 Fishery Management Plan for Atlantic Tunas, Swordfish, and Sharks

As noted under Section 3.1.1.1, 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 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) (Cortés, 2002). 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 was occurring on finetooth sharks while the three other species in the SCS complex (Atlantic sharpnose, bonnethead, and blacknose) were not overfished and overfishing was not occurring. On October 17, 2002, NMFS announced the availability of the 2002 LCS stock assessment (Cortés *et al*., 2002) and the workshop meeting report (67 FR 64098). The results of this stock assessment indicate that the LCS complex was still overfished and overfishing was occurring. Additionally, the 2002 LCS stock assessment found that sandbar sharks were no longer overfished but that overfishing is still occurring and that blacktip sharks were rebuilt and overfishing was 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 established in the 1999 FMP, 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) (NMFS, 2003a). These regulations were based on the 2002 SCS and LCS 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 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 North Carolina for BLL fishermen; and establishing vessel monitoring system (VMS) requirements for BLL and gillnet fishermen.

3.1.1.5 Other Post-1999 FMP Regulations for Sharks

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

- 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' FAO 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 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 EEZ and on the high seas.

- 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.

Other regulatory actions that have been taken including the 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 Stock Assessment and Fishery Evaluation (SAFE) Reports (http://www.nmfs.noaa.gov/sfa/hms).

3.1.1.6 Consolidated HMS FMP and Beyond

As stated in the previous sections, NMFS issued two separate FMPs 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 1 to the Billfish Management Plan updated and amended the 1988 Billfish FMP.

During the time that these two FMPs had co-existed, there had been a growing recognition by the Agency of the interrelated nature of these fisheries and the need to consolidate

management actions. In addition, the Agency had 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. Therefore, NMFS proposed to improve coordination of the conservation and management of the domestic fisheries for Atlantic swordfish, tunas, sharks and billfish by consolidating all HMS management measures into one FMP. In 2005, NMFS released the draft Consolidated HMS FMP. The final Consolidated HMS FMP was completed in July 2006 and the implementing regulations were published on October 2, 2006 (71 FR 58058).

The 2006 Consolidated HMS FMP changed certain management measures, adjusted regulatory framework measures, and continued the process for updating HMS EFH. Measures that are specific to the shark fisheries include mandatory workshops and certifications for all vessel owners and operators that have PLL or BLL gear on their vessels and that have been issued or are required to be issued any of the HMS limited access permits (LAPs) to participate in HMS longline and gillnet fisheries. The aim of these workshops is to provide information and ensure proficiency with equipment to handle, release, and disentangle sea turtles, smalltooth sawfish, and other non-target species. The Consolidated HMS FMP also requires federally permitted shark dealers to attend Atlantic shark identification workshops to train shark dealers how to properly identify shark carcasses. Additional measures specific to sharks include the differentiation between PLL and BLL gear based upon the species composition of the catch onboard or landed, the requirement that the second dorsal fin and the anal fin remain on all Atlantic sharks through landing, and a new prohibition making it illegal for any person to sell or purchase any HMS that was offloaded from an individual vessel in excess of the retention limits specified in § 635.23 and 635.24. The 2006 Consolidated HMS FMP also implemented complementary HMS management measures in Madison-Swanson and Steamboat Lumps Marine Reserves and established criteria to consider when implementing new time/area closures or making modifications to existing time/area closures.

The 2002 SCS stock assessment found that finetooth sharks were not overfished but that overfishing was occurring. The 2006 Consolidated HMS FMP included a plan for preventing overfishing by expanding observer coverage, collecting more information on where finetooth sharks are being landed, and coordinating with other fisheries management entities that are contributing to finetooth shark fishing mortality. The latest 2007 stock assessment of SCS in the U.S. Atlantic and Gulf of Mexico was recently completed (72 FR 63888, November 13, 2007), and found, among other things, that finetooth sharks were not experiencing overfishing, but blacknose sharks are overfished with overfishing occurring. This peer reviewed assessment, which was conducted according to the SEDAR process, provides an update from the 2002 stock assessment on the status of SCS stocks and projects their future abundance under a variety of catch levels in the U.S. Atlantic Ocean, Gulf of Mexico, and Caribbean Sea. The SEDAR process is a cooperative program designed to improve the quality and reliability of the stock assessments. The SEDAR process emphasizes constituent and stakeholder participation in the assessment development, transparency in the assessment process, and a rigorous and independent scientific review of the completed stock assessment. It consists of three workshops: the Data Workshop, the Assessment Workshop, and the Review Workshop. The Data Workshop for the stock assessment documents, reviews, and compiles the data for conducting the assessment. The Assessment Workshop develops and refines the population analyses and parameter estimates.

Finally, the Review Workshop is where independent scientists review the assessment and data. The 2007 assessment includes updated catch estimates, new biological data, and a number of fishery-independent catch rate series, as well as fishery-dependent catch rate series.

In 2007, NMFS expanded the equipment required for the safe handling, release, and disentanglement of sea turtles caught in the Atlantic shark BLL fishery (72 FR 5633, February 7, 2007). As a result, equipment required for BLL vessels is now consistent with the requirements for the PLL fishery. Furthermore, this action implemented several year-round BLL closures to protect EFH to maintain consistency with the Caribbean Fishery Management Council.

Other actions taken by NMFS affecting the Atlantic shark fishery include a combined emergency and final rule (December 14, 2006, 71 FR 75122) that adjusted the 2007 first season commercial quotas for LCS, SCS, and pelagic sharks based on over- or underharvests from the 2006 fishing season and that announced the season opening and closing dates for the first season of 2007. During the first trimester season of 2007, the South Atlantic region landed 16.0 mt dw LCS, even though there was no quota available (-112.9 mt dw). The South Atlantic region also landed 28.7 mt dw (9.3 percent) of their SCS quota. During this time, the Gulf of Mexico region landed 186.9 mt dw (300 percent) of their LCS quota and 14.7 mt dw (97.4 percent) of their SCS quota, while the North Atlantic region experienced underharvests for both LCS and SCS. In late 2007, NMFS published a final rule (November 29, 2007, 72 FR 67580), which established the 2008 first trimester season commercial quotas for LCS, SCS, and pelagic sharks based on over- or underharvests from the 2007 first trimester fishing season. Specifically, NMFS closed the LCS fishery in all regions for the 2008 first and second trimester seasons. The SCS and pelagic shark fisheries opened January 1, 2008, and remained open during the first trimester season.

3.1.2 Amendment 2 to the Consolidated HMS FMP

On April 10, 2008, NMFS released the Final Environmental Impact Statement for Amendment 2 to the Consolidated HMS FMP based on several stock assessments that were completed in 2005/2006. Assessments for dusky and sandbar sharks indicated that these species are overfished with overfishing occurring and that porbeagle sharks (*Lamna nasus*) are overfished. NMFS implemented management measures consistent with recent stock assessments for sandbar, porbeagle, dusky, blacktip and the LCS complex. The implementing regulations were published on June 24, 2008 (73 FR 35778; corrected version published July 15, 2008; 73 FR 40658). Management measures implemented in Amendment 2 included:

- Initiating rebuilding plans for porbeagle, dusky, and sandbar sharks consistent with stock assessments;
- Implementing commercial quotas and retention limits consistent with stock assessment recommendations to prevent overfishing and rebuild overfished stocks;
- Modifying recreational measures to reduce fishing mortality of overfished/overfishing stocks;
- Modifying reporting requirements;
- Modifying timing of shark stock assessments;

- Clarifying timing of release for annual Stock Assessment and Fishery Evaluation (SAFE) reports;
- Updating dehooking requirements for smalltooth sawfish;
- Requiring that all Atlantic sharks be offloaded with fins naturally attached;
- Collecting shark life history information via the implementation of a shark research program; and,
- Implementing time/area closures recommended by the South Atlantic Fishery Management Council.

3.1.3 International Shark Management

ICCAT is responsible for the conservation of tunas and tuna-like species in the Atlantic Ocean and adjacent seas. Tuna-like species include the following pelagic sharks only: the Atlantic blue shark and the shortfin mako. The organization was established at a Conference of Plenipotentiaries, which prepared and adopted the International Convention for the Conservation of Atlantic Tunas, signed in Rio de Janeiro, Brazil, in 1966. For purposes of clarity, it should be understood that ICCAT recommendations are binding instruments for Contracting Parties while ICCAT resolutions are non-binding and express the will of the Commission. All ICCAT recommendations and resolutions are available on the ICCAT website at http://www.ICCAT.es. Under ATCA, however, NMFS has authority to promulgate regulations as "necessary and appropriate" to implement ICCAT measures.

3.1.3.1 Atlantic Sharks

The first binding measure passed by ICCAT dealing specifically with sharks, *Recommendation 04-10 Concerning the Conservation of Sharks Caught in Association with Fisheries Managed by ICCAT*, includes, among other measures: reporting of shark catch data by Contracting Parties, a ban on shark finning, research on gears and shark nursery areas, 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. ICCAT completed stock assessments for shortfin mako and blue sharks in 2004. 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 Standing Committee on Research and Statistics (SCRS) assessment indicated that the current biomass of North and South Atlantic blue sharks was above MSY ($B>B_{MSY}$), however, these results were conditional and based on assumptions that were made by the committee. These assumptions indicate that blue sharks were not overfished. This conclusion was conditional and based on limited landings data. The North Atlantic shortfin mako population had experienced some level of stock depletion, as suggested by the historical catch-per-unit-effort (CPUE) trend and model outputs. The stock may have been below MSY ($B<B_{MSY}$), suggesting that the species may have been overfished (SCRS, 2004). In 2005, additional measures pertaining to pelagic sharks were added to the 2004 ICCAT recommendation. Measures included a requirement for Contracting Parties that have not yet

implemented the 2004 recommendation, to reduce shortfin mako mortality, and annually report on their efforts to the commission.

The 2006 regular meeting of ICCAT was held November 17 – 26, 2006, in Dubrovnik, Croatia. As such, much of the work at the 2006 Commission meeting dealt with improvement of ICCAT statistics and conservation measures, compliance with existing ICCAT recommendations, and the functioning of the Commission. The 2007 Commission meeting resulted in a recommendation regarding pelagic sharks, as discussed below.

At the 2007 ICCAT annual meeting in Antalya, Turkey, ICCAT adopted a recommendation concerning pelagic sharks (07-06, "Supplemental Recommendation by ICCAT Concerning Sharks"). The new operative paragraphs call for SCRS to conduct stock assessments and recommend management alternatives for porbeagle sharks, take appropriate measures to reduce fishing mortality in porbeagles and North Atlantic shortfin mako sharks, and implement research on pelagic shark species caught in the Convention area in order to identify potential nursery areas. It also requires that Contracting Parties, Cooperating non-Contracting Parties, Entities and Fishing Entities submit Task I and II data for sharks in advance of the next SCRS assessment.

In 2008, an updated stock assessment for blue and shortfin mako sharks was conducted by ICCAT's SCRS. The SCRS determined that while the quantity and quality of the data available for use in the stock assessment had improved since the 2004 assessment, they were still uninformative and did not provide a consistent signal to inform the models used in the 2008 assessment. The SCRS noted that if these data issues could not be resolved in the future, their ability to determine stock status for these and other species will continue to be uncertain. The SCRS assessed blue and shortfin mako sharks as three different stocks, North Atlantic, South Atlantic, and Mediterranean. However, the Mediterranean data was considered insufficient to conduct the quantitative assessments for these species.

3.1.4 Existing State Regulations

Table 3.1 outlines the existing State regulations as of October 15, 2008, with regard to shark species. While the HMS Management Division updates this table periodically throughout the year, persons interested in the current regulations for any state should contact that state directly.

Table 3.1 State Rules and Regulations Pertaining to Atlantic HMS, as of October 15, 2008.
Please note that state regulations are subject to change. Please contact the appropriate state personnel to ensure that the regulations listed below remain current. X = Regulations in Effect; n = Regulation Repealed; FL = Fork Length; CL = Carcass Length; TL = Total Length; LJFL = Lower Jaw Fork Length; CFL = Curved Fork Length; DW = Dressed Weight; and SCS = Small Coastal Sharks; LCS = Large Coastal Sharks.

State	Cite Reference	Regulatory Details	Contact Information
ME	Code ME R. 13-188 ' 50.02	Regulations apply to Spiny dogfish only.	ME Department of Marine Resources George Lapointe Phone: 207/624-6553 Fax: 207/624-6024
NH	FIS 603.19	Regulations apply to Spiny dogfish only	NH Fish and Game Clare McBane Phone: 603/868-1095 Fax: 603/868-3305
MA	322 CMR ' 6.35, 6.37, & 6.41 CMRs available online at http://www.mass.gov/dfwele/dmf/commercialfishing/cmr_index.htm	Regulations apply to Spiny and Smooth dogfish; Prohibition on harvest, catch, take, possession, transportation, selling or offer to sell any basking, dusky, sand tiger, or white sharks	MA Division of Marine Fisheries Melanie Griffin Phone: 617/626-1528 Fax: 617/626-1509
RI	RIMFC Regulations § 7.15	Regulations apply to spiny dogfish only	RI Department of Environment Management Brian Murphy Phone: 401/783-2304
CT	Regulations of Connecticut State Agencies § 26-159a-19	Regulations apply to spiny dogfish only	CT Department of Environmental Protection David Simpson Phone: 860/434-6043 Fax: 860/434-6150
NY	NY Environmental Conservation ' 13-0338; State of New York Codes, Rules and Regulations (Section 40.1)	Shark finning prohibited; Reference to the Federal regulations 50 CFR part 635; Prohibited sharks listed	NY Department of Environmental Conservation Phone: 631/444-0430 Fax: 631/444-0449

State	Cite Reference	Regulatory Details	Contact Information
NJ	NJ Administrative Code, Title 7. Department of Environmental Protection, NJAC 7:25-18.1 and 7:25-18.12(d)	Commercial/Recreational: min size 48" TL or 23" from the origin of the first dorsal fin to pre-caudal pit; possession limit - 2 fish/vessel or 2 fish per person if fishing from shore or a land based structure, must hold federal permit to possess or sell more than 2 sharks; no sale during federal closures; Finning prohibited; Prohibited Species: basking, bigeye sand tiger, sand tiger, whale and white sharks	NJ Fish and Wildlife Hugh Carberry Phone: 609/748-2020 Fax: 609/748-2032
DE	DE Code Regulations 3541	Reference to federal regulations for sharks; Recreational/Commercial: min size – 54" FL; bag limit – 1 shark/vessel/trip; shorebound anglers – 1 shark/person/day; 2 Atlantic sharpnose/vessel/trip with no min size; Prohibited Species: same as federal species. Prohibition against fins without being naturally attached to the body	DE Division of Fish and Wildlife Roy Miller Phone: 302/739-9914
MD	Code of Maryland Regulations tit. 8 ' 02.12.03 and tit. 8, ' 02.05.17	Reference to listing sharks of the order Squaliformes as in need of conservation; In the process of adopting into regulation all measures of the ASMFC Interstate Fishery Management Plan for Atlantic Coastal Sharks (August 2008). It will be effective March 23, 2009.	MD Department of Natural Resources Harley Speir Phone: 410/260-8264
VA	4 VA Administrative Code 20-490	Recreational: bag limit – 1 LCS, SCS, or pelagic shark/vessel/day with a min size of less than 54" FL or 30" CL; 1 Atlantic sharpnose and bonnethead/person/day with no min size; No limits on rec harvest of smooth and spiny dogfish; Commercial: possession limit - 4000 lb dw/day, min size - 58" FL or 31" CL west of the COLREGS line and no min size limit east of the COLREGS line; Prohibitions: fillet at sea, finning, longlining, same prohibited shark species as Federal regulations; and spiny dogfish commercial regulations.	VA Marine Resources Commission Jack Travelstead Phone: 757/247-2247 Fax: 757/247-2020

State	Cite Reference	Regulatory Details	Contact Information
NC	NC Administrative Code tit. 15A, r.3M.0505; Proclamation FF-38-2006	Director may impose restrictions for size, seasons, areas, quantity, *etc*. via proclamation; Commercial: open seasons and species groups same as Federal; 33 non-sandbar LCS retention limit; no retention of sandbar sharks; retain fins with carcass through point of landing; LL shall only be used to harvest LCS during open season, shall not exceed 500 yds or have more than 50 hooks; Recreational: LCS (54" FL min size) - no more than 1 shark/vessel/day or 1 shark/person/day, SCS (no min size) – no more than 1 finetooth or blacknose shark/vessel/day and no more than 1 Atlantic sharpnose and 1 bonnethead/person/day, pelagics (no min size) -1 shark/vessel/day; Same prohibited shark species as Federal regulations	NC Division of Marine Fisheries Randy Gregory Phone: 252/726-7021 Fax: 252/726-0254
SC	SC Code Ann. § 50-5-2725, 50-5-2730	Recreational: 2 Atlantic sharpnose/person/day and 1 Bonnethead/person/day, no min size; All others – 1 shark/boat/trip, min size – 54" FL; Reference to Federal commercial regulations and prohibited species	SC Department of Natural Resources Robert Boyles Phone: 843/953-9304 Fax: 843/953-9159
GA	GA Code Ann. § 27-4-130.1; OCGA §27-4-7(b); GA Comp. R. & Regs. § 391-2-4-.04	Commercial/Recreational: 2 sharks from the Small Shark Composite (bonnethead, sharpnose, and spiny dogfish, daily limit may consist of 2 of the same species (*e.g.*, 2 bonnetheads, 2 sharpnoses) or 2 different species, SCS min size 30" TL; All other sharks - 2 sharks/person or boat, whichever is less, min size 48" TL, may include only 1 greater than 84"; Prohibited Species: sand tiger sharks. 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 Carolyn Belcher Phone: 912/264-7218 Fax: 912/262-3143
FL	FL Administrative Code Ann. r.68B-44, F.A.C	Commercial/Recreational: min size - none; possession limit – 1 shark/person/day or 2 sharks/vessel on any vessel with 2 or more persons on board; State waters close to commercial harvest when adjacent Federal waters close; Federal permit required for commercial harvest, so Federal regulations apply unless state regulations are more restrictive; Finning & Filleting prohibited; and same prohibited species as Federal regulations, except Caribbean sharpnose is not included	FL Fish and Wildlife Conservation Commission Lisa Gregg Phone: 850/487-0554 Fax: 850/487-4847

State	Cite Reference	Regulatory Details	Contact Information
AL	AL Administrative Code r. 220-2-.46, r.220-3-.30, r.220-3-.37	Recreational & Commercial: bag limit – 2 sharpnose/person/day; no min size; all other sharks – 1/person/day; min size – 54" FL or 30" dressed; state waters close when Federal season closes; Prohibition: Atlantic angel, bigeye thresher, dusky, longfin mako, sand tiger, basking, whale, white, and nurse sharks	AL Department of Conservation and Natural Resources Major Jenkins jjenkins@dcnr.state.al.us Phone: 251 861 2882
LA	LA Administrative Code Title 76, Pt. VII, Ch. 3, § 357	Recreational: min size – 54" FL, except Atlantic sharpnose and bonnethead; bag limit - 1 sharpnose/person/day; all other sharks – 1 fish/person/day; Commercial: 33 per vessel per trip limit, no min size; Com & Rec Harvest Prohibited: 4/1-6/30; Prohibition: same as federal regulations.	LA Department of Wildlife and Fisheries Harry Blanchet 225 765-2889 fax (225) 765-2489 hblanchet@wlf.louisiana.gov
MS	MS Code Title-22 part 7	Recreational: min size - LCS/Pelagics 37" TL; SCS 25" TL; bag limit - LCS/Pelagics 1/person up to 3/vessel; SCS 4/person; Commercial & Prohibited Species - Reference to Federal regulations	MS Department of Marine Resources Kerwin Cuevas Phone: 228/374-5000
TX	TX Administrative Code Title 31, Part 2, Parks and Wildlife Code Title 5, Parks and Wildlife Proclamations 65.3 and 65.72	Commercial/Recreational: bag limit - 1 shark/person/day; Commercial/Recreational possession limit is twice the daily bag limit (*i.e.*, 2 sharks/person/day); min size 24" TL for Atlantic sharpnose, blacktip, and bonnethead sharks and 64" TL for all other lawful sharks. Sandbar and silky sharks are prohibited species.	TX Parks & Wildlife Mark Lingo Phone: 956/350-4490 Fax: 956/350-3470
Puerto Rico	Regulation #6768 Article 8 – General Fishing Limits Article 13 – Limitations Article 17 – Permits for Recreational Fishing (March 2004)	Sharks are covered under the federal regulation known as Highly Migratory Species of the United States Department of Commerce (50 CFR, Part 635); Fishers who capture these species shall comply with said regulation. Nurse Sharks are prohibited in territorial waters.	Puerto Rico Department of Natural and Environmental Resources Craig Lilyestrom Phone: 787-724-8774 x4042 craig@caribe.net

State	Cite Reference	Regulatory Details	Contact Information
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. Nurse Sharks are prohibited in territorial waters.	www.caribbeanfmc.com http://www.caribbeanfmc.com/usvi%20booklet/fisher%20booklet%20final.pdf

3.2 Status of the Stocks

The thresholds used to determine the status of Atlantic HMS, including sharks, are fully described in Chapter 3 of the 1999 FMP and Amendment 1 to the Billfish FMP, Chapter 3 of the 2006 Consolidated HMS FMP, and are presented in Figure 3.1. These thresholds are based on the thresholds described in a paper describing the technical guidance for implementing National Standard (NS) 1 of the Magnuson-Stevens Act (Restrepo *et al*., 1998).

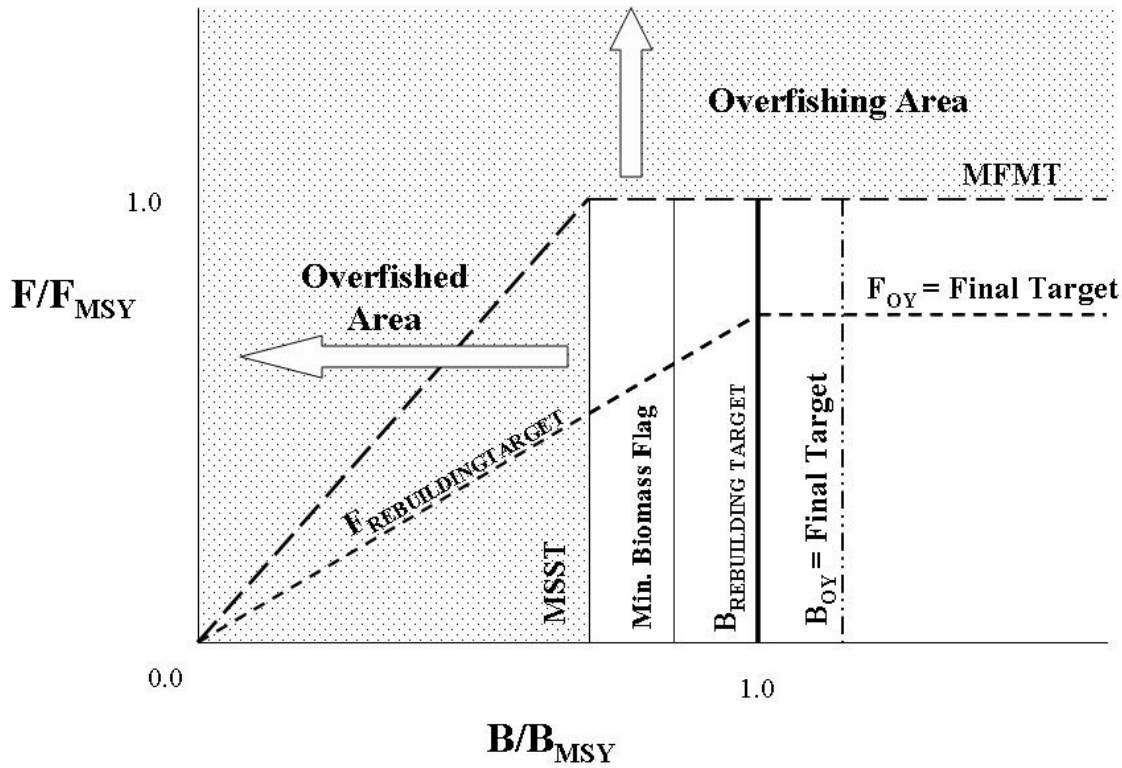

Figure 3.1 Illustration of the status determination and rebuilding terms.

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 MSY (B_{MSY}). 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 required by law. 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}).

In summary, the thresholds to use to calculate the status of Atlantic HMS, as described in the 1999 FMP and 2006 Consolidated HMS FMP, are:

- Maximum Fishing Mortality Threshold (MFMT) = $F_{limit} = F_{MSY}$;
- Overfishing is occurring when $F_{year} > F_{MSY}$;
- Minimum Stock Size Threshold (MSST) = $B_{limit} = (1\text{-}M)B_{MSY}$ when $M < 0.5 = 0.5B_{MSY}$ when $M >= 0.5$;
- Overfished when $B_{year}/B_{MSY} <$ MSST;
- Biomass target during rebuilding = B_{MSY};
- Fishing mortality during rebuilding < F_{MSY};
- Fishing mortality for healthy stocks = $0.75F_{MSY}$;
- Biomass for healthy stocks = B_{OY} = ~1.25 to $1.30B_{MSY}$;
- Minimum biomass flag = $(1\text{-}M)B_{OY}$; and
- Level of certainty of *at least* 50 percent but depends on species and circumstances; for sharks, a level of certainty of 70 percent is used as a guide.
- For sharks, in some cases, spawning stock fecundity (SSF) or spawning stock number (SSN) was used as a proxy for biomass since biomass does not influence pup production in sharks

3.2.1 Atlantic Sharks

3.2.1.1 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. The life span of all shark species 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 (Casey and Hoey, 1985; Sminkey and Musick, 1995; Heist *et al*., 1995), lemon (Brown and Gruber, 1988), and bull sharks (*Carcharhinus leucas)* (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 approximately 350 species of sharks, ranging from tiny pygmy sharks of only 20 cm (7.8 in) in length to the giant whale sharks, over 12 meters (39 feet) 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 (*Carcharadon carcharias*), mako, tiger (*Galeocerdo cuvier*), bull, and great hammerhead (*Sphyrna mokarran*). Some shark species reproduce by laying eggs, while others nourish their embryos through a placenta. Despite their diversity in size, feeding habits, behavior and reproduction, many of these adaptations have 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, finetooth, bull, lemon, and Atlantic sharpnose sharks. 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, blue, and oceanic whitetip 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 sharks are examples of a 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. Thirty-nine species are managed by HMS; spiny dogfish also occur along the U.S. coast, however management for this species is under the authority of the ASMFC as well as the New England and Mid-Atlantic Fishery Management Councils. Deep-water sharks were removed from the management unit in 2003. Based on the ecology and fishery dynamics, the sharks have previously been divided into four species complexes for management: (1) LCS, (2) SCS, (3) pelagic sharks, and (4) prohibited species (Table 3.2). As a result of Amendment 2 to the HMS FMP, sandbar sharks can only be taken commercially within a shark research fishery. In addition, sandbar and silky sharks can not be retained by recreational anglers.

Table 3.2 Common names of shark species included within the four species management units under Amendment 2 to the Consolidated HMS FMP.

Management Unit	Shark Species Included
LCS (11)	Sandbar, silky, tiger, blacktip, bull, spinner, lemon, nurse, smooth hammerhead, scalloped hammerhead, and great hammerhead sharks
SCS (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, sand tiger, bigeye sand tiger, white, dusky, night, bignose, Galapagos, Caribbean reef, narrowtooth, longfin mako, bigeye thresher, sevengill, sixgill, bigeye sixgill, Caribbean sharpnose, smalltail, and Atlantic angel sharks

3.2.1.2 Stock Status and Outlook

NMFS is responsible for conducting stock assessments for the LCS and SCS complexes (Cortés, 2002; Cortés *et al*., 2002). The Committee on the Status of Endangered Wildlife in Canada (COSEWIC) has recently conducted assessments of three pelagic shark species. ICCAT's SCRS conducted stocks assessments for blue sharks and shortfin mako in 2008. Ecological risk assessments (ERAs) were also conducted by the SCRS for eight additional priority species of sharks (longfin mako (*Isurus paucus)*; bigeye thresher; common thresher; oceanic whitetip; silky (*Carcharhinus falciformis)*; porbeagle; scalloped hammerhead (*Sphyrna lewini)*; and smooth hammerhead. Stock assessments were conducted for the LCS complex, sandbar sharks, and blacktip sharks in 2006 (NMFS, 2006a), and the SCS stock assessment was finalized during the summer of 2007 (NMFS, 2007a), which also assessed finetooth, Atlantic sharpnose, blacknose, and bonnethead sharks separately. NMFS also recently released a stock assessment for dusky sharks (May 25, 2006, 71 FR 30123) (Cortés *et al*., 2006). Summaries of recent stock assessments and reports on several species of pelagic sharks (blue sharks, shortfin mako sharks, and porbeagle sharks by COSEWIC and ICCAT are also included in this section.

Based on those assessments, NMFS has determined that sandbar, dusky, and porbeagle sharks are overfished; sandbar and dusky sharks have overfishing occurring; the status of the

Atlantic blacktip shark population and the LCS complex is unknown; and the Gulf of Mexico blacktip shark population is not overfished with no overfishing occurring (November 7, 2006, 71 FR 65086). Based on the 2005 and 2006 stock assessments and these stock status determinations, NMFS has developed new management measures to rebuild sandbar, dusky, and porbeagle sharks while providing an opportunity for the sustainable harvest of blacktip and other sharks in the Gulf of Mexico. In addition, based on the 2007 SCS assessment, NMFS has determined that blacknose sharks are overfished with overfishing occurring (May 7, 2008, 73 FR 25665). Based on the latest SCRS assessment, NMFS has determined that shortfin mako sharks are experiencing overfishing. NMFS is proposing in Amendment 3 to develop management measures to rebuild blacknose sharks and end overfishing for blacknose shark and shortfin mako sharks.

3.2.1.3 Large Coastal Sharks

The 2005/2006 stock assessment for LCS follows the SEDAR process. This process is a cooperative program designed to improve the quality and reliability of the stock assessments. The SEDAR process emphasizes constituent and stakeholder participation in the assessment development, transparency in the assessment process, and a rigorous and independent scientific review of the completed stock assessment. The Data Workshop for the stock assessment, which documented, analyzed, reviewed, and compiled the data for conducting the assessment, was held from October 31 to November 4, 2005, in Panama City, FL (September 15, 2005, 70 FR 54537; correction October 5, 2005, 70 FR 58190). The Assessment Workshop, which developed and refined the population analyses and parameter estimates, was held from February 6 to February 10, 2006, in Miami, FL (December 22, 2005, 70 FR 76031). At the Review Workshop held on June 5 to June 9, 2006, in Panama City, FL (March 9, 2006, 71 FR 12185), independent scientists reviewed the assessment and data used in the stock assessment.

The latest 2005/2006 stock assessments for LCS in the Gulf of Mexico and Atlantic Ocean were recently completed (July 24, 2006, 71 FR 41774). Unlike past assessments, the 2005/2006 LCS stock assessment determined that it is inappropriate to assess the LCS complex as a whole due to the variation in life history parameters, different intrinsic rates of increase, and different catch and abundance data for all species included in the LCS complex. Based on these results, NMFS changed the status of the LCS complex from overfished to unknown and is continuing to examine viable options to assess shark populations (November 7, 2006; 71 FR 65086).

Sandbar Sharks

According to 2005/2006 sandbar shark stock assessment, sandbar sharks are overfished ($SSF_{2004}/SSF_{MSY} = 0.72$; SSF is spawning stock fecundity and was used a proxy for biomass), and overfishing is occurring ($F_{2004} / F_{MSY} = 3.72$). The assessment recommends that rebuilding could be achieved with 70 percent probability by 2070 with a total allowable catch across all fisheries of 220 metric tons (mt) whole weight (ww) each year and fishing pressure (F) between 0.0009 and 0.011.

Blacktip Sharks

The 2005/2006 stock assessment assessed blacktip sharks for the first time as two separate populations: a Gulf of Mexico and an Atlantic population. The results indicate that the Gulf of Mexico stock is not overfished and overfishing is not taking place (November 7, 2006, 71 FR 65086), but the assessment Panel did not accept the absolute estimates of the stock status. The three abundance indices believed to be most representative of the stock were consistent with each other, suggesting that stock abundance has been increasing over a period of declining catch during the past 10 years. Based on life history characteristics, blacktip sharks are a relatively productive shark species, and a combination of these characteristics and recent increases in the most representative abundance indices, suggested that the blacktip stock is relatively healthy. There was no scientific basis, however, to consider increasing the catch or quota.

This assessment also indicated that the current status of the blacktip shark population in the South Atlantic region is unknown. The assessment scientists were unable to provide estimates of stock status or reliable population projections, but indicated that current catch levels should not change. NMFS has declared the status of the South Atlantic blacktip shark population to be unknown (November 7, 2006, 71 FR 65086).

Dusky Sharks

The first dusky-specific shark assessment was released on May 25, 2006 (71 FR 30123) (Cortés *et al*., 2006). The 2006 dusky shark stock assessment used data through 2003 and indicates that dusky sharks are overfished ($B_{2003}/B_{MSY} = 0.15 – 0.47$) with overfishing occurring ($F_{2004}/F_{MSY} = 1.68 – 1{,}810$). The assessment recommends that rebuilding for dusky sharks could require 100 to 400 years. Based on these results, NMFS declared the status of dusky sharks as overfished with overfishing occurring (November 7, 2006, 71 FR 65086).

Table 3.3 summarizes stock assessment information and the current status of Atlantic sharks as of October 2008.

Table 3.3 **Stock Assessment Summary Table for Large Coastal Atlantic sharks.**
Sources: SCRS, 2007; Gibson and Campana, 2005; Cortés *et al*., 2006; NMFS, 2006b; NMFS, 2007a.

Species	Current Relative Biomass Level	Minimum Stock Size Threshold	Current Relative Fishing Mortality Rate	Maximum Fishing Mortality Threshold	Outlook
LCS Complex	*Unknown*	*Unknown*	*Unknown*	*Unknown*	*Unknown*
Sandbar	SSF_{04}/SSF_{MSY} = 0.72	4.75-5.35E+05	F_{04}/F_{MSY} = 3.72	0.015	Overfished; overfishing is occurring
Gulf of Mexico Blacktip	SSF_{04}/SSF_{MSY} = 2.54-2.56	0.99-1.07E+07	F_{04}/F_{MSY} = 0.03–0.04	0.20	Not overfished; overfishing not occurring
Atlantic Blacktip	*Unknown*	*Unknown*	*Unknown*	*Unknown*	*Unknown*
Dusky Sharks	B_{03}/B_{MSY} = 0.15-0.47	*Unknown*	F_{03}/F_{MSY} = 1.68-1,810	0.00005-0.0115	Overfished; overfishing is occurring

3.2.1.4 Small Coastal Sharks

On November 13, 2007, NMFS completed a SCS stock assessment following the SEDAR process (72 FR 63888). The SCS Data Workshop was held February 5-9, 2007 (December 7, 2006, 71 FR 70965). The SCS Assessment workshop was held May 7-11, 2007 (April 19, 2007, 72 FR 19701), and the SCS Review workshop was held on August 6-10, 2007 (July 19, 2007, 72 FR 39606). The assessment reviewed data and models for the SCS complex and for each individual species within the SCS complex, per recommendations in previous assessments. This allowed individual analyses, discussions, and stock status determinations for five separate assessments: 1) SCS complex, 2) Atlantic sharpnose shark, 3) bonnethead shark, 4) blacknose shark, and 5) finetooth sharks. These assessments are included in one report as many of the indices, data, and issues overlap among assessments. The Review Panel found that the data and methods used were appropriate and the best available; however, the panel recommended using the individual assessments for each species rather than the assessment on the SCS complex as a whole. The Review Panel also endorsed recommendations for future research contained in the Data Assessment workshop reports, added additional recommendations, and provided comments on the SEDAR process to consider in the future. Based on these assessments, NMFS determined that blacknose sharks are overfished with overfishing occurring; however, Atlantic sharpnose, bonnethead, and finetooth sharks are not overfished and overfishing is not occurring (May 7, 2008, 73 FR 25665)

SCS complex

According to the 2007 the SCS stock assessment, the SCS complex is not overfished and overfishing is not occurring (May 7, 2008, 73 FR 25665). The peer reviewed assessment

provides an update from the 2002 stock assessment on the status of SCS stocks and projects future abundance under a variety of catch levels in the U.S. Atlantic Ocean, Gulf of Mexico, and Caribbean Sea. Because the species were individually assessed, the peer reviewers recommended using species-specific results rather than on the aggregated SCS complex results. As a result of this recommendation, and because the stock assessment covered all SCS species, NMFS will no longer provide status updates or determinations on the SCS complex as a whole.

Atlantic sharpnose

The 2002 SCS stock assessment found that Atlantic sharpnose sharks were not overfished and overfishing was not occurring. The 2007 assessment for Atlantic sharpnose sharks also indicated that the stock is not overfished ($SSF_{2005}/SSF_{MSY} = 1.47$) and that no overfishing is occurring ($F_{2005} / F_{MSY} = 0.74$) (Table 3.4). Based on these results, NMFS has determined that Atlantic sharpnose sharks are not overfished with no overfishing occurring (May 7, 2008, 73 FR 25665). However, because estimates of fishing mortality from the assessment indicate that fishing mortality is close to, but presently below, F_{MSY} (*i.e.*, overfishing is not occurring), the peer reviewers suggest setting a threshold for fishing mortality to keep it below the F_{MSY} threshold to prevent overfishing in the future.

Bonnethead Sharks

Based on the bonnethead stock assessment, the peer reviewers determined that bonnethead sharks are not overfished ($SSF_{2005}/SSF_{MSY} = 1.13$). In addition, the estimate of fishing mortality rate in 2005 was less than F_{MSY}, ($F_{2005} / F_{MSY} = 0.61$) (Table 3.4), thus overfishing was not occurring. As a result, NMFS has determined that bonnethead sharks are not overfished and no overfishing is occurring (May 7, 2008, 73 FR 25665). In addition, the assessment showed that there had been years of overfishing, and the main contributor of population mortality is the recreational fleet and the commercial gillnet fleet.

Blacknose Sharks

The 2002 assessment found blacknose sharks were not overfished and overfishing was not occurring. However, the 2007 assessment for blacknose shark indicates that spawning stock fecundity (SSF; *i.e.*, the number of reproductive-age individuals in a population) in 2005 and during 2001-2005 was smaller than SSF_{MSY} ($SSF_{2005}/SSF_{MSY} = 0.48$). Therefore, NMFS has determined that blacknose sharks are overfished. In addition, the estimate of fishing mortality in 2005 and the average from 2001-2005 was greater than $F_{MSY,}$ and the ratio was substantially greater than 1 in both cases ($F_{2005} / F_{MSY} = 3.77$). Based on these results, NMFS has determined that blacknose sharks are experiencing overfishing (May 7, 2008, 73 FR 25665). The assessment recommended a rebuilding plan with 70 percent probability of recovering to SSF_{MSY} by 2019 if F=0. This recommended rebuilding time is 11 years from 2009. A constant TAC of 19,200 individuals would lead to rebuilding with 70 percent probability by 2027. The constant TAC also allows for rebuilding with 50 percent confidence by 2024. The assessment found that the majority of the mortality for blacknose sharks was occurring as bycatch in the Gulf of Mexico shrimp trawl fishery. In addition, the majority of mortality was occurring on juvenile and neonate blacknose sharks. Blacknose sharks mature around 91 cm total length and around 4.5 years of age.

Finetooth Sharks

According to the 2007 finetooth shark stock assessment, finetooth sharks are not overfished ($N_{2005}/N_{MSY} = 1.80$) and overfishing is not occurring ($F_{2005}/F_{MSY} = 0.17$) (May 7, 2008, 73 FR 25665). This is a change from the 2002 assessment in which finetooth sharks were determined to be experiencing overfishing. However, NMFS also notes that while the peer reviewers agreed that it is reasonable to conclude that the stock is not currently overfished, they also indicated that given the limited data available on the population dynamics for finetooth, management should be cautious. Unlike the other SCS, where the bulk of the mortality occurs in shrimp trawl gear, the majority of the mortality for finetooth sharks occur in gillnets.

Table 3.4 Summary Table of Biomass and Fishing Mortality for Small Coastal Sharks (SCS)
Source: NMFS, 2007a.

Species	Current Relative Biomass Level	Current Biomass N_{2005}	Stock Abundance N_{MSY}	Minimum Stock Size Threshold (MSST)	Current Relative Fishing Mortality Rate (F_{2005}/F_{MSY})	Maximum Fishing Mortality Threshold	Outlook
Small Coastal Sharks (SCS)	1.69 (N_{2005}/N_{MSY})	5.16E+07	2.98E+07	2.1E+07	0.25	0.09	Not overfished; No overfishing is occurring
Bonnethead Sharks	1.13 (SSF_{2005}/SSF_{MSY})	1.59E+06	1.92E+06	1.4E+06	0.61	0.31	Not overfished; No overfishing is occurring
Atlantic Sharpnose Sharks	1.47 (SSF_{2005}/SSF_{MSY})	5.96E+06	4.45E+06	4.09E+06	0.74	0.19	Not overfished; No overfishing is occurring
Blacknose Sharks	0.48 (SSF_{2005}/SSF_{MSY})	3.49E+05	5.7E+05	4.3E+05	3.77	0.07	Overfished; Overfishing is occurring
Finetooth Sharks	1.80 (N_{2005}/N_{MSY})	6.00E+06	3.20E+06	2.4E+06	0.17	0.03	Not overfished; No overfishing is occurring

3.2.1.5 Pelagic Sharks

Pelagic sharks are subject to exploitation by many different nations and exhibit trans-oceanic migration patterns. As a result, ICCAT's SCRS Subcommittee on Bycatch has recommended that ICCAT take the lead in conducting stock assessments for pelagic sharks.

An ICCAT meeting was held in September 2001 to review available statistics for Atlantic and Mediterranean pelagic sharks. Newly available biological and fishery information presented for review included age and growth, length/weight relationships, species identification, species composition of catch, catch per unit effort, mortality (both natural and fishing estimates for blue sharks), bycatch, and tagging and migration studies. Landings estimates, which incorporated data for both the Atlantic and Mediterranean populations of blue shark, suggested that landings declined in 2000 (3,652 mt) following a peak of 32,654 mt in 1999. Landings of porbeagles peaked in 1997, with an estimated total of 1,450 mt, and have slowly declined each year since that time period (1998 – 2000). Similarly, landing estimates for shortfin mako also peaked in 1997 (5,057 mt) and have declined by 83 percent (863 mt in 2000) since that time. Meeting participants expressed concern regarding the lack of information pertaining to the number of fleets catching sharks, landing statistics, and dead discards for sharks.

An ERA conducted by the SCRS for eleven priority species of elasmobranchs (including blue shark and shortfin mako) caught in ICCAT fisheries, demonstrated that most Atlantic pelagic sharks have exceptionally limited biological productivity and, as such, can be overfished even at very low levels of fishing mortality. Specifically, the analyses indicated that bigeye threshers, longfin makos, and shortfin makos have the highest vulnerability (and lowest biological productivity) of the shark species examined (with bigeye thresher being substantially less productive than the other species). All species considered in the ERA, particularly smooth hammerhead, longfin mako, bigeye thresher and crocodile sharks (*Pseudocarcharias kamaharai*), are in need of improved biological data to evaluate their biological productivity more accurately and thus specific research projects should be supported to that end. The SCRS recommended that ERAs be updated with improved information on the productivity and susceptibility of these species.

The SCRS decided to conduct an assessment of Atlantic pelagic sharks beginning in 2004. Emphasis was placed on blue sharks and shortfin mako sharks. Several models such as non-equilibrium production and statistical age/length-structured models were considered to analyze the population dynamics of pelagic shark species. The SCRS conducted additional assessments of Atlantic pelagic sharks in 2008. All SCRS stock assessments can be found at http://www.iccat.es/assess.htm.

2008 ICCAT Shark Stock Assessment

In 2008, an updated stock assessment for blue and shortfin mako sharks was conducted by ICCAT's SCRS. The SCRS determined that while the quantity and quality of the data available for use in the stock assessment had improved since the 2004 assessment, they were still uninformative and did not provide a consistent signal to inform the models used in the 2008 assessment. The SCRS noted that if these data issues could not be resolved in the future, their

ability to determine stock status for these and other species will continue to be uncertain. The SCRS assessed blue and shortfin mako sharks as three different stocks, North Atlantic, South Atlantic, and Mediterranean. However, the Mediterranean data was considered insufficient to conduct the quantitative assessments for these species.

Blue Sharks

With regard to North and South Atlantic blue sharks, the stock assessment determined that the biomass is estimated to be above the biomass that would support MSY. Similar to the results of the 2004 assessment, in many of the model runs, stock status appeared to be close to the unfished biomass levels (B_{2007}/B_{msy} = 1.87-2.74) and fishing mortality rates were well below those corresponding to the level at which MSY is reached (F_{msy} = 0.15). Most of the models used in the assessment consistently predicted that blue shark stocks in the Atlantic are not overfished and overfishing is not occurring (SCRS, 2008). Given these results, NMFS is considering blue sharks as not overfished with no overfishing occurring.

Shortfin Mako Sharks

The estimates of stock status for the North Atlantic shortfin mako shark were much more variable than for blue sharks. For the North Atlantic, multiple model outcomes indicated stock depletion to be about 50 percent of virgin biomass (1950s levels) and levels of F above those resulting in MSY, whereas other models estimated considerably lower levels of depletion and no overfishing. The SCRS determined that there is a "non-negligible probability" that the North Atlantic shortfin mako stock could be below the biomass that could support MSY (B_{2007}/B_{msy} = 0.95-1.65) and above the fishing mortality rate associated with MSY (F_{2007}/F_{msy} = 0.48-3.77). Similar outcomes were determined by the SCRS from the 2004 assessment; however, recent biological data show decreased productivity for this species. NMFS believes this to be the best available scientific information with respect to shortfin mako stock status. Therefore, given the results of this assessment, NMFS has determined that North Atlantic shortfin mako is not overfished, but is approaching an overfished status and is experiencing overfishing.

COSEWIC Stock Assessment on Porbeagle

COSEWIC conducted a species report and assessment for porbeagle in 2004 (COSEWIC, 2004). They suggest that significant declines in porbeagle abundance have occurred as a result of overexploitation in fisheries. In May 2004, the COSEWIC recommended to the Canadian Minister of Fisheries that porbeagles be listed as endangered under the Species at Risk Act (SARA). In 2006, the Canadian government decided not to list the porbeagle shark under SARA due to the economic impact of a listing.

The Canadian Department of Fisheries and Oceans has conducted stock assessments on porbeagle sharks in 1999, 2001, 2003, and 2005. Reduced Canadian porbeagle quotas in 2002 brought the 2004 exploitation rate to a sustainable level. According to the 2005 recovery assessment report conducted by Canada (Canadian Science Advisory Secretariat, 2005), the North Atlantic porbeagle stock has a 70 percent probability of recovery in approximately 100 years if F is less than or equal to 0.04. To date, the United States has not conducted a stock assessment on porbeagle sharks. NMFS has reviewed the Canadian stock assessment and deemed it to be the best available science and appropriate to use for U.S. domestic management

purposes (NMFS, 2006c). The Canadian assessment indicates that porbeagle sharks are overfished (SSN_{2004}/SSN_{MSY} = 0.15 – 0.32; SSN is spawning stock number and was used as a proxy for biomass) (Gibson and Campana, 2005). However, the Canadian assessment indicates that overfishing is not occurring (F_{2004}/F_{MSY} = 0.83) (Gibson and Campana, 2005). Based on these results, NMFS declared the status of porbeagle sharks as overfished, but overfishing is not occurring (71 FR 65086).

Table 3.5 Stock Assessment Summary Table for Pelagic sharks.
Sources: SCRS 2008.

Species	Current Relative Biomass Level	Minimum Stock Size Threshold	Current Relative Fishing Mortality Rate	Maximum Fishing Mortality Threshold	Outlook
North Atlantic Blue Sharks	B_{2007}/B_{MSY} = 1.87-2.74	*Unknown*	F_{2007}/F_{MSY} = 0.13-0.17	F_{MSY} =0.15	Not overfished; overfishing is not occurring
Shortfin Mako Sharks	B_{2007}/B_{MSY} = 0.95-1.65	*Unknown*	F_{2007}/F_{MSY} = 0.48-3.77	F_{MSY} = 0.007-0.05	Not overfished (approaching overfished); overfishing is occurring
Porbeagle Sharks	SSN_{2004}/SSF_{MSY}=0.15-0.32	*Unknown*	F_{2004}/F_{MSY} = 0.83	F_{MSY} =0.033-0.065	Overfished; overfishing not occurring

3.2.1.6 Effects of Regulations

International Management

ICCAT may have authority to develop recommendations for shark management associated with its managed fisheries. At the 2004 ICCAT annual meeting in New Orleans, ICCAT adopted *Recommendation 04-10 Concerning the Conservation of Sharks Caught in Association with Fisheries Managed by ICCAT*. This was the first binding measure passed by ICCAT dealing specifically with sharks. This recommendation included, 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. In 2005, additional measures pertaining to pelagic sharks were added to the 2004 ICCAT recommendation. Measures included a requirement for Contracting Parties that have not yet implemented the 2004 recommendation, to reduce shortfin mako mortality, and annually report on their efforts to the Commission.

At the 2006 ICCAT annual meeting in Dubrovnik, Croatia, ICCAT adopted Recommendation 06-10 which amended Paragraph 7 of *Recommendation 04-10 Concerning the Conservation of Sharks Caught in Association with Fisheries Managed by ICCAT*. The new paragraph called for SCRS to conduct stock assessments and recommended management alternatives for Atlantic blue sharks and shortfin mako sharks in time for consideration at the

2008 annual ICCAT meeting. It also required a data prepatory meeting to be held in 2007 to review all relevant data on biological parameters, catch, effort, discards, trade, and historical data.

At the 2007 ICCAT annual meeting in Antalya, Turkey, ICCAT adopted a recommendation (07-06) concerning pelagic sharks. The new operative paragraphs called for SCRS to conduct stock assessments and recommended management alternatives for porbeagle sharks, to take appropriate measures to reduce fishing mortality in porbeagles and North Atlantic shortfin mako sharks, and to implement research on pelagic shark species caught in the Convention area in order to identify potential nursery areas. It also required that Contracting Parties, Cooperating non-Contracting Parties, Entities and Fishing Entities submit Task I and II data for sharks in advance of the next SCRS assessment.

At the 2008 ICCAT annual meeting in Marrakech, Morocco, ICCAT adopted recommendation (08-07) concerning bigeye thresher sharks and recommendation (08-08) concerning porbeagle sharks. *Recommendation (08-07) by ICCAT on the Conservation of Big Eye Thresher Sharks (Alopias superciliosus) Caught in Association with Fisheries Managed by ICCAT* would require the live release of bigeye thresher sharks, a species that is the most vulnerable of the top 10 species of concern that were evaluated by the international commission's science committee. U.S. fisheries are already subject to this requirement under domestic regulations. In addition, all CPCs would be required to report incidental catches as well as live releases of bigeye thresher sharks in accordance with ICCAT data reporting requirements. *Recommendation (08-08) Resolution by ICCAT on Porbeagle Shark (Lamna nasus)* calls for a joint ICCAT-ICES Inter-sessional meeting in 2009 to further assess porbeagle (Lamna nasus) in accordance with recommendation (07-06).

Domestic Regulations

Domestically, Atlantic sharks have been managed by NMFS since the 1993 FMP for Atlantic Sharks. The 1999 FMP for Atlantic Tunas, Swordfish, and Sharks addressed numerous shark management measures, including: reducing commercial LCS and SCS quotas; establishing a commercial quota for blue sharks and a species-specific quota for porbeagle sharks; expanding the list of prohibited shark species; implementing a LAP system in commercial fisheries; and establishing season-specific over- and underharvest adjustment procedures. The 1999 FMP also partitioned the LCS complex into ridgeback and non-ridgeback categories but did not include regional quota measures. Due to litigation, many management measures in the 1999 FMP were not implemented.

The regulations governing the recreational and commercial shark fisheries allow opportunities for participants to pursue sharks for leisure, subsistence, and/or commercial gain while maintaining compliance with statutes that include, but are not limited to, the MSA, ESA, MMPA, and NEPA. These regulations seek to minimize bycatch of non-target, prohibited shark species, and protected resources by a variety of measures, including, but not limited to: mandating the use of corrodible, non-stainless steel hooks; requiring possession of handling and release equipment for protected resources; conducting gillnet checks every two hours; mandatory observer coverage for commercial fisheries (if selected); limits on the deployment and operation of authorized gears; and, maintaining 19 species of shark on the prohibited species list (possession not authorized). Rebuilding overfished stocks is another objective of shark fishery

regulations, and was accomplished through numerous measures, including, but not limited to: regional fishing quotas based on MSY; regional fishing seasons; commercial trip limits (4,000 lbs dw for LCS); recreational bag limits (1 shark/vessel/day for all authorized species except Atlantic sharpnose and bonnethead sharks (1 shark/person/day); and, recreational minimum size limits (>54" FL for all authorized species except Atlantic sharpnose and bonnethead sharks). Controlling fishing effort was accomplished by the requirement to possess a LAP for commercial shark fisheries and upgrading restrictions for transferred permits. Reducing fishing mortality of prohibited dusky sharks and juvenile sandbar sharks was achieved by the Mid-Atlantic time area closure (January 1 – July 31) and the requirement to use VMS when BLL gear is onboard during this time period.

The final rule implementing Amendment 1 to the 1999 FMP was published in the Federal Register on December 23, 2003. This final rule revised the shark regulations based on the results of the 2002 stock assessments for SCS and LCS. In Amendment 1 to the 1999 FMP, NMFS revised the rebuilding timeframe for LCS to 26 years from 2004, and implemented several new regulatory changes. Management measures enacted in the amendment included, among other things: using MSY as a basis for setting commercial quotas; eliminating the commercial minimum size restrictions; implementing a commercial trip limit for LCS and SCS; imposing gear restrictions to reduce bycatch; and implementing a time/area closure off the coast of North Carolina effective January 1, 2005. Annual quotas established under Amendment 1 to the 1999 FMP were as follows: 1,017 metric tons (mt) dressed weight (dw) (2.24 million lbs dw) for LCS; 454 mt dw per year for SCS; 273 mt dw for blue sharks, 92 mt dw for porbeagle sharks, and 488 mt dw for pelagic sharks other than porbeagle and blue sharks.

An updated LCS stock assessment became available in 2006 and data workshops for an updated SCS stock assessment began in early 2007. Based on the 2006 LCS stock assessment, NMFS implemented Amendment 2 to the 2006 Consolidated HMS FMP to rebuild overfished sandbar, dusky, and porbeagle shark stocks and to end overfishing. The final rule for Amendment 2 published on June 24, 2008 (73 FR 35778) with a correction published on July 15, 2008 (73 FR 40658). The final rule became effective on July 24, 2008. In the final rule, NMFS focused on additional shark management measures. These included, but were not limited to, removing sandbar sharks from the LCS quota and establishing a non-sandbar LCS quota; setting new annual quotas for sandbar sharks (87.9 mt dw), non-sandbar LCS (Atlantic: 187.7 mt dw; Gulf of Mexico: 390.5 mt dw), and porbeagle sharks (1.7 mt dw); maintaining the annual SCS quota (454 mt dw), pelagic sharks quota (273 mt dw for blue sharks), and quota for pelagic sharks other than porbeagle and blue sharks (488 mt dw); establishing a sandbar shark research fishery with prohibition on the retention of sandbar sharks outside the shark research fishery; creating one region for SCS, sandbar, and pelagic sharks and two regions for non-sandbar LCS (Gulf of Mexico and Atlantic regions); creating eight marine protected areas as requested by the South Atlantic Fishery Management Council to prohibit the use of bottom longline gear in those areas; establishing new non-sandbar LCS retention limits for directed and incidental shark permit holders (33 non-sandbar LCS per vessel per trip for directed permit holders and 3 non-sandbar LCS per vessel per trip for incidental permit holders); establishing a fishing year for sharks that begins on January 1 of each year; limiting the carry over of underharvest to 50 percent of the base quota for shark stocks whose status are healthy and prohibiting the carry over of underharvest for shark stocks whose status are overfished, experiencing overfishing, or are

determined to be unknown; deducting overharvests from the following fishing year, or multiple years (up to five year maximum), based on the level of overharvest; requiring HMS dealer reports to be received by NMFS within 10 days of the end of a reporting period; requiring sharks to landed with fins on; and, proportioning unclassified sharks out among each shark species/complex based on observer and dealer reports. Regulations are subject to change based on stock assessments, international obligations, litigation, and public sentiment.

3.2.1.7 Recent and Ongoing Research

Northeast Fisheries Science Center (NEFSC)

Fishery Independent Surveys for Coastal and Pelagic Sharks

Atlantic Surveys for Coastal and Pelagic Shark Species

The bi-annual fishery independent survey of Atlantic large and small coastal sharks in U.S. waters was conducted in the spring of 2007. The goals of this survey are to: 1) monitor the species composition and sizes, distribution, and abundance of sharks in the coastal Atlantic; 2) tag and inject sharks for age validation and migration studies; 3) collect biological samples for age and growth, feeding ecology, and reproductive studies; and 4) collect morphometric data for size conversions. The time series of abundance indices from this survey are critical to the evaluation of coastal Atlantic shark species. Results from this 2007 survey included 457 fish (447 sharks) representing sixteen species. Sharks represented 98% of the total catch of which sandbar sharks were the most common, followed by tiger and dusky sharks. As part of this survey, bottom longline sets were conducted in the closed area off North Carolina. Additional cooperative work included sample collections of blood, heart and other tissues for post-release survivorship and ribosomal DNA species identification marker studies, and the deployment of electronic tags. In conjunction with Monterey Bay Aquarium, UC Long Beach, and Massachusetts Division of Marine Fisheries (MDMF), two smart position or temperature transmitting (SPOT) and three pop-up satellite archival (PSAT) tags were placed on dusky and tiger sharks. Pelagic sets were made subsequent to the coastal survey as a continuation of fishery independent longline surveys for highly migratory swordfish, tunas, and sharks conducted by NMFS and its predecessor agencies periodically since the 1950's. Goals of this research are to conduct a consistent standardized fishery independent pelagic shark survey for research collections and to monitor their abundance and distribution for management and stock assessment.

Juvenile Shark Survey for Monitoring and Assessing Delaware Bay Sandbar Sharks

The juvenile sandbar shark population in Delaware Bay is surveyed by NEFSC staff as part of the Cooperative Atlantic States Shark Pupping and Nursery (COASTSPAN) project. A random stratified longline sampling plan, based on depth and geographic location, was developed in 2001 to assess and monitor the juvenile sandbar shark population during the nursery season (McCandless, 2007). The juvenile index of abundance from this standardized survey has been used as an input into various stock assessment models. In addition, the mark-recapture data from this project are being used to examine the temporal and spatial relative abundance and distribution of sandbar sharks in the Bay (McCandless *et al*. 2007b). In 2007, a total of 263 sandbar sharks were caught, with 251 (95 percent) of the sharks released with tags.

Delaware Bay Sand Tiger Survey

A survey initiated in 2006, targeting the sand tiger for identifying EFH and for future stock assessment purposes, continued in 2007. This study incorporates historical NEFSC sampling stations for comparison to pre-management abundance. Preliminary results indicate that this survey will be a successful monitoring tool for the Delaware Bay sand tiger population and for evaluating long-term changes in abundance and size composition. In 2007, a total of 26 sand tigers were caught, with 25 (96 percent) of the sharks released with conventional tags and one with a PSAT.

NEFSC Historical Longline Surveys

The NEFSC recently recovered the shark species catch per set data from the exploratory shark longline surveys conducted by the Sandy Hook and Narragansett Labs from 1961 to 1991, which provide a valuable historical perspective for evaluating the stock status of Atlantic sharks. This data recovery process is part of a larger, systematic effort to electronically recover and archive historical longline surveys and biological observations of large marine predators (swordfish, sharks, tunas and billfishes) in the North Atlantic. When completed, these efforts will include reconstructing the historic catch, size composition, and biological sampling data into a standardized format for time series analysis of CPUE and size. Standardized indices of abundance for the Atlantic sharpnose shark were developed for the exploratory shark longline surveys and used in the 2007 SCS SEDAR process (McCandless and Hoey, 2007). Work on the recovery of environmental data for this time series, as well as the associated individual shark data, is ongoing to further refine these indices, develop indices of abundance for other shark species, and for future use in shark EFH designations.

NEFSC-UNC Cooperative Study to Archive and Analyze FI Coastal Shark Survey

In addition to the fishery independent surveys conducted by the NEFSC, scientific staff has been working with the University of North Carolina to electronically recover the data from an ongoing coastal shark survey in Onslow Bay that began in 1972. Standardized indices of abundance for the top ten species in numerical abundance were recently developed. The abundance indices created for SCS (SCS complex, Atlantic sharpnose and blacknose sharks) were used in the 2007 SCS SEDAR process (Schwartz *et al.*, 2007) and the indices developed for the LCS species are expected to be useful in future SEDAR processes for LCS. Efforts to recover environmental data are ongoing and will be incorporated into future generalized linear models (GLMs) to further refine the standardized indices of abundance.

SEDAR Process

Staff participated in the SEDAR Data Workshop for the SCS Complex and contributed seven SEDAR working papers. These documents were on small coastal shark mark-recapture data from the Cooperative Shark Tagging Program (Kohler and Turner, 2007), NEFSC historical longline surveys (McCandless and Hoey, 2007), relative abundance trends for small coastal sharks from the COASTSPAN surveys in South Carolina (McCandless *et al*., 2007c) and Georgia (McCandless and Belcher, 2007), catch rate information obtained from the NMFS Northeast longline surveys (McCandless and Natanson, 2007), relative abundance trends for Atlantic sharpnose sharks observed in the NEFSC Observer Program (Mello *et al.*, 2007), and relative abundance trends for small coastal sharks caught during the University of North Carolina shark longline survey (Schwartz *et al.*, 2007).

Essential Fish Habitat

NEFSC staff participated on a working group with other staff from the NMFS HMS Division and SEFSC to update and refine the EFH designations for managed shark species. This process was ongoing in 2007 and entailed providing updated data from the Cooperative Shark Tagging Program (CSTP) and NEFSC surveys for use in delineating EFH, refining the size limits of the life stages for each managed species, and refining the methodology used to determine EFH. NEFSC staff coordinated with Atlantic States Marine Fisheries Commission (ASMFC) coastal shark technical committee members (RI and MA State) to provide EFH and nursery data to begin formulation of ASMFC Draft FMP for Atlantic Coastal Sharks. In addition, NEFSC staff organized and edited a peer-reviewed AFS volume (22 chapters) on shark nursery research in the Gulf of Mexico and U.S. Atlantic coastal waters (McCandless *et al.*, 2007a). Results from the studies detailed in this volume provided critical data needed for updating and refining EFH designations for the juvenile life stages of many coastal shark species (McCandless *et al.*, 2007b; Merson and Pratt, 2007).

Porbeagle Habitat Utilization

A study on the habitat utilization, movement patterns, and post-release survivorship of porbeagles captured on longline in the North Atlantic was funded by the University of New Hampshire Large Pelagics Research Center's External Grants Program. This work is in conjunction with scientists from Massachusetts Department of Marine Fisheries (MDMF) and the University of Massachusetts. The primary objective of this research is to deploy PAT tags to examine the migratory routes, potential nursery areas, swimming behavior, and environmental associations that characterize habitat utilization by porbeagles. In addition, information will be obtained to validate the assessment of the physiological effects of capture stress and post-release recovery in longline-captured porbeagles which will increase our understanding of capture related stress and the potential long-term effects on survival. Moreover, these efforts will potentially allow the quantification of the stress cascade for this shark species captured using commercial gear, thereby providing fishery managers with data showing the minimum standards for capturing (*e.g.* longline soak time) and releasing these fishes ensuring post-release survival. To date, 17 of the 20 PSATs deployed in 2006 released in 2007. Preliminary results were obtained and were presented at the 2008 American Elasmobranch Society meeting as well as at the PI meeting for the funding agency.

Pelagic Nursery Grounds

An investigation into pelagic nursery grounds was initiated with the collection of length-frequency data and biological samples, and the deployment of conventional and electronic tags on pelagic shark species as part of cooperative work with the high seas longline fleet. Sampling took place on board a commercial longline vessel targeting swordfish on the Grand Banks off Newfoundland and the Flemish Cap. In 19 sets, 666 sharks, primarily juvenile blue sharks and shortfin makos, were tagged with conventional tags as well and 2 shortfin makos with SPOT tags. The SPOT tags reported immediately and continued reporting for two weeks. One tag reported several months later. Dissections were accomplished on over 200 sharks.

COASTSPAN Survey

The NEFSC manages and coordinates this project, which surveys Atlantic coastal waters from Florida to Delaware and in the U.S. Virgin Islands, by conducting cooperative, comprehensive, and standardized investigations of coastal shark nursery habitat. Participants in the 2007 COASTSPAN survey included the North Carolina Division of Marine Fisheries, South Carolina Department of Natural Resources, Coastal Carolina University, Georgia Department of Natural Resources, and the Florida Fish and Wildlife Conservation Commission. Researchers from the NEFSC and the University of Rhode Island conducted the survey in Delaware Bay and the U.S. Virgin Islands (USVI). The first objective of the COASTSPAN survey is to determine the location of shark nursery grounds along the U.S. east coast using presence/absence data. The second objective is to determine the relative abundance, distribution and migrations of sharks utilizing these nursery grounds through longline and gillnet sampling and mark-recapture data. The COASTSPAN surveys in Delaware Bay and South Carolina have moved into this second phase, and these data produce standardized indices of abundance (McCandless, 2007; McCandless *et al.*, 2007c). The South Carolina indices of abundance for bonnethead, finetooth, Atlantic sharpnose and blacknose sharks were used in stock assessments for the 2007 Small Coastal Shark SEDAR process (McCandless *et al.*, 2007c). The NEFSC also conducts active and passive acoustic telemetry studies on juvenile blacktip and lemon sharks in Fish Bay, USVI, based on the results of the COASTSPAN survey in that area. This work is being conducted in cooperation with the MDMF and in conjunction with studies on other species by NMFS Galveston Laboratory and NMFS Headquarters. In addition, COASTPAN data from all states and the USVI were recently used to update and refine EFH designations for juvenile life stages of managed coastal shark species.

Habitat Utilization and Essential Fish Habitat of Delaware Bay Sand Tigers

Funding was received through the NOAA Living Marine Resources Cooperative Science Center to support the second year of cooperative research with staff from Delaware State University and the University of Rhode Island on habitat use, depth selection, and the timing of residency for sand tigers in Delaware Bay. Both manual and passive tracking were used to monitor sand tiger habitat utilization patterns during their Delaware Bay residency. Sand tigers were implanted with standard acoustic (n=19) and depth sensing transmitters (n=10) during the summers of 2006 and 2007. Two sand tigers tagged in June of 2006 returned to Delaware Bay during the third week of June 2007, which closely corresponded to the time of first successful captures that year. A total of 72,241 detections of telemetered sand tigers were collected on receivers during the 2006 and 2007 field seasons.

Elasmobranch Life History Studies

NEFSC life history studies are conducted on Atlantic species of elasmobranchs to address identified priority knowledge gaps and focus on species of concern because of declines and management issues. Biological samples are obtained on research surveys and cruises, on commercial vessels, at recreational fishing tournaments, and opportunistically from observers on commercial fishing vessels. In recent years, the shift has been to concentrate on a complete life history for a species to get a total picture for management. This comprehensive life history approach encompasses studies on age and growth rates and validation, diet and trophic ecology, and reproductive biology essential to estimate parameters for demographic, fisheries, and ecosystem models.

Collection of Recreational Shark Fishing Data and Samples

Biological samples for life history studies and catch and morphometric data for more than 300 pelagic sharks were collected at eight recreational fishing tournaments in the U.S. Northeast. This information will enhance ongoing biological studies and will be added to a long-term database of historic landings information for the period 1961–2007.

Atlantic Blue Shark and Shortfin Mako Life History and Assessment Studies

Collaborative programs to examine the biology and population dynamics of the blue shark and shortfin mako in the North Atlantic are ongoing. These studies—critical for use in stock assessment—are being conducted in collaboration with scientists at the University of Washington (blue shark) and University of Rhode Island (shortfin mako) and have resulted in the publication of two manuscripts in 2007. The blue shark research (Aires-da-Silva and Gallucci, 2007) provides fishery-independent demographic and risk analysis results for use in conservation and management with the construction of an age-structured matrix population model in which the vital rates are stochastic. The results of the demographic analyses confirm the importance of juvenile survival for population growth. The risk analysis is proposed as a supplement to the data-limited stock assessment to better evaluate the probability that a given management strategy will put the population at risk of decline. Shortfin mako survival was estimated from NMFS Cooperative Shark Tagging Program mark-recapture data (Wood *et al.*, 2007). Estimates of survival were generated with the computer software MARK, which provided a means for estimating parameters from the 6,309 tagged animals when they were recaptured (n=730). The results of several models are presented with various combinations of constant and time-specific survival and recovery rates and gave a range of survival for the shortfin mako from 0.705–0.873 year^{-1}. An estimate of survival is a key variable for stock assessments and subsequent demographic analyses and is crucial when it comes to directly managing exploited or commercially viable species.

Biology of the Thresher Shark

Life history studies of the thresher shark in the western North Atlantic continued with the completion of a manuscript on age. Age and growth estimates were generated using vertebral centra from 173 females, 135 males, and 11 individuals of unknown sex ranging in size from 56 to 264-centimeter fork length. In addition, further collection of food habits and reproductive samples were accomplished primarily at recreational fishing tournaments. Reproductive tissues were processed and sectioned using histological techniques with the results combined with the morphological reproductive data to determine sexual sizes at maturity for this species.

Biology of the Torpedo Ray

A life history study of the torpedo ray (*Torpedo nobiliana*) continued with data collection and sampling on over 150 rays for age and growth, reproduction, and food habits. Reproductive tissues were processed and sectioned using histological techniques, morphological data on organ measurements have been plotted and will be compared to the histological results. Vertebrae were also processed using histology and image analysis and are currently being read. This research is part of a University of Rhode Island graduate student's master's thesis.

Age and Growth of Coastal and Pelagic Sharks

Age and growth estimates for the smooth skate, *Malacoraja senta*, were published (Natanson *et al.*, 2007) and derived from 306 vertebral centra from skates caught in the North Atlantic off the coast of New Hampshire and Massachusetts. Male and female growth diverged at both ends of the data range and the sexes required different growth functions to describe them. Males and females were aged to 15 and 14 years, respectively. A manuscript on the ontogenetic changes in the vertebrae of the basking shark (*Cetorhinus maximus*) was accepted for publication by Marine Ecology Progress Series. In addition, collections of vertebrae took place at tournaments and fish were OTC-injected during fishing operations on board sport, commercial and research vessels.

Basking Shark Isotope Analysis

Researchers at the Woods Hole Oceanographic Institution, MDMF, and the NEFSC are using isotopic analysis on vertebrae to determine the trophic position of the basking shark as well as to learn more about their migratory behavior and ocean connectivity. This type of retrospective trophic-level reconstruction has broad applications in future studies on the ecology of this shark species to determine life-long feeding and migratory patterns and to augment electronic tag data.

Sable Island Seal Predation

An investigation into shark predation on five species of seal on Sable Island, Nova Scotia, Canada, is underway. Flesh wound patterns, tooth fragments, and bone markings are being analyzed to determine the identification of the predator. This work is being completed in conjunction with Sable Island researcher Zoe Lucas.

Diet, Feeding Ecology, and Gastric Evacuation Studies of Delaware Bay Sandbar and Smooth Dogfish Sharks

The diet and feeding ecology of sandbar sharks and smooth dogfish (*Mustelus canis*) are being investigated within Delaware Bay. These species are the two most abundant shark species in the Bay ecosystem, so their role as top predators within the Bay could be substantial. Research indicates that these two species exhibit distinctly different feeding strategies. Smooth dogfish nearly always contained food, which typically consisted of 5 to 10 prey items, but often more, in several states of digestion. The total relative mass of the stomach contents as a percentage body weight was usually around one percent. Sandbar sharks were frequently empty, and those containing food usually contained only one or two prey items. The sandbar sharks contained a smaller total mass of stomach contents (on average 0.5 percent body weight, but larger individual meals were consumed more frequently than in smooth dogfish. Overall, the sandbar shark had an intermittent feeding pattern relative to the rate of digestion but often consuming larger individual meals, whereas smooth dogfish had a continuous pattern with little or no pause between meals of smaller prey items. This may be at least partially linked to the energetic quality of the diet. Reported values in the literature for many of the important prey indicate lower energy content for the invertebrate prey commonly consumed by smooth dogfish than the teleost fish prey most prevalent in the sandbar shark diet; although, metabolic differences and digestive speed and efficiency also likely are not the same for the two species.

Movements and Migrations

CSTP

The CSTP provides information on distribution, movements and essential fish habitat for shark species in U.S. Atlantic and Gulf of Mexico waters. This program involves more than 7,000 volunteer recreational and commercial fishermen, scientists, and fisheries observers since 1962. Through 2007, over 205,000 sharks of more than 50 species were tagged and 12,400 sharks of 33 species were recaptured. To improve the quality of data collected through the CSTP, identification placards for coastal and pelagic shark species were produced and distributed in collaboration with RI Sea Grant. Substantial progress was made on the NEFSC Integrated Mark-Recapture Management System with data modules for tagging and contact information brought online and reports (letters to constituents) finalized including location maps and data. A toll free number was established as well as online reporting to collect information on recaptures for all species. This system creates a centralized tagging infrastructure for the more than 50 species of sharks in the CSTP and other NEFSC teleost tagging programs including cod, black sea bass, yellowtail flounder, and scup.

Electronic Tagging Studies and Movement Patterns

The primary objectives of the new technology tag studies are to examine shark migratory routes, potential nursery areas, swimming behavior, and environmental associations. Secondarily, these studies can assess the physiological effects of capture stress and post-release recovery in commercially- and recreationally-captured sharks. NEFSC electronic tagging studies include 1) acoustic tagging and bottom monitor studies for coastal shark species in Delaware Bay and the USVI as part of COASTSPAN; 2) tracking of porbeagle sharks with acoustic and PSATs in conjunction with the MDMF; 3) placing PSAT and SPOT tags on dusky and tiger sharks in conjunction with Monterey Bay Aquarium, UC Long Beach, and MDMF and 4) placing SPOT tags on shortfin makos on the Flemish Cap. Integration of data from conventional (CSTP) and new-technology tags (28 sharks of 5 species) is necessary to provide a comprehensive picture of the movements and migrations of sharks along with possible reasons for the use of particular migratory routes, swimming behavior, and environmental associations. Additionally, NEFSC staff attended a training session at the University of New Hampshire on the analysis of satellite tagging data using the statistical package KFTrack.

Post-Release Recovery and Survivorship Studies in Sharks—Physiological Effects of Capture Stress

This ongoing cooperative research with the MDMF and the University of Massachusetts, Dartmouth is directed toward coastal and pelagic shark species caught on recreational and commercial fishing gear. These studies use blood and muscle sampling methods coupled with acoustic tracking and PSAT data to quantify the magnitude and impacts of capture stress.

One study utilizing blood samples taken from 62 specimens of eight shark species on the NEFSC coastal and pelagic shark surveys is used to examine their physiological stress response to longline gear. Laboratory analyses for physiological stress indicators, including hematocrit, plasma ion levels, and red blood cell counts, have been partially completed for these samples. PSATs placed on three blood-sampled tiger sharks popped-up after 4 months and showed that these individuals recovered from the stress of longline capture. The combination of these PSAT data and the resulting blood analysis will provide valuable information on post-release

survivorship given the magnitude of capture stress. The results of this research will be critical to evaluate the extensive current catch-and-release management strategies for sharks.

Another ongoing cooperative study is on the post-release survivorship, habitat utilization, and movement patterns of porbeagles captured on longline gear in the North Atlantic using PAT tags. One of the objectives of this research is to quantify and characterize the long-term physiological effects of capture stress and post-release recovery in longline-captured porbeagles. These efforts will potentially allow the quantification of the stress cascade for this shark species captured on commercial gear, thereby providing fishery managers with data showing the minimum standards for capturing (*e.g.* longline soak time) and releasing these fishes while ensuring post-release survival. The second year brought analysis of the heat shock proteins on the sampled individuals. Additionally, 17 of the 20 PSATs released the last 11 months after tagging. All of the tagged individuals have corresponding blood samples currently being analyzed for stress indicators. These data in conjunction with PSAT data will provide important information on post-release survivorship.

Southeast Fisheries Science Center (SEFSC)

Stock Assessments of LCS, SCS, and Prohibited Sharks

The 2005/2006 assessment for the LCS Complex was run according to the SEDAR process. The SEDAR 11 Stock Assessment Report (NMFS, 2006a) compiled the new data used in the assessments, the report from the Assessment Workshop, and the final report by the peer reviewers (the Consensus Summary Report). This Stock Assessment Report constitutes the best available science. The results of the assessment, released on July 24, 2006 (71 FR 41774), showed that the Atlantic stock of sandbar sharks was overfished with overfishing occurring, the status of blacktip sharks in the Atlantic could not be determined due to an absence of reliable estimates of abundance, biomass, and exploitation rates, and the Gulf of Mexico stock of blacktip sharks was not overfished and overfishing was not occurring. A stock assessment of dusky shark, a prohibited species and candidate for listing under the ESA, was completed and released on May 25, 2006 (71 FR 30123). Results indicated that the dusky shark stock off the western North Atlantic had been depleted by 62 to 80 percent of the unfished virgin biomass.

In 2007 a stock assessment for SCS following the SEDAR process was completed on November 13, 2007 (72 FR 63888). Based on these assessments, NMFS determined blacknose sharks to be overfished with overfishing occurring; however, Atlantic sharpnose, bonnethead, and finetooth sharks were found to be not overfished with no overfishing occurring (May 7, 2008, 73 FR 25665). NMFS is currently working on a new amendment to rebuild blacknose sharks and end overfishing.

Update on Catches of Atlantic Sharks

An update on catches of LCS, SCS, and pelagic sharks in U.S. Atlantic, Gulf of Mexico, and Caribbean waters was generated in October 2006 (Cortés and Neer, 2005; SEDAR 11 LCS05/06-DW-16) and formed the basis of the catch scenarios included in the SEDAR Data Workshop report described above. Time series of commercial and recreational landings and discard estimates from several sources were compiled for the LCS complex and sandbar and blacktip sharks. In addition, 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 BLL observer program were also included. Another update on catches of Atlantic sharks was generated in 2007 for the SCS assessment (Cortés and Neer, 2007; SEDAR 13-DW-15). This document presented updated commercial and recreational landings of Atlantic SCS up to 2005. Species-specific information on the geographical distribution of commercial landings and recreational catches was presented along with the different gear types used in the commercial fisheries. Length-frequency information and average weights of the catches in three separate recreational surveys and in the directed shark BLL observer program were also included.

Status evaluation of shark species in the Species of Concern list

Funds from the NMFS Protected Resources Species of Concern Program were provided in 2006 to provide an assessment of the night shark as it pertains to the species of concern criteria. Productivity, abundance trends, and endemism were assessed (Carlson *et al.*, 2008) and based on the analysis of all current available information, night sharks should be removed from the NMFS species of concern list but retained on the prohibited species list as a precautionary approach to management until a more comprehensive assessment of the status of the stock can be conducted (*i.e.*, a stock assessment). A similar study was conducted on the sandtiger shark in 2008 (Carlson *et al*., 2009). While sand tigers shark have one of the lowest productivities among sharks in the Northwest Atlantic Ocean, results from this study indicate sand tigers do not meet all criteria outlined in the species of concern list. Sand tigers are not limited in their distribution and available evidence indicates that relative abundance and size have not declined substantially since pre-exploitation levels or at least lightly exploited levels. However, due to the very high levels of uncertainty in relative abundance trends, removal of this species from the NMFS species of concern list was not recommended and it should be retained as a precautionary approach.

Determination of critical habitat for the conservation of dusky shark using satellite archival tags

Habitat utilization and movement patterns and the utility of the closed area on the conservation and recovery of dusky shark are being examined using satellite archival tags. Information gathered through this study will not only verify the utilization of the closed area by dusky shark but also provide information on daily and seasonal movement patterns, such as migration corridors that could aid in developing additional critical habitat information. Data will also be obtained on preferred depth and habitat, which may help reduce further fishery interactions through bycatch mitigation.

As part of a cooperative study, funded by a NOAA/NMFS CRP grant awarded to the University of Southern Mississippi, dusky sharks have been tagged in the northern Gulf of Mexico to examine habitat utilization and movements of this species in the region. Preliminary results indicate somewhat random dispersion of this species throughout the Gulf of Mexico with at least one individual moving into the southern Gulf of Mexico, off the Yucatan Peninsula, a short time after initial tagging. The final results of this ongoing project, expected to be completed in 2009, will provide information on both short and long term movement patterns of dusky sharks as well as define temperature and depth preferences for the species.

Ecological Risk Assessments for Atlantic sharks

Several Ecological Risk Assessments (ERAs)—also known as Productivity and Susceptibility Analyses (PSA)—for the effect of fishing on Atlantic sharks were undertaken by SEFSC staff in 2008. The analyses included 1) a PSA for 37 species in the Atlantic shark complex as one of six case studies of the NMFS Vulnerability Evaluation Working Group, whose goal was to provide a methodology for determining the vulnerability of a stock to assist in revisions to the National Standard 1 (NS1) Guidelines; 2) an ERA for pelagic shark species as part of a Lenfest Ocean Program Expert Working Group to consider approaches to data-limited shark species and associated management strategies for achieving sustainable fisheries (Simpfendorfer *et al.*, 2008); and 3) a similar ERA for pelagic shark species for the International Commission for the Conservation of Atlantic Tunas (ICCAT) pelagic shark stock assessment meeting (Cortés *et al.*, 2008; SCRS/2008/017). These studies showed differential vulnerabilities of the various species included in the analyses. For pelagic sharks, the bigeye thresher, shortfin mako, longfin mako, and silky sharks tended to have the highest vulnerabilities and, thus, the highest risk of overexploitation.

Observer Programs: Shark Longline Program

From 1994 to 2004, the southeastern United States commercial shark BLL fishery was monitored by the University of Florida Commercial Shark Fishery Observer Program. In 2005, the responsibilities of the program were moved to the NOAA Fisheries Service Panama City Laboratory Shark Population Assessment Group in Panama City, FL. This program is designed to meet the intent of the ESA and the FMP for HMS. It was created to obtain better data on catch, bycatch, and discards in the shark BLL fishery. All observers are required to attend a 1-week safety training and species identification course prior to being dispatched to the fishery. While onboard the vessel, the observer records information on gear characteristics and all species caught, condition of the catch (*e.g.*, alive, dead, damaged, or unknown), and the final disposition of the catch (*e.g.*, kept, released, etc.). As of 2008, the target coverage level is 100 percent for vessels participating in the sandbar shark research fishery and 4-6 percent of the total fishing effort for vessels outside this fishery. This level is estimated to attain a sample size needed to provide estimates of protected resource interaction with an expected coefficient of variation of 0.3.

Observer Programs: Shark Gillnet Program

Since 1993, an observer program has been underway to estimate catch and bycatch in the directed shark gillnet fisheries along the southeastern U.S. Atlantic coast. This program was designed to meet the intent of the MMPA, ESA, and the 1999 revised FMP for HMS. It was also created to obtain better data on catch, bycatch, and discards in the shark fishery. The ALWTRP and the BiOp issued under Section 7 of ESA mandate 100 percent observer coverage during the right whale calving season (15 November - 1 April). Outside the right whale calving season (1 April - 14 November), observer coverage equivalent to 38 percent of all trips is maintained. Based on June 25, 2007 rule (72 FR 34632) shark gillnet vessels fishing between 29° 00' N and 26° 46.5' N have certain requirements as outlined 50 CFR § 229.32 from December 1 through March 31 of each year. These include vessel operators contacting the SEFSC Panama City Laboratory at least 48 hours prior to departure of a fishing trip in order to arrange for an observer. In addition, a recent rule (October 5, 2007, 72 FR 57104) amends restriction in the Southeast U.S.

Monitoring Area from December 1 through March 31. In that area the 100 percent observer coverage has been replaced with VMS requirements found in 50 CFR 635.69. Similar to the shark longline observer program, all observers are required to attend a 1-week safety training and species identification course and while onboard the vessel record information on gear characteristics and all species caught, condition of the catch, and the final disposition of the catch.

Ecosystem Modeling: Reconstructing ecosystem dynamics in the Gulf of Mexico. An assessment of the trophic impacts of fishing and its effects on keystone predator dynamics

Keystone species, such as sharks, can play a central role in the structure and function of marine communities. There are conflicting views surrounding the ecological interactions between sharks and fisheries. One view suggests that removals of keystone species are thought to cause a cascading trophic effect within the remaining community. These effects may involve changes in species composition among the prey or changes in the preferred prey of the predator. An alternate view has been suggested that the high diversity of oceanic systems may oppose strong "top-down" effects. In light of the recent revelations on the reductions of higher trophic levels species and fishing down food webs, an improved understanding of the role of keystone predators in the Gulf of Mexico would be useful in evaluating the impacts of fishing on the marine ecosystem. An Ecopath with Ecosim model has been developed to model the Gulf of Mexico ecosystem dynamics (Carlson, 2007). In addition, hierarchical-Bayesian (HB) statistical models coupled with ecological tracers are being developed to quantify relationships between predators and potential prey.

Shark Depredation Rates on Pelagic Longlines

A suite of modeling approaches was employed to analyze shark depredation rates from the US Atlantic pelagic longline fishery. As depredation events are relatively rare, there are a large number of zeroes in pelagic longline data, and conventional generalized GLMs may be ineffective as tools for statistical inference. GLMs (Poisson and negative-binomial), two-part (delta-lognormal and truncated negative binomial, T-NB), and mixture models (zero-inflated Poisson, ZIP, and zero-inflated negative binomial, ZINB) were used to understand the factors that contributed most to the occurrence of depredation events that included a small proportion of whale damage. Of the six distribution forms used, only the ZIP and T-NB models performed adequately in describing depredation data, and the T-NB and ZINB models outperformed the ZIP models in bootstrap cross-validation estimates of prediction error. Candidate T-NB and ZINB model results showed that encounter probabilities were more strongly related to large-scale covariates (space, season) and that depredation counts were correlated with small-scale characteristics of the fishery (temperature, catch composition). Moreover, there was little evidence of historical trends in depredation rates. The results show that the factors contributing to most depredation events are those already controlled by ships' captains and, beyond novel technologies to repel sharks, there may be little more to do to reduce depredation loss in the fishery within current economic and operational constraints. Results have recently been published in ICES Journal of Marine Science (MacNeil *et al.*, 2009).

Elasmobranch Feeding Ecology and Shark Diet Database

Because there is little quantitative species-specific data on diet, competition, predator-prey interactions, and habitat requirements of sharks, several studies are currently under way describing the diet and foraging ecology, habitat use, and predator–prey interactions of

elasmobranchs in various communities. Atlantic angel sharks (*Squatina dumerili*) have been collected for stomach content analysis from a trawl fishery in northeastern Florida since 2004. Evidence suggests angel sharks consumed mostly teleost fishes, with Atlantic croaker (*Micropogonias undulatus*) being the most common fish species (Baremore *et al.*, 2006). The diet of the roundel skate, *Raja texana*, from the northern Gulf of Mexico is also being examined (Bethea and Hale, 2006). A database containing information on quantitative diet 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 and is being used as part of a collaborative study with researchers from the University of Washington, University of Wisconsin, and the Inter-American Tropical Tuna Commission, aimed at characterizing intra-guild predation and cannibalism in pelagic predators and evaluate the implications for the dynamics, assessment and management of Pacific tuna populations.

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 northwest Florida (Cedar Key-Pensacola) 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 EFH 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. This index has been utilized as an input to various stock assessment models.

Cooperative SEAMAP Gulf of Mexico Bottom Longline Surveys

A recent SEAMAP initiative (formally began in 2008) is for Gulf of Mexico states to conduct coastal BLL surveys. The SEAMAP surveys are intended to provide a near-coastal index (monthly from March to November as logistics allow) to augment the more offshore Mississippi Laboratories surveys. Similar longline gear and survey designs and tagging protocols are used. At present Texas Parks and Wildlife and Gulf Coast Research Laboratory (Ocean Springs, Mississippi) are participating. The State of Alabama is considering participating in conjunction with current effort by Dauphin Island Sea Lab, University of Southern Alabama, a project that also follows Mississippi Laboratories protocols. The State of Florida has not began SEAMAP longline surveys but did provide a representative to the planning meeting and indications are that provided they can coordinate vessel time they may participate as well. The State of Louisiana is not interested in a SEAMAP BLL effort at present due to a lack of vessel resources.

Development of shark tagging interactive website, NMFS Mississippi Laboratories and NMFS Panama City Laboratory

This cooperative tag tracking effort is based on tagging effort by the Mississippi Laboratories and the Panama City Laboratory, and incorporates tagging information in an accessible format that allows new tagging effort and tag return tracking, coupled with tag specimen specifics (genus, species, morphometrics, sampling, location, release and recapture information). The website is designed to allow researchers access to important tagging vitals.

Essential Fish Habitat

Conventional theory assumes that shark nursery areas are habitats where female sharks give birth to young or lay eggs, or where juvenile sharks spend their first weeks, months, or years of life. The SEFSC Panama City Shark Population Assessment Group is currently testing a number of hypotheses regarding juvenile sharks and EFH that challenge this assumption. There are many bays and inlets along the Gulf of Mexico coastline which may serve as EFH for sharks. These habitats vary from near-oceanic conditions to shallow, enclosed estuarine areas. Following Heupel *et al.* (2007), the SEFSC Panama City Shark Population Assessment Group is determining which habitats provide a greater "nursery value" for a given species. A study using diet and bioenergetics published in 2006 by the Panama City Laboratory (Bethea *et al.*, 2006) concluded that Crooked Island Sound provided a greater "nursery value" than Apalachicola Bay, FL.

Life History Studies of Elasmobranchs

Biological samples are obtained through research surveys and cruises, recreational fishers, and 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 they are harvested at sustainable levels. Samples are obtained from commercial fishers and fishery-independent surveys. Samples and preliminary analysis continue on determining life history parameters for skates in the Gulf of Mexico, a group of elasmobranchs often ignored despite being harvested as catch and bycatch in commercial fisheries. In 2006, the age and growth parameters of blacktip sharks (Carlson *et al*., 2006) and scalloped hammerhead shark (Piercy *et al*., 2007) from the Gulf of Mexico and southeast United States were published. In addition, a study was published on the reproductive cycle of blacknose sharks in the Gulf of Mexico, which concluded that not all carcharhinid sharks exhibit a biennial reproductive cycle (Sulikowski *et a*l., 2007). Along this line, new studies began in 2006 on the age and growth of great hammerheads, diet of tiger shark, and reproductive cycle and maturity schedule of blacktip sharks and sandbar sharks in the Atlantic Ocean.

Recent studies have indicated that at least two species of small coastal sharks have divergent reproductive cycles within the western North Atlantic Ocean (Driggers *et al*., 2004). Results of these studies suggest the reproductive biology of many sharks could be spatially and temporally variable. As a result, in depth studies of the reproductive biology of several species, including the Atlantic sharpnose, bonnethead, finetooth, smoothhound (*Mustelus mustelus*), Cuban dogfish (*Squalus cubensis*), and shortspine dogfish (*Squalus mitsukurii*) sharks, are being conducted using samples collected throughout the northern Gulf of Mexico and/or the eastern seaboard. Additionally, the life history of several deepwater sharks, including *Etmopterus* sp. and *Squaliolus laticaudus*, is being examined and results will provide baseline data for those species potentially impacted by developing deepwater fisheries.

The life history of *Mustelus* sp. is being examined in the northern Gulf of Mexico. Historically, there have been at least three putative species of smoothhounds in the area, however,

genetic analysis indicate that only two exist. While *Mustelus* sp. is not a managed species it is frequently encountered as bycatch in several fisheries.

Using molecular techniques, biologists from the Pascagoula laboratory have discovered a new species of hammerhead shark. To date, this new species has only been found in the western North Atlantic Ocean. The formal description of this species, tentatively called *Sphyrna gilberti*, is near completion. Morphologically, the new species is nearly identical to the scalloped hammerhead, therefore, additional work will be needed to examine the relative abundance of both species in U.S. waters.

Elemental chemistry of elasmobranch vertebrae

Although numerous studies have utilized elemental analysis techniques for age determination in bony fishes, little work has been conducted utilizing these procedures to verify age assessments or temporal periodicity of growth band formation in elasmobranchs. A study was completed in 2006 to determine the potential of laser ablation inductively coupled plasma-mass spectrometry (LA-ICP-MS) to provide information on the seasonal deposition of elements in the vertebrae of the round stingray. Spatially resolved time scans for elements across the round stingray vertebrae showed peaks in calcium intensity that aligned with and corresponded to the number of seasonal growth bands identified using standard light microscopy. Higher signals of calcium were associated with the wide opaque bands while lower signals of calcium corresponded to the narrow translucent bands. While a close alignment between the numbers of calcium peaks and annual growth bands was observed in round stingray samples aged five years or younger, this relationship was less well defined in vertebral samples from round stingrays over 11 years old. To the best of our knowledge, this is the first study of its kind to utilize ICP-MS to verify age assessments and seasonal band formation in an elasmobranch. The results of this research were published in 2006 (Hale *et al*., 2006).

Cooperative Research—Brazil-U.S. pelagic shark research project

The main goal of this cooperative project between Brazil (Universidade Federal Rural de Pernambuco) and the United States (SEFSC and the University of Florida's Museum of Natural History) is to conduct simultaneous research on pelagic sharks in the North and South Atlantic Ocean. Central to this project is also the development of fisheries research capacity in Brazil through graduate student training and stronger scientific cooperation between Brazil and the United States. The main research objectives include: 1) development of bycatch reduction and habitat models; 2) investigation of movement and migratory patterns; and 3) ancillary life history studies. Bycatch reduction is being investigated with the placement of hook timers and temperature-depth recorders (TDRs) on fishing gear to gain information on preferential feeding times, fishing depths, and temperatures of pelagic sharks and associated fauna. This information can be used in the future for development of habitat-based models. Movement and migratory patterns are being investigated through the deployment of pop-up satellite tags on pelagic species that are frequently caught in fishing operations or are of special importance to conservation interests in both countries. Information gathered will provide insight into geographical and vertical distribution patterns, which in turn will provide data on catchability that can be used if bycatch reduction measures are implemented in the future. Data obtained from hook timers, TDRs, and archival tags can also be used to estimate the susceptibility of pelagic shark species to surface longline fisheries under ERA approaches. To date, an oceanic whitetip, a longfin mako,

and a bigeye thresher shark have been tagged with satellite tags off U.S. waters, and two blue sharks have been tagged off Brazilian waters as part of this project. The ancillary studies include genetic, age and growth, reproduction and trophic ecology analysis.

Cooperative Research— University of Southern Mississippi-NMFS Mississippi Laboratory shark research project

The movement patterns of whale sharks in the northern Gulf of Mexico are being examined using satellite tags in cooperation with scientists from various institutions, including the University of Southern Mississippi. An area off the Mississippi River Delta has been identified where a large number of whale sharks occur on a predictable cycle (Burks *et al*., 2006. This ongoing project will provide information on habitat utilization, seasonal distribution and large scale horizontal and vertical movements of whale sharks in the northern Gulf of Mexico. Additionally, movements of silky, tiger and scalloped hammerhead sharks are being investigated using satellite tags.

Shark Assessment Research Surveys

The SEFSC Mississippi Laboratories has conducted BLL surveys in the Gulf of Mexico, Caribbean, and Southern North Atlantic since 1995 (21 surveys completed through 2005). The primary objective was assessment of the distribution and abundance of large and SCS across their known ranges to develop a time series for trend analysis. The surveys were designed to satisfy five important assessment principles: stockwide survey, synopticity, well-defined universe, controlling biases, and useful precision. The BLL surveys are the only long-term, nearly stock-wide, fishery-independent surveys of Western North Atlantic Ocean sharks conducted in U.S. and neighboring waters. Ancillary objectives were to collect biological and environmental data and to tag-and-release sharks. Starting in 1997 and under the auspices of the MEXUS Gulf Program, the Mississippi Laboratories have provided logistical and technical support to Mexico's Instituto Nacional de la Pesca to conduct a cooperative research cruise aboard both the NOAA Ship OREGON II (1997 and 1998) and the Mexican research vessel Onjuku (2001 and 2002) in Mexican waters of the Gulf of Mexico. The circumference of Cuba was surveyed with the NOAA Ship OREGON II during 1998. One of the most noteworthy changes in the surveys was a shift from the standard "J" hook used in all the earlier surveys to a circle "C" hook (gear testing surveys conducted in 2000), which is much more efficient for capturing teleosts and slightly more efficient for elasmobranchs. Current surveys continue to address expanding fisheries management requirements for both elasmobranchs and teleosts and annual surveys include the U.S. Atlantic coast from Cape Hatteras to southern Florida and the U.S. Gulf of Mexico.

Shark Research Fishery

Amendment 2 to the Consolidated HMS FMP established a shark research fishery to maintain time series data for stock assessments and to help meet NMFS' shark research objectives. Each year, NMFS determines the research objectives for the upcoming shark research fishery. The research objectives are developed by a shark board, which is comprised of representatives within NMFS including representatives from the SEFSC Panama City Laboratory, NEFSC Narragansett Laboratory, the Southeast Regional Office of Protected Resources Division (SERO\PRD), and the HMS Management Division. The research objectives of the shark research fishery are primarily based on the research needs identified in shark stock assessments.

Many of the research objectives for 2008 and 2009 came from the SEDAR 11, 2005/2006 LCS stock assessment. These objectives were developed with input from non-governmental organizations, industry representatives, fishery managers, and academics present during the stock assessment workshops. In addition, the shark board identified additional needs for tagging studies, collection of genetic material, and controlled BLL experiments to assess the impact of different hook types.

Other Recent Shark Research:

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3.3 Habitat

Section 303(a)(7) of the Magnuson-Stevens Act, 16 U.S.C. §§ 1801 *et seq*., requires FMPs to describe and identify 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 EFH:

> "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. EEZ for all life stages of each species in a fishery management unit. FMPs must describe EFH in text, tables, and figures 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 and were updated in Amendment 1 to the 2006 Consolidated HMS FMP.

NMFS originally described and identified EFH and related EFH regulatory elements for all HMS in the management unit in the 1999 FMPs, which were updated in Amendment 1 to the 1999 Tunas, Swordfish, and Shark FMP and implemented in 2003. The EFH regulations require NMFS to conduct a comprehensive review of all EFH related information at least once every five years and revise or amend the EFH boundaries if warranted. To that effect, NMFS undertook the comprehensive five-year review of information pertaining to EFH for all HMS in the management unit in the 2006 Consolidated HMS FMP. Based on the findings of this review, NMFS issued a Notice of Intent to amend EFH for HMS through Amendment 1 to the 2006 Consolidate HMS FMP on November 7, 2006 (71 FR 65087). In the Notice of Intent NMFS described its intent to prepare an Environmental Impact Statement (EIS) to examine alternatives for updating existing HMS Essential Fish Habitat (EFH), consider additional Habitat Areas of Particular Concern (HAPCs), analyze fishing gear impacts, and if necessary, identify ways to avoid or minimize, to the extent practicable, adverse fishing impacts on EFH consistent with the Magnuson-Stevens Act and other relevant federal laws. At that time, NMFS requested new information not previously considered in the 2006 Consolidated HMS FMP, comments on potential HAPCs, and information regarding potential fishing and non-fishing impacts that may adversely affect EFH.

On June 12, 2009, NMFS published a Notice of Availability of the Final Environmental Impact Statement for Amendment 1 to the 2006 Consolidated HMS FMP for Essential Fish Habitat (EFH) (74 FR 28018). This amendment updated and revised EFH boundaries for HMS, designated a new HAPC for bluefin tuna in the Gulf of Mexico, and analyzed fishing and non-fishing impacts on EFH. To facilitate public outreach, an internet-based mapping program (HMS EFH Evaluation Tool) was created to show the updated and revised EFH boundaries for HMS. Currently, there is no EFH designated for smooth dogfish and, therefore, no specific management measures exist to mitigate adverse impacts, if any, to such EFH from fishing.

3.3.1.1 Habitat Areas of Particular Concern

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 are a rare habitat type. HAPCs can be used to focus conservation efforts on specific habitat types that are particularly important to managed species. Currently, HAPC has been designated for two HMS species: sandbar sharks and bluefin tuna. The areas off of North Carolina, Chesapeake Bay, MD, and Great Bay, NJ, have been identified as a HAPC for sandbar sharks (1999 FMP). HAPC for bluefin tuna was designated in Amendment 1 to the 2006 Consolidated HMS FMP and is located across the western, northern, and central Gulf of Mexico.

3.3.2 Habitat Types and Distributions

Sharks may be found in 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 EEZ. For a detailed description of shark coastal and estuarine habitat, continental shelf and slope area habitat, and pelagic habitat for the Atlantic, Gulf of Mexico, and U.S. Caribbean, please refer to Section 3.3.2 of the 2006 Consolidated HMS FMP.

3.4 Fishery Data Update

In this section, HMS fishery data are analyzed by gear type. 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.

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 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, buoy gear; PLL fishery - longline; shark drift gillnet fishery - gillnet; shark BLL 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.

3.4.1 Bottom Longline

3.4.1.1 Domestic History and Current Management

The majority of commercially caught sharks are caught using BLL gear. However, the regulations for the shark fishery as discussed in this section apply to all gear types. In 1993, NMFS implemented the FMP for Sharks of the Atlantic Ocean, which established three management units: LCS, SCS, and pelagic sharks. At that time, NMFS identified LCS as overfished, and 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 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, but did revise 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.

The final rule for Amendment 2 to the 2006 Consolidated HMS FMP published on June 24, 2008 (73 FR 35778) with a correction published on July 15, 2008 (73 FR 40658). The final rule became effective on July 24, 2008. In the final rule, NMFS removed sandbar sharks from the LCS quota and established a non-sandbar LCS quota. In addition, NMFS established two regions for the non-sandbar LCS: an Atlantic and Gulf of Mexico region. NMFS also implemented new annual adjusted quotas for sandbar sharks (87.9 mt dw), non-sandbar LCS (Atlantic: 187.7 mt dw; Gulf of Mexico: 390.5 mt dw), and a porbeagle shark commercial quota (1.7 mt dw). The sandbar shark and non-sandbar LCS quotas would increase to their annual base quotas of 116.6 mt dw for sandbar sharks, 188.3 mt dw for non-sandbar LCS in the Atlantic region, and 439.5 mt dw for non-sandbar LCS in the Gulf of Mexico region as of January 1, 2013, depending on overharvests. NMFS maintained the annual SCS quota (454 mt dw), pelagic sharks quota (273 mt dw for blue sharks), and quota for pelagic sharks other than porbeagle and blue sharks (488 mt dw).

Commercial shark fishing effort is generally concentrated in the southeastern United States and Gulf of Mexico (Cortés and Neer, 2005). During 1997 – 2004, 92 – 99 percent of LCS, 37 – 49 percent of pelagic sharks, and nearly all SCS (80 – 100 percent) came from the southeast region (Cortés and Neer, 2005). McHugh and Murray (1997) found in a survey of shark fishery participants that the largest concentration of BLL 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 participants move from their homeports to other fishing areas as the seasons change and fish stocks move.

The Atlantic BLL fishery targets both LCS and SCS. BLL 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 BLL containing about 600 hooks, is fished overnight. Skates, sharks, or various fin fishes 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.

3.4.1.2 Recent Catch and Landings Data

The following section provides information on shark landings as reported in the shark BLL observer program. In January 2002, the observer coverage requirements in the shark BLL fishery changed from voluntary to mandatory participation if selected. Vessels were randomly selected if they have a directed shark LAP, have reported landings from sharks during the previous year, and have not been selected for observer coverage during each of the three previous seasons.

The U.S. Atlantic commercial shark BLL fishery was monitored by the University of Florida and Florida Museum of Natural History, Commercial Shark Fishery Observer Program (CSFOP) from 1994 through the first season of 2005. In June 2005, responsibility for the observer program was transferred to the SEFSC's Panama City Laboratory. The observer program trains and places the observers aboard vessels in the directed shark BLL 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 LCS and SCS BLL 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 2003, LCS comprised 68.4 percent of the total catch, and sandbar sharks were 30.6 percent of total LCS catch.

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. In 2004 LCS comprised 66.7 percent of the total catch, and sandbar sharks were 26.6 percent of catch in 2004. 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 LCS 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 LCS catch (Burgess and Morgan, 2003). Blacktip sharks comprised 13.9 percent of total observed catch and 20.3 percent of the LCS catch (Burgess and Morgan, 2002). Tiger sharks comprised 7.5 percent of the total observed catch and 11.0 percent of the LCS catch. A majority of tiger sharks (71.7 percent) and nurse sharks (98.8 percent) were tagged and released.

From July 2005 through December 2006, five observers logged 89 trips on 37 vessels with a total of 211 hauls for the second and third seasons in the Atlantic from North Carolina to Florida and in the eastern Gulf of Mexico off Florida (Hale and Carlson, 2007). Observers documented the catches and fishing effort on 34 hauls on four trips targeting grouper/snapper or grouper/shark in the Gulf of Mexico, 82 hauls on 31 trips targeting shark in the Gulf of Mexico, 77 hauls on 50 trips targeting ships in the South Atlantic, and 18 hauls on four trips observed targeting tilefish in the South Atlantic.

From January to November 2007, the shark BLL observer program covered a total of 42 trips on 25 vessels with a total of 264 hauls. Gear characteristics of trips varied by area (Gulf of Mexico or the U.S. Atlantic Ocean) and target species (grouper/snapper or grouper/tilefish, shark or tilefish) (for more details, see Hale *et al*., 2007). There were no grouper/snapper-targeted trips observed in the U.S. Atlantic Ocean. No trips were observed in the northern U.S. Atlantic Ocean. Observers documented the catches and fishing effort on 179 hauls and 10 trips targeting snapper/grouper or grouper/tilefish in the Gulf of Mexico. There were 24 hauls on 7 trips

observed targeting sharks in the Gulf of Mexico. In the U.S. Atlantic Ocean, 39 hauls on 21 trips were observed targeting shark, and 22 hauls on three trips were observed targeting tilefish.

In 2007 on the trips targeting shark in the Gulf of Mexico, 1,302 individual animals were caught. This consisted of 94.9 percent sharks, 4.1 percent teleosts, 0.5 percent invertebrates, and 0.2 percent batoids. LCS comprised the greatest amount of shark catch, at 69.5 percent, and SCS comprised 30.3 percent. The prohibited dusky shark was also caught (0.1 percent). Red grouper was the most caught teleost, while blacktip sharks was the most commonly caught shark (Hale *et al*., 2007).

In 2007 on the trips targeting grouper/snapper or grouper/tilefish in the Gulf of Mexico, 8,980 individual animals were caught. This consisted of 87.3 percent teleosts, 11.6 percent sharks, 0.2 percent batoids, and 0.8 percent invertebrates. LCS species comprised 16.5 percent of the shark catch, while SCS comprised the majority of the shark catch at 73.7 percent. Red grouper was the most caught teleost, and Atlantic sharpnose were the most caught sharks (Hale *et al*., 2007).

On the trips targeting shark in the South Atlantic in 2007, 2,735 individual animals were caught. This consisted of 95.7 percent sharks, 2.5 percent teleosts, 1.2 percent batoids, and 0.4 percent invertebrates. Large coastal shark species comprised 78.7 percent of the shark catch while SCS species comprised 19.2 percent of the shark catch. Sandbar sharks and tiger sharks were the most commonly caught LCS. Other shark species caught were dusky sharks, sand tiger sharks, night sharks, and sixgill sharks. Great amberjack, almaco jack, and great barracuda were the most commonly caught teleosts (Hale *et al.*, 2007).

On the trips targeting tilefish in the South Atlantic in 2007, 1,293 individual animals were caught. This consisted of 97.2 percent teleosts, 2.5 percent sharks, and 0.2 percent invertebrates. LCS comprised 9.4 percent of the shark catch, while no SCS species were caught. Other shark species caught included the sevengill shark, shortfin mako shark, smooth dogfish and spiny dogfish (87.5 percent). Spiny dogfish was the most commonly caught shark species (75 percent) while tilefish was the most caught teleost at 97.5 percent (Hale *et al*., 2007).

BLL for sharks has relatively low observed bycatch rates. For vessels targeting sharks in the Gulf of Mexico in 2007, four loggerhead turtles were observed caught in BLL gear. Of these, two were released alive, and two were released dead. For vessels targeting shark in the Atlantic, no loggerhead turtles were observed caught in BLL gear. However, three smalltooth sawfish were observed caught, with two being released alive and one released dead.

From January to December 2008, the shark BLL observer program covered a total of 50 trips on 17 vessels with a total of 214 hauls. Gear characteristics of trips varied by area (Gulf of Mexico or the U.S. Atlantic Ocean) and target species (grouper/snapper or grouper/tilefish, shark or tilefish) (for more details, see Hale *et al*., 2009). There were no grouper/snapper or grouper/tilefish targeted trips observed in the U.S. Atlantic Ocean. No trips were observed in the northern U.S. Atlantic Ocean. Observers documented the catches and fishing effort on 147 hauls and 7 trips targeting snapper/grouper or grouper/tilefish in the Gulf of Mexico. There were 41

hauls on 27 trips observed targeting sharks in the Gulf of Mexico. In the U.S. Atlantic Ocean, 26 hauls on 16 trips were observed targeting sharks.

In 2008 on the trips targeting shark in the Gulf of Mexico, 2,540 individual animals were caught. This consisted of 90.8 percent sharks, 7.7 percent teleosts, 0.8 percent invertebrates, and 0.6 percent batoids. LCS comprised the greatest amount of shark catch, at 75.3 percent, and SCS comprised 22.3 percent. The prohibited dusky shark, Caribbean reef shark, night shark, and white shark were also caught (1.0 percent). King snake eel was the most caught teleost (55.4 percent), and sandbar shark was the most commonly caught shark (16.6 percent) (Hale *et al*., 2009).

In 2008, on the trips targeting grouper/snapper or grouper/tilefish in the Gulf of Mexico, 10,253 individual animals were caught. This consisted of 86.1 percent teleosts, 12.0 percent sharks, 1.8 percent invertebrates, and 0.04 percent batoids. Deep water shark species comprised the majority of the shark catch at 52.0 percent, followed by small coastal sharks (29.5 percent), large coastal sharks (10.4 percent) and pelagic sharks (0.1 percent). Yellow edge grouper was the most caught teleost, and smooth dogfish was the most caught shark (Hale *et al*., 2009).

On the trips targeting shark in the South Atlantic in 2008, 1,836 individual animals were caught. This consisted of 99.1 percent sharks, 0.4 percent teleosts 0.4 percent batoids, and 0.1 percent invertebrates. Large coastal shark species comprised 83.8 percent of the shark catch while SCS species comprised 16.1 percent and deep water sharks comprised 0.1 percent of the shark catch. Tiger sharks were the most commonly caught shark (50.5 percent) and cobia were the most commonly caught teleost (28.6 percent) (Hale *et al.*, 2009).

BLL for sharks has relatively low observed bycatch rates. For vessels targeting sharks in the Gulf of Mexico in 2008, two smalltooth sawfish were observed caught in BLL gear and both were released alive. No other protected species interactions were observed in the Gulf of Mexico directed shark BLL fishery. For vessels targeting shark in the Atlantic, one loggerhead turtle was observed caught in BLL gear and ultimately released alive. No other protected species interactions were observed in the South Atlantic directed shark BLL fishery (Hale *et al.*, 2009).

3.4.1.3 Bottom Longline Bycatch

Under 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 BLL as Category III (remote likelihood or no known serious injuries or mortalities) (June 28, 2007; 72 FR 35393). The Southeast Regional Office of Protected Resources Division prepared a new BiOp regarding the actions implemented under the final rule for Amendment 2 to the Consolidated HMS FMP on May 20, 2008. The BiOp concluded, based on the best available scientific information, that Amendment 2 to the HMS FMP was 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. The actions implemented under Amendment 2 were not expected to increase endangered species or marine mammal interaction rates. Furthermore, the BiOp concluded that the actions implemented under Amendment 2 were not likely to adversely affect any listed species of marine mammals, invertebrates (*i.e.*, listed species of coral) or other listed species of fishes (*i.e.*, Gulf sturgeon and Atlantic salmon) in the action area.

The BiOp analyzed the effects of the commercial and recreational shark fisheries under Amendment 2 on sea turtles and smalltooth sawfish. These analyses recognized that the actions implemented under Amendment 2 would reduce shark fishing effort as a result of reduced quotas and retention limits (compared to 2004-2007 levels). These measures were expected to reduce the number of participants targeting sharks and should reduce impacts of BLL gear on endangered or threatened sea turtles. It also recognized that smalltooth sawfish interactions with BLL gear may also decline; however, since nearly all individuals are expected to survive interaction with this gear, the BiOp concludes that the actions implemented under Amendment 2 would have little effect on smalltooth sawfish mortality. Furthermore, the BiOp recognized that changes in shark strikenet effort under Amendment 2 were not likely to adversely affect sea turtle or smalltooth sawfish takes because very few takes occur as a result of gillnet practices prior to Amendment 2. The BiOp also stated that drift or sink gillnet sea turtle and smalltooth sawfish takes were more frequent compared to the strikenet fishery, but were still minimal compared to BLL fishing.

The BiOp recognized that implementing 100 percent observer coverage in the shark research fishery would allow observer reports to be used to monitor interactions of directed shark fishing in near real-time, which would improve monitoring and increase the sample size available for evaluating important sea turtle and smalltooth sawfish interaction characteristics (*e.g.*, average life stage and genetic origin data). This would improve data acquisition and monitoring of protected resource interactions in the shark BLL fishery. Maintaining current levels of observer coverage outside the shark research fishery would continue to allow NMFS to observe the non-research BLL and gillnet fishing activities by vessels with directed and incidental shark permits at a level that would allow for statistically reliable monitoring. This would provide a better understanding of the changing dynamics of this fishery and its impacts on all marine resources. Time/area closures being implemented consistent with the South Atlantic Fishery Management Council could provide additional protection for sea turtles and smalltooth sawfish within the marine protected areas; however, they were not likely to reduce the overall interactions between the fishery and protected species given their small size.

The BiOp indicated that the impacts of changes to seasons and regions on sea turtles and smalltooth sawfish interactions were unknown. The research fishery would likely create a more uniform distribution of effort. Thus, shark fishing effort might also occur at different times of the year. The quota and retention limit reductions would likely reduce interactions with protected species, regardless of any anticipated changes in effort patterns. Recreational measures were not expected to have any effect on sea turtles and smalltooth sawfish as there were no documented takes to indicate adverse effects on sea turtles, and only one documented take of a smalltooth sawfish using rod-and-reel to target sharks in federal waters prior to the implementation of Amendment 2.

The BiOp included a revised Incidental Take Statement (ITS) consistent with the modifications to the fishery implemented under Amendment 2. The Atlantic shark fishery had been managed under a 5-year ITS previously, but was modified to three years. A 3-year ITS was provided because the 5-year time period is too long for meaningful monitoring given the frequency of changes in management and the uncertainty of how effort by gear type will shift in

response to the proposed action. The BiOp's 3-year approach would reduce the likelihood of requiring re-initiation unnecessarily because of inherent variability in take levels, but would still allow for an accurate assessment of how the fishery is performing. There were three Reasonable and Prudent Measures (RPMs) that have been implemented to minimize the impacts of the actions implemented under Amendment 2 on protected resources and Terms and Conditions for implementing the RPMs. The Agency has implemented the RPMs and adheres to the terms and conditions of the ITS to ensure compliance with the ESA.

Overall, the BiOp concluded in its evaluation of the effects of the actions implemented under Amendment 2 that the fishery's impacts on both sea turtles and smalltooth sawfish would decrease. Take of these species would continue but at a reduced level in the future because of reductions in fishing effort.

Loggerhead Sea Turtles

In the BLL fishery, a total of 80 sea turtles were observed caught from 1994 through 2008 (Table 3.8 and Table 3.9). Seasonal variation indicates that most of the sea turtles were caught early in the year. Of the 80 observed sea turtles, 65 were loggerhead sea turtles, of which 34 were released alive. Another 14 loggerheads were released in an unknown condition and 17 were released dead. Based on extrapolation of observer data, 784.3 loggerhead interactions with BLL gear occurred between 2004 and 2006. An additional 17.4 unidentified sea turtles were estimated to have been taken for this time period (NMFS, 2007b; Richards, 2007a). No extrapolation has been conducted for 2007 or 2008.

Leatherback Sea Turtles

Of the 80 observed sea turtle interactions in the BLL fishery from 1994 – 2008, six were leatherback sea turtles, of which one was dead and five were released with its condition unknown (Table 3.8 and Table 3.9). Based on extrapolated takes from observer data, it was estimated that 83.2 leatherback sea turtles were taken in the shark BLL fishery from 2004 through 2006 (NMFS, 2007b; Richards, 2007a). Given the large number of turtles released in an unknown condition, these estimated take numbers do not discriminate between live and dead releases. However, leatherback mortality is usually low 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. No extrapolation has been conducted for 2007 or 2008.

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; over-utilization for commercial, recreational, scientific, or educational purposes; inadequacy of existing regulatory mechanisms; and other natural or manmade factors affecting its continued existence. NMFS is in the process

of designating critical habitat for smalltooth sawfish. A proposed rule regarding designation of critical habitat published on November 20, 2008 (73 FR 70290).

From 1994 through 2007, 15 smalltooth sawfish interactions have been observed (13 released alive, one released dead, and one released in unknown condition) in shark BLL fisheries (Morgan pers. comm.; Burgess and Morgan, 2004; Hale and Carlson, 2007; Hale *et al*., 2007). In 2008, there were two observed smalltooth sawfish interactions with shark BLL gear (Hale *et al*., 2009). Both interactions occurred in the Gulf of Mexico, and both smalltooth sawfish were released alive. Based on extrapolated takes for 2004 through 2006, 60 smalltooth sawfish have taken in the BLL fisheries (NMFS, 2007b; Richards, 2007a). No mortalities were extrapolated based on the overall extrapolated takes from 2004 to 2006; however, one known mortality occurred in 2007. NMFS has not calculated the extrapolated takes since the mortality occurred in 2007.

Marine Mammals

Four delphinids have been observed caught and released alive between 1994 and 2007, and one bottlenose dolphin was observed dead in 2003 (G. Burgess, pers. comm.; Hale and Carlson, 2007; Hale *et al*., 2007). Based on this one dead encounter in 2003 (no interactions with marine mammals and BLL were observed in 2004 through 2008), NMFS extrapolated that a total of 100 bottlenose dolphin interactions could have occurred with BLL gear during 2003-2007 (Richards, 2007a).

Seabirds

Bycatch of seabirds in the shark BLL fishery is rare with a single pelican observed killed between 1994 and 2007 (G. Burgess, University of Florida, pers. com.). In 2008, observed seabird takes were 2 brown pelicans, one herring gull, and one unidentified seabird (Hale *et al*., 2009). These birds were observed dead during BLL sets targeting grouper/snapper or grouper/shark mix in the Gulf of Mexico. No expanded estimates of seabird bycatch or catch rates are available for the BLL fishery.

Table 3.6 Species composition of observed BLL catch during 2008 for BLL trips targeting sharks in the South Atlantic.
Source: Hale *et al*., 2009.

Species	Total Number Caught	% Total Catch	% Kept	% Discarded Dead	% Discarded Alive	% Unknown
Tiger shark	920	50.1	12.2	10.2	76.8	0.8
Sandbar shark	383	20.9	85.9	1.3	11.7	1
Atlantic sharpnose shark	290	15.8	94.1	5.5	0	0.3
Blacktip shark	148	8.1	80.4	15.5	3.4	0.7
Great hammerhead shark	34	1.9	88.2	8.8	0	2.9
Bull shark	23	1.3	73.9	4.3	21.7	0
Nurse shark	13	0.7	0	0	100	0
Clearnose skate	5	0.3	100	0	0	0

Species	Total Number Caught	% Total Catch	% Kept	% Discarded Dead	% Discarded Alive	% Unknown
Blacknose shark	4	0.2	100	0	0	0
Lemon shark	3	0.2	66.7	0	33.3	0
Cobia	2	0.1	0	50	50	0
Remora	2	0.1	0	0	100	0
Southern stingray	2	0.1	0	0	100	0
Coral	1	0.1	0	0	0	100
Goliath grouper	1	0.1	0	0	100	0
Remora family	1	0.1	0	0	100	0
Sharks	1	0.1	0	100	0	0
Smooth dogfish	1	0.1	100	0	0	0
Warsaw grouper	1	0.1	100	0	0	0
Total	1835	100.0				

Table 3.7 Species composition of observed BLL catch during 2008 for BLL trips targeting sharks in the Gulf of Mexico.
Source: Hale *et al*., 2009.

Species	Total Number Caught	% Total Catch	% Kept	% Discarded Dead	% Discarded Alive	% Unknown
Sandbar shark	382	15.1	98.4	0.3	1	0.3
Atlantic sharpnose shark	327	12.9	83.2	15	0.6	1.2
Tiger shark	324	12.8	38.6	4.3	55.9	1.2
Bull shark	320	12.6	92.5	0.3	4.7	2.5
Blacktip shark	270	10.6	85.2	11.5	3	0.4
Nurse shark	241	9.5	10	0.8	89.2	0
Blacknose shark	177	7.0	83.1	15.3	1.7	0
King snake eel	108	4.3	100	0	0	0
Great hammerhead shark	69	2.7	94.2	1.4	2.9	1.4
Lemon shark	65	2.6	98.5	0	0	1.5
Scalloped hammerhead shark	38	1.5	92.1	2.6	2.6	2.6
Shortspine dogfish	28	1.1	32.1	17.9	50	0
Cubera snapper	20	0.8	90	0	0	10
Red grouper	19	0.7	78.9	15.8	5.3	0
Silky shark	19	0.7	89.5	5.3	5.3	0
Dusky shark	16	0.6	0	100	0	0
Mutton snapper	16	0.6	75	25	0	0
Southern stingray	13	0.5	7.7	0	92.3	0
Molluscs	8	0.3	0	0	100	0
Yellowedge grouper	8	0.3	87.5	12.5	0	0
Bonnethead shark	7	0.3	57.1	42.9	0	0
Caribbean reef shark	7	0.3	71.4	28.6	0	0
Goliath grouper	7	0.3	0	0	100	0

Species	Total Number Caught	% Total Catch	% Kept	% Discarded Dead	% Discarded Alive	% Unknown
Sponges	6	0.2	0	100	0	0
Gafftopsail catfish	4	0.2	25	75	0	0
Greater amberjack	4	0.2	75	0	25	0
Almaco jack	3	0.1	100	0	0	0
Coral	3	0.1	0	100	0	0
Shortfin mako shark	3	0.1	100	0	0	0
Spinner shark	3	0.1	66.7	0	33.3	0
Eels	2	0.1	50	0	50	0
Night shark	2	0.1	0	50	50	0
Requiem shark family	2	0.1	0	100	0	0
Snowy grouper	2	0.1	100	0	0	0
Bullnose ray	1	0.0	0	0	100	0
Cancer crabs	1	0.0	0	0	100	0
Clearnose skate	1	0.0	0	0	100	0
Finetooth shark	1	0.0	0	100	0	0
Great white shark	1	0.0	0	100	0	0
Octopus	1	0.0	0	0	100	0
Sea stars	1	0.0	0	0	100	0
Sharks	1	0.0	0	0	0	100
Smooth dogfish	1	0.0	0	100	0	0
Smooth hammerhead shark	1	0.0	100	0	0	0
Southern hake	1	0.0	0	100	0	0
Spiny dogfish	1	0.0	0	0	100	0
Spotted eagle ray	1	0.0	0	0	100	0
Warsaw grouper	1	0.0	100	0	0	0
Polychaete Worms	1	0.0	0	0	100	0
Total	2538	100.0				

Table 3.8 Total Number of Observed Sea Turtle Interactions by Species by Month for Years 1994-2008 in the Shark BLL Fishery.
Source: Shark BLL Observer Program

Month	Leatherback Sea Turtle	Loggerhead Sea Turtle	Other Sea Turtles	Total
Jan	1	16	1	18
Feb	3	10	6	19
Mar		7		9
Apr		4		4
May	1			1
Jun				
July		18		18
Aug		4		4
Sept	1	3	1	5
Oct		2	1	3
Nov		1		1
Dec				
Total	6	65	9	80

Table 3.9 Total number of Observed Sea Turtle Interactions by Year for Years 1994-2008 in the Shark BLL Fishery.
Source: Shark BLL Observer Program. Letters in parentheses indicate whether the sea turtle was released alive (A), dead (D), or in an unknown (U) condition.

Year	Leatherback Sea Turtle	Loggerhead Sea Turtle	Other Sea Turtle	Total
1994	1 (1U)	5 (5U)	6 (6U)	12
1995		4 (3A, 1D)		4
1996	1 (1U)	6 (3A, 2D, 1U)		7
1997	1 (1U)	5 (3A, 2U)		6
1998		2 (1A, 1D)	1 (1A)	3
1999		2 (2A)		2
2001	1 (1D)	2 (2A)		3
2002		5 (3A, 1D, 1U)		5
2003		7 (6A, 1D)	1 (1U)	8
2004		5 (3A, 2D)		5
2005	2 (1A, 1D)	4 (1A, 3D)	1 (1U)	7
2006		12 (3A, 4D, 5U),		12
2007		5 (3A, 2D)		5
2008		1 (1A)		1
Total	6	65	9	80

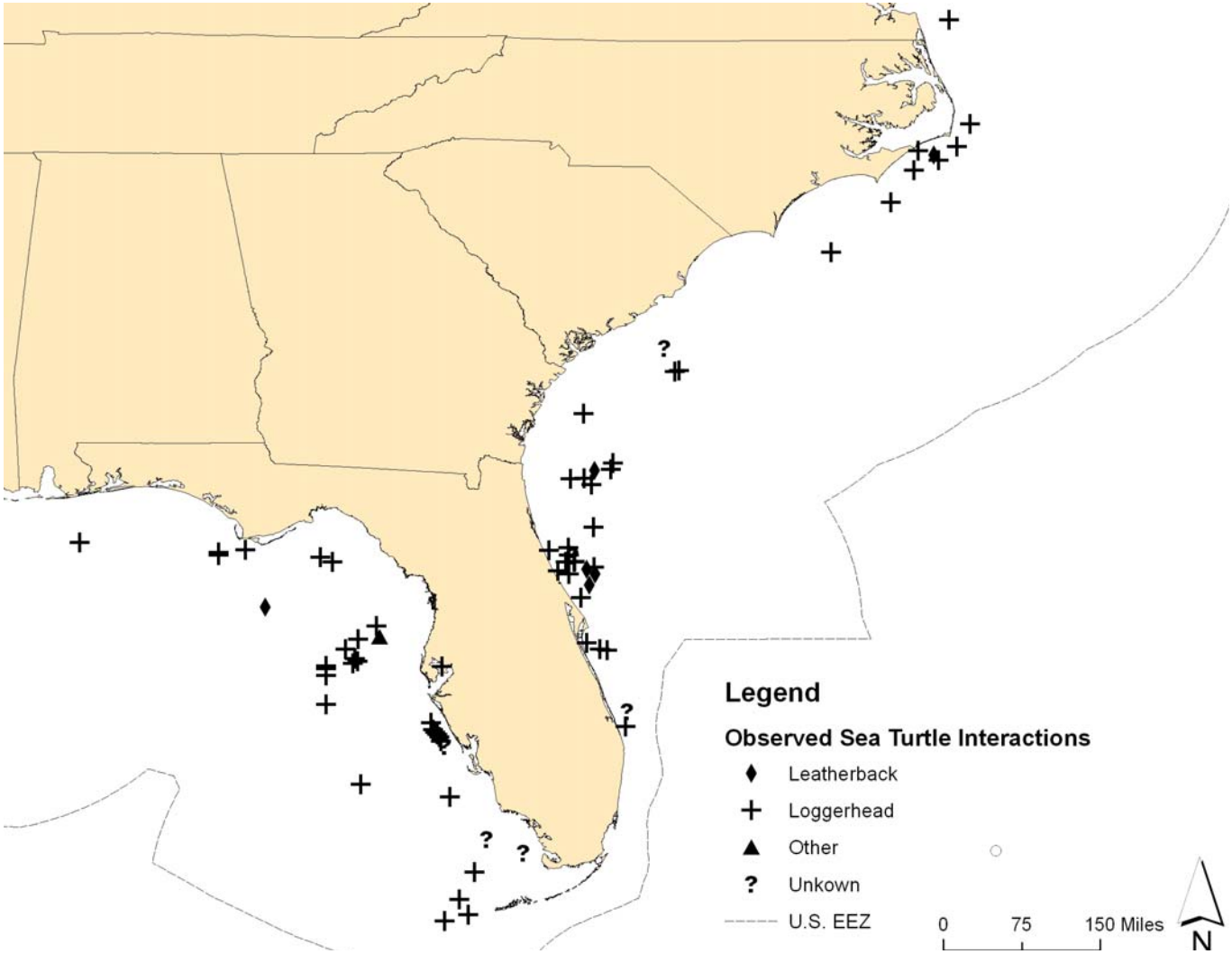

Figure 3.2 **Observed sea turtle interactions in the shark BLL fishery from 1994-2008.**
Source: Commercial Shark Fishery Observer Program data (1994-1st season of 2005) and NMFS' Shark Observer Program data (2nd season 2005-2008).

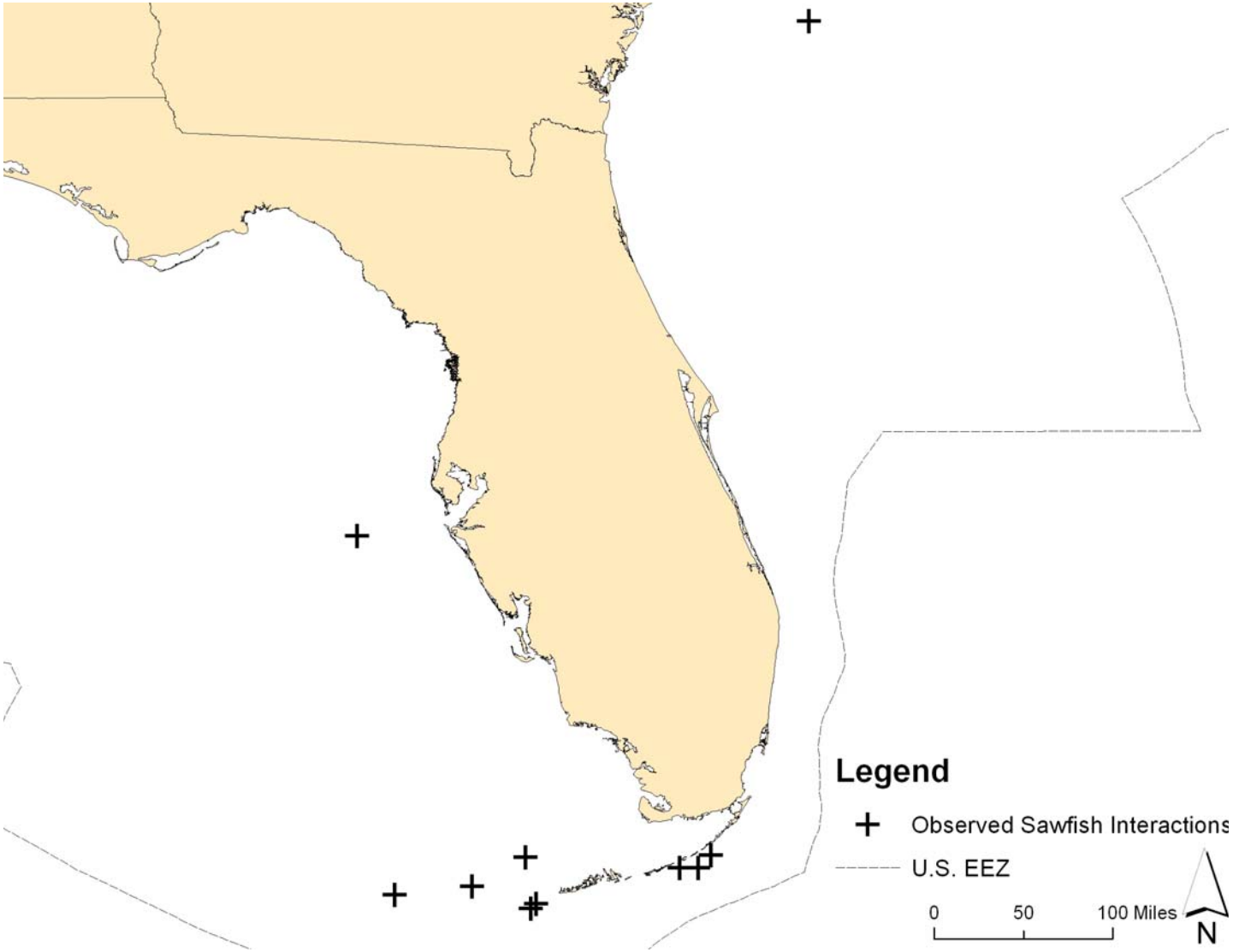

Figure 3.3 **Observed sawfish interactions in the shark BLL fishery from 1994-2008.**
Source: Commercial Shark Fishery Observer Program data (1994-1st season of 2005) and NMFS' Shark Observer Program data (2nd season 2005-2008).

3.4.2 Gillnet Fishery

3.4.2.1 Domestic History and Current Management

The southeast shark gillnet fishery is comprised of several vessels based primarily out of ports in northern Florida (South Atlantic Region). These vessels use drift gillnet, strike gillnet, and sink gillnet gear. The drift gillnet fishery set duration was on average 0.08 hours in depths ranging from 3.1m to 6.1m, and haulback averaged 0.37 hours. The average time from setting the net through completion of haulback was 2.7 hours. Stretched mesh sizes measured from 7.6-15.2 cm. Strikenetters were not observed targeting sharks in 2008, however, in 2006 this gear had the largest mesh size (22.9-30.4 cm) and the set times were 3.2 hours. Sink gillnets used to target sharks generally use 7.0-30.5 cm mesh size and the process lasted for approximately 2.36 hours (Passerotti and Carlson, 2009).

In 2001, NMFS established a requirement to conduct net checks every two hours to look for and remove any protected species. In 2007 the regulations implementing the ALWTRP were amended, thus removing the requirement for 100 percent observer coverage for drift gillnet vessels during the right whale calving season and prohibiting all gillnets in an expanded southeast U.S. restricted area from Cape Canaveral, Florida to the North Carolina/South Carolina border during November 15 – April 15. The rule has limited exemptions, which allows shark strikenet fishing only in waters south of 29° N. latitude during this same period and for Spanish mackerel, *Scomberomorus maculates,* gillnet fishing in the months of December to March. Operations in this area during this time period require VMS and observer coverage, if selected. Based on these regulations, and on current funding levels, the shark gillnet observer program now covers all anchored (sink, stab, set), strike, or drift gillnets fishing by vessels that fish from Florida to North Carolina, year-round.

3.4.2.2 Recent Catch and Landings

The following section provides information on shark landings as reported in the shark gillnet observer program. The "Catch and Bycatch in U.S. Southeast Gillnet Fisheries, 2008" report described the gear and soak time deployed by drift gillnet, strike gillnet, and sink gillnet fishermen (Passerotti and Carlson, 2009).

Gillnet Landings and Bycatch

Strikenets - NMFS published a final rule (72 FR 34632, June 25, 2007) to reduce bycatch of right whales. It prohibits gillnet fishing or gillnet possession during periods associated with the right whale calving season. Limited exemptions to the fishing prohibitions are provided for gillnet fishing for sharks and for Spanish mackerel south of 29°00' N. lat. In this area, only gillnets used in a strikenet fashion can operate during day time when right whales are present. Operation in this area at that time requires VMS and observer coverage, if selected. Vessels fishing in a strikenet fashion used nets 364.8 meters long, 30.4 meters deep, and with mesh size 22.9 cm.

The total observed strike gillnet catch consisted of eight species of sharks from 2005-2006. Finetooth and blacktip sharks made up the greatest percentage of catch in terms of total number caught in strike gillnets from 2005-2006 (Table 3.10). There were no strike gillnet trips observed in 2007, potentially due a first trimester closure of the large coastal shark fishery. This closure was required because of 2006 landings in excess of the quota (Baremore *et al.*, 2007). Similarly, in 2008, no vessels were observed using strikenets to target sharks. This is likely due to the large coastal shark fishery closure in place during the first half of 2008, correcting for overages from the 2007 harvest (Passerotti and Carlson, 2009).

In the strikenet fishery from 2005-2006, 99.7 percent of the observed catch were sharks with only 0.15 percent teleosts, and 0.07 percent non-shark elasmobranchs. Blacktip, finetooth, and spinner shark comprised over 94 percent of the observed shark strike net catch by number and weight. Tarpon and little tunny were the teleosts encountered most frequently (Carlson and Bethea, 2007).

Drift Gillnets – In 2007, a total of five driftnet gillnet vessels were observed making 84 sets on 11 trips. Of those trips, there were 3 vessels observed that targeted sharks for a total of 4 trips and 4 hauls. The total observed catch composition for sets targeting sharks was 86.7 percent shark, 13.3 percent teleosts, zero percent non-shark elasmobranches, and zero percent protected resources. Two species of sharks made up 98.1 percent of the observed shark catch: Atlantic sharpnose shark and blacknose shark. By weight, the shark catch was composed of Atlantic sharpnose, followed by scalloped hammerhead shark, blacknose shark, and blacktip shark. Three species of teleosts made up approximately 97 percent by number of the overall non-shark species. These species were little tunny, king mackerel, and barracudas (Baremore *et al.*, 2007).

In 2008, a total of five driftnet gillnet vessels were observed making 68 sets on 9 trips. The total observed catch composition for sets targeting sharks was 74.9 percent shark, 22.2 percent teleosts, 1.8 percent non-shark elasmobranches, and zero percent protected resources. Two species of sharks made up 99.1 percent of the observed shark catch by number: smooth dogfish (87.2 percent) and spiny dogfish (11.8 percent) (Table 3.11). By weight, the shark catch was composed of smooth dogfish, followed by spiny dogfish, and Atlantic sharpnose. Five species of teleosts made up the majority of the non-shark catch, including: bluefish, Spanish mackerel, butterfish, menhaden and king mackerel (Passerotti and Carlson, 2009).

Sink Gillnets - Sinknet landings and bycatch vary by target species. A total of 29 trips making 112 sink net sets on six vessels were observed in 2007. Of those, 17 trips making 60 sets targeted sharks, 3 trips making 27 sets targeted Spanish mackerel, and 4 trips making 9 sets targeted Atlantic croaker, and 6 trips making 16 sets targeted other teleosts. Sink gillnets that targeted sharks caught 97.8 percent shark, 1.4 percent teleosts, 0.7 percent non-shark elasmobranches, and 0.1 percent protected resources. By number, the shark catch was primarily bonnethead shark, finetooth shark, Atlantic sharpnose shark, and blacknose shark. By weight the shark catch was made up of mostly finetooth shark, followed by bonnethead shark, blacknose shark, and spinner shark. Cobia made up 25.8 percent of the teleost catch, followed by Gulf kingfish and banded drum. Cownose ray and Atlantic guitarfish and other stingrays made up 100 percent of the non-shark elasmobranch catch (Baremore *et al*., 2007).

Catch of vessels targeting Spanish mackerel was 99.4 teleosts and 0.6 percent shark. Shark catches were mostly Atlantic sharpnose by number, and blacktip and bonnethead sharks. By weight, spiny dogfish were the predominant catch, followed by smooth dogfish, blacktip shark, and bonnethead shark. Spanish mackerel, butterfish, and bluefish made up the majority of the catch (Baremore *et al*., 2007).

Sink gillnet vessels targeting croaker caught 3.2 percent sharks, 96.7 percent teleosts, an 0.01 percent non-shark elasmobranches. Sink gillnet vessels that targeted other species other than sharks, Spanish mackerel, and Atlantic croaker caught mostly bluefish and Atlantic croaker (Baremore *et al*., 2007).

A total of 41 trips making 134 sink net sets on 14 vessels were observed in 2008. Target species included shark, Spanish mackerel, Southern kingfish, and goosefish (monkfish). Specific proportion breakdown of target species by trip was not possible in the 2008 data due to vessel confidentiality restrictions. Sink gillnets, regardless of target species, caught 86.0 percent teleosts, 12.0 percent sharks, 1.7 percent non-shark elasmobranchs and zero percent protected resources. By number, the shark catch was primarily Atlantic sharpnose shark (45.3 percent), bonnethead shark (34.0 percent), blacknose shark (8.0 percent) and spinner shark (6.7 percent) (Table 3.12). By weight the shark catch was made up of mostly Atlantic sharpnose shark, followed by bonnethead shark, blacknose shark and spinner shark, finetooth shark. Spanish mackerel made up 45.7 percent of the teleost catch, followed by bluefish, blue runner, Atlantic bumper, and spot. Winter skate and Cownose ray made up the majority of the non-shark elasmobranch catch (Passerotti and Carlson, 2009).

Loggerhead Sea Turtles

Loggerhead sea turtles are rarely caught in the shark gillnet fishery. No loggerheads 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 were 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, 2003a).

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). In 2005, five loggerheads were observed caught, and in 2006, three loggerheads were observed caught (Table 3.13). In 2007, 4 loggerhead sea turtles were observed, three were released alive, and one was released in an unknown condition (Baremore *et al*., 2007). There were no observed loggerhead sea turtle interactions in 2008 (Passerotti and Carlson, 2009).

Leatherback Sea Turtles

In the shark gillnet fishery, leatherback sea turtles are sporadically caught. 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 2 in 2002 (Carlson, 2000; Carlson and Baremore, 2001; Carlson and Baremore, 2002a; Garrison, 2003a). 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.). In 2005, one leatherback turtle was caught and released alive (Table 3.13). In 2006 and 2007, no leatherbacks were observed caught in gillnets (Carlson and Bethea, 2007; Baremore *et al*., 2007; Table 3.13). There were no observed leatherback sea turtle interactions in 2008 (Passerotti and Carlson, 2009).

Smalltooth Sawfish

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 off the west coast of Florida and was released alive (Carlson and Baremore, 2003). 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. 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. From 2004-2008, there were no observed catches of smalltooth sawfish in shark gillnet fisheries.

Although sometimes described as a lethargic demersal species, smalltooth sawfish feed mostly on schooling fish, 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.

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 2008 BiOp permitted one incidental take of smalltooth sawfish (released alive) from 2008 through 2011 as a result of the use of all gillnets in this fishery (NMFS, 2008b).

Marine Mammals

Observed takes of marine mammals in the Southeast Atlantic shark gillnet fishery during 1999 – 2007 totaled 12 bottlenose dolphins and four spotted dolphins. Extrapolated observations from 2004-2006 suggest 1.4 interactions with bottlenose dolphin and zero Atlantic spotted dolphin outside the right whale season. During the right whale season, there was one interaction

with bottlenose dolphins and zero interactions with Atlantic spotted dolphins in the shark gillnet fishery from 2004 through 2006 (Garrison, 2007).

On January 22, 2006, a dead right whale was spotted offshore of Jacksonville Beach, Florida. The survey team identified the whale as a right whale calf, and photos indicated the calf as having one large wound along the midline and smaller lesions around the base of its tail. The right whale calf was located at 30°14.4' N. Lat., 81° 4.2'′ W. Long., which was approximately 1 nautical mile outside of the designated right whale critical habitat, but within the Southeast U.S. Restricted Area. NMFS determined that both the entanglement and death of the whale occurred within the Southeast U.S. Restricted Area, and all available evidence suggested the entanglement and injury of the whale by gillnet gear ultimately led to the death of the animal.

On February 16, 2006, NMFS published a temporary rule (71 FR 8223) to prohibit, through March 31, 2006, any vessel from fishing with any gillnet gear in the Atlantic Ocean waters between 32°00' N. Lat. (near Savannah, GA) and 27°51' N. Lat. (near Sebastian Inlet, FL) and extending from the shore eastward out to 80°00' W. long under the authority of the ALWTRP (50 CFR 229.32 (g)) and ESA. NMFS took this action based on its determination that a right whale mortality was the result of an entanglement by gillnet gear within the Southeast U.S. Restricted Area.

NMFS implemented the final rule on June 25, 2007 (72 FR 34632), that prohibits gillnet fishing, including shark gillnet fishing, from November 15 to April 15, between the NC/SC border and 29° 00' N. The action was taken to prevent the significant risk to the wellbeing of endangered right whales from entanglement in gillnet gear in the core right whale calving area during calving season. Limited exemptions to the fishing prohibitions are provided for gillnet fishing for sharks and for Spanish mackerel south of 29°00' N. lat. Shark gillnet vessels fishing between 29° 00' N and 26° 46.5' N have certain requirements as outlined 50 CFR § 229.32 from December 1 through March 31 of each year. These include vessel operators contacting the SEFSC Panama City Laboratory at least 48 hours prior to departure of a fishing trip in order to arrange for an observer.

In addition, a recent rule (October 5, 2007, 72 FR 57104) amends restriction in the Southeast U.S. Monitoring Area from December 1 through March 31. In that area no person may fish with or possess gillnet gear for sharks with webbing of 5" or greater stretched mesh unless the operator of the vessel is in compliance with the VMS requirements found in 50 CFR 635.69. The Southeast U.S. Monitoring Area is from 27°51' N. (near Sebastian Inlet, FL) south to 26°46.5' N. (near West Palm Beach, FL), extending from the shoreline or exemption line eastward to 80°00' W. In addition, NMFS may select any shark gillnet vessel regulated under the ALWTRP to carry an observer. When selected, the vessels are required to take observers on a mandatory basis in compliance with the requirements for at-sea observer coverage found in 50 CFR 229.7. Any vessel that fails to carry an observer once selected is prohibited from fishing pursuant to 50 CFR § 635. There are additional gear marking requirements that can be found at 50 CFR § 229.32.

Table 3.10 Total Strike gillnet Shark Catch and Bycatch by Species in order of Decreasing Abundance for all Observed Trips, 2005-2006.
Source: Carlson and Bethea, 2007.

Species	Total Number Caught	Kept (%)	Discarded Alive (%)	Discarded Dead (%)
Blacktip shark	9,831	89.5	0.2	10.3
Finetooth	1,687	100	0	0
Spinner Shark	1,108	100	0	0
Blacknose shark	541	100	0	0
Dusky shark	20	0	25	75
Atlantic sharpnose	7	100	0	0
Scalloped Hammerhead	7	71.4	0	28.6
Tarpon	5	0	0	100
Blackfin tuna	5	100	0	0
Manta ray	4	0	100	0
Bonnethead shark	3	100	0	0
Cobia	3	100	0	0
Cownose ray	3	0	33.3	66.7
Red drum	2	0	50	50
Bull shark	2	100	0	0
Spotted eagle ray	2	0	100	0
Nurse shark	1	100	0	0
Crevalle jack	1	100	0	0
Southern flounder	1	100	0	0
Barracudas	1	0	0	100
Remoras	1	100	0	0
Ocellated flounder	1	0	0	100
Total	**13,236**			

Table 3.11 Total Shark Catch and bycatch by Species and Species Disposition in Order of Decreasing Abundance for all Observed Drift gillnet Sets 2008.
Source: Passerotti and Carlson, 2009

Species	Total Number Caught	Kept (%)	Discarded Alive (%)	Discarded Dead (%)
Smooth dogfish	2331	79.1	20.9	0.0
Bluefish	340	74.1	11.5	14.4
Spiny dogfish	316	0.0	100.0	0.0
Spanish mackerel	268	93.3	0.0	6.7
Butterfish	59	98.3	0.0	1.7
Clearnose skate	56	0.0	100.0	0.0
Menhaden	39	0.0	7.7	92.3
King mackerel	34	97.1	0.0	2.9
Jellyfishes	34	0.0	100.0	0.0
Atlantic croaker	22	0.0	31.8	68.2
Blue crab	8	0.0	100.0	0.0
Flounders	8	0.0	100.0	0.0
Cobia	7	42.9	28.6	28.6
Atlantic sharpnose shark	7	28.6	71.4	0.0
Thresher shark	6	100.0	0.0	0.0
Stingrays	5	0.0	100.0	0.0
Remora	4	0.0	100.0	0.0
Cownose ray	3	0.0	100.0	0.0
Lookdown	3	0.0	66.7	33.3
Sand tiger shark	3	0.0	100.0	0.0
Lady fish	2	0.0	0.0	100.0
Blacktip shark	2	50.0	50.0	0.0
Sandbar shark	2	0.0	100.0	0.0
Angel shark	2	0.0	100.0	0.0
Flounders	2	100.0	0.0	0.0
Spadefish	1	0.0	100.0	0.0
Atlantic bonito	1	100.0	0.0	0.0
Red drum	1	0.0	100.0	0.0
Blacknose shark	1	0.0	0.0	100.0
Spinner shark	1	0.0	100.0	0.0
Great hammerhead shark	1	0.0	100.0	0.0
Total	**3569**			

Table 3.12 Total Sink gillnet Shark Catch and Bycatch by Species in order of Decreasing Abundance for all Observed Trips, 2008.
Source: Passerotti and Carlson, 2009.

Species	Total Number Caught	Kept (%)	Discarded Alive (%)	Discarded Dead (%)
Spanish mackerel	5875	98.3	0.0	1.7
Bluefish	1969	97.1	1.2	1.7
Blue runner	1105	99.3	0.0	0.7
Atlantic bumper	1040	86.8	6.6	6.5
Atlantic sharpnose shark	853	73.4	11.4	15.2
Spot	657	87.5	5.9	6.5
Bonnethead	609	86.4	3.9	9.7
Goosefish family	414	76.6	1.2	22.2
Yellowfin menhaden	393	60.8	5.1	34.1
Sand drum	340	0.0	25.0	75.0
Southern kingfish	281	98.2	0.0	1.8
Winter skate	238	50.0	6.3	43.7
Blacknose shark	143	98.6	1.4	0.0
Spinner shark	120	55.0	10.8	34.2
Atlantic moonfish	115	59.1	18.3	22.6
King mackerel	115	21.7	2.6	75.7
Atlantic croaker	79	78.5	2.5	19.0
Banded drum	79	16.5	13.9	69.6
Blacktip shark	73	24.7	63.0	12.3
Butterfish	57	96.5	3.5	0.0
Flounder family	49	85.7	8.2	6.1
Crevalle jack	34	100.0	0.0	0.0
Florida pompano	25	68.0	32.0	0.0
Cobia	25	28.0	32.0	40.0
Weakfish	25	84.0	0.0	16.0
Horseshoe crab	19	0.0	100.0	0.0
Atlantic cutlassfish	18	94.4	0.0	5.6
Silver perch	18	77.8	0.0	22.2
Gafftopsail catfish	17	0.0	11.8	88.2
Scalloped hammerhead shark	16	12.5	75.0	12.5
Seatrout family	15	93.3	0.0	6.7
Jellyfish family	14	0.0	0.0	100.0
Gulf kingfish	14	100.0	0.0	0.0
Gulf butterfish	12	83.3	0.0	16.7

Species	Total Number Caught	Kept (%)	Discarded Alive (%)	Discarded Dead (%)
Menhaden	10	0.0	0.0	100.0
Cownose ray	9	0.0	100.0	0.0
Sea robins	9	0.0	88.9	11.1
Herring	9	0.0	22.2	77.8
Spiny dogfish	9	0.0	22.2	77.8
Pomfrets	7	0.0	0.0	100.0
Atlantic thread herring	6	16.7	33.3	50.0
Spadefish	6	0.0	16.7	83.3
Unknown teleost-eaten/damaged	6	0.0	0.0	100.0
Lookdown	5	0.0	0.0	100.0
Ladyfish	5	80.0	20.0	0.0
Remoras	6	0.0	100.0	0.0
Finetooth shark	4	25.0	75.0	0.0
Rays	3	0.0	100.0	0.0
Little tunny	3	100.0	0.0	0.0
Dusky shark	3	0.0	0.0	100.0
Houndfish	2	100.0	0.0	0.0
Inshore lizardfish	2	0.0	0.0	100.0
Swimming crabs	2	0.0	50.0	50.0
Devil ray	2	0.0	50.0	50.0
Spotted eagle ray	2	0.0	100.0	0.0
Smooth dogfish	2	0.0	100.0	0.0
Sand tiger shark	2	0.0	100.0	0.0
Atlantic guitarfish	1	0.0	100.0	0.0
Southern flounder	1	100.0	0.0	0.0
Pigfish	1	100.0	0.0	0.0
Bullnose ray	1	0.0	100.0	0.0
Manta ray	1	0.0	100.0	0.0
Silver seatrout	1	0.0	0.0	100.0
Barred grunt	1	0.0	100.0	0.0
Unicorn filefish	1	100.0	0.0	0.0

Table 3.13 Total number of Observed Sea Turtle Interactions by Year from 2000-2008 in the Shark Gillnet Fishery.

Source: Directed Shark Gillnet Observer Program. Letters in parentheses indicate whether the sea turtle was released alive (A), dead (D), or unknown (U).

Year	Leatherback Sea Turtle	Loggerhead Sea Turtle	Total
2000		1 (U)	1
2001		1 (U)	1
2002		1 (U)	1
2003			0
2004			0
2005	1(A)	5 (4A, 1D)	6
2006		3 (2A, 1D)	3
2007		4 (3A, 1U)	4
2008			0
Total	1	15	16

Table 3.14 Observed Interactions of Sea Turtles in the PLL Fishery and Directed Shark BLL and Gillnet Fishery by Year and Gear Type (LGH = Loggerhead, LTRB = Leatherback).

Source: Directed Shark Gillnet Observer Program, BLL Observer Program, PLL Observer Program.

		2004			2005			2006			2007			2008		
		LGH	LTRB	Other	LGH	LTRB	Other	LGH	LTRB	Other	LGH	LTRB	Other	LGH	LTRB	Other
Gillnet	Drift Gillnet	0	0	0	4	1	0	0	0	0	1	0	0	0	0	0
	Strikenet	0	0	0	1	0	0	3	0	0	0	0	0	0	0	0
	Sink Gillnet	0	0	0	1	0	0	0	0	0	3	0	0	0	0	0
Pelagic Longline		733	1,362	0	282	368	0	558	415	11	542	500	1	Data not available		
Bottom Longline		5	0	0	4	2	0	12	0	0	5	0	0	1	0	0
Total		2,100			662			999			1,052					

3.4.3 Pelagic Longline Fishery

3.4.3.1 Domestic History and Current Management

The U.S. PLL fishery for Atlantic HMS primarily targets swordfish, yellowfin tuna, and bigeye tuna in various areas and seasons. Secondary target species include dolphin, albacore tuna, and to a lesser degree 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. PLL gear sometimes attracts and hooks non-target finfish with little or 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 MMPA. 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.

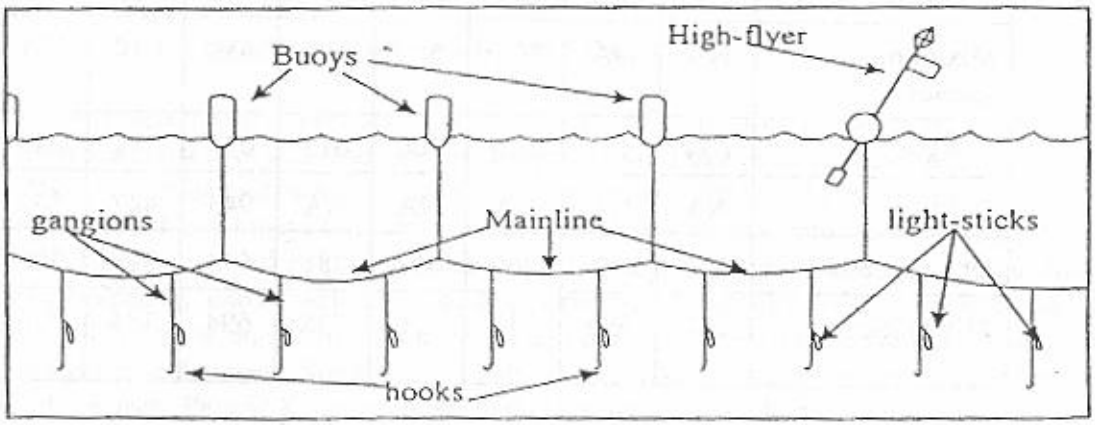

Figure 3.4 Typical U.S. PLL Gear.
Source: Arocha, 1996

PLL gear is composed of several parts (see Figure 3.4[1]) (NMFS, 1999). 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, or gangion, 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, PLL gear is generally 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

[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.

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 3.15) (NMFS, 1999). The PLL gear components may also be deployed as a trolling gear to target surface feeding tunas. Under this configuration, the mainline and gangions are elevated and actively trolled so that the baits fish on or above the water's surface. This style of fishing is often referred to as "green-stick fishing," and reports indicate that it can be extremely efficient compared to conventional fishing techniques. For more information on green-stick fishing gear and the configurations allowed under current regulations, please refer to section 4.8 of the 2008 SAFE Report for Highly Migratory Species.

Table 3.15 Average Number of Hooks per PLL Set, 1999-2006.
Source: PLL logbook data.

Target Species	1999	2000	2001	2002	2003	2004	2005	2006	2007
Swordfish	521	550	625	695	711	701	747	742	672
Bigeye Tuna	768	454	671	755	967	400	634	754	773
Yellowfin Tuna	741	772	731	715	720	696	691	704	672
Mix of tuna species	NA	638	719	767	765	779	692	676	640
Shark	613	621	571	640	696	717	542	509	494
Dolphin	NA	943	447	542	692	1,033	734	988	789
Other species	781	504	318	300	865	270	889	236	NA
Mix of species	738	694	754	756	747	777	786	777	757

Regional U.S. Pelagic Longline Fisheries Description

The U.S. PLL fishery sector has historically been 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, these segments have historically differed 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). Due to the various changes in the fishery, *i.e.*, regulations, operating costs, market conditions, availability, etc., the fishing practices and strategies of these different segments may change over time.

Management of the U.S. Pelagic Longline Fishery

The U.S. Atlantic PLL fishery is restricted by a 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; bluefin tuna target catch requirements; shark quotas; protected species incidental take limits; reporting requirements (including logbooks);

gear and bait requirements; limited access vessel permits, and mandatory workshop 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 PLL gear must be discarded, and are considered bycatch. PLL is a heavily managed gear type and, as such, is strictly monitored. Because it is difficult for PLL fishermen to avoid undersized or prohibited 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 decrease bycatch in the PLL fishery by closing those areas with the highest rates of bycatch. There are also time/area closures for PLL 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 PLL vessels to report positions on an approved VMS.

In addition to the regulations mentioned above, vessels with PLL gear onboard, at all times, in all areas open to PLL fishing, excluding the NED, must possess onboard and/or use only 16/0 or larger non-offset circle hooks and/or 18/0 or larger circle hooks with an offset not to exceed ten degrees. Only whole finfish and squid baits may be possessed and/or utilized with allowable hooks. All PLL vessels must possess and use sea turtle handling and release gear in compliance with NMFS careful release protocols. Additionally, all PLL vessel owners and operators must be certified in the use of the protected species handling and release gear. Certification must be renewed every three years and can be obtained by attending a workshop.

Permits

The 1999 FMP established six different LAP types: (1) directed swordfish, (2) incidental swordfish, (3) swordfish handgear, (4) directed shark, (5) incidental shark, and (6) tuna longline. To reduce bycatch in the PLL 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. This allows limited retention of species that might otherwise have been discarded.

As of May 1, 2008, approximately 241 tuna longline limited access permits had been issued. In addition, approximately 181 directed swordfish limited access permits, 76 incidental swordfish limited access permits, 214 directed shark limited access permits, and 285 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 in HMS fisheries.

Monitoring and Reporting

PLL 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

During 2007, NMFS observers recorded 944 PLL sets for an overall fishery coverage of 10.8 percent. (Fairfield and Garrison, 2008) Table 3.16 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 3.16 Observer Coverage of the PLL Fishery.
Source: Yeung, 2001; Garrison, 2003b; Garrison and Richards, 2004; Garrison, 2005; Walsh and Garrison, 2006, 2007.

Year	Number of Sets Observed			Percentage of Total Number of Sets		
1999	420			3.8		
2000	464			4.2		
2001*	Total	Non-NED	NED	Total	Non-NED	NED
	584	398	186	5.4	3.7	100.0
2002*	856	353	503	8.9	3.9	100.0
2003*	1088	552	536	11.5	6.2	100.0
	Total	Non-EXP	EXP	Total	Non-EXP	EXP
2004**	702	642	60	7.3	6.7	100.0
2005**	796	549	247	10.1	7.2	100.0
2006	568	-	-	7.5	-	-
2007	944	-	-	10.8	-	-

*In 2001, 2002, and 2003, 100 percent observer coverage was required in the NED research experiment.
** In 2004 and 2005 there was 100 percent observer coverage in experimental fishing (EXP).

3.4.3.2 Recent Catch and Landings

U.S. PLL catch (including bycatch, incidental catch, and target catch) is largely related to vessel and gear characteristics, but is summarized for the whole fishery in Table 3.17.

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).

Table 3.17 Reported Catch of Species Caught by U.S. Atlantic PLLs, in Number of Fish, for 2000-2007. Source: PLL Logbook Data.

Species	2000	2001	2002	2003	2004	2005	2006	2007
Swordfish Kept	62,978	47,560	49,320	51,835	46,440	41,139	38,241	45,933
Swordfish Discarded	17,074	13,993	13,035	11,829	10,675	11,134	8,900	11,823
Blue Marlin Discarded	1,443	635	1,175	595	712	567	439	611
White Marlin Discarded	1,261	848	1,438	809	1,053	989	557	744
Sailfish Discarded	1,091	356	379	277	424	367	277	321
Spearfish Discarded	78	137	148	108	172	150	142	147
Bluefin Tuna Kept	235	177	178	273	475	375	261	337
Bluefin Tuna Discarded	737	348	585	881	1,031	765	833	1,345
Bigeye, Albacore, Yellowfin, Skipjack Tunas Kept	94,136	80,466	79,917	63,321	76,962	57,132	73,058	70,390
Pelagic Sharks Kept	3,065	3,460	2,987	3,037	3,440	3,149	2,098	3,504
Pelagic Sharks Discarded	28,046	23,813	22,828	21,705	25,355	21,550	24,113	27,478
Large Coastal Sharks Kept	7,896	6,478	4,077	5,326	2,292	3,362	1,768	546
Large Coastal Sharks Discarded	6,973	4,836	3,815	4,813	5,230	5,877	5,326	7,133
Dolphin Kept	29,125	27,586	30,384	29,372	38,769	25,707	25,658	68,124
Wahoo Kept	4,193	3,068	4,188	3,919	4,633	3,348	3,608	3,073
Turtle Interactions	271	424	465	399	369	152	128	300
Number of Hooks (x 1,000)	*7,976*	*7,564*	*7,150*	*7,008*	*7,276*	*5,911*	*5,662*	*6,291*

Incidental bycatch

Other species including marine mammals, turtles, seabirds, and finfish are occasionally hooked by pelagic longling vessels. For detailed descriptions of interactions with these species, please refer to section 3.4.1.2 of the 2006 Consolidated HMS FMP.

3.4.3.3 Safety Issues

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 in the PLL

fishery. 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.

3.4.3.4 International Issues and Catch

PLL fisheries for Atlantic HMS primarily target swordfish and tunas. Directed PLL fisheries in the Atlantic have been operated by Spain, the United States, and Canada since the late 1950s or early 1960s. The Japanese PLL tuna fishery started in 1956 and has operated throughout the Atlantic since then (NMFS, 1999). Most of the 46 other ICCAT nations now also operate PLL 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 PLL 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 PLL fishing for bluefin tuna in the Gulf of Mexico, and mandated reductions in Atlantic white and blue marlin landings for PLL 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 PLL fishery. For example, a discussion of the authorized 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 PLL. 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 (SCRS, 2004). Purse seines produce the highest volume of catch of ICCAT managed species from the Atlantic (SCRS, 2004). Figure 3.5 shows the aggregate distribution of hooks from all fishing fleets from 2000-2006. In 2007, international longline landings of HMS in fisheries in which the U.S. participated totaled 102,876 mt, which represented a continuation of the generally decreasing trend since 1999.

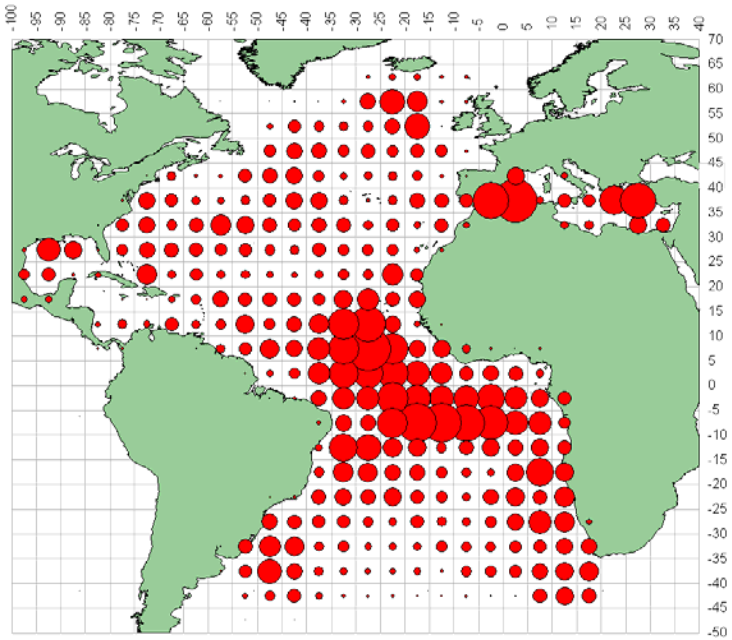

Figure 3.5 **Aggregate Distribution of Hooks Deployed by All ICCAT Parties 2000-2006.**
Source: SCRS, 2008.

Scientific observer data are being collected on a range of PLL 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 PLL (per ICCAT Recommendation 96-01), are no longer in force. There is currently no ICCAT required minimum level of observer coverage specific to PLL fishing. Nevertheless, the United States has implemented a mandatory observer program in the U.S. PLL fishery. Japan is required to have eight percent observer coverage of its vessels fishing for swordfish in the North Atlantic, which are primarily PLL 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, requires at least five percent observer coverage of PLL vessels over 24 meters participating in that particular fishery.

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 3.18). 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 3.18 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%

U.S. Pelagic Longline Catch in Relation to International Catch

Highly Migratory Species

The U.S. PLL fleet represents a small fraction of the international PLL fleet that competes on the high seas for catches of tunas and swordfish. In recent years, the proportion of U.S. PLL landings of HMS, for the fisheries in which the United States participates, has remained relatively stable in proportion to international landings. 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. Within the area where the U.S. longline fleet operates, U.S. longline landings still represent a limited fraction of total landings. In recent years (1999-2007), the U.S. longline landings have averaged 4.9 percent of total Atlantic longline landings, ranging from a high of 5.5 percent in 1999 to a low of 4.2 percent in 2002.

Atlantic Sharks

Data collection from international fisheries for Atlantic sharks has improved in recent years due to increasing reporting requirements adopted by ICCAT. At its annual meeting in New Orleans in 2004, ICCAT adopted *Recommendation 04-10 Concerning the Conservation of Sharks Caught in Association with Fisheries Managed by ICCAT.* Recommendation 04-10 required ICCAT Contracting Parties to report Task I and Task II data for catches of sharks in accordance with ICCAT data reporting procedures to allow for assessment of stocks.

Recommendation 04-01 also banned shark finning, requires vessels to fully utilize their entire catches of sharks, and encourages the release of live sharks that are caught incidentally and are not used for food.

At the 2006 ICCAT annual meeting in Dubrovnik, Croatia, ICCAT adopted Recommendation 06-10 which amended Paragraph 7 of *Recommendation 04-10 Concerning the Conservation of Sharks Caught in Association with Fisheries Managed by ICCAT*. The new paragraph called for SCRS to conduct stock assessments and recommend management alternatives for Atlantic blue sharks and shortfin mako sharks in time for consideration at the 2008 annual ICCAT meeting. It also required a data preparatory meeting to be held in 2007 to review all relevant data on biological parameters, catch, effort, discards, trade, and historical data.

At the 2007 ICCAT annual meeting in Antalya, Turkey, ICCAT adopted a recommendation (07-06) concerning pelagic sharks. That recommendation called for the SCRS to conduct stock assessments and recommend management alternatives for porbeagle sharks, for Contracting Parties to take appropriate measures to reduce fishing mortality in porbeagles and North Atlantic shortfin mako sharks, and implement research on pelagic shark species caught in the Convention area in order to identify potential nursery areas. It also required that Contracting Parties, Cooperating non-Contracting Parties, Entities and Fishing Entities submit Task I and II data for sharks in advance of the next SCRS assessment.

In 2008, the SCRS assessed blue sharks, and shortfin mako sharks. SCRS concluded that blue sharks were not overfished or experiencing overfishing. SCRS concluded that shortfin mako sharks were at or slightly below levels that could support MSY and produced widely varying estimates of fishing mortality (0.48 to 3.77). At the 2008 ICCAT annual meeting in Marrakech, Morocco, ICCAT adopted a recommendation requiring the live release of bigeye thresher sharks that are brought to the boat alive as well as reporting bycatch and live releases of bigeye thresher sharks. The most recent catch totals for blue and shortfin mako sharks are presented in Tables 3.19 and 3.20.

Table 3.19 Nominal Catches of Blue Shark Reported to ICCAT (landings and discards) by Major Gear and Flag between 1991 and 2007 (NLD=No Landing Data).
Source: SCRS, 2008.

		1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007
Atlantic Total		3,533	2,343	7,879	8,310	8,422	9,036	36,895	33,211	34,208	38,512	33,859	31,867	35,301	35,359	20,596	13,066	44,623
LANDINGS	BELIZE	0	0	0	0	0	0	0	0	0	0	0	0	0	37	259	0	236
	BENIN	0	0	0	0	0	0	6	4	27	0	0	0	0	0	0	0	NLD
	BRAZIL	0	0	0	0	0	743	1,103	0	179	1,683	2,173	1,971	2,166	1,667	2,523	2,591	2,258
	CANADA	0	0	0	0	276	12	11	5	54	18	0	5	6	0	11	4	
	CAPE VERDE	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	NLD
	CHINA P.R.	0	0	0	0	0	0	0	0	0	0	750	420	600	0	0	0	952
	CHINESE TAIPEI	0	0	0	0	0	0	0	0	0	0	0	0	692	1,006	1,106	2,383	2,339
	EC DENMARK	1	1	0	1	2	3	1	1	0	2	1	13	5	1	0	0	NLD
	EC ESPANA	0	0	0	0	0	0	29,769	28,078	28,984	31,063	25,105	21,034	22,601	24,680	21,416	24,188	25,980
	EC FRANCE	187	276	322	350	266	278	213	163	399	395	207	221	57	106	120	99	167
	EC IRELAND	0	0	0	0	0	0	0	0	66	31	66	11	2	0	0	0	NLD
	EC PORTUGAL	2,257	1,583	5,726	4,669	5,569	5,710	3,966	3,316	3,337	4,215	4,672	4,589	7,484	3,888	7,211	7,089	9,776
	EC UNITED KINGDOM	0	0	0	0	12	0	0	1	0	12	9	6	4	6	5	242	6
	JAPAN	0	0	0	2,116	1,078	906	963	1090	771	553	578	718	893	1,308	1,739	2,813	2,433
	MEXICO	0	0	0	0	0	0	0	0	0	0	6	0	0	0	0	0	0
	NAMIBIA	0	0	0	0	0	0	0	0	0	0	0	2,213	0	1,906	6,616	0	NLD
	PANAMA	0	0	0	0	0	0	0	0	177	22	0	0	0	0	0	254	NLD
	SOUTH AFRICA	0	0	0	0	0	0	0	23	21	0	83	63	232	128	154	90	82
	TRINIDAD & TOBAGO	0	0	0	0	0	0	0	0	0	0	0	6	3	2	1	1	0
	USA	308	215	680	29	23	283	211	255	217	291	42	0	1	7	2	2	1
	UK BERMUDA	0	0	0	0	0	0	1	2	0	0	0	0	0	0	0	0	0
	URUGUAY	8	107	10	84	57	259	180	248	118	81	66	85	480	462	376	232	337
	VENEZUELA	0	0	0	0	0	0	0	0	0	0	0	0	0	9	26	10	18
	BRAZIL	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	60
	CANADA	0	0	0	0	0	0	0	16	0	0	0	0	0	0	0	0	NLD
DISCARDS	JAPAN	0	0	0	7,571	5,379	6,881	6,164	5,998	4,442	4,150	3,318	2,184	4,753	3,784	2,827	3,921	NLD
	USA	772	184	1,136	572	618	711	185	196	101	137	106	68	0	65	66	45	38
	UK BERMUDA	0	0	0	0	3	1	0	0	8	0	0	0	0	0	0	0	NLD

Table 3.20 Nominal Catches of Shortfin Mako Shark Reported to ICCAT (landings and discards) by Major Gear and Flag between 1991 and 2007 (NLD=No Landing Data).
Source: SCRS, 2008.

		1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007
Atlantic Total		1,210	1,302	2,957	2,952	4,866	2,771	5,577	5,275	4,002	4,858	4,683	5,380	7,370	7,510	3,801	3,346	6,425
LANDINGS	BRAZIL	0	0	0	0	0	83	190	0	27	219	409	226	283	238	426	210	36
	CANADA	0	0	0	0	111	67	110	69	70	78	69	78	73	80	91	71	72
	CHINA P.R.	0	0	34	45	23	27	19	74	126	305	22	208	260	0	0	0	158
	CHINESE TAIPEI	0	0	0	0	0	0	0	0	0	0	0	0	710	178	147	172	226
	CÔTE D'IVOIRE	9	13	10	20	13	15	23	10	10	9	15	15	30	15	14	16	25
	EC ESPAÑA	0	0	0	0	0	0	3,772	3,340	2,912	2,766	2,919	2,858	3,226	4,107	2,335	2,582	2,470
	EC PORTUGAL	314	220	796	649	749	785	519	423	446	706	518	471	1,874	486	1,351	1,444	1,915
	EC UNITED KINGDOM	0	0	0	0	0	0	0	0	2	3	2	1	1	1	0	5	0
	JAPAN	663	778	2	1,583	2,209	1,304	502	1,159	271	402	161	571	385	970	0	0	
	MEXICO	0	0	0	0	10	0	0	0	0	10	16	0	9	6	9	5	8
	NAMIBIA	0	0	0	0	0	0	0	0	1	0	0	459	0	509	1,415	1,243	1002
	PANAMA	0	0	0	0	0	0	0	0	25	1	0	0	0	0	0	0	2
	SOUTH AFRICA	0	0	0	0	0	0	0	19	13	0	79	19	138	126	125	99	208
	ST VINCENT AND THE GRENADINES	0	0	0	0	0	0	0	0	3	0	0	0	0	0	0	0	NLD
	TRINIDAD & TOBAGO	0	0	0	0	0	0	0	0	3	0	0	0	0	0	0	0	NLD
	USA	315	376	948	642	1,710	469	409	348	159	456	395	415	142	411	187	130	215
	UK BERMUDA	0	0	0	0	0	0	1	2	0	0	0	0	0	0	0	0	0
	URUGUAY	13	20	28	12	17	26	20	23	21	35	40	38	188	249	146	68	36
	VANUATU	0	0	0	0	0	0	0	0	0	0	0	0	0	52	12	13	NLD
	VENEZUELA	0	0	0	0	0	0	0	0	0	0	0	0	0	58	20	6	11
	MEXICO	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0
DISCARDS	USA	11	38	24	21	28	1	0	0	0	0	0	0	0	0	0	0	41
	UK BERMUDA	0	0	0	0	0	0	0	0	2	0	0	0	0	0	0	0	NLD
	JAPAN	0	0	0	429	194	142	29	134	74	68	48	71	153	297	102	122	NLD

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, buoy gear, and harpoon) fishery includes both commercial and recreational fisheries and is described fully in Section 2.5.8 of the 1999 FMP and 2006 Consolidated HMS FMP. Handgear components may also be deployed as a specialized trolling gear to target surface-feeding tunas. Under this configuration, the line and leaders are elevated and actively trolled so that the baits fish on or above the water's surface. This style of fishing is often referred to as "green-stick fishing," and reports indicate that it can be extremely efficient compared to conventional fishing techniques. For more information on green-stick fishing gear and the configurations allowed under current regulations, please refer the 2008 SAFE Report.

3.4.4.1 Overview of History and Current Management

Atlantic tunas, swordfish, and sharks are managed under the 2006 Consolidated FMP and Amendment 1 to the 1999 FMP. Summaries of the Atlantic shark fishery are found in Sections 2.4.3 of the 1999 FMP.

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. The recreational shark fishery is managed using an authorized shark species list, bag limits, minimum size requirements, and landing requirements (sharks must be landed with head and fins attached). Additionally, the possession of 19 species of sharks is prohibited.

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.

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 often occur 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. Since 2003, the recreational fishery has been limited to rod and reel and handline gear only. Similar state regulations along the Atlantic seaboard were implemented through an ASMFC interstate fishery management plan in 2009.

Table 3.21 Estimates of Total Recreational Harvest of Atlantic Sharks: 1999-2007 (numbers of fish in thousands).
Source: Cortés and Neer 2005, Cortés, pers. comm. Estimates include prohibited species.

Species Group	1999	2000	2001	2002	2003	2004	2005	2006	2007
LCS	92.3	140.0	137.2	82.8	88.8	66.6	86.2	59.5	68.7
Pelagic	11.1	13.3	3.8	4.7	4.3	5.0	5.4	18.1	9.0
SCS	125.7	199.9	212.5	153.8	133.7	126.0	119.1	121.7	172.4
Unclassified	6.9	10.9	24.5	5.4	18.1	27.9	47.4	7.3	23.8

Table 3.22 Recreational Harvest of Atlantic LCS by Species, in number of fish: 1999-2007.
Sources: Cortés and Neer 2005, Cortés, pers. comm.

LCS Species	1999	2000	2001	2002	2003	2004	2005	2006	2007
Basking**	0	0	0	0	0	0	0	0	0
Bignose*	0	0	0	0	0	17	0	0	55
Bigeye sand tiger**	0	0	0	0	0	0	0	0	0
Blacktip	31,778	73,998	49,488	39,756	40,402	30,872	44,831	31,724	28,883
Bull	2,775	6,075	4,117	1,823	3,455	4,883	1,377	4,284	5,983
Caribbean Reef*	3	59	268	741	0	652	5	47	0
Dusky*	5,337	3,116	5,993	1,047	2,806	142	3,050	191	130
Galapagos*	0	0	0	0	0	0	0	0	0
Hammerhead, Great	555	925	3,446	4	47	9	162	139	813
Hammerhead, Scalloped	614	3,781	1,494	1,358	2,956	930	5,212	537	1,840
Hammerhead, Smooth	1	2	703	2	1	0	0	2	0
Hammerhead, Unclassified	0	3,691	0	5,247	0	0	2,676	1,099	807
Lemon	122	5,434	5,884	4,921	4,876	5,578	506	1,145	3
Night*	50	24	0	0	0	0	15	1	2
Nurse	1,429	2,214	4,934	2,562	563	3,463	2,341	1,553	334
Sandbar	20,228	10,965	36,094	8,530	5,151	3,853	2,795	848	7,110
Sand tiger**	0	0	604	0	0	0	0	1,040	0
Silky	361	6,233	3,928	1,741	1,943	399	3,589	2,042	1,980
Spinner	6,075	4,810	3,384	3,732	4,483	3,435	3,055	2,022	6,217
Tiger	7	1,480	732	126	110	1	1,321	1,309	1,815
Whale**	0	0	0	0	0	0	0	0	0
White**	0	0	0	0	0	0	0	0	0
Requiem shark unclassified	12,813	17,164	16,136	11,173	21,990	12,388	15,319	11,511	12,730
Total:	82,148	139,971	137,205	82,763	88,783	66,622	86,254	59,494	68,702

*indicates species that were prohibited in the recreational fishery as of July 1, 1999.
** indicates species that were prohibited as of April 1997.

Table 3.23 Recreational Harvest of Atlantic Pelagic Sharks by Species, in number of fish: 1999-2007.
Sources: Cortés and Neer 2005, Cortés, pers. comm.

Pelagic Shark Species	1999	2000	2001	2002	2003	2004	2005	2006	2007
Bigeye thresher*	0	0	0	65	0	0	0	42	0
Bigeye sixgill*	0	0	0	0	0	0	0	0	0
Blue Shark	5,218	7,011	950	0	376	0	31	980	1,622
Mako, Longfin*	0	0	0	0	0	0	0	0	0
Mako, Shortfin	1,383	5,813	2,827	3,206	3,922	4,964	3,857	3,363	2,556
Mako, Unclassified	9	0	0	0	0	0	0	0	0
Oceanic whitetip	0	0	0	0	0	0	0	0	0
Porbeagle	0	0	0	0	0	0	0	0	0
Sevengill*	0	0	0	0	0	0	0	0	0
Sixgill*	0	0	0	0	0	0	0	0	0
Thresher	4,512	529	0	1,467	0	0	1,504	13,747	4,813
Total:	11,122	13,353	3,777	4,738	4,298	4,964	5,392	18,132	8,991

* indicates species that were prohibited in the recreational fishery as of July 1, 1999.

Table 3.24 Recreational Harvest of Atlantic SCS by Species, in number of fish: 1999-2007.
Sources: Cortés and Neer 2005, Cortés, pers. comm.

SCS Species	1999	2000	2001	2002	2003	2004	2005	2006	2007
Atlantic Angel*	0	0	0	0	0	0	0	0	0
Blacknose	6,139	10,410	14,885	11,438	6,615	15,215	7,110	9,947	9,168
Bonnethead	37,341	56,436	59,017	51,048	40,066	42,050	31,369	24,302	43,006
Finetooth	78	1,390	6,628	3,027	1,758	286	2,847	268	3,935
Sharpnose, Atlantic	69,153	130,727	131,912	88,297	85,299	68,421	77,712	87,180	116,263
Sharpnose, Caribbean*	0	0	0	0	0	0	0	0	0
Smalltail*	4	973	70	0	0	71	35	0	0
Total:	112,715	199,936	212,512	153,810	133,738	126,043	119,073	121,697	172,372

*indicates species that were prohibited in the recreational fishery as of July 1, 1999.

3.4.4.3 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 a minimum or maximum size. Sharks may be discarded because they are a prohibited species. 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.

Bycatch can result in death or injury to discarded fish. Therefore, bycatch mortality is 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 sharks reported or observed through the LPS dockside intercepts for 1997 – 2007 is presented in Table 3.25.

An outreach program to address bycatch and to educate anglers on the benefits of circle hooks has been implemented by NMFS. One of the key elements of the outreach program is to provide information that leads to an improvement in post-release survival from recreational gear by encouraging recreational anglers to use circle hooks. The initial implementation of this outreach program began in 2007 with the distribution of DVDs to tournament operators showing the proper rigging and deployment of circle hooks with natural baits. This outreach program is anticipated to be expanded by NMFS in future years. Also, a final rule to require the mandatory use of circle hooks when fishing with natural baits in billfish tournaments was published in May 2007 (72 FR 26735, May 11, 2007) and became effective on January 1, 2008.

Table 3.25 Observed or reported number of Atlantic Shark kept and released in the rod and reel fishery, Maine through Virginia, 2000 -2007.
Source: Large Pelagic Survey (LPS) Preliminary Data.

	Number of Fish Kept [1]								Number of Fish Released Alive							
Species	**2000**	**2001**	**2002**	**2003**	**2004**	**2005**	**2006**	**2007**	**2000**	**2001**	**2002**	**2003**	**2004**	**2005**	**2006**	**2007**
Thresher Shark	2	5	20	24	58	45	34	62	1	0	5	8	27	9	15	24
Mako Shark	49	27	72	141	216	99	111	143	114	65	120	208	350	142	177	190
Sandbar Shark	1	2	0	9	7	1	1	9	4	10	17	26	68	37	158	168
Dusky Shark	0	0	1	1	0	0	3	6	32	8	9	44	60	49	73	87
Tiger Shark	0	1	1	0	0	1	0	1	3	2	3	12	0	6	7	11
Porbeagle	0	0	1	0	1	1	1	0	0	0	14	3	1	6	8	2
Blacktip Shark	0	1	0	1	0	1	1	0	0	0	6	0	1	19	9	31
Atlantic Sharpnose Shark	0	0	0	0	0	0	0	0	0	0	0	0	0	11	0	0
Blue Shark	12	2	36	65	74	67	61	109	374	141	505	2,060	2,242	920	884	1,978
Hammerhead Shark	1	2	0	0	1	0	0	0	0	1	6	38	2	5	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.

3.4.5 Fishery Data: Landings by Shark Species

The purpose of this section is to provide a summary of recent landings of sharks on a species by species basis, including sharks caught under special permits (such as EFPs), which are not recorded in commercial logbooks. Landings for sharks were compiled from the most recent stock assessment documents.

Table 3.26 Commercial landings of LCS in lb dw: 1999-2007.
Sources: Cortés 2003; Cortés and Neer 2002, 2005; Cortés pers. comm.

Large Coastal Sharks	1999	2000	2001	2002	2003	2004	2005	2006	2007
Basking**	0	0	0	0	0	0	0	0	0
Bignose*	9,050	672	1,442	0	318	0	98	61	0
Bigeye sand tiger**	0	0	0	0	0	0	0	0	0
Blacktip	1,259,016	1,633,919	1,135,199	1,099,194	1,474,362	1,092,600	993,380	1,311,257	1,089,199
Bull	28,603	24,980	27,037	40,463	93,816	49,556	133,265	173,125	157,890
Caribbean Reef*	0	0	1	0	0	0	0	0	0
Dusky*	110,942	205,746	1,973	8,779	23,288	1,025	874	4,209	1,907
Galapagos*	0	0	0	0	0	0	0	0	0
Hammerhead, Great	0	0	0	0	0	0	0	0	0
Hammerhead, Scalloped	0	0	0	0	0	0	0	0	0
Hammerhead, Smooth	0	0	0	0	0	92	54	150	0
Hammerhead, Unclassified	53,393	35,060	69,356	108,160	150,368	116,546	197,067	153,854	65,255
Large Coastal, Unclassified	67,197	16,575	172,494	147,359	51,433	0	0	0	0
Lemon	25,298	45,269	24,453	56,921	80,688	67,810	71,805	62,738	72,583
Narrowtooth*	0	0	0	0	0	0	0	0	0
Night*	4,287	0	0	0	20	0	0	0	0
Nurse	1,176	429	387	69	70	317	97	2,258	15
Sandbar	1,320,239	1,491,908	1,407,550	1,863,420	1,425,628	1,223,241	1,282,477	1,580,142	669,525
Sand Tiger**	6,401	6,554	1,248	409	624	1,832	5,167	4,321	210

Large Coastal Sharks	1999	2000	2001	2002	2003	2004	2005	2006	2007
Silky	9,961	31,959	14,197	30,731	51,588	11,808	17,646	16,173	16,496
Spinner	629	14,473	6,970	8,447	12,133	14,806	44,150	96,259	17,888
Tiger	30,779	24,443	26,973	16,115	18,536	30,976	33,477	53,706	17,500
Whale**	0	0	0	0	0	0	0	0	0
White**	82	1,201	26	0	1,454	58	0	122	88
Unclassified, assigned to large coastal	821,648	92,117	525,661	771,450	908,077	603,229	527,026	393,749	199,550
Unclassified, fins	116,570	87,820	23,988	142,565	181,431	137,375	110,613	146,037	102,615
Total (excluding fins)	**3,865,271 (1,753 mt dw)**	**3,713,125 (1,684 mt dw)**	**3,414,967 (1,549 mt dw)**	**4,151,594 (1,883 mt dw)**	**4,292,403 (1,947 mt dw)**	**3,213,896 (1,458 mt dw)**	**3,306,583 (1,500 mt dw)**	**3,852,124 (1,747 mt dw)**	**2,308,018 (1,047 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.

Table 3.27 **Commercial landings of small coastal sharks in lb dw: 1999-2007.**
Source: Cortés and Neer, 2002, 2005; Cortés, 2003; Cortés pers. comm.

Small coastal sharks	1999	2000	2001	2002	2003	2004	2005	2006	2007
Atlantic Angel*	0	97	0	495	1,397	818	3,587	500	29
Blacknose	137,619	178,083	160,990	144,615	131,511	68,108	120,320	187,907	91,438
Bonnethead	58,150	69,411	63,461	36,553	38,614	29,402	33,295	33,911	53,638
Finetooth	285,230	202,572	303,184	185,120	163,407	121,036	107,327	80,536	171,099
Sharpnose, Atlantic	244,356	142,511	196,441	213,301	190,960	230,880	375,881	520,028	334,421
Sharpnose, Atlantic, fins	0	0	209	0	0	0	0	0	0
Sharpnose, Caribbean*	2,039	353	205	0	0	0	0	0	0
Unclassified Small Coastal	336	0	51	35,831	8,634	1,407	9,792	471	3,474
Total (excluding fins)	**727,730 (330 mt dw)**	**593,027 (269 mt dw)**	**724,332 (329 mt dw)**	**615,915 (279 mt dw)**	**534,523 (242 mt dw)**	**451,651 (205 mt dw)**	**650,202 (295 mt dw)**	**823,353 (373 mt dw)**	**654,099 (297 mt dw)**

* indicates species that were prohibited in the commercial fishery as of June 21, 2000.

Table 3.28 Commercial landings of pelagic sharks in lb dw: 1999-2007.
Sources: Cortés and Neer 2002, 2005; Cortés 2003; Cortés pers. comm.

Pelagic Sharks	1999	2000	2001	2002	2003	2004	2005	2006	2007
Bigeye thresher*	18,683	4,376	330	0	0	719	267	68	0
Bigeye sixgill*	0	0	0	0	0	0	0	0	0
Blue shark	886	3,508	65	137	6,324	423	0	588	0
Mako, longfin*	3,394	6,560	9,453	3,008	1,831	1,827	403	2,198	2,039
Mako, shortfin	150,073	129,088	171,888	159,840	151,428	217,171	154,187	102,901	165,120
Mako, Unclassified	56,625	74,690	73,556	58,392	33,203	50,978	35,241	28,557	38,170
Oceanic whitetip	1,480	657	922	1,590	2,559	1,082	713	338	787
Porbeagle	5,650	5,272	1,152	2,690	1,738	5,832	2,452	3,810	3,370
Sevengill*	0	0	0	0	0	0	0	0	0
Sixgill*	0	0	0	0	0	0	0	0	0
Thresher	96,266	81,624	56,893	53,077	46,502	44,915	24,280	33,299	49,257
Unclassified, pelagic	0	233	0	5,965	79,439	0	0	571	0
Unclassified, assigned to pelagic	41,006	40,951	31,636	182,983	314,300	356,522	18,057	12,936	5,022
Unclassified, pelagic, fins	2,408	3,746	12,239	0	0	41	0	0	0
Total (excluding fins)	**376,471 (171 mt dw)**	**350,705 (159 mt dw)**	**345,895 (157 mt dw)**	**467,682 (212 mt dw)**	**637,324 (289 mt dw)**	**679,469 (308 mt dw)**	**235,600 (107 mt dw)**	**185,266 (84 mt dw)**	**263,765 (120 mt dw)**

* indicates species that were prohibited in the commercial fishery as of June 21, 2000.

Table 3.29 **The number of sharks and non-shark species that were discarded alive, discarded dead, and kept under the exempted fishing program during 2008, including exempted fishing permits, display permits, scientific research permits, and letters of acknowledgement. These numbers do not include fish that were reported in commercial logbooks.**

Species	Number Discarded Alive	Number Discarded Dead	Number Kept	Total Number of Interactions
Shark Species				
Angel Shark	1			1
Atlantic Sharpnose Shark	535	402	1	938
Bignose	1			1
Blacknose Shark	39		8	47
Blacktip Shark	41	1	12	54
Bonnethead Shark	182	92	14	288
Bull Shark	5			5
Dusky Shark	12			12
Finetooth Shark	2			2
Florida Smoothhound Shark	36	2	1	39
Great Hammerhead Shark	2		1	3
Mako Shark			1	1
Night Shark	17	19		36
Nurse Shark	21		4	25
Sand Tiger Shark	9		2	11
Sandbar Shark	10			10
Scalloped Hammerhead Shark	7	4		11
Silky Shark	15	49		64
Spinner Shark	5			5
Thresher Shark	1			1
Tiger Shark	21			21
Unidentified Shark	4			4
Non-Shark Species				
Barracuda	1			1
Bigeye Tuna		2		2
Bluefin Tuna	47	29	3	79
Eagle Ray			2	2
Cobia	1			1
Humpback Whale	1			1
Little Tunny	2		5	7
Longbill Spearfish		6		6
Mahi Mahi		1	8	9
Manta Ray	2			2
Oilfish		1		1
Red Drum	2			2
Roundscale Spearfish		20	1	21
Southern Stingray	1			1
Swordfish	8	9	29	46
White Marlin		58		58
Yellowfin Tuna			2	2

Table 3.30 Estimates of total landings and dead discards for LCS from 1981 through 2007 (numbers of fish in thousands).
Sources: Modified from Table 2.2 in SEDAR 11 LCS Data Workshop Report (NMFS, 2006b) and Cortés, pers. comm.

Year	Commercial Landings	Pelagic Longline Discards	Recreational Catches	Unreported Catches	Bottom Longline Discards	Mexican Catches	Menhaden Fishery Bycatch	Confiscated Mexican catches in U.S.	Total
1981	16.2	0.9	285.1		0.5	120.0	37.5		460.2
1982	16.2	0.9	539.3		0.5	81.9	38.5		677.3
1983	17.5	0.9	812.7		0.6	85.4	38.0		955.1
1984	23.9	1.3	273.3		0.8	120.7	38.0		458.0
1985	22.2	1.2	407.8		0.7	87.7	34.2		553.9
1986	54.0	2.9	426.7	24.9	1.7	81.8	33.8		625.8
1987	104.7	9.7	298.3	70.3	3.3	80.2	35.2		601.7
1988	274.6	11.4	317.2	113.3	8.7	89.3	34.2		848.6
1989	351.0	10.5	224.8	96.3	11.1	105.6	36.1		835.3
1990	267.5	8.0	219.2	52.1	8.5	122.2	35.2		712.7
1991	200.2	7.5	306.2	11.3	6.3	95.7	27.2		654.4
1992	215.2	20.9	218.0		6.8	103.4	23.9		588.2
1993	169.4	7.3	189.2		5.4	119.8	24.4		515.5
1994	228.0	8.8	155.2		3.7	110.7	26.1		532.6
1995	222.4	5.2	186.0		5.2	96.0	24.0		538.8
1996	161.0	5.7	196.6		4.8	106.1	23.9		498.0
1997	130.6	5.6	167.6		6.7	83.1	24.4		418.0
1998	174.9	4.3	161.4		6.6	74.1	23.5		444.8

Year	Commercial Landings	Pelagic Longline Discards	Recreational Catches	Unreported Catches	Bottom Longline Discards	Mexican Catches	Menhaden Fishery Bycatch	Confiscated Mexican catches in U.S.	Total
1999	111.5	9.0	82.1		2.9	57.1	25.8		288.4
2000	111.2	9.4	140.0		4.1	52.1	22.1	1.0	339.9
2001	95.8	5.6	137.2		5.5	52.1	20.6	1.5	318.2
2002	123.7	1.8	82.8		4.8	52.1	20.2	1.4	286.7
2003	128.0	2.9	89.3		7.1	52.1	19.7	1.3	300.4
2004	103.4	4.9	67.2		4.7	52.1	20.2	2.1	254.5
2005	107.4	4.3	86.3		8.1	52.1	20.2	2.1	280.4
2006	132.2	1.9	59.4		7.7	52.1	20.2	2.1	275.6
2007	74.8	3.2	68.7		6.0	52.1	20.2	2.1	227.0

Table 3.31 **Catch history for the Small Coastal Shark complex (numbers of fish). 2007 recreational catches are preliminary (TXPWD Survey catches assumed equal to those in 2006); 2006 and 2007 values for shrimp bycatch (GOM and SA) and EFP assumed equal to those in 2005**.
Sources: Modified from Table 2.2 in SEDAR 13 (NMFS, 2007b) and Cortés, pers. comm.

	Commercial				Recreational Catches	Bottom Longline Discards	Shrimp Bycatch (GOM)	Shrimp Bycatch (SA)	EFP	Total
Year	Total	Longline Discards	Nets	Lines						
1972							840,633	105,680		946,313
1973							233,634	29,371		263,005
1974							411,643	51,749		463,392
1975							872,930	109,740		982,670
1976							292,878	36,819		329,697
1977							946,230	118,955		1,065,185
1978							635,527	79,895		715,422
1979							933,737	117,384		1,051,121
1980							1,738,982	218,615		1,957,597
1981					82,759		1,736,376	218,287		2,037,422
1982					67,647		409,794	51,517		528,958
1983					87,399		674,421	84,784		846,604
1984					57,342		377,532	47,461		482,335
1985					62,885		476,828	59,944		599,657
1986					111,425		485,197	60,996		657,618
1987					98,947		1,040,738	130,836		1,270,521

	Commercial				Recreational Catches	Bottom Longline Discards	Shrimp Bycatch (GOM)	Shrimp Bycatch (SA)	EFP	Total
Year	Total	Longline Discards	Nets	Lines						
1988					172,684		580,306	72,953		825,943
1989					104,757		603,506	75,869		784,132
1990					96,977		614,590	77,263		788,830
1991					143,845		891,723	112,102		1,147,670
1992					111,829		1,172,572	147,409		1,431,810
1993	262				93,562		509,360	64,034		667,219
1994	3,308				140,473		443,215	55,718		642,714
1995	139,569	57,819	80,791	627	164,884	22,607	1,051,681	132,211		1,510,952
1996	118,425	39,967	75,317	3,134	114,007	12,230	920,627	115,736		1,281,026
1997	214,221	29,527	181,922	1,723	99,382	12,106	703,350	88,421		1,117,481
1998	187,931	22,044	163,396	2,397	123,593	17,547	806,300	101,363		1,236,734
1999	222,715	18,064	198,804	4,601	112,715	16,239	641,017	80,585		1,073,271
2000	168,544	24,689	141,425	2,377	199,043	24,220	796,602	100,144	11	1,288,565
2001	219,962	14,643	201,777	1,535	212,442	14,511	641,786	80,682		1,169,384
2002	173,847	25,133	146,719	1,949	153,810	18,171	1,104,353	138,833		1,589,015
2003	147,313	36,678	90,411	20,120	135,644	30,956	544,058	68,396	5	926,372
2004	133,937	35,741	97,080	1,374	128,468	29,665	797,000	101,330	1,872	1,192,273
2005	156,679	43,583	111,084	1,466	119,073	21,573	530,943	66,893	484	895,646

	Commercial				Recreational Catches	Bottom Longline Discards	Shrimp Bycatch (GOM)	Shrimp Bycatch (SA)	EFP	Total
Year	**Total**	**Longline Discards**	**Nets**	**Lines**						
2006	183,714	63,987	117,404	2,234	119,504	47,056	530,943	66,893	484	948,594
2007	174,326	20,442	150,120	3,295	172,372	15,418	530,943	66,893	484	960,436

3.5 HMS Permits and Tournaments

This section provides updates for the number of permits that were issued in conjunction with HMS fishing activities. These are current through 2008 and, in some cases, March 2009, depending on the table in which the data appears. Furthermore, Section 3.5.6 provides a comprehensive synthesis of recreational fishing tournaments and their role in the context of HMS management.

NMFS' HMS Management Division continues to monitor capacity in HMS fisheries. Updated permit numbers for HMS and non-HMS fisheries as of March 18, 2009 are included in Table 3.32. The overall number of HMS permits for Atlantic swordfish and sharks (directed and incidental) decreased between 2005 and 2008 (Table 3.32), however, these numbers are subject to change based upon on-going permit renewal or expiration.

Table 3.32 Distribution of Shark Directed and Incidental Permits and Other held in other Fisheries by State as of March 18, 2009.

State	SHK-Directed	SHK Incidental	SWO Directed	SWO Incidental/ Handgear	GOM Reef Fish	Dolphin Wahoo	Mackerel:		Spiny Lobster	Snapper-Grouper	Non-HMS Charter Head Boat General*
							King	Spanish			
ME	1	1	1	0	0	1	0	0	0	0	0
NH	1	2	1	0	0	0	0	0	0	0	0
MA	5	13	11	3	0	11	1	5	2	0	0
RI	0	4	0	3	0	1	0	0	0	0	0
CT	1	1	0	0	1	0	0	0	0	0	0
NY	9	10	12	4	1	15	0	4	0	0	5
NJ	25	31	32	12	0	35	12	18	1	1	3
DE	0	1	1	0	0	1	0	0	0	0	0
MD	5	2	6	0	1	6	0	1	0	0	6
VA	2	2	1	2	0	3	1	1	0	1	0
NC	18	14	10	7	0	29	20	20	2	14	10
SC	7	12	4	1	0	12	8	2	0	13	3
GA	2	1	0	0	0	3	3	3	2	3	0
FL	138	136	69	37	97	165	115	153	14	71	99
AL	5	1	0	0	3	0	1	1	0	0	0
MS	0	5	0	0	2	0	4	3	0	0	0
LA	3	36	33	3	4	6	6	3	0	0	0
TX	1	7	1	3	6	2	5	2	0	0	3

State	SHK-Directed	SHK Incidental	SWO Directed	SWO Incidental/ Handgear	GOM Reef Fish	Dolphin Wahoo	Mackerel:		Spiny Lobster	Snapper-Grouper	Non-HMS Charter Head Boat General*
							King	Spanish			
Total 2009	**223**	**279**	**182**	**75**	**115**	**290**	**176**	**216**	**21**	**103**	**129**
Total 2008	**214**	**285**	**181**	**76**	**	**	**	**	**	**	**
Total 2007	**231**	**296**	**180**	**160**	**134**	**316**	**444** (King / Spanish Combined)		**54**	**119**	**193**
Total 2006 ***	**240**	**312**	**191**	**86**	***	***	***	***	***	***	***
Total 2005 ***	**235**	**320**	**190**	**91**	***	***	***	***	***	***	***

* Non-HMS Charter Headboat (CHB) General includes: Atlantic CHB for dolphin/wahoo, South Atlantic (SA) CHB for pelagic fish, SA CHB for snapper/grouper, Gulf of Mexico (GOM) CHB for pelagic fish, and GOM CHB for reef fish.
** 2008 numbers taken from 2008 SAFE Report. Not all permit totals are available.
*** Numbers for 2005 and 2006 were taken from the Consolidated HMS FMP. Non-HMS permits were not calculated at that time.

3.5.1 Upgrading and Safety Issues

When the limited access program was implemented, NMFS included upgrading restrictions that were the same as those implemented by the NEFMC and MAFMC in order to help minimize the number of regulations for fishermen in those areas. These regulations restrict vessels from any increase over ten percent length overall (LOA), ten percent gross or net tonnage, and 20 percent horsepower. NMFS continued to receive comments that these vessel upgrading restrictions are not appropriate for longline fisheries, may inhibit full utilization of the domestic swordfish quota, 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 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 HMS AP in March of 2007.

On June 7, 2007, NMFS published a final rule which modified HMS limited access vessel upgrading restrictions for vessels concurrently issued certain HMS permits (72 FR 31688). According to this rule, effective August 6, 2007, HMS limited access vessel upgrading restrictions are modified, but only for vessels that concurrently possess, or are eligible to renew, on August 6, 2007, incidental or directed swordfish and shark permits, as well as an Atlantic Tunas Longline category permit. These vessels may be upgraded, or permits transferred, so long as the upgrade or permit transfer does not result in an increase in vessel size (LOA, gross registered tonnage (GRT), and net tonnage (NT)) of more than 35 percent, relative to the vessel first issued the HMS LAP. Also, all horsepower upgrading restrictions for these vessels are removed by the rule. In addition, effective July 9, 2007, restrictions specifying that a vessel may be upgraded only once were removed for all HMS LAPs. NMFS provided additional information to LAP holders regarding eligibility for the modified vessel upgrading restrictions in a subsequent notice.

3.5.2 HMS CHB Permits

In 2002, NMFS published a final rule (67 FR 77434, December 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 2006 and 2008 (Table 3.33).

Table 3.33 CHB Permits by State in 2008.

State	CHB permits	State	CHB Permits
AL	78	NJ	644
CT	112	NV	1
DE	156	NY	394
FL	819	OH	2
GA	31	PA	53
LA	108	PR	27
MA	748	RI	199
MD	174	SC	180
ME	107	TN	--
MI	3	TX	202
MS	32	VA	143
NC	509	VI	23
NH	66	Other	26
Total (2008)			**4,837**
Total (2007)			**3,899**
Total (2006)			**4,173**

3.5.3 HMS Angling Permits

Effective March 2003 (67 FR 77434, December 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 cannot be 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 MRFSS and the 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.

Table 3.34 HMS Angling Permits by State in 2008.

State	CHB permits	State	CHB Permits
AL	584	NJ	4634
CT	949	NV	6
DE	1363	NY	2328
FL	5534	OH	24
GA	179	PA	326
LA	830	PR	1036
MA	4601	RI	905
MD	1814	SC	1214
ME	628	TN	30
MI	25	TX	945
MS	273	VA	1449
NC	2556	VI	92
NH	456	Other	153
Total (2008)			**32,934**
Total (2007)			**24,220**
Total (2006)			**25,238**

3.5.4 Dealer Permits

Dealer permits are required for commercial receipt of Atlantic tuna, swordfish, and sharks, and are described in further detail in the 1999 FMP for Atlantic Tunas, Swordfish, and Sharks. Shark dealers are also required to attend shark identification workshops as of December 31, 2007. Dealer permits are not limited access. 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). As of March 18, 2009, there were 100 permitted shark dealers (Table 3.35). 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.

Table 3.35 Number of shark dealer permits and other permits held by shark dealers by state or country as of March 18, 2009.

State	Sharks	Domestic Swordfish	Dolphin/ Wahoo	Reef Fish	Rock Shrimp	Snapper/ Grouper	Golden Crab	Wreckfish	Total # of Permits
AL	3	1	2	3	0	1	0	0	10
FL	39	24	20	24	9	24	8	6	154
GA	1	1	1	0	1	1	0	1	6
LA	7	6	5	6	0	5	0	0	29
MA	6	6	6	1	1	1	1	2	24
MD	2	2	2	0	0	0	0	0	6
ME	2	2	2	0	0	1	0	0	7
NC	7	6	7	0	2	7	0	2	31
NJ	8	8	6	1	1	1	0	1	26
NY	4	4	2	1	1	2	1	2	17
RI	3	3	3	0	0	0	0	0	9
SC	11	4	6	0	0	7	0	1	29
TX	3	2	1	3	0	1	0	0	10
VA	4	4	4	0	0	3	0	2	17
Totals (2008)	**100**	**73**	**67**	**39**	**15**	**54**	**10**	**17**	**375**

3.5.5 Exempted Fishing Permits (EFPs), Display Permits, Chartering 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 1999 FMP for Atlantic Tunas, Swordfish, and Sharks 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 EFPs, display permits, and SRPs.

Issuance of EFPs, display permits, and SRPs may be necessary because possession of certain shark (and other HMS) species are prohibited. These EFPs, SRPs, and display permits would authorize collections of sharks and other HMS species from federal waters in the Atlantic Ocean, Gulf of Mexico, and Caribbean Sea 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 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 authorized to use the quota or entitlement of the United States until the chartering permit expires or is terminated. This is because of the fact that under a chartering arrangement, it is assumed that vessels have attained temporary authorization to harvest another ICCAT Contracting Parties' quota. 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 BiOps. 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 from 2003 – 2008 by category and species are listed in Table 3.36.

Table 3.36 Number of Exempted Fishing Permits (EFPs), Display Permits, Scientific Research Permits (SRPs), Letters of Acknowledgement (LOAs) issued between 2003 and 2008.

Permit type		2003	2004	2005	2006	2007	2008
EFPs	Sharks for display	8	8	6	7	6	5
	HMS for display	1	1	1	1	2	1
	Tunas for display	0	1	0	--	--	0
	Shark research on a non-scientific vessel	9	6	5	7	4	4
	Tuna research on a non-scientific vessel	5	11	7	5	4	5
	HMS research on a non-scientific vessel	18	5	3	4	7	7
	Billfish research on a non-scientific vessel	0	1	2	3	2	3
	Shark Fishing	1	0	0	--	--	0
	HMS Chartering	0	1	0	--	--	0
	Tuna Fishing	7	2	0	5	--	0
	TOTAL	**49**	**36**	**24**	**32**	**25**	**25**
SRPs	Shark research	1	3	4	2	2	0
	Tuna research	0	0	0	--	1	0
	Billfish research	0	0	0	1	--	0
	HMS (multi-species) research	1	1	4	4	1	1
	TOTAL	**2**	**4**	**8**	**7**	**4**	**1**
LOAs	Shark research	3	2	4	5	7	6
	TOTAL	**3**	**2**	**4**	**5**	**7**	**6**

3.5.6 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 HMS. 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. Tournament operators may be selected for reporting and, if selected, must submit tournament results to NMFS within seven days of the conclusion of the tournament.

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 social and economic impact of tournament angling in relation to other types of angling (*e.g*., commercial, non-tournament recreational, *etc*.) 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. Tournament registration forms are available at: http://www.nmfs.noaa.gov/sfa/hms/linkpages/reporting_forms.htm.

NMFS estimates that fewer than 300 HMS fishing tournaments occur annually along the U.S. Atlantic coast, including the Gulf of Mexico and Caribbean (NMFS Atlantic HMS Tournament Registration Database). These tournaments 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. Also, some tournaments are components of larger series, including state Governors Cups (North Carolina, South Carolina), the World Billfish Series, and the MTU (Detroit Diesel) Legend Series, among others.

Many HMS fishing tournaments promote strict conservation principles in their rules. For example, 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. Many HMS fishing tournaments support charitable organizations.

Table 3.37 presents the total number of registered HMS tournaments, by state, between 2001 and 2008. This table indicates that, in 2008, HMS fishing tournaments were conducted most frequently in Florida, Louisiana, Texas, New Jersey, Puerto Rico, North Carolina, South Carolina, New York, and Maryland. By far, the largest number of registered HMS tournaments has consistently occurred in the State of Florida.

Table 3.37 Number of Registered HMS Tournaments by State between 2001 and 2008.
Source: NMFS Atlantic HMS Tournament Registration Database.

STATE	2001	2002	2003	2004	2005	2006	2007	2008
ME	2	3	3	5	3	5	5	4
NH	0	0	0	0	0	0	0	0
MA	7	1	7	10	4	7	10	10
RI	2	2	3	3	2	2	2	2
CT	1	0	0	0	1	1	0	1
NY	5	4	14	14	10	12	13	13
NJ	11	5	18	17	16	19	17	20
DE	2	0	0	1	0	0	1	1
MD	4	2	14	14	14	13	11	13
VA	5	1	5	4	5	4	6	5
NC	11	5	15	16	18	17	17	16
SC	6	3	13	9	9	12	13	16
GA	6	1	12	3	13	11	11	10
FL	46	26	66	57	74	83	97	80
AL	7	7	9	8	7	8	10	8
MS	3	2	7	2	2	1	1	1
LA	19	0	20	22	26	20	24	24
TX	14	1	17	10	17	17	33	21
PR	16	4	13	17	22	19	20	19
USVI	9	0	6	1	10	7	7	2
Bahamas[1]	3	2	1	2	2	1	1	1
Bermuda[1]	0	0	0	0	1	0	0	0
Mexico[1]	1	0	0	0	0	0	0	0
Turks/Caicos[1]	0	0	1	0	0	0	0	0
TOTAL	**181**	**68**	**244**	**215**	**256**	**259**	**299**	**267**

[1]Some foreign tournaments voluntarily registered because the participants were mostly U.S. citizens.

Table 3.38 shows the number and percentage of HMS tournaments awarding points or awards for a particular HMS, based upon 2006 and 2008 tournament registrations. Blue marlin, white marlin, sailfish, and yellowfin tuna have consistently been the predominant target species

in HMS fishing tournaments. Bluefin tuna, swordfish, and pelagic sharks are also frequently targeted in HMS tournaments.

From 2006 – 2008, the overall number of registered tournaments peaked in 2007. The drop in the number of tournaments in 2008 is likely due to a variety of economic factors including the rise in fuel costs. The large percentage drop is quite evident in the billfish tournaments.

Table 3.38 Number and Percent of All HMS Tournaments Awarding Points or Prizes for a HMS, 2006-2008.
Source: NMFS Atlantic HMS Tournament Registration Database

Species	Number of Tournaments			Percent of Tournaments*		
	2006	2007	2008	2006	2007	2008
Blue Marlin	173	201	153	67%	67%	57%
Sailfish	164	186	148	63%	62%	55%
White Marlin	163	184	136	63%	62%	51%
Yellowfin Tuna	144	168	152	56%	56%	57%
Bluefin Tuna	78	93	90	30%	31%	34%
Swordfish	74	83	90	29%	28%	34%
Pelagic Sharks	67	59	60	26%	20%	23%
Bigeye Tuna	42	53	56	16%	18%	21%
Albacore Tuna	20	29	28	8%	10%	11%
Ridgeback Sharks	13	21	14	5%	7%	5%
Non-Ridgeback Sharks	10	21	10	4%	7%	4%
Skipjack Tuna	7	11	24	3%	4%	9%
Small Coastal Sharks	6	10	7	2%	3%	3%

*Species targeted by tournaments are not mutually exclusive categories; therefore, a sum of percentages by year will not equal 100%.

Table 3.39, Table 3.40, and Table 3.41 indicate the percentage and number of 2008 HMS registered tournaments, by state, for pelagic, LCS (ridgeback and non-ridgeback), and SCS, respectively. These tables indicate that the Louisiana/Texas, Florida, New York/New Jersey, and Massachusetts/Maine areas are the primary areas for pelagic shark fishing tournaments. LCS and SCS fishing tournaments are conducted less frequently.

Table 3.39 Registered Pelagic Shark Tournaments, 2008.
Source: NMFS Atlantic HMS Tournament Registration Database.

State	Number of 2008 Tournaments Awarding Points or Prizes for Pelagic Sharks	Percent of Total 2008 Tournaments Awarding Points or Prizes for Pelagic Sharks
Louisiana	18	30%
New York	11	18%
New Jersey	10	17%
Massachusetts	4	7%
Maine	4	7%
Florida	4	7%
Maryland	3	5%
Rhode Island	2	3%
Connecticut	1	2%
North Carolina	1	2%
South Carolina	1	2%
Texas	1	2%
TOTAL	**60**	**100%***

*Detail may not sum to total because of rounding.

Table 3.40 Registered Large Coastal Shark (ridgeback and non-ridgeback) Tournaments, 2008.
Source: NMFS Atlantic HMS Tournament Registration Database.

State	Number of 2008 Tournaments Awarding Points or Prizes for Large Coastal Sharks	% of Total 2008 Tournaments Awarding Points or Prizes for Large Coastal Sharks
Florida	5	33%
Texas	3	20%
Maryland	2	13%
New York	2	13%
New Jersey	1	7%
North Carolina	1	7%
South Carolina	1	7%
TOTAL	**15**	**100%**

Table 3.41 Registered Small Coastal Shark Tournaments, 2008.
Source: NMFS Atlantic HMS Tournament Registration Database.

State	Number of 2008 Tournaments Awarding Points or Prizes for Small Coastal Sharks	% of Total 2008 Tournaments Awarding Points or Prizes for Small Coastal Sharks
Florida	2	29%
New Jersey	2	29%
North Carolina	1	14%
South Carolina	1	14%
Texas	1	14%
TOTAL	**7**	**100%**

3.6 Economic Status of HMS Shark Fisheries

The review of each rule, and of HMS fisheries as a whole, is facilitated when there is an economic baseline against which the rule or fishery may be evaluated. In this analysis, NMFS used the past eight years of data to facilitate the analysis of trends. It also should be noted that all dollar figures are reported in nominal dollars (*i.e.*, current dollars). If analysis of real dollar (*i.e.*, constant dollar) trends controlled for inflation is desired, price indexes for 2000 to 2007 are provided in Table 3.42. 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 2004, the Consumer Price Index (CPI-U) indicates that prices have risen by 20.4 percent, the Gross Domestic Product (GDP) Implicit Price Deflator indicates that prices have risen 16.3 percent, and the Producer Price Index (PPI) for unprocessed finfish indicates a 20.8 percent rise in prices. From 2004 to 2005, the CPI, GDP Deflator, and the PPI for unprocessed finfish indicate prices rose by 3.4 percent, 3.2 percent, and 12.9 percent respectively. From 2005 to 2006, the CPI, GDP Deflator, and the PPI for unprocessed finfish indicate prices rose by 3.2 percent, 3.2 percent, and 32.2 percent respectively. From 2006 to 2007, the CPI, GDP Deflator, and the PPI for unprocessed finfish indicate prices rose by 2.6 percent, 2.7 percent, and -4.9 percent.

Table 3.42 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	104.2	201.5
2003	184	106.4	195.8
2004	188.9	109.4	224.1
2005	195.3	113.0	253.1
2006	201.6	116.0	334.6
2007	207.3	119.8	318.1

3.6.1 Commercial Fisheries[2]

In 2006, the total commercial shark landings at ports in the 50 states by U.S. fishermen were valued at $8.6 million. In 2007, the total commercial shark landings at ports in the 50 states by U.S. fishermen were valued at $4.3 million. The 2007 ex-vessel price indicated that prices for shark fins dropped by about 25%, while the weight of fins dropped by a third. Furthermore, landings by weight for LCS and SCS dropped 40% and 20% respectively, all contributing to a significant drop in shark fishery revenue. For a summary of all pricing, see Table 3.43.

3.6.1.1 Ex-Vessel Prices

The average ex-vessel prices per pound dw for 2000-2007 by shark species complex and area are summarized in Table 3.43. In this table, 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.

[2] All the information and data presented in this section were obtained from NMFS, 1997a and NMFS, 2005b.

Table 3.43 Average ex-vessel prices per lb (in U.S. dollars) for shark by area.

Species	Area	1996	1999	2000	2001	2002	2003	2004	2005	2006	2007
LCS	Gulf of Mexico	0.21	0.56	0.43	0.44	0.36	0.38	0.37	0.46	0.43	0.51
	S. Atlantic	1.02	1.10	0.78	1.12	1.27	0.39	0.44	0.50	0.40	0.45
	Mid-Atlantic	0.55	0.59	0.53	1.09	1.56	1.62	1.93	1.75	1.71	0.64
	N. Atlantic	0.88	0.77	1.01	1.02	0.77	0.72	0.70	0.74	1.02	0.70
Pelagic sharks	Gulf of Mexico	-	1.36	1.31	1.42	1.11	1.13	1.08	1.12	1.21	1.17
	S. Atlantic	0.62	0.83	0.76	0.68	0.67	0.71	0.65	0.73	0.72	0.86
	Mid-Atlantic	1.21	1.23	1.20	1.09	1.17	1.21	1.29	1.39	1.38	1.39
	N. Atlantic	1.31	0.81	1.10	1.23	1.00	1.12	1.46	1.40	1.26	0.97
Small coastal sharks	Gulf of Mexico	-	0.55	0.52	0.58	0.48	0.40	0.45	0.55	0.53	0.51
	S. Atlantic	0.25	0.50	0.48	0.52	0.53	0.51	0.61	0.62	0.55	0.63
	Mid-Atlantic	0.25	0.47	0.38	0.55	0.48	0.38	0.44	0.42	0.45	0.73
	N. Atlantic	-	-	-	1.51	0.58	-	-	0.50	-	-
Shark fins	Gulf of Mexico	-	14.01	15.99	20.90	22.64	18.12	17.93	20.24	20.76	15.12
	S. Atlantic	10.74	11.10	14.16	18.43	17.10	15.85	14.57	16.12	16.30	12.55
	Mid-Atlantic	4.60	3.41	4.90	-	-	-	-	-	-	-
	N. Atlantic	2.69	1.19	6.83	-	-	-	-	-	-	-

The average ex-vessel price for SCS decreased slightly in the Gulf of Mexico in 2007, however, there was a large increase in both the South Atlantic and Mid-Atlantic regions. Prices for pelagic sharks increased in all the regions except the Gulf of Mexico (Table 3.43). The average ex-vessel prices for LCS decreased significantly in the Mid-Atlantic and North Atlantic regions, while slightly increasing in the other regions (Table 3.43).

3.6.1.2 Revenues

Table 3.44 summarizes the average annual revenues of the shark fisheries based on average ex-vessel prices and the weight reported landed as per the U.S. National Report (NMFS, 2004a, 2008c), the Shark Evaluation Reports (NMFS, 1997b), and information given to ICCAT (Cortés and Neer, 2005). These values indicate that the estimated total annual revenue of shark fisheries between 2000 and 2007 peaked in 2002, and then steadily decreased until 2007, excluding the small peak in 2006. Prices did not follow a similar trend, however, weight of LCS and shark fins did, likely contributing to the overall fishery valuation results.

Table 3.44 **Estimates of the total ex-vessel annual revenues of Atlantic shark fisheries**.
Sources: NMFS, 1997b; NMFS 2008c; Cortés, 2003; Cortés and Neer, 2002, 2005; Cortés, pers.comm.

Species		2000	2001	2002	2003	2004	2005	2006	2007
Large coastal sharks	Ex-vessel $/lb dw	$0.68	$0.91	$0.99	$0.78	$0.86	$0.86	$0.89	$0.58
	Weight lb dw	3,713,125	3,414,967	4,151,594	4,292,403	3,213,896	3,306,583	3,852,124	2,308,018
	Fishery Revenue	$2,524,925	$3,107,620	$4,110,078	$3,348,074	$2,763,951	$2,843,661	$3,428,390	$1,338,650
Pelagic sharks	Ex-vessel $/lb dw	$1.09	$1.11	$0.99	$1.04	$1.12	$1.16	$1.14	$1.10
	Weight lb dw	350,705	345,895	467,682	637,324	679,469	235,600	185,266	263,765
	Fishery Revenue	$382,268	$383,943	$463,005	$662,817	$761,005	$273,296	$211,203	$290,142
Small coastal sharks	Ex-vessel $/lb dw	$0.46	$0.79	$0.52	$0.43	$0.50	$0.52	$0.51	$0.63
	Weight lb dw	593,027	724,332	615,915	534,523	451,651	650,202	823,353	654,099
	Fishery Revenue	$272,792	$572,222	$320,276	$229,845	$225,826	$338,105	$419,910	$412,082
Shark fins (weight = 5% of all sharks landed)	Ex-vessel $/lb dw	$10.47	$19.67	$19.87	$17.09	$16.25	$18.18	$18.53	$13.84
	Weight lb dw	232,843	224,260	261,760	273,213	217,251	209,619	243,037	161,294
	Fishery Revenue	$2,437,865	$4,411,188	$5,201,162	$4,669,202	$3,530,326	$3,810,878	$4,503,478	$2,232,310
Total sharks	**Fishery Revenue**	**$5,617,851**	**$8,474,974**	**$10,094,521**	**$8,909,938**	**$7,281,107**	**$7,265,940**	**$8,562,982**	**$4,273,185**

Note: Average ex-vessel prices may have some weighting errors.

3.6.1.3 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 3.45 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 3.45 indicates that the average wholesale price of shark sold in Atlantic and Gulf of Mexico states decreased from 1996 to 2004 for the mako shark. Prices for other shark species have appeared to have rebounded in 2004, when compared to 1996.

Table 3.45 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, 2004c.

Species	1996 Price/lb	1999 Price/lb	2000 Price/lb	2001 Price/lb	2002 Price/lb	2003 Price/lb	2004 Price/lb
Blacktip	$1.05	$1.04	$1.04	$1.05	$1.00	$1.33	$1.08
Mako	$2.77	$2.74	$3.18	$3.00	$2.00	$2.37	$2.24
Thresher	$1.00	$0.91	$0.82	$1.25	$1.25	$0.78	$1.24

3.6.2 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 in 2006 found that for the entire United States 7.7 million saltwater anglers (including anglers in state waters) went on approximately 67 million fishing trips and spent approximately $8.9 billion (USFWS, 2006). These participation rates are down from the 2001 survey which found 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). The 2006 survey found saltwater anglers spent $5.3 billion on trip-related costs and $3.6 billion on equipment (USFWS, 2006). Expenditure on trip-related costs increased 17 percent from 2001, but equipment expenditures have declined 7 percent. These 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. Approximately 79 percent of the saltwater anglers surveyed fished in their home state in 2006, compared to 76 percent in 2001 (USFWS, 2001).

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 MRFSS. These 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 $85 per person per day on pelagic shark directed trips, $95 on LCS directed trips, and $81 on SCS.

The American Sportfishing Association (ASA) also has a report listing the 2006 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 $125 billion dollars. ASA estimates 8,528,000 anglers participate in saltwater fishing. These saltwater anglers spent $11 billion in retail sales, resulting in 263,000 jobs, and $9 billion in salaries, wages, and business earnings in 2006. Saltwater fishing contributed $30 billion of the overall economic impact estimated. Florida, Texas, South Carolina, and North Carolina are among the top ten states in terms of overall economic expenditures for both saltwater and freshwater fishing. Florida is also one of the top states in terms of economic impact of saltwater fishing with $3.0 billion in angler expenditures, $5.1 billion in overall economic impact, $1.6 billion in salaries and wages related to fishing, and 51,588 fishing related jobs (ASA, 2008).

At the end of 2004, NMFS began collecting market information regarding advertised charterboat rates. This analysis of the data collected focused 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 3.46 summarizes the average charterboat rate for 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 3.46 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

State	2004 Average Daily Charter Rate
ME	$900
NC	$1,130
NJ	$1,298
NY	$1,113
RI	$917
SC	$1,300
TX	$767
VA	$825
Overall Average	**$1,053**

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 and $450. The team entry fee is not directly proportional to the number of anglers per team, but rather is proportional 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.

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.

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. 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.

3.7 Community and Social Update

According to NS 8, conservation and management measures should, consistent with conservation requirements, "take into account the importance of fishery resources to fishing communities by utilizing economic and social data [based on the best available information] in order to (A) provide for the sustained participation of such communities, (B) to the extent practicable, minimize adverse economic impacts on such communities." The information presented here addresses new data concerning the social and economic well-being of participants in the fishery and considers the impact of significant regulatory measures enacted in the past year.

3.7.1 Overview of Current Information and Rationale

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)).

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 NSs that apply to all fishery management plans and the implementation of regulations. Specifically, NS 8 notes that:

> "Conservation and management measures, 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 by utilizing economic and social data that meet the requirements of paragraph (2), in order to: (A) provide for the sustained participation of such communities; and, (B) to the extent practicable, minimize adverse economic impacts on such communities." (§301(a)(8)). See also 50 CFR §600.345 for NS 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.

The 2006 Consolidated HMS FMP used information from the Wilson *et al*. (1998) study for the 1999 FMP for Atlantic Tunas, Swordfish and Sharks that 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 FMP and Atlantic Billfish Amendment, and because they are fairly evenly spread along the Atlantic and Gulf coasts and the Caribbean. In addition, the 2006 Consolidated HMS FMP used 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 FMP for Atlantic Tunas, Swordfish and Sharks 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 shark fishery, participation and landings were not documented in a manner that allowed community identification. Wilson, *et al*. (1998), 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. As of 2009, 80 percent of directed shark permit holders are located in Florida, New Jersey and North Carolina. Communities in these states are expected to be the most affected by the measures in Amendment 3. A detailed description of additional information used in the community profiles analysis can be found in Section 9.2.2 of the 2006 Consolidated HMS FMP. Several other chapters in this document include information that addresses the requirements described in section 9.1. In addition to the community profile information found in the Consolidated HMS FMP, a recent report was completed by MRAG Americas, Inc. and Jepson (2008) titled "Updated Profiles for HMS Dependent Fishing Communities" can be found in Appendix E of Amendment 2 to the 2006 Consolidated HMS FMP (NMFS, 2008a) and in chapter 6 of the 2008 SAFE Report (NMFS, 2008b). This report includes updated community profiles and new social impacts assessments for HMS fishing communities along the Atlantic and Gulf of Mexico coasts. Please also refer to the Economic Evaluation in Chapter 6, the Regulatory Impact Review (RIR) in Chapter 7, and the Initial Regulatory Flexibility Analysis (IRFA) 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.

3.7.2 Summary of New Social and Economic Data Available

3.7.2.1 2008-2009 Social Science Publications

Abbott, J., Maharaj, V., and Wilen, J.E. 2009. Designing ITQ programs for commercial recreational fishing. Marine Policy 33:766–774.

Barnes, C. and McFadden, K.W. 2008. Marine ecosystem approaches to management: challenges and lessons in the United States. Marine Policy 32:387–392.

Claesson, S. 2009. An ecosystem-based framework for governance and management of maritime cultural heritage in the USA. Marine Policy 33: 698–706.

Gilman, E., Clarke, S., Brothers, N., Alfaro-Shigueto, J., Mandelman, J., Mangel, J., Petersen, S., Piovano, S., Thomson, N., Dalzell, P., Donoso, M., Goren, M., and Werner, T. 2008. Shark interactions in pelagic longline fisheries. Marine Policy 32(1):1-18.

Hernandez-Milian, G., Goetz, S., Varela-Dopico, C., Rodriguez-Gutierrez, J., Romon-Olea, J., Fuertes-Gamundi, J., Ulloa-Alonso, E., Tregenza, N., Smerdon, A., Otero, M., Tato, V., Wang, J., Santos, M., Lopez, A., Lago, R., Portela, J., and Pierce, G. 2008. Results of a short study of interactions of cetaceans and longline fisheries in Atlantic waters: environmental correlates of catches and depredation events. Hydrobiologia 612(1): 251-268.

Jeon, Y., C. Reid, and D. Squires. 2008. Is there a global market for tuna? Policy implications for tropical tuna fisheries. Ocean development and international Law 39(1):32-50.

Pinkerton, E. and Edwards, D.N. 2009. The elephant in the room: The hidden costs of leasing individual transferable fishing quotas. Marine Policy 33: 707–713.

3.7.2.2 Summary of Social Data and Information

The 2006 Consolidated HMS FMP provides a thorough analysis, by state, of HMS fisheries including the shark fishery for in the Atlantic and Gulf of Mexico states and will not be duplicated here. The MRAG Americas Report, "Updated Profiles for HMS Dependent Fisheries," can be found in Appendix E of Amendment 2 to the 2006 Consolidated HMS FMP and chapter 6 of the 2008 SAFE Report and provides social impact analysis by state of HMS dependent fishing communities.

3.8 International Trade and Fish Processing

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 some shark species. 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. In addition, it is important to keep in mind that the ICCAT RFMO collects information only on the pelagic sharks: the shortfin mako and the blue shark, and has also produced some numbers on the porbeagle shark. United States participation in shark and all 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 shark species.

3.8.1 Overview of International Trade for Atlantic HMS

3.8.1.1 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 all marine fish products online for the public at http://www.st.nmfs.gov/st1/trade/index.html. Shark species 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.

Trade data for Atlantic HMS, including shark species, 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 http://www.nmfs.noaa.gov/sfa/hms/. These and several other trade monitoring programs established by NMFS for HMS, including sharks, are described in further detail below.

3.8.2 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.

3.8.2.1 Shark Exports

Export data for sharks is 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 3.47 indicates the magnitude and value of shark exports by the United States from 1999 – 2007. The reduction in shark fin exports from 2002 to 2007 is of particular note, as is the increase in the unit value of shark fins during this time period. Decreases in shark fin trade were expected as the result of the Shark Finning Prohibition Act, which was enacted in December of 2000 and implemented by final rule (67 FR 6194, February 11, 2002).

Table 3.47 Amount and Value of U.S. Shark Product Exports From 1999-2007.
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	2075	7.28
2003	45	4.03	87.79	837	1.31	1.57	592	1.34	2.28	1476	6.70
2004	63	3.02	47.53	536	1.18	2.21	472	.98	2.09	1071	5.18
2005	31	2.37	76.93	377	1.03	2.73	494	1.06	2.15	902	4.46
2006	34	3.17	94.66	816	1.62	1.99	747	1.38	1.85	1597	6.17
2007	19	1.78	93.68	502	1.05	2.09	695	1.35	1.94	1216	4.18

Note: Exports may be in whole (ww) or product weight (dw); data are preliminary and subject to change.

3.8.3 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 statistical document programs. U.S. Census Bureau import data are used by NMFS as well.

3.8.3.1 Shark Imports

For shark imports, 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, and then imported back into the United States for consumption by urban-dwelling Asian Americans (Rose, 1996).

Table 3.48 summarizes Census Bureau data on shark imports for 1999 through 2007. Imports of fresh shark products and shark fins have decreased significantly since 1999. As of July 2, 2008, shark importers, exporters, and re-exporters are required to be permitted under NMFS' HMS International Trade Permit regulations (73 FR 31380). Permitting of shark fin traders was implemented to assist in enforcement and monitoring trade of this valuable commodity.

From 1999 to 2007, the overall annual amount and value of shark imports has fluctuated. Imports of dried shark fins has been increasing gradually since 2003.

Table 3.48 U.S. Imports of Shark Products From All Ocean Areas Combined: 1999-2007.
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	0.01	515	0.72	100	0.99	626	1.82
2004	14	0.34	650	1.00	156	2.35	821	3.70
2005	27	0.75	537	1.02	147	2.27	711	4.04
2006	28	1.38	338	0.68	93	1.35	459	3.41
2007	29	1.68	548	1.03	174	1.04	751	3.75

NOTE: Imports may be whole weight (ww) or product weight (dw); data are preliminary and subject to change.

3.9 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, 1998b), 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.

3.9.1 Bycatch Reduction and the Magnuson-Stevens Act

The Magnuson-Stevens Act defines bycatch as fish are harvested in a fishery, but 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. Birds and marine mammals are therefore not considered bycatch under the MSA but are examined as incidental catch. Bycatch does not include fish released alive under a recreational catch-and-release fishery management program.

NS 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 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 zero 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 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.

3.9.2 Standardized Reporting of Bycatch

Section 303(a)(11) of the Magnuson-Stevens Act requires that a FMP 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, 2004d). 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, 2004d). 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, 2004d).

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, 2004d) contains an in-depth examination of the issues of precision and accuracy in estimating bycatch. Accuracy refers to the closeness between the estimated value and the (unknown) true value that the statistic was intended to measure. Precision refers to how closely multiple measurements of the same statistic are to one another when obtained under the same protocol. The precision of an estimate depends on how consistent independent measurements are to one another; the tighter the cluster, or the greater the consistency in independent measurements, the more precise the estimate. The precision of an estimate is often expressed in terms of the coefficient of variation (CV) defined as the standard error of the estimator divided by the estimate. The lower the CV, the more precise the estimate is considered to be. A precise estimate is not necessarily an accurate estimate. The National Bycatch Report (NMFS, 2004d) 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, 2004d). In other words, accuracy refers to how correct the estimate is. Efficient allocation of sampling effort within a stratified survey design improves the precision of the estimate of overall discard rates (Rago *et al.*, 2005). Accuracy of sample estimates can be evaluated by comparing performance measures (*e.g.*, landings, trip duration) between vessels with and without observers present. 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, 2004d). 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 CV of each estimate. For marine mammals and other protected species, including seabirds and sea turtles, the recommended precision goal is a 20 to 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 to 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 to 30 percent CV for estimates of total catch (NMFS, 2004d). 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 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 the National Bycatch Report (NMFS, 2004d). 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, 2004d), the relationship between sample size and accuracy is not reliable. 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, 2004d).

Rago *et al.* (2005) examined potential sources of bias in commercial fisheries of the Northeast Atlantic by comparing measures of performance for vessels with and without observers. Bias can arise if the vessels with observers onboard consistently catch more or less than other vessels, if trip durations change, or if vessels fish in different areas. Average catches (pounds landed) for observed and total trips compared favorably and the expected differences of the stratum specific means and standard deviations for both kept weight and trip duration was near zero (Rago *et al.*, 2005). Although mean trip duration was slightly longer on observed trips, the difference was not significantly different from zero. The spatial distribution of trips matched well based on a comparison of VMS data with observed trips (Murawski, 2005). The authors concluded that the level of precision in discard ratios as a whole was high and that there was little evidence of bias. The results of this study indicate that bias may not be as large an issue in self-reported data as has been suggested by Babcock *et al.* (2003), but additional analyses would need to be conducted to determine the applicability to HMS fisheries.

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 fisheries. 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 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. In general, 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, 2004d).

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, 2004d).

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. 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 can be 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 HMS 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. Cramer (2000) compared dead discards of undersized swordfish, sailfish, white and blue marlin, and pelagic sharks from HMS logbook and POP data

in the U.S. Atlantic PLL fishery. Cramer (2000) provided the ratio of catch estimated from the POP data divided by the reported catch in the HMS logbooks. The ratio indicated the amount of underreporting for each species in a given area. However, the data analyzed by Cramer (2000), was based on J-hook data from 1997 – 1999 and that gear is now illegal. In some instances, logbooks are used to provide effort information against which bycatch rates obtained from observers are 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 methodologies for all shark fisheries: the U.S. PLL fishery, the shark BLL fishery, the shark gillnet fishery, and the recreational handgear fishery. 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. In addition, NMFS is in the process of developing a National Bycatch Report which may provide additional insight and guidance on areas to be addressed for each fishery. Further analyses of bycatch in the various HMS fisheries may be conducted as time, resources, and priorities allow.

3.9.2.1 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 PLL 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 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 BiOp for Atlantic PLL Fishery for HMS (NMFS, 2004f). Observer coverage in 2005-07 ranged from 7.5 – 10.8 percent. Since 1992, data collection priorities have been to collect catch and effort data of the U.S. Atlantic PLL fleet on highly migratory fish species, although information is also collected on bycatch of protected species.

Fishery observer effort is allocated among eleven large geographic areas and calendar quarter based upon the historical fishing range of the fleet (Walsh and Garrison, 2006). The target annual coverage is eight percent of the total reported sets, and observer coverage is randomly allocated based upon reported fishing effort during the previous fishing year/quarter/statistical reporting area (Beerkircher *et al.*, 2002). Bycatch rates of protected species (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).

3.9.2.2 Shark Bottom Longline Fishery

Vessels participating in the BLL fishery for sharks are required to submit Gulf of Mexico reef fish, South Atlantic snapper-grouper, king and Spanish mackerel, and shark fisheries logbooks to report their catch and effort, including bycatch species. All vessels having shark LAPs are required to report. The CSFOP has monitored the shark BLL fishery since 1994. Since 2005, the program has been administered through the SEFSC out of the Panama City, Florida Laboratory. 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. From 2002 – 2005, the objective of the vessel selection was to achieve a representative five percent level of coverage of the total fishing effort in each fishing area (North Atlantic, South Atlantic, and Gulf of Mexico) and during each fishing season of that year (Smith *et al*., 2006). In 2006, target coverage level has been 3.9 percent of the total fishing effort. In 2007, target coverage level of 4-6 percent of the total fishing effort. This level was estimated to attain a sample size needed to provide estimates of sea turtle, smalltooth sawfish, or marine mammal interactions with an expected CV of 0.3 (Carlson, unpubl., as cited in Smith *et al*., 2006).

Effective August 1, 2001, selected Federal permit holders that report in the Coastal Fisheries logbook (Gulf of Mexico reef fish, South Atlantic snapper-grouper, king and Spanish mackerel, and shark fisheries) 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 3,498 vessels with Federal permits in these fisheries in 2006, a total of 512 vessels were selected to report. Of the 3,491 vessels with Federal permits in these fisheries in 2007, 449 were selected to report. Shark fishermen can use the PLL logbook or the northeast vessel trip reports (VTR) 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.

The final rule for Amendment 2 to the Consolidated Highly Migratory Species (HMS) Fishery Management Plan (FMP) (73 FR 35778, June 24, 2008, corrected at 73 FR 40658, July 15, 2008) established, among other things, a shark research fishery to maintain time series data for stock assessments and to meet NMFS' research objectives. The shark research fishery permits authorize participation in the shark research fishery and the collection of sandbar and non-sandbar LCS from federal waters in the Atlantic Ocean, Gulf of Mexico, and Caribbean Sea for the purposes of scientific data collection subject to 100 percent observer coverage. The commercial vessels selected to participate in the shark research fishery are the only vessels authorized to land/harvest sandbars subject to the sandbar quota available for each year. The base quota is 87.9 mt dw/year through December 31, 2012, although this number may be reduced in the event of overharvests, if any, and 116.6 mt dw/year starting on January 1, 2013. The selected vessels would also have access to the non-sandbar LCS, SCS, and pelagic shark quotas. Commercial vessels not participating in the shark research fishery may only land non-sandbar LCS, SCS, and pelagic sharks subject to the retention limits and quotas per 50 CFR 635.24 and 635.27, respectively.

3.9.2.3 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 ALWTRP and the May 2008 BiOp. During right whale calving season (15 November to 15 April), 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 (Carlson and Baremore, 2002a).

NMFS implemented the final rule on June 25, 2007 (72 FR 34632), that prohibits gillnet fishing, including shark gillnet fishing, from November 15 to April 15, between the NC/SC border and 29° 00' N. The action was taken to prevent the significant risk to the wellbeing of endangered right whales from entanglement in gillnet gear in the core right whale calving area during calving season. Limited exemptions to the fishing prohibitions are provided for gillnet fishing for sharks and for Spanish mackerel south of 29°00' N. lat. Shark gillnet vessels fishing between 29° 00' N and 26° 46.5' N have certain requirements as outlined 50 CFR § 229.32 from December 1 through March 31 of each year. These include vessel operators contacting the SEFSC Panama City Laboratory at least 48 hours prior to departure of a fishing trip in order to arrange for an observer.

In addition, a recent rule (October 5, 2007, 72 FR 57104) amends restrictions in the Southeast U.S. Monitoring Area from December 1 through March 31. In that area no person may fish with or possess gillnet gear for sharks with webbing of 5" or greater stretched mesh unless the operator of the vessel is in compliance with the VMS requirements found in 50 CFR 635.69. The Southeast U.S. Monitoring Area is from 27°51' N. (near Sebastian Inlet, FL) south to 26°46.5' N. (near West Palm Beach, FL), extending from the shoreline or exemption line eastward to 80°00' W. In addition, NMFS may select any shark gillnet vessel regulated under the ALWTRP to carry an observer. When selected, the vessels are required to take observers on a mandatory basis in compliance with the requirements for at-sea observer coverage found in 50 CFR 229.7. Any vessel that fails to carry an observer once selected is prohibited from fishing pursuant to 50 CFR § 635. There are additional gear marking requirements that can be found at 50 CFR § 229.32.

Starting in 2005, a pilot observer program began to include all vessels that have an active directed shark permit and fish with sink gillnet gear (Carlson and Bethea, 2006). These vessels were not subject to observer coverage because they were either targeting non-HMS or were not fishing gillnets in a drift or strike fashion. These vessels were selected for observer coverage in an effort to determine their impact on finetooth shark landings and their overall impact on shark resources when not targeting sharks.

3.9.2.4 Recreational Handgear Fishery

NMFS collects recreational catch-and-release data from dockside surveys (LPS and MRFSS) 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 can be high for many HMS (rare event species in 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 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 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.

The National Academy of Sciences (NAS) assembled a committee to review current marine recreational fishing surveys at the request of NMFS (NAS, 2006). The committee was tasked with developing recommendations for improvements to current surveys and to recommend the implementation of possible alternative approaches. The committee's final report was published in April 2006. Based on recommendations made by the National Research Council, a new, nationwide system to standardize recreational data collection has begun. This has been termed the Marine Recreational Information Program (MRIP), and the program focuses on integrating state and federal level recreational permit information to create a resource for targeted surveys of anglers' catch and effort.

3.9.3 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 1999 FMP for Atlantic Tunas, Swordfish and Sharks (NMFS, 1999), in Regulatory Amendment 1 to the 1999 FMP for Atlantic Tunas, Swordfish and Sharks (NMFS, 2000), in Regulatory Adjustment 2 to the 1999 FMP for Atlantic Tunas, Swordfish and Sharks (NMFS, 2002), in Amendment 1 to the 1999 FMP for Atlantic Tunas, Swordfish and Sharks (NMFS, 2003a), the June 2004 Final Rule for Reduction of Sea Turtle Bycatch and Bycatch Mortality in the Atlantic PLL Fishery (69 FR 40734), the 2006 Consolidated HMS FMP (NMFS, 2006a), Amendment 2 to the 2006 Consolidated HMS FMP (NMFS, 2008a), and Section 3.9 of this chapter. In addition, an HMS Bycatch Reduction Implementation Plan was developed in late 2003 which identify 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.

3.10 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.

PLL dead discards of LCS and pelagic sharks are estimated using data from NMFS observer reports and pelagic logbook reports. Shark BLL and shark gillnet discards can be estimated using logbook data and observer reports as well. Shark gillnet discards have also been estimated using logbook data when observer coverage is equal to 100 percent.

3.10.1 Bycatch Mortality

3.10.1.1 Introduction

The reduction of bycatch mortality is an important component of NS 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 shark species but there are some data for certain species. Information on bycatch mortality should continue to be collected, and in the future, could be used to estimate bycatch mortality in stock assessments. For a summary of bycatch species in BLL and gillnet fisheries, please refer to Table 3.49. For all other fisheries, please refer to Table 3.107 in the Consolidated HMS FMP.

NMFS submits annual data (Task II) 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.

Table 3.49 Summary of bycatch species in HMS fisheries, Marine Mammal Protection Act (MMPA) category, Endangered Species Act (ESA) requirements, data collection, and management measures by fishery/gear type.
(Excerpted from HMS Bycatch Priorities and Implementation Plan and updated through September 2008)

Fishery/Gear Type	Bycatch Species	MMPA Category	ESA Requirements	Bycatch Data Collection	Management Measures
Shark Bottom Longline	Prohibited shark species Target species after closure Sea turtles Smalltooth sawfish Non-target finfish	Category III	ITS, Terms & Conditions, RPMs	Permit requirement (1993); logbook requirement (1993); observer coverage (1994)	Quotas (1993); trip limit (1994); gear marking (1999); handling & release guidelines (2001); line clippers, dipnets, corrodible hooks, de-hooking devices, move 1 nm after an interaction (2004); South Atlantic closure, VMS (2005); shark identification workshops for dealers (2007); sea turtle control device (2008)
Shark Gillnet	Prohibited shark species Sea turtles Marine mammals Non-target finfish Smalltooth sawfish	Category II	ITS, Terms & Conditions, RPMs	Permit requirement (1993); logbook requirement (1993); observer coverage (1994)	Quotas (1993); trip limit (1994); gear marking (1999); deployment restrictions (1999); 30-day closure for leatherbacks (2001); handling & release guidelines (2001); net checks (2002); whale sighting (2002); VMS (2004); closure for right whale mortality (2006); shark identification workshops for dealers (2007)
Pelagic Longline	Bluefin tuna Billfish Undersize target species Marine mammals Sea turtles Seabirds Non-target finfish Prohibited shark species Large Coastal Shark species after closure	Category I	Jeopardy findings in 2000 & 2004; Reasonable and Prudent Alternative implemented 2001-04; ITS, Terms & Conditions, RPMs	Permit requirement (1985); logbook requirement (SWO-1985; SHK - 1993); observer requirement (1992), EFPs (2001-present)	BFT target catch requirements (1981); quotas (SWO - 1985; SHK - 1993); prohibit possession of billfish (1988); minimum size (1995); gear marking (1999); line clippers, dipnets (2000); MAB closure (1999); limited access (1999); limit the length of mainline (1996-1997 only); move 1 nm after an interaction (1999); voluntary vessel operator workshops (1999); GOM closure (2000); FL, Charleston Bump, NED closures (2001); gangion length, corrodible hooks, de-hooking devices, handling & release guidelines (2001); NED experiment (2001-03); VMS (2003); circle hooks and bait requirements (2004); mandatory safe handling and release workshops (2006); sea turtle control device (2008); closed area research (2008)

3.10.1.2 Mortality by Fishery

Bottom Longline Fishery

The shark BLL fishery has relatively low observed bycatch rates. Historically, finfish bycatch has averaged approximately 6.4 percent in the Gulf of Mexico region and 2.3 percent in the Atlantic region for the BLL fishery. Observed protected species bycatch (sea turtles) has typically been much lower, less than 0.01 percent of the total observed catch. See Section 3.4.1.3 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 2007 fishery ranged from 1.4 to 13.3 percent of the total catch from directed shark sets. Observed protected species bycatch (sea turtles and marine mammals) was very low, less than 0.1 percent. See Section 3.4.2.2 for more information. Disposition of discards is recorded by observers and can be used to estimate discard mortality.

For PLL and recreational handgear mortality summaries, please refer to Section 3.9.8.2 of the 2006 Consolidated HMS FMP.

3.10.1.3 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 NS 9, minimizing bycatch and bycatch mortality. 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. For a detailed description of the code, please refer to Section 3.9.8.3 of the 2006 Consolidated HMS FMP.

3.10.2 HMS Fishing Gears with Protected Species

This section examines the interaction between protected species and Atlantic HMS fisheries managed under this FMP. As a point of clarification, interactions are different than bycatch. Interactions take place between fishing gears and marine mammals, and seabirds while bycatch consists of the incidental take and discards of non-targeted finfish, shellfish, mollusks, crustaceans, sea turtles, and any other marine life other than marine mammals and seabirds. 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).

3.10.2.1 Interactions and the MMPA

The MMPA of 1972 as amended is one of the principal Federal statutes that guides 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 the Caribbean Sea. Draft stock assessment reports are typically published in January and final reports are typically published in the fall. 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 list of species outlines the marine mammal species that 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 incidental mortality to marine mammals;
2. Category II fisheries are those with occasional serious injury or incidental mortality; and
3. Category III fisheries are those with remote likelihood of serious injury or known incidental mortality to marine mammals.

The final 2008 MMPA LOF was published on November 27, 2007 (72 FR 66048) and the final 2009 MMPA LOF was published on December 1, 2008 (73 FR 73032). 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. Beginning with the 2009 LOF, high seas fisheries are included in the LOF. Many fisheries operate in both U.S. waters and on the high seas thereby making the high seas component an extension of a fishery already on the LOF. NMFS categorizes the majority of high seas fisheries on the LOF as Category II based on the lack of marine mammal stock abundance information from the high seas. Exceptions to this are high seas fisheries that also operate in U.S. waters that have already been categorized as I, II, or III. For additional information on the fisheries categories and how fisheries are classified, see http://www.nmfs.noaa.gov/pr/interactions/lof/.

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 BiOps for Atlantic HMS fisheries have resulted in a conclusion of no jeopardy for marine mammals. The 1999 HMS FMP implemented several of the recommendations of the Atlantic Offshore Cetacean Take Reduction Team (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.

More recently, a Pelagic Longline Take Reduction Team (PLTRT) was formed which replaced the disbanded AOCTRT. The PLTRT developed a draft Take Reduction Plan (TRP) and was published along with a proposed rule to implement it on June 24, 2008 (73 FR35623). The PLTRT recommended a suite of management strategies to reduce mortality and serious injury of pilot whales and Risso's dolphins in the Atlantic pelagic longline fishery. NMFS proposed the following three regulatory measures: (1) Establish a Cape Hatteras Special Research Area (CHSRA), with specific observer and research participation requirements for fishermen operating in that area; (2) set a 20–nm (37.02–km) upper limit on mainline length for all pelagic longline sets within the MAB; and (3) develop and publish an informational placard that must be displayed in the wheelhouse and the working deck of all active pelagic longline vessels in the Atlantic fishery. The final rule for this action published May 19th, 2009 (74 FR 23349).

3.10.2.2 Interactions and the ESA

The ESA of 1973 as amended (16 U.S.C. 1531 *et seq*.) provides for the listing of species determined by the USFWS or NOAA to be threatened or endangered throughout all or a portion of their range and the designation of critical habitat for such species, prohibition on unauthorized or unpermitted take, and for avoiding jeopardy and ultimately conserving and recovering listed 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, among other 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 result in jeopardy to a listed species or destroy or adversely modify designated critical habitat or taking species in the absence of an incidental take statement included in a Biological Opinion (BiOp). Federal agencies carry out their duties under the ESA to avoid jeopardy, receive authorization for incidental take, and provide for conservation and recovery of species

through formally consulting with either NMFS or the USFWS depending on the species at issue under Section 7 of the ESA. Formal Section 7 consultation concludes with the USFWS or NMFS issuing a BiOp evaluating the effects of the proposed action to listed species, determining whether there is a likelihood of jeopardy, including an incidental take statement authorizing a specific level of take, requiring terms and conditions and implementing reasonable and prudent measures for incidental take, and recommendations for conservation measures. If the BiOp concludes that the action is likely to jeopardize a listed species, USFWS or NMFS must suggest reasonable and prudent alternatives to implement the proposed action without jeopardizing the species. The following is a list of endangered or threatened species that have critical habitat listed within the proposed action area.

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.

†U.S. Distinct Population Segment

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 PLL 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 (NMFS,

2008d) and a copy can be found at http://www.nmfs.noaa.gov/sfa/hms/Protected%20Resources/TM580_color_standard_1_7_09.pdf.

A BiOp completed on June 14, 2001, found that the actions of the PLL fishery jeopardized the continued existence of loggerhead and leatherback sea turtles. This document reported that the PLL 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 NED area to PLL fishing (effective July 15, 2001), modified how PLL 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 PLL 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. PLL 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 PLL 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 PLL 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 PLL fishery was completed on June 1, 2004 (NMFS, 2004f). The BiOp concluded that long-term continued operation of the Atlantic PLL 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 PLL 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, line clippers, 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*., 2004; 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, 2004e). 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 PLL fleets of other nations to reduce global sea turtle bycatch and bycatch mortality. U.S gear experts have presented this bycatch reduction technology and data from research activities at approximately 15 international events that included fishing communities and resource managers between 2002 and mid-2005 (NMFS, 2005a).

On February 7, 2007, NMFS published a rule that required BLL vessels to carry the same dehooking equipment as the PLL vessels. To date, all bottom and PLL vessels with commercial shark permits are required to have NMFS-approved sea turtle dehooking equipment onboard (PLL: July 6, 2004, 69 FR 40734; BLL: February 7, 2007, 72 FR 5639).

A May 20, 2008 Biological Opinion (BiOp) issued under Section 7 of the ESA for Amendment 2 to the 2006 Consolidated HMS FMP concluded, based on the best available scientific information, that Amendment 2 to the Consolidated HMS FMP was 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.

Internationally, the United States is pursuing sea turtle conservation through international, regional, and bilateral organizations such as ICCAT, the Asia Pacific Fishery 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 ESA. After reviewing the best scientific data and commercial fisheries 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. NMFS is working on designating critical habitat for smalltooth sawfish.

NMFS believes that smalltooth sawfish takes in the shark gillnet fishery are rare given the high rate of observer coverage. 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. The May 20, 2008, BiOp Amendment 2 to the 2006 Consolidated HMS FMP, which includes the shark gillnet fishery, found that the shark gillnet fishery was not likely to jeopardize the continued existence of endangered smalltooth sawfish.

Smalltooth 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 (NMFS, 2003a). 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. All were released alive except one. Estimates of sawfish bycatch for 2003-06 have been developed and range from 0 to 161 interactions per year (Richards, 2007a; 2007b). However, due to the sparseness of observations (interactions) and effort variables chosen for the various approaches to estimating total interactions, the results were not very precise. A small BLL time-area closure to protect smalltooth sawfish southwest of Key West, FL was considered during the development of the 2006 Consolidated HMS FMP (NMFS, 2006a) but not implemented due to the lack of information regarding critical habitat for this species. A proposed rule to designate critical habitat for smalltooth sawfish was published on November 20, 2008 (73 FR 70290). The May 20, 2008, BiOP Amendment 2 to the 2006 Consolidated HMS FMP, which includes the shark bottom longline fishery, found that the shark bottom longline fishery was not likely to jeopardize the continued existence of endangered smalltooth sawfish.

3.10.2.3 Interactions with Seabirds

Observer data from 1992 through 2007 indicate that seabird bycatch is relatively low in the U.S. Atlantic pelagic longline fishery (NMFS, 2008b). Since 1992, a total of 141 seabird interactions have been observed, with 101 observed killed (71.6 percent). In 2007, there were 117 active U.S. pelagic longline vessels fishing for swordfish in the Atlantic Ocean, Gulf of Mexico, and Caribbean Sea that reportedly set approximately 6.1 million hooks. A total of six seabirds were observed taken. Extrapolated estimates of seabird bycatch varied substantially from 1992-2007, ranging from 0 in 1996 to a high of 1,109 in 1997. The average extrapolated estimate of seabird bycatch was 210 per year while the extrapolated estimate of dead seabird bycatch was 150 per year, ranging from 0 to 623.

The 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 USFWS, 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. NMFS 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 BLL fishery has been virtually non-existent. A single pelican has been observed killed from 1994 through 2005. No expanded estimates of seabird bycatch or catch rates for the BLL fishery have been made due to the rarity of seabird takes.

3.10.3 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 closed the Southeast U.S. Restricted Area to gillnet fisheries from February 15, 2006, to March 31, 2006, as a result of an entanglement and subsequent mortality of a right whale with gillnet gear (71 FR 8223). NMFS also closed eight Marine Protected Areas under Amendment 2 to the 2006 Consolidated HMS FMP (73 FR 35778 corrected 73 FR 40658). 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.

Table 3.50 Estimated sea turtle interactions by species in the US Atlantic pelagic longline fishery, 1999-2007, and Incidental Take Levels (ITS).

PLL Fishery	1999	2000	2001	2002	2003	2004	2005	2006	2007	3 year ITS, 2004-06 / 2007-09	
										Total	Annual
Leatherback	1,016	769	1,208	962	1,112	1,362	368	415	500	1,981 / 1,764	660 / 588
Loggerhead	994	1,256	312	575	727	733	282	558	542	1,869 / 1,905	632 / 635
Other/Unidentified Sea Turtles	66	128	0	50	38	0	0	11	1	105 / 105	35 / 35
Marine Mammals	422	403	177	201	300	164	372	313	151	NA	NA

3.10.4 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 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 ASMFC 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.

3.10.4.1 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 (Table 3.51) (SEDAR 11, 2006). Bycatch estimates of the small coastal shark complex were generated for both the GOM and SA shrimp trawl fisheries for the most recent SCS stock assessment. Requirements for turtle excluder devices in these fisheries have probably resulted in less bycatch because sharks are physically excluded from entering the gear. Bycatch of the SCS complex in the Gulf of Mexico shrimp trawl fishery consists mainly of Atlantic sharpnose and bonnethead sharks (SEDAR 13, 2007). However, approximately 45 percent of blacknose shark mortality occurs in the Gulf of Mexico shrimp trawl fishery. Finetooth sharks were added as a select species for the shrimp trawl observer program in 2005 to help determine if this fishery has bycatch of finetooth sharks. Prior to this, data on finetooth shark bycatch was not recorded.

Table 3.51 Estimates of bycatch (numbers of fish) of small coastal sharks in the U.S. south Atlantic and Gulf of Mexico shrimp trawl fisheries and bottom longline fishery relative to total catch. Source: SEDAR 13, 2007.

Year	Shrimp Bycatch (GOM)	Percent of Total Catch (GOM)	Shrimp Bycatch (SA)	Percent of Total Catch (SA)	Bottom Longline Discards	Percent of Total Catch	Total Catch
1992	1172572	81.9	147409	10.3			1431810
1993	509360	76.4	64034	9.6			666956
1994	443215	69.3	55718	8.7			639406
1995	1051681	69.2	132211	8.7	32494	2.1	1520508
1996	920627	71.7	115736	9.0	15627	1.2	1284416
1997	703350	63.2	88421	7.9	9035	0.8	1113361
1998	806300	65.7	101363	8.3	9038	0.7	1228131
1999	641017	59.9	80585	7.5	14379	1.3	1070164
2000	796602	61.9	100144	7.8	22196	1.7	1286476
2001	641786	55	80682	6.9	14365	1.2	1167231
2002	1104353	69.2	138833	8.7	24906	1.6	1595703
2003	544058	59.1	68396	7.4	26518	2.9	919918
2004	797000	67.1	101330	8.5	30165	2.5	1188402
2005	530943	59.9	66893	7.5	29020	3.3	886732

Table 3.52 Estimates of bycatch (numbers of fish) of blacknose sharks in the U.S. south Atlantic and Gulf of Mexico shrimp trawl fisheries and bottom longline fishery relative to total catch. Source: SEDAR 13, 2007.

Year	Shrimp Bycatch (GOM)	Percent of Total Catch (GOM)	Shrimp Bycatch (SA)	Percent of Total Catch (SA)	Bottom Longline Discards	Percent of Total Catch	Total Catch
1992	38197	79.3	4802	10	-	-	48198
1993	15514	76.3	1950	9.6	-	-	20339
1994	27351	60.4	3438	7.6	-	-	45253
1995	40316	58.3	5068	7.3	5181	7.5	69191
1996	35295	45.1	4437	5.7	2195	2.8	78322
1997	58309	47.7	7330	6	1869	1.5	122306
1998	34082	45.5	4285	5.7	2622	3.5	74856
1999	27461	41.4	3452	5.2	901	1.4	66273
2000	31556	30.4	3967	3.8	11321	10.9	103856
2001	45593	43.6	5732	5.5	3456	3.3	104537
2002	25400	33.7	3193	4.2	6623	8.8	75333
2003	54258	56.6	6821	7.1	5131	5.4	95801
2004	65546	62.4	8243	7.9	1999	1.9	105038
2005	20568	38.2	2586	4.8	5617	10.4	53835

3.10.5 Evaluation of Other Bycatch Reduction Measures

NMFS continues to monitor and evaluate bycatch in HMS fisheries through direct enumeration (pelagic and BLL observer programs, shark gillnet observer program), evaluation of management measures (closed areas, trip limits, gear modifications, *etc*.), and VMS.

The following section provides a review of additional management measures or issues that may address bycatch reduction:

ALWTRP regulations

Major changes to the ALWTRP were implemented in a final rule that published on October 5, 2007 (72 FR 57104). Regulations that affect HMS fisheries specifically gillnet fisheries, include: 1) a closed area for all gillnet fisheries from November 15 – April 15 from 29° 00’ N to 32° 00’ N from shore eastward to 80° 00’W and off SC, within 35 nautical miles of the coast (Southeast US Restricted Area North); 2) a restricted area from December 1 – March 31 from 27° 51’N to 29° 00’N from shore eastward to 80° 00’W (Southeast US Restricted Area South); 3) additional seasonal boundaries for EEZ waters east of 80° 00’W from 26° 46.50’N to 32° 00’N (Other Southeast Gillnet Waters); and 4) a monitoring area specific to the Atlantic shark gillnet fishery that extends from the area along the coast from 27° 51’N south to 26° 46.50’N eastward to 80° 00’W (Southeast US Monitoring Area) effective December 1 – March

31. Specific compliance requirements for fishing in these areas varies and are summarized in the Guide to the Atlantic Large Whale Take Reduction Plan. For additional information please see the ALWTRP website http://www.nero.noaa.gov/whaletrp/index.html.

Atlantic Bottlenose Dolphin Take Reduction Team

NMFS published a final rule on April 22, 2006, to implement the TRP. Included in the final rule are: 1) effort reduction measures; 2) gear proximity requirements; 3) gear or gear deployment modifications; and 4) outreach and education measures to reduce dolphin bycatch below the stock's potential biological removal level. The final 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 2008 final list is available. The final 2009 List of Fisheries published on December 1, 2008 (73 FR 73032). Final 2007 and draft 2008 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.

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 PLL 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 PLL fishery has been formed.

PLTRT

NMFS appointed a PLTRT in June 2005, to address issues in the longline fishery and marine mammals, specifically pilot whales. A proposed rule to implement the TRP has been developed and published on June 24, 2008 (73 FR35623). The PLTRT recommended a suite of management strategies to reduce mortality and serious injury of pilot whales and Risso's dolphins in the Atlantic pelagic longline fishery. NMFS proposed the following three regulatory measures: (1) Establish a Cape Hatteras Special Research Area (CHSRA), with specific observer and research participation requirements for fishermen operating in that area; (2) set a 20–nm (37.02–km) upper limit on mainline length for all pelagic longline sets within the MAB; and (3) develop and publish an informational placard that must be displayed in the wheelhouse and the working deck of all active pelagic longline vessels in the Atlantic fishery. The final rule for this action published May 19, 2009 (74 FR 23349).

VMS in the PLL fishery

NMFS adopted fleet-wide VMS requirements in the Atlantic PLL 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 PLL 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.

VMS 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 required all vessels with shark LAPs to participate in the Directed Shark Gillnet Observer program. Directed shark BLL vessels located between 33° N and 36° 30' N need to install and operate a VMS unit from January through July.

3.11 Effectiveness of Existing Time/Area Closures in Reducing Bycatch

Since 2000, NMFS has implemented a number of time/area closures and gear restrictions 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*.). Preliminary analyses of the effectiveness of these closures are summarized here.

The combined effects of the individual area closures and gear restrictions were examined by comparing the reported catch and discards from 2005-2007 to the averages for 1997-1999 throughout the entire U.S. Atlantic fishery. Previous analyses attempted to examine the effectiveness of the time/area closures only by comparing the 2001-03 reported catch and discards to the base period (1997-99) chosen and are included here as well for reference. The percent changes in the reported numbers of fish caught and discarded were compared to the predicted changes from the analyses in Regulatory Amendment 1 to the 1999 FMP (NMFS, 2000). Overall effort, expressed as the number of hooks reported set, declined by 30 percent from 1997-99 (Table 3.53). Declines were noted for both the numbers of kept and discards of almost all species examined including swordfish, tunas, sharks, billfish, and sea turtles. The only positive changes from the base period were the numbers of bluefin tuna and dolphin kept and discarded. The reported number of bluefin tuna kept increased by 39.2 percent for 2005-07 compared to 1997-99 (Table 3.53). The number of reported discards of bluefin tuna increased by almost 12 percent between the same time periods, which matches the predicted 11 percent increase from the analyses in Regulatory Amendment 1. The number of dolphin kept was virtually unchanged between time periods and the number of dolphin discards increased by 13 percent, although the absolute number of discards were relatively low (less than one thousand fish) (Table 3.53). Billfish (blue and white marlin, sailfish) discards reportedly decreased by 61.3 to 76 percent from 1997-99 to 2005-07 (Table 3.53). The reported discards of spearfish declined by 30.4 percent, although the absolute number of discards was also low (less than 200 fish). The reported number of turtle interactions decreased by 67.5 percent from 1997-99 to 2005-07.

Table 3.53 **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 reported caught and discarded in the U.S. Atlantic PLL fishery, 1997 – 2007, and percent change from 1997-99.**
Predicted values from Regulatory Amendment 1 where Pred [1] = without redistribution of effort, Pred [2] = with redistribution of effort.
Source: HMS logbook 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	5,110	82,022	13,746	7,869	63,530	1,204	4,787	91	2,309	2,436	1,765	384	267
1998	3,731	45,261	6,458	5,577	23,643	299	5,445	305	1,301	1,511	850	103	890
1999	2,852	28,995	6,375	5,477	31,960	321	5,285	128	1,253	1,971	1,411	151	632
2000	3,068	28,048	7,758	6,727	29,272	294	4,232	48	1,163	1,286	1,106	79	271
2001	3,511	23,954	6,510	4,892	27,914	329	3,084	62	659	874	358	142	421
2002	3,071	23,325	4,077	3,968	30,559	185	4,223	33	1,181	1,449	386	161	467
2003	3,129	21,771	5,332	4,882	29,609	452	4,020	126	606	813	280	114	399
2004	3,460	25,414	2,304	5,144	39,561	295	4,674	35	713	1,060	425	172	370
2005	3,150	21,560	3,365	5,881	25,709	556	3,360	280	569	990	367	155	154
2006	2,098	24,113	1,768	5,326	25,658	1,041	3,608	100	439	557	277	142	128
2007	3,504	27,478	546	7,133	68,124	467	3,073	52	611	744	321	147	300
Mean													
1997-99	3,898	52,093	8,860	6,308	39,711	608	5,172	175	1,621	1,973	1,342	213	596
A) 2001-03	3,237	23,017	5,306	4,581	29,361	322	3,776	74	815	1,045	341	139	429
B) 2005-07	2,917	24,384	1,893	6,113	39,830	688	3,347	144	540	764	322	148	194
% dif (A)	-17.0	-55.8	-40.1	-27.4	-26.1	-47.0	-27.0	-57.8	-49.7	-47.0	-74.6	-34.6	-28.1
% dif (B)	-25.2	-53.2	-78.6	-3.1	0.3	13.2	-35.3	-17.6	-66.7	-61.3	-76.0	-30.4	-67.5
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

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4.0 ENVIRONMENTAL CONSEQUENCES OF ALTERNATIVES

NMFS is proposing commercial and recreational shark management measures in the draft Amendment 3 to the 2006 Consolidated HMS FMP. The commercial management measures focus on three main categories, including: SCS commercial quotas (alternatives A1-A5); commercial gear restrictions (alternatives B1-B3); and pelagic shark effort controls (alternatives C1-C6). The recreational management measures focus on two categories: SCS (alternatives D1-D4) and pelagic sharks (alternatives E1-E5). Finally, there is a smooth dogfish section that focuses on commercial and recreational measures for smooth dogfish (alternatives F1-F3). All of the issues within these categories focus on management measures within the HMS Atlantic shark fishery. NMFS is also working in cooperation with the Gulf of Mexico Management Council (GMFMC) and SAFMC regarding management measures in the shrimp trawl fisheries managed by the different Councils. Any changes in the shrimp trawl fisheries in the Gulf of Mexico and South Atlantic regions would be done through the Council process in separate fishery management plans. Concurrent with the draft amendment, NMFS has prepared and released a proposed rule that would implement the preferred alternatives if selected after public review and comment. This chapter contains NMFS' assessment of the direct, indirect, and cumulative impacts of a full range of reasonable alternatives on the physical and human environment for the Atlantic shark fisheries in each category. This includes evaluation of the environmental impacts of a no action alternative for each category.

Data sources

NMFS collects fishery-dependent data on sharks from a number of different sources. The following is a brief description of the data sources available to NMFS, and NMFS' rationale for choosing particular data sources as the best available data for this document.

NMFS uses two logbooks to collect information from commercial shark permit holders: the Coastal Fisheries logbook and the HMS logbook. In general, the Coastal Fisheries logbook is used by directed and incidental shark permit holders fishing with BLL and gillnet gear that may also be targeting or retaining reef fish or other coastal species. NMFS used this logbook for information regarding landings and effort for SCS and smooth dogfish. The HMS logbook is used by fishermen targeting tunas and swordfish with PLL gear. NMFS used this logbook to primarily get information regarding landings and effort for shortfin mako sharks. Fishermen report landings by species in both logbooks as well as discard information by species in the HMS logbook. Fishermen also record effort data and fishing location for each trip (in the Coastal Fisheries logbook) or set (in the HMS logbook). Logbooks are submitted to NMFS by individual fishermen and include effort data by permit type and gear type. Fishermen in the Northeast region who typically do not report in the Coastal Fisheries or HMS logbooks may also submit landings to the VTR program. NMFS used VTRs to determine the number of vessels and landings for species, such as smooth dogfish, that may not be reported in the Coastal Fisheries or HMS logbooks. NMFS used the MRFSS and LPS (Large Pelagic Survey) databases to get information on recreational landings of sharks.

NMFS also collects commercial data on shark landings and discards through the shark BLL, shark gillnet, and PLL observer programs. More detailed information on landings (*e.g.*,

average size, weight, *etc*.) and discards is available through the observer reports than through the logbooks. In addition, through the observer program, NMFS gathers data on fishing trips that do not target sharks (*i.e.*, target other species such as the snapper-grouper complex or Spanish mackerel). However, observers are only present on a portion of the shark BLL and gillnet fleet and PLL fleet whereas the Coastal Fisheries and HMS logbooks contain data from the entire HMS fishing fleet with federal permits. Since only federally-permitted commercial shark fishermen are required to submit federal logbooks and are selected to carry observers, logbook data and observer program data do not encapsulate state landings or effort data and are not normally used for quota monitoring purposes.

NMFS uses federal and state dealer reports to monitor commercial shark landings for quota monitoring and stock assessment purposes. The dealer reports come from state shark dealers as well as from federal shark dealers through the state and federal quota monitoring system. Thus, commercial dealer reports include shark landings in both federal and state waters. NMFS then cross-checks these different sources to ensure double-reporting does not take place between federal and state dealers, and releases regular shark landings updates from these reports. NMFS also uses data submitted to the Gulf of Mexico commercial Fishery Information Network (GulfFIN) and commercial dealer data submitted to the ACCSP to quantify landings of species, such as smooth dogfish landings, in state and federal waters from Maine through Texas. In addition, the shark dealer reports are used to incorporate commercial fishery landings into stock assessments. However, shark dealer reports do not have detailed effort information that is included in logbook data, such as landings or trip data by different permit holders or gear type.

Because effort data is obtained through logbooks, while both state and federal landings are obtained through dealer reports, NMFS used a combination of both logbook and dealer reports to obtain the necessary information for analyses in the this document. NMFS used logbook data to estimate effort in terms of number of trips taken by different permit and gear types in different regions and to quantify landings by permit and gear type in different regions. NMFS used landings data from shark dealer reports to determine historical landings of each shark species as well as baseline information under the different status quo alternatives.

Time series

NMFS used 2004 to 2007 data from the Coastal Fisheries and HMS logbooks and shark dealer reports for SCS and shortfin mako sharks and data from 1998-2007 from the ACCSP and GulfFIN programs for smooth dogfish to analyze the ecological, social, and economic impacts of the alternatives. NMFS chose this time series of data for this document for a number of reasons. First, the latest shark stock assessments for the SCS complex, finetooth, Atlantic sharpnose, bonnethead, and blacknose sharks were conducted with data through 2005. The ICCAT shortfin mako shark stock assessment was conducted with data up through 2007. Thus, using data from 2004 to 2007 allowed 2 years worth of data before and after the terminal year of the latest SCS assessment and encompassed the terminal year included in the shortfin mako assessment. In addition, in the middle of 2008, new management measures were implemented under Amendment 2 to the 2006 Consolidated HMS FMP. Thus, using data before implementation of Amendment 2 would most accurately reflect the shark fisheries based on the latest stock assessments. Finally, NMFS used 10 years worth of data for smooth dogfish (1998-2007) to monitor the trends in smooth dogfish landings given this species has never been assessed.

NMFS estimated discards and bycatch in the commercial shark fishery based on data from the individual SCS stock assessments completed in 2007 and data from the BLL, gillnet, and PLL observer programs. In addition, NMFS used average 2004-2007 ex-vessel prices for economic analyses and 2009 permit information from NMFS' Southeast and Northeast Regional Offices for social analyses in this document. Based on these data, NMFS analyzed the ecological, social, and economic impacts associated with the different alternatives described below.

4.1 Commercial Measures

4.1.1 SCS Commercial Quotas

NMFS is considering several alternatives relating to commercial quotas. The alternatives for the Atlantic shark commercial fishery range from maintaining the status quo under the No Action alternative, to restructuring the SCS quota, and closing the SCS fishery. The ecological, social, and economic impacts of each alternative are described below.

All of these alternatives only pertain to the Atlantic shark commercial fishery. In order for the TAC of 19,200 blacknose sharks per year recommended by the 2007 blacknose shark stock assessment to be attained, NMFS is working with the GMFMC and SAFMC to reduce blacknose shark discards in the shrimp trawl fisheries in addition to the management measures analyzed in this document. The alternatives considered below assume for purposes of analysis that bycatch of blacknose sharks in shrimp trawl fisheries is being reduced via Council action.

As described in Chapter 2, the alternatives considered for commercial quotas are:

Alternative A1	No Action. Maintain the existing SCS quota and species complex
Alternative A2	Establish a new SCS quota of 392.5 mt dw and a blacknose commercial quota of 13.5 mt dw
Alternative A3	Establish a new SCS quota of 42.7 mt dw and a blacknose commercial quota of 16.6 mt dw; allow all current authorized gears for sharks
Alternative A4	*Establish a new SCS quota of 56.9 mt dw and a blacknose commercial quota of 14.9 mt dw; remove shark gillnet gear as an authorized gear for sharks – Preferred Alternative*
Alternative A5	Close the SCS fishery

Ecological Impacts

Under alternative A1, the No Action alternative, NMFS would keep blacknose sharks within the SCS quota and maintain the annual SCS quota of 454 mt dw. NMFS would also maintain the current SCS complex (finetooth, Atlantic sharpnose, bonnethead, and blacknose sharks). This quota would apply to one overall region. NMFS would also maintain the current regulations regarding overharvests where overharvests of quota for each species/complex would be removed from the next fishing year. The carryover of underharvests for species that are not overfished or are not experiencing overfishing would be added to the base quota the following year and capped at 50 percent of the base quota. However, there would be no carryover of underharvests for species that are unknown, overfished, or experiencing overfishing. In addition, NMFS would close each species/complex with five days notice upon filing in the Federal

Register when 80 percent of a given quota is filled or projected to be filled. In addition, under the No Action alternative, A1, NMFS would continue to allow blacknose sharks to be taken under EFPs, SRPs, Display permits, and LOAs. On average, 54 blacknose sharks are taken (*i.e.*, kept or discarded dead) under the exempted fishing program. Given the average weight of the blacknose sharks taken under the exempted fishing program is 3.3 lb dw, this equals approximately 178.2 lb dw of blacknose sharks taken under the exempted fishing program each year. This level of mortality would continue under alternative A1.

These measures would have neutral ecological impacts for finetooth, Atlantic sharpnose, and bonnethead sharks, which have all been determined to not be overfished with no overfishing occurring. However, this alternative would have negative ecological impacts on blacknose sharks, which have been determined to be overfished with overfishing occurring, as there would be no reduction in current blacknose mortality. Without reductions in current blacknose shark mortality, NMFS would not be able to achieve the TAC of 19,200 blacknose sharks per year recommended by the 2007 blacknose shark stock assessment. To achieve this TAC, NMFS would need to reduce overall blacknose mortality by at least 78 percent in each sector which captures blacknose sharks. The average annual landings of blacknose sharks in the Atlantic shark commercial fishery was 27,484 blacknose sharks from 1999-2005 (136,595 lb dw), and the average annual discards were 5,007 blacknose sharks over that same time period (27,038 lb dw; Table 4.1). A 78-percent reduction in blacknose landings (6,046 blacknose sharks/year) and discards (1,102 blacknose sharks/year) in the Atlantic shark commercial fishery would be a total of 7,148 blacknose sharks per year (6,046 + 1,102 = 7,148), which is equivalent to 45,032 lb dw (20.4 mt dw), assuming the average commercial blacknose weight across all commercial gears (*i.e.*, BLL, gillnet, and shrimp trawl gear) is 6.3 lb dw (7,148 blacknose sharks x 6.3 lb dw = 45,032 lb dw). With the additional landings of blacknose sharks within the EFP program as described above, the commercial allowance for the commercial shark fishery would be 44,853.8 lb dw (45,032 lb dw - 178.2 lb dw) or 7,094 blacknose sharks (7,148 blacknose sharks – 54 blacknose sharks taken in the EFP program = 7,094 blacknose sharks). Without achieving such a reduction in the Atlantic shark commercial fishery, blacknose sharks would not be able to rebuild within their specified rebuilding timeframe (see Chapter 1). Therefore, NMFS does not prefer this alternative at this time.

Table 4.1 **Sources of blacknose shark mortality, 1999-2005**
Source: NMFS, 2007. Estimates from the 'longline', 'nets', and 'lines' columns are derived from data reported in the Northeast and Southeast General Canvass data systems. Longline discards are derived from multiplying the longline landings by the ratio of dead discards observed in the commercial shark bottom longline fishery. The numbers in the shrimp bycatch columns are derived using a Bayesian model (Nichols, 2007). Average commercial weight across all fisheries is 4.97 lb dw. Average recreational weight is 1.5 lb dw (Cortés and Neer, 2007).

Gear	Shark Longline	Shark Nets	Shark Lines	Shark Longline Discards	GOM Shrimp bycatch	SA Shrimp bycatch	Recreational Landings	Total
Number of fish	8,091	19,041	352	5,007	38,626	4,856	10,408	86,381
Percent by number	9%	22%	<1%	6%	45%	6%	12%	100%
Weight (lb dw)	40,212	94,634	1,749	24,885	191,971	24,134	15,612	393,198

Gear	Shark Longline	Shark Nets	Shark Lines	Shark Longline Discards	GOM Shrimp bycatch	SA Shrimp bycatch	Recreational Landings	Total
Weight (mt dw)	18	43	1	11	87	11	7	178
Percent by weight	10%	24%	<1%	6%	49%	6%	4%	100%

Alternative A2 would remove blacknose sharks from the SCS quota and create a blacknose shark-specific quota and a separate "non-blacknose SCS" quota. The non-blacknose SCS quota would apply to finetooth, Atlantic sharpnose, and bonnethead sharks. The non-blacknose SCS quota would be the current SCS quota (454 mt dw) minus average annual landings of blacknose sharks (136,595 lb dw or 61.5 mt dw/year; Table 4.1). This would result in a non-blacknose SCS quota of 392.5 mt dw/year (454 mt dw – 61.5 mt dw = 392.5 mt dw). The blacknose shark quota would be a 78-percent reduction in current landings or 13.5 mt dw or 29,762 lb dw/year (61.5 mt dw x 78 percent = 48 mt dw; 61.5 mt dw – 48 mt dw = 13.5 mt dw/year). This is equivalent to approximately 2,834 blacknose sharks/year assuming an average shark commercial fishery weight of blacknose = 10.5 lb dw (*i.e.*, average weight caught on shark BLL and gillnet gear). Regulations regarding over- and underharvest quota adjustments and closing a species/complex when 80 percent of a given quota is filled would not change under this alternative. In addition, blacknose sharks would continue to be taken under the exempted fishing program as they currently are under the No Action alternative, A1.

Alternative A2 would have neutral ecological impacts on finetooth, Atlantic sharpnose, and bonnethead sharks as it would most likely not result in reduced landings of any of these species since the overall SCS quota would only be reduced by the average annual blacknose shark landings. However, although this alternative could reduce landings of blacknose sharks by 78 percent, because discards would continue as fishermen directed on non-blacknose SCS, overall mortality for blacknose sharks would still be above the commercial allowance of 44,853.8 lb dw/year (7,094 blacknose sharks/year), even if the retention of blacknose sharks was prohibited (see Appendix A). This would have negative ecological impacts for blacknose sharks as it would not allow them to rebuild within their allotted rebuilding time as described in Chapter 1. Thus, NMFS does not prefer alternative A2 at this time.

Alternative A3 would also remove blacknose sharks from the SCS quota and create a blacknose shark-specific quota and a separate "non-blacknose SCS" quota. The non-blacknose SCS quota would apply to finetooth, Atlantic sharpnose, and bonnethead sharks and would equal 42.7 mt dw (94,115 lb dw). The non-blacknose SCS quota would be based on an 82-percent reduction of the average current landings of finetooth, Atlantic sharpnose, and bonnethead sharks from 2004 through 2007 (Table 4.2). NMFS determined that by reducing the overall SCS fishery NMFS could reduce the level of blacknose shark discards such that the total blacknose shark mortality would stay below the commercial allowance (see Appendix A). NMFS reduced the non-blacknose SCS quota by various amounts and determined the percent reductions that would allow for some commercial harvest of blacknose sharks yet keep the overall mortality of blacknose sharks below the commercial allowance (see Appendix A). NMFS would establish a blacknose-specific quota of 16.6 mt dw (36,526 lb dw), which is the amount of blacknose sharks

that would be landed while the non-blacknose SCS quota is taken (see Appendix A). Under this alternative, fishermen with an incidental shark permit would not be allowed to retain any blacknose sharks under alternative A3. This alternative assumes that fishermen with a directed shark permit would fish for SCS in a directed fashion until the non-blacknose SCS and/or blacknose shark quota reached 80 percent. At that time, both the non-blacknose SCS fishery and the blacknose shark fishery would close, and fishermen would fish for other fish species, and all SCS, including blacknose sharks, would have to be discarded. NMFS anticipates that some of the displaced SCS fishing effort may be redistributed to other gillnet and BLL fisheries once the non-blacknose and blacknose fisheries close. As shown in Chapter 3 (Table 3.32), many shark fishermen hold permits in other BLL and gillnet fisheries. Redistributed effort to these other fisheries could result in indirect negative ecological impacts in those fisheries. However, because most of those fisheries are limited access and have quotas and/or fishing seasons in place to limit catch and prevent overfishing, NMFS feels any negative ecological impacts due to redistributed effort would likely be limited. Assuming the fishery operates in this fashion, NMFS estimates that total mortality for blacknose sharks would be 43,601 lb dw, which is below the commercial allowance of 44,853.8 lb dw (see Appendix A). As such, this alternative could reduce blacknose shark mortality below the level needed in order to rebuild the stock as outlined in Chapter 1.

Table 4.2 Average commercial landings of SCS from 2004-2007 (lb dw).
Source: Cortés and Neer, 2005; Cortés pers. comm.

SCS	2004	2005	2006	2007
Bonnethead	29,402	33,295	33,911	53,638
Finetooth	121,036	107,327	80,536	171,099
Sharpnose, Atlantic	230,880	375,881	520,028	334,421

Alternative A3 is anticipated to have positive ecological impacts for blacknose, Atlantic sharpnose, bonnethead, and finetooth sharks as it would reduce landings by 73 percent for blacknose sharks and 82 percent for non-blacknose SCS based on current landings (Table 4.3). In addition, it would reduce discards by 74 percent for blacknose sharks. However, since non-blacknose SCS are caught more often in the SCS fishery and other fisheries that incidentally catch SCS compared to blacknose sharks (for instance, on average, incidental fisheries catch approximately one blacknose sharks per trip whereas the same trips, on average, catch 40 non-blacknose SCS per trip), discards of non-blacknose SCS could increase by up to 62 percent for the non-blacknose SCS based on current discard rates and assuming past fishing effort continues after the implementation of these management measures (Table 4.3). Despite the increase in discards, this alternative would still result in overall lower mortality of non-blacknose sharks compared to the No Action alternative, and therefore, could have positive ecological impacts for non-blacknose SCS. However, given the potential increase in non-blacknose SCS discards and due to the reduction in the non-blacknose SCS quota under alternative A3, which is larger than the reduction under alternative A4, NMFS does not prefer this alternative at this time.

Table 4.3 Estimated landings and discards of blacknose sharks and non-blacknose SCS under alternative A3

Species	Estimated Landings (lb dw)	Percent Change in Landings Compared to No Action Alternative	Estimated Discards (lb dw)	Percent Change in Discards Compared to No Action Alternative
Blacknose				
Under No Action	136,595	0%	27,038	0%
Under Alternative A3	36,526	73%↓	7,075	74%↓
Non-Blacknose SCS				
Under No Action	522,864	0%	43,116	0%
Under Alternative A3	94,115	82%↓	69,843	62%↑

Alternative A4, the preferred alternative, would remove blacknose sharks from the SCS quota and create a blacknose shark-specific quota and a separate "non-blacknose SCS" quota. The non-blacknose SCS quota would apply to finetooth, Atlantic sharpnose, and bonnethead sharks and would equal 56.9 mt dw (125,487 lb dw). The non-blacknose SCS quota would be based on a 76-percent reduction of the average current landings of finetooth, Atlantic sharpnose, and bonnethead sharks from 2004 through 2007 (Table 4.4). NMFS determined that by reducing the overall SCS fishery, NMFS could reduce the level of blacknose shark discards such that the total blacknose shark mortality would stay below the commercial allowance (see Appendix A). NMFS would establish a blacknose-specific quota of 14.9 mt dw (32,753 lb dw), which is the amount of blacknose sharks that would be landed while the non-blacknose SCS quota is taken (see Appendix A). Under this alternative, fishermen with an incidental shark permit would not be allowed to retain any blacknose sharks under alternative A4. In addition, this alternative assumes that gillnet gear would not be used to harvest sharks under alternatives B2 or B3, and fishermen would fish for SCS in a directed fashion until the non-blacknose SCS and/or blacknose shark quota reached 80 percent (see Appendix A). At that time, both the non-blacknose SCS fishery and the blacknose shark fishery would close, and fishermen would fish for other fish species, and all SCS, including blacknose sharks, would have to be discarded. NMFS anticipates some of the displaced SCS fishing effort may be redistributed to other gillnet and BLL fisheries once the non-blacknose and blacknose fisheries close. As mentioned above, many shark fishermen hold permits in other BLL and gillnet fisheries. Redistributed effort to these other fisheries could result in indirect negative ecological impacts in those fisheries. However, because most of those fisheries are limited access and have quotas and/or fishing seasons in place to limit catch and prevent overfishing, NMFS feels any negative ecological impacts due to redistributed effort would likely be limited. Assuming the fishery operates in this fashion, NMFS estimates that total mortality for blacknose sharks would be 37,763 lb dw, which is below the commercial allowance of 44,853.8 lb dw (see Appendix A). As such, this alternative could reduce blacknose shark mortality below the level needed to rebuild the stock as outlined in Chapter 1.

Alternative A4 is anticipated to have positive ecological impacts for all SCS as it would reduce landings by 76 percent for blacknose sharks and non-blacknose SCS based on current landings (Table 4.4). In addition, it would reduce discards by 81 percent for blacknose sharks and 2 percent for the non-blacknose SCS based on current discards if gillnets are prohibited in the Atlantic, Gulf of Mexico, and Caribbean Sea under alternative B2. Alternative A4 could decrease discards of non-blacknose SCS by 3 percent if gillnets are prohibited from South

Carolina south, including the Gulf of Mexico and Caribbean Sea under alternative B3 (Table 4.4). Cumulatively, this would reduce mortality of blacknose sharks by at least 78 percent and would meet the rebuilding plan for blacknose sharks. Fishermen which target SCS with gillnet gear do not typically discard SCS; discards predominately occur by fishermen that fish with BLL gear. Therefore, removing shark gillnet gear is not expected to affect discards of either blacknose sharks or non-blacknose SCS. NMFS assumes that if retention of sharks is prohibited with gillnet gear, directed gillnet fishing for sharks would cease. Fishermen would continue to use gillnet gear to target other fish species, and discard any sharks that were incidentally caught.

In addition, alternative A4 would reduce landings of LCS, predominately blacktip sharks, which are also caught in gillnet gear. If gillnets are prohibited in the Atlantic, Gulf of Mexico, and Caribbean Sea under alternatives A4 and B2, NMFS estimates that LCS landings could decrease by approximately 104,132 lb dw (3 percent) compared to current average landings of 3,170,155 lb dw from 2004-2007 (Table 4.4). Dead discards could decrease by 52,979 lb dw or 15 percent compared to average annual discards of 359,129 lb dw from 2003-2005 (Table 4.4). If gillnets are prohibited for sharks from South Carolina south, including the Gulf of Mexico and Caribbean Sea under alternatives A4 and B3, NMFS estimates that landings of LCS could decrease by 101,409 lb dw (3 percent) compared to current average annual landing of 3,170,155 lb dw from 2004-2007 (Table 4.4). Dead discards could decrease by 50,797 lb dw or 14 percent compared to average annual discards of 359,129 lb dw from 2003-2005 (Table 4.4). These reductions could be greater given management measures that were implemented under Amendment 2 to the 2006 Consolidated HMS FMP, which reduced quotas and trip limits in the directed LCS fishery starting in July 2008. Therefore, this alternative would also have positive ecological impacts on LCS. Given the positive ecological impacts on non-blacknose SCS, blacknose sharks, and LCS, NMFS prefers alternative A4 at this time. While the gillnet fishermen would be impacted the most by alternative A4 in combination with alternative B2 or B3, alternative A4 would allow for a higher non-blacknose SCS quota (56.9 mt dw) compared to alternative A3 (42.7 mt dw). This higher quota would benefit the larger SCS fishery, while the prohibition of gillnet gear would affect a small number of directed gillnet fishermen. Additionally, compared to alternative A3, this alternative would result in fewer discards of non-blacknose SCS and blacknose sharks.

Table 4.4 Estimated landings and discards of blacknose sharks and non-blacknose SCS under alternative A4

Species	Estimated Landings (lb dw)	Percent Change in Landings Compared to No Action Alternative	Estimated Discards (lb dw)	Percent Change in Discards Compared to No Action Alternative
Blacknose				
Under No Action	136,595	0%	27,038	0%
Gillnets prohibited in all Atlantic (B2)	32,753	76%↓	5,010†	81%↓
Gillnets prohibited South Carolina south (B3)	32,753	76%↓	5,010†	81%↓
Non-Blacknose SCS				
Under No Action	522,864	0%	43,116	0%
Gillnets prohibited in all Atlantic (B2)	125,487	76%↓	42,090†	2%↓

Species	Estimated Landings (lb dw)	Percent Change in Landings Compared to No Action Alternative	Estimated Discards (lb dw)	Percent Change in Discards Compared to No Action Alternative
Gillnets prohibited South Carolina south (B3)	125,487	76%↓	41,691†	3%↓
LCS				
Under No Action	3,170,155	0%	359,129*	0%
Gillnets prohibited in all Atlantic (B2)	3,066,023	3%↓	306,150	15%↓
Gillnets prohibited South Carolina south (B3)	3,068,746	3%↓	308,332	14%↓

†all blacknose and non-blacknose SCS discards are estimated to come from BLL gear
*estimates taken from FEIS for Amendment 2 to the 2006 Consolidated HMS FMP

Alternative A5 would close the entire SCS commercial shark fishery, prohibiting the landing of any SCS, including blacknose sharks. This alternative would have positive ecological impacts for all SCS species as it would reduce landings of finetooth, Atlantic sharpnose, bonnethead, and blacknose sharks. On average, landings of finetooth, Atlantic sharpnose, bonnethead, and blacknose sharks were 120,000 lb dw, 363,303 lb dw, 37,562 lb dw, and 136,595 lb dw, respectively. However, since shark fishermen would presumably continue to fish for LCS using BLL gear, discards of SCS would continue on BLL gear. Based on the latest SCS stock assessments, discards for finetooth, Atlantic sharpnose, bonnethead, and blacknose sharks on BLL gear were 0 lb dw, 39,613 lb dw, 3,503 lb dw, and 27,038 lb dw, respectively (NMFS, 2007).

This alternative could also have positive ecological impacts for LCS. Since gillnets are the primary gear used to target SCS, except for strikenets, which are used to target blacktip sharks, presumably all directed shark gillnet fishing, with the exception of strikenets, would stop under Alternative A5. If all directed shark gillnet fishing stopped under alternative A5, NMFS estimates that landings of LCS could decrease by approximately 102,171 lb dw (3 percent) compared to current average landings of 3,170,155 lb dw from 2004-2007; however, this decrease may be slightly less if blacktip sharks continue to be harvested with directed strikenet gear. Alternative A5 could also decrease LCS dead discards in gillnets by 52,979 lb dw or 15 percent compared to average annual discards of 359,129 lb dw from 2003-2005. Thus, alternative A5 could have positive ecological impacts for LCS. However, while this alternative could reduce blacknose mortality below the commercial allowance of 44,853.8 lb dw, it would also completely eliminate the fishery for all SCS landings. This would severely curtail data collection on all SCS that could be used for future stock assessments. Thus, NMFS does not prefer this alternative at this time.

Social and Economic Impacts

As of March 18, 2009, there were 223 directed shark permit holders, 279 incidental permit holders, and 100 shark dealers. On average between 2004 and 2007, approximately 85 vessels with directed shark permits had SCS landings, of which 44 vessels had blacknose shark landings. Sixty-eight of the 85 vessels with directed shark permits also had finetooth, Atlantic sharpnose, and bonnethead shark landings. On average between 2004 and 2007, approximately 31 vessels with incidental shark permits had SCS landings, of which approximately 7 vessels had

blacknose landings. Twenty-nine of the 31 vessels with incidental shark permits also had finetooth, Atlantic sharpnose, and bonnethead shark landings. It is estimated that these permit holders would be the most affected by the management measures proposed under "SCS Commercial Quotas." The intensity of social and economic impacts would depend on the particular alternative as described below. The average annual gross revenues from 2004 through 2007 from all SCS meat were $438,092 (Table 4.5). Average annual gross revenues for SCS fins were $395,542, making total average annual gross revenues for SCS landings for the entire fishery $833,634 (Table 4.5). Directed shark permit holders landed approximately 97 percent of the SCS landings whereas incidental shark permit holders landed approximately 3 percent of the SCS total landings. Thus, in total, directed shark permit holders earned approximately $807,792 in average annual gross revenues from SCS landings whereas incidental shark permit holders earned approximately $25,843 from SCS landings (Table 4.5).

As for non-blacknose SCS, the average annual gross revenues from 2004 through 2007 from non-blacknose SCS meat for the entire fishery were $347,900. Average annual gross revenues for non-blacknose SCS fins were $313,613, making total average annual gross revenues for non-blacknose SCS landings for the entire fishery $661,513 (Table 4.5). Directed shark permit holders landed approximately 97 percent of the non-blacknose SCS whereas incidental shark permit holders landed approximately 3 percent of the non-blacknose SCS. Thus, in total, directed permit holders earned approximately $641,006 in average annual gross revenues from non-blacknose SCS landings whereas incidental shark permit holders earned approximately $20,507 from non-blacknose SCS landings (Table 4.5). Spread amongst the directed and incidental shark permit holders that landed non-blacknose SCS, the average directed shark permit holder earned $9,427 in average annual gross revenues ($641,006 / 68 directed vessels = $9,427 per vessel), and the average incidental shark permit holder earned $707 in average annual gross revenues from non-blacknose SCS landings ($20,507 / 29 incidental vessels = $707 per vessel).

Finally, the average annual gross revenues from 2004 through 2007 from blacknose shark meat for the entire fishery were $90,267. Average annual gross revenues for blacknose shark fins were $81,930, making total average annual gross revenues for blacknose shark landings for the entire fishery $172,197 (Table 4.5). Directed shark permit holders landed approximately 93 percent of the blacknose sharks, whereas incidental shark permit holders landed approximately 7 percent of the blacknose sharks. In total, directed shark permit holders earned approximately $160,143 in average annual gross revenues from blacknose shark landings, whereas incidental shark permit holders earned approximately $12,054 from blacknose shark landings (Table 4.5). Spread amongst the directed and incidental shark permit holders that landed blacknose, the average directed shark permit holder earned $3,640 in average annual gross revenues ($160,143 / 44 directed vessels = $3,640 per vessel), and the average incidental shark permit holder earned $1,722 in average annual gross revenues from blacknose shark landings ($12,054 / 7 incidental vessels = $1,722 per vessel).

Under the No Action alternative, A1, there would be neutral social and economic impacts to directed and incidental shark permit holders as the average annual gross revenues from SCS landings, including blacknose shark landings, would be the same as the status quo in the short term. Neutral social impacts are anticipated as fishermen would be expected to fish in a similar

manner as they currently do under the status quo, and neutral indirect social impacts are anticipated for shark dealers and other entities that deal with shark products as NMFS expects these businesses to operate in the same manner as the status quo in the short term. However, in the long term, a decrease in revenues may be expected as the blacknose shark stock continues to decline, which could result in negative economic impacts. This could result in direct negative social impacts as fishermen would have to fish in other fisheries to make up for lost revenues, and indirect negative social impacts on shark dealers and other entities that deal with shark products as they would also have to diversify or leave the shark business as revenues decrease. Any negative impacts experienced as a result of the implementation of Amendment 2 to the 2006 Consolidated HMS FMP have not been quantified here. However, since alternative A1 would not reduce blacknose shark mortality to the level needed to rebuild blacknose sharks (or 44,853.8 lb dw), NMFS does not prefer this alternative at this time.

Table 4.5 Average ex-vessel prices and average annual gross revenues from 2004-2007 under the No Action alternative, A1. Shark fins are assumed to be 5 percent of the carcass weight.

Species	Average Landings (lb dw)	Average Ex-Vessel Price	Average Annual Gross Revenues
Entire Fishery			
SCS	659,459	$0.66	$438,092
Fins	32,973	$12.00	$395,542
Total			$833,634
Non-Blacknose SCS	522,864	$0.67	$347,900
Fins	26,143	$12.00	$313,613
Total			$661,513
Blacknose	136,595	$0.66	$90,267
Fins	6,830	$12.00	$81,930
Total			$172,197
Directed Fishery			
SCS	639,015	$0.66	$424,511
Fins	31,951	$12.00	$383,281
Total			$807,792
Non-Blacknose SCS	506,655	$0.67	$337,115
Fins	25,333	$12.00	$303,891
Total			$641,006
Blacknose	127,033	$0.66	$83,948
Fins	6,352	$12.00	$76,194
Total			$160,143
Incidental Fishery			
SCS	20,443	$0.66	$13,581
Fins	1,022	$12.00	$12,262
Total			$25,843
Non-Blacknose SCS	16,209	$0.67	$10,785
Fins	810	$12.00	$9,722
Total			$20,507

Species	Average Landings (lb dw)	Average Ex-Vessel Price	Average Annual Gross Revenues
Blacknose	9,562	$0.66	$6,319
Fins	478	$12.00	$5,735
Total			$12,054

Under alternative A2, NMFS would remove blacknose sharks from the SCS quota and create a blacknose shark-specific quota of 13.5 mt dw and a separate "non-blacknose SCS" quota, which would apply to finetooth, Atlantic sharpnose, and bonnethead sharks, of 392.5 mt dw. NMFS anticipates that non-blacknose SCS landings would not decrease as the non-blacknose SCS quota would only be reduced by the average blacknose shark landings. Therefore, neutral social impacts would be anticipated for the 68 directed shark permits and 29 incidental shark permits that had non-blacknose SCS landings from the new non-blacknose SCS quota; these fishermen would be expected to fish as they currently do under the No Action alternative, and shark dealers and other entities that deal with shark products would be expected to operate as they do under the No Action alternative. Average annual gross revenues for non-blacknose SCS landings for the entire fishery are anticipated to be the same as under the No Action alternative, A1, or $661,513 (Table 4.6). Therefore, social and economic impacts of the non-blacknose SCS quota on fishermen with directed and incidental shark permit would be neutral under alternative A2. However, the blacknose shark quota would be a 78-percent reduction based on average landings from 2004-2007. Thus, negative social impacts would be anticipated for the 44 vessels with directed shark permits and 7 vessels with incidental shark permits that had blacknose shark landings from the new blacknose shark quota. These fishermen would either have to switch to other fisheries to make up for lost blacknose landings and revenues or leave the fishery. In addition, shark dealers and other entities that deal with blacknose shark products would be indirectly affected by the reduced blacknose quota; these businesses would need to diversify to make up for lost blacknose product and could experience negative social impacts by this alternative. Average annual gross revenues for the blacknose shark landings for the entire fishery would decrease from $172,197 under the No Action alternative (Table 4.5) down to $37,500 (Table 4.6) under alternative A2, which is a 78-percent reduction in average annual gross revenues for blacknose sharks. As directed shark permit holders had the majority of blacknose shark landings under the No Action alternative, NMFS anticipates that directed shark permit holders would experience the largest impacts under alterative A2. The decrease in average annual gross revenues for directed and incidental shark permit holders would depend on the specific trip limit associated with the blacknose shark quota established under A2 (see Appendix A). However, because discards would continue as fishermen directed on non-blacknose SCS, regardless of the retention limits, overall mortality for blacknose sharks would still be above the commercial allowance of 44,853.8 lb dw/year (7,094 blacknose sharks/year), even if the retention of blacknose sharks was not allowed (see Appendix A). In the long term, a decrease in revenues may be expected as the blacknose shark stock continues to decline resulting in a decline in landings. Therefore, NMFS does not prefer this alternative at this time.

Table 4.6 Average ex-vessel prices and average annual gross revenues from 2004-2007 under alternative A2. Shark fins are assumed to be 5 percent of the carcass weight.

Species	Average Landings (lb dw)	Average Ex-Vessel Price	Average Annual Gross Revenues
Entire Fishery			
Non-Blacknose SCS	522,864	$0.67	$347,900
Fins	26,143	$12.00	$313,613
Total			$661,513
Blacknose	29,762	$0.66	$19,643
Fins	1488.1	$12.00	$17,857
Total			$37,500

Under alternative A3, NMFS would remove blacknose sharks from the SCS quota and create a blacknose shark-specific quota of 16.6 mt dw and a separate "non-blacknose SCS" quota of 42.7 mt dw (94,115 lb dw), which would apply to finetooth, Atlantic sharpnose, and bonnethead sharks. While trip limits would not change for non-blacknose SCS for directed and incidental shark permit holders (*i.e.*, no trip limit for directed shark permit holders and a 16 non-blacknose SCS/pelagic sharks combined trip limit for incidental shark permit holders), given the reduction in the non-blacknose SCS quota, NMFS anticipates that the 68 directed shark permit holders and 29 incidental shark permit holders that had non-blacknose SCS landings would experience direct negative social impacts from the new non-blacknose SCS quota. These fishermen would need to fish in other fisheries to make up for lost non-blacknose SCS landings and revenues or leave the SCS fishery. In addition, shark dealers and other entities that deal with non-blacknose SCS product would be affected indirectly as these businesses would need to diversify to make up for lost revenues, which could lead to negative social impacts. Average annual gross revenues for non-blacknose SCS landings for the entire fishery are anticipated to be $119,526 (Table 4.7). This is an 82-percent reduction in average annual gross revenues compared to the average annual gross revenues expected under the No Action alternative, A1 (*i.e.*, $661,513; Table 4.5). Since directed permit holders land approximately 97 percent of the non-blacknose SCS landings as explained in alternative A1, NMFS anticipates that directed shark permit holders would lose more in average annual gross revenues from lost non-blacknose SCS landings compared to incidental shark permit holders under alternative A3. Thus, directed shark permit holders would experience larger direct negative social impacts compared to incidental shark permit holders that do not rely on shark landings for revenues as much as fishermen with directed shark permits. In total, average annual gross revenues for directed shark permit holders of non-blacknose SCS under alternative A3 would be $115,821 (Table 4.7), which is a loss of $525,185 in average annual gross revenues or an 82-percent reduction in average annual gross revenues compared to the average annual gross revenues under the No Action alternative, A1 (*i.e.*, $641,006; Table 4.5). Spread amongst the directed shark permit holders that land non-blacknose SCS, this is an anticipated loss of $7,723 in average annual gross revenues from non-blacknose SCS landings per permit holder ($525,185 / 68 directed vessels = $7,723 per vessel). Incidental shark permit holders land approximately 3 percent of the non-blacknose SCS landings as explained in alternative A1. In total, average annual gross revenues for incidental shark permit holders of non-blacknose SCS under alternative A3 would be $3,705 (Table 4.7), which is a loss of $16,802 in average annual gross revenues or an 82-percent reduction in average annual gross revenues compared to the average annual gross revenues under the No Action alternative, A1 (*i.e.*, $20,507; Table 4.5). These lost revenues

could translate into negative social impacts as fishermen with incidental shark permits would need to change fishing practices to make up for lost non-blacknose SCS landings. Spread amongst the incidental shark permit holders that land non-blacknose SCS, this is an anticipated loss of $579 in average annual gross revenues from non-blacknose SCS landings per permit holder ($16,802 / 29 incidental vessels = $579 per vessel).

Under alternative A3, the blacknose shark quota would be reduced by 73-percent based on average landings from 2004-2007. In addition, in order to keep the total mortality of blacknose sharks below the commercial allowance for the Atlantic shark commercial fishery (see Appendix A), incidental vessels would not be allowed to retain blacknose sharks under alternative A3. Thus, the 44 directed shark permit holders and 7 incidental shark permit holders that had blacknose shark landings would experience direct negative social impacts from the new blacknose shark quota as they would most likely have to fish in other fisheries to make up for lost blacknose landings or leave the fishery altogether. Other entities that deal with blacknose shark products, such as shark dealers, would indirectly experience negative social impacts as they would also have to change their business practices to make up for lost blacknose shark product. Since incidental shark permit holders would not be able to retain blacknose sharks, the total blacknose shark quota would be available only to fishermen with directed shark permit holders. In total, average annual gross revenues for the blacknose shark landings for the directed shark permit holders would decrease from $172,197 under the No Action alternative (Table 4.5) down to $46,023 under alternative A3 (Table 4.7), which is a loss of $126,174 or a 73-percent reduction in average annual gross revenues for blacknose sharks for directed shark fishermen. Spread amongst the directed shark permit holders that land blacknose sharks, there could be an anticipated loss of $2,868 in average annual gross revenues from blacknose landings per permit holder ($126,174 / 44 directed vessels = $2,868 per vessel). Since fishermen with incidental shark permits would not be able to retain blacknose sharks, they would lose an estimated $12,054 in average annual gross revenues from blacknose shark landings (Table 4.5). These lost revenues could translate into negative social impacts as fishermen with incidental shark permits would need to change fishing practices to make up for lost non-blacknose SCS landings as well as discard all blacknose shark catches. Spread amongst the incidental shark permit holders that land blacknose sharks, there could be an anticipated loss of $1,722 in average annual gross revenues from blacknose landings per permit holder ($12,054 / 7 incidental vessels = $1,722 per vessel).

Alternative A3 could result in direct, significant negative social and economic impacts for directed and incidental shark fishermen. It could also indirectly result in negative social and economic impacts for shark dealers and other entities that deal with non-blacknose SCS and blacknose shark products due to decreases in the non-blacknose SCS and blacknose shark quotas. Given the large reduction in the non-blacknose SCS quota under alternative A3, which would affect more directed and incidental shark permit holders compared to the smaller reduction in the non-blacknose SCS quota under alternative A4, NMFS does not prefer alternative A3 at this time.

Table 4.7 Average ex-vessel prices and average annual gross revenues from 2004-2007 under alternative A3. Shark fins are assumed to be 5 percent of the carcass weight.

Species	Average Landings (lb dw)	Average Ex-Vessel Price	Average Annual Gross Revenues
Entire Fishery			
Non-Blacknose SCS	94,115	$0.67	$63,057
Fins	4,706	$12.00	$56,469
Total			$119,526
Directed Fishery			
Non-Blacknose SCS	91,197	$0.67	$61,102
Fins	4,560	$12.00	$54,718
Total			$115,821
Blacknose	36,526	$0.66	$24,107
Fins	1,826	$12.00	$21,916
Total			$46,023
Incidental Fishery			
Non-Blacknose SCS	2,918	$0.67	$1,955
Fins	146	$12.00	$1,751
Total			$3,705

Under alternative A4, the preferred alternative, NMFS would remove blacknose sharks from the SCS quota and create a blacknose shark-specific quota and a separate "non-blacknose SCS" quota equal to 56.9 mt dw (125,487 lb dw), which would apply to finetooth, Atlantic sharpnose, and bonnethead sharks. The non-blacknose SCS quota would be based on a 76-percent reduction of the average current landings of finetooth, Atlantic sharpnose, and bonnethead sharks from 2004 through 2007 (Table 4.8). NMFS determined that by reducing the overall SCS fishery, NMFS could reduce the level of blacknose shark discards such that the total blacknose shark mortality would stay below the commercial allowance (see Appendix A). NMFS would establish a blacknose-specific quota of 14.9 mt dw (32,753 lb dw), which is the amount of blacknose sharks that would be landed while the non-blacknose SCS quota is taken (see Appendix A) assuming that fishermen with a directed shark permit would fish for SCS in a directed fashion until the non-blacknose SCS and/or blacknose shark quota reached 80 percent, and, gillnet gear would not be used to harvest sharks. In addition, fishermen with incidental shark permits would not be allowed to retain any blacknose sharks under alternative A4. This alternative also assumes that gillnet gear would not be used to harvest sharks as explained under alternatives B2 and B3.

While trip limits would not change for non-blacknose SCS for fishermen with directed and incidental shark permits (*i.e.*, no trip limit for directed shark permit holders and a 16 non-blacknose SCS/pelagic sharks combined trip limit for incidental shark permit holders), given the reduction in the non-blacknose SCS quota, NMFS anticipates that the 41 directed shark permit holders and 22 incidental shark permit holders that did not use gillnet gear to land non-blacknose SCS could experience significant negative social and economic impacts from the new non-blacknose SCS quota. These fishermen would experience direct negative social impacts as they would need to fish in other non-gillnet fisheries to make up for lost non-blacknose SCS landings and revenues. In addition, shark dealers and other entities that deal with non-blacknose SCS product would be affected indirectly as these businesses would need to diversify to make up for

lost revenues, which could lead to negative social impacts. Average annual gross revenues for non-blacknose SCS landings for the entire fishery are anticipated to be $159,368 (Table 4.8). This is a 76-percent reduction in average annual gross revenues compared to the average annual gross revenues expected under the No Action alternative, A1 (*i.e.*, $661,513; Table 4.5). Since directed shark permit holders land approximately 97 percent of the non-blacknose SCS landings as explained in alternative A1, NMFS anticipates that directed shark permit holders would lose more in average annual gross revenues from lost non-blacknose SCS landings compared to incidental shark permit holders under alternative A4. Thus, directed shark permit holders would experience larger direct negative social impacts compared to incidental shark permit holders that do not rely on shark landings for revenues as much as fishermen with directed shark permits. Average annual gross revenues of non-blacknose SCS for directed shark permit holders under alternative A4 would be $153,841 (Table 4.8), which is a loss of $487,165 in average annual gross revenues or a 76-percent reduction in average annual gross revenues compared to the average annual gross revenues under the No Action alternative, A1 (*i.e.*, $641,006; Table 4.5). Spread amongst the directed shark permit holders that did not use gillnet gear to land non-blacknose SCS, there could be an anticipated loss of $11,882 in average annual gross revenues from non-blacknose SCS landings per permit holder ($487,165 / 41 directed vessels = $11,882 per vessel). Incidental shark permit holders land approximately 3 percent of the non-blacknose SCS landings as explained in alternative A1. These lost revenues could translate into negative social impacts as fishermen with incidental shark permits would need to change fishing practices to make up for lost non-blacknose SCS landings. Average annual gross revenues for incidental shark permit holders of non-blacknose SCS under alternative A4 would be $4,922 (Table 4.8), which is a loss of $15,585 in average annual gross revenues or a 76-percent reduction in average annual gross revenues compared to the average annual gross revenues under the No Action alternative, A1 (*i.e.*, $20,507; Table 4.5). Spread amongst the incidental shark permit holders that did not use gillnet gear to land non-blacknose SCS, there could be an anticipated loss of $708 in average annual gross revenues from non-blacknose SCS landings per permit holder ($15,585 / 22 incidental vessels = $708 per vessel).

Under alternative A4, the blacknose shark quota would also be reduced by 76-percent based on average landings from 2004-2007. In addition, in order to keep the total mortality of blacknose sharks below the commercial allowance for the Atlantic shark commercial fishery (see Appendix A), fishermen with incidental shark permits would not be allowed to retain blacknose sharks. Thus, the 15 directed shark permit holders and 5 incidental shark permit holders that did not use gillnet gear to land blacknose sharks would experience direct negative social impacts from the new blacknose shark quota as they would most likely have to fish in other fisheries to make up for lost blacknose landings or leave the fishery altogether. Other entities that deal with blacknose shark products, such as shark dealers, would indirectly experience negative social impacts as they would also have to change their business practices to make up for lost blacknose shark product. Since incidental shark permit holders would not be able to retain blacknose sharks, the total blacknose shark quota would be available only to directed shark fishermen. Average annual gross revenues for the blacknose shark landings for the directed fishery would decrease from $172,197 under the No Action alternative, A1, (Table 4.5) down to $41,269 under alternative A4 (Table 4.8), which is a loss of $130,928 or a 76-percent reduction in average annual gross revenues from blacknose sharks for fishermen with directed shark permits. Spread amongst the directed shark permit holders that did not use gillnet gear to land blacknose sharks,

there could be an anticipated loss of $8,729 in average annual gross revenues from blacknose landings per permit holder ($130,928 / 15 directed vessels = $8,729 per vessel). However, since incidental shark permit holders would not be able to retain blacknose sharks, they would lose an estimated $12,054 in average annual gross revenues from blacknose shark landings (Table 4.5). These lost revenues could translate into negative social impacts as fishermen with incidental shark permits would need to change fishing practices to make up for lost blacknose shark landings as well as discard all blacknose shark catches. Spread amongst the incidental shark permit holders that did not use gillnet gear to land blacknose sharks, there could be an anticipated loss of $2,411 in average annual gross revenues from blacknose landings per permit holder ($12,054 / 5 incidental vessels = $2,411 per vessel).

Table 4.8 Average ex-vessel prices and average annual gross revenues for entire fishery from 2004-2007 under alternative A4. Shark fins are assumed to be 5 percent of the carcass weight.

Species	Average Landings (lb dw)	Average Ex-Vessel Price	Average Annual Gross Revenues
Entire Fishery			
Non-Blacknose SCS	125,487	$0.67	$84,076
Fins	6,274	$12.00	$75,292
Total			$159,368
Directed Fishery			
Non-Blacknose SCS	121,597	$0.67	$80,907
Fins	6,080	$12.00	$72,934
Total			$153,841
Blacknose	32,753	$0.66	$21,617
Fins	1,638	$12.00	$19,652
Total			$41,269
Incidental Fishery			
Non-Blacknose SCS	3,890	$0.67	$2,588
Fins	195	$12.00	$2,333
Total			$4,922

Alternative A4 would also prohibit the use of gillnets to land sharks as described further under alternatives B2 and B3. Alternative B2 would prohibit the landings of sharks with gillnet gear in the Atlantic, Gulf of Mexico, and Caribbean Sea. Therefore, approximately 27 directed shark permit holders and 7 incidental shark permit holders that used gillnet gear to land non-blacknose SCS and approximately 15 directed shark permit holders and 2 incidental shark permit holders that used gillnet gear to land blacknose sharks would experience additional losses under alternatives A4 and B2. Shark fishermen with directed shark permits that use gillnets would presumably leave the shark gillnet fishery and would experience significant direct negative social impacts as they would have to change their fishing practices to work in other fisheries. Fishermen with incidental shark permits would also experience direct negative social impacts as they would have to change their fishing practices and switch to other fisheries to make up for lost shark revenues. Shark dealers and other entities that purchase shark products from shark gillnet fishermen would also experience indirect negative social impacts as they would have to diversify to make up for lost shark product. Under alternatives A4 and B2, lost average annual gross revenues for all vessels landing non-blacknose SCS using gillnet gear would be $287,427 (Table 4.9). This is approximately 43 percent of the average annual gross revenues for the entire non-

blacknose SCS fishery under the No Action alternative, A1 (*i.e.*, $661,513; Table 4.5). Lost average annual gross revenues for directed shark permit holders using gillnet gear to land non-blacknose SCS under alternative A4 would be $275,832 (Table 4.9), which is 45 percent of the average annual gross revenues for directed shark permits holder under the No Action alternative, A1 (*i.e.*, $641,006; Table 4.5). Spread amongst the directed shark permit holders that landed non-blacknose SCS with gillnet gear, this is an anticipated loss of $10,216 in average annual gross revenues from non-blacknose SCS landings per permit holder ($275,832 / 27 directed vessels = $10,216 per vessel). However, since there are 5-7 gillnet vessels that primarily target non-blacknose SCS with gillnet gear, these shark permit holders may experience higher losses. These fishermen would most likely experience the largest negative social impacts as they would have to leave the shark fishery and switch to other fisheries or stop fishing altogether. Lost average annual gross revenues for incidental shark permit holders using gillnet gear to land non-blacknose SCS under alternative A4 would be $11,595 (Table 4.9), which is 57 percent of the average annual gross revenues for incidental shark permit holders under the No Action alternative, A1 (*i.e.*, $20,507; Table 4.5). Spread amongst the incidental shark permit holders that use gillnet gear to land non-blacknose SCS, this is an anticipated loss of $1,656 in average annual gross revenues from non-blacknose SCS landings per permit holder ($11,595 / 7 incidental vessels = $1,656 per vessel).

Lost average annual gross revenues for all vessels landing blacknose sharks using gillnet gear under alternatives A4 and B2 would be $90,501 (Table 4.9). This is approximately 53 percent of the average annual gross revenues for the entire blacknose fishery under the No Action alternative, A1 (*i.e.*, $172,197; Table 4.5). Lost average annual gross revenues for directed shark permit holders using gillnet gear to land blacknose sharks under alternatives A4 and B2 would be $90,123 (Table 4.9), which is 56 percent of the average annual gross revenues for directed shark permit holders under the No Action alternative, A1 (*i.e.*, $160,143; Table 4.5). Spread amongst the directed shark permit holders that land blacknose sharks with gillnet gear, this would be a loss of $6,008 in average annual gross revenues from blacknose shark landings per permit holder ($90,123 / 15 directed vessels = $6,008 per vessel). However, since there are 5-7 gillnet vessels that primarily target blacknose sharks with gillnet gear, these shark permit holders may experience higher losses. As explained above, these fishermen would most likely experience the largest negative social impacts as they would have to leave the shark fishery and switch to other fisheries or stop fishing altogether. Incidental shark permit holders would not be allowed to retain any blacknose sharks under alternative A4, whether or not they used gillnet gear. Lost average annual gross revenues for incidental shark permit holders using gillnet gear to land blacknose sharks under alternatives A4 and B2 would be $378 (Table 4.9), which is 2 percent of the average annual gross revenues for incidental permit holders under the No Action alternative, A1 (*i.e.*, $20,507; Table 4.5). Spread amongst the incidental shark permit holders that use gillnet gear to land blacknose sharks, this is an anticipated loss of $189 in average annual gross revenues from blacknose landings per permit holder ($378 / 2 incidental vessels = $189 per vessel).

Under alternatives A4 and B3, which would prohibit the landings of sharks with gillnet gear South Carolina south, including the Gulf of Mexico and Caribbean Sea, approximately 24 directed shark permit holders and 5 incidental shark permit holders that used gillnet gear to land non-blacknose SCS and approximately 13 directed shark permit holders and 2 incidental shark

permit holders that used gillnet gear to land blacknose sharks would experience additional losses. These shark fishermen with directed shark permits that use gillnets would presumably leave the shark gillnet fishery and would experience significant, direct negative social impacts as they would have to change their fishing practices and work in other fisheries. Fishermen with incidental shark permits would also experience direct negative social impacts as they would have to change their fishing practices and switch to other fisheries to make up for lost shark revenues. Shark dealers and other entities that purchase shark products from shark gillnet fishermen would also experience indirect negative social impacts as they would have to diversify to make up for lost shark product. Lost average annual gross revenues for all shark permit holders landing non-blacknose SCS using gillnet gear would be $275,008 under alternatives A4 and B3 (Table 4.9). This is approximately 42 percent of the average annual gross revenues for the entire non-blacknose SCS fishery under the No Action alternative, A1 (*i.e.*, $661,513; Table 4.5). Lost average annual gross revenues for directed shark permit holders using gillnet gear to land non-blacknose SCS under alternatives A4 and B3 would be $268,580 (Table 4.9), which is 42 percent of the average annual gross revenues for directed shark permit holders under the No Action alternative, A1 (*i.e.*, $641,006; Table 4.5). Spread amongst the directed shark permit holders that land non-blacknose SCS with gillnet gear, this is an anticipated loss of $11,191 in average annual gross revenues from non-blacknose SCS landings per permit holder ($268,580 / 24 directed vessels = $11,191 per vessel). However, as with alternatives A4 and B2, since there are 5-7 gillnet vessels that primarily target non-blacknose SCS with gillnet gear, these shark permit holders may experience higher losses. As explained above, these fishermen would most likely experience the largest negative social impacts as they would have to leave the shark fishery and switch to other fisheries or stop fishing altogether. Total lost average annual gross revenues for incidental shark permit holders using gillnet gear to land non-blacknose SCS under alternatives A4 and B3 would be $6,429 (Table 4.9), which is 31 percent of the average annual gross revenues for incidental shark permit holders under the No Action alternative, A1 (*i.e.*, $20,507; Table 4.5). Spread amongst the incidental shark permit holders that use gillnet gear to land non-blacknose SCS, this is an anticipated loss of $1,286 in average annual gross revenues from non-blacknose SCS landings per permit holder ($6,429 / 5 incidental vessels = $1,286 per vessel).

Lost average annual gross revenues for all vessels landing blacknose sharks and using gillnet gear under alternatives A4 and B3 would be $90,059 (Table 4.9). This is approximately 53 percent of the average annual gross revenues for the entire blacknose fishery under the No Action alternative, A1 (*i.e.*, $172,197; Table 4.5). Lost average annual gross revenues for directed shark permit holders using gillnet gear to land blacknose sharks under alternatives A4 and B3 would be $89,681 (Table 4.9), which is 56 percent of the average annual gross revenues for directed shark permits holder under the No Action alternative, A1 (*i.e.*, $160,143; Table 4.5). Spread amongst the directed shark permit holders that land blacknose sharks with gillnet gear, this would be a loss of $6,899 in average annual gross revenues from blacknose shark landings per permit holder ($89,681 / 13 directed vessels = $6,899 per vessel). However, as with alternatives A4 and B2, since there are 5-7 gillnet vessels that primarily target blacknose sharks with gillnet gear, these shark permit holders may experience higher losses. As explained above, these fishermen would most likely experience the largest negative social impacts as they would have to leave the shark fishery and switch to other fisheries or stop fishing altogether. Incidental shark permit holders would not be allowed to retain any blacknose sharks under alternative A4, whether or not they used gillnet gear. Lost average annual gross revenues for incidental shark

permit holders using gillnet gear to land blacknose sharks under alternatives A4 and B3 would be $378 (Table 4.9), which is 2 percent of the average annual gross revenues for incidental shark permit holders under the No Action alternative, A1 (*i.e.*, $20,507; Table 4.5). Spread amongst the incidental shark permit holders that use gillnet gear to land blacknose sharks, this is an anticipated loss of $189 in average annual gross revenues from blacknose landings per permit holder ($378 / 2 incidental vessels = $189 per vessel).

Table 4.9 Lost average annual gross revenues (from 2004-2007) for vessels that fish for non-blacknose SCS and blacknose sharks with gillnet gear under alternative A4. Shark fins are assumed to be 5 percent of the carcass weight.

Species	Average Landings (lb dw)	Average Ex-Vessel Price	Average Annual Gross Revenues
Under Alternative B2			
Entire Fishery			
Non-Blacknose SCS	227,184	$0.67	$151,162
Fins	11,359	$12.00	$136,265
Total			$287,427
Blacknose	71,827	$0.66	$47,406
Fins	3,591	$12.00	$43,096
Total			$90,501
Directed Fishery			
Non-Blacknose SCS	218,019	$0.67	$145,064
Fins	10,901	$12.00	$130,768
Total			$275,832
Blacknose	71,527	$0.66	$47,208
Fins	3,576	$12.00	$42,916
Total			$90,123
Incidental Fishery			
Non-Blacknose SCS	9,165	$0.67	$6,098
Fins	458	$12.00	$5,497
Total			$11,595
Blacknose	300	$0.66	$198
Fins	15	$12.00	$180
Total			$378
Under Alternative B3			
Entire Fishery			
Non-Blacknose SCS	217,368	$0.67	$144,631
Fins	10,868	$12.00	$130,377
Total			$275,008
Blacknose	71,475	$0.66	$47,174
Fins	3,574	$12.00	$42,885
Total			$90,059
Directed Fishery			
Non-Blacknose SCS	212,287	$0.67	$141,250
Fins	10,614	$12.00	$127,329

Species	Average Landings (lb dw)	Average Ex-Vessel Price	Average Annual Gross Revenues
Total			$268,580
Blacknose	71,175	$0.66	$46,976
Fins	3,559	$12.00	$42,705
Total			$89,681
Incidental Fishery			
Non-Blacknose SCS	5,081	$0.67	$3,381
Fins	254	$12.00	$3,048
Total			$6,429
Blacknose	300	$0.66	$198
Fins	15	$12.00	$180
Total			$378

In addition, LCS are also landed with gillnet gear. Therefore, alternative A4 in combination with alternatives B2 and B3 would also impact LCS fishermen using gillnet gear. Under this alternative, the approximate 11 and 5 vessels with directed and incidental shark permits, respectively, that used gillnet gear to land LCS would experience additional lost revenues under alternatives A4 and B2. If these LCS fishermen also rely on SCS catches, then they would be expected to experience significant, direct negative social impacts as they would have to change their fishing practices and work in other fisheries. Fishermen with incidental shark permits would also experience direct negative social impacts as they would have to change their fishing practices and switch to other fisheries to make up for lost shark revenues. Shark dealers and other entities that purchase shark products from shark gillnet fishermen would experience indirect negative social impacts as they would have to diversify to make up for lost shark product. However, social impacts from lost LCS revenues alone under alternatives A4 and B2, as described below, are expected to be minimal. Under alternatives A4 and B2, which would prohibit the landings of sharks with gillnet gear in the Atlantic, Gulf of Mexico, and Caribbean Sea, lost average annual gross revenues for all vessels landing LCS using gillnet gear would be $109,339 (Table 4.10). This is approximately 3 percent of the average annual gross revenues for the entire LCS fishery under the status quo (*i.e.*, $3,328,663; Table 4.11). Under alternatives A4 and B2, LCS fishermen that do not use gillnet gear to land LCS would earn average annual gross revenues of $3,219,324 from LCS landings, which is approximately 97 percent of the average annual gross revenues from LCS landings under the status quo (Table 4.11). Lost average annual gross revenues for directed shark permit holders using gillnet gear to land LCS under alternative A4 would be $107,280 (Table 4.10). Spread amongst the directed shark permit holders that land LCS with gillnet gear, this is an anticipated loss of $9,753 in average annual gross revenues from LCS landings per permit holder ($107,280 / 11 directed vessels = $9,753 per vessel). Lost average annual gross revenues for incidental shark permit holders using gillnet gear to land LCS under alternative A4 would be $2,059 (Table 4.10). Spread amongst the incidental shark permit holders that use gillnet gear to land LCS, this is an anticipated loss of $412 in average annual gross revenues from LCS landings per permit holder ($2,059 / 5 incidental vessels = $412 per vessel).

Under alternatives A4 and B3, which would prohibit the landings of sharks with gillnet gear from South Carolina south, including the Gulf of Mexico and Caribbean Sea, approximately 10 directed shark permit holders and 2 incidental shark permit holders that used gillnet gear to land LCS would experience additional losses. As explained above, if these LCS fishermen also rely on SCS catches, then they would be expected to experience significant, direct negative social impacts as they would have to change their fishing practices and work in other fisheries. Fishermen with incidental shark permits would also experience direct negative social impacts as they would have to change their fishing practices and switch to other fisheries to make up for lost shark revenues. Shark dealers and other entities that purchase shark products from shark gillnet fishermen would experience indirect negative social impacts as they would have to diversify to make up for lost shark product. However, social impacts from lost LCS revenues alone under alternatives A4 and B3, as described below, are expected to be minimal. Lost average annual gross revenues for all shark permit holders landing LCS using gillnet gear would be $106,479 (Table 4.10). This is approximately 3 percent of the average annual gross revenues for the entire LCS fishery under the status quo (*i.e.*, $3,328,663; Table 4.11). Under alternatives A4 and B3, LCS fishermen that do not use gillnet gear to land LCS would earn average annual gross revenues of $3,222,183 from LCS landings, which is approximately 97 percent of the average annual gross revenues under the status quo (Table 4.11). Lost average annual gross revenues for directed shark permit holders using gillnet gear to land LCS would be $106,189 (Table 4.10). Spread amongst the directed shark permit holders that land LCS with gillnet gear, this is an anticipated loss of $10,619 in average annual gross revenues from LCS landings per permit holder ($106,189/ 10 directed vessels = $10,619 per vessel). Lost average annual gross revenues for incidental shark permit holders using gillnet gear to land LCS under alternatives A4 and B3 would be $290 (Table 4.10). Spread amongst the incidental shark permit holders that use gillnet gear to land LCS, this is an anticipated loss of $145 in average annual gross revenues from LCS landings per permit holder ($290 / 2 incidental vessels = $145 per vessel).

Table 4.10 Lost average annual gross revenues (from 2004-2007) for vessels that fish for LCS with gillnet gear under alternative A4. Shark fins are assumed to be 5 percent of the carcass weight.

Species	Average Landings (lb dw)	Average Ex-Vessel Price	Average Annual Gross Revenues
Under Alternative B2			
Entire Fishery			
LCS	104,132	$0.45	$46,859
Fins	5,207	$12.00	$62,479
Total			$109,339
Directed Fishery			
LCS	102,171	$0.45	$45,977
Fins	5,109	$12.00	$61,303
Total			$107,280
Incidental Fishery			
LCS	1,961	$0.45	$882
Fins	98	$12.00	$1,177
Total			$2,059

Species	Average Landings (lb dw)	Average Ex-Vessel Price	Average Annual Gross Revenues
Under Alternative B3			
Entire Fishery			
LCS	101,409	$0.45	$45,634
Fins	5,070	$12.00	$60,845
Total			$106,479
Directed Fishery			
LCS	101,132	$0.45	$45,509
Fins	5,057	$12.00	$60,679
Total			$106,189
Incidental Fishery			
LCS	276	$0.45	$124
Fins	14	$12.00	$166
Total			$290

Table 4.11 Total average annual gross revenues (from 2004-2007) of vessels that land LCS under alternative A4. Shark fins are assumed to be 5 percent of the carcass weight.

Species	Average Landings (lb dw)	Average Ex-Vessel Price	Average Annual Gross Revenues
Status Quo			
LCS	3,170,155	$0.45	$1,426,570
Fins	158,508	$12.00	$1,902,093
Total			$3,328,663
Under Alternative B2			
Entire Fishery			
LCS	3,066,023	$0.45	$1,379,710
Fins	153,301	$12.00	$1,839,614
Total			$3,219,324
Under Alternative B3			
Entire Fishery			
LCS	3,068,746	$0.45	$1,380,936
Fins	153,437	$12.00	$1,841,248
Total			$3,222,183

Alternative A5 would close the entire SCS commercial shark fishery, prohibiting the landing of any SCS, including blacknose sharks. Thus, this alternative would eliminate the majority of the landings of all SCS, including finetooth, Atlantic sharpnose, bonnethead, and blacknose sharks. This alternative would have the most significant, direct negative impacts on fishermen with directed and incidental shark permits using all gear types that fish for SCS as they would have to switch to other fisheries to make up for lost SCS landings and revenues or leave the fishing industry altogether. This alternative would also have significant, indirect negative social impacts on shark dealers and other entities that rely on SCS products for revenues. These businesses would have to diversify in order to make up for lost SCS revenues. This would have negative economic impacts on the average 85 directed shark permit holders, and the average 31 incidental shark permit holders that had SCS landings during 2004-2007.

This would result in a loss of average annual gross revenues of $833,634 from SCS landings (Table 4.5). Cumulatively, directed shark permit holders would lose $641,006 in average annual gross revenues from non-blacknose SCS landings and $160,143 in average annual gross revenues from blacknose shark landings for a total loss of $801,149 in average annual gross revenues (Table 4.12). Spread among the 85 directed shark permit holders that land SCS, this could result in a loss in average annual gross revenues of $9,426 per permit holder ($801,149 / 85 directed vessels = $9,426).

Cumulatively, incidental shark permit holders would lose $20,507 in average annual gross revenues from non-blacknose SCS landings and $12,054 in average annual gross revenues from blacknose shark landings for a total of $32,561 in average annual gross revenues under alternative A5 (Table 4.12). Spread among the 31 incidental shark permit holders that land SCS, this could result in a loss in average annual gross revenues of $1,050 per permit holder ($32,561 / 31 incidental vessels = $1,050).

In addition, as gillnet gear is the primary gear used to target SCS, it is assumed that directed shark gillnet fishing would cease, except for fishermen that use gillnet gear to strikenet for blacktip sharks. Approximately 11 directed shark permit holders also use gillnet gear to land LCS. This would result in a decrease in LCS landings of 102,171 lb dw and a decrease in average annual gross revenues of $107,280. Spread among the 11 directed shark permit holders that land LCS with gillnet gear, this could result in a loss in average annual gross revenues of $9,753 per permit holder ($107,280 / 11 directed vessels = $9,753). However, while this alternative could reduce blacknose mortality below the commercial allowance of 44,853.8 lb dw, it would also completely eliminate all SCS landings and have the largest social and economic impacts of all the alternatives considered. This would severely curtail data collection on all SCS that could be used for future stock assessments. Thus, NMFS does not prefer this alternative at this time.

Table 4.12 Lost average annual gross revenues (from 2004-2007) for vessels landings non-blacknose SCS, blacknose sharks, and LCS under alternative A5. Shark fins are assumed to be 5 percent of the carcass weight.

Species	Average Landings (lb dw)	Average Ex-Vessel Price	Average Annual Gross Revenues
Entire Fishery			
Non-Blacknose SCS	522,864	$0.67	$347,900
Fins	26,143	$12.00	$313,613
Total			$661,513
Blacknose	136,595	$0.66	$90,267
Fins	6,830	$12.00	$81,930
Total			$172,197
Directed Fishery			
Non-Blacknose SCS	506,655	$0.67	$337,115
Fins	25,333	$12.00	$303,891
Total			$641,006
Blacknose	127,033	$0.66	$83,948
Fins	6,352	$12.00	$76,194
Total			$160,143

Species	Average Landings (lb dw)	Average Ex-Vessel Price	Average Annual Gross Revenues
LCS	102,171	$0.45	$45,977
Fins	5,109	$12.00	$61,303
Total			$107,280
Incidental Fishery			
Non-Blacknose SCS	16,209	$0.67	$10,785
Fins	810	$12.00	$9,722
Total			$20,507
Blacknose	9,562	$0.66	$6,319
Fins	478	$12.00	$5,735
Total			$12,054

Conclusion

NMFS prefers alternative A4 at this time for several different reasons. First, alternative A4, along with alternatives A3 and A5, would reduce effort in the overall SCS fishery, and could reduce the level of blacknose shark discards such that the total blacknose shark mortality would stay below the commercial allowance needed in order to rebuild the stock, consistent with the objectives of this proposed amendment. Alternatives A1 and A2 do not. Also, under alternative A4, blacknose shark landings would decrease by 76 percent and discards would decrease by 81 percent (Table 4.4). Landings for non-blacknose SCS would also decrease by 76 percent and discards could decrease by 2-3 percent (Table 4.4). Under alternative A3, landings of blacknose and non-blacknose sharks would decrease by 73 and 82 percent, respectively. However, while discards of blacknose sharks could decrease by 74 percent, discards of non-blacknose sharks could increase by 62 percent (Table 4.3). Under alternative A5, landings of SCS would decrease by 100 percent as retention of SCS would be not be allowed; however, discards of all SCS would continue in shark BLL and non-SCS gillnet fisheries. In addition, alternative A5 would end fisheries-dependent data collection for SCS. Alternative A4, in combination with alternative B2 or B3, could decrease landings of LCS by only three percent, but could decrease discards of LCS by up to 15 percent (Table 4.4). Alternative A4 would also result in a 76-percent reduction in average annual gross revenues from non-blacknose SCS and blacknose shark landings overall. However, such reductions are needed to lower the overall mortality on blacknose sharks (see Appendix A). While gillnet fishermen would be impacted the most and would have estimated annual gross revenue losses between $377,928 and $365,067, alternative A4 would allow for a higher non-blacknose SCS than blacknose shark quota (56.9 mt dw) compared to alternative A3 (42.7 mt dw) because associated gillnet effort is anticipated to decline more under alternative A4 leaving a larger available quota for the rest of the SCS fishery. This higher quota would benefit the larger SCS fishery, while the prohibition of gillnet gear would affect a small number of shark fishermen that use gillnet gear. For instance, under alternative A3, expected average annual gross revenues are $165,549 from SCS landings whereas under alternative A4, expected average annual gross revenues are $200,637 from SCS landings. Thus, social impacts on fishermen that do not use gillnet gear to harvest sharks are expected to be lower under alternative A4 than alternative A3. However, shark gillnet fishermen are anticipated to experience larger negative social impacts under alternative A4 in combination with alternatives B2 or B3 as gillnets would no longer be an authorized gear for harvesting sharks. Thus, these fishermen would need to

leave the shark gillnet fishery and either shift to other gillnet or BLL fisheries or leave the fishing industry altogether. Under alternative A5, the expected losses in average annual gross revenues from lost SCS landings is $833,710, which is the largest negative economic impact of all the alternatives considered, given the entire SCS fishery would be closed. Therefore, NMFS prefers alternative A4 at this time.

4.1.2 Commercial Gear Restrictions

Currently BLL, PLL, gillnet, rod and reel, handline, and bandit gear are authorized gears in the Atlantic shark commercial fishery; however, BLL and gillnet gears are the primary gears used to harvest sharks. Gillnet gear is the primary gear that is used to harvest SCS, including blacknose sharks, whereas BLL gear is typically used to target LCS (although, some LCS are also caught in gillnet gear and some SCS are also caught on BLL gear). To reduce fishing pressure on blacknose sharks, NMFS is considering alternatives regarding commercially authorized gears to reduce mortality of blacknose sharks. As described in Chapter 2, the alternatives considered for commercial gear restrictions are:

Alternative B1	No Action. Maintain current authorized gears for commercial shark fishing
Alternative B2	Close shark gillnet fishery; remove gillnet gear as an authorized gear type for commercial shark fishing
Alternative B3	*Close the gillnet fishery to commercial shark fishing from South Carolina south, including the Gulf of Mexico and the Caribbean Sea – Preferred Alternative*

Ecological Impacts

Under alternative B1, the No Action alternative, NMFS would maintain list of authorized gears for the commercial shark fishery. This alternative would also maintain the restrictions regarding those gears such as the requirement for BLL vessels to use corrodible hooks and safe handling and release gear, the prohibition on gillnets over 2.5 km, and the requirement for gillnets to remain attached to the vessel. Since there would be no change to the gear restrictions under alternative B1, the ecological impacts associated with this alternative would be the same as the status quo. This would have neutral ecological impacts for Atlantic sharpnose, bonnethead, and finetooth sharks, as all species were not determined to be overfished and overfishing is not occurring. However, this would have negative ecological impacts on blacknose sharks as blacknose sharks were determined to be overfished with overfishing occurring. NMFS would not be able to achieve the commercial allowance of 44,853.8 lb dw/year (7,094 blacknose sharks/year) within the commercial shark fishery without changing the current gear restrictions (see Appendix A). To achieve this catch, the blacknose mortality within the Atlantic commercial shark fishery would have to be reduced by 78 percent, which would require a reduction in fishing effort, possibly through changes in authorized commercial gear for SCS. Since this alternative would not reduce commercial blacknose shark landings, NMFS does not prefer this alternative at this time.

Under alternative B2, NMFS would remove gillnet gear as an authorized gear type for commercial shark fishing. This alternative would close the shark gillnet fishery. This alternative

would allow shark LAP holders to continue to use other commercially authorized gears such as BLL, rod and reel, handline or bandit gear. This alternative would have positive ecological impacts for SCS, LCS, and smooth dogfish as it would reduce commercial landings and decrease bycatch rates of both target and non-target species, including protected resources. Since gillnets are the dominant gear type used to target SCS, this restriction would have a large impact on the total SCS landings per year. The directed shark permit holders have, on average, total landings of all SCS of 639,015 lb dw/year with all gear types. Of these, 289,546 lb dw/year landings of SCS are made with gillnet gear. If gillnets were prohibited, the average total landings could drop by 45 percent to 349,469 lb dw/year (639,015 – 289,546 = 349,469 lb dw/year). SCS landings by incidental shark permit holders would decline by 5 percent from 20,443 lb dw/year to 19,497 lb dw/year. Blacknose sharks are predominantly landed with gillnet gear. Thus, removing gillnet gear as an authorized gear type could reduce overall blacknose landings. Given that 71,827 lb dw of the 136,595 lb dw commercial landings of blacknose sharks per year were made with gillnet gear (53 percent), removing gillnets from the shark commercial landings would help achieve the reduction needed in order to rebuild blacknose sharks. With the removal of gillnet gear, NMFS assumes that all directed shark gillnet effort would cease. However, it is estimated that blacknose sharks would still be caught and discarded by fishermen targeting other species (*i.e.*, Spanish mackerel) using gillnet gear. Under alternative B2, NMFS estimates that 158.6 blacknose sharks per year (2,284 lb dw/year) would be discarded by fishermen fishing for other species.

LCS are also caught in gillnet gear; however, the ecological impacts would be minimal for the LCS fishery since bottom longlines are the primary gear type used in the LCS fishery. The directed and incidental shark landings from gillnet gear only account for three percent of the total LCS fishery. Also, the removal of gillnets would reduce the level of bycatch associated with this gear type and decrease the interaction with protected species. From 2004-2007, a total of 14 loggerhead and leatherback sea turtles (2 discarded dead) were observed caught in gillnets. Extrapolated takes of protected species varied by gillnet type and season (right whale [November-March] and non-right whale [April-November]). For drift gillnets during the non-right whale calving season, it was estimated that between 0.1 and 0.5 loggerhead turtles, 0 leatherback sea turtles, 0.1 to 0.9 bottlenose dolphins, and 0 Atlantic spotted dolphins interacted with drift gillnet per year from 2000-2006 (Garrison, 2007). During the right whale calving season, estimated interactions increased from 0 to 1.7 loggerhead sea turtles, 0 to 7.2 leatherback sea turtles, 0 to 2.5 bottlenose dolphins, and 0 to 1.7 Atlantic spotted dolphins per year from 2000-2006 (Garrison, 2007). For strike gillnets, only loggerhead sea turtle interactions occurred during the right whale calving season. It is estimated that 0.2 to 1.1 loggerhead sea turtles interacted with strike gillnet gear per year from 2000-2006 (Garrison, 2007). Finally, for sink gillnet gear, only loggerhead sea turtle interactions occurred during the non-right whale calving season. It was estimated that 2.2 to 4.1 loggerhead sea turtles interacted with sink gillnet gear per year from 2000-2006 (Garrison, 2007). Also, interactions with north Atlantic right whales could occur in shark gillnet fishing areas. In 2006, a right whale was observed dead in Florida and available evidence suggests that the entanglement and injuries of the whale by gillnet gear eventually led to the death of the animal. It is unknown if the gillnet gear was from the shark fishery, but the removal of gillnets as an authorized gear type would reduce interactions with this species within the shark fishery. Some prohibited shark species that are also impacted by

gillnets, such as sand tiger, sandbar, angel, and dusky sharks, would benefit from the gillnet restriction.

Alternative B2 would have a significant impact on the smooth dogfish fishery. Gillnets are the primary gear type used in this fishery. This species is not currently managed in a federal fishery management plan, and a stock assessment has not been conducted for this species. If the preferred alternative for smooth dogfish, alternative F2, is implemented, then federal permit holders would not be allowed to land smooth dogfish sharks using gillnet gear. In addition, shark fishermen fishing for smooth dogfish in federal waters would have to obtain a federal permit to land smooth dogfish. This could result in reduced smooth dogfish landings, which could have positive ecological impacts for the stock, but could reduce the overall smooth dogfish fishery. Since there has not been a stock assessment conducted for this species and due to the potentially large impact of the removal of gillnet gear on the smooth dogfish fishery, NMFS does not prefer this alternative at this time.

Under alternative B3, the preferred alternative, NMFS would close the gillnet fishery to commercial shark fishing from South Carolina south, including the Gulf of Mexico and Caribbean Sea. This would have positive ecological impacts on the SCS fishery, and blacknose sharks, by reducing landings from the predominate gear used to target SCS in the southeast. However, since most smooth dogfish landings occur from North Carolina north, and the majority of LCS landings occur with BLL gear, the ecological impacts of alternative B3 to the LCS and smooth dogfish fishery would be minimal. This prohibition would decrease the total landings/year of directed and incidental shark permit holders for all SCS by 76 percent from 659,459 lb dw/year to 158,240 lb dw/year under alternative B3. This preferred alternative would also have positive ecological impacts for the overfished blacknose shark population. Blacknose sharks are not reported as landed with gillnets north of South Carolina. Therefore, prohibiting gillnets from South Carolina south would remove the predominate gear type for blacknose sharks. Blacknose landings by directed shark permit holders are anticipated to be reduced from 127,033 lb dw/year to 55,858 lb dw/year, or a 44-percent reduction in landings. Blacknose shark landings by incidental shark permit holders would drop from 9,562 lb dw/year to 9,262 lb dw/year, or a three-percent reduction in landings. Thus, the preferred alternative would help reduce commercial blacknose shark landings and help achieve the recommended commercial allowance for the Atlantic commercial shark fishery.

In the LCS fishery, this alternative would have minor, positive ecological impacts because the majority of fishermen use BLL gear. With the prohibition of gillnets from South Carolina south, total landings/year of LCS are only anticipated to decrease by 3 percent. There would also be minimal ecological impacts to the smooth dogfish fishery, since this species is primarily caught from North Carolina north. The smooth dogfish fishery is currently not managed on a federal level, and the exact ecological impacts would vary based on the landings of commercial and recreational fishermen.

As described under alternative B2, removal of gillnet gear from South Carolina south could reduce interactions with protected resources. This is especially true for right whales during their calving season, which occurs in the southeast. Since this alternative would remove gillnet gear from the southeast region, the interactions with right whales and gillnet gear in their

calving area would be reduced. NMFS prefers this alternative at this time given that the alternative reduces the number of commercial blacknose shark landings, and has positive ecological impacts on protected resources, and minimal ecological impacts on other shark fisheries.

Social and Economic Impacts

Under alternative B1, the No Action alternative, NMFS would maintain the current list of authorized gears for commercial shark fishing. Therefore, the social and economic impacts of alternative B1 would be the same as the status quo, and no negative social or economic impacts would be anticipated under alternative B1. On average from 2004-2007, the fishermen with directed and incidental shark permits earned average annual gross revenues from SCS landings of $833,634, while LCS fishermen with directed and incidental shark permits earned larger average annual gross revenues of $3,328,663. The smooth dogfish fishery is smaller than the other fisheries and only has average annual gross revenues of $371,786 for state and federally permitted fishermen reporting to the ACCSP. Based on this alternative, the average annual gross revenues of these fisheries would remain the same as the status quo. The average number of directed and incidental shark permit holders that reported SCS landings in the Coastal Fisheries logbook from 2004-2007 were 116 (85 directed and 31 incidental), and the LCS fishery had an annual average of 162 shark permit holders (129 directed and 33 incidental) reporting LCS landings in the Coastal Fisheries logbook from 2004-2007. The number of shark permit holders would not be impacted by the No Action alternative.

Under alternative B2, which would close the shark gillnet fishery, NMFS would remove gillnet gear as an authorized gear type for commercial shark fishing. This alternative would have a significant negative social and economic impact by potentially affecting 30 directed and 7 incidental shark permit holders that land SCS with gillnets. These fishermen would have to redirect their fishing efforts to new fisheries or use a different gear type. Also, this restriction would have a considerable impact on the total landings per year of SCS. On average, directed shark permit holders landed 289,546 lb dw of SCS with gillnet gear. Under this alternative, directed shark permit holders would lose approximately $365,955 in average annual gross revenues from SCS landings. Based on average ex-vessel prices per pound from 2004-2007, fishermen with directed shark permits earned $807,792 in average annual gross revenues from SCS landings. On average, incidental shark permit holders landed 9,465 lb dw of SCS with gillnet gear. Thus, incidental shark permit holders would lose approximately $11,973 in average annual gross revenues from SCS landings. Based on average ex-vessel prices per pound from 2004-2007, fishermen with incidental shark permits earned a total of $25,843 from SCS landings under the status quo. Under this alternative, fishermen with a directed shark permit would lose approximately 45 percent in SCS total annual gross revenues and fishermen with an incidental shark permit would lose approximately 46 percent in SCS average annual gross revenues compared to the No Action alternative, alternative B1.

Alternative B2 would have minimal negative social and economic impacts on the LCS fishery. Only 11 directed and 5 incidental shark permit holders out of the 162 total shark permit holders would be affected. On average, directed shark permit holders landed 102,171 lb dw of LCS with gillnet gear. Under this alternative shark fishermen with directed shark permits would lose approximately $107,280 in average annual gross revenues from LCS landings. On average,

incidental shark permit holders landed 1,961 lb dw of LCS with gillnet gear. Under this alternative incidental shark permit holders would lose approximately $2,059 in average annual gross revenues from LCS landings. In total ($109,339), this is approximately 3 percent of the gross revenues for the entire LCS fishery under the status quo (*i.e.*, $3,328,663).

Gillnets are also the primary gear type used to catch smooth dogfish. Within the VTR data, a primarily Northeast U.S. reporting system, an average of 213 vessels reported smooth dogfish landings per year between 2004 and 2007. Within the Coastal Fisheries Logbooks data, a primarily Southeast U.S. reporting system, an average of 10 vessels reported smooth dogfish landings per year between 2004 and 2007. From this data, an estimate of 223 vessels would require a smooth dogfish permit. However, as fishermen are currently not required to have a permit to retain smooth dogfish, this could be an underestimate of the number of fishermen that would require a federal commercial permit for smooth dogfish in the future. According to ACCSP data, the average total landings per year from 1998-2007 was 950,859 lb dw. Using ex-vessel prices per pound from 2004-2007, these landings equate to $357,286 in average annual gross revenues for the entire smooth dogfish fishery. If NMFS prefers alternative F2 or F3, which would place smooth dogfish under federal management, then under alternative B2, those fishermen would not be able to use gillnet gear to land smooth dogfish. This would have a negative social and economic impacts on fishermen who previously used gillnet gear in federal waters to land smooth dogfish. As fishermen do not currently have to have a federal permit to land smooth dogfish, at this time NMFS is uncertain about the universe of fishermen who might be affected by alternative B2 in combination with alternative F2 or F3. Given the potentially large negative social and economic impacts of this alternative to the SCS, LCS, and smooth dogfish fisheries, NMFS does not prefer this alternative at this time.

Under alternative B3, the preferred alternative, NMFS would close the commercial gillnet fishery from South Carolina south, including the Gulf of Mexico and the Caribbean Sea. This would have negative social and economic impacts on federally permitted directed and incidental shark fishermen. In the SCS fishery, this alternative would affect 27 directed and 5 incidental shark permit holders out of the 116 total shark permit holders that land SCS. The SCS gillnet fishery from South Carolina south accounts for 44 percent of the total directed SCS fishery landings, and 26 percent of incidental landings. On average, directed shark permit holders landed 283,462 lb dw ($358,261) of SCS with the gillnet gear. Thus, directed shark fishermen would lose $358,261 in average annual gross revenues from SCS landings from the gillnet prohibition under alternative B3. Using average ex-vessel prices from 2004-2007, fishermen with directed shark permits earned $807,792 in average annual gross revenues from SCS landings. On average, incidental shark permit holders landed 5,381 lb dw of SCS with gillnet gear from South Carolina south. Thus, fishermen with incidental shark permits would lose $6,807 in average annual gross revenues from non-blacknose SCS landings under alternative B3. Fishermen with directed and incidental shark permits would lose total gross revenues of $365,068 from their current gross revenues of $833,634 (44 percent reduction).

This alternative would have minor social and economic impacts on the LCS fishery. NMFS estimates that it would affect 12 directed and incidental shark permit holders (out of 162 total shark permit holders). The directed shark permit holders would lose $106,189 in average annual gross revenues from lost LCS landings in gillnet gear from South Carolina south under

alternative B3. Incidental shark permit holders would lose $290 from lost LCS landings in gillnet gear from South Carolina south. In total ($106,479), this is only 3 percent of the total average annual gross revenues (*i.e.*, $3,328,663) from LCS landings for the LSC fishery under the status quo.

This alternative, in combination with either the preferred alternative F2 or alternative F3, would not have any social and economics impacts on the smooth dogfish fishery. Smooth dogfish are primarily caught from North Carolina north. According to ACCSP data, the average total landings per year is 950,859 lb dw, which translates into total annual gross revenues of $357,286 lb dw from smooth dogfish landings. Given smooth dogfish are not typically landed with gillnet gear from South Carolina south, it is anticipated that this alternative, in combination with either alternative F2 or F3, would minimal loss in average annual gross revenues from smooth dogfish landings. NMFS prefers this alternative, since this alternative allows NMFS to implement the allowable catch for commercial blacknose shark landings, and has minimal social and economic impacts to LCS and smooth dogfish shark fisheries.

Conclusion

Blacknose sharks have been determined to be overfished with overfishing occurring. According to the latest blacknose stock assessment, NMFS needs to reduce mortality in the Atlantic shark commercial fishery by 78 percent, or keep blacknose shark mortality below 44,853.8 lb dw/year (7,094 blacknose sharks/year). The preferred alternative, alternative B3, reduces fishing effort on blacknose sharks by removing gillnet gear from the areas where blacknose sharks interact with gillnet gear. NMFS estimates that this alternative alone would reduce blacknose shark landings by 71,475 lb dw per year. This alternative also allows gillnet gear in the areas where the majority of the smooth dogfish are landed, which is the predominate gear used to harvest smooth dogfish. By prohibiting gillnet gear from South Carolina south, NMFS is mitigating impacts in the smooth dogfish fishery while allowing blacknose sharks to rebuild. While alternative B2 also reduces blacknose mortality below the level needed in order to rebuild the stock, alternative B2 would have negative social and economic impacts on the smooth dogfish fishery. The prohibition of gillnet gear from South Carolina south under alternative B3 would also have positive ecological impacts to non-blacknose SCS by reducing their landings by an estimated 217,368 lb dw. This decrease would have significant social and economic impacts by affecting approximately 37 directed and 7 incidental SCS and LCS permit holders. It would also reduce SCS and LCS revenues for directed permit holders by $464,450 and SCS and LCS revenues for incidental permit holders by $7,097. This is a total loss of $471,547 due to the elimination of gillnet gear from South Carolina south. This total gross revenues loss under alternative B3 is less when compared to the total gross revenues loss by fishermen under alternative B2 ($487,267). Given the need to reduce blacknose shark mortality, and the fact that gillnet gear is the predominate gear used to harvest blacknose sharks, NMFS prefers the removal of gillnet gear in the areas that interact with blacknose sharks at this time to rebuild blacknose sharks. NMFS prefers alternative B3 over alternative B2 at this time to mitigate impacts on the smooth dogfish fishery. Since this alternative reduces the number of commercial blacknose shark landings, has positive ecological impacts on protected resources, and minimal ecological impacts on other shark fisheries, NMFS prefers this alternative at this time.

4.1.3 Pelagic Shark Effort Controls

In 2008, an updated stock assessment shortfin mako sharks was conducted by ICCAT's SCRS. For North Atlantic shortfin mako sharks, multiple model outcomes indicated stock depletion to be about 50 percent of virgin biomass (1950s levels) and levels of F above those resulting in MSY, whereas other models estimated considerably lower levels of depletion and no overfishing. The SCRS determined that there is a "non-negligible probability" that the North Atlantic shortfin mako stock could be below the biomass that could support MSY (B_{2007}/B_{msy} = 0.95-1.65) and above the fishing mortality rate associated with MSY (F_{2007}/F_{msy} = 0.48-3.77). Similar outcomes were determined by the SCRS from the 2004 assessment; however, recent biological data show decreased productivity for this species. Therefore, given the results of this assessment, NMFS has determined that North Atlantic shortfin mako is not overfished, but is approaching an overfished status and is experiencing overfishing.

There are several ICCAT recommendations that pertain to sharks. In 2004, ICCAT adopted *Recommendation 04-10 Concerning the Conservation of Sharks Caught in Association with Fisheries Managed by ICCAT*. This was the first binding measure passed by ICCAT dealing specifically with sharks. This recommendation included, 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. In 2005, additional measures pertaining to pelagic sharks were added to the 2004 recommendation. Measures included a requirement for Contracting Parties that have not yet implemented the 2004 recommendation, to reduce shortfin mako mortality and to report their progress to the Secretariat. In 2006, a recommendation was adopted that amended a paragraph in Recommendation 04-10 that recommended management alternatives and a stock assessment for blue and shortfin mako sharks. At the 2007 meeting, ICCAT adopted measures for the conservation of sharks (Recommendation 07-06) that included requirements to submit Task I and Task II data on bycatch and targeted fisheries for sharks, and to reduce fishing mortality in fisheries targeting porbeagle and shortfin mako sharks. Recommendation 08-07, made at the 2008 ICCAT meeting, called for the live release of bigeye thresher sharks (*Alopias superciliosis*).

As described in Chapter 2, the alternatives considered for pelagic shark in the commercial fishery are:

Alternative C1	No Action. Keep shortfin mako sharks in the pelagic shark species complex and do not change the quota
Alternative C2	Remove shortfin mako sharks from pelagic shark species quota and establish a shortfin mako quota
Alternative C3	Remove shortfin mako sharks from pelagic shark species complex and place this species on the prohibited shark species list
Alternative C4	Establish a commercial size limit for shortfin mako sharks

Alternative C4a) Establish a minimum size limit for shortfin mako sharks that is based on the size at which 50 percent of female shortfin mako sharks reach the sexual maturity or 32 inches interdorsal length (IDL)

Alternative C4b) Establish a minimum size limit for shortfin mako sharks that is based on the size at which 50 percent of male shortfin mako sharks reach the sexual maturity or 22 inches IDL

Alternative C5 *Take action at the international level to end overfishing of shortfin mako sharks – Preferred Alternative*

Alternative C6 *Promote the release of shortfin mako sharks brought to fishing vessels alive – Preferred Alternative*

Ecological Impacts

Alternative C1 is the No Action alternative and would maintain the existing regulations for shortfin mako sharks. The current commercial quota for common thresher, oceanic whitetip and shortfin mako sharks is 488 mt dw. This alternative would have neutral ecological impacts for the common thresher and oceanic whitetip sharks, and would likely maintain fishing mortality of shortfin mako sharks at current levels, which may have negative ecological impacts based on the 2008 ICCAT stock assessment. According to the 2008 ICCAT stock assessment, NMFS determined that shortfin mako sharks were experiencing overfishing but were not overfished. While the average annual commercial landings from 2004 to 2007 of shortfin mako landings were 72.5 mt dw (NMFS, 2008) and the existing 488 mt dw commercial quota for shortfin mako, common thresher, and oceanic whitetip sharks has not been fully utilized, landings of shortfin mako sharks could increase above current levels. If the landings of shortfin mako sharks continue at current levels or increase, this could lead to further overfishing and negative ecological impacts for this species. The United States commercial harvest of Atlantic shortfin mako sharks has historically been incidental in nature and less than 10 percent of the recorded total international landings, based on ICCAT data from 1997 through 2007. Because of the small U.S. contribution to Atlantic shortfin mako shark mortality, domestic reductions on shortfin mako shark mortality would not end overfishing of the entire North Atlantic stock. Therefore, NMFS does not prefer alternative C1 at this time.

Alternative C2 would remove shortfin mako sharks from the pelagic shark species quota, and would establish a species-specific quota for shortfin mako sharks. Shortfin mako sharks are caught as bycatch in the PLL fishery, and there is no directed fishery in the United States for this species. Currently, the annual quota for common thresher, oceanic whitetip, and shortfin mako is 488 mt dw. Based on the average annual commercial landings of shortfin mako sharks from 2004-2007, the species-specific quota for shortfin mako sharks would be 72.5 mt dw (NMFS, 2008). The common thresher and oceanic whitetip sharks would be allocated a quota of 415.5 mt dw after removal of the shortfin mako quota of 72.5 mt dw (488 mt dw – 72.5 mt dw = 415.5 mt dw). Removing shortfin mako sharks from the quota group of pelagic sharks would allow them to be managed separately and would give NMFS the ability to track this separate quota more efficiently. The 2008 ICCAT stock assessment did not recommend a TAC necessary to stop overfishing of shortfin mako sharks. Therefore, it is difficult to determine if setting a species-specific quota for shortfin mako sharks at the level of current commercial landings would have positive ecological benefits for the stock. However, setting a quota of 72.5 mt dw

would maintain fishing mortality at current levels and prevent commercial landings from increasing, which may provide more ecological benefits than maintaining the quota at 488 mt dw for common thresher, oceanic whitetip, and shortfin mako sharks. Because there are no current stock assessments for oceanic whitetip or common thresher sharks, it is difficult to determine the ecological impacts of setting a quota of 415.5 mt dw for these two species. Current average annual commercial landings from 2004 to 2007 for common thresher and oceanic whitetip combined, was 17.5 mt dw (NMFS, 2008). It is not expected that the level of fishing effort or mortality would increase under this alternative, and therefore, alternative C2 would have neutral ecological impacts for common thresher and oceanic whitetip sharks. NMFS does not prefer this alternative at this time because the United States contributes a very small portion of the overall shortfin mako mortality in the North Atlantic, the 2008 stock assessment did not recommend a TAC for this species.

Alternative C3 would add shortfin mako sharks to the prohibited species list. Adding shortfin mako sharks to the prohibited species list would make it illegal to retain and land shortfin mako sharks commercially or recreationally. NMFS has established criteria for adding shark species to the prohibited species list; a species can be added if two of the following four criteria are met: 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). Shortfin mako sharks were determined to have overfishing occurring based on the 2008 ICCAT stock assessment and could, therefore, meet the first criterion. In addition, shortfin mako sharks look similar to other sharks on the prohibited species list (*i.e.*, white sharks and longfin mako sharks) and could, therefore, meet the fourth criterion. This alternative is expected to have neutral or slightly positive ecological impacts for this stock. Average commercial landings of shortfin mako sharks from 2004 to 2007 were 72.5 mt dw and were well below the 488 mt dw quota as they are primarily caught as bycatch in the PLL fishery. According to observer reports from 1992-2006, 68.9 percent of shortfin mako sharks are brought to the vessel alive and 30.1 percent come to the vessel dead. Also, of the shortfin mako sharks that are caught, 61.4 percent are kept, 22.1 percent are discarded alive, and 9.9 percent are discarded dead. This data indicates that although prohibiting the retention of shortfin mako sharks may have more positive ecological impacts for this stock than alternative C2, this alternative could also result in a slight increase of dead discards. In addition, the United States does not have a directed commercial fishery for this species and does not contribute to a significant proportion of Atlantic-wide fishing mortality of shortfin mako sharks (Table 3.20). Therefore, NMFS does not prefer alternative C3 at this time.

Alternative C4 would establish a commercial size limit for shortfin mako sharks. Currently, there is no commercial minimum size limit for shortfin mako sharks; therefore, establishing a size limit could result in varying degrees of ecological impacts. Two size limits have been analyzed for shortfin mako sharks, one based on the size at which 50 percent of females reach sexual maturity (Alternative C4a) and one based on the size at which 50 percent of males reach sexual maturity (Alternative C4b). For each alternative, fork length (FL) estimates of sexual maturity were used from Natanson *et al.* (2006) (185 cm FL for males and 275 cm FL

for females, respectively), converted to inches, and rounded to the nearest inch (in) to determine the size limit for each alternative to be analyzed. The size limit for alternative C4a, female sexual maturity, was determined to be 108 inches FL, and the size limit for alternative C4b, male sexual maturity, was determined to be 73 inches FL.

Because shortfin mako sharks are dressed at sea by the commercial fleet, a minimum FL measurement would be ineffective in enforcing a size limit. Therefore, an interdorsal length (IDL) measurement (the straight line measurement from the base of the trailing edge of the first dorsal fin to the base of the leading edge of the second dorsal fin) would be utilized. To convert from straight FL to IDL, NMFS converted FL to curved fork length (CFL) using a conversion formula from Francis and Duffy (2005), and then converted CFL to IDL using a conversion formula from Campana *et al*. (2005). This number was then converted to inches and rounded to the nearest inch to determine the size limit for each alternative to be analyzed. The IDL size limit for alternative C4a that corresponds to female sexual maturity was determined to be 32 inches IDL, and the size limit for alternative C4b that corresponded to male sexual maturity, was determined to be 22 inches IDL.

To assess the potential ecological impacts of implementing a commercial size limit for shortfin mako sharks, as in alternatives C4a and C4b, NMFS examined commercial fisheries data from the POP and HMS Logbook (logbook) in their analysis. The POP data covered all observed PLL shortfin mako shark catches from 1992-2006, regarding the size, number caught, disposition of the catch, and at-vessel mortality status. Logbook data covered landings, dead discards, and live releases of shortfin mako sharks by PLL and BLL fishermen from 2004-2007.

NMFS analyzed the POP data to determine the percentage of shortfin mako sharks that are currently landed that would be released alive if commercial size limits in alternatives C4a and C4b were implemented. Based on the POP data, the total number of shortfin mako sharks caught was 4,375. Of the 4,375 shortfin mako sharks that were caught, 208 were kept that were less than 32 inches IDL and 9 were kept that were less than 22 inches IDL. In order to determine how many additional shortfin mako sharks would be released alive if either size limit was implemented, the at-vessel survival rates from the POP data were used for this analysis. Based on the POP data, 65.6 percent of shortfin mako sharks less than 32 inches IDL were brought to the vessel alive and 80.4 percent shortfin mako sharks less than 22 inches IDL were brought to the vessel alive. These survival rates were then used to determine the number of shortfin mako sharks that would be released alive given each size limit under alternatives C4a and C4b.

For alternative C4a, the number of shortfin mako sharks kept under 32 inches IDL (208 shortfin mako sharks) was multiplied by the percentage of shortfin mako sharks that came to the vessel alive under 32 inches IDL (65.5 percent), to determine the number of shortfin mako sharks that could be released alive under this size limit (208 x 65.6 percent = 136 shortfin mako sharks released alive). This number was then divided by the total number of shortfin mako sharks caught according to the POP data to find the percentage of additional shortfin mako sharks that would be released alive if a size limit of 32 inches IDL was implemented (136 / 4,375 = 3.1 percent) (Table 4.13). The percent of additional shortfin mako sharks released alive under 32 inches IDL (3.1 percent) was then applied to the HMS logbook data to determine the estimated number of additional shortfin mako sharks that would be released alive under 32

inches IDL. On average, from 2004 to 2007, 2,845 shortfin mako sharks were kept per year according to the HMS logbook data. In addition, 47 shortfin mako sharks of all sizes were released alive according to the logbook data. When applying the percentage of additional shortfin mako sharks that would be released alive given the 32 inches IDL size limit (3.1 percent) to the number of shortfin mako sharks kept per the logbook data (2,845 shortfin mako sharks), an additional 89 shortfin mako sharks would be released alive every year if a size limit of 32 inches IDL were implemented. This represents an increase of 89 shortfin mako sharks released alive annually in the PLL and BLL fisheries (Table 4.13).

NMFS assumes that not all shortfin mako sharks kept are alive when reaching the vessel; therefore, imposing a size limit could lead to an increase in dead discards. NMFS calculated the number of additional dead discards expected due to an IDL size limit of 32 inches using the same methodology for calculating live releases described above, with an at-vessel mortality rate of 34.5 percent. Alternative C4a would result in an estimated increase of 46 shortfin mako sharks discarded dead annually in the PLL and BLL fisheries (Table 4.14). It is important to note that, although shortfin mako shark dead discards may increase under the size limit in alternative C4a, no additional shortfin mako shark mortality would result from implementing this size limit.

To estimate the number of additional shortfin mako sharks anticipated to be released alive under alternative C4b, NMFS multiplied the number of shortfin mako sharks kept under 22 inches IDL (9 shortfin mako sharks) by the percentage of shortfin mako sharks that came to the vessels alive under 73 inches (80.4 percent), which equals 7 shortfin mako sharks released alive under 22 inches IDL. The number of shortfin mako sharks released alive was divided by the total number of shortfin mako sharks caught, according to the POP data, to find the percentage of the total catch that would be released alive if a size limit of 22 inches IDL was implemented (7 / 4,375 = 0.17 percent) (Table 4.13). The percentage of additional shortfin mako sharks released alive under 22 inches IDL (0.17 percent) was then applied to the HMS logbook data to determine the estimated number of additional shortfin mako sharks released alive under 22 inches IDL. On average, from 2004 to 2007, 2,845 shortfin mako sharks were kept per year according to the HMS logbook data. In addition, 47 shortfin mako sharks of all sizes were released alive according to the logbook data. When applying the percentage of additional shortfin mako sharks that would be released alive given the 22 inches IDL size limit (0.17 percent) to the number of shortfin mako sharks kept per the logbook data (2,845 shortfin mako sharks), an additional 5 shortfin mako sharks would be released alive every year if a size limit of 22 inches IDL were implemented. This represents an estimated increase of 5 shortfin mako sharks released alive annually in the PLL and BLL fisheries (Table 4.13).

NMFS assumes that not all shortfin mako sharks kept are alive when reaching the vessel; therefore, imposing a size limit could lead to an increase in dead discards. NMFS calculated additional dead discards associated with a 22 inches IDL size limit using the same methodology for calculating live releases as described above, with an at-vessel mortality rate of 19.6 percent. Alternative C4b would lead to an estimated increase of 1 shortfin mako shark dead discard annually in the PLL and BLL fisheries (Table 4.14). It is important to note that although shortfin mako shark dead discards may increase under the size limit in alternative C4b, no additional shortfin mako shark mortality would result from implementing this size limit.

Table 4.13 Comparison of commercial size limits for shortfin mako sharks (SFM), and their estimated affect on shortfin mako shark live releases.

Alt.	A Size Limit (inches IDL)	B Total SFM catch (POP)	C Total number of SFM kept (POP)	D Number of SFM kept under size limit (POP)	E Estimated number of SFM released alive under size limit	F Percentage of additional shortfin mako released alive under size limit E/B	G Average number of SFM kept per year (logbook) D	H Estimated number of additional SFM released alive under size limit F*G	I Average number of all SFM released alive (logbook)	J Total number of SFM released alive per year H+I
C4a	32	4375	2535	208	136	3.12%	2845	89	47	136
C4b	22	4375	2535	9	7	0.17%	2845	5	47	53

Table 4.14 Comparison of commercial size limits for shortfin mako sharks (SFM), and their estimated affect on shortfin mako shark dead discards.

Alt.	A Size Limit (inches IDL)	B Total SFM catch (POP)	C Total number of SFM kept (POP)	D Number of SFM kept under size limit (POP)	E Estimated number of SFM dead discards under size limit	F Percentage of additional shortfin mako dead discards under size limit E/A	G Average number of SFM kept per year (logbook)	H Estimated number of additional SFM dead discards under size limit F*G	I Average number of SFM dead discards per year (logbook)	J Total number of SFM dead discards per year (logbook) H+I
C4a	32	4375	2535	208	72	1.64%	2845	46	7	53
C4b	22	4375	2535	9	2	0.04%	2845	1	7	8

Alternatives C4a and C4b would both result in positive ecological impacts to the shortfin mako shark stock, as more shortfin mako sharks would be released alive than under the No Action alternative. The positive impacts are less in C4b than in C4a because there are fewer shortfin mako sharks released alive. Also, retention of immature female sharks would still be allowed in alternative C4b because the size limit is set at the size at which 50 percent of males reach sexual maturity, which is lower than the size at which 50 percent of females reach sexual maturity. Alternative C4a would result in 84 more live releases of more shortfin mako sharks than alternative C4b, and retention of immature females would be minimized because the size limit would equal the size at which 50 percent of females reached sexual maturity. However, given the relatively few number of additional live releases of shortfin mako sharks under either alternative C4a or C4b, NMFS does not prefer either alternative at this time.

Under alternative C5, the preferred alternative, NMFS would take action at the international level through international fisheries management organizations to develop management measures applicable to all participating nations to end overfishing of shortfin mako sharks. ICCAT assumes three shortfin mako shark stocks for assessment purposes: northern and southern Atlantic stocks, separated at 5°N latitude, and a Mediterranean stock. Based on the 2008 SCRS stock assessment on the North Atlantic shortfin mako shark population, NMFS determined domestically that the species is experiencing overfishing and approaching an overfished status. According to ICCAT estimates, shortfin mako shark annual commercial landings did not exceed 11,000 fish from 1992 to 2007 (Table 4.15). Most of the landings were attributable to the recreational fishery, whose catches in numbers peaked in 1985 to about 80,000 fish, and ranged from less than 1,400 fish to over 31,000 fish in the remaining years. PLL discards of shortfin mako sharks were negligible since the meat of this species is highly valued, with a median real dollar, U.S. ex-vessel price per pound of $1.59 from 2004 to 2007. Total catches ranged from about 5,600 fish in 1998 to almost 80,000 fish in 1985, when recreational catches peaked (Table 4.15). U.S. commercial harvest of Atlantic shortfin mako sharks has historically been less than ten percent of the recorded total international landings, based on 1997 through 2007 data (Table 3.20). Because of the small U.S. contribution to Atlantic shortfin mako shark mortality, domestic reductions on shortfin mako shark mortality would not end overfishing of the entire North Atlantic stock. Therefore, NMFS believes that ending overfishing and preventing an overfished status would be better accomplished through international efforts where other countries that have large takes of shortfin mako sharks could participate in mortality reduction discussions. Sections 102 and 304(i) of the Magnuson-Stevens Act encourage this approach, particularly where a species is approaching an overfished condition due to excessive international fishing pressure and there are no management measures to end overfishing under an international agreement to which the United States is a party. While this alternative could have negative ecological impacts for the portion of the shortfin mako shark stock that is fished by U.S. fishermen, in the short term, any management recommendations adopted at the international level to end overfishing of shortfin mako sharks could have positive ecological impacts on shortfin mako sharks in the long term. Therefore, NMFS prefers alternative C5 at this time.

Table 4.15 Estimates of commercial and recreational landings and dead discards for shortfin mako sharks in the U.S. Atlantic, Gulf of Mexico, and Caribbean. (ICCAT, 2008)

	Commercial					Recreational			Discards			Total		
Year	mt (ww) [1]	mt (dw) [2]	lb (dw) [3]	av. weight [4]	number [5]	number [6]	av. weight [7]	lb (dw)	number	mt (ww)	lb (dw) [8]	number	lb (dw)	mt (ww)
1981						7,678	56.395	433,001				7,678	433,001	385
1982						13,522	50.996	689,568				13,522	689,568	613
1983						7,375	51.597	380,529				7,375	380,529	338
1984						15,474	67.531	1,044,975				15,474	1,044,975	929
1985						79,912	41.487	3,315,309				79,912	3,315,309	2,947
1986						20,792	70.107	1,457,665				20,792	1,457,665	1,296
1987						14,809	35.069	519,337			0	14,809	519,337	462
1988						19,998	44.693	893,771			0	19,998	893,771	795
1989						8,367	90.117	754,009			0	8,367	754,009	670
1990						8,509	35.483	301,925			0	8,509	301,925	268
1991						3,422	69.02	236,186			0	3,422	236,186	210
1992				64.400	3,782	8,382	33.589	281,543	437	25.57	28,761	12,601	310,304	276
1993	281.09	143.41	316,164	35.800	4,044	15,034	49.883	749,941	460	19.85	22,327	19,538	1,088,432	968
1994	324.66	165.64	365,177	39.100	4,623	4,496	79.296	356,515	487	18.03	20,280	9,606	741,972	660
1995	288.83	147.36	460,767	52.700	8,743	31,212	51.227	1,598,897	446	28.44	31,989	40,401	2,091,653	1,860
1996	238.05	121.46	427,020	87.000	4,908	8,618	30.265	260,824	0	0.00	0	13,526	687,844	612
1997	245.46	125.23	446,305	44.000	10,143	3,025	60.839	184,038	0	0.00	0	13,168	630,343	560
1998	199.76	101.92	401,491	72.600	5,530	5,633	29.590	166,680	0	0.00	0	11,163	568,171	505
1999	90.05	45.94	217,867	47.000	4,635	1,383	51.597	71,359	0	0.00	0	6,018	289,226	257
2000	166.74	85.07	286,764	44.200	6,488	5,813	51.597	299,934	0	0.00	0	12,301	586,698	522
2001	182.02	92.87	347,844	50.700	6,861	2,827	83.938	237,293	0	0.00	0	9,688	585,137	520
2002	165.59	84.48	314,736	38.900	8,091	3,206	87.152	279,409	0	0.00	0	11,297	594,145	528
2003	140.80	71.84	285,222	40.000	7,131	3,906	35.880	140,147	0	0.00	0	11,037	425,369	378
2004	188.31	96.07	392,628	40.023	9,810	5,052	55.796	281,881	0	0.00	0	14,862	674,509	600
2005	186.03	94.91	341,391	61.576	5,544	3,857	31.204	120,354	0	0.00	0	9,401	461,745	411
2006	129.67	66.16	232,757	37.556	6,198	3,352	53.232	178,434	0	0.00	0	9,550	411,191	366
2007	214.88	109.63	352,905	47.920	7,364	2,556	38.975	99,620	0	0.00	0	9,920	452,525	402

[1] In whole weight from weighout data sheets; [2] Whole weight to dressed weight conversion ratio is 1.96; [3] 1982-1994 data are from weighout data sheets, 1995-2007 data are the sum of the southeast quota monitoring program/southeast general canvass and the northeast general canvass/dealer weighout data; [4] In pounds dressed weight from the pelagic longline observer program; [5] 1982-1994 data are taken directly from weighout data sheets, 1995-2007 data obtained by dividing values in fourth column (lb dw) by those in fifth column (av. weight); [6] Almost all recreational landings are from the MRFSS survey; [7] In pounds dressed weight; [8] Whole weight to dressed weight conversion ratio is 1.96.

Under alternative C6, the preferred alternative, NMFS would promote the live release of shortfin mako sharks in the commercial shark fishery, but this alternative would not result in any changes to the current commercial regulations regarding shortfin mako sharks. This alternative is expected to have slightly positive or neutral ecological benefits for shortfin mako sharks because 68.9 percent of shortfin mako sharks are brought to the vessel alive and could be released. This action would not restrict commercial harvest and landing of shortfin mako sharks that are alive at haulback, therefore, this alternative would likely have neutral ecological impacts for this stock since 61.4 percent of shortfin mako sharks that are caught are kept. However, as this alternative could result in the reduction of fishing mortality of shortfin mako sharks by encouraging fishermen to release shortfin mako sharks brought to the fishing vessel alive, NMFS prefers this alternative at this time.

Social and Economic Impacts

Currently, on average, 72.5 mt dw of shortfin mako sharks were commercially landed between 2004 and 2007. Using the median real dollar, ex-vessel price per pound of $1.59 for meat and $12.00 for fins, for shortfin mako sharks during the same timeframe, this is equivalent to $350,039 in average annual gross revenues. Because the No Action Alternative, alternative C1, would not modify or alter commercial fishing practices for shortfin mako sharks or other shark species, it would likely not result in any adverse economic or social impacts.

Alternative C2 would implement a species-specific quota for shortfin mako sharks at the level of the average annual commercial landings for this species. This alternative is expected to have neutral or slightly negative socioeconomic impacts. On average, 72.5 mt dw (159,834 lb dw) of shortfin mako sharks were commercially landed between 2004 and 2007. The average landings weight was then multiplied by the median real dollar, ex-vessel price per pound for shortfin mako shark meat from 2004 to 2007 ($1.59) to generate estimated annual economic revenues from the meat of shortfin mako sharks of $254,135. Fin weight was calculated by using the standard fin to carcass ratio of 5 percent dw. Using this ratio, of the 159,834 lb dw of shortfin mako shark landed, approximately 7,992 lb dw would have been shortfin mako shark fins. The fin weight was then multiplied by the median fin price per pound from 2004 to 2007 ($12.00) to generate estimated annual economic revenues from the fins of shortfin mako sharks of $95,904. Therefore, the estimated annual revenues for both the meat and fins of shortfin mako shark landings from 2004-2007 is equal to approximately $350,039. While fishermen would be able to maintain current fishing effort under this alternative, any increase in effort would be restricted by the species-specific quota of 72.5 mt dw. Under the No Action alternative, commercial fishermen currently have a 488 mt dw quota which could potentially be filled entirely by shortfin mako shark landings. Based on the median real dollar, ex-vessel price per pound of $1.59 for shortfin mako sharks, a quota of 488 mt dw could result in maximum annual revenues equal to $1,710,593. Thus, if the quota is reduced to 72.5 mt dw, which equals $254,135 in ex-vessel annual revenues, this could potentially result in a loss of annual revenues of $1,456,458 for commercial fishermen; however, given that shortfin mako sharks are bycatch in the PLL fishery, it is unlikely that the entire pelagic shark quota would be entirely filled with shortfin mako landings. NMFS does not prefer this alternative at this time because the United States contributes a small portion of shortfin mako shark mortality (due to no directed fishery) compared to the relative cumulative fishing mortality caused by other nations, and the 2008

stock assessment did not recommend a TAC that was necessary to end overfishing of shortfin mako sharks.

Alternative C3 would remove shortfin mako sharks from the pelagic shark species complex and add them to the prohibited species list. This alternative is not expected to have negative economic impacts for commercial fishermen because this is not a species that is targeted by commercial fishermen. Shortfin mako sharks are predominately caught as bycatch in the PLL fishery and, on average, the annual commercial landings for shortfin mako sharks from 2004 to 2007 were 72.5 mt dw. Based on the median real dollar, ex-vessel prices per pound of $1.59, this is equivalent to $254,135. However, since shortfin mako sharks would be placed on the prohibited species list under alternative C3, there could be an estimated reduction in annual revenues of $254,135 to the commercial fishermen. This alternative could lead to increased operation time if commercial fishermen have to release and discard all shortfin mako sharks that are caught on the PLL gear. Also, if the commercial PLL fleet expands in the future, placing shortfin mako sharks on the prohibited species list could result in a loss of future revenues for the commercial PLL fishery.

The potential economic impacts of implementing alternatives C4a or C4b were assessed by estimating the annual mt dw of shortfin mako sharks that would normally be landed for sale, which would now have to be released under these alternatives. Size limits in alternatives C4a and C4b would restrict the harvest of smaller shortfin mako sharks. To assess the impact of the size limits, NMFS calculated the average dressed weight percentage of shortfin mako sharks retained below each size limit using POP data and then applied that to landings data from the 2008 SAFE Report. Because the POP data is recorded as number of individuals caught, the data were converted into dressed weight by utilizing records of shortfin mako sharks that were recorded as kept and had an associated length measurement in the POP data. Fork lengths were converted into pounds dressed weight, and each conversion was multiplied by the number of sharks kept at each fork length. The dressed weights of individual sharks were then summed to get a total dressed weight for all shortfin mako sharks kept in the PLL and BLL fisheries (*i.e.*, 184,803.1 lb dw).

For alternative C4a, the summed dressed weight of all kept shortfin mako sharks under the proposed 32 inches IDL size limit was 2,550.5 lb dw. This made up 1.4 percent of total dressed weight landings of shortfin mako sharks ((2,550.5 / 184,803.1)*100). This percentage was then applied to the average commercial landings found in the 2008 SAFE Report from 2004-2007 (*i.e.*, 158,884.8 lb dw) to determine the estimated dressed weight of shortfin mako sharks that would be unavailable for landing under alternative C4a (158,884.8 lb dw * 1.4 percent = 2,061.1 lb dw) (Table 4.16). The 2,061.1 lb dw of unavailable shortfin mako shark meat was then multiplied by the median real dollar price per pound estimate ($1.59) for shortfin mako sharks from 2004 to 2007 to generate an estimated annual economic loss of $3,277. Fin weight was calculated by using the standard fin to carcass ratio of 5 percent dw. Using this ratio, 103 lb of fins would be unavailable for harvest. The unavailable fin weight was then multiplied by the median fin price per pound from 2004 to 2007 ($12.00) to generate an estimated annual economic loss of $1,236.00. Economic losses of meat and fins were then summed to calculate a total economic loss of $4,513 under alternative C4a.

For alternative C4b, the summed dressed weight of all kept shortfin mako sharks under the proposed 22 inches IDL size limit was 39.7 lb dw. This made up 0.02 percent of dressed weight landings of shortfin mako sharks ((39.7 / 184,803.1)*100). This percentage was then applied to the average commercial landings found in the 2008 SAFE Report from 2004-2007 (158,884.8 lb dw) to determine the estimated dressed weight of shortfin mako sharks that would be unavailable for landing under alternative C4b (158,884.8 lb dw * 0.02 percent = 34.3 lb dw) (Table 4.16). The 34.3 lb dw of unavailable shortfin mako shark was then multiplied by the median price per pound estimate ($1.59) for shortfin mako sharks from 2004 to 2007 to generate an estimated annual economic loss of $54.54. Fin weight was calculated by using the standard fin to carcass ratio of 5 percent dw. Using this ratio, 1.72 lb of fins would be unavailable for harvest. The unavailable fin weight was then multiplied by the median fin price per pound from 2004 to 2007 ($12.00) to generate an estimated annual economic loss of $20.64. Economic losses of meat and fins were then summed to calculate a total economic loss of $75.18 under alternative C4b.

Table 4.16 Estimates of shortfin mako shark landings (lb dw) reductions according to size restrictions in alternatives C4a and C4b.

Alternative	Size Limit (inches IDL)	Average shortfin mako shark commercial landings (lb dw) from 2004-2007 (2008 Safe Report)	Percentage of total landings (lb dw) of shortfin mako sharks below size limit (POP)	Estimated total weight (lb dw) of shortfin mako shark prohibited.
C4a	32	159,884.75	1.4	2,061.1
C4b	22	159,884.75	0.02	34.3

Alternatives C4a and C4b would both have minimal economic impacts because only a small percentage of commercial landings would be affected by the size restrictions. Of the two alternatives, the negative economic impact of C4a would be greater, as commercial landings by weight are 2,026.8 lb dw greater than in alternative C4b. Despite these minimum economic impacts, since the size limits would not reduce fishing mortality of shortfin mako sharks in the commercial sector, NMFS does not prefer this alternative at this time.

Under alternative C5, a preferred alternative, NMFS would, take action at the international level through international fishery management organizations to establish management measures to end overfishing of shortfin mako sharks. In the short term, this alternative would not result in any negative economic or social impacts on commercial fishermen as it would not restrict commercial harvest of shortfin mako sharks, nor alter the pelagic shark quota. Therefore, the social and economic impacts of alternative C5 would be the same as described in the No Action alternative, alternative C1. However, although this alternative could have negative social and economic impacts in the long term if management measures were adopted by the United States that would reduce landings domestically for shortfin mako sharks. Those recommendations would ultimately help end overfishing of shortfin mako in the long term. Therefore, NMFS prefers alternative C5 at this time.

Alternative C6, a preferred alternative, would promote the release of shortfin mako sharks brought to fishing vessels alive. This alternative would likely not result in any negative economic or social impacts as it would not restrict commercial harvest of shortfin mako sharks

that are alive at haulback, and quotas and retention limits would remain as described in the No Action alternative, Alternative C1. However, as this alternative could result in the reduction of fishing mortality of shortfin mako sharks by encouraging fishermen to release shortfin mako sharks brought to the fishing vessel alive, NMFS prefer this alternative at this time.

Conclusion

Based on the latest ICCAT stock assessment, the United States has determined that shortfin mako sharks are not overfished but appear to be approaching an overfished condition and have overfishing occurring. In comparison to the cumulative fishing mortality caused by other nations, the minor relative impact of the United States contributes very little to shortfin mako shark mortality in the North Atlantic because there is no directed U.S. commercial fishery. The ICCAT stock assessment did not provide a recommended TAC or mortality reductions to prevent overfishing of shortfin mako sharks, making it difficult to set a quota or other limit to prevent overfishing. Therefore, the preferred alternatives at this time would be to take action at the international level through international fishery management organizations to establish management measures to end overfishing of shortfin mako sharks and to promote the live release of shortfin mako sharks in the domestic commercial shark fishery. Neither of these two preferred alternatives would change the current commercial regulations for shortfin mako sharks. NMFS believes that ending overfishing and preventing an overfished status would be better accomplished through international efforts where other countries that have large takes of shortfin mako sharks could participate in shortfin mako shark mortality reductions. While this alternative would have neutral ecological and socioeconomic impacts for the portion of the shortfin mako shark stock that is fished by U.S. fishermen, in the short term, any international management recommendations adopted by the United States to help protect shortfin mako sharks would be implemented domestically and could have positive ecological impacts on shortfin mako sharks and potentially negative socioeconomic impacts on U.S. fishermen in the long term. Promoting the release of shortfin mako sharks that are brought to the vessel alive could result in the reduction of fishing mortality of shortfin mako sharks and thus, have positive ecological impacts for this species. Compared to alternatives C2, C3, and C4, the preferred alternatives would likely not result in any negative socioeconomic impacts as it would not restrict commercial harvest of shortfin mako sharks that are alive at haulback, and commercial quotas and retention limits would remain as described in the No Action alternative.

4.2 Recreational Measures

4.2.1 Small Coastal Sharks

As with the commercial fishery, NMFS is also considering new management measures within the recreational fishery to ensure that blacknose sharks are rebuilt by 2027. On average, from 1999-2005, the recreational fishery landed 10,408 blacknose sharks per year. However, since most, if not all, blacknose sharks rarely reach the 54 inch FL minimum size limit that is currently in place in federal waters, presumably blacknose sharks are being landed in state waters that have more liberal size limits. NMFS would have to work with states to ensure complementary recreational management measures, including the ASMFC and their interstate FMP for coastal sharks, in order to achieve the needed reduction in recreational landings and in order to rebuild blacknose sharks (*i.e.*, at least a 78-percent reduction in landings or total

mortality of 2,290 blacknose sharks per year by recreational fishermen). As described in Chapter 2, the alternatives considered for small coastal shark in the recreational fishery are:

Alternative D1	No Action. Maintain the current recreational retention and size limit for SCS
Alternative D2	Modify the minimum recreational size limit for blacknose sharks based on their biology
Alternative D3	Increase the retention limit for Atlantic sharpnose sharks based on current catches
Alternative D4	*Prohibit retention of blacknose sharks in recreational fisheries - Preferred Alternative*

Ecological Impacts

Under alternative D1, the No Action alternative, NMFS would maintain the existing recreational retention limits for SCS. Recreational anglers are currently allowed one authorized shark per vessel per trip (including SCS). In addition, they are allowed 1 bonnethead shark and 1 Atlantic sharpnose shark per person per trip. In addition, there is a recreational minimum size of 54 inches (4.5 ft) FL, which does not apply to Atlantic sharpnose or bonnethead sharks. The current recreational harvest of SCS combined from 2004-2007 was 536,886 fish (33,555.4/year). The Atlantic sharpnose shark was the most abundant species caught at a rate of 86,862.8/year. The other average yearly harvest rates were 35,164.8 for bonnethead sharks, 10,360 for blacknose sharks, and 1,834 for finetooth sharks. Since there would be no change to the retention limits under alternative D1, the ecological impacts associated with this alternative would be the same as the status quo. This would have neutral ecological impacts for Atlantic sharpnose, bonnethead, and finetooth sharks, as all species were not determined to be overfished and overfishing is not occurring. However, this could have negative ecological impacts on blacknose sharks as blacknose sharks were determined to be overfished with overfishing occurring. Without reductions in current blacknose shark recreational landings, NMFS would not be able to achieve the TAC of 19,200 blacknose sharks per year recommended by the 2007 blacknose shark stock assessment. To achieve this TAC, NMFS would need to reduce overall blacknose mortality by at least 78 percent. Since this alternative would not reduce blacknose shark recreational landings, NMFS does not prefer this alternative at this time.

Alternative D2 would modify the minimum recreational size for blacknose sharks based on their biology. Currently, the minimum retention size is 54 inches. However, the minimum size was based on the size at which 50 percent of female sandbar sharks reached sexual maturity. Blacknose sharks rarely, if ever, reach 54 inches as a maximum size. Given the difference in sizes for sexual maturity for blacknose and sandbar sharks, such a minimum size would need to be changed. A minimum size for blacknose sharks that corresponds to the size at which 50 percent of the female blacknose sharks reach sexual maturity is 36 inches FL. Thus, if NMFS based a new minimum size for blacknose sharks based on the size at which 50 percent of the female blacknose sharks reach sexual maturity, or 36 in FL, the new restriction would lower the current minimum size for blacknose sharks and could lead to increased landings of blacknose sharks. Based on data from MRFSS, the average length of blacknose sharks landed by recreational anglers was less than 36 inches FL. Thus, landings are not expected to increase by a significant amount by implementing this smaller size limit for blacknose sharks. However, in

order to achieve the TAC recommended by the 2007 blacknose shark stock assessment, NMFS would need to reduce overall blacknose mortality. Since decreasing the minimum size for blacknose sharks could result in increased landings of blacknose sharks, NMFS does not prefer this alternative at this time.

Alternative D3 would increase the retention limit for Atlantic sharpnose sharks based on their current catches and stock status. Based on the 2007 stock assessment for Atlantic sharpnose, the biomass for Atlantic sharpnose sharks is falling towards the maximum sustainable yield (B_{MSY}) threshold (NMFS, 2007). While the stock is not currently overfished or experiencing overfishing, the latest stock assessment suggests that increasing fishing effort, such as increasing the retention limit of Atlantic sharpnose sharks, could result in an overfished status and/or cause overfishing to occur. Thus, since increasing the retention limit for Atlantic sharpnose could result in increased fishing effort and result in negative ecological impacts for the stock, NMFS does not prefer this alternative at this time.

Under alternative D4, the preferred alternative, NMFS would prohibit the retention of blacknose sharks in the recreational fishery. This would have positive ecological impacts for the stock as it would reduce recreational landings of blacknose sharks in federal waters. To the extent that individual states mirror federal regulations, blacknose shark recreational landings could also be reduced in state waters. A reduction of blacknose shark recreational landings of 78 percent is needed to achieve the overall TAC of 19,200 blacknose sharks killed/year. This alternative would help reduce blacknose shark recreational landings and help rebuild the blacknose shark stock. Given that state recreational catch rates were 6,958.3 blacknose/year and total (federal and state) blacknose shark recreational landings were 10,360 blacknose/year, it can be assumed that blacknose shark landings would be reduced by at least 3,402.7 blacknose sharks/year under alternative D4. However, in order to achieve the TAC, blacknose shark recreational landings would need to be reduced by 78 percent or to 2,280 blacknose/year (see alternative D1). Thus, cooperation by individual states to prohibit the retention of blacknose sharks in state waters would be important in achieving the mortality reduction required to achieve the TAC recommended by the latest stock assessment in order to rebuild the blacknose shark stock. Since this alternative reduces the number of blacknose shark recreational landings and aids in reaching the TAC needed to rebuild the stock, NMFS prefers this alternative at this time.

Social and Economic Impacts

Under alternative D1, the No Action alternative, NMFS would maintain current recreational management measures, including the current retention limits and size limits for SCS. Therefore, the social and economic impacts of alternative D1 would be the same as the status quo, and no negative social or economic impacts would be anticipated under alternative D1. However, as this alternative would not help rebuild blacknose sharks, as explained in the ecological impacts of this section, NMFS does not prefer this alternative at this time.

Alternative D2 would modify the minimum recreational size for blacknose sharks based on the biology of blacknose sharks. This would lower the current size limit from 54 in FL to 36 in FL, the size at which 50 percent of the female blacknose sharks reach sexual maturity. According to data from MRFSS, the average length of blacknose sharks landed by recreational

anglers is less than 36 in FL. As such, this alternative could increase the landings of recreationally harvested blacknose sharks and, therefore, could have a positive social and economic impact. Since this alternative could result in the increase of blacknose shark recreational landings and NMFS needs to reduce the number of blacknose shark landings in order to rebuild the stock, NMFS does not prefer this alternative at this time.

Alternative D3 would increase the retention limit for Atlantic sharpnose sharks based on their current catches and stock status. Any increase in the retention limit for Atlantic sharpnose sharks would provide positive social and economic impacts, especially if this resulted in more charter trips for charter/headboats. However, since the latest stock assessment suggests that increased fishing effort could result in an overfished status and/or cause overfishing to occur in the future (NMFS, 2007), NMFS does not prefer this alternative at this time.

Under alternative D4, the preferred alternative, NMFS would prohibit the retention of blacknose sharks in the recreational fishery. While recreational fishermen may still catch blacknose sharks when fishing for other species, they would not be permitted to retain blacknose sharks and would have to release them. This could have negative social and economic impacts on recreational fishermen, including tournaments and charter/headboats, if the prohibition of blacknose sharks resulted in fewer charters. However, since blacknose sharks are not one of the primary species targeted by recreational anglers, in tournaments or on charters, NMFS does not anticipate large negative social and economic impacts from this alternative on recreational anglers, tournaments, or in the charter/headboat sector. Therefore, NMFS prefers this alternative at this time.

Conclusion

The preferred alternative D4, to prohibit the retention of blacknose sharks in the recreational fishery, would reduce the number of blacknose sharks recreationally landed in federal waters. This prohibition would help to achieve the overall TAC of 19,200 blacknose sharks/year across all fisheries and would assist in rebuilding the stock. In order to accomplish rebuilding, blacknose shark recreational landings would need to be reduced from 6,958.3 blacknose/year or to 2,280 blacknose/year. Therefore, complementary measures in states waters to prohibit the retention of blacknose sharks would be important in achieving the mortality reduction required to attain the TAC recommended by the latest stock assessment. The other alternatives of no action or modifying the minimum size limit for blacknose sharks would not allow NMFS to reduce the mortality of blacknose sharks and achieve the recommended TAC. Also, increasing the retention limit of Atlantic sharpnose sharks under alternative D3 could cause overfishing of Atlantic sharpnose in the future. Therefore, NMFS prefers alternative D4 at this time.

4.2.2 Pelagic Sharks

As described in Chapter 2, the alternatives considered for pelagic sharks in the recreational fishery are:

Alternative E1	No Action. Maintain the current recreational retention and size limits for shortfin mako sharks

Alternative E2 Increase the recreational minimum size limit of shortfin mako sharks

Alternative E2a) Establish a minimum size limit for shortfin mako sharks that is based on the size at which 50 percent of female shortfin mako sharks reach sexual maturity or 108 inches FL

Alternative E2b) Establish a minimum size limit for shortfin mako sharks that is based on the size at which 50 percent of male shortfin mako sharks reach sexual maturity or 73 inches FL

Alternative E3 *Take action at the international level to end overfishing of shortfin mako sharks – Preferred Alternative*

Alternative E4 *Promote the release of shortfin mako sharks brought to fishing vessels alive – Preferred Alternative*

Alternative E5 Prohibit landing of shortfin mako sharks in the recreational fishery (catch and release only)

Ecological impacts

Under alternative E1, the No Action alternative, NMFS would maintain the current recreational shark fishing regulations that pertain to shortfin mako sharks established in the 2006 Consolidated HMS FMP. The current bag limit for HMS Angling and HMS Charter/Headboat permit holders is one authorized shark species greater than 54 inches FL per vessel per trip, plus one Atlantic sharpnose and one bonnethead shark per person per trip. According to recreational landings data, on average 3,682 shortfin mako sharks were landed from 2004 to 2007 (NMFS 2008). Therefore, due to the low numbers of shortfin mako sharks landed in the commercial fishery, it is unlikely that maintaining the No Action alternative would have significant negative ecological impacts on the shortfin mako stock.

Alternative E2 would increase the current recreational size limit for shortfin mako sharks. Currently, the recreational size limit for shortfin mako sharks is 54 inches FL; therefore, increasing this size limit would result in varying degrees of ecological, social and economic impacts. Two size limits have been analyzed for shortfin mako sharks, one based on the size of sexual maturity of females (Alternative E2a) and one based on the size of sexual maturity of males (Alternative E2b). For each alternative, FL estimates of the size at which 50 percent of shortfin mako sharks reach sexual maturity was used from Natanson *et al*., 2006 (185 cm FL for males and 275 cm FL females, respectively), converted to inches, and rounded to the nearest inch to determine the size limit for each alternative to be analyzed. The size limit in inches for alternative E2a was determined to be 108 inches FL, and the size limit in inches for alternative E2b was determined to be 73 inches FL.

To assess the impacts of alternatives E2a and E2b, NMFS used recreational data obtained from the Large Pelagic Survey (LPS). The LPS data comprised recreational landings of shortfin mako sharks from 2004 to 2008, which is reported as recreational activities that took place during HMS fishing tournaments (tournament) and independent of HMS fishing tournaments (non-tournament).

The LPS data analysis was conducted according to whether shortfin mako sharks were landed during tournament or non-tournament fishing activities. The total number of shortfin

mako sharks recorded as tournament and non-tournament landings were summed (292 and 121 sharks, respectively), along with the number of shortfin mako sharks landed below the current size limit of 54 inches FL (4 and 12 sharks, respectively), the number of shortfin mako sharks below the size limit of 108 inches FL in alternative E2a (292 and 119 sharks, respectively), and the number of shortfin mako sharks below the size limit of 73 inches FL in alternative E2b (151 and 98 sharks, respectively). These totals were then used to determine what percentage of tournament and non-tournament recreational shortfin mako shark landings fall below the current recreational size limit, and the two size limits in alternatives E2a and E2b.

According to the LPS tournament data, 1.4 percent of shortfin mako sharks landed were below the current 54 inch FL minimum size, 100 percent were below the 108 inch FL size limit in alternative E2a, and 50.7 percent were below the 73 inch FL size limit in alternative E2b (Table 4.17). Based on non-tournament landings data of shortfin mako sharks, 3.9 percent were below the current 54 inch FL minimum size, 98.3 percent were under the 108 inch FL minimum size in alternative E2a, and 81 percent were under the 73 inch minimum size under alternative E2b (Table 4.17).

Table 4.17 Percentage of shortfin mako sharks with FL measurements reported as landed to the LPS from 2004 to 2008 under the current size limit and size limits in alternatives E2a and E2b.

	Total reported recreational shortfin mako landings with FL measurements from 2004-2007	**Percentage of recreational shortfin mako landings from 2004-2007 below the current 54 inch FL size limit**	**Percentage of recreational shortfin mako landings from 2004-2007 below 108 inch FL sizes**	**Percentage of reported recreational shortfin mako shark landings from 2004-2007 below 73 inch FL sizes**
Tournament	292	1.4%	100%	51.7%
Non-tournament	121	9.9%	98.3%	81.0%
Total	413	3.9%	99.5%	60.3%

For alternative E2a, NMFS applied the total 99.5 percent reduction (tournament and non-tournament landings combined) of shortfin mako sharks landed that were below the 108 inch FL size limit to the recreational landings data found in the 2008 SAFE Report to determine the estimated reduction in recreational shortfin mako shark landings under this alternative. According to the recreational landings data, on average 3,682 shortfin mako sharks were landed from 2004 to 2007 (NMFS 2008). Therefore, when applying the 99.5 percent reduction to the average shortfin mako recreational landings, this would result in 3,664 shortfin mako sharks that would have to be released (3,682 * 99.5 percent = 3,664), and 18 that could be landed under this alternative.

For alternative E2b, NMFS applied the total 60.3 percent reduction (tournament and non-tournament landings combined) of shortfin mako sharks landed that were below the 73 inch FL size limit to the recreational landings data found in the 2008 SAFE Report to determine the estimated reduction in recreational shortfin mako shark landings under this alternative. According to recreational landings data, on average 3,682 shortfin mako sharks were landed from 2004 to 2007 (NMFS 2008). Therefore, when applying the 60.3 percent reduction to the

average shortfin mako recreational landings, this would result in 2,220 shortfin mako sharks that would have to be released (3,682 * 60.3 percent = 2,220), and 1,462 that could be landed under this alternative.

Alternatives E2a and E2b could have positive ecological impacts on shortfin mako sharks, as both alternatives would lead to a large majority of the recreationally caught shortfin mako sharks to be released alive (99.5 and 81 percent, respectively). Due to the larger size limit of 108 inches FL, alternative E2a would have 65 percent more shortfin mako shark released than alternative E2b; therefore, having the greatest ecological benefit of these two alternatives.

Under alternative E3, NMFS would take action at the international level to end overfishing of shortfin mako sharks through participation in international fisheries organizations such as ICCAT. As discussed under alternative C5, ICCAT assumes three shortfin mako shark stocks for assessment purposes: northern and southern Atlantic stocks, separated at 5°N latitude, and a Mediterranean stock. The recreational fishery contributes to most of the landings, whose catches in numbers peaked in 1985 to about 80,000 fish, and ranged from less than 1,400 fish to over 31,000 fish in the remaining years (Table 4.15). Total catches ranged from about 5,600 fish in 1998 to almost 80,000 fish in 1985, when recreational catches peaked (Table 4.15). However, the Unites States contributes only a minor portion of the mortality for North Atlantic shortfin mako sharks. Therefore, NMFS believes that ending overfishing and preventing an overfished status would best be accomplished through development of management measures at the international level to be adopted and implemented by the United States and other nations. While this alternative would have neutral ecological impacts for shortfin mako sharks in the short term, any management recommendations adopted at the international level to end overfishing of shortfin mako sharks could have positive ecological impacts on shortfin mako sharks in the long term. Therefore, NMFS prefers alternative E3 at this time.

Under alternative E4, NMFS would promote the live release of shortfin mako sharks in the recreational shark fishery, but this alternative would not result in any changes to the current recreational regulations regarding shortfin mako sharks. Recreational shark fishermen would still be able to retain one authorized shark species greater than 54 inches FL per vessel per trip, and one Atlantic sharpnose and one bonnethead shark per person per trip. While this alternative would have neutral ecological impacts to the shortfin mako shark stock in the short term, NMFS would encourage the catch and release of live shortfin mako sharks. If any management recommendations are adopted at ICCAT to help protect shortfin mako sharks under the preferred alternative E3, NMFS would implement those recommendations domestically, which could have positive ecological impacts on shortfin mako sharks in the long term. Therefore, NMFS prefers E4 at this time.

Alternative E5 would prohibit the landings of shortfin mako sharks in the recreational fishery by placing shortfin mako sharks on the prohibited species list. Shark species can only be added to the prohibited species list provided that two of the following four criteria are met: 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). Shortfin mako sharks were determined to have overfishing occurring based on the 2008 ICCAT stock assessment. In addition, shortfin mako sharks look similar to other sharks on the prohibited species list (*i.e.*, white sharks, longfin mako sharks). According to recreational landings data, on average 3,682 shortfin mako sharks were landed from 2004 to 2007 (NMFS 2008). Because of the small number of shortfin mako sharks taken in the recreational fishery, placing this species on the prohibited species list is likely to have neutral or slightly positive ecological impacts for shortfin mako sharks.

Social and Economic Impacts

Alternative E1 would likely not result in any adverse economic or social impacts as the No Action alternative would not substantially modify or alter recreational fishing practices for shortfin mako sharks or other shark species.

Alternative E2a could have significant negative social and economic impacts, as almost all of the reported shortfin mako sharks landed (99.5 percent) were smaller than the 108 inch FL size limit and would have to be released. This alternative would create a catch and release fishery for shortfin mako sharks. The social and economic impacts of alternative E2b would be less severe than alternative E2a, but would result in a 60.3 percent overall reduction in recreational shortfin mako shark landings. Under alternative E2b, economic and social impacts would be greater on the non-tournament recreational shortfin mako shark fishery participants, as 81 percent of non-tournament landings would fall below the 73 inch FL size limit. Also, under alternative E2b, the percentage of shortfin mako sharks landed during tournaments that would have to be released under this alternative would be 51.7 percent as opposed to 81 percent that would have to be released in the non-tournament recreational fishery (to, respectively) (Table 4.17). According to LPS data, 41 percent of shortfin mako sharks caught recreationally are kept (Table 4.18); therefore, the size limits considered in alternatives E2a and E2b may have negative economic and social impacts on tournament and non-tournament recreational fishery participants.

Table 4.18 Total number of shortfin mako sharks reported to the LPS from 2004 to 2008.

Year	Kept	Released Alive	Discard Dead	Total
2004	4640	6731	17	11389
2005	2732	3086	7	5825
2006	3639	5485	0	9123
2007	2283	3363	0	5647
2008	2348	3524	0	5872
Total	15643	22189	24	37856
Average	3129	4438	5	7571
% of Average	41%	59%	0%	100%

Under alternative E3, NMFS would take action at the international level to end overfishing of shortfin mako sharks. This alternative would not result in any changes to the current recreational regulations regarding bag or size limits for shortfin mako sharks. Therefore, this alternative would likely not result in any negative social or economic impacts for recreational fishermen compared to the No Action alternative, alternative E1.

Under alternative E4, NMFS would promote the live release of shortfin mako sharks in the recreational shark fishery, but this alternative would not result in any changes in the current recreational regulations regarding bag or size limits for shortfin mako sharks. Therefore, this alternative would likely not result in any negative social or economic impacts.

Under alternative E5, NMFS would remove shortfin mako sharks from the authorized species list and place them on the prohibited species list. Placing shortfin mako sharks on the prohibited species list would result in a recreational catch and release fishery for this species. According to recreational landings data, on average 3,682 shortfin mako sharks were landed from 2004 to 2007 (NMFS 2008). Although a small number of shortfin mako sharks were landed in the recreational fishery during this time period, it is also an important shark species in fishing tournaments. Fishing tournaments are an important component of HMS recreational fisheries. In 2007, there were 42 shark tournaments throughout the U.S. Atlantic, including the Gulf of Mexico and the Caribbean Sea. Therefore, compared to the alternatives discussed above, adding this species to the prohibited species list could have negative social and economic impacts for recreational fishermen and those who participate in recreational shark tournaments that would no longer be able to retain this species.

Conclusion

Shortfin mako sharks have been determined to not be overfished but have overfishing occurring according to the latest ICCAT stock assessment. In comparison to other ICCAT Contracting Parties, the United States contributes very little to shortfin mako shark mortality in the North Atlantic because there is no directed fishery. The ICCAT stock assessment did not provide a recommended TAC necessary to rebuild shortfin mako sharks, making it difficult to set a quota that would aid in rebuilding this species. Therefore, the preferred alternatives at this time would be to take action at the international level through development of management measures to end overfishing of shortfin mako sharks and to promote the live release of shortfin mako sharks in the recreational shark fishery. Neither of these two preferred alternatives would change the current recreational regulations for shortfin mako sharks. Ending overfishing and preventing an overfished status may be better accomplished through international efforts where other countries that have large takes of shortfin mako sharks could participate in shortfin mako shark mortality reductions. While this alternative would have neutral ecological, social and socioeconomic impacts for the portion of the shortfin mako shark stock that is fished by U.S. fishermen, in the short term, any international management recommendations adopted to help protect shortfin mako sharks could be implemented domestically and could have positive ecological impacts on shortfin mako sharks in the long term and potentially negative social and economic impacts on U.S. fishermen. Promoting the release of shortfin mako sharks that are brought to the vessel alive could result in the reduction of fishing mortality of shortfin mako sharks and thus, have positive ecological impacts for this species. Compared to alternatives E2 and E5, the preferred alternatives would likely not result in any negative social or economic impacts on the fishery participants as it does not restrict recreational harvest of shortfin mako sharks that are brought to the vessel alive, and recreational size limits and retention limits would remain as described in the No Action alternative.

4.3 Smooth Dogfish

NMFS currently manages sharks in four management units (small coastal sharks, pelagic sharks, large coastal sharks, and prohibited species). There are additional species of sharks that are HMS that fall outside of the current management units but remain under Secretarial authority should the Secretary determine the species is in need of conservation and management. One of these species, smooth dogfish, is not currently managed at the federal level. Due to increasing concerns regarding the lack of management on smooth dogfish along with the addition of smooth dogfish to the Atlantic States Marine Fisheries Commission (ASMFC) Interstate Coastal Shark FMP, NMFS is considering several alternatives regarding smooth dogfish. Although smooth dogfish were previously included in a fishery management unit (FMU) that included deepwater and other sharks, these species were removed from the FMU in the 2003 Amendment 1 to the Fishery Management Plan for Atlantic Tunas, Swordfish, and Sharks since they were protected under the Shark Finning Prohibition Act (67 FR 6124, February 11, 2002). The Magnuson-Stevens Act grants authority to manage oceanic shark species within the U.S. EEZ to the Secretary. NMFS has determined that smooth dogfish is an oceanic shark species. The Magnuson-Stevens Act further defines Secretarial authority for HMS that crosses the jurisdiction of more than one of the following five Councils: NEFMC, MAFMC, SAFMC, GMFMC, and CFMC. Smooth dogfish range crosses the jurisdiction of all five of eastern United States Councils. Based on public comments and its independent review of the species, NMFS has determined that smooth dogfish are in need of conservation and management under HMS authority. However, limited data regarding landings, effort, or participants in the fishery complicates new regulations. Any management measures implemented for smooth dogfish would also apply to Florida smoothhounds (*Mustelus norrisi*). Emerging molecular and morphological research has determined that Florida smoothhounds have been misclassified as a separate species from smooth dogfish (Jones, pers. comm.). Because of this taxonomic correction, Florida smoothhounds would be considered smooth dogfish and would fall under all smooth dogfish management measures, such as permit requirements and quotas.

While there are no data regarding stock status and data on participants in the fishery are sparse, a number of sources exist that document smooth dogfish landings. Despite the lack of management, many fishermen in the mid-Atlantic region have been reporting their landings. Some of these fishermen have federal permits for other species and are required to report all landings, including smooth dogfish, due to the regulations in those other fisheries. Other fishermen do not have federal permits and report smooth dogfish landings voluntarily. These landings, and the number of vessels reporting these landings, have remained fairly constant since the late 1990s. Existing sources, particularly the Atlantic Coastal Cooperative Statistics Program (ACCSP) for commercial catches and the Marine Recreational Fishing Statistics Survey (MRFSS) for recreational catches, offer insight into the current state of the fishery. A third source, NMFS' Science and Technology's (S&T) Annual Commercial Landings Statistics, available on the S&T webpage (http://www.st.nmfs.noaa.gov), is also available, however this system only contains non-confidential landings data, and, thus, underestimates commercial landings. For this reason, ACCSP data was used instead of S&T data for analysis.

As described in Chapter 2, the alternatives considered for smooth dogfish management are:

Alternative F1 No Action. Do not add smooth dogfish under NMFS management

Alternative F2 Add smooth dogfish under NMFS management and develop management measures, such as a federal permit requirement-Preferred Alternative

- Alternative F2a1) Establish a smooth dogfish quota that is equal to the average annual landings from 1998-2007 (950,859 lb dw)
- Alternative F2a2) Establish a smooth dogfish quota equal to the maximum annual landing between 1998-2007 (1,270,137 lb dw)
- *Alternative F2a3) Establish a smooth dogfish quota equal to the maximum annual landing between 1998-2007 plus one standard deviation (1,423,727 lb dw) – Preferred Alternative*
- *Alternative F2b1) Establish a separate smooth dogfish set-aside quota for the exempted fishing program of 6 mt ww – Preferred Alternative*
- Alternative F2b2) Establish a smooth dogfish set-aside quota for the exempted fishing program and add it to the current 60 mt ww set-aside quota for the exempted fishing program

Alternative F3 Add smooth dogfish under NMFS management and mirror management measures implemented in the ASMFC Interstate Shark FMP

Ecological Impacts

The No Action alternative, alternative F1, would likely not have any ecological impacts beyond the status quo as it would not implement any new management measures for the smooth dogfish fishery. However, under the No Action alternative, there would continue to be a lack of data collection regarding numbers of participants in the fishery and catch and effort information that could be used to characterize the fishery and determine stock status for smooth dogfish. Thus, if current fishing effort is putting too much pressure on the stock, negative ecological impacts could persist but would continue to go undocumented under the No Action alternative. NMFS does not prefer alternative F1 at this time.

Alternative F2, the preferred alternative, would implement federal management measures for smooth dogfish and establish a permit requirement for commercial and recreational retention of smooth dogfish in federal waters. This alternative would also provide NMFS the ability to select vessels to carry an observer. These management measures would focus on characterizing the fishery in terms of permitting the universe of fishermen (both commercial and recreational) that retain smooth dogfish in federal waters and collecting landing data through dealer reports, but would not actively change catch levels or rates. Similarly, at this time, this alternative would not require fishermen to attend the protected species release, disentanglement, and identification workshops. As NMFS gathers information about the fishery and the fishermen, NMFS may decide to require fishermen attend these workshops as is required in other HMS longline and gillnet fisheries. This alternative would likely not have significant positive or negative ecological impacts on smooth dogfish unless the requirement of a federal permit reduces the number of participants in the fishery, which could have positive ecological impacts on the stock.

In the future, NMFS may implement additional management measures for smooth dogfish, such as reporting requirements, or additional measures if warranted by future stock assessments. Over time, NMFS would likely implement logbook or other reporting for smooth dogfish fishermen. NMFS would not do this, however, until the universe of fishermen is known and until NMFS can determine the appropriate mechanism of reporting without duplicating current reporting requirements. Alternative F2 would establish federal management measures and could begin collection of smooth dogfish catch data, effort data, and data regarding participants in the fishery.

The proposed EFH for smooth dogfish would not have any ecological, social, or economic impacts. The designation satisfies a statutory requirement, and no management measures are associated with its designation. In the 2006 Consolidated HMS FMP and Amendment 1 to the 2006 Consolidated HMS FMP, NMFS reviewed the various gear types with the potential to affect EFH and, based on the best information available at this time, NMFS has determined that fishing is not likely to adversely affect EFH for smooth dogfish. Authorized gear types for HMS fishing that contact the ocean floor include sink gillnets and BLL. Sink gillnets are only used over non-complex bottom types such as sand and mud, and are not likely to damage or alter the substrate. Thus any impacts from gillnet gear would be minimal and only temporary in nature. In the FEIS for Amendment 1 to the 2006 Consolidated HMS FMP, NMFS determined that shark BLL gear does not have adverse effects on EFH. Based on these conclusions, NMFS has decided that it is not necessary to develop management measures to mitigate adverse impacts to EFH for smooth dogfish.

Gillnets are the primary gear type in the smooth dogfish fishery and if the fishery is brought under federal management, fishermen using gillnets to target smooth dogfish would be required to comply with federal marine mammal take reduction programs mandated in the Marine Mammal Protection Act at 50 CFR 229.32, including frequent net-checks (every 0.5-2 hours) and the requirement for gillnets to remain attached to the vessel**.** Positive ecological impacts are expected to continue from this compliance due to a decreased risk of marine mammal interactions with smooth dogfish gillnets. In addition, alternative F2 in combination with the preferred alternative B3, would preclude fishermen that use gillnets in federal waters to retain any sharks, including smooth dogfish, from South Carolina south. This would reduce gillnet fishing effort in this area and would reduce bycatch of non-target species and protected resource interactions with gillnet gear.

As described in Chapter 1, NMFS, on January 16, 2009, published the final NSG1 (74 FR 3178) implementing, among other things, ACL and AM requirements of the Magnuson-Stevens Act 16 U.S.C. §1853(a)(15). Per NSG1, ACLs and AMs apply to all species in a federally managed fishery under the Magnuson-Stevens Act unless otherwise exempted. Because smooth dogfish are not subject to an exemption from the statutory requirement, NMFS must establish an ACL and AMs for smooth dogfish if it is incorporated in this draft amendment. The Amendment 3 to the 2006 Consolidated HMS FMP will include a “mechanism” for establishing ACLs, including those for smooth dogfish. This “mechanism” is described more fully in Chapter 1. The five alternatives under alternative F2 would implement a smooth dogfish commercial quota and a set-aside quota for smooth dogfish to be taken under the exempted fishing program. Each alternative aims to set a quota around current catch levels of smooth dogfish to minimize

restrictions on the current fishery. Therefore, it is not anticipated that these quotas would have any additional ecological impacts beyond those discussed for alternative F2.

Alternative F2a1 would establish a smooth dogfish quota that is equal to the average annual landings from 1998-2007 or 950,859 lb dw. While this alternative could have positive ecological impacts on the stock by capping effort at the average level of landings, as fishermen are not currently required to report smooth dogfish landings, such a quota could be overly restrictive to the fishery. Thus, NMFS does not prefer this alternative at this time.

Alternative F2a2 would establish a smooth dogfish quota equal to the maximum annual landing between 1998-2007 or 1,270,137 lb dw. Similarly to alternative F2a1, this alternative could have positive ecological impacts on the stock by capping effort at the maximum reported level of landings. However, this quota could also be overly restrictive to the fishery due to underreporting, and therefore, NMFS does not prefer this alternative at this time.

Alternative F2a3, the preferred alternative, would have similar positive ecological impacts to the previous two alternatives by capping total landings. Establishing a smooth dogfish quota equal to the maximum annual landing between 1998-2007 plus one standard deviation (1,423,727 lb dw), would maintain the quota near historical landing levels. The one standard deviation buffer would ensure that the fishery is not unnecessarily restricted while also ensuring that effort does not increase significantly until a stock assessment is conducted. For this reason, NMFS prefers alternative F2a3. NMFS would also account for underharvest and overharvest of smooth dogfish as it does for other shark species and would close the smooth dogfish shark quota with five days notice upon filing in the Federal Register when the smooth dogfish shark quota reaches or is projected to reach 80 percent. This would help prevent overharvest from occurring while still giving the public 5 days notice that the fishery would close.

Alternative F2b1, the preferred alternative, would establish a separate smooth dogfish set-aside quota for the exempted fishing program. Currently, there is a 60 mt ww set-aside quota for sharks for the exempted fishing program. However, as smooth dogfish have not been federally managed in the past, smooth dogfish were not included in this 60 mt ww set-aside. Thus, to allow fishermen to take smooth dogfish for research purposes and outside of any established regulations for smooth dogfish, NMFS would establish a separate set-aside for smooth dogfish based on the maximum yearly smooth dogfish takes during research over the past 10 years or 6 mt ww. Thus, the set-aside would not be expected to have any negative ecological impacts on smooth dogfish as these takes are already occurring. In addition, by establishing a separate set-aside for smooth dogfish, there would be no negative ecological impacts on other shark species taken under the exempted fishing program, as they would be limited to the current 60 mt ww set-aside.

Under alternative F2b2, NMFS would establish a smooth dogfish set-aside quota for the exempted fishing program and add it to the current 60 mt ww set-aside quota for the exempted fishing program. As explained under alternative F2b1, smooth dogfish are not included in the current 60 mt ww set-aside quota for sharks for the exempted fishing program. Thus, the inclusion of smooth dogfish under the exempted fishing program shark quota set-aside would

allow fishermen to take smooth dogfish for research purposes and outside of any established regulations for smooth dogfish. NMFS would establish a set-aside for smooth dogfish based on the maximum yearly smooth dogfish takes during research over the past 10 years or 6 mt ww, and add it to the existing 60 mt ww research set-aside for a total of 66 mt ww. Thus, the set-aside would not be expected to have any negative ecological impacts on smooth dogfish as these takes are already occurring. However, increasing the overall 60 mt ww shark quota set-aside to allow the inclusion of smooth dogfish, could allow the increased take of other shark species. Thus, NMFS would need to monitor the number of smooth dogfish and other species of sharks allocated to research programs to ensure there is no increased mortality of other shark species under the exempted fishing program. For this reason, NMFS does not prefer alternative F2b2 at this time.

Alternative F3 would also implement federal management measures for smooth dogfish, however, NMFS management measures would mirror and/or complement, to the extent practicable, ASMFC measures included in the Coastal Shark FMP. On May 6, 2009, the ASMFC approved a smooth dogfish Addendum to the Atlantic Coastal Sharks FMP for public comment. Included within this Addendum is an exception for smooth dogfish to allow at-sea processing (*i.e.*, removal of shark fins while still onboard a fishing vessel), removal of recreational retention limits for smooth dogfish, and removal of the two hour net-check requirement for shark gillnets. The at-sea processing would require a 5 percent fin to carcass ratio but would allow for the removal of fins at sea. The allowance for the removal of shark fins while still onboard a fishing vessel and the removal of the two hour net-check requirement differs from current federal regulations. NMFS considers the requirements for gillnet checks and maintaining shark fins naturally attached through offloading to be necessary to minimize impacts on protected resources and to prevent shark finning. NMFS recently implemented the fins attached regulation for all Atlantic sharks for enforcement and species identification reasons and would not want to open a loophole that would hinder enforcement. Additionally, both the House of Representatives and the Senate are reviewing bills that, if approved and signed by the President, would require all fins be naturally attached for all sharks in U.S. federal waters. Second, ASMFC has not established a quota for the smooth dogfish fishery. As noted above, NMFS is required to establish ACLs and AMs under the Magnuson-Stevens Act. Third, ASMFC has not established a permitting requirement. NMFS believes that permitting is the first step to gaining information about the fishery. Thus, NMFS is not preferring to mirror the ASMFC regulations at this time. Nonetheless, if NMFS implements alternative F2, NMFS would continue to work with ASMFC to ensure federal and state regulations are consistent to the extent practicable.

Social and Economic Impacts

Alternative F1 would likely not have any new social or economic impacts beyond the status quo, as no action would be taken. However, applying the No Action alternative would preclude gathering fishery participant information. Therefore, NMFS does not prefer this alternative at this time.

Implementing federal management of smooth dogfish through alternative F2 would focus on characterizing the fishery and would not actively change catch levels or rates. Therefore, this alternative would likely not have significant positive or negative economic impacts, except that

fishermen would have to purchase an open access smooth dogfish commercial fishing permit or HMS Angling or CHB permit and dealers would be required to report smooth dogfish on HMS dealer reports or through the Standard Atlantic Fisheries Information System (SAFIS). However, if the federal permitting system creates enough of an inconvenience as to prevent some participants from remaining in the fishery, negative social and economic impacts could result. Permitted smooth dogfish fishermen would be eligible for observer coverage selection which could result in negative social and economic impacts due to increased cost and burden. Utilizing VTR and Coastal Fisheries Logbook data, an estimate of the number of participants with current federal permits in the commercial smooth dogfish fishery could be calculated. Within the VTR data, a primarily Northeast U.S. reporting system, an average of 213 vessels reported smooth dogfish landings per year between 2004 and 2007. Within the Coastal Fisheries Logbooks data, a primarily Southeast U.S. reporting system, an average of 10 vessels reported smooth dogfish landings per year between 2004 and 2007. From this data, an estimate of 223 vessels would require a smooth dogfish permit; however, as fishermen are currently not required to have a permit to retain smooth dogfish, this could be an underestimate of the number of fishermen that would require a federal commercial permit for smooth dogfish in the future. As noted in the previous section, the proposed EFH for smooth dogfish would not have any social or economic impacts.

Based on MRFSS data from 2004 to 2007, an average of 58,161 smooth dogfish were retained per year in the recreational fishery. This number may be used as a proxy for the upper limit of participants in the federal recreational fishery that catch this species since a single fisherman may have caught multiple smooth dogfish. Based on the life history of this species and the fact that most recreational fisherman are shore-based, most smooth dogfish are likely caught in state waters, and would not require a federal HMS angling permit. Of those that fish in federal waters, the nominal fee of $16.00 for a recreational HMS Angling category or CHB permit is not expected to create an impediment to entering or remaining in the recreational fishery.

Based on ACCSP data from 1998-2007, in the commercial fishery an average of 1,321,695 lb ww of smooth dogfish were retained per year. Of this whole weight, 950,860 lb dw fish and 47,543 lb of fins would be available for sale (conversion of 1.39 for ww to dw, and 5 percent of dw for shark fins). Using the median ex-vessel price of these products between 2004 and 2007 ($0.29 for smooth dogfish meat and $2.02 for smooth dogfish fins), the fishery averaged $371,786 in value per year.

Social impacts resulting from alternative F2 and the associated sub-alternatives primarily relate to perceptions and attitudes regarding the current state of the fishery. Anecdotal evidence suggests that smooth dogfish are often considered an incidental catch and are only rarely targeted. A portion of the catch enters the commercial market, but some are retained only for bait in other fisheries. Due to the lack of reporting requirements, NMFS is unsure of the extent of these different uses. Furthermore, smooth dogfish are considered by some to be a nuisance species, sometimes interrupting more desirable commercial and recreational fisheries. Attitudes and perceptions such as these, to the extent they exist, could confound management actions if participants in the fishery do not see the need to manage a bycatch, bait, or nuisance species. Establishing federal management could alter these attitudes and change the low perception of the

species. This change in perception would likely have neutral impacts except in the case of participants using smooth dogfish as bait. In this case, participants may feel the requirements associated with federal level management are unnecessary and hinder the use of the species as an inexpensive source of bait. This could lead to negative social impacts as the current fishery changes from having minimal federal interference to requiring management measures such as the purchase of a federal smooth dogfish permit

Alternatives F2a1, which would establish a smooth dogfish quota that is equal to the average annual landings from 1998-2007, and F2a2, which would establish a smooth dogfish quota equal to the maximum annual landing between 1998-2007, could potentially have negative economic impacts to fishermen if the associated quotas reflect a significantly underreported fishery. If the actual landings are higher than these two quotas, fishermen would be prevented from fishing at status quo levels, thus, negative economic impacts could result. Therefore, NMFS does not prefer these two alternatives at this time.

Alternative F2a3, which would establish a smooth dogfish quota above the maximum annual landings between 1998-2007, would have neutral economic impacts. The quota of maximum historical annual landings plus one standard deviation between the years 1998 and 2007 would allow a buffer for potential unreported landings during that time. This would allow the fishery to continue in the future without having to be shut down prematurely, which may be warranted given smooth dogfish sharks have not been assessed. Thus, alternative F2a3 is NMFS' preferred alternative at this time.

There are no negative economic impacts anticipated with alternative F2b1. There is no charge associated with fishermen and researchers obtaining an exempted fishing permit (EFP), scientific permit (SRP), display permit, or letter of acknowledgement (LOA) for research or the collection for public display. In addition, NMFS would establish a smooth dogfish set-aside that would accommodate current and future research activities. Thus, NMFS does not anticipate any negative economic impacts associated with alternative F2b1.

As with alternative F2b1, there are no negative economic impacts anticipated with alternative F2b2. There is no charge associated with fishermen and researchers obtaining an EFP, SRP, display permit, or LOA for research or for the collection for public display. In addition, NMFS would establish a smooth dogfish set-aside that would accommodate current and future research activities. Thus, NMFS does not anticipate any negative economic impacts associated with alternative F2b2.

Alternative F3 would likely have neutral to slightly positive economic impacts. Most of the ASMFC regulations would not change the smooth dogfish fishery, and would therefore, have neutral impacts on fishermen. In addition, the ASMFC's consideration of removing the two hour-net check provision and allowing fishermen to process smooth dogfish while at sea would allow fishermen to conduct the fishery as they have in the past, and therefore, result in neutral or slightly positive economic impacts. However, since NMFS considers the requirements for gillnet checks and maintaining shark fins naturally attached through offloading necessary conservation tools for protected resources and to prevent shark finning, NMFS does not prefer

this alternative at this time. Social impacts resulting from alternative F3 are likely the same as those described for alternative F2.

Conclusion

Under the Magnuson-Stevens Act, NMFS must, consistent with the National Standards, manage fisheries to maintain OY when rebuilding overfished fisheries and preventing overfishing. Thus, NMFS prefers alternative F2 to include smooth dogfish in a federal management plan and implement a federal permit requirement to better characterize the universe of fishermen landing smooth dogfish and collect landings data from dealer reports. In addition, the Magnuson-Stevens Act requires the establishment of ACLs and AMs for each species within a fishery unless the species is subject to narrow exemptions. Smooth dogfish are not exempt from the requirement. NMFS prefers to establish a quota equal to the maximum annual landings plus one standard deviation between the years 1998 and 2007 to serve as an ACL: a specific level of catch that could prevent overfishing of the species. This quota would allow the fishery to operate as it has without unintentional restrictions. The quota would be set above the maximum recorded landings given fishermen have not had to report smooth dogfish landings in the past. For AMs, smooth dogfish would be subject to the same closure requirements as other shark species when 80% of quota is reached and would include additional provisions for addressing overharvest in subsequent seasons. The set-aside quota of 6 mt under alternative F2b1 would allow for continued research on smooth dogfish as well as some limited collection for public display.

Ecological and socioeconomic impacts are expected to be minimal since no restrictions would be placed on the fishery beyond a federal permit and the requirement that federal dealers report smooth dogfish landings. Fees associated with the permit would be minimal, and are not expected to create any impediment to entering or remaining in the fishery.

4.4 Impacts on Essential Fish Habitat

The Magnuson-Stevens Act requires NMFS, 16 U.S.C. 1855((b)(1), as implemented by 50 C.F.R. §800.815, to identify and describe essential fish habitat (EFH) for each life stage of managed species and to evaluate the potential adverse effects of fishing activities on EFH §800.815(a)(2) including the cumulative effects of multiple fisheries activities. If NMFS determines that fishing gears are having an adverse effect on HMS EFH, or other species' EFH, then NMFS must include management measures that minimize adverse effects to the extent practicable. Ecological impacts to EFH due to actions in this proposed amendment would likely be positive and have no adverse effects as the preferred alternatives would decrease SCS fishing effort with BLL gear as a result of reduced non-blacknose SCS and blacknose shark quotas. In the 2006 Consolidated HMS FMP and Amendment 1 to the 2006 Consolidated HMS FMP, NMFS reviewed the various gear types with the potential to affect EFH and, based on the best information available at this time, NMFS has determined that fishing is not likely to adversely affect EFH for smooth dogfish. Thus, there is no evidence to suggest that implementing any of the preferred alternatives in this amendment would adversely affect EFH to the extent that adverse effects could be identified on the habitat or fisheries.

4.5 Impacts on Protected Resources

The combination of the preferred alternatives A4 and B3 could have positive ecological impacts on protected resources, including sea turtles, marine mammals, smalltooth sawfish, and prohibited shark species, since NMFS would reduce the non-blacknose SCS quota and blacknose quota under alternative A4 and remove shark gillnet gear as an authorized gear for sharks under alternative B3. These alternatives would reduce fishing effort, prevent overfishing, and rebuild overfished stocks. Alternatives A1 through A3 would not have large, positive ecological impacts on protected resources when compared to Alternative A4. Alternative A5 would have large ecological impacts, but the alternative would have significant negative social and economic impacts on fishermen. The alternative B1 would have neutral ecological impacts on protected resources, while alternative B2 would have significant positive ecological impacts by removing gillnet gear for sharks everywhere and large, significant negative social and economic impacts. If gillnets are prohibited for sharks from South Carolina south under Alternative B3, the interactions with the protected species could decrease (see Chapter 3). For example, from 2004-2006, 9 loggerhead (2 discarded dead) and 1 leatherback sea turtles were observed caught in gillnets from South Carolina south (Garrison, 2007). Also, this alternative would remove gillnet gear from the southeast region and prevent the significant risk to north Atlantic right whales from entanglement in gillnet gear in the right whale calving area during calving season. NMFS has designated critical habitat for right whales during their calving season (December-March) in this area, and there are strict requirements in place when fishermen use gillnet during certain periods of time in this area. In 2006, a right whale calf was observed dead off the coast of Florida. Available evidence suggested that the entanglement and injuries of the whale were caused by gillnet gear, which eventually led to the death of the animal. It is still unknown if the gillnet gear was from a shark fishermen. NMFS believes reducing fishing effort and removing gillnet gear under alternatives A4 and B3 would reduce bycatch and interactions of protected species with shark fishermen. Redistributed effort to these other fisheries could result in indirect negative ecological impacts in those fisheries. However, due to the cost associated with shifting from gillnet gear to BLL gear and because most of those fisheries are limited access and have quotas and/or fishing seasons in place to limit catch and prevent overfishing, NMFS feels any negative ecological impacts due to redistributed effort would likely be limited.

The other preferred alternatives would likely have neutral ecological impacts on protected resources. Under preferred alternatives C5, C6, E3 and E4, NMFS would promote conservation and management measures at the international level to end overfishing of shortfin mako sharks and promote the live release of shortfin mako sharks brought alive to a fishing vessel in both the recreational and commercial sectors. In addition, under the preferred alternative D4, NMFS would prohibit the retention of blacknose sharks in the HMS recreational shark fishery. Finally, under the preferred alternative F2, NMFS would establish a federal permit for smooth dogfish as well as set a smooth dogfish quota and EFP set-aside quota. The combination of these alternatives and the other non-preferred alternatives are not anticipated to have any adverse ecological impacts on protected resources as they are not expected to increase fishing effort in the recreational or commercial fishery for pelagic sharks and smooth dogfish.

4.6 Environmental Justice

Executive Order 12898 requires agencies to identify and address disproportionately high and adverse environmental effects of its regulations on 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.

In addition to the community profile information found in the 2006 Consolidated HMS FMP (Chapter 9), a recent report was completed by MRAG Americas, and Jepson (2008) titled "Updated Profiles for HMS Dependent Fishing Communities" (Appendix E of Amendment 2 to the 2006 Consolidated HMS FMP). This report includes updated community profiles and new social impacts assessments for HMS fishing communities along the Atlantic and Gulf of Mexico coasts. The communities of Dulac, Louisiana and Fort Pierce, Florida have significant populations of Native Americans and African-Americans, respectively. The 2000 Census data indicates that Native Americans made up 39 percent of the Dulac population, specifically the Houma Indians, which is not a federally recognized tribe. About 30 percent of the Dulac population was living below poverty level in 2000. In 2000, African-Americans were about 41 percent of the Fort Pierce, Florida population with about 30 percent of the entire Fort Pierce population living below the poverty line. These two communities also have significant populations of low-income residents. In addition to Dulac and Fort Pierce, there is a diffuse of low-income, minority Vietnamese-American population in Louisiana, actively participating in the PLL 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. 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 were 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. More in-depth information about potential social impacts of each preferred alternatives is briefly described below with detailed information provided earlier in this chapter. Demographic data indicate that coastal counties with fishing communities are variable in terms of social indicators like income, employment, and race and ethnic composition.

The preferred alternative A4, to establish a new SCS quota and a blacknose shark commercial quota, would have negative economic and social impacts throughout the fishery. NMFS does not anticipate that these effects would fall disproportionately on minority or low-income populations. Alternative A4 was designed to reduce quotas necessary to rebuild and end overfishing of blacknose sharks. Quota reductions were chosen instead of large time-area closures or complete fishery closures as a quota reduction would meet the conservation goals necessary to rebuild blacknose sharks and allow data collections while mitigating some of the significant economic impacts that are necessary and expected under these alternatives to reduce fishing mortality as prescribed by recent stock assessments. In addition, the preferred alternative B3 would prohibit retention of any shark species from South Carolina south including the Gulf of Mexico and the Caribbean Sea with gillnet gear. Gillnet gear is the primary gear used to harvest blacknose sharks and non-blacknose SCS in this area. By removing this gear in the

primary area where blacknose sharks are harvested, NMFS could implement a larger overall non-blacknose SCS quota, which would benefit more fishermen than the few fishermen that use gillnets to target SCS from South Carolina south. Thus, by redistributing their efforts and gear selection, shark fishermen would be able to continue collecting revenue from SCS. NMFS believes these alternatives would provide an appropriate balance between positive ecological impacts that must be achieved in order to rebuild and end overfishing on overfished stocks, while minimizing the severity of negative economic impacts that would occur as a result of these measures.

The other preferred alternatives are not anticipated to have any significant negative social or economic impacts on minority or low-income populations. Under preferred alternatives C5, C6, E3, and E4, NMFS would work in at the international level to develop measures for implementation by other nations to end overfishing in addition to promoting domestically the live release of shortfin mako sharks in both the commercial and recreational sectors. These alternatives would not change the current commercial harvest regulations for shortfin mako sharks. Under preferred alternative D4, NMFS would prohibit the retention of blacknose sharks in the recreational fishery. Since blacknose sharks are not one of the primary species targeted by recreational anglers, this alternative is anticipated to cause minimal social and economic impacts on recreational fishermen. Finally, under preferred alternative F2, NMFS would implement a federal permit requirement for smooth dogfish. This alternative would not change the retention limits for this fishery so there would not be any disproportionate negative social or economic impacts on minority or low-income populations.

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 preferred alternatives 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. All of the alternatives do not affect coastal resources to the extent practicable, and NMFS is seeking concurrence with respect to the preferred alternatives. NMFS will ask for states' agreement with this determination during the proposed rule stage. NMFS has worked closely with states in the past and would continue to work with the states to ensure consistency between state and federal regulations.

4.8 Cumulative Impacts

Cumulative impact are the impacts on the environment, which results from the incremental impacts 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 reasonably foreseeable 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 would 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 4.19 Comparison of alternatives considered. (+) denotes positive impact, (-) denotes negative impact, (0) denotes neutral impact

Alternative	Alternative Description	Ecological Impacts	Social Impacts	Economic Impacts
Alternative A1	No Action. Maintain the existing SCS quota and species complex	0/-	0/-	0/-
Alternative A2	Establish a new SCS complex quota of 392.5 mt dw and a blacknose commercial quota of 13.5 mt dw	0/-	0/-	0/-
Alternative A3	Establish a new SCS complex quota of 42.7 mt dw and a blacknose commercial quota of 16.6 mt dw; allow all current authorized gears for sharks	+	-	-
Alternative A4	*Establish a new SCS quota of 56.9 mt dw and a blacknose commercial quota of 14.9 mt dw; remove shark gillnet gear as an authorized gear for sharks – Preferred Alternative*	+	-	-
Alternative A5	Close the SCS fishery	+/-	-	-
Alternative B1	No Action. Maintain current authorized gears for commercial shark fishing	0/-	0/-	0/-
Alternative B2	Close shark gillnet fishery; remove gillnet gear as an authorized gear type for commercial shark fishing	+	-	-
Alternative B3	*Close the gillnet fishery to commercial shark fishing from South Carolina south, including the Gulf of Mexico and the Caribbean Sea – Preferred Alternative*	+	-	-

Alternative	Alternative Description	Ecological Impacts	Social Impacts	Economic Impacts
Alternative C1	No Action. Keep shortfin mako sharks in the pelagic shark species complex and do not change the quota	0/-	0/-	0/-
Alternative C2	Remove shortfin mako sharks from pelagic shark species quota and establish a shortfin mako quota	0/+	0/-	0/-
Alternative C3	Remove shortfin mako sharks from pelagic shark species complex and place this species on the prohibited shark species list	+	-	-
Alternative C4	Establish a commercial size limit for shortfin mako sharks	0/+	0/-	0/-
Alternative C4a	Establish a minimum size limit for shortfin mako sharks that is based on the size at which 50 percent of female shortfin mako sharks reach sexual maturity or 32 inches interdorsal length (IDL)	0/+	0/-	0/-
Alternative C4b	Establish a minimum size limit for shortfin mako sharks that is based on the size at which 50 percent of male shortfin mako sharks reach sexual maturity or 22 inches IDL	0/+	0/-	0/-
Alternative C5	*Take action at the international level to end overfishing of shortfin mako sharks - Preferred Alternative*	0/+	0/-	0/-
Alternative C6	*Promote the release of shortfin mako sharks brought to fishing vessels alive – Preferred Alternative*	0/+	0/-	0/-

Alternative	Alternative Description	Ecological Impacts	Social Impacts	Economic Impacts
Alternative D1	No Action. Maintain the current recreational retention and size limit for SCS	0/-	0/-	0/-
Alternative D2	Modify the minimum recreational size limit for blacknose sharks based on their biology	-	+	+
Alternative D3	Increase the retention limit for Atlantic sharpnose sharks based on current catches	-	+	+
Alternative D4	*Prohibit retention of blacknose sharks in recreational fisheries - Preferred Alternative*	+	-	-
Alternative E1	No Action. Maintain the current recreational retention and size limits for shortfin mako sharks	0/-	0/-	0/-
Alternative E2	Increase the recreational minimum size limit of shortfin mako sharks	+	-	-
Alternative E2a	Establish a minimum size limit for shortfin mako sharks that is based on the size at which 50 percent of female shortfin mako sharks reach sexual maturity or 108 in FL	+	-	-
Alternative E2b	Establish a minimum size limit for shortfin mako sharks that is based on the size at which 50 percent of male shortfin mako sharks reach sexual maturity or 73 inches FL	+	-	-
Alternative E3	*Take action at the international level to end overfishing of shortfin mako sharks– Preferred Alternative*	0/+	0/-	0/-

Alternative	Alternative Description	Ecological Impacts	Social Impacts	Economic Impacts
Alternative E4	*Promote the release of shortfin mako sharks brought to fishing vessels alive – Preferred Alternative*	0/+	0/-	0/-
Alternative E5	Prohibit landing of shortfin mako sharks in recreational fisheries (catch and release only)	0/+	-	-
Alternative F1	No Action. Do not add smooth dogfish under NMFS management	+/0/-	0/-	0/-
Alternative F2	*Add smooth dogfish under NMFS management and develop management measures, such as a federal permit requirement - Preferred Alternative*	0/+	0	0
Alternative F2 a1	Establish a smooth dogfish quota that is equal to the average annual landings from 1998-2007 (950,859 lb dw)	0	0	0
Alternative F2 a2	Establish a smooth dogfish quota equal to the maximum annual landings from 1998-2007 (1,270,137 lb dw)	0	0	0
Alternative F2 a3	*Establish a smooth dogfish quota equal to the maximum annual landings from 1998-2007 plus one standard deviation (1,423,727 lb dw) – Preferred Alternative*	0/+	-	-
Alternative F2 b1	*Establish a separate smooth dogfish set-aside quota for the exempted fishing program of 6 mt ww– Preferred Alternative*	0/+	0	0

Alternative	Alternative Description	Ecological Impacts	Social Impacts	Economic Impacts
Alternative F2 b2	Establish a smooth dogfish set-aside quota for the exempted fishing program and add it to the current 60 mt ww set-aside quota for the exempted fishing program	0/+	0	0
Alternative F3	Add smooth dogfish under NMFS management and mirror management measures implemented in the ASMFC Interstate Shark FMP	0/+	0	0

4.9 Past, Present, and Reasonably Foreseeable Actions

As discussed in Section 3.1, NMFS has taken a number of actions in the past in order to, among other things, rebuild overfished and prevent overfishing of Atlantic sharks. These actions have included FMPs, FMP amendments, and framework actions. The goals and objectives of these past rules are summarized in Section 3.1. NMFS is required to take similar actions in this document, and can reasonably expect to implement regulations in the future to address the management and conservation of Atlantic sharks. The need and objectives of this document are described in earlier sections, particularly Chapter 1, and are not repeated here.

Other recent actions within HMS fisheries that may affect shark fishermen both directly and indirectly include Amendment 2 to the 2006 Consolidated HMS FMP that changed quotas, retention limits, and authorized species for the commercial shark fishery. (corrected rule: 73 FR 40658; July 15, 2008), Amendment 1 to the 2006 Consolidated HMS FMP that amended essential fish habitat designations for HMS (Notice of Availability of final EIS: 74 FR 28018; June 12, 2009), an inseason action (or temporary rule) that closed the Gulf of Mexico commercial non-sandbar LCS fishery (74 FR 26803; June 4, 2009); implementation of the Atlantic Pelagic Longline Take Reduction Plan (74 FR 23349; May 19, 2009) to reduce protected species interactions in HMS fisheries; an inseason action (or temporary rule) that closed the commercial porbeagle shark fishery for the remainder of 2008 (73 FR 68361; November 18, 2008); a rule authorizing greenstick gear for the harvest of Atlantic tunas and a requirement for PLL and BLL HMS fishermen to possess and use an authorized sea turtle control device (73 FR 54721; September 23, 2008); a rule that amends the regulations governing the Atlantic tunas longline LAPs and amends the workshop attendance requirements for businesses issued Atlantic shark dealer permits (73 FR 38144; July 3, 2008); and a rule modifying permitting and reporting requirements for the HMS International Trade Permit program (73 FR 31380; June 2, 2008).

These actions would have varying degrees of impacts on the human environment when considered in conjunction with Amendment 3 to the 2006 Consolidated HMS FMP:

- Amendment 2 to the 2006 Consolidated HMS FMP changed quotas, retention limits, and authorized species for the commercial shark fishery. Changes in this amendment could result in positive ecological impacts for SCS by decreasing fishing mortality, but reductions in SCS quotas could lead to additional negative socioeconomic impacts when considered in conjunction with Amendment 2 to the 2006 Consolidated HMS FMP.
- Amendment 1 to the 2006 Consolidated HMS FMP amended essential fish habitat designations for HMS. This is not expected to have any additional impacts with the implementation of Amendment 3.
- The temporary closure of the commercial shark fishery in the Gulf of Mexico is not expected to have any ecological or socioeconomic impacts in conjunction with Amendment 3 to the 2006 Consolidated HMS FMP as the fishery will reopen in 2010 with quotas adjusted for any 2009 overharvest of non-sandbar LCS.
- The Atlantic Pelagic Longline Take Reduction (APLTR) final rule may have cumulative ecological or socioeconomic impacts in conjunction with Amendment 3 to the 2006 Consolidated HMS FMP, as restrictions on maximum pelagic longline mainline length in the mid-Atlantic Bight could reduce commercial access to sharks. The ecological impacts may be positive for pelagic sharks if the APLTR rule results in decreasing fishing mortality, but socioeconomic impacts may be negative if pelagic shark landings are reduced.
- The temporary rule closing the commercial porbeagle fishing season is not expected to have any ecological or socioeconomic impacts in conjunction with Amendment 3 to the 2006 Consolidated HMS FMP as the fishery has reopened in 2009 with quotas adjusted for the 2008 overharvest of porbeagle sharks.
- The rule authorizing greenstick gear for the harvest of Atlantic tunas and a requirement for PLL and BLL HMS fishermen to possess and use an authorized sea turtle control device should not increase the mortality rates of Atlantic tunas and should help in the safe release of sea turtles caught in PLL and BLL gear. The authorization of greenstick gear creates more economic opportunities to harvest Atlantic tunas. This is not expected to have any additional impacts with the implementation of Amendment 3.
- The rule that amends the regulations governing the Atlantic tunas longline LAPs and amends the workshop attendance requirements for businesses issued Atlantic shark dealer permits slightly modifies requirements that were already in place. Therefore, this is not expected to have any additional impacts with the implementation of Amendment 3.
- Finally, the rule modifying permitting and reporting requirements for the HMS ITP program slightly modifies requirements that were already in place. Therefore, this is not expected to have any additional impacts with the implementation of Amendment 3.

Foreseeable future actions may include: 2010 shark season specifications; changes to swordfish management measures; modifications in Atlantic bluefin tuna management measures; establishing reporting requirements for recreational and commercial U.S. Caribbean HMS

fisheries, and changes to HMS permitting requirements recently announced in an Advanced Notice of Proposed Rulemaking (74 FR 26174; June 1, 2009). These are measures that, while not all directly related to sharks, could be implemented in other rulemakings and affect participants in shark fisheries in conjunction with the preferred alternatives selected in this proposed amendment. Such actions would have varied effects on shark fishermen. Additional actions that reduce fishing opportunity would have negative impacts on shark fishermen in conjunction with Amendment 3 to the 2006 Consolidated HMS FMP. However, other actions that address regional issues in the Caribbean region could increase fishing opportunities and would have positive impacts on fishermen, which could help mitigate some of the negative socioeconomic impacts under Amendment 3 to the Consolidated HMS FMP.

In general, preferred alternatives for SCS would implement quotas necessary to rebuild and stop overfishing of blacknose sharks, and mitigate some of the significant economic impacts that are necessary and expected to reduce fishing mortality as prescribed by recent stock assessments. Preferred alternatives for pelagic sharks and smooth dogfish sharks would include ending overfishing internationally and promoting the live release of shortfin mako sharks, and establishing an HMS permit requirement to possess smooth dogfish, respectively. These actions are anticipated to have positive ecological impacts on SCS and shortfin mako shark populations, and neutral ecological impacts on smooth dogfish populations. Socioeconomic impacts from the alternatives could be negative for fishermen that catch SCS and shortfin mako sharks, and may be neutral for fishermen that catch smooth dogfish sharks. While NMFS has evaluated the cumulative ecological and socioeconomic impacts of these preferred alternatives below, NMFS also evaluated how other non-HMS fisheries may be impacted by the preferred alternative suite. In particular, NMFS evaluated other fisheries that fishermen currently have permits for, shark fishermen's ability to enter other fisheries, and the subsequent impacts those fisheries might experience as a result of redirected shark fishing effort.

As part of this analysis, NMFS investigated the different types of commercial permits that directed and incidental shark permit holders currently have in addition to their HMS permits (see Table 3.32). NMFS found that many directed and incidental shark permit holders also have Gulf of Mexico reef fish, dolphin/wahoo, mackerel (including king and Spanish mackerel), South Atlantic snapper/grouper commercial permits, and non-HMS Charter/Headboat permits. A few fishermen also have lobster permits. NMFS also evaluated the ability of shark fishermen to move into these other fisheries (*i.e.*, Gulf of Mexico reef fish, dolphin/wahoo, mackerel, and South Atlantic snapper/grouper fisheries) as a result of quota and retention limit reductions in the Atlantic shark fishery under the preferred alternatives. Shark fishermen may also participate in shark fisheries in state waters or may participate in other HMS fisheries for which they may already possess permits (*i.e.*, swordfish). Table 3.32 includes vessels that possess swordfish permits in addition to commercial shark permits. An overview of each fishery is listed below, and the cumulative ecological and socioeconomic impacts of the preferred alternative, including impacts of any redistributed effort to other fisheries, are discussed below.

<u>Gulf of Mexico Reef Fish Fishery</u>

The GMFMC originally established the Gulf of Mexico Reef Fish FMP in 1984. Thirty amendments have been made to this plan and currently Amendment 31 is under development.

A Gulf of Mexico commercial reef fish vessel permit allows the harvest and sale of all reef fish listed in the Reef Fish FMP under quota (where applicable) and in excess of the bag limits (where applicable), except goliath grouper (all harvest prohibited), Nassau grouper (all harvest prohibited), and red snapper. Fishermen wanting to harvest and sell red snapper must also possess individual fishing quota (IFQ) shares. Issuance of new reef fish permits is under a moratorium. Access to this fishery is limited to existing permits holders. However, existing permits are transferable. As of March 18, 2009, shark directed and incidental permit holders possessed 115 Gulf of Mexico reef fish permits (Table 3.32). There are 97 Gulf of Mexico reef fish permits held by shark permitted vessels are concentrated in Florida, which represent approximately 84 percent of the total number of Gulf of Mexico reef fish permits held by commercial shark permit holders.

A portion of the reef fish permit holders also possess IFQ shares, which allow them to land red snapper in addition to other reef fish. Anyone commercially fishing for red snapper now must possess an IFQ allocation and follow the established reporting protocol. Quota shares are freely transferable to any other reef fish permit holders during the first five years following implementation of the IFQ program and then to anyone thereafter. Shark permit holders that also possess a reef fish permit, but did not receive an IFQ allocation will likely find that it would be costly to attain such an allocation.

The Gulf of Mexico Reef Fish FMP authorizes the use of longline, hook and line, handline, bandit gear, rod and reel, buoy gear, spear, powerhead, cast net, and trawl. There is a 6,000 lb gutted weight trip limit for all groupers, deep-water and shallow-water, combined. In January 2008, NMFS published a final rule implementing the Joint Reef Fish Amendment 27/Shrimp Amendment 14. This amendment reduced the commercial red snapper quota to 2.55 million pounds (mp) and a recreational quota of 2.45 mp between 2008 and 2010. The amendment also reduced the commercial minimum size limit to 13 inches total length, requires the use of non-stainless steel circle hooks, venting tools, and dehooking devices when fishing for reef fish, establish a red snapper bycatch mortality reduction goal for the shrimp trawl fishery, and, if necessary, shrimp fishery seasonal closures if the reduction target is not met.

Gulf of Mexico commercial grouper and tilefish fishermen in December 2008 approved a referendum that allowed the Council to approve Amendment 29 to the Reef Fish FMP in January 2009. The amendment is currently under review by the Secretary of Commerce, and if approved, would establish an IFQ management program for grouper and tilefish. Fishermen would receive quota according to a percentage of their average landings from 1999 and 2004.

The GMFMC submitted Amendment 30B to the Reef Fish FMP to NMFS in August 2008 for approval. An interim rule became effective on January 1, 2009, and set seasonal closures, size limits, and catch quotas for the commercial and recreational grouper fisheries. The final rule for Amendment 30B was published on April 16, 2009, and includes reducing the recreational aggregate grouper and gag grouper bag limit, increasing the recreational red grouper bag limit, decreasing the commercial red grouper minimum size, increasing the commercial red grouper closure, eliminating the commercial fishing season closure, and eliminates the end date for the Madison-Swanson and Steamboat Lumps marine reserves. A seasonal closure area for recreational and commercial fishing from January 1 to April 30, “The Edges”, was removed from

the Amendment 30B final rule because of a error contained in the proposed rule and was proposed in separate rule on April 17, 2009 (74 FR 17812). NMFS implemented an emergency rule (74 FR 20229) that bans BLL fishing shoreward of 50 fathoms east of Cape San Blas, FL from May 18, 2009, to October 28, 2009, to reduce sea turtle bycatch in the GOM BLL reef fish fishery. This sea turtle issue would be addressed for the long-term in Amendment 31, which is currently in the draft stage (GMFMC, 2009).

Approximately 23 percent of all shark permit holders (directed and incidental combined) already possess the LAPs necessary to participate in the Gulf of Mexico reef fish fishery. Of these, the Agency did not estimate the number of vessels that were selected to participate in the red snapper fishery since the inception of an IFQ program for that fishery because permits to participate in this fishery are no longer being issued. Since the fishery is limited access and has extensive measures in place to control effort and harvest levels, it is not likely that shark fishermen would be able to compensate all potential losses from reductions in quota and retention limits proposed for sharks solely by transferring effort to the Gulf of Mexico reef fish fishery.

Dolphin/Wahoo Fishery

In the Gulf of Mexico, dolphin is included in the management unit under the Coastal Migratory Pelagic Resources FMP, and a charter/headboat vessel permit is required to fish for or possess dolphin in the Gulf of Mexico. Otherwise, there are no regulations controlling the harvest of these species in the Gulf of Mexico.

In the South Atlantic, historically, the dolphin/wahoo fishery has been a recreational fishery (NMFS, 2003). However, during the 1990s, commercial landings in the Atlantic Ocean increased, due in part to an increasing number of pelagic longliners targeting dolphin (NMFS, 2003). As a result, the SAFMC, in cooperation with the MAFMC and NEFMC, developed a comprehensive FMP for both dolphin and wahoo in the Atlantic Ocean (NMFS, 2003). This FMP was approved in December of 2003. The final rule implementing the regulations in this FMP was published on May 27, 2004 (69 FR 30235). Owing to the significant importance of the dolphin/wahoo fishery to the recreational fishing community in the Atlantic, the overall goal of the FMP was to adopt a precautionary and risk-averse approach to management that set harvest limits based on the status quo at that time, which was average catch and effort levels from 1993 to 1997 (NMFS, 2003). These limits were implemented to deter shifts in the historical PLL fisheries for sharks, tunas, and swordfish or expansions into nearshore coastal waters to target dolphin, which could create user conflicts and possible localized depletion in abundance (NMFS, 2003).

As such, the dolphin/wahoo fishery is an open access fishery where people can purchase a vessel, dealer, or operator permit in the South Atlantic. Operators of commercial vessels, charter vessels, and headboats in the South Atlantic that fish south of 39° N. Latitude are required to have a federal vessel permit for dolphin/wahoo and must have and display operator permits. There is no trip limit for dolphin for a vessel with a commercial federal vessel permit. However, there is a 500 pound commercial trip limit for wahoo for vessels with such a permit. For commercially permitted vessels fishing north of 39° N. Latitude that do not have a federal commercial vessel permit for dolphin/wahoo, there is a trip limit of 200 pounds combined of

dolphin and wahoo. In addition, there is a 20 inch fork length minimum size limit for dolphin off the coasts of Georgia and Florida with no size restrictions elsewhere, and PLL fishing for dolphin and wahoo is prohibited in areas closed to the use of such gear for HMS. Dolphin/wahoo longline vessels must also comply with sea turtle protection measures. Finally, there is also a non-binding 1.5 million pound (or 13 percent of the total harvest) cap on commercial landings for dolphin. Should the catch exceed this level, the SAFMC would review the data and evaluate the need for additional regulations, which may be established through a framework action.

The recreational dolphin fishery has the same minimum size restrictions as the commercial fishery. In addition, there is a recreational bag limit of 2 wahoo per person per day and 10 dolphin per person per day or 60 dolphin per vessel per day, whichever is less (headboats are excluded from the vessel limit). There is a prohibition on recreational sale of dolphin and wahoo caught under the bag limit unless the seller holds the necessary commercial permits.

The authorized gears for dolphin and wahoo fishery are hook-and-line gear including manual, electric, and hydraulic rods and reels; bandit gear; handlines; longlines; and spearfishing (including powerheads) gear. PLL vessels permitted in the shark and swordfish fisheries are subject to the hook size regulations regarding the HMS fishery, which has impacted their ability to simultaneously fish for dolphin by attaching smaller-hooked gangions directly to their PLL gear. The total 1999 recreational harvest accounted for 91 percent (10,127,970 pounds total recreational harvest and 1,050,090 pounds commercial harvest) of the total U.S. harvest (NMFS, 2003).

The commercial fishery for wahoo appears to be incidental to fishing for dolphin or other pelagic species. Like dolphin, the recreational landings of wahoo account for a larger proportion of the total harvest in the Gulf of Mexico and Atlantic Ocean. In 1999, the total commercial harvest amounted to 99,159 pounds, compared to 1.41 million pounds harvested by recreational anglers (NMFS, 2003).

The dolphin/wahoo fishery is extremely seasonal in nature. This seasonality would influence the number of displaced shark fishermen's ability to direct effort towards dolphin and wahoo. In addition, there have been no formal stock assessments for dolphin or wahoo. The status of wahoo is considered unknown, and time-series data seems to indicate neither a decline in stock abundance nor a decrease in mean size of individual dolphin fish (SAFMC, 1998). However, a precautionary approach to management was taken in 2003 since the dolphin and wahoo tend to aggregate, they are economically valuable before the age of maturity, and there is high interannual variability in these stocks due to environmental factors. Therefore, the 2003 FMP set harvest limits based on the status quo at that time.

As of March 18, 2009, 290 dolphin/wahoo permit holders also have directed or incidental shark permits (Table 3.32). One hundred sixty five of these dolphin/wahoo permit holders are from the state of Florida (Table 3.32). Because the dolphin/wahoo fishery is an open access fishery, shark permit holders who do not currently have a dolphin/wahoo permit would be able to enter the fishery in the south Atlantic. Fishermen in the Gulf of Mexico could switch to the dolphin/wahoo fishery without trip limits or any permit requirements. However, gear

modification may be difficult since dolphin and wahoo are pelagic in nature, and PLL gear requires the use of 18/0 (with an offset not to exceed 10°) or 16/0 non-offset circle hooks. These larger hooks would make it difficult to catch small dolphin and wahoo, thus limiting catch to larger individuals. In addition, because of the seasonal nature of this fishery, directed fishing year-round would be difficult.

Spanish mackerel

In the south Atlantic, fisheries for Spanish mackerel (*Scomberomorus maculatus*) are important for commercial participants who also engage in shark fisheries. Fisheries are managed by the SAFMC and the GMFMC under the FMP for Coastal Migratory Pelagic Resources and its amendments. A stock assessment for south Atlantic Spanish mackerel was completed in 2008 and concluded that the population is not overfished or experiencing overfishing (SEDAR, 2008).

Authorized gear for Spanish mackerel in the south Atlantic include automatic reel, bandit gear, rod and reel, cast net, run-around gill nets, and stab nets; in the Gulf of Mexico, all gears are legal except drift and long gillnets and purse seines. However, there is an incidental catch allowance for vessels with purse seines onboard. A minimum size of 3.5 inches (8.9 cm) stretched mesh is required for all run-around gill nets and soak time is limited to one hour. The fishing year in the south Atlantic is from March 1 through the end of February. The fishing year in the Gulf of Mexico is April 1 through March 31. A federal vessel permit is required for commercial fisheries; however, the fishery is open to new participants who can demonstrate they meet an income requirement.

In the south Atlantic, the fishery is managed in two zones with differing regulations: a northern zone (Georgia to New York) and a southern zone (east coast of Florida to Dade-Monroe County). Catch restrictions vary by month and are dependant on the percentage of each zones allocation that is actually harvested. The majority of landings occur off Florida, where the commercial trip limit from April – November is 3,500 lb/trip. Trip limits are unlimited on weekdays beginning December 1 with a 1,500 lb trip limit on weekends until 75 percent of the quota is reached, and 1,500 lb daily trip limits are established. When 100 percent of the adjusted quota is met, trip limits are reduced to 500 pounds through the end of fishing year (SAFMC 2009a).

Gillnets were the predominant gear type for Spanish mackerel prior to the net ban in Florida (NMFS, 2004). As of 2003, approximately 60 percent of the overall catch came from cast nets and approximately 25 percent are caught with gillnets, the remainder being caught with other authorized gears (NMFS, 2004). In Florida, the majority of the effort is still in state waters, where gillnets are not allowed (NMFS, 2004). Some netting occurs in federal waters; however, the cast net is used more often (NMFS, 2004). Fishing effort follows the fish migrating north to waters off North Carolina in the summer and then following the fish back to Florida during the winter months (NMFS, 2004). Sinknets are the primary gear type off North Carolina (NMFS, 2004).

Shark fishermen could transfer fishing effort to Spanish mackerel fisheries to replace some of the lost revenues as a result of measures in this proposed amendment, such as the prohibition of the retention of sharks with gillnet gear from South Carolina south. Many vessels

that deploy gillnets for sharks also possess Spanish mackerel permits. Of vessels that possess directed and incidental shark permits, 216 also possess Spanish mackerel permits (Table 3.32). Because the commercial fishery for Spanish mackerel is not limited access, with only an income qualifier restriction and the stocks are healthy, this could be an attractive fishery for participants to engage in, especially those who possess vessels that are already set up for fishing with gillnet or castnet gear.

NMFS published a final rule (June 25, 2007, 72 FR 34632) revising regulations implementing the ALWTRP by expanding the Southeast U.S. Restricted Area and modifying regulations pertaining to gillnetting within the Southeast U.S. Restricted Area. NMFS prohibits gillnet fishing or gillnet possession during annual restricted periods associated with the right whale calving season. Limited exemptions to the fishing prohibitions are provided for gillnet fishing for sharks and for Spanish mackerel south of 29°00' N. Latitude. An exemption to the possession prohibition is provided for transiting through the area if gear is stowed in accordance with this final rule. This action is required to meet the goals of the MMPA and the ESA. This action is necessary to protect northern right whales from serious injury or mortality from entanglement in gillnet gear in their calving area in Atlantic Ocean waters off the Southeast U.S.

King Mackerel

Commercial fisheries for king mackerel (*Scomberomorus cavalla*) are an important source of revenue for participants in the Atlantic and Gulf of Mexico regions. Similar to Spanish mackerel, king mackerel is managed by both the SAFMC and GMFMC under the Coastal Migratory Pelagic Resources FMP.

A stock assessment was conducted for king mackerel in 2009. The assessment determined that the Atlantic and Gulf of Mexico migratory groups of king mackerel are not overfished and that it was uncertain if the two stocks are experiencing overfishing (SEDAR, 2009). Permits in the commercial fishery are limited access and there is currently a permit moratorium in place. The minimum size for king mackerel is 24 inches (61 cm); however, vessels may possess up to five percent of the fish on board as undersized fish. In the south Atlantic, the fishing season is March 1 through the end of February, or until the quota of 3.71 million pounds is met. In the Gulf of Mexico, the fishing year is July 1 through June 30, or until the quota of 1.01 million pounds is met.

In the south Atlantic, trip limits vary by region and time of year, including:

- From New York to Flagler/Volusia County, Florida from April 1 to March 31, the trip limit is 3,500 pounds;
- From Flagler/Volusia to Volusia/Brevard County lines from April to October 31, the trip limit is 75 fish; and,
- In Monroe County, Florida, from April 1 to October 31, the trip limit is 1,250 pounds.

Authorized gear for king mackerel varies by region, including: rod and reel, bandit gear, handline, automatic reel, gillnets, and long gillnets (except north of Cape Lookout, North Carolina); PLL, run-around gillnets (>4.75 inches (12.1 cm) stretched mesh); and purse seine (no more than 400,000 lb may be harvested by purse seine) (SAFMC, 2009b).

In the Gulf of Mexico, trip limits are established according to regional sub-divisions, each with their own quota.

- From the Florida/Alabama state boundary through Texas, the trip limit is 3,000 pounds.
- From The Florida/Alabama state boundary to the Lee/Collier County, Florida, boundary, the trip limit is 1,250 pounds.
- From the Lee/Collier County boundary to the Monroe/Miami-Dade County boundaries, from November 1 through March 31, the trip limit is 1,250 pounds.
- From the Monroe/Miami-Dade County boundary to the Broward/Volusia County boundary, from November 1 through March 31, the trip limit is 50 fish until February 1, when it increases to 75 fish if 75 percent of the quota is not taken.

There are 176 king mackerel permits held by shark permit holders (directed and incidental combined) as of March 18, 2009 (Table 3.32). The king mackerel fishery is limited access so entry by those who do not currently possess a permit would be more difficult. Because approximately one-third of shark permit holders also have king mackerel permits, NMFS anticipates that shark fishermen may increase fishing effort in king mackerel fisheries. Vessels that are already set up to deploy run-around gillnets, PLL, bandit gear, or other gillnets are most likely to increase fishing effort in the king mackerel fishery as they would have the least difficulty reconfiguring their vessel.

South Atlantic Snapper-Grouper Fishery

The SAFMC manages the 73 species that comprise the south Atlantic snapper-grouper fishery management unit (FMU). In 1998, Amendment 8 to the snapper-grouper FMP was implemented initiating a limited access program. Recent stock assessments were conducted for two deepwater snapper-grouper species, snowy grouper and golden tilefish as well as some shallower snapper-grouper species (red porgy, vermilion snapper, and black sea bass). Snowy grouper, black seabass, and red porgy were found to be overfished. Red porgy and golden tilefish were determined to not be overfished, and the overfished status of vermilion snapper was unknown. Snowy grouper, golden tilefish, black seabass, and vermilion snapper were determined to be experiencing overfishing. An assessment of south Atlantic red snapper conducted in 2008 determined that the stock is overfished and experiencing overfishing. Stock assessments for south Atlantic and Gulf of Mexico black grouper, and south Atlantic red grouper are scheduled to be completed in January 2010.

NMFS implemented the final rule for Amendment 13C to the FMP for the south Atlantic snapper-grouper Fishery on October 23, 2006 (71 FR 55096). The intent of the amendment was to reduce harvests, end overfishing, and achieve optimum yield. The management measures included in the final rule included reductions in annual commercial quotas for snowy grouper and golden tilefish. Quotas were specified for black sea bass, red porgy, and vermilion snapper, and commercial trip limits were increased for red porgy. Amendment 14 was recently approved in January 2009 (74 FR 1621) and established eight MPAs off south Atlantic states to protect a portion of the population and habitat of deepwater snapper-grouper species from directed fishing

pressure. Amendment 2 to the 2006 Consolidated HMS FMP prohibited use of shark BLL gear in the MPAs, and prohibits harvest for all species in the snapper-grouper complex in these eight MPAs.

In response to the 2006 Magnuson-Stevens Reauthorization Act and the 2008 red snapper stock assessment, the SAFMC is developing Amendment 17 to address overfishing requirements by 2010. This includes increasing catch limits and establishing new closed areas for snapper-grouper fishing. The amendment would also establish ACLs and AMs for 10 species (red snapper, golden tilefish, snowy grouper, speckled hind, warsaw grouper, black grouper, black sea bass, gag, red grouper, and vermilion snapper) within the snapper-grouper fishery. Amendment 17 is projected to be approved by the SAFMC in December 2009 (SAFMC, 2009c).

In December 2006, the SAFMC voted to explore the use of a LAPP for the snapper-grouper fishery, which could include the use of IFQ. Shark directed and incidental permit holders that already possess limited access permits in the snapper-grouper fishery may benefit from a future IFQ program as it may mitigate the more restrictive management measures that are in place for some of the snapper-grouper species. However, entrance into the snapper-grouper fishery is difficult due to the need to find two transferable limited access permits available for purchase.

As of March 18, 2009, 103 shark directed and incidental permit holders also held permits in the south Atlantic snapper-grouper fishery (Table 3.32). New entrants into the snapper-grouper fishery must obtain two existing snapper-grouper transferable permits and exchange them for one new permit. Allowable commercial gear for the snapper-grouper fishery includes vertical hook and line including bandit gear, black seabass pots, sink nets (North Carolina only), and BLL. Vessels with BLL gear onboard may only possess snowy grouper, one warsaw grouper, yellowedge grouper, misty grouper, golden tilefish, blueline tilefish, and sand tilefish. No other snapper-grouper species may be possessed or harvested.

4.10 Cumulative Ecological Impacts

Fishing Impacts

The commercial SCS preferred alternative, alternative A4, which would establish a separate blacknose shark quota and remove shark gillnet gear as an authorized gear for sharks, would provide positive ecological impacts by stopping overfishing of blacknose sharks and rebuild the stock. By allowing a limited blacknose shark quota, the Agency would ensure that data for stock assessments and life history samples would continue to be collected, which would help with future stock assessments and management of these stocks. In addition, under the preferred alternative D4, NMFS would prohibit the retention of blacknose sharks by recreational anglers in federal waters. This prohibition would help reduce mortality of blacknose sharks. Thus, the establishment of a small non-blacknose SCS quota, the banning of shark gillnet gear from South Carolina south under the preferred alternative B3, and the prohibition of the retention of blacknose sharks by recreational anglers would be the primary way through which blacknose mortality would be reduced. A significant portion of blacknose shark mortality also occurs in the shrimp trawl fisheries in the South Atlantic and Gulf of Mexico. The management measures proposed in this amendment assume a reduction in blacknose bycatch in the shrimp trawl

fisheries is also occurring. NMFS will continue to work closely with the Councils in these regions to reduce bycatch of this species, as appropriate, in order to meet the bycatch reduction target needed to rebuild the stock.

Under the preferred alternative B3, NMFS would close the shark gillnet fishery from South Carolina south (including the Gulf of Mexico and Caribbean Sea). NMFS assumes that some of the shark gillnet fishing effort may be displaced to other gillnet and BLL fisheries in which shark fishery participants are currently permitted (Table 3.32 in Chapter 3) and some of this redistributed effort may interact with protected resources. However, other fisheries, such as the South Atlantic snapper-grouper and Gulf of Mexico reef fish fisheries, are limited access fisheries. If fishermen do not currently hold permits in these fisheries, it would be difficult and expensive for them to enter these fisheries in the future. In addition, for shark fishermen that are currently permitted in these fisheries, strict retention limits and quotas are in place which would protect these stocks from further overfishing and from being further overfished by any redirected shark fishing effort. Therefore, redistributed effort is not anticipated to result in significant negative ecological impacts, including increases in bycatch or interactions with protected resources.

Other fisheries that are open access that shark fishermen could pursue, such as the mackerel fishery and the dolphin/wahoo fishery, generally have few interactions with protected resources and little bycatch compared to directed shark fishing trips (see NMFS, 2003 and Carlson and Bethea, 2007). Therefore, redistributed effort into these fisheries is not anticipated to increase interactions with protected resources or result in significant increases in bycatch. In addition, retention limits, quotas and other effort controls are in place for these fisheries to protect the stocks from overfishing and from being overfished.

In addition to these impacts, cumulative ecological impacts on HMS stocks and fisheries due to actions under consideration by Regional Fishery Management Councils, Interstate Marine Fisheries Commissions, or other management bodies may be slightly positive. NMFS backstopped the Caribbean Fishery Management Council's area closures which could have minor positive benefits for Atlantic HMS (72 FR 5633, February 7, 2007). NMFS also published a rule that requires sea turtle handling and release equipment in the shark BLL fishery (72 FR 5633, February 7, 2007). Additionally, NMFS backstopped the eight marine protected areas implemented by the South Atlantic Fishery Management Council in Amendment 2 to the 2006 Consolidated HMS FMP (June 24, 2008, 73 FR 35778; July 15, 2008, 73 FR 40658). The Gulf of Mexico Fishery Management Council implemented regulations that would implement similar dehooking requirements to those required in the HMS PLL fishery and to those for the HMS BLL fishery (71 FR 45428, August 9, 2006). New requirements for non-stainless steel circle hooks in the reef fish fishery under Amendment 27 were implemented on January 29, 2008 (73 FR 5117) by the Gulf of Mexico Fishery Management Council. NMFS has also recently implemented workshops for the safe handling and release and identification of protected resources for all HMS gillnet and longline fishery participants, and identification workshops for shark dealers (71 FR 58058, October 2, 2006). NMFS implemented an emergency rule that bans BLL reef fish fishing shoreward of 50 fathoms east of Cape San Blas, FL from May 18, 2009 to October 28, 2009, to reduce sea turtle bycatch in the Gulf of Mexico BLL reef fish fishery (add FR notice when we know it). This sea turtle issue would be addressed for the long-term in

Amendment 31, which is currently in the draft stage (GMFMC, 2009). NMFS would closely monitor any resulting redistribution of effort from the reef fish fishery to the shark BLL fishery in the Gulf of Mexico.

The incremental contribution of the actions proposed in Amendment 3 to the 2006 Consolidated HMS FMP, when considered in conjunction with the activities listed above, is considered a significant ecological benefit to the ecology of the managed species. The measures listed above were implemented to help reduce interactions with protected species, or increase post-release survival of non-target species and protected species, to help rebuild overfished fish stocks and end overfishing, or to protect EFH for deep water species. In conjunction with Amendment 3 to the 2006 Consolidated HMS FMP , which would help rebuild blacknose shark stocks and end overfishing, such measures would help conserve fishery resources in the long-term, which would ultimately have positive ecological impacts.

The preferred alternatives regarding smooth dogfish (alternative F2 and sub-alternatives F2a3 and F2b1) and shortfin mako sharks (alternatives C5, C6, E3 and E4) would likely not have any significant cumulative ecological impacts. The smooth dogfish preferred alternative would establish a federal permit and would not significantly alter fishing practices. The shortfin mako shark preferred alternatives would encourage the live release of the species in both the commercial and recreational sectors, which would only affect post-catch behavior and not fishing practices, and would establish a foundation to work at the international level to implement an international plan to end overfishing of this species.

Non-Fishing Impacts

Other actions that might affect shark populations, such as offshore oil and gas production, and non-fishing activities that may affect EFH are described in Section 10.5 of the 2006 Consolidated HMS FMP (NMFS, 2006) and Amendment 1 to the 2006 Consolidated HMS FMP (NMFS, 2009).

4.11 Cumulative Social and Economic Impacts

The commercial SCS preferred alternatives, which would establish a separate blacknose shark quota and remove shark gillnet gear as an authorized gear for sharks from South Carolina south, would likely result in negative social and economic impacts on Atlantic shark fishermen. It is unlikely that shark fishermen would be able to recuperate all of these economic losses by switching to other southeast fisheries due to quota reductions and/or limited access programs in these other fisheries. The Agency presumes that since some shark fishermen also possess several permits in other fisheries (Table 3.32 in Chapter 3), they do not receive all of their revenues from shark products. At the present time, NMFS estimates that fishermen make decisions about which fisheries to participate in based on the ex-vessel prices they can expect from a given species of fish, seasonality, quotas, trip limits, and other factors. In the past, due to higher quotas, revenues received from sharks likely comprised a larger share of fishermen's overall revenues from fishing activities than is expected in the future. However, it could be difficult for all lost shark revenues to be replaced by transferring more effort to other fisheries in which they have historically participated due to restrictions in those fisheries as well.

The preferred alternative D4, which would prohibit retention of blacknose sharks in the recreational shark fishery, is not expected to have large, negative social and economic impacts on recreational fishermen. Recreational fishermen could still catch blacknose sharks; they would just have to release them. Also, blacknose sharks are not one of the primary species targeted by recreational anglers, in tournaments, or on charters.

There are limited-access permit programs in place for the South Atlantic snapper-grouper fishery as well as the Gulf of Mexico reef fish fishery, where no new permits are being issued. Therefore, if shark fishermen do not currently possess a South Atlantic snapper-grouper permit or a Gulf of Mexico reef fish permit, it would be difficult and costly to enter these fisheries in the future. There are also quota reductions for many reef fish species (see above), which would affect current Gulf of Mexico reef fish permit holders. Thus, shark fishermen who have shark and reef fish permits could experience economic hardships in both fisheries.

In addition, there is an IFQ program in place for the Gulf of Mexico red snapper fishery, with limitations on transfers during the first five years (see above), and a new IFQ program would be implemented in the near future for the South Atlantic snapper-grouper fishery. These IFQ programs could benefit current South Atlantic snapper-grouper or Gulf of Mexico red snapper permit holders; however, it would make it difficult and expensive for shark fishermen who do not currently possess these permits to enter these fisheries in the future.

As mentioned in Section 4.9, the dolphin/wahoo fishery is an open access fishery. However, redistribution of commercial shark fishing effort into this fishery may result in user conflicts between recreational and commercial fishermen. Additionally, commercial PLL fishermen that currently fish for dolphin and wahoo could suffer economically if a large proportion of the shark fishermen redirect their effort to the dolphin/wahoo fishery, given the 1.5 million pounds commercial landings cap (or 13 percent of total landings, whichever is greater) for the dolphin fishery. If this cap is exceeded, the SAFMC may decide to take more stringent measures in this fishery to reduce overall catch. More importantly, due to the seasonality of the dolphin/wahoo fishery, it would be difficult for commercial fishermen to direct on dolphin/wahoo (S. Branstetter, NOAA, personal communication). Finally, it would be difficult for shark fishermen using PLL gear to catch smaller dolphin and wahoo due to hook requirements in the PLL fishery (see discussion above). Shark fishermen would have to either target larger fish with larger circle hooks or relinquish their HMS permit(s) so that they could use smaller hook sizes to target smaller dolphin/wahoo. The latter would preclude them from retaining any HMS catch.

It is likely that shark fishermen using gillnet gear for sharks would transfer some fishing effort to the Spanish mackerel fishery. Participants currently using other gears for sharks may consider purchasing the necessary gear (*e.g.*, gillnets, *etc*.) to become involved in this fishery. Since this fishery is not limited access, transferring effort into this fishery would not require paying high costs to acquire permits from other vessels. Furthermore, since the stock status of Spanish mackerel is healthy, there does not appear to be any significant restrictions on quotas or other effort controls necessary at this time or in the foreseeable future. However, this fishery is seasonal, so year-round revenues from Spanish mackerel may not be realized. Rather,

participants in North Carolina would be expected to fish for Spanish mackerel in the summer while participants in Florida could target these fish in the winter.

The commercial fishery for King mackerel is managed via a limited access permit system, and shark fishermen who do not currently possess a King mackerel permit may have a difficult time entering this fishery. However, there are 176 participants in the shark fishery that currently possess these king mackerel permits. Therefore, effort in this fishery is expected to increase as a result of shark management measures in this proposed amendment.

The additional management measures taken by other Councils and Commissions, such as the eight MPAs implemented by the SAFMC's Amendment 14, dehooking requirements by the GMFMC, the interstate shark plan being implemented by the ASMFC, and the requirement to use non-stainless steel, circle hooks in the reef fish fishery as well as the measures that NMFS has backstopped or other rules that NMFS has recently implemented, such as requiring safe handling and release gear on shark BLL and gillnet boats and backstopping closed areas in the Caribbean to protect EFH, would all have negative economic and social impacts on fishermen in the short-term. Therefore, the incremental contribution of the proposed measures in Amendment 3 to the 2006 Consolidated HMS FMP, when considered with these other actions, is expected to have a significant socioeconomic impact over the short-term on participants in the shark fishery. However, because these measures were implemented to help reduce interactions with protected species or increase post-release survival of non-target species and protected species, to help rebuild overfished fish stocks and end overfishing or to protect EFH for deep-water species, such measures would help conserve fishery resources in the long-term, which would ultimately have positive economic and social impacts for fishermen in the long-term.

The preferred alternatives regarding smooth dogfish and shortfin mako sharks would likely not have any significant cumulative socioeconomic impacts. The smooth dogfish preferred alternative would establish a federal permit and the associated fees are expected to be minimal and not present a significant impediment for fishermen wishing to enter or remain in the fishery. The shortfin mako shark preferred alternative would encourage the live release of the species in the commercial and recreational sectors, and would only affect post-catch behavior and not fishing practices. In addition, the preferred alternative to work at the international level with other countries to implement a plan to end overfishing of shortfin mako sharks would only have negative economic impacts if and when those management measures would reduce fishing opportunities for U.S. shortfin mako sharks.

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5.0 MITIGATION AND UNAVOIDABLE IMPACTS

Ecological Impacts Summary of the Preferred Alternatives

The preferred alternative for the SCS effort controls, alternative A4, would create a blacknose shark-specific quota and a separate "non-blacknose SCS" quota equal to 56.9 mt dw. Alternative A4 is anticipated to have positive ecological impacts for blacknose, Atlantic sharpnose, bonnethead, and finetooth sharks as it would reduce landings by 76 percent for blacknose sharks and 76 percent for non-blacknose SCS based on current landings. In addition, it would reduce discards by 81 percent for blacknose sharks and 2 percent for non-blacknose SCS based on current discards if gillnets are prohibited in the Atlantic, GOM, and the Caribbean Sea under the gear restriction alternative, B2, and 3 percent for non-blacknose SCS if gillnets are prohibited from South Carolina south, including the GOM and the Caribbean Sea, under the preferred gear restriction alternative, B3. NMFS prefers alternative A4 at this time because by reducing the overall SCS fishery, NMFS could reduce the level of blacknose shark discards such that the total blacknose shark mortality would stay below the TAC needed to rebuild the stock.

The preferred alternative for the commercial gear restrictions, alternative B3, would close the gillnet fishery to commercial shark fishing from South Carolina south, including the Gulf of Mexico and the Caribbean Sea. This would have positive ecological impacts in the SCS fishery by reducing landings from the predominate gear used to target SCS, including blacknose sharks. In addition, blacknose sharks are typically caught from South Carolina south, however, blacknose sharks are not reported as landed with gillnet gear north of South Carolina. Therefore, prohibiting gillnets from South Carolina south would remove the predominate gear type for blacknose sharks, but allow gillnet gear for sharks to continue in areas north of the blacknose shark distribution, mitigating impacts to the northeastern shark gillnet fishery. LCS are also caught in gillnet gear; however, the ecological impacts would be minimal for the LCS fishery since longlines are the primary gear type used in the LCS fishery. Also, the removal of gillnets would lower the bycatch associated with this gear type and decrease the interaction with protected species.

The preferred alternatives for the pelagic shark effort controls, alternatives C5 and C6, would promote measures to end overfishing of shortfin mako sharks at the international level and promote the release of shortfin mako sharks that are brought to the vessel alive. Because of the small U.S. contribution to Atlantic shortfin mako shark mortality, domestic reductions on shortfin mako shark mortality would not end overfishing of the entire stock. Therefore, NMFS believes that ending overfishing and preventing an overfished status would be better accomplished through international efforts where other countries that have large takes of shortfin mako sharks could participate in shortfin mako shark mortality reductions. While this alternative would have neutral ecological impacts for the portion of the shortfin mako shark stock that is fished by U.S. fishermen in the short term, any management recommendations adopted to end overfishing of shortfin mako sharks at the international level could be implemented domestically and could have positive ecological impacts on shortfin mako sharks in the long term. In addition, NMFS would promote the live release of shortfin mako sharks in the commercial shark fishery, but this alternative would not result in any changes in the current commercial regulations

regarding shortfin mako sharks. This alternative is expected to have slightly positive or neutral ecological benefits for shortfin mako sharks because in the commercial fishery 68.9 percent of shortfin makos are brought to the vessel alive and could be released; however, 61.4 percent of shortfin mako sharks that are caught are kept. While this action would not restrict commercial harvest and landing of shortfin mako sharks, it would encourage the live release of shortfin mako sharks in the commercial sector.

The preferred alternative for the SCS recreational measures, alternative D4, would prohibit the retention of blacknose sharks in the recreational fishery. This would have positive ecological impacts for the stock as it could reduce recreational landings of blacknose sharks in federal waters. However, complementary measures in state waters would be important for reducing mortality of blacknose sharks in the recreational sector. The preferred alternatives for the pelagic shark recreational measures, alternatives E3 and E4, would promote conservation and management measures to end overfishing at the international level and promote the release of shortfin mako sharks that are brought to the vessels alive. While alternative E3 would have neutral ecological impacts for the portion of the shortfin mako shark stock that is fished by U.S. fishermen in the short term, any conservation and management recommendations adopted through international efforts to help end overfishing of shortfin mako sharks could have positive ecological impacts on shortfin mako sharks in the long term. Under alternative E4, NMFS would promote the live release of shortfin mako sharks in the recreational shark fishery, but this alternative would not result in any changes in the current recreational regulations regarding shortfin mako sharks. Recreational shark fishermen would still be able to retain one authorized shark species greater than 54 inches FL per vessel per trip, and one Atlantic sharpnose and one bonnethead shark per person per trip. While this alternative is expected to have neutral ecological impacts to the shortfin mako shark stock in the short term, NMFS would encourage the catch and release of live shortfin mako sharks.

The preferred alternative for the additional species measures would add smooth dogfish to the Atlantic HMS management unit and develop management measures, such as a federal permit requirement and a commercial quota. Smooth dogfish are currently not managed by NMFS and there is a lack of stock status information, participant information, and effort data. Management measures implemented under the preferred alternative would focus on characterizing the fishery and stock status and would not actively change catch levels or rates. Therefore, this alternative would likely not have large positive or negative ecological impacts.

Social and Economic Impacts Summary of the Preferred Alternatives

The preferred alternative for the SCS effort controls, alternative A4, would have negative socioeconomic impacts on SCS and blacknose shark fishermen. Under alternative A4, blacknose shark landings would decrease by 76 percent and discards would decrease by 81 percent. Landings for non-blacknose SCS would also decrease by 76 percent and discards could decrease by 2 to 3 percent, depending on the gear restriction alternative (see Table 4.4 in Chapter 4). This could translate into total annual gross revenues loses of $644,073. In addition, alternative A4 in combination with alternatives B2 or B3, which would eliminate gillnet gear, could decrease landings of LCS by only three percent, but could decrease discards of LCS by up to 15 percent, depending on the gear restriction alternative (see Table 4.4 in Chapter 4). This could translate into total annual gross revenue losses of $109,339 in combination with alternative B2 and

$106,479 under alternative B3 from lost LCS landings. These reductions in landings of non-blacknose SCS and blacknose sharks would result in a 76-percent reduction in annual gross revenues from non-blacknose SCS and blacknose shark landings overall; however, such a reduction is needed to lower the overall mortality on blacknose sharks. Gillnet fishermen would be impacted the most by alternative A4 in combination with alternative B2 or B3, with estimated annual gross revenue losses between $377,928 and $365,067 from the reduced non-blacknose SCS and blacknose landings. However, alternative A4 would allow for a higher non-blacknose SCS quota (56.9 mt dw) compared to alternative A3 (42.7 mt dw). This higher quota would benefit the larger SCS fishery, while the prohibition of gillnet would affect a small number of directed gillnet fishermen.

The preferred alternative for commercial gear restrictions reduces fishing effort on blacknose sharks by removing gillnet gear from the areas where blacknose sharks are most commonly caught with gillnet gear. However, it would not prohibit gillnet gear in the areas where the majority of the smooth dogfish are landed, given that gillnet gear is the predominate gear used to harvest smooth dogfish. By prohibiting gillnet gear from South Carolina south, NMFS would be mitigating impacts in the smooth dogfish fishery while allowing blacknose sharks to rebuild. This would have significant social and economic impacts by affecting approximately 31 directed and incidental shark permit holders that land SCS and 12 directed and incidental shark permit holders that land LCS. It would also reduce SCS and LCS revenues for directed permit holders that use gillnet gear to catch sharks by $464,450 and SCS and LCS revenues for incidental permit holders by $7,097. However, given the need to reduce blacknose shark mortality, and the fact that gillnet gear is the predominate gear used to harvest blacknose sharks, NMFS believes that the removal of gillnet gear in the areas that interact with blacknose sharks is warranted at this time to rebuild blacknose sharks.

The preferred alternatives for the pelagic shark effort controls, alternatives C5 and C6, would not result in any negative economic or social impacts on commercial fishermen in the short term, as it would not restrict commercial harvest of shortfin mako sharks, nor alter the pelagic shark quota. However, any management recommendations adopted through international agreements to help protect shortfin mako sharks could be implemented domestically and could have slightly negative socioeconomic impacts on fishery participants in the long term if the measures implemented are more restrictive than current regulations.

The preferred alternative for the SCS recreational measures, alternative D4, which would prohibit the retention of blacknose sharks in the recreational shark fishery, could have negative social and economic impacts on recreational fishermen, including tournaments and charter/headboats if the prohibition of blacknose sharks results in fewer charters and fewer recreational fishing trips. However, since blacknose sharks are not one of the primary species targeted by recreational anglers in tournaments or on charters and the minimum size in recent years has already prevented most legal landings, NMFS does not anticipate large negative social and economic impacts from this preferred alternative in tournaments or in the charter/headboat sector. The preferred alternatives for the pelagic shark recreational measures, alternatives E3 and E4, would not result in any changes in the current recreational regulations regarding bag or size limits for shortfin mako sharks. Therefore, this alternative would likely not result in any negative social or economic impacts for recreational fishermen.

The preferred alternative under the additional species considerations, alternative F2, would focus on characterizing the smooth dogfish fishery and stock status by implementing federal management of smooth dogfish and would not actively change catch levels or rates. Therefore, this alternative would likely not have significant positive or negative social or economic impacts.

5.1 Mitigation Measures

The alternatives were specifically selected to mitigate potential adverse impacts on the environment. As a result, mitigation was explicitly addressed in the analyses conducted for selecting the preferred alternatives in other sections of this DEIS including Chapters 4, 6, 7, 8, and 9. At this time, NMFS has not identified other mitigation measures to offset adverse impacts beyond those built into the alternatives analyzed in this document. NMFS would monitor the impacts of the management measures in the preferred alternatives and would consider other mitigation measures in the future as necessary. Should the preferred alternatives change in response to public comment or other considerations, the mitigating aspects of any revised alternatives would similarly be addressed within the prior chapters of the EIS as part of NMFS assessment of alternatives.

As stated above, mitigation measures were explicitly addressed in the analyses conducted for selecting the management measures in the preferred alternatives. For example, in analyzing possible quotas and retention limits for SCS and blacknose sharks, the preferred alternative was selected because it balances the need to end overfishing based on recent assessments, while allowing for the non-blacknose SCS and limited blacknose shark fisheries to continue. For pelagic sharks, the preferred alternatives were chosen to address mortality of shortfin mako sharks, which were domestically determined to be experiencing overfishing. NMFS would address overfishing at the international level and promote the release of shortfin mako sharks that are brought to the vessels alive. This would help address the majority of shortfin mako mortality that occurs outside of the United States. With regard to commercial gear restrictions, eliminating gillnet gear in certain areas would reduce mortality of blacknose sharks, allowing them to rebuild, but would also allow the use of gillnet gear for targeting other sharks species, such as smooth dogfish, whose fishery occurs outside the range of blacknose sharks. To mitigate some of the potential impacts as a result of the preferred alternatives, directed and incidental permit holders would still be allowed to land non-sandbar LCS, sandbar sharks (in the shark research fishery), non-blacknose SCS, blacknose sharks and pelagic sharks, as established in Amendment 2 and in this amendment. The quotas and retention limits in the preferred alternatives comply with the mandate to end overfishing, while still providing a reasonable opportunity to target sharks and harvest the allocated quota.

In summary, while many of the actions taken in this amendment impose additional restrictions on the shark fishery, NMFS specifically selected preferred alternatives that minimize economic impacts while accomplishing the mandate to end overfishing and implement a rebuilding plan for overfished shark stocks.

5.2 Unavoidable Adverse Impacts

In general, there are no unavoidable adverse impacts expected as a result of the preferred alternatives and corresponding management measures considered in the DEIS. NMFS would continue to monitor the impact of the management measures in the preferred alternatives and would propose additional management measures, as necessary, to avoid any unanticipated adverse impacts.

However, there are unavoidable adverse socioeconomic impacts as a result of the preferred alternatives and corresponding SCS Effort Controls and Commercial Gear Restriction management measures. NMFS must administer and operate under the National Standards of the Magnuson-Stevens Act, which includes a mandate to prevent overfishing and rebuild overfished stocks. In trying to rebuild shark stocks and meet the Magnuson-Stevens Act mandate of ending overfishing, NMFS would reduce fishing effort under the preferred SCS Effort Controls and Commercial Gear Restrictions alternatives. This might result in directed and incidental shark permit holders and dealers redirecting to other fisheries and/or leaving the fishing industry due to lowered quotas and the prohibition of gillnet gear, which could decrease overall effort and landings. Participants in recreational shark fisheries may experience minor negative socioeconomic impacts as a result of prohibiting the landing of blacknose sharks. As with SCS Effort Controls and Commercial Gear Restriction alternatives, such a measure is needed to comply with the National Standards of the Magnuson-Stevens Act. In the analyses for selecting the preferred alternatives, NMFS determined that the management measures are necessary in order to comply with the Magnuson-Stevens Act mandate to end overfishing of blacknose sharks. In addition, the preferred alternatives have been determined to be the most feasible alternatives to rebuild shark stocks according to the most recent assessments.

As described above, the preferred alternatives and the corresponding management measures are expected to have positive or neutral conservation benefits for shark species, bycatch species, and protected resources. This is because the preferred alternatives were specifically selected to mitigate any potential adverse impacts. Any resulting economic or social impacts, beyond those described above, are unavoidable.

5.3 Irreversible and Irretrievable Commitment of Resources

The management measures in the preferred alternatives would not result in any irreversible and irretrievable commitment of resources. Positive ecological impacts are expected due to reduction of quotas, retention limits and commercial gear restrictions for the Atlantic shark fishery. Because of this, the Agency expects fishing effort and bycatch of non-target species and protected resources levels to decrease.

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6.0 ECONOMIC EVALUATION

This section assesses the economic impacts of the alternatives presented in this document. The primary purpose of this chapter is to provide the baseline economic data for the Regulatory Impact Review (RIR) in Chapter 7 and the Initial regulatory Flexibility Analysis (IRFA) in Chapter 8. It also provides relevant data for Community Profiles described in Chapter 9. While this chapter provides an economic analysis, more specific data necessary to completely analyze socio-economic impacts related to the proposed action and amendments is disclosed in Chapters 3, 4 and 9.

6.1 Number of Vessel and Dealer Permit Holders

In order to examine the baseline universe of entities potentially affected by the preferred alternatives, NMFS analyzed the number of permits that were issued as of March 2009 in conjunction with HMS fishing activities.

As of March 18, 2009, there were a total of 502 commercial permit holders in the Atlantic shark fishery (223 directed and 279 incidental permits). Table 6.1 provides a summary of these permit holders since 2004. Further detail regarding commercial permit holders is provided in Chapter 3.

Table 6.1 Number of Shark Limited Access Permits holder between 2004 and 2009.

Year	# Directed Shark	# Incidental Shark
2009	223	279
2008	214	285
2007	231	296
2006	240	312
2005	235	320
2004	241	348

In addition to the universe of commercial shark permit holders, some of the alternatives considered also impact Atlantic HMS CHB permit holders. The historic numbers of CHB permit holders are listed in Table 6.2. The total number of CHB increased between 2006 and 2009.

Table 6.2 Number of CHB Permits by Year in 2009-2006.

Year	CHB Permits
2009	4,837
2008	4,297
2007	3,899

Year	CHB Permits
2006	4,173

As of March 18, 2009, there were a total of 100 Atlantic shark dealer permit holders. Table 6.3 provides a summary of shark dealer permit holders by year. Further detail regarding shark dealer permit holders is provided in the 2006 Consolidated HMS FMP. All dealer permit holders are required to submit reports detailing the nature of their business. For shark permit holders, dealers must submit bi-weekly dealer reports on all HMS they purchase. To facilitate quota monitoring "negative reports" for shark 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).

Table 6.3 Number of shark dealer permits issued from 2004-2009. The actual number of permits per region may change as permit holders move or sell their businesses.

Year	Atlantic shark dealers
2009	100
2008	128
2007	206
2006	336
2005	228
2004	230

6.2 Gross Revenue of the Commercial Shark Fishermen

NMFS calculated annual gross revenues by combining current Federal permit holders with their reported landings from logbooks and shark dealer reports averaged from 2000 to 2007. These landings were multiplied by ex-vessel prices for LCS meat, pelagic shark meat, SCS meat, and shark fins obtained from dealer reporting to determine annual gross revenues.

Of all Atlantic HMS, sharks bring in the lowest total gross revenues (~$4.3 million in 2007) according to the 2008 SAFE Report. Table 6.4 provides data on the prices shark fishermen received at the dock. The average values for ex-vessel prices from the Southeast Fisheries Science Center's Accumulative Landings System (ALS) and dealer reports from the Northeast were used to construct the table.

Table 6.4 Estimates of the total ex-vessel annual revenues of Atlantic Shark HMS fisheries.

Sources: NMFS 2008; Cortés, 2003; Cortés and Neer, 2002, 2005; Cortés, pers.comm.

Species		2000	2001	2002	2003	2004	2005	2006	2007
Large coastal sharks	Ex-vessel $/lb dw	$0.68	$0.91	$0.99	$0.78	$0.86	$0.86	$0.89	$0.58
	Weight lb dw	3,713,125	3,414,967	4,151,594	4,292,403	3,213,896	3,306,583	3,852,124	2,308,018
	Fishery Revenue	$2,524,925	$3,107,620	$4,110,078	$3,348,074	$2,763,951	$2,843,661	$3,428,390	$1,338,650
Pelagic sharks	Ex-vessel $/lb dw	$1.09	$1.11	$0.99	$1.04	$1.12	$1.16	$1.14	$1.10
	Weight lb dw	350,705	345,895	467,682	637,324	679,469	235,600	185,266	263,765
	Fishery Revenue	$382,268	$383,943	$463,005	$662,817	$761,005	$273,296	$211,203	$290,142
Small coastal sharks	Ex-vessel $/lb dw	$0.46	$0.79	$0.52	$0.43	$0.50	$0.52	$0.51	$0.63
	Weight lb dw	593,027	724,332	615,915	534,523	451,651	650,202	823,353	654,099
	Fishery Revenue	$272,792	$572,222	$320,276	$229,845	$225,826	$338,105	$419,910	$412,082
Shark fins (weight = 5% of all sharks landed)	Ex-vessel $/lb dw	$10.47	$19.67	$19.87	$17.09	$16.25	$18.18	$18.53	$13.84
	Weight lb dw	232,843	224,260	261,760	273,213	217,251	209,619	243,037	161,294
	Fishery Revenue	$2,437,865	$4,411,188	$5,201,162	$4,669,202	$3,530,326	$3,810,878	$4,503,478	$2,232,310
Total sharks	Fishery Revenue	$5,617,851	$8,474,974	$10,094,521	$8,909,938	$7,281,107	$7,265,940	$8,562,982	$4,273,185

Note: Average ex-vessel prices may have some weighting errors.

Table 6.5 reports ex-vessel prices by shark complex and year. The ex-vessel price data indicates somewhat stable ex-vessel prices since 2004.

Table 6.5 **Ex-vessel prices per pound dress weight for shark complexes from 2004-2007.**
Source: HMS Dealer Reports

Species Complex	2004	2005	2006	2007
Small coastal sharks	$0.59	$0.60	$0.55	$0.75
Large coastal sharks	$0.40	$0.50	$0.40	$0.40
Pelagic sharks	$1.01	$1.27	$1.35	$1.20
Shark fins	$10.00	$12.00	$12.85	$6.00

Table 6.6 **Ex-vessel prices per pound dress weight for proposed new shark species quotas from 2004-2007.**

Species	2004	2005	2006	2007
Blacknose shark	$0.70	$0.60	$0.50	$0.75
Other SCS	$0.53	$0.60	$0.60	$0.75
Shortfin mako	$1.50	$1.50	$1.54	$1.50
Other pelagic shark	$0.52	$0.50	$0.55	$0.70
Sandbar shark	$0.40	$0.50	$0.45	$0.45
Other LCS	$0.35	$0.48	$0.40	$0.40
Smooth dogfish	$0.25	$0.33	$0.29	$0.27
Smooth dogfish fins	$1.82	$2.25	$1.74	$2.00

Table 6.7 **Median real ex-vessel prices for shark species groups from 2004-2007. Prices adjusted to December 2007 dollars using CPI-U.**

Species Group	Median Real Price
Blacknose shark	$0.66
Other small coastal sharks	$0.67
Small coastal sharks	$0.66
Shortfin mako	$1.59
Other pelagic sharks	$0.61
Pelagic sharks	$1.27
Sandbar shark	$0.61
Other large coastal sharks	$0.44
Large coastal sharks	$0.45
Shark fins	$12.00
Smooth dogfish	$0.29
Smooth dogfish fins	$2.02

6.3 Variable Costs and Net Revenues of Commercial Shark Fishermen

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 PLL variable costs and net revenues available to NMFS analyzed data from 1996 and 1997. The 2006 Consolidated HMS FMP provides a summary of several past studies on the variable costs and net revenues of longline fleets.

An analysis of the 2004 HMS logbook cost-earnings data provides updated information regarding the costs and revenue of a cross section of vessels operating in the

HMS fisheries. The data contains a total of 579 trips taken by 51 different vessels. As described in Larkin *et al*. (2000), median values are reported. Median gross revenues per trip for 2004 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 (13 percent) 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 ($1,346) and the owner share was reported to be 50 percent ($3,364). The 2004 cost earnings information is similar to the findings of the 1996 study, but gross revenues appear to be lower than the Porter *et al.* (2001) study of 1997 operations.

6.4 Expected Economic Impacts of the Alternatives

In this rulemaking, NMFS considered six different categories of issues to address shark management measures where each issue had it own range of alternatives that would meet the objectives of the Magnuson-Stevens Act and the 2006 Consolidated HMS FMP. The expected economic impacts of the different alternatives considered and analyzed are discussed below.

6.4.1 Commercial Measures

6.4.1.1 SCS Commercial Quotas

As of March 18, 2009, there were 223 directed shark permit holders, 279 incidental permit holders, and 100 shark dealers. On average between 2004 and 2007, approximately 85 vessels with directed shark permits had SCS landings, of which 44 vessels had blacknose shark landings. Sixty-eight of the 85 vessels with directed shark permits also had finetooth, Atlantic sharpnose, and bonnethead shark landings. On average between 2004 and 2007, approximately 31 vessels with incidental shark permits had SCS landings, of which approximately 7 vessels had blacknose landings. Twenty-nine of the 31 vessels with incidental shark permits also had finetooth, Atlantic sharpnose, and bonnethead shark landings. The average annual gross revenues from 2004 through 2007 from all SCS meat were $438,092 (Table 6.8). Average annual gross revenues for SCS fins were $395,542, making total average annual gross revenues for SCS landings for the entire fishery $833,634 (Table 6.8). Directed permit holders landed approximately 97 percent of the SCS landings whereas incidental permit holders landed approximately 3 percent of the SCS total landings. Thus, directed permit holders earned approximately $807,792 in average annual gross revenues from SCS landings where as incidental permit holders earned approximately $25,843 from SCS landings (Table 6.8).

As for non-blacknose SCS, or finetooth, Atlantic sharpnose, and bonnethead sharks, the average annual gross revenues from 2004 through 2007 from non-blacknose SCS meat for the entire fishery was $347,900. Average annual gross revenues for non-blacknose SCS fins were $313,613, making total average annual gross revenues for non-blacknose SCS landings for the entire fishery $661,513 (Table 6.8). Directed permit

holders landed approximately 97 percent of the non-blacknose SCS landings whereas incidental permit holders landed approximately 3 percent of the non-blacknose SCS total landings. Thus, directed permit holders earned approximately $641,006 in average annual gross revenues from non-blacknose SCS landings whereas incidental permit holders earned approximately $20,507 from non-blacknose SCS landings (Table 6.8). Spread amongst the directed and incidental permit holders that landed non-blacknose SCS, the average directed permit holder earned $9,427 in average annual gross revenues ($641,006 / 68 directed vessels = $9,427 per vessel), and the average incidental permit holder earned $707 in average annual gross revenues from non-blacknose SCS landings ($20,507 / 29 incidental vessels = $707 per vessel).

Finally, the average annual gross revenues from 2004 through 2007 from blacknose shark meat for the entire fishery were $90,267. Average annual gross revenues for blacknose shark fins were $81,930, making total average annual gross revenues for blacknose shark landings for the entire fishery $172,197 (Table 6.8). Directed permit holders landed approximately 93 percent of the blacknose shark landings whereas incidental permit holders landed approximately 7 percent of the blacknose shark total landings. Thus, directed permit holders earned approximately $160,143 in average annual gross revenues from blacknose shark landings where as incidental permit holders earned approximately $12,054 from blacknose shark landings (Table 6.8). Spread amongst the directed and incidental permit holders that landed blacknose sharks, the average directed permit holder earned $3,640 in average annual gross revenues ($160,143 / 44 directed vessels = $3,640 per vessel), and the average incidental permit holder earned $1,722 in average annual gross revenues from blacknose shark landings ($12,054 / 7 incidental vessels = $1,722 per vessel).

Table 6.8 Average ex-vessel prices and average annual gross revenues from 2004-2007 under the No Action alternative, A1. Shark fins are assumed to be 5 percent of the carcass weight.

Species	Average Landings (lb dw)	Average Ex-Vessel Price	Average Annual Gross Revenues
Entire Fishery			
SCS	659,459	$0.66	$438,092
Fins	32,973	$12.00	$395,542
Total			$833,634
Non-Blacknose SCS	522,864	$0.67	$347,900
Fins	26,143	$12.00	$313,613
Total			$661,513
Blacknose	136,595	$0.66	$90,267
Fins	6,830	$12.00	$81,930
Total			$172,197
Directed Fishery			
SCS	639,015	$0.66	$424,511
Fins	31,951	$12.00	$383,281
Total			$807,792

Species	Average Landings (lb dw)	Average Ex-Vessel Price	Average Annual Gross Revenues
Non-Blacknose SCS	506,655	$0.67	$337,115
Fins	25,333	$12.00	$303,891
Total			$641,006
Blacknose	127,033	$0.66	$83,948
Fins	6,352	$12.00	$76,194
Total			$160,143
Incidental Fishery			
SCS	20,443	$0.66	$13,581
Fins	1,022	$12.00	$12,262
Total			$25,843
Non-Blacknose SCS	16,209	$0.67	$10,785
Fins	810	$12.00	$9,722
Total			$20,507
Blacknose	9,562	$0.66	$6,319
Fins	478	$12.00	$5,735
Total			$12,054

Under alternative A2, NMFS would remove blacknose sharks from the SCS quota and create a blacknose shark-specific quota and a separate "non-blacknose SCS" quota, which would apply to finetooth, Atlantic sharpnose, and bonnethead sharks. The non-blacknose SCS complex quota would be the current SCS quota (454 mt dw) minus average annual landings of blacknose sharks (136,595 lb dw or 61.5 mt dw/year; Table 4.1). This would result in a non-blacknose SCS complex quota of 392.5 mt dw/year (454 mt dw – 61.5 mt dw = 392.5 mt dw). The blacknose shark quota would be a 78-percent reduction in current landings resulting in a 13.5 mt dw or 29,762 lb dw/year quota (61.5 mt dw x 78 percent = 48 mt dw; 61.5 mt dw – 48 mt dw = 13.5 mt dw/year).

NMFS anticipates that non-blacknose SCS landings should not decrease as the non-blacknose SCS quota would only be reduced by the average blacknose shark landings. Therefore, the 68 directed vessels and 29 incidental vessels that had non-blacknose SCS landings would not be affected by the new non-blacknose SCS quota. Average annual gross revenues for non-blacknose SCS landings for the entire fishery are anticipated to be the same as under the No Action alternative, A1, or $661,513 (Table 6.9). Therefore, economic impacts on directed and incidental shark permit holders for the non-blacknose SCS quota would be neutral under alternative A2. However, the blacknose shark quota would be a 78-percent reduction based on average landings from 2004-2007. Average annual gross revenues for the blacknose shark landings for the entire fishery would decrease from $172,197 under the No Action alternative (Table 6.8) down to $37,500 (Table 6.9) under alternative A2, which is a 78-percent reduction in average annual gross revenues for blacknose sharks. Thus, the 44 vessels with directed shark permits and 7 vessels with incidental shark permits that had blacknose shark landings would be affected by the new blacknose shark quota. As directed permit holders

made the majority of blacknose shark landings under the No Action alternative, it is anticipated that directed permit holders would experience the largest impacts under alterative A2. The decrease in average annual gross revenues for directed and incidental permit holders would depend on the specific trip limit associated with the blacknose quota established under A2 (see Appendix A).

Table 6.9 Average ex-vessel prices and average annual gross revenues from 2004-2007 under alternative A2. Shark fins are assumed to be 5 percent of the carcass weight.

Species	Average Landings (lb dw)	Average Ex-Vessel Price	Average Annual Gross Revenues
Entire Fishery			
Non-Blacknose SCS	522,864	$0.67	$347,900
Fins	26,143	$12.00	$313,613
Total			$661,513
Blacknose	29,762	$0.66	$19,643
Fins	1488.1	$12.00	$17,857
Total			$37,500

Under alternative A3, NMFS would remove blacknose sharks from the SCS quota and create a blacknose shark-specific quota and a separate "non-blacknose SCS" quota equal to 42.7 mt dw (94,115 lb dw), which would apply to finetooth, Atlantic sharpnose, and bonnethead sharks. The non-blacknose SCS quota would be based on a 82-percent reduction of the average current landings of finetooth, Atlantic sharpnose, and bonnethead sharks from 2004 through 2007 (Table 4.2). NMFS determined that by reducing the overall SCS fishery, NMFS could reduce the level of blacknose shark discards such that the total blacknose shark mortality would stay below the commercial allowance (see Appendix A). NMFS would establish a blacknose-specific quota of 16.6 mt dw (36,526 lb dw), which is the amount of blacknose sharks that would be harvested while the non-blacknose SCS quota is harvested (see Appendix A); however, fishermen with incidental shark permits would not be allowed to retain any blacknose sharks under alternative A3.

While trip limits would not change for non-blacknose SCS for fishermen with directed and incidental shark permits (*i.e.*, no trip limit for directed fishermen and a 16 non-blacknose SCS/pelagic sharks combined trip limit for incidental fishermen), given the reduction in the non-blacknose SCS quota, NMFS anticipates that the 68 vessels with directed shark permits and 29 vessels with incidental shark permits that had non-blacknose SCS landings would be affected by the new non-blacknose SCS quota. Average annual gross revenues for non-blacknose SCS landings for the entire fishery are anticipated to be $119,526 (Table 6.10). This is an 82-percent reduction in average annual gross revenues compared to average annual gross revenues expected under the No Action alternative, A1 (*i.e.*, $661,513; Table 6.8). Since directed permit holders land approximately 97 percent of the non-blacknose SCS landings as explained in alternative A1, it is anticipated that directed permit holders would lose more in average annual gross revenues from non-blacknose SCS landings compared to incidental permit holders under alternative A3. Average annual gross revenues for directed shark permit holders of non-

blacknose SCS under alternative A3 would be $115,821 (Table 6.10), which is a loss of $525,185 in average annual gross revenues or an 82-percent reduction in average annual gross revenues from the average annual gross revenues expected under the No Action alternative, A1 (*i.e.*, $641,006; Table 6.8). Spread amongst the directed shark permit holders that land non-blacknose SCS, this is an anticipated loss of $7,723 in average annual gross revenues from non-blacknose SCS landings per permit holder ($525,185 / 68 directed vessels = $7,723 per vessel). Incidental permit holders land approximately 3 percent of the non-blacknose SCS landings as explained in alternative A1. Average annual gross revenues for incidental shark permit holders of non-blacknose SCS under alternative A3 would be $3,705 (Table 6.10), which is a loss of $16,802 in average annual gross revenues or also an 82-percent reduction in average annual gross revenues from the average annual gross revenues expected under the No Action alternative, A1 (*i.e.*, $20,507; Table 6.8). Spread amongst the incidental shark permit holders that land non-blacknose SCS, this is an anticipated loss of $579 in average annual gross revenues from non-blacknose SCS landings per permit holder ($16,802 / 29 incidental vessels = $579 per vessel).

The blacknose shark quota would be a 73-percent reduction based on average landings from 2004-2007. In addition, in order to keep the total mortality of blacknose sharks below the commercial allowance for the HMS Atlantic shark fishery (see Appendix A), incidental shark permit holders would not be allowed to retain blacknose sharks under alternative A3. Thus, the 44 directed shark permit holders and 7 incidental shark permit holders that had blacknose shark landings would be affected by the new blacknose shark quota. Since incidental shark permit holders would not be able to retain blacknose sharks, the total blacknose shark quota would be available only to fishermen with directed shark permits. Average annual gross revenues for the blacknose shark landings for the directed fishery would decrease from $172,197 under the No Action alternative (Table 6.8) down to $46,023 under alternative A3 (Table 6.10), which is a loss of $126,174 or a 73-percent reduction in average annual gross revenues for blacknose sharks for fishermen with directed shark permits. Spread amongst the fishermen with directed shark permits that land blacknose sharks, there could be an anticipated loss of $2,868 in average annual gross revenues from blacknose landings per permit holder ($126,174 / 44 directed vessels = $2,868 per vessel). However, since fishermen with incidental shark permits would not be able to retain blacknose sharks, they would lose an estimated $12,054 in average annual gross revenues from blacknose shark landings (Table 6.8). Spread amongst the fishermen with incidental shark permits that land blacknose sharks, there could be an anticipated loss of $1,722 in average annual gross revenues from blacknose landings per permit holder ($12,054 / 7 incidental vessels = $1,722 per vessel).

Table 6.10 Average ex-vessel prices and average annual gross revenues from 2004-2007 under alternative A3. Shark fins are assumed to be 5 percent of the carcass weight.

Species	Average Landings (lb dw)	Average Ex-Vessel Price	Average Annual Gross Revenues
Entire Fishery			
Non-Blacknose SCS	94,115	$0.67	$63,057
Fins	4,706	$12.00	$56,469
Total			$119,526
Directed Fishery			
Non-Blacknose SCS	91,197	$0.67	$61,102
Fins	4,560	$12.00	$54,718
Total			$115,821
Blacknose	36,526	$0.66	$24,107
Fins	1,826	$12.00	$21,916
Total			$46,023
Incidental Fishery			
Non-Blacknose SCS	2,918	$0.67	$1,955
Fins	146	$12.00	$1,751
Total			$3,705

Under alternative A4, the preferred alternative, NMFS would remove blacknose sharks from the SCS quota and create a blacknose shark-specific quota and a separate "non-blacknose SCS" quota equal to 56.9 mt dw (125,487 lb dw), which would apply to finetooth, Atlantic sharpnose, and bonnethead sharks. The non-blacknose SCS quota would be based on a 76-percent reduction of the average current landings of finetooth, Atlantic sharpnose, and bonnethead sharks from 2004 through 2007 (Table 6.11). NMFS determined that by reducing the overall SCS fishery, NMFS could reduce the level of blacknose shark discards such that the total blacknose shark mortality would stay below the commercial allowance (see Appendix A). NMFS would establish a blacknose-specific quota of 14.9 mt dw (32,753 lb dw), which is the amount of blacknose sharks that would be landed while the non-blacknose SCS quota is taken (see Appendix A); however, incidental fishermen would not be allowed to retain any blacknose sharks under alternative A4. In addition, this alternative assumes that gillnet gear would not be used to harvest sharks as explained under alternatives B2 and B3.

While trip limits would not change for non-blacknose SCS for fishermen with directed and incidental shark permits (*i.e.*, no trip limit for directed fishermen and a 16 non-blacknose SCS/pelagic sharks combined trip limit for incidental fishermen), given the reduction in the non-blacknose SCS quota, NMFS anticipates that the 41 directed shark permit holders and 22 incidental shark permit holders that did not use gillnet gear to land non-blacknose SCS would be affected by the new non-blacknose SCS quota. Average annual gross revenues for non-blacknose SCS landings for the entire fishery are anticipated to be $159,368 (Table 6.11). This is a 76-percent reduction in average annual

gross revenues compared to the average annual gross revenues expected under the No Action alternative, A1 (*i.e.*, $661,513; Table 6.8). Since directed permit holders land approximately 97 percent of the non-blacknose SCS landings as explained in alternative A1, it is anticipated that directed permit holders would lose more in average annual gross revenues from non-blacknose SCS landings compared to incidental permit holders under alternative A4. Average annual gross revenues for directed shark permit holders of non-blacknose SCS under alternative A4 would be $153,841 (Table 6.11), which is a loss of $487,165 in average annual gross revenues or an 76-percent reduction in average annual gross revenues from the average annual gross revenues expected under the No Action alternative, A1 (*i.e.*, $641,006; Table 6.8). Spread amongst the directed shark permit holders that did not use gillnet gear to land non-blacknose SCS, there could be an anticipated loss of $11,882 in average annual gross revenues from non-blacknose SCS landings per permit holder ($487,165 / 41 directed vessels = $11,882 per vessel). Incidental permit holders land approximately 3 percent of the non-blacknose SCS landings as explained in alternative A1. Average annual gross revenues for incidental shark permit holders of non-blacknose SCS under alternative A4 would be $4,922 (Table 6.11), which is a loss of $15,585 in average annual gross revenues or a 76-percent reduction in average annual gross revenues from the average annual gross revenues expected under the No Action alternative, A1 (*i.e.*, $20,507; Table 6.8). Spread amongst the incidental shark permit holders that did not use gillnet gear to land non-blacknose SCS, there could be an anticipated loss of $708 in average annual gross revenues from non-blacknose SCS landings per permit holder ($15,585 / 22 incidental vessels = $708 per vessel).

The blacknose shark quota would also be a 76-percent reduction based on average landings from 2004-2007. In addition, in order to keep the total mortality of blacknose sharks below the commercial allowance for the HMS Atlantic shark fishery (see Appendix A), incidental shark permit holders would not be allowed to retain blacknose sharks under alternative A4. Thus, the 15 directed shark permit holders and 5 incidental shark permit holders that did not use gillnet gear to land blacknose sharks would be affected by the new blacknose shark quota. Since incidental permit holders would not be able to retain blacknose sharks, the total blacknose shark quota would be available only to directed shark permit holders. Average annual gross revenues for the blacknose shark landings for the directed fishery would decrease from $172,197 under the No Action alternative (Table 6.8) down to $41,269 under alternative A4 (Table 6.11), which is a loss of $130,928 or a 76-percent reduction in average annual gross revenues from blacknose sharks for directed shark permit holders. Spread amongst the directed shark permit holders that did not use gillnet gear to land blacknose sharks, there could be an anticipated loss of $8,729 in average annual gross revenues from blacknose landings per permit holder ($130,928 / 15 directed vessels = $8,729 per vessel). However, since incidental shark permit holders would not be able to retain blacknose sharks, they would lose an estimated $12,054 in average annual gross revenues from blacknose shark landings (Table 6.8). Spread amongst the incidental shark permit holders that did not use gillnet gear to land blacknose sharks, there could be an anticipated loss of $2,411 in average annual gross revenues from blacknose landings per permit holder ($12,054 / 5 incidental vessels = $2,411 per vessel).

Table 6.11 Average ex-vessel prices and average annual gross revenues for entire fishery from 2004-2007 under alternative A4. Shark fins are assumed to be 5 percent of the carcass weight.

Species	Average Landings (lb dw)	Average Ex-Vessel Price	Average Annual Gross Revenues
Entire Fishery			
Non-Blacknose SCS	125,487	$0.67	$84,076
Fins	6,274	$12.00	$75,292
Total			$159,368
Directed Fishery			
Non-Blacknose SCS	121,597	$0.67	$80,907
Fins	6,080	$12.00	$72,934
Total			$153,841
Blacknose	32,753	$0.66	$21,617
Fins	1,638	$12.00	$19,652
Total			$41,269
Incidental Fishery			
Non-Blacknose SCS	3,890	$0.67	$2,588
Fins	195	$12.00	$2,333
Total			$4,922

Alternative A4 would also prohibit the use of gillnets to land sharks as explained under alternatives B2 and B3. Alternative B2 would prohibit the landings of sharks with gillnet gear in the Atlantic, Gulf of Mexico, and Caribbean Sea. Therefore, the approximate 27 directed and 7 incidental shark permit holders that used gillnet gear to land non-blacknose SCS and the approximate 15 directed and 2 incidental shark permit holders that used gillnet gear to land blacknose sharks would experience additional losses under alternatives A4 and B2. Under alternatives A4 and B2, lost average annual gross revenues for all shark permit holders landing non-blacknose SCS using gillnet gear would be $287,427 (Table 6.12). This is approximately 43 percent of the average annual gross revenues for the entire non-blacknose SCS fishery under the No Action alternative, A1 (*i.e.*, $661,513; Table 6.8). Lost average annual gross revenues for directed shark permit holders using gillnet gear to land non-blacknose SCS under alternative A4 would be $275,832 (Table 6.12), which is 45 percent of the average annual gross revenues for directed shark permit holders under the No Action alternative, A1 (*i.e.*, $641,006; Table 6.8). Spread amongst the directed shark permit holders that land non-blacknose SCS with gillnet gear, this is an anticipated loss of $10,216 in average annual gross revenues from non-blacknose SCS landings per permit holder ($275,832 / 27 directed vessels = $10,216 per vessel). However, since there are 5-7 gillnet vessels that primarily target non-blacknose SCS with gillnet gear, these permit holders may experience higher losses. Lost average annual gross revenues for incidental shark permit holders using gillnet gear to land non-blacknose SCS under alternative A4 would be $11,595 (Table 6.12), which is

57 percent of the average annual gross revenues for incidental permit holders under the No Action alternative, A1 (*i.e.*, $20,507; Table 6.8). Spread amongst the incidental shark permit holders that use gillnet gear to land non-blacknose SCS, this is an anticipated loss of $1,656 in average annual gross revenues from non-blacknose SCS landings per permit holder ($11,595 / 7 incidental vessels = $1,656 per vessel).

Lost average annual gross revenues for all shark permit holders landing blacknose sharks using gillnet gear under alternatives A4 and B2 would be $90,501 (Table 6.12). This is approximately 53 percent of the average annual gross revenues for the entire non-blacknose SCS fishery under the No Action alternative, A1 (*i.e.*, $172,197; Table 6.8). Lost average annual gross revenues for directed shark permit holders using gillnet gear to land blacknose sharks under alternatives A4 and B2 would be $90,123 (Table 6.12), which is 56 percent of the average annual gross revenues for directed permits holder under the No Action alternative, A1 (*i.e.*, $160,143; Table 6.8). Spread amongst the directed shark permit holders that land blacknose sharks with gillnet gear, this would be a loss of $6,008 in average annual gross revenues from blacknose shark landings per permit holder ($90,123 / 15 directed vessels = $6,008 per vessel). However, since there are 5-7 gillnet vessels that primarily target blacknose sharks with gillnet gear, these permit holders may experience higher losses. Incidental permit holders would not be allowed to retain any blacknose sharks under alternative A4, whether or not they used gillnet gear. Lost average annual gross revenues for incidental shark permit holders using gillnet gear to land blacknose sharks under alternatives A4 and B2 would be $378 (Table 6.12), which is 2 percent of the average annual gross revenues for incidental permit holders under the No Action alternative, A1 (*i.e.*, $20,507; Table 6.8). Spread amongst the incidental shark permit holders that use gillnet gear to land blacknose sharks, this is an anticipated loss of $189 in average annual gross revenues from non-blacknose SCS landings per permit holder ($378 / 2 incidental vessels = $189 per vessel).

Under alternatives A4 and B3, which would prohibit the landings of sharks with gillnet gear from South Carolina south, including the Gulf of Mexico and Caribbean Sea, approximately 24 directed and 5 incidental shark permit holders that used gillnet gear to land non-blacknose SCS and approximately 13 directed and 2 incidental shark permit holders that used gillnet gear to land blacknose sharks would experience additional losses under alternatives A4 and B3. Lost average annual gross revenues for all shark permit holders landing non-blacknose SCS using gillnet gear would be $275,008 under alternatives A4 and B3 (Table 6.12). This is approximately 42 percent of the average annual gross revenues for the entire non-blacknose SCS fishery under the No Action alternative, A1 (*i.e.*, $661,513; Table 6.8). Lost average annual gross revenues for directed shark permit holders using gillnet gear to land non-blacknose SCS under alternatives A4 and B3 would be $268,580 (Table 6.12), which is 42 percent of the average annual gross revenues for directed permits holder under the No Action alternative, A1 (*i.e.*, $641,006; Table 6.8). Spread amongst the directed shark permit holders that land non-blacknose SCS with gillnet gear, this is an anticipated loss of $11,191 in average annual gross revenues from non-blacknose SCS landings per permit holder ($268,580 / 24 directed vessels = $11,191 per vessel). However, as with alternatives A4 and B2, since there are 5-7 gillnet vessels that primarily target non-

blacknose SCS with gillnet gear, these permit holders may experience higher losses. Lost average annual gross revenues for incidental shark permit holders using gillnet gear to land non-blacknose SCS under alternatives A4 and B3 would be $6,429 (Table 6.12), which is 31 percent of the average annual gross revenues for incidental permit holders under the No Action alternative, A1 (*i.e.*, $20,507; Table 6.8). Spread amongst the incidental shark permit holders that use gillnet gear to land non-blacknose SCS, this is an anticipated loss of $1,286 in average annual gross revenues from non-blacknose SCS landings per permit holder ($6,429 / 5 incidental vessels = $1,286 per vessel).

Lost average annual gross revenues for all shark permit holders landing blacknose sharks using gillnet gear under alternatives A4 and B3 would be $90,059 (Table 6.12). This is approximately 53 percent of the average annual gross revenues for the entire non-blacknose SCS fishery under the No Action alternative, A1 (*i.e.*, $172,197; Table 6.8). Lost average annual gross revenues for directed shark permit holders using gillnet gear to land blacknose sharks under alternatives A4 and B3 would be $89,681 (Table 6.12), which is 56 percent of the average annual gross revenues for directed permits holder under the No Action alternative, A1 (*i.e.*, $160,143; Table 6.8). Spread amongst the directed shark permit holders that land blacknose sharks with gillnet gear, this would be a loss of $6,899 in average annual gross revenues from blacknose shark landings per permit holder ($89,681 / 13 directed vessels = $6,899 per vessel). However, as with alternatives A4 and B2, since there are 5-7 gillnet vessels that primarily target blacknose sharks with gillnet gear, these permit holders may experience higher losses. Incidental permit holders would not be allowed to retain any blacknose sharks under alternative A4, whether or not they used gillnet gear. Lost average annual gross revenues for incidental shark permit holders using gillnet gear to land blacknose sharks under alternatives A4 and B3 would be $378 (Table 6.12), which is 2 percent of the average annual gross revenues for incidental permit holders under the No Action alternative, A1 (*i.e.*, $20,507; Table 6.8). Spread amongst the incidental shark permit holders that use gillnet gear to land blacknose sharks, this is an anticipated loss of $189 in average annual gross revenues from non-blacknose SCS landings per permit holder ($378 / 2 incidental vessels = $189 per vessel).

Table 6.12 Lost average annual gross revenues (from 2004-2007) for vessels that fish for non-blacknose SCS and blacknose sharks with gillnet gear under alternative A4. Shark fins are assumed to be 5 percent of the carcass weight.

Species	Average Landings (lb dw)	Average Ex-Vessel Price	Average Annual Gross Revenues
Under Alternative B2			
Entire Fishery			
Non-Blacknose SCS	227,184	$0.67	$151,162
Fins	11,359	$12.00	$136,265
Total			$287,427
Blacknose	71,827	$0.66	$47,406
Fins	3,591	$12.00	$43,096
Total			$90,501

Species	Average Landings (lb dw)	Average Ex-Vessel Price	Average Annual Gross Revenues
Directed Fishery			
Non-Blacknose SCS	218,019	$0.67	$145,064
Fins	10,901	$12.00	$130,768
Total			$275,832
Blacknose	71,527	$0.66	$47,208
Fins	3,576	$12.00	$42,916
Total			$90,123
Incidental Fishery			
Non-Blacknose SCS	9,165	$0.67	$6,098
Fins	458	$12.00	$5,497
Total			$11,595
Blacknose	300	$0.66	$198
Fins	15	$12.00	$180
Total			$378
Under Alternative B3			
Entire Fishery			
Non-Blacknose SCS	217,368	$0.67	$144,631
Fins	10,868	$12.00	$130,377
Total			$275,008
Blacknose	71,475	$0.66	$47,174
Fins	3,574	$12.00	$42,885
Total			$90,059
Directed Fishery			
Non-Blacknose SCS	212,287	$0.67	$141,250
Fins	10,614	$12.00	$127,329
Total			$268,580
Blacknose	71,175	$0.66	$46,976
Fins	3,559	$12.00	$42,705
Total			$89,681
Incidental Fishery			
Non-Blacknose SCS	5,081	$0.67	$3,381
Fins	254	$12.00	$3,048
Total			$6,429
Blacknose	300	$0.66	$198
Fins	15	$12.00	$180
Total			$378

In addition, LCS are also landed with gillnet gear. Therefore, alternative A4 in combination with alternatives B2 and B3 would also impact LCS fishermen using gillnet gear. Therefore, the approximate 11 directed and 5 incidental shark permit holders that used gillnet gear to land LCS would experience additional losses under alternatives A4 and B2. Under alternatives A4 and B2, which would prohibit the landings of sharks with gillnet gear in the Atlantic, Gulf of Mexico, and Caribbean Sea, lost average annual gross revenues for all vessels landing LCS using gillnet gear would be $109,339 (Table 6.13). This is approximately 3 percent of the average annual gross revenues for the entire LCS fishery under the No Action alternative, A1 (*i.e.*, $3,328,663; Table 6.14). Under alternatives A4 and B2, LCS fishermen that do not use gillnet gear to land LCS would earn average annual gross revenues of $3,219,324 from LCS landings, which is approximately 97 percent of the average annual gross revenues from LCS landings under the status quo (Table 6.14). Lost average annual gross revenues for directed shark permit holders using gillnet gear to land LCS under alternative A4 would be $107,280 (Table 6.13). Spread amongst the directed shark permit holders that land LCS with gillnet gear, this is an anticipated loss of $9,494 in average annual gross revenues from LCS landings per permit holder ($107,280 / 11 directed vessels = $9,494 per vessel). Lost average annual gross revenues for incidental shark permit holders using gillnet gear to land LCS under alternative A4 would be $2,059 (Table 6.13). Spread amongst the incidental shark permit holders that use gillnet gear to land LCS, this is an anticipated loss of $429 in average annual gross revenues from non-blacknose SCS landings per permit holder ($2,059 / 5 incidental vessels = $429 per vessel).

Under alternatives A4 and B3, which would prohibit the landings of sharks with gillnet gear from South Carolina south, including the Gulf of Mexico and Caribbean Sea, approximately 10 directed and 2 incidental shark permit holders that used gillnet gear to land LCS would experience additional losses under alternatives A4 and B3. Lost average annual gross revenues for all vessels landing LCS using gillnet gear would be $106,479 under alternatives A4 and B3 (Table 6.13). This is approximately 3 percent of the average annual gross revenues for the entire LCS fishery under the status quo (*i.e.*, $3,328,663; Table 6.14). Under alternatives A4 and B3, LCS fishermen that do not use gillnet gear to land LCS would earn average annual gross revenues of $3,222,183 from LCS landings, which is approximately 97 percent of the average annual gross revenues under the status quo (Table 6.14). Lost average annual gross revenues for directed shark permit holders using gillnet gear to land LCS under alternatives A4 and B3 would be $106,189 (Table 6.13). Spread amongst the directed shark permit holders that land LCS with gillnet gear, this is an anticipated loss of $10,619 in average annual gross revenues from LCS landings per permit holder ($106,189/ 10 directed vessels = $10,619 per vessel). Lost average annual gross revenues for incidental shark permit holders using gillnet gear to land LCS under alternatives A4 and B3 would be $290 (Table 6.13). Spread amongst the incidental shark permit holders that use gillnet gear to land LCS, this is an anticipated loss of $145 in average annual gross revenues from non-blacknose SCS landings per permit holder ($290 / 2 incidental vessels = $145 per vessel).

Table 6.13 **Lost average annual gross revenues (from 2004-2007) for vessels that fish for LCS with gillnet gear under alternative A4. Shark fins are assumed to be 5 percent of the carcass weight.**

Species	Average Landings (lb dw)	Average Ex-Vessel Price	Average Annual Gross Revenues
Under Alternative B2			
Entire Fishery			
LCS	104,132	$0.45	$46,859
Fins	5,207	$12.00	$62,479
Total			$109,339
Directed Fishery			
LCS	102,171	$0.45	$45,977
Fins	5,109	$12.00	$61,303
Total			$107,280
Incidental Fishery			
LCS	1,961	$0.45	$882
Fins	98	$12.00	$1,177
Total			$2,059
Under Alternative B3			
Entire Fishery			
LCS	101,409	$0.45	$45,634
Fins	5,070	$12.00	$60,845
Total			$106,479
Directed Fishery			
LCS	101,132	$0.45	$45,509
Fins	5,057	$12.00	$60,679
Total			$106,189
Incidental Fishery			
LCS	276	$0.45	$124
Fins	14	$12.00	$166
Total			$290

Table 6.14 **Average annual gross revenues (from 2004-2007) of vessels that land LCS but do not use gillnet gear under alternative A4. Shark fins are assumed to be 5 percent of the carcass weight.**

Species	Average Landings (lb dw)	Average Ex-Vessel Price	Average Annual Gross Revenues
Status Quo			
LCS	3,170,155	$0.45	$1,426,570
Fins	158,508	$12.00	$1,902,093
Total			$3,328,663
Under Alternative B2			
Entire Fishery			
LCS	3,066,023	$0.45	$1,379,710

Species	Average Landings (lb dw)	Average Ex-Vessel Price	Average Annual Gross Revenues
Fins	153,301	$12.00	$1,839,614
Total			$3,219,324
Under Alternative B3			
Entire Fishery			
LCS	3,068,746	$0.45	$1,380,936
Fins	153,437	$12.00	$1,841,248
Total			$3,222,183

Alternative A5 would close the entire SCS commercial shark fishery, prohibiting the landing of any SCS, including blacknose sharks. Thus, this alternative would eliminate landings of all SCS, including finetooth, Atlantic sharpnose, bonnethead, and blacknose sharks. This would have negative economic impacts on the average 85 directed shark permit holders, and the average 31 incidental shark permit holders that had SCS landings during 2004-2007. This would result in a loss of average annual gross revenues of $661,513 for non-blacknose SCS and $172,197 from blacknose shark landings for a total loss of $833,710 in average annual gross revenues from SCS landings. Directed shark permit holders would lose $641,006 in average annual gross revenues from non-blacknose SCS landings and $160,143 in average annual gross revenues from blacknose shark landings for a total of $801,149 in average annual gross revenues (Table 6.15). Spread among the 85 directed shark permit holders that land LCS with gillnet gear, this could result in a loss in average annual gross revenues of $9,426 per permit holder ($801,149 / 85 vessels = $9,426).

Incidental permit holders would lose $20,507 in average annual gross revenues from non-blacknose SCS landings and $12,054 in average annual gross revenues from blacknose shark landings for a total of $32,561 in average annual gross revenues under alternative A5 (Table 6.15). Spread among the 31 incidental shark permit holders that land SCS, this could result in a loss in average annual gross revenues of $1,050 per permit holder ($32,561 / 31 incidental vessels = $1,050).

In addition, as gillnet gear is the primary gear used to target SCS, it is assumed that directed shark gillnet fishing would end, except for fishermen that use gillnet gear to strikenet for blacktip sharks. Approximately 11 directed shark permit holders use gillnet gear to land LCS. This would result in a decrease in LCS landings of 102,171 lb dw and a decrease in average annual gross revenues of $107,280. Spread among the 11 directed shark permit holders that land LCS with gillnet gear, this could result in a loss in average annual gross revenues of $9,753 per permit holder ($107,280 / 11 vessels = $9,753). However, while this alternative could reduce blacknose mortality below the commercial allowance of 44,853.8 lb dw, it would also completely eliminate the fishery for all SCS. This would severely curtail data collection on all SCS that could be used for future stock assessments.

Table 6.15 Lost average annual gross revenues (from 2004-2007) for vessels landings non-blacknose SCS, blacknose sharks, and LCS under alternative A5. Shark fins are assumed to be 5 percent of the carcass weight.

Species	Average Landings (lb dw)	Average Ex-Vessel Price	Average Annual Gross Revenues
Entire Fishery			
Non-Blacknose SCS	522,864	$0.67	$347,900
Fins	26,143	$12.00	$313,613
Total			$661,513
Blacknose	136,595	$0.66	$90,267
Fins	6,830	$12.00	$81,930
Total			$172,197
Directed Fishery			
Non-Blacknose SCS	506,655	$0.67	$337,115
Fins	25,333	$12.00	$303,891
Total			$641,006
Blacknose	127,033	$0.66	$83,948
Fins	6,352	$12.00	$76,194
Total			$160,143
LCS	102,171	$0.45	$45,977
Fins	5,109	$12.00	$61,303
Total			$107,280
Incidental Fishery			
Non-Blacknose SCS	16,209	$0.67	$10,785
Fins	810	$12.00	$9,722
Total			$20,507
Blacknose	9,562	$0.66	$6,319
Fins	478	$12.00	$5,735
Total			$12,054

NMFS prefers alternative A4 at this time, because by reducing the overall SCS fishery, NMFS could reduce the level of blacknose shark discards such that the total blacknose shark mortality would stay below the commercial allowance needed in order to rebuild the stock. Under alternative A4, blacknose shark landings would decrease by 76 percent and discards would decrease by 81 percent (Table 4.4). Landings for non-blacknose SCS would also decrease by 76 percent and discards could decrease by 2-3 percent (Table 4.4). In addition, alternative A4 in combination with alternatives B2 or B3 could decrease landings of LCS by only three percent, but could decrease discards of LCS by up to 15 percent (Table 4.4). These reductions in landings of non-blacknose SCS and blacknose sharks would also result in a 76-percent reduction in average annual gross revenues from non-blacknose SCS and blacknose shark landings overall. However, such a reduction is needed to lower the overall mortality on blacknose sharks (see Appendix A). While gillnet fishermen would be impacted the most and would have estimated annual gross revenue losses between $377,928 and $365,067, alternative A4 would allow

for a higher non-blacknose SCS than blacknose shark quota (56.9 mt dw) compared to alternative A3 (42.7 mt dw) because associated gillnet effort is anticipated to decline more under alternative A4, leaving a larger available quota for the rest of the SCS fishery. This higher quota would benefit the larger SCS fishery, while the prohibition of gillnet gear would affect a small number of shark fishermen that use gillnet gear. For instance, under alternative A3, expected average annual gross revenues are $165,549 from SCS landings whereas under alternative A4, expected average annual gross revenues are $200,637 from SCS landings. Under alternative A5, the expected losses in average annual gross revenues from lost SCS landings is $833,710, which is the largest negative economic impact of all the alternatives considered, given the entire SCS fishery would be closed. Therefore, NMFS prefers alternative A4 at this time.

6.4.1.2 SCS Commercial Gear Restrictions

Under alternative B1, the No Action alternative, NMFS would maintain the current gear restrictions for rod and reel, gillnet, and BLL gear. Therefore, the economic impacts of alternative B1 would be the same as the status quo, and no negative social or economic impacts would be anticipated under alternative B1. On average from 2004-2007, the directed and incidental shark permit holders retained average annual gross revenues from SCS landings of $833,634, while the directed and incidental shark permit holders retaining LCS had larger gross revenues of $3,328,663. The smooth dogfish fishery is smaller than the other fisheries and has average annual gross revenues of $371,786 for state and federally permitted fishermen reporting to the ACCSP. Based on this alternative, the average annual gross revenues of these fisheries would remain the same as the status quo. The average number of directed and incidental shark permit holders that reported SCS landings in the Coastal Fisheries logbook from 2004-2007 were 116 (85 directed and 31 incidental shark permit holders), and the LCS fishery had an annual average of 162 permit holders (129 directed and 33 incidental shark permit holders) reporting LCS landings in the Coastal Fisheries logbook from 2004-2007. The number of permit holders would not be impacted by the No Action alternative.

Under alternative B2, which would close the shark gillnet fishery, NMFS would remove gillnet gear as an authorized gear type for commercial shark fishing. This alternative would have significant negative economic impacts by potentially affecting 30 directed and 7 incidental permit holders that land SCS. Also, this restriction would have a considerable impact on the total landings/year of SCS. Gillnets are the dominant gear type in the SCS fishery. On average, directed shark permit holders landed 289,546 lb dw of SCS with gillnet gear. This is equivalent to $365,955 in lost average annual gross revenues from SCS landings for directed shark permit holders. Based on average ex-vessel prices per pound from 2004-2007, directed fishermen earned $807,792 in average annual gross revenues from SCS landings. On average, incidental shark permit holders landed 9,465 lb dw of SCS with gillnet gear. This is equivalent to $11,973 in lost average annual gross revenues from SCS landings for incidental shark permit holders due to the prohibition of gillnet gear. Based on average ex-vessel prices per pound from 2004-2007, incidental shark permit holders earned $25,843 from SCS landings under the status quo. This represents a 45 percent reduction in SCS revenues for directed shark

permit holders and a 46 percent reduction in SCS revenues for incidental shark permit holders compared to the No Action alternative, alternative B1.

This alternative would have a minimal negative economic impact on the LCS fishery. Only 11 directed and 5 incidental shark permit holders out of the 162 total shark permit holders would be affected. On average, directed shark permit holders landed 102,171 lb dw of LCS with gillnet gear. This is equivalent to $107,280 in lost average annual gross revenues from LCS landings (3 percent reduction). On average, incidental shark permit holders landed 1,961 lb dw of LCS with gillnet gear. This is equivalent to $2,059 in lost average annual gross revenues from LCS landings for incidental shark fishermen due to the prohibition of gillnet gear. In total ($109,339), this is approximately 3 percent of the gross revenues for the entire LCS fishery under the status quo (*i.e.*, $3,328,663).

Gillnets are also the primary gear type used to catch smooth dogfish. Within the VTR data, a primarily Northeast U.S. reporting system, an average of 213 vessels reported smooth dogfish landings per year between 2004 and 2007. Within the Coastal Fisheries Logbooks data, a primarily Southeast U.S. reporting system, an average of 10 vessels reported smooth dogfish landings per year between 2004 and 2007. From this data, an estimate of 223 vessels would require a smooth dogfish permit; however, as fishermen are currently not required to have a permit to retain smooth dogfish, this could be an underestimate of the number of fishermen that would require a federal commercial permit for smooth dogfish in the future. The average total landings/year of smooth dogfish from 1998-2007 were 950,859 lb dw/year (by state and federally permitted fishermen reporting to the ACCSP, however, since fishermen do not have to currently report smooth dogfish landings, this could be an underestimate of total landings, and thus, an underestimate of average annual gross revenues for this fishery). Based on average ex-vessel prices per pound from 2004-2007, average annual gross revenues for the entire smooth dogfish fishery totaled $371,786 from smooth dogfish landings. If NMFS prefers alternative F2, which would require fishermen who fish for smooth dogfish in federal waters to obtain a federal smooth dogfish permit, then under alternative B2, those fishermen would not be able to use gillnet gear to land smooth dogfish. This would have a negative economic impacts on fishermen who previously used gillnet gear in federal waters to land smooth dogfish. However, as fishermen do not have to have a federal permit currently to land smooth dogfish, NMFS is uncertain of the universe of fishermen who might be affected by alternatives B2 and F2 at this time. However, given the potential large negative economic impacts of this alternative to the SCS, LCS, and smooth dogfish fisheries, NMFS does not prefer this alternative B2 at this time.

Under alternative B3, the preferred alternative, NMFS would close the commercial gillnet fishery from South Carolina south, including the Gulf of Mexico and Caribbean Sea. This would have a negative economic impact on federally permitted directed and incidental shark permit holders. In the SCS fishery, this alternative would affect 27 directed and 5 incidental shark permit holders out of the 116 total shark permit holders that landed SCS. The SCS gillnet fishery from South Carolina south accounts for 44 percent of the total shark landings by directed shark permit holders, and 26 percent of

landings by incidental permit holders. On average, directed shark permit holders landed 283,462 lb dw ($358,261) of SCS with gillnet gear. Thus, directed shark fishermen would lose $358,261 in average annual gross revenues from SCS landings from the gillnet prohibition under alternative B3. Based on average ex-vessel prices from 2004-2007, directed fishermen earned $807,792 in average annual gross revenues from SCS landings. On average, incidental shark permit holders landed 5,381 lb dw ($6,807) of SCS with gillnet gear from South Carolina south. Thus, incidental shark fishermen would lose $6,807 in average annual gross revenues from non-blacknose SCS landings under alternative B3. The directed and incidental shark permit holders would lose average annual gross revenues of $365,068 from their current gross revenues of $833,634.

This alternative would have minor economic impacts on the LCS fishery. It would only affect 12 directed and incidental shark permit holders (162 total shark permit holders). The directed shark permit holders would lose $106,189 in average annual gross revenues from lost LCS landings in gillnet gear from South Carolina south under alternative B3. Incidental fishermen shark permit holders would lose $290 from lost LCS landings in gillnet gear from South Carolina south. In total ($106,479), this is only 3 percent of the average annual gross revenues (*i.e.*, $3,328,663) from LCS landings for the LSC fishery under the status quo.

Alternative B3, in combination with the preferred alternative F2, would not affect the economics impacts of the smooth dogfish fishery. Smooth dogfish are primarily caught from North Carolina north. The average total landings/year are 950,859 lb dw/year (by state and federally permitted fishermen reporting to the ACCSP, however, since fishermen do not have to currently report smooth dogfish landings, this could be an underestimate of total landings, and thus, an underestimate of average annual gross revenues for this fishery), which translates into average annual gross revenues of $371,786 lb dw/year from smooth dogfish landings. Given smooth dogfish are not typically landed with gillnet gear from South Carolina south, it is anticipated that this alternative, in combination with the preferred alternative F2, would not cause any loss in average annual gross revenues from smooth dogfish landings. Since this alternative would assist NMFS in reaching the commercial allowance for blacknose sharks for the commercial shark fishery, and has minimal economic impacts to LCS and smooth dogfish shark fishermen, NMFS prefers this alternative at this time.

6.4.1.3 Pelagic Shark Effort Controls

Currently, on average, 72.5 mt dw of shortfin mako sharks were commercially landed between 2004 and 2007. Based on the median real dollar, ex-vessel price per pound of $1.59 for meat and $12.00 for fins, for shortfin mako sharks during the same timeframe, this is equivalent to $350,039 in annual revenues. Because the No Action Alternative, alternative C1, would not modify or alter commercial fishing practices for shortfin mako sharks or other shark species, it would likely not result in any adverse economic impacts.

Alternative C2 would implement a species-specific quota for shortfin mako at the level of the average annual commercial landings for this species. This alternative is expected to have neutral or slightly negative socio-economic impacts. On average, 72.5 mt dw (159,834 lb dw) of shortfin mako sharks were commercially landed between 2004 and 2007. Based on the median real dollar, ex-vessel price per pound of $1.59 for shortfin mako shark meat, multiplied by the average shortfin mako landings from 2004-2007 (159,834 lb dw), this is equivalent to $254,135 in annual revenues. Fin weight was calculated by using the standard fin to carcass ratio of 5 percent dressed weight. Using this ratio, of the 159,834 lb dw of shortfin mako, approximately 7,992 lb dw would have been shortfin mako shark fins. The fin weight was then multiplied by the median fin price per pound from 2004 to 2007 ($12.00) to generate estimated annual economic revenues from the fins of shortfin mako sharks of $95,904. Therefore, the estimated annual revenues for both the meat and fins of shortfin mako shark landings from 2004-2007 is equal to approximately $350,039. While fishermen would be able to maintain current fishing effort under this alternative, any increase in effort would be restricted by the species-specific quota of 72.5 mt dw. Under the No Action alternative, commercial fishermen currently have a 488 mt dw quota which could potentially be filled entirely by shortfin mako landings. Based on the median real dollar, ex-vessel price per pound of $1.59 for shortfin mako sharks, a quota of 488 mt dw could result in maximum annual gross revenues equal to $1,710,593. Thus, if the quota is reduced to 72.5 mt dw, which equals $254,135 in ex-vessel annual gross revenues, this could potentially result in a loss of annual gross revenues of $1,456,458 for commercial fishermen; however, given shortfin mako sharks are caught incidentally in the PLL fishery, it is unlikely that the entire pelagic shark quota would be entirely filled with shortfin mako landings. NMFS does not prefer this alternative at this time because the United States contributes a small portion of shortfin mako shark mortality due to the lack of a directed fishery compared to other foreign nations, including contracting parties to ICCAT. The 2008 ICCAT stock assessment did not recommend a TAC that was necessary for ending overfishing of shortfin mako sharks, and no international fishery management organization in which the United States participates, including ICCAT, has set a species-specific quota for shortfin mako sharks.

Alternative C3 would remove shortfin mako sharks from the pelagic shark species complex and add them to the prohibited species list. This alternative is expected to have only slightly negative economic impacts for commercial fishermen because it is not a species that is targeted by commercial fishermen. Shortfin mako sharks are predominately caught incidentally in the PLL fishery, and on average, the commercial landings for shortfin mako sharks from 2004 to 2007 were 72.5 mt dw. Based on the median real dollar, ex-vessel prices per pound of $1.59, this is equivalent to $254,135 in annual gross revenues. However, since shortfin mako sharks would be placed on the prohibited species list under alternative C3, there could be an estimated reduction in annual gross revenues of $254,135 to commercial fishermen. In addition, this alternative could lead to increased operation time if commercial fishermen have to release and discard all shortfin mako sharks that are caught on PLL gear. In addition, if the commercial PLL fleet expands in the future, placing shortfin mako sharks on the

prohibited species list could result in a loss of future revenues for the commercial PLL fishery.

Potential economic impacts of implementing alternatives C4a or C4b were assessed by estimating the annual mt dw of shortfin mako sharks that would normally be landed for sale, which would have to be released under these alternatives. The size limits in alternatives C4a and C4b would restrict the harvest of smaller shortfin mako sharks. To assess the impact of the size limits, NMFS calculated the average dressed weight percentage of shortfin mako sharks retained below each size limit using POP data and then applied to landings data from the 2008 SAFE Report. Because the POP data is recorded as number of individuals caught, the data needed to be converted into dressed weight. This was accomplished by utilizing records of shortfin mako sharks that were recorded as kept and had an associated length measurement in the POP data. Fork lengths were converted into pounds dressed weight, and each conversion was multiplied by the number of sharks kept at each fork length. The dressed weights of individual sharks were then summed to get a total dressed weight for all shortfin mako sharks kept in the PLL and BLL fisheries (*i.e.*, 184,803.1 lb dw).

For alternative C4a, the summed dressed weight of all kept shortfin mako sharks under the 32 in. IDL size limit was 2,550.5 lb dw. This made up 1.4 percent of total dressed weight landings of shortfin mako sharks ((2,550.5 / 184,803.1)*100). This percentage was then applied to the average commercial landings found in the 2008 SAFE Report from 2004-2007 (*i.e.*, 158,884.8 lb dw) to determine the estimated dressed weight of shortfin mako sharks that would be unavailable for landing under alternative C4a (158,884.8 lb dw * 1.4 percent = 2,061.1 lb dw) (Table 6.16). The 2,061.1 lb dw of unavailable shortfin mako shark meat was then multiplied by the median price per pound estimate ($1.59) for shortfin mako sharks from 2004 to 2007 to generate an estimated annual economic loss of $3,277. Fin weight was calculated by using the standard fin to carcass ratio of 5 percent dressed weight. Using this ratio, 103 lb of fins would be unavailable for harvest. The unavailable fin weight was then multiplied by the median fin price per pound from 2004 to 2007 ($12.00) to generate an estimated annual economic loss of $1,236 in gross revenues. Economic losses of meat and fins were then summed to calculate a total economic loss of $4,513 in annual gross revenues under alternative C4a.

For alternative C4b, the summed dressed weight of all kept shortfin mako sharks under the 22 in IDL size limit was 39.7 lb dw. This made up 0.02 percent of dressed weight landings of shortfin mako sharks ((39.7 / 184,803.1)*100). This percentage was then applied to the average commercial landings found in the 2008 SAFE Report from 2004-2007 (*i.e.*, 158,884.8 lb dw) to determine the estimated dressed weight of shortfin mako sharks that would be unavailable for landing under alternative C4b (158,884.8 lb dw * 0.02 percent = 34.3 lb dw) (Table 6.16). The 34.3 lb dw of unavailable shortfin mako shark was then multiplied by the median price per pound estimate ($1.59) for shortfin mako sharks from 2004 to 2007 to generate an estimated annual economic loss of $55 in annual gross revenues. Fin weight was calculated by using the standard fin to carcass ratio of 5 percent dressed weight. Using this ratio, 1.72 lb of fins would be

unavailable for harvest. The unavailable fin weight was then multiplied by the median fin price per pound from 2004 to 2007 ($12.00) to generate an estimated annual economic loss of $20.64 in gross revenues. Economic losses of meat and fins were then summed to calculate a total economic loss of $75 in annual gross revenues under alternative C4b.

Table 6.16 Estimates of shortfin mako shark landings (lb dw) reductions according to size restrictions proposed in alternatives C4a and C4b.

Alternative	Size Limit (inches IDL)	Average shortfin mako shark commercial landings (lb dw) from 2004-2007 (2008 Safe Report)	Percentage of total landings (lb dw) of shortfin mako sharks below size limit (POP)	Estimated total weight (lb dw) of shortfin mako shark prohibited.
C4a	32	159,884.75	1.4	2,061.1
C4b	22	159,884.75	0.02	34.3

Alternatives C4a and C4b would have minor economic impacts because only a small percentage of commercial landings would be affected by the size restrictions. Of the two alternatives, the negative economic impact of C4a would be greater, as commercial landings by weight are 2,026.8 lb dw greater than in alternative C4b. Despite these minor economic impacts, since the size limits would not reduce fishing mortality of shortfin mako sharks in the commercial sector, NMFS does not prefer this alternative at this time.

Under alternative C5, the preferred alternative, NMFS would take action at the international level through international fisheries management organizations to develop management measures applicable to all participating nations to end overfishing of shortfin mako sharks. In the short term, this alternative would not result in any negative economic impacts on commercial fishermen as it would not restrict commercial harvest of shortfin mako sharks, nor alter the pelagic shark quota. Therefore, the economic impacts of alternative C5 would be the same as described in the No Action alternative, alternative C1. However, although this alternative could have negative economic impacts in the long term if management measures were adopted by the United States that would reduce landings domestically for shortfin mako sharks. Those recommendations would ultimately help end overfishing of shortfin mako in the long term. Therefore, NMFS prefers alternative C5 at this time.

Alternative C6, the preferred alternative, would promote the release of shortfin mako sharks brought to fishing vessels alive. This alternative would likely not result in any negative economic or social impacts as it does not restrict commercial harvest of shortfin mako sharks that are alive at haulback, and quotas and retention limits would remain as described in the No Action alternative, Alternative C1. However, as this alternative could result in the reduction of fishing mortality of shortfin mako sharks by encouraging fishermen to release shortfin mako sharks brought to the fishing vessel alive, NMFS prefer this alternative at this time.

6.4.2 Recreational Measures

6.4.2.1 Small Coastal Sharks

Under alternative D1, the No Action alternative, NMFS would maintain the current recreational management measures, including the current retention limits and size limits for SCS. Therefore, the economic impacts of alternative D1 would be the same as the status quo, and no negative social or economic impacts would be anticipated under alternative D1. However, as this alternative would not help rebuild blacknose sharks, as explained in the ecological impacts of this section in Chapter 4, NMFS does not prefer this alternative at this time.

Alternative D2 would modify the minimum recreational size for blacknose sharks based on the biology of blacknose sharks. This would lower the current size limit from 54 inches FL to 36 inches FL, the size at which 50 percent of the female blacknose sharks reach sexual maturity. This could increase the landings of recreationally harvested blacknose sharks and, therefore, have positive economic impacts for recreational fishermen. Since this alternative could result in the increase of blacknose shark recreational landings, and NMFS needs to reduce the number of blacknose shark landings in order to rebuild the stock, NMFS does not prefer this alternative at this time.

Alternative D3 would increase the retention limit for Atlantic sharpnose sharks based on their current catches and stock status. Any increase in the retention limit for Atlantic sharpnose sharks would provide positive economic impacts for recreational fishermen, especially if this resulted in more charter trips for charter/headboats. However, since the latest stock assessment suggests that increased fishing efforts could result in an overfished status and/or cause overfishing to occur in the future (NMFS, 2007), NMFS does not prefer this alternative at this time.

Under alternative D4, the preferred alternative, NMFS would prohibit the retention of blacknose sharks in the recreational fishery. While recreational fishermen could still catch blacknose sharks, they would not be permitted to retain blacknose sharks and would have to release them. This could have negative economic impacts on recreational fishermen, including tournaments and charter/headboats if the prohibition of blacknose sharks resulted in fewer charters. However, since blacknose sharks are not one of the primary species targeted by recreational anglers, in tournaments, or on charters, NMFS does not anticipate large negative economic impacts from this alternative on recreational anglers, tournaments, or in the charter/headboat sector. Therefore, NMFS prefers this alternative at this time.

6.4.2.2 Pelagic Sharks

Alternative E1 would likely not result in any adverse economic or social impacts as the No Action alternative would not substantially modify or alter recreational fishing practices for shortfin mako sharks or other shark species.

Alternative E2a would have the most severe economic impacts, as almost all of the reported shortfin mako sharks landed (99.5 percent) were smaller than the 108 inch FL size limit and would have to be released. This alternative would basically create a catch-and-release fishery for shortfin mako sharks. The impacts of alternative E2b would be less severe than alternative E2a, but would result in a 60.3 percent overall reduction in recreational shortfin mako shark landings. Under this alternative, economic impacts would be greater on the non-tournament recreational mako shark fishery, as 81 percent of those landings would fall below the 73 inch FL size limit. The percentage of recreational landings during tournaments that would be released under alternative E2b would be less than the non-tournament recreational landings (51.7 percent to 81 percent, respectively). According to LPS data, 41 percent of shortfin mako sharks caught are kept (Table 6.17); therefore the size limit in alternatives E2 may have a substantial economic impact on the recreational fishery.

Table 6.17 Total number of shortfin mako sharks reported to the LPS from 2004 to 2008.

Year	Kept	Released Alive	Discard Dead	Total
2004	4640	6731	17	11389
2005	2732	3086	7	5825
2006	3639	5485	0	9123
2007	2283	3363	0	5647
2008	2348	3524	0	5872
Total	15643	22189	24	37856
Average	3129	4438	5	7571
% of Average	41%	59%	0%	100%

Under alternative E3, NMFS would establish a foundation through international fisheries management organizations, such as ICCAT to end overfishing of shortfin mako sharks. This alternative would not result in any changes in the current recreational regulations regarding bag or size limits for shortfin mako sharks. Therefore, this alternative would likely not result in any negative social or economic impacts for recreational fishermen compared to the No Action alternative, alternative E1.

Under alternative E4, NMFS would promote the live release of shortfin mako sharks in the recreational shark fishery, but this alternative would not result in any changes in the current recreational regulations regarding bag or size limits for shortfin mako sharks. Therefore, this alternative would likely not result in any negative social or economic impacts compared to the No Action alternative, alternative E1.

Under alternative E5, NMFS would remove shortfin mako sharks from the authorized species list and add them to the prohibited species list. Placing shortfin mako sharks on the prohibited species list would essentially make it a recreational catch and release fishery for this species. According to recreational landings data, on average 3,682 shortfin mako sharks were landed from 2004 to 2007 (NMFS, 2008). Although a small number of shortfin mako sharks were landed in the recreational fishery during this time period, it is also an important fishing tournament species. Fishing tournaments are an important component of HMS recreational fisheries. In 2007, there were 42 shark tournaments throughout the U.S. Atlantic Coast, including the Gulf of Mexico and the

Caribbean Sea. Therefore, adding this species to the prohibited species list could lead to negative socioeconomic impacts for fishermen who participate in recreational shark tournaments that would no longer be able to retain this species during recreational fishing or tournaments.

6.4.3 Smooth Dogfish

While data regarding stock status and participants in the fishery is sparse, a number of sources exist that summarize any reports of smooth dogfish catches. These sources, particularly the ACCSP for commercial catches and the MRFSS for recreational catches, offer insight into current state of the fishery. A third source, NMFS' Science and Technology's (S&T) Annual Commercial Landings Statistics, available on the S&T webpage, is also available, however this system only contains non-confidential landings data and does not report any confidential numbers. For this reason, ACCSP data was used instead of S&T data for analysis.

Alternative F1 would likely not have any new social or economic impacts beyond the status quo, as no action would be taken. However, applying the No Action alternative would preclude gathering fishery participant information. Therefore, NMFS does not prefer this alternative at this time.

Implementing federal management of smooth dogfish through alternative F2 would focus on characterizing the fishery and stock status, and would not actively change catch levels or rates. Therefore, this alternative would likely not have significant positive or negative social or economic impacts, except that fishermen would have to purchase an open access smooth dogfish commercial fishing permit and dealers would have to report smooth dogfish landings through HMS dealer reports or SAFIS if they are not already reporting through another system. However, if the federal permitting system creates enough of an inconvenience as to prevent some participants from remaining in the fishery, negative economic impacts could result. Utilizing VTR and Coastal Fisheries Logbook data, an estimate of the number of participants with current federal permits in the commercial smooth dogfish fishery could be calculated. Within the VTR data, a primarily Northeast U.S. reporting system, an average of 213 vessels reported smooth dogfish landings per year between 2004 and 2007. Within the Coastal Fisheries Logbooks data, a primarily Southeast U.S. reporting system, an average of 10 vessels reported smooth dogfish landings per year between 2004 and 2007. From this data, an estimate of 223 vessels would require a smooth dogfish permit; however, as fishermen are currently not required to have a permit to retain smooth dogfish, this could be an underestimate of the number of fishermen that would require a federal commercial permit for smooth dogfish in the future.

Based on MRFSS data from 2004 to 2007, an average of 58,161 smooth dogfish were retained per year in the recreational fishery. This number is a proxy for the upper limit of participants in the federal recreational fishery that catches this species, but is likely lower because a single fisherman may have caught multiple smooth dogfish, and based on the life history of this species and the fact the most recreational fisherman are

shore-based, most smooth dogfish are likely caught in state waters, which would not require a federal HMS Angling category permit. Of those that fish in federal waters, the nominal fee of $16.00 for a recreational HMS Angling category permit is not expected to create an impediment to entering or remaining in the recreational fishery.

Based on ACCSP data from 1998-2007, in the commercial fishery, an average of 950,859 lb dw of smooth dogfish were retained per year. Of this, 47,543 lb dw of fins would be available for sale (5 percent of dw for shark fins). Using the median ex-vessel price of these products between 2004 and 2007 ($0.29 for smooth dogfish meat and $2.02 for smooth dogfish fins), the fishery averaged $371,786 in revenue per year.

Alternatives F2 a1, which would establish a smooth dogfish quota that is equal to the average annual landings from 1998-2007, and F2 a2, which would establish a smooth dogfish quota equal to the maximum annual landing between 1998-2007, could potentially have negative economic impacts on fishermen if the associated quotas reflect significant underreporting. If the actual landings are higher than these two quotas, fishermen would be prevented from fishing at status quo levels, which could result in negative economic impacts. Thus, NMFS does not prefer these two alternatives at this time.

Alternative F2 a3, which would establish a smooth dogfish quota above the maximum annual landings between 1998 and 2007, would have neutral economic impacts. The quota of maximum historical annual landings plus one standard deviation between the years 1998 and 2007 would allow a buffer for potential unreported landings during that time. This would allow the fishery to continue in the future without having to be shut down prematurely, which may not be warranted given smooth dogfish sharks have not been assessed. Thus, alternative F2 a3 is NMFS' preferred alternative at this time.

There are no negative economic impacts anticipated with alternative F2 b1. There is no charge associated with fishermen and researchers obtaining an EFP, SRP, display permit, or LOA for research or the collection for public display. In addition, NMFS would establish a smooth dogfish set-aside that would accommodate current and future research activities. Thus, NMFS does not anticipate any negative economic impacts associated with alternative F2 b1.

As with alternative F2 b1, there are no negative economic impacts anticipated with alternative F2 b2. There is no charge associated with fishermen and researchers obtaining an EFP, SRP, display permit, or LOA for research or for the collection for public display. In addition, NMFS would establish a smooth dogfish set-aside that would accommodate current and future research activities. Thus, NMFS does not anticipate any negative economic impacts associated with alternative F2 b1.

Alternative F3, which would implement management measures for smooth dogfish that complement the ASMFC plan, would likely have neutral to slightly positive socio-economic impacts. Most of the ASMFC regulations would not change the smooth

dogfish fishery, and therefore, would have neutral impacts on fishermen. In addition, the ASMFC's consideration of removing the two hour-net check provision and allowing fishermen to process smooth dogfish while at sea would allow fishermen to conduct the fishery as they have in the past, and therefore, result in neutral or slightly positive socio-economic impacts. However, since NMFS considers the requirements for gillnet checks and maintaining shark fins naturally attached through offloading necessary conservation tools for protected resources and to prevent shark finning, NMFS does not prefer this alternative at this time.

Chapter 6 References

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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 this environmental impact statement (EIS). This RIR builds upon the data and analysis presented in Chapters 4 and 6 of this DEIS. The information contained in Section 7.0, taken together with the data and analysis incorporated by reference, comprise the complete RIR.

The requirements for all regulatory actions specified in EO 12866 are summarized in the following statement from the order:

> *In deciding whether and how to regulate, agencies should assess all costs and benefits of available regulatory alternatives, including the alternative of not regulating. Costs and benefits should be understood to include both quantifiable measures (to the fullest extent that these can be usefully estimated) and qualitative measures of costs and benefits that are difficult to quantify, but nonetheless essential to consider. Further, in choosing among alternative regulatory approaches, agencies should select those approaches that maximize net benefits (including potential economic, environmental, public health and safety, and other advantages; distributive impacts; and equity), unless a statute requires another regulatory approach.*

E.O. 12866 further requires Office of Management and Budget review of proposed regulations that are considered to be "significant." A significant regulatory action is one that is likely to:

- 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, local or tribal governments of communities;
- Create serious inconsistency or otherwise interfere with an action taken or planned by another agency;
- Materially alter the budgetary impact of entitlements, grants, user fees, or loan programs or the rights and obligations of recipients thereof; or
- Raise novel legal or policy issues arising out of legal mandates, the president's priorities, or the principles set forth in this Executive Order.

7.1 Description of the Management Objectives

Please see Chapter 1 for a full description of the purpose and need for the proposed amendments to the 2006 Consolidated HMS FMP and implementing regulations including proposed fishery management actions. The management goals and objectives of the proposed regulation are to provide for the sustainable management of shark species under authority of the Secretary consistent with the requirements of the Magnuson-Stevens Act and other statutes which may apply to such management, including the ESA, MMPA and ATCA. The primary mandate of the Magnuson-Stevens Act is for the Secretary to provide for the conservation and management of HMS through development of an FMP for species identified for management and to implement the FMP with necessary regulations. In addition, the Magnuson-Stevens Act

directs the Secretary in managing HMS to prevent overfishing of species while providing for their OY on a continuing basis and to rebuild fish stocks that are considered overfished. The management objectives of the proposed regulations will be to amend the 2006 Consolidated HMS FMP to ensure that it ends overfishing of both the blacknose shark and shortfin mako sharks, rebuild the blacknose shark, and bring the smooth dogfish under management jurisdiction of the Secretary.

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 a full discussion of the problem and need for these management actions. The proposed regulations are designed to address the following problems. The blacknose shark has been determined to be in an overfished condition with overfishing occurring. The Secretary is responsible for ensuring that he takes action to end overfishing of the stock and rebuild it to its maximum sustained yield. The shortfin mako has been determined to be subject to overfishing and approaching an overfished condition. The Secretary has a responsibility to take action to end and prevent overfishing of the stock. The smooth dogfish is not presently under federal management. The Secretary has determined that the species needs conservation and management and thus has a statutory responsibility to exercise his authority to include the species under NMFS management.

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 economic impacts of the alternatives.

7.5 Economic Analysis of Expected Effects of Each Alternative Relative to the Baseline

Table 7.1 Net Economic Benefits and Costs of Alternatives

Alternatives	Net Economic Benefits	Net Economic Costs
Alternative A1 No Action. Maintain the existing SCS quota	This alternative would maintain current economic activity associated with SCS landing levels in the short term.	In the long term, there could be economic costs associated with continued overfishing of blacknose sharks, including population decline and associated reduced revenues from landings.
Alternative A2 Establish a new SCS quota of 392.5 mt dw and a blacknose commercial quota of 13.5 mt dw	No change in non-blacknose SCS revenues. There would be unquantified benefits to the public associated with reducing the commercial landings of blacknose sharks. However, because discards of blacknose would continue as fishermen direct on non-blacknose SCS, mortality for blacknose sharks would still be above the commercial allowance.	There would be an estimated decrease in annual gross revenues of $134,697 from the commercial harvest of blacknose shark.
Alternative A3 Establish a new SCS quota of 42.7 mt dw and a blacknose commercial quota of 16.6 mt dw; allow all current authorized gears for sharks	There would be unquantified benefits to the public associated with reducing the landings and discards of overfished blacknose sharks. These benefits include passive use values, such as shark viewing trips, and nonuse values including knowing that shark species remain for future generations (bequest value) and values placed on knowing shark species will continue to survive (existence value). Similar benefits could also occur as a result of reduced landings of Atlantic sharpnose, bonnethead and finetooth sharks. Long-term, the blacknose shark stock could rebuild. Then SCS and blacknose quotas could be increased to sustainable levels and allow for increased harvests and associated revenues.	Annual gross revenues for non-blacknose SCS are anticipated to decline by $541,987 annually. Incidental shark permit holders would not be allowed to retain blacknose sharks. Those permit holders would forgo an estimated $12,054 in gross revenues per year from blacknose shark landings. There would be an estimated overall reduction in annual SCS gross revenues of $668,161. There would be economic costs associated with the estimated 62% increase in non-blacknose SCS discards under this alternative.

Alternatives	Net Economic Benefits	Net Economic Costs
Alternative A4 *Establish a new SCS quota of 56.9 mt dw and a blacknose commercial quota of 14.9 mt dw; remove shark gillnet gear as an authorized gear for sharks – Preferred Alternative*	There would be unquantified benefits to the public associated with reducing the landings and discards of overfished blacknose sharks and for non-blacknose SCS. These benefits include passive use values, such as shark viewing trips, and nonuse values including knowing that shark species remain for future generations (bequest value) and values placed on knowing shark species will continue to survive (existence value). This alternative would result in fewer discards of non-blacknose SCS than under alternative A3, and thus reduce the ecological costs associated with dead discards and the operational costs associated with handling discards. Long-term, the SCS stocks could rebuild. Then SCS and blacknose quotas could be increased to sustainable levels and allow for increased harvests and associated revenues.	There would be an estimated reduction of $502,145 in gross revenues annually from non-blacknose SCS. There would be an estimated reduction of $130,928 in gross revenues annually from blacknose sharks. Incidental shark permit holders would not be allowed to retain blacknose sharks. Those permit holders would forgo an estimated $12,054 in gross revenues per year from blacknose shark landings. This alternative could also reduce landings of LCS, predominately blacktip sharks, which are also caught in gillnet gear.
Alternative A5 Close the SCS fishery	Significant unquantified benefits to the public would like be achieved for all SCS species and there would also be some benefits from reduced LCS landings from gillnet gear. These benefits include passive use values, such as shark viewing trips, and nonuse values including knowing that shark species remain for future generations (bequest value) and values placed on knowing shark species will continue to survive (existence value). Long-term, the SCS stocks could rebuild. Then SCS and blacknose quotas could be increased to sustainable levels and allow for increased harvests and associated revenues.	This alternative would result in a loss of annual gross revenues of approximately $661,513 for non-blacknose SCS and $172,197 from blacknose shark landings per year for a total loss of $833,710 in annual gross revenues from SCS landings. It would also be likely that directed shark gillnet fishing would end, except for fishermen that use gillnet gear to strikenet for blacktip sharks. This could decrease average annual gross revenues from LCS landings by an estimated $107,280. This alternative would also severely curtail data collection on all SCS that could be used for future stock assessments.
Alternative B1 No Action. Maintain current authorized gears for commercial shark fishing	No change	No change

Alternatives	Net Economic Benefits	Net Economic Costs
Alternative B2 Close shark gillnet fishery; remove gillnet gear as an authorized gear type for commercial shark fishing	There would be unquantified benefits to the public associated with the positive impacts to SCS and LCS, and resulting from reduced commercial landings and decrease bycatch rates of both target and non-target species, including protected resources. These benefits include passive use values, such as shark viewing trips, and nonuse values including knowing that shark species remain for future generations (bequest value) and values placed on knowing shark species will continue to survive (existence value).	This alternative would close the shark gillnet fishery and negatively impact the business operations of vessels that utilize gillnet gear for shark fishing. It would reduce gross annual landings of SCS with gillnet gear by directed shark permit holders by an estimated $365,955 per year. It would also reduce gross annual landings of SCS with gillnet gear by incidental shark permit holders by an estimated $11,973 per year. There would be an estimated reduction of $109,399 in average annual gross revenues from lost LCS landings. There would be an estimated reduction of $371,786 in gross revenues annually from smooth dogfish landings.
Alternative B3 *Close the gillnet fishery to commercial shark fishing from South Carolina south, including the Gulf of Mexico and Caribbean Sea – Preferred Alternative*	There would be unquantified benefits to the public associated with the positive impacts to SCS, LCS, and smooth dogfish resulting from reduced commercial landings and decrease bycatch rates of both target and non-target species, including protected resources. These benefits include passive use values, such as shark viewing trips, and nonuse values including knowing that shark species remain for future generations (bequest value) and values placed on knowing shark species will continue to survive (existence value).	As a result of a closure of the gillnet fishery to commercial shark fishing from South Carolina south, directed shark fishermen would lose $358,261 average annual gross revenues from lost SCS landings. It would also reduce gross annual landings of SCS with gillnet gear by incidental shark permit holders by an estimated $6,807 per year. There would be an estimated reduction of $106,479 in average annual gross revenues from lost LCS landings.
Alternative C1 No Action. Keep shortfin mako sharks in the pelagic shark species complex and do not change the quota	No change	No change

Alternatives	Net Economic Benefits	Net Economic Costs
Alternative C2 Remove shortfin mako sharks from pelagic shark species quota and establish a shortfin mako quota	Removing shortfin mako sharks from this group of pelagic sharks would allow them to be managed separately and would give NMFS the ability to track this separate quota more efficiently. This could result in more efficient management that would result in less economic impacts.	This alternative is expected to have neutral or slightly negative socioeconomic impacts. While fishermen would be able to maintain current fishing effort under this alternative, any increase in effort would be restricted by the species specific quota of 72.5 mt dw. If the quota is reduced to 72.5 mt dw, which equals $254,135 in average annual gross revenues, this could potentially result in a loss of annual revenues of $1,456,458 for commercial fishermen. However, as shortfin mako sharks are a bycatch species in the PLL fishery, it is unlikely that 488 mt dw of shortfin mako would be landed, and therefore, this alternative could result in neutral or slightly negative socioeconomic impacts for commercial fishermen.
Alternative C3 Remove shortfin mako sharks from pelagic shark species complex and place this species on the prohibited shark species list	Placing shortfin mako sharks on the prohibited species list would prohibit landings and help prevent further overfishing. There would be unquantified benefits to the public associated with this. These benefits include passive use values, such as shark viewing trips, and nonuse values including knowing that shark species remain for future generations (bequest value) and values placed on knowing shark species will continue to survive (existence value). Long-term, the shortfin mako shark stock could rebuild and then harvest could potentially resume at sustainable levels.	This alternative would result in an estimated reduction in average annual gross revenues of $254,135 to the commercial fishermen. In addition, this alternative could lead to increased operation time if commercial fishermen have to release and discard all shortfin makos that are caught on the PLL gear.
Alternative C4 Establish a commercial size limit for shortfin mako sharks	These alternatives would result in varying degree of ecological benefits.	There would be minimal economic impacts, because only a small percentage of commercial landings would be affected by the size restrictions.

Alternatives	Net Economic Benefits	Net Economic Costs
Alternative C4a Establish a minimum size limit for shortfin mako sharks that is based on the size at which 50 percent of female shortfin mako sharks reach the sexual maturity or 32 inches interdorsal length (IDL)	There would be an increase in the number of shortfin mako sharks released alive annually in the PLL fishery. There would be unquantified benefits to the public associated with this. These benefits include passive use values, such as shark viewing trips, and nonuse values including knowing that shark species remain for future generations (bequest value) and values placed on knowing shark species will continue to survive (existence value). Long-term, the shortfin mako shark stock could rebuild and then harvest could potentially resume at sustainable levels.	This alternative would result in an estimated reduction of $4,513 in average annual gross revenues from shortfin mako shark landings.
Alternative C4b Establish a minimum size limit for shortfin mako sharks that is based on the size at which 50 percent of male shortfin mako sharks reach the sexual maturity or 22 inches IDL	There would be an increase in the number of shortfin mako sharks released alive annually in the PLL fishery, but less than under Alternative C4b. There would be unquantified benefits to the public associated with this. These benefits include passive use values, such as shark viewing trips, and nonuse values including knowing that shark species remain for future generations (bequest value) and values placed on knowing shark species will continue to survive (existence value). Long-term, the shortfin mako shark stock could rebuild and then harvest could potentially resume at sustainable levels.	There would be an estimated decrease in average annual gross revenues of $75 from the reduction in commercial harvest of shortfin mako sharks.

Alternatives	Net Economic Benefits	Net Economic Costs
Alternative C5 *Take action at the international level to end overfishing of shortfin mako sharks – Preferred Alternative*	While this alternative would have neutral ecological impacts for shortfin mako sharks in the short term, any management recommendations adopted at ICCAT to help protect shortfin mako sharks would be implemented domestically and could have positive ecological impacts on shortfin mako sharks in the long term. There would be unquantified benefits to the public associated with this. These benefits include passive use values, such as shark viewing trips, and nonuse values including knowing that shark species remain for future generations (bequest value) and values placed on knowing shark species will continue to survive (existence value). Long-term, the shortfin mako shark stock could rebuild and then harvest could potentially resume at sustainable levels.	In the short term, this alternative would not result in any negative economic or social impacts on commercial fishermen as it would not restrict commercial harvest of shortfin mako sharks, nor alter the pelagic shark quota. There could be potential economic impacts in the long-term if ICCAT develops management recommendations that are implemented domestically.
Alternative C6 *Promote the release of shortfin mako sharks brought to fishing vessels alive – Preferred Alternative*	This alternative is expected to have slightly positive or neutral ecological benefits for shortfin mako sharks because 68.9 percent of shortfin makos are brought to the vessel alive and could be released. There would be unquantified benefits to the public associated with this. These benefits include passive use values, such as shark viewing trips, and nonuse values including knowing that shark species remain for future generations (bequest value) and values placed on knowing shark species will continue to survive (existence value). There could also be positive economic benefits to fishermen if they are perceived as being environmentally responsible because they are voluntarily releasing a species suffering from overfishing.	This alternative would likely not result in any negative economic or social impacts as it does not restrict commercial harvest of shortfin mako sharks that are alive at haulback, and quotas and retention limits would remain as described under alternative C1.
Alternative D1 No Action. Maintain the current recreational retention and size limit for SCS	No change	This could have negative ecological impacts on blacknose sharks as blacknose sharks were determined to be overfished with overfishing occurring. This alternative would not allow blacknose sharks to rebuild.

Alternatives	Net Economic Benefits	Net Economic Costs
Alternative D2 Modify the minimum recreational size for blacknose sharks based on their biology	This alternative could increase the landings of recreationally harvested blacknose sharks and, therefore, have positive social and economic impacts in the short-term.	This alternative could result in the increase of blacknose shark recreational landings, and NMFS needs to reduce the number of blacknose shark landings in order to rebuild the stock.
Alternative D3 Increase the retention limit for Atlantic sharpnose sharks based on current catches	Any increase in the retention limit for Atlantic sharpnose sharks would provide positive social and economic impacts, especially if this resulted in more charter trips for charter/headboats.	Since the latest stock assessment suggests that increased fishing efforts could result in an overfished status and/or cause overfishing to occur in the future, this alternative could result in negative ecological impacts.
Alterative D4 *Prohibit retention of blacknose sharks in recreational fisheries - Preferred Alternative*	There would be unquantified benefits to the public associated with reducing recreational landings of overfished blacknose sharks. These benefits include passive use values, such as improved catch-and-release fishing, shark viewing trips, and nonuse values including knowing that shark species remain for future generations (bequest value) and values placed on knowing shark species will continue to survive (existence value).	While recreational fishermen may still catch blacknose sharks, they would not be permitted to retain blacknose sharks and would have to release them. This could have negative social and economic impacts on recreational fishermen, including tournaments and charter/headboats if the prohibition of blacknose sharks resulted in fewer charters. Blacknose sharks rarely, if ever, reach the current federal minimum recreational size limit of 54 inches FL. In addition, blacknose sharks are not one of the primary species targeted by recreational anglers in tournaments or on charters. Thus, NMFS does not anticipate large negative social and economic impacts from this preferred alternative in tournaments or in the charter/headboat sector.
Alternative E1 No Action. Maintain the current recreational measures for shortfin mako sharks	No change	No change

Alternatives	Net Economic Benefits	Net Economic Costs
Alternative E2a Establish a minimum size limit for shortfin makos that is based on the size at which 50 percent of female shortfin mako sharks reach sexual maturity or 108 in FL	This alternative would result in 65% more shortfin mako sharks released than alternative E2b. There would be unquantified benefits to the public associated with this. These benefits include passive use values, such as improved catch-and-release fishing, shark viewing trips, and nonuse values including knowing that shark species remain for future generations (bequest value) and values placed on knowing shark species will continue to survive (existence value). Long-term, this alternative could increase angler consumer surplus by reducing overfishing of shortfin mako sharks and allowing stocks to rebuild.	This alternative would have negative economic impacts on shark recreational fishing, as almost all of the reported shortfin mako sharks landed (99.5%) were smaller than the 108 inch FL size limit and would have to be released.
Alternative E2b Establish a minimum size limit for shortfin makos that is based on the size at which 50 percent of male shortfin mako sharks reach sexual maturity or 73 inches FL	This alternative would cause a positive ecological impact for the stock. There would be unquantified benefits to the public associated with this. These benefits include passive use values, such as improved catch-and-release fishing, shark viewing trips, and nonuse values including knowing that shark species remain for future generations (bequest value) and values placed on knowing shark species will continue to survive (existence value). Long-term, this alternative could increase angler consumer surplus by reducing overfishing of shortfin mako sharks and allowing stocks to rebuild.	This alternative would have less severe impacts on recreational anglers compared to alternative E2a, but would result in a 60.3% overall reduction in recreational shortfin mako shark landings. Economic impacts would be greater on the non-tournament recreational mako shark fishery, as 81% of those landings would fall below the 73 inch FL size limit.
Alternative E3 *Take action at the international level to end overfishing of shortfin mako sharks – Preferred Alternative*	Could have positive ecological impacts on shortfin mako sharks in the long term	No change in the short term. There could be potential economic impacts in the long-term if ICCAT develops management recommendations that are implemented domestically.

Alternatives	Net Economic Benefits	Net Economic Costs
Alternative E4 *Promote the release of shortfin mako sharks brought to fishing vessels alive – Preferred Alternative*	Could have positive ecological impacts on shortfin mako sharks in the long term.	No change
Alternative E5 Prohibit retention of shortfin mako sharks in recreational fisheries (catch and release only)	This alternative would have positive ecological impacts on the stock. There would be unquantified benefits to the public associated with this. These benefits include passive use values, such as improved catch-and-release fishing, shark viewing trips, and nonuse values including knowing that shark species remain for future generations (bequest value) and values placed on knowing shark species will continue to survive (existence value).	This alternative would lead to negative socio-economic impacts for fishermen who participate in recreational shark tournaments that would no longer be able to retain this species during recreational fishing or tournaments and it would also negatively impact fishermen that desire to retain shortfin mako sharks outside of tournaments. This could also reduce the demand for CHB trips that target shortfin mako sharks.
Alternative F1 No Action. Do not add smooth dogfish under NMFS management	No change	No change
Alternative F2 *Add smooth dogfish under NMFS management and develop management measures, such as a federal permit requirement - Preferred Alternative*	Improved data on fishery participation would improve future management of the fishery.	This alternative would result in some administrative costs and fees associated with completing an application for a federal smooth dogfish permit.
Alternative F2 a1 Establish a smooth dogfish quota that is equal to the average annual landings from 1998-2007 (950,859 lb dw)	Potential positive ecological benefits for smooth dogfish could result from setting the quota equal to average current landings.	This alternative could restrict the fishery given the likelihood of underreporting. Establishing a quota equal to average current landings could reduce the revenue generated by the commercial landing of smooth dogfish if there are substantial current unreported smooth dogfish landings.
Alternative F2 a2 Establish a smooth dogfish quota equal to the maximum annual landing between 1998-2007 (1,270,137 lb dw)	Potential positive ecological benefits for smooth dogfish could result from setting the quota equal to the maximum annual landings.	Establishing a quota equal to the maximum annual landings could reduce the revenue generated by the commercial landing of smooth dogfish if there are substantial current unreported smooth dogfish landings

Alternatives	Net Economic Benefits	Net Economic Costs
Alternative F2 a3 *Establish a smooth dogfish quota equal to the maximum annual landing between 1998-2007 plus one standard deviation (1,423,727 lb dw) – Preferred Alternative*	Potential positive ecological benefits for smooth dogfish could result from setting the quota to the maximum annual landings plus one standard deviation.	Establishing a quota equal to the maximum annual landings plus one standard deviation would maintain revenues generated by the commercial landing of smooth dogfish the same if there are substantial current unreported smooth dogfish landings
Alternative F2 b1 *Establish a separate smooth dogfish set-aside quota for the exempted fishing program of 6 mt ww – Preferred Alternative*	No change	No change
Alternative F2 b2 Establish a smooth dogfish set-aside quota for the exempted fishing program and add it to the current 60 mt ww set-aside quota for the exempted fishing program	No change	No change
Alternative F3 Add smooth dogfish under NMFS management and mirror management measures implemented in the ASMFC Interstate Coastal Shark FMP	The economic benefits of this alternative are difficult to assess in the absence of definitive ASMFC management plans.	The future economic costs of this alternative are difficult to assess in the absence of definitive ASMFC management plans.

7.6 Conclusions

As noted above 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; and (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; or, (4) raise novel legal or policy issues arising out of legal mandates, the president's priorities, or the principles set forth in this Executive Order. The preferred alternatives described in this document do not meet the above criteria. The preferred alternatives would have an annual effect on the economy less than $100 million and would not adversely affect the aforementioned parameters (see Table 7.1). The preferred alternatives would also not create an inconsistency or interfere with an action taken by another agency. Furthermore, the preferred alternatives would not materially alter the budgetary impact of entitlements, grants, user fees, the President's priorities, or the principles set forth in E.O. 12866. Nor would the proposed regulations raise any unique legal or policy issues. The Secretary, through NMFS, has been managing shark species through FMPs since 1993 and from time-to-time amending plans and implementing regulations to modify management measures and add additional species for management. In addition, NMFS has participated in international efforts to develop management measures for stocks affected by multiple nations. The preferred alternative and other alternatives do not materially depart from this management approach. 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. The Office of Management and Budget (OMB) concurred with this determination provided in the listing memo for this proposed rule. 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.

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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.) (RFA). The goal of the RFA is to minimize the economic burden of federal regulations on small entities. To that end, the RFA directs federal agencies to assess whether the proposed regulation is likely to result in significant economic impacts to a substantial number of small entities, and identify and analyze any significant alternatives to the proposed rule that accomplish the objectives of applicable statutes and minimize any significant effects on small entities. Certain data and analysis required in an IRFA are also included in other Chapters 6 of this DEIS. Therefore, the IRFA incorporates the economic impacts identified in the DEIS by reference as supporting data for this analysis.

8.1 Description of the Reasons Why Action is Being Considered

Please see Chapter 1 for a description of the need for action for these management actions. The proposed regulations are designed to address the following problems. The blacknose shark has been determined to be in an overfished condition with overfishing occurring. The Secretary is responsible for ensuring that he takes action tend overfishing of the stock and rebuild it to its maximum sustained yield. The shortfin mako has been determined to be subject to overfishing and approaching an overfished condition. The Secretary has a responsibility to take action to end and prevent overfishing of the stock. The smooth dogfish is not presently under federal management. The Secretary has determined that the species needs conservation and management and thus has a statutory responsibility to exercise his authority to include the species in the 2006 Consolidated HMS FMP.

8.2 Statement of the Objectives of, and Legal Basis for, the Proposed Rule

Please see Chapter 1 for a full description of the objective of the proposed rule amendments to the 2006 Consolidated HMS FMP and implementing regulations including proposed fishery management actions. The management goals and objectives of the proposed regulation are to provide for the sustainable management of shark species under authority of the Secretary consistent with the requirements of the Magnuson-Stevens Act and other statutes which may apply to such management, including the ESA, MMPA and ATCA. The primary mandate of the Magnuson-Stevens Act is for the Secretary to provide for the conservation and management of HMS through development of an FMP for species identified for management and to implement the FMP with necessary regulations. In addition, the Magnuson-Stevens Act directs the Secretary, in managing HMS to prevent overfishing of species while providing for their OY on a continuing basis and to rebuild fish stocks that are considered overfished. The management objectives of the proposed regulations will be to amend the 2006 Consolidated HMS FMP to ensure that it ends overfishing of both the blacknose shark and short fin mako, rebuild the blacknose shark, and bring the smooth dogfish under management jurisdiction of the Secretary.

8.3 Description and Estimate of the Number of Small Entities to Which the Proposed Rule Would Apply

NMFS considers all HMS permit holders to be small entities because they either had average annual receipts less than $4.0 million for fish-harvesting, average annual receipts less than $6.5 million for charter/party vessels, 100 or fewer employees for wholesale dealers, or 500 or fewer employees for seafood processors. These are the Small Business Administration (SBA) size standards for defining a small versus large business entity in this industry.

The proposed rule would apply to the 502 commercial shark permit holders in the Atlantic shark fishery based on an analysis of permit holders on March 18, 2009. Of these permit holders, 223 have directed shark permits and 279 hold incidental shark permits. Not all permit holders are active in the fishery in any given year. NMFS estimates that between 2004 and 2007, approximately 85 vessels with directed shark permits and 31 vessels with incidental shark permits landed SCS. A further breakdown of these permit holders is provided in Table 3.32.

The recreational measures proposed would also impact HMS Angling category and HMS Charter/Headboat category permit holders. In general, the HMS Charter/Headboat category permit holders can be regarded as small businesses, while HMS Angling category permits are typically obtained by individuals who are not considered small entities for purposes of the RFA. In 2008, 4,837 vessels obtained HMS Charter/Headboat category permits. Table 3.33 provides the geographic distribution of these permit holders by state and the overall historic trend in the number of permit holders since 2006. It is unknown what portion of these permit holders actively participate in shark fishing or market shark fishing services for recreational anglers.

Finally, the preferred alternatives to add smooth dogfish under NMFS management and develop management measures, such as a federal permit requirement, would impact an additional group of small entities. The number of entities impacted by this preferred alternative cannot be precisely measured at this time, since there is currently no federal permit requirement for smooth dogfish fishing. Utilizing VTR and Coastal Logbook data, an estimate of the number of participants in the commercial smooth dogfish fishery can be calculated. Within the VTR data, a primarily Northeast U.S. reporting system, an average of 213 vessels reported smooth dogfish landings per year between 2004 and 2007. Within the Coastal Logbooks data, a primarily Southeast U.S. reporting system, an average of 10 vessels reported smooth dogfish landings per year between 2004 and 2007. From these data, an estimated 223 commercial vessels would require a smooth dogfish permit.

To estimate the number of recreational participants in the smooth dogfish fishery, NMFS examined MRFSS data. Based on MRFSS data from 2004 to 2007, an average of 58,161 smooth dogfish were retained per year by private anglers and CHBs in the recreational fishery. This number is the upper limit of participants in the federal recreational fishery of the species, and is likely much lower since multiple individual fish are expected to have been caught by one fisherman. Furthermore, based on the life

history of the species and the fact the most recreational fisherman are shore-based, the vast majority of smooth dogfish caught recreationally are in coastal, state waters and would not require a federal HMS angling permit.

NMFS has determined that the proposed rule would not likely affect any small governmental jurisdictions. More information regarding the description of the fisheries affected, and the categories and number of permit holders can be found in Chapter 3.

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 Would Be Subject to the Requirements of the Report or Record

The commercial and recreational measures for SCS and pelagic sharks would not introduce any new reporting and record-keeping requirements. However, alternative F2, would implement federal management of smooth dogfish and establish a permit for commercial and recreational retention of smooth dogfish in federal waters.

The proposed federal permit requirement for smooth dogfish would allow NMFS to collect data regarding participants in the fishery and landings through federal shark dealer reports. The federal dogfish permit requirement would require a similar permit application to the other current HMS permits. The information collected on the application would include vessel information and owner identification and contact information. A modest fee to process the application and annual renewal would also likely be required. The cost would likely be similar to the current fee associated with the Atlantic Tunas General Category and Atlantic HMS Angling permits, which both cost $16 in 2009 to obtain.

8.5 Identification of All Relevant Federal Rules Which May Duplicate, Overlap, or Conflict with the Proposed Rule

Fishermen, dealers, and managers in these fisheries must comply with a number of international agreements, domestic laws, and other FMPs. These include, but are not limited to, the Magnuson-Stevens Act, ATCA, the High Seas Fishing Compliance Act, MMPA, ESA, the National Environmental Policy Act, the Paperwork Reduction Act, and the Coastal Zone Management Act. NMFS does not believe that the new regulations proposed to be implemented would conflict with any relevant regulations, federal or otherwise.

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.

In order to meet the objectives of this proposed rule, consistent with Magnuson-Stevens Act and ESA, NMFS cannot exempt small entities or change the reporting requirements only for small entities because all the entities affected are considered small entities. Thus, there are no alternatives discussed that fall under the first and fourth categories described above. NMFS does not know of any performance or design standards that would satisfy the aforementioned objectives of this rulemaking while, concurrently, complying with the Magnuson-Stevens Act. Thus, there are no alternatives considered under the third category. As described below, NMFS analyzed several different alternatives in this proposed rulemaking and provides rationale for identifying the preferred alternative to achieve the desired objective.

The alternatives considered and analyzed have been grouped into three major categories. These categories include commercial measures, recreational measures, and smooth dogfish. Under commercial measures, alternatives for SCS commercial quotas, gear restrictions, and pelagic shark effort controls were considered and analyzed. The SCS commercial quota alternatives include: (A1) maintain the existing SCS quota; (A2) establish a new SCS quota of 392.5 mt dw and a blacknose commercial quota of 13.5 mt dw; (A3) establish a new SCS quota of 42.7 mt dw and a blacknose commercial quota of 16.6 mt dw; allow all current authorized gears for sharks; (A4) establish a new SCS quota of 56.9 mt dw and a blacknose commercial quota of 14.9 mt dw; remove shark gillnet gear as an authorized gear for sharks; and (A5) close the SCS fishery. The commercial gear restrictions alternatives include: (B1) maintain current authorized gears for commercial shark fishing; (B2) close shark gillnet fishery; remove gillnet gear as an authorized gear type for commercial shark fishing; and (B3) close the gillnet fishery to commercial shark fishing from South Carolina south, including the Gulf of Mexico and the Caribbean Sea. The pelagic shark effort controls alternatives include: (C1) keep shortfin mako sharks in the pelagic shark species complex and do not change the quota; (C2) remove shortfin mako sharks from pelagic shark species quota and establish a shortfin mako quota; (C3) remove shortfin mako sharks from pelagic shark species complex and place this species on the prohibited shark species list; (C4a) establish a minimum size limit for shortfin mako sharks that is based on the size at which 50 percent of female shortfin mako sharks reach the sexual maturity or 32 inches interdorsal length (IDL); (C4b) establish a minimum size limit for shortfin makos that is based on the size at which 50 percent of male shortfin mako sharks reach the sexual maturity or 22 inches IDL; (C5) take action at the international level to end overfishing of shortfin mako

sharks; and (C6) promote the release of shortfin mako sharks brought to fishing vessels alive.

Under recreational measures, NMFS considered alternatives for both SCS and pelagic sharks. The recreational measures considered for SCS include: (D1) maintain the current recreational retention and size limit for SCS; (D2) modify the minimum recreational size for blacknose sharks based on their biology, (D3) increase the retention limit for Atlantic sharpnose sharks based on current catches; and (D4) prohibit retention of blacknose sharks in recreational fisheries. The recreational measures considered for pelagic sharks include: (E1) maintain the current recreational measures for shortfin mako sharks; (E2a) establish a minimum size limit for shortfin makos that is based on the size at which 50 percent of female shortfin mako sharks reach sexual maturity or 108 in FL; (E2b) establish a minimum size limit for shortfin makos that is based on the size at which 50 percent of male shortfin mako sharks reach sexual maturity or 73 inches FL; (E3) take action at the international level to end overfishing of shortfin mako sharks; (E4) promote the release of shortfin mako sharks brought to fishing vessels alive; and (E5) prohibit retention of shortfin mako sharks in recreational fisheries (catch and release only).

Finally, NMFS also considered alternatives for managing smooth dogfish. These alternatives include: (F1) do not add smooth dogfish under NMFS management, (F2) add smooth dogfish under NMFS management and establish a federal permit requirement, and (F3) add smooth dogfish under NMFS management and mirror management measures implemented in the ASMFC Interstate Shark FMP. NMFS considered several alternatives for adding smooth dogfish under NMFS management. These alternatives include: (F2 a1) Establish a smooth dogfish quota that is equal to the average annual landings from 1998-2007 (950,859 lb dw); (F2 a2) establish a smooth dogfish quota equal to the maximum annual landing between 1998-2007 (1,270,137 lb dw); (F2 a3) establish a smooth dogfish quota equal to the maximum annual landing between 1998-2007 plus one standard deviation (1,423,727 lb dw); (F2 b1) establish a separate smooth dogfish set-aside quota for the exempted fishing program of 6 mt ww; and (F2 b2) establish a smooth dogfish set-aside quota for the exempted fishing program and add it to the current 60 mt ww set aside quota for the exempted fishing program.

The potential impacts these alternatives may have on small entities have been analyzed and are discussed in the following sections. The preferred alternatives include: A4, B3, C5, C6, D4, E3, E4, F2, and preferred sub-alternatives F2 a3 and F2 b1. The economic impacts that would occur under these preferred alternatives were compared with the other alternatives to determine if economic impacts to small entities could be minimized while still accomplishing the stated objectives of this rule.

8.6.1 Commercial Measures

8.6.1.1 SCS Commercial Quotas

Under the No Action alternative, A1, there would be no additional economic impacts to directed and incidental shark permit holders as the average annual gross revenues from SCS landings, including blacknose shark landings, would be the same as

the status quo. The average annual gross revenues from 2004 through 2007 from all SCS meat and fins was $833,634.

Based on data from 2004 to 2007 for directed and incidental shark permit holders that landed non-blacknose SCS, the average directed shark permit holder earned $9,427 in average annual gross revenues, and the average incidental shark permit holder earned $707 in average annual gross revenues from non-blacknose SCS landings. For those permit holders that actually landed blacknose shark during that same time period, the average directed shark permit holder earned $3,640 in average annual gross revenues, and the average incidental shark permit holder earned $1,722 in average annual gross revenues from blacknose shark landings. These revenues are not expected to be impacted by alternative A1. However, since alternative A1 would not reduce blacknose shark mortality to the level needed to rebuild blacknose sharks (or 44,853.8 lb dw), NMFS does not prefer this alternative at this time.

Under alternative A2, NMFS would remove blacknose sharks from the SCS quota and create a blacknose shark-specific quota and a separate "non-blacknose SCS" quota, which would apply to finetooth, Atlantic sharpnose, and bonnethead sharks. NMFS anticipates that non-blacknose SCS landings should not decrease as the non-blacknose SCS quota would only be reduced by the average blacknose shark landings. Therefore, the 68 directed and 29 incidental shark permit holders that had non-blacknose SCS landings would not be affected by the new non-blacknose SCS quota. However, the blacknose shark quota would be a 78-percent reduction based on average landings from 2004-2007. Average annual gross revenues for the blacknose shark landings for the entire fishery would decrease from $172,197 under the No Action alternative down to $37,500 under alternative A2, which is a 78-percent reduction in average annual gross revenues for blacknose sharks. Thus, the 44 directed and 7 incidental shark permit holders that had blacknose shark landings would be affected by the new blacknose shark quota. As directed permit holders landed the majority of blacknose shark under the No Action alternative, it is anticipated that directed permit holders would experience the largest impacts under alterative A2. The decrease in average annual gross revenues for directed and incidental permit holders would depend on the specific trip limit associated with the blacknose quota established under A2 (see Appendix A). However, because discards would continue as fishermen directed on non-blacknose SCS, regardless of the retention limits, overall mortality for blacknose sharks would still be above the commercial allowance of 44,853.8 lb dw/year (7,094 blacknose sharks/year), even if the retention of blacknose sharks was prohibited (see Appendix A). Therefore, NMFS does not prefer this alternative at this time.

Under alternative A3, NMFS would remove blacknose sharks from the SCS quota and create a blacknose shark-specific quota and a separate "non-blacknose SCS" quota equal to 42.7 mt dw (94,115 lb dw), which would apply to finetooth, Atlantic sharpnose, and bonnethead sharks. NMFS determined that by reducing the overall SCS fishery, NMFS would reduce the level of blacknose shark discards such that the total blacknose shark mortality would stay below the commercial allowance (see Appendix A). NMFS would establish a blacknose-specific quota of 16.6 mt dw (36,526 lb dw), which is the

amount of blacknose sharks that would be harvested while the non-blacknose SCS quota is harvested (see Appendix A); however, incidental fishermen would not be allowed to retain any blacknose sharks under alternative A3.

While trip limits would not change for non-blacknose SCS for directed and incidental permit holders (*i.e.*, no trip limit for directed fishermen and a 16 non-blacknose SCS/pelagic sharks combined trip limit for incidental fishermen), given the reduction in the non-blacknose SCS quota, NMFS anticipates that the 68 directed and 29 incidental permit holders that had non-blacknose SCS landings would be affected by the new non-blacknose SCS quota. Average annual gross revenues for non-blacknose SCS landings for the entire fishery are anticipated to be $119,526. This is an 82-percent reduction in average annual gross revenues compared to average annual gross revenues expected under the No Action alternative, A1. Since directed permit holders land approximately 97 percent of the non-blacknose SCS landings as explained in alternative A1, NMFS anticipates that directed permit holders would lose more in average annual gross revenues from non-blacknose SCS landings compared to incidental permit holders under alternative A3. Average annual gross revenues for directed shark permit holders of non-blacknose SCS under alternative A3 would be $115,821, which is a loss of $525,185 in average annual gross revenues or an 82-percent reduction in average annual gross revenues from the average annual gross revenues expected under the No Action alternative, A1. Spread amongst the directed shark permit holders that land non-blacknose SCS, this is an anticipated loss of $7,723 in average annual gross revenues from non-blacknose SCS landings per permit holder. Incidental permit holders land approximately 3 percent of the non-blacknose SCS. Average annual gross revenues for incidental shark permit holders of non-blacknose SCS under alternative A3 would be $3,705, which is a loss of $16,802 in average annual gross revenues or also an 82-percent reduction in average annual gross revenues from the average annual gross revenues expected under the No Action alternative, A1. Spread amongst the incidental shark permit holders that land non-blacknose SCS, this is an anticipated loss of $579 in average annual gross revenues from non-blacknose SCS landings per permit holder.

The blacknose shark quota would be a 73-percent reduction based on average landings from 2004-2007. In addition, in order to keep the total mortality of blacknose sharks below the commercial allowance for the HMS Atlantic shark fishery (see Appendix A), incidental shark permit holders would not be allowed to retain blacknose sharks under alternative A3. Thus, the 44 directed and 7 incidental shark permit holders that had blacknose shark landings would be affected by the new blacknose shark quota. Since incidental permit holders would not be able to retain blacknose sharks, the total blacknose shark quota would be available only to directed shark permit holders. Average annual gross revenues for the blacknose shark landings for the directed fishery would decrease from $172,197 under the No Action alternative down to $46,023 under alternative A3, which is a loss of $126,174 or a 73-percent reduction in average annual gross revenues for blacknose sharks for directed shark fishermen. Spread amongst the directed shark permit holders that land blacknose sharks, there would be an anticipated loss of $2,868 in average annual gross revenues from blacknose landings per permit holder. However, since incidental shark permit holders would not be able to retain

blacknose sharks, they would lose an estimated $12,054 in average annual gross revenues from blacknose shark landings. Spread amongst the incidental permit holders that land blacknose sharks, there would be an anticipated loss of $1,722 in average annual gross revenues from blacknose landings per permit holder.

Given the large reduction in the non-blacknose SCS quota under alternative A3, which would affect more directed and incidental permit holders compared to the smaller reduction in the non-blacknose SCS quota under alternative A4, NMFS does not prefer alternative A3 at this time.

Under alternative A4, the preferred alternative, NMFS would remove blacknose sharks from the SCS quota and create a blacknose shark-specific quota and a separate "non-blacknose SCS" quota equal to 56.9 mt dw (125,487 lb dw), which would apply to finetooth, Atlantic sharpnose, and bonnethead sharks. NMFS determined that by reducing the overall SCS fishery, NMFS could reduce the level of blacknose shark discards such that the total blacknose shark mortality would stay below the commercial allowance (see Appendix A). NMFS would establish a blacknose-specific quota of 14.9 mt dw (32,753 lb dw), which is the amount of blacknose sharks that would be landed while the non-blacknose SCS quota is taken (see Appendix A); however, incidental fishermen would not be allowed to retain any blacknose sharks under alternative A4. In addition, this alternative assumes that gillnet gear would not be used to harvest sharks as explained under alternatives B2 and B3.

While trip limits would not change for non-blacknose SCS for directed and incidental permit holders (*i.e.*, no trip limit for directed fishermen and a 16 non-blacknose SCS/pelagic sharks combined trip limit for incidental fishermen), given the reduction in the non-blacknose SCS quota, NMFS anticipates that the 41 directed and 22 incidental shark permit holders that did not use gillnet gear to land non-blacknose SCS would be affected by the new non-blacknose SCS quota. Average annual gross revenues for non-blacknose SCS landings for the entire fishery are anticipated to be $159,368. This is a 76-percent reduction in average annual gross revenues compared to the average annual gross revenues expected under the No Action alternative, A1. Since directed shark permit holders land approximately 97 percent of the non-blacknose SCS landings as explained in alternative A1, NMFS anticipates that directed shark permit holders would lose more in average annual gross revenues from non-blacknose SCS landings compared to incidental shark permit holders under alternative A4. Average annual gross revenues for directed shark permit holders of non-blacknose SCS under alternative A4 would be $153,841, which is a loss of $487,165 in average annual gross revenues or a 76-percent reduction in average annual gross revenues from the average annual gross revenues expected under the No Action alternative, A1. Spread amongst the directed shark permit holders that did not use gillnet gear to land non-blacknose SCS, there could be an anticipated loss of $11,882 in average annual gross revenues from non-blacknose SCS landings per permit holder. Incidental shark permit holders land approximately 3 percent of the non-blacknose SCS landings as explained in alternative A1. Average annual gross revenues for incidental shark permit holders of non-blacknose SCS under alternative A4 would be $4,922, which is a loss of $15,585 in average annual gross revenues or a 76-

percent reduction in average annual gross revenues from the average annual gross revenues expected under the No Action alternative, A1. Spread amongst the incidental shark permit holders that did not use gillnet gear to land non-blacknose SCS, there could be an anticipated loss of $708 in average annual gross revenues from non-blacknose SCS landings per permit holder.

The blacknose shark quota would also be a 76-percent reduction based on average landings from 2004-2007. In addition, in order to keep the total mortality of blacknose sharks below the commercial allowance for the HMS Atlantic shark fishery (see Appendix A), incidental shark permit holders would not be allowed to retain blacknose sharks under alternative A4. Thus, the 15 directed and 5 incidental shark permit holders that did not use gillnet gear to land blacknose sharks would be affected by the new blacknose shark quota. Since incidental shark permit holders would not be able to retain blacknose sharks, the total blacknose shark quota would be available only to directed shark permit holders. Average annual gross revenues for the blacknose shark landings for the directed fishery would decrease from $172,197 under the No Action alternative down to $41,269 under alternative A4, which is a loss of $130,928 or a 76-percent reduction in average annual gross revenues from blacknose sharks for directed shark permit holders. Spread amongst the directed shark permit holders that did not use gillnet gear to land blacknose sharks, there could be an anticipated loss of $8,729 in average annual gross revenues from blacknose landings per vessel. However, since incidental shark permit holders would not be able to retain blacknose sharks, they would lose an estimated $12,054 in average annual gross revenues from blacknose shark landings. Spread amongst the incidental shark permit holders that did not use gillnet gear to land blacknose sharks, there could be an anticipated loss of $2,411 in average annual gross revenues from blacknose landings per permit holder.

NMFS prefers alternative A4 at this time because by reducing effort in the overall SCS fishery, NMFS could reduce the level of blacknose shark discards such that the total blacknose shark mortality would stay below the commercial allowance needed to rebuild the stock. While gillnet fishermen would be affected the most by alternative A4 in combination with alternative B2 or B3, with estimated gross revenue losses between $377,928 and $365,067 from lost non-blacknose SCS and blacknose landings, alternative A4 would allow for a higher non-blacknose SCS quota (56.9 mt dw) compared to alternative A3 (42.7 mt dw). This higher quota would benefit the larger SCS fishery, while the prohibition of gillnet gear would affect a small number of directed gillnet fishermen. Therefore, NMFS prefers alternative A4 at this time.

Alternative A5 would close the entire SCS commercial shark fishery, prohibiting the landing of any SCS, including blacknose sharks. Thus, this alternative would eliminate landings of all SCS, including finetooth, Atlantic sharpnose, bonnethead, and blacknose sharks. This would have negative economic impacts on the average 85 directed shark permit holders, and the average 31 incidental shark permit holders that had SCS landings during 2004-2007. This would result in a loss of average annual gross revenues of $661,513 for non-blacknose SCS and $172,197 from blacknose shark landings for a total loss of $833,710 in average annual gross revenues from SCS landings.

Directed shark permit holders would lose $641,006 in average annual gross revenues from non-blacknose SCS landings and $160,143 in average annual gross revenues from blacknose shark landings for a total of $801,149 in average annual gross revenues. Spread among the 85 directed shark permit holders that landed SCS, this could result in a loss in average annual gross revenues of $9,426 per permit holder.

Incidental shark permit holders would lose $20,507 in average annual gross revenues from non-blacknose SCS landings and $12,054 in average annual gross revenues from blacknose shark landings for a total of $32,561 in average annual gross revenues under alternative A5. Spread among the 31 incidental shark permit holders that landed SCS, this could result in a loss in average annual gross revenues of $1,050 per permit holder.

In addition, as gillnet gear is the primary gear used to target SCS, it is assumed that directed shark gillnet fishing would end, except for fishermen that use gillnet gear to strikenet for blacktip sharks. Approximately 11 directed shark permit holders use gillnet gear to land LCS. This would result in a decrease in LCS landings of 102,171 lb dw and a decrease in average annual gross revenues of $107,280. Spread among the 11 directed shark permit holders that land LCS with gillnet gear, this alternative would result in a loss in average annual gross revenues of $9,753 per permit holder.

While this alternative could reduce blacknose mortality below the commercial allowance of 44,853.8 lb dw, it would also completely eliminate the fishery for all SCS. Of the alternatives analyzed, alternative A5 would result in the most significant economic impacts to small entities. In addition, this alternative would severely curtail data collection on all SCS that could be used for future stock assessments. Thus, NMFS does not prefer this alternative at this time.

8.6.1.2 SCS Commercial Gear Restrictions

Under alternative B1, the No Action alternative, NMFS would maintain the current gear restrictions for rod and reel, gillnet, and BLL gear. Therefore, the economic impacts of alternative B1 would be the same as the status quo, and no negative economic impacts would be anticipated under alternative B1. On average from 2004-2007, the directed and incidental shark permit holders earned average annual gross revenues from SCS landings of $833,634, while the directed and incidental permit holders that landed LCS earned larger gross revenues of $3,328,663. The smooth dogfish fishery is smaller than the other fisheries and only has average annual gross revenues of $371,786 for state and federally permitted fishermen reporting to the ACCSP. Based on this alternative, the average annual gross revenues of these fisheries would remain the same as the status quo. The average number of directed and incidental shark permit holders that reported SCS landings in the Coastal Fisheries logbook from 2004-2007 were 116 (85 directed and 31 incidental shark permit holders), and the LCS fishery had an annual average of 162 permit holders (129 directed and 33 incidental shark permit holders) reporting LCS landings in the Coastal Fisheries logbook from 2004-2007. The number of permit holders would not be impacted by the No Action alternative.

Under alternative B2, NMFS would remove gillnet gear as an authorized gear type for commercial shark fishing. This alternative would have significant negative economic impacts by potentially affecting 30 directed and 7 incidental shark permit holders. On average, directed shark permit holders landed 289,546 lb dw of SCS with gillnet gear. This is equivalent to $365,955 in lost average annual gross revenues from SCS landings for directed shark permit holders. Based on average ex-vessel prices per pound from 2004-2007, directed shark permit holders made $807,792 in average annual gross revenues from SCS landings. On average, incidental shark permit holders landed 9,465 lb dw of SCS with gillnet gear. This is equivalent to $11,973 in lost average annual gross revenues from SCS landings for incidental shark fishermen due to the prohibition of gillnet gear. Based on average ex-vessel prices per pound from 2004-2007, incidental shark permit holders made $25,843 from SCS landings under the status quo. This represents a 45 percent reduction in SCS revenues for directed shark permit holders and a 46 percent reduction in SCS revenues for incidental shark permit holders compared to the No Action alternative, alternative B1.

This alternative would have a minimal negative economic impact on the LCS fishery. Only 11 directed and 5 incidental shark permit holders out of the 162 total shark permit holders would be affected. On average, directed shark permit holders landed 102,171 lb dw of LCS with gillnet gear. This is equivalent to $107,280 in lost average annual gross revenues from LCS landings (3 percent reduction). On average, incidental shark permit holders landed 1,961 lb dw of LCS with gillnet gear. This is equivalent to $2,059 in lost average annual gross revenues from LCS landings for incidental shark permit holders due to the prohibition of gillnet gear. In total ($109,339), this is approximately 3 percent of the gross revenues for the entire LCS fishery under the status quo (*i.e.*, $3,328,663).

Gillnets are also the primary gear type used to catch smooth dogfish. Within the VTR data, a primarily Northeast U.S. reporting system, an average of 213 vessels reported smooth dogfish landings per year between 2004 and 2007. Within the Coastal Fisheries Logbooks data, a primarily Southeast U.S. reporting system, an average of 10 vessels reported smooth dogfish landings per year between 2004 and 2007. From these data, an estimate of 223 vessels would require a smooth dogfish permit; however, as fishermen are currently not required to have a permit to retain smooth dogfish, this could be an underestimate of the number of fishermen that would require a federal commercial permit for smooth dogfish in the future. The average total annual landings from 1998-2007 was 950,859 lb dw (by state and federally permitted fishermen reporting to the ACCSP, however, since fishermen do not have to currently report smooth dogfish landings, this could be an underestimate of total landings, and thus, an underestimate of average annual gross revenues for this fishery). Based on average ex-vessel prices per pound from 2004-2007, average annual gross revenues for the entire smooth dogfish fishery totaled $371,786 from smooth dogfish landings. Based on the preferred alternative F2, which would require fishermen who fish for smooth dogfish in federal waters to obtain a federal smooth dogfish permit, then under alternative B2, those fishermen would not be able to use gillnet gear to land smooth dogfish. This would have a negative economic impacts on fishermen who previously used gillnet gear in federal

waters to land smooth dogfish. However, as fishermen do not have to have a federal permit currently to land smooth dogfish, NMFS is uncertain the universe of fishermen who might be affected by alternatives B2 and F2 at this time. However, given the potential large negative economic impacts of this alternative to the SCS, LCS, and smooth dogfish fisheries, NMFS does not prefer this alternative at this time.

Under alternative B3, the preferred alternative, NMFS would close the commercial gillnet fishery from South Carolina south, including the Gulf of Mexico and the Caribbean Sea. This would have a negative economic impact on federally permitted directed and incidental fishermen. In the SCS fishery, this alternative would affect an average of 27 directed and 5 incidental shark permit holders out of the average 116 total shark permit holders that landed SCS from 2004-2007. The SCS gillnet fishery from South Carolina south accounts for 44 percent of the total directed shark permit holder landings, and 26 percent of landings in the incidental fishery. On average, directed shark permit holders landed 283,462 lb dw ($358,261) of SCS with the gillnet gear from South Carolina south. Thus, directed shark fishermen would lose $358,261 in average annual gross revenues from SCS landings from the gillnet prohibition under alternative B3. Based on average ex-vessel prices from 2004-2007, directed shark permit holders made $807,792 in average annual gross revenues from SCS landings. On average, incidental shark permit holders landed 5,381 lb dw ($6,807) of SCS with gillnet gear from South Carolina south. Thus, incidental shark permit holders would lose $6,807 in average annual gross revenues from non-blacknose SCS landings under alternative B3. The directed and incidental shark permit holders would lose average annual gross revenues of $365,068 from their current gross revenues of $833,634.

This alternative would have minor economic impacts on the LCS fishery. It would only affect 12 directed and incidental shark permit holders. The directed shark permit holders would lose $106,189 in average annual gross revenues from lost LCS landings in gillnet gear from South Carolina south under alternative B3. Incidental shark permit holders would lose $290 from lost LCS landings in gillnet gear from South Carolina south. In total ($106,479), this is only 3 percent of the average annual gross revenues (*i.e.*, $3,328,663) from LCS landings compared to the LCS fishery under the status quo.

Alternative B3, in combination with the preferred alternative F2, would not affect the economics impacts of the smooth dogfish fishery. Smooth dogfish are primarily caught from North Carolina north. The average total landings/year is 950,859 lb dw/year (by state and federally permitted fishermen reporting to the ACCSP, however, since fishermen do not have to currently report smooth dogfish landings, this could be an underestimate of total landings, and thus, an underestimate of average annual gross revenues for this fishery), which translates into average annual gross revenues of $371,786 lb dw/year from smooth dogfish landings. Given smooth dogfish are not typically landed with gillnet gear from South Carolina south, NMFS anticipates that this alternative, in combination with the preferred alternative F2, would not cause any loss in average annual gross revenues from smooth dogfish landings. Since this alternative would assist NMFS in reaching commercial allowance for blacknose sharks for the

commercial shark fishery, and has minimal economic impacts to LCS and smooth dogfish shark fishermen, NMFS prefers this alternative at this time.

8.6.1.3 Pelagic Shark Effort Controls

The No Action alternative, C1, would not modify or alter commercial fishing practices for shortfin mako sharks or other shark species. There would be no additional economic impacts to directed and incidental fishermen as the average annual gross revenues from shortfin mako sharks or other shark species would be the same as the status quo. On average, 72.5 mt dw of shortfin mako sharks were commercially landed between 2004 and 2007, which is equivalent to $350,039 in annual revenues. On average between 2004 and 2007, approximately 90 vessels had shortfin mako shark landings. Directed shark permit holders made up 39 of these vessels. However, since shortfin mako is typically incidentally caught, the average landings value per vessel was estimated by dividing annual revenues amongst all the vessels that have landed shortfin mako. Therefore, the vessels that landed shortfin mako generated an average of $3,889 in gross revenues per year from shortfin mako sharks.

Alternative C2 would implement a species-specific quota for shortfin mako at the level of the average annual commercial landings for this species. This alternative is expected to have neutral or slightly negative economic impacts. On average, 72.5 mt dw (159,834 lb dw) of shortfin mako sharks were commercially landed between 2004 and 2007, which is equivalent to $350,039 in average annual gross revenues. Spread amongst the vessels that landed shortfin mako sharks, the average vessel earned $3,889 in annual gross revenues from shortfin mako sharks. While fishermen would be able to maintain current fishing effort under this alternative, any increase in effort would be restricted by the species-specific quota of 72.5 mt dw. Under the No Action alternative, commercial fishermen currently have a 488 mt dw quota, which could potentially be filled entirely by shortfin mako landings. This could result in maximum annual revenues equal to $2,356,106. Thus, there is the potential loss of the option to fish up to the maximum level under this alternative. This difference is $2,006,067 in annual gross revenues from shortfin mako sharks. Spread amongst the 90 vessels that, on average, have landed shortfin mako sharks from 2004 to 2007, that difference would be $22,289 annually per vessel. However, given shortfin mako sharks are incidentally caught in the PLL fishery, it is unlikely that the entire pelagic shark quota would be entirely filled with shortfin mako landings. NMFS does not prefer this alternative at this time because the United States contributes a small portion of shortfin mako mortality due the lack of a directed fishery compared to shortfin mako mortality resulting from the fishing of foreign vessels outside of the U.S. EEZ. In addition, this alternative does not minimize the potential economic impacts on small entities.

Alternative C3 would remove shortfin mako sharks from the pelagic shark species complex and add them to the prohibited species list. This alternative is not expected to have negative economic impacts for commercial fishermen because it is not a species that is targeted by commercial fishermen. Shortfin mako sharks are predominately caught incidentally in the PLL fishery and, on average, the commercial landings for shortfin mako sharks, from 2004 to 2007 were 72.5 mt dw with an estimated gross ex-vessel

value of $350,039. However, since shortfin makos would be placed on the prohibited species list under alternative C3, there could be an estimated reduction in average annual gross revenues of $350,039 to the commercial fishermen. Based on the average number of vessels that have landed shortfin mako from 2004 to 2007, the revenue reductions would be approximately $3,889 per vessel annually. In addition, this alternative could lead to increased operation time if commercial fishermen have to release and discard all shortfin makos that are caught on the PLL gear. In addition, if the commercial PLL fleet expands in the future, placing shortfin mako sharks on the prohibited species list could result in a loss of future revenues for the commercial PLL fishery. Thus, NMFS does not prefer this alternative at this time.

Alternative C4a would establish a minimum size limit for shortfin makos that is based on the size at which 50 percent of female shortfin mako sharks reach sexual maturity or 32 inches IDL. The summed dressed weight of all shortfin mako sharks kept under the 32 inches IDL size limit made up 1.4 percent of total dressed weight landings of shortfin mako sharks based on POP data. NMFS estimated this would reduce shortfin mako harvests by 2,061.1 lb dw. The economic impacts of this restriction would be an average annual gross revenues loss of $4,513 for this fishery. Spread amongst the 90 vessels that have landed shortfin mako sharks from 2004 to 2007, the per vessel losses would be approximately $50 annually.

Alternative C4b would establish a minimum size limit for shortfin makos that is based on the size at which 50 percent of male shortfin mako sharks reach sexual maturity or 22 inches IDL. The summed dressed weight of all kept shortfin mako sharks under the 22 inches IDL size limit made up 0.02 percent of dressed weight landings of shortfin mako based on POP data. NMFS estimated this would reduce shortfin mako harvests by 34.3 lb dw. The economic impacts of this restriction would be an average annual gross revenues loss of $75 for this fishery.

Alternatives C4a and C4b would have minimal economic impacts because only a small percentage of commercial landings would be affected by the size restrictions. Of the two alternatives, the negative economic impact of C4a would be greater, as commercial landings by weight are 2,026.8 lb dw greater than in alternative C4b. Despite these minimum economic impacts, since the size limits would not reduce fishing mortality of shortfin mako sharks in the commercial sector, NMFS does not prefer these alternatives at this time.

Under alternative C5, the preferred alternative, NMFS would, take action at the international level through international fishery management organizations to establish management measures to end overfishing of shortfin mako sharks. In the short term, this alternative would not result in any negative economic impacts on commercial fishermen as it would not restrict commercial harvest of shortfin mako sharks, nor alter the pelagic shark quota. Therefore, the economic impacts of alternative C5 would be the same as described in the No Action alternative C1. However, this alternative could have negative economic impacts in the long term if directed management measures were adopted at an appropriate international forum that would require the reduction of landings domestically

for shortfin mako sharks. Recommended reductions in landings, if implemented by multiple nations, would ultimately end overfishing of shortfin mako. Therefore, NMFS prefers alternative C5 at this time.

Alternative C6, the preferred alternative, would promote the release of shortfin mako sharks brought to fishing vessels alive. This alternative would likely not result in any negative economic impacts on commercial fishermen as it does not restrict commercial harvest of shortfin mako sharks that are alive at haulback, and quotas and retention limits would remain as described in the No Action alternative C1. However, as this alternative could result in the reduction of fishing mortality of shortfin mako sharks by encouraging fishermen to release shortfin mako sharks brought to the fishing vessel alive, NMFS prefers this alternative at this time.

8.6.2 Recreational Measures

8.6.1.4 Small Coastal Sharks

Under alternative D1, the No Action alternative, NMFS would maintain the current recreational management measures, including the current retention limits and size limits for SCS. Therefore, the economic impacts of alternative D1 would be the same as the status quo, and no negative economic impacts would be anticipated under alternative D1. However, as this alternative would not help rebuild blacknose sharks, as explained in the ecological impacts in Chapter 4, NMFS does not prefer this alternative at this time.

Alternative D2 would modify the minimum recreational size for blacknose sharks based on the biology of blacknose sharks. This would lower the current size limit from 54 inches FL to 36 inches FL, the size at which 50 percent of the female blacknose sharks reach sexual maturity. This could increase the landings of recreationally harvested blacknose sharks and, therefore, have positive economic impacts for small business entities supporting recreational fishermen. The potential for increased landings associated with the lower size limit could marginally increase demand for charter/headboat services and for products and service provided by shoreside businesses that support recreational fishermen. Since this alternative could result in the increase of blacknose shark recreational landings, and NMFS needs to reduce the number of blacknose shark landings in order to rebuild the stock, NMFS does not prefer this alternative at this time.

Alternative D3 would increase the retention limit for Atlantic sharpnose sharks based on their current catches and stock status. Any increase in the retention limit for Atlantic sharpnose sharks would provide positive economic impacts for recreational fishermen, especially if this resulted in more charter trips for charter/headboats. However, since the latest stock assessment suggests that increased fishing efforts could result in an overfished status and/or cause overfishing to occur in the future (NMFS, 2007), NMFS does not prefer this alternative at this time.

Under alternative D4, the preferred alternative, NMFS would prohibit the retention of blacknose sharks in the recreational fishery. While recreational fishermen

could still catch blacknose sharks, they would not be permitted to retain blacknose sharks and would have to release them. This could have negative economic impacts on recreational fishermen, including tournaments and charter/headboats if the prohibition of blacknose sharks resulted in fewer charters and reduced tournament participation. However, since blacknose sharks are not one of the primary species targeted by recreational anglers, in tournaments, or on charters, NMFS does not anticipate large negative economic impacts from this alternative on tournaments or charter/headboat businesses. Therefore, NMFS prefers this alternative at this time since it meets the objectives of this draft amendment of reducing overfishing of blacknose sharks while also minimizing economic impacts on small entities.

8.6.1.5 Pelagic Sharks

Maintaining the current recreational measures for shortfin mako sharks under alternative E1 would likely not result in any adverse economic impacts on small entities since the No Action alternative would not modify or alter recreational fishing practices for shortfin mako sharks or other shark species. However, this alternative would not meet the objective of this rule in reducing overfishing of shortfin mako sharks, thus, NMFS does not prefer this alternative at this time.

Alternative E2a would set a minimum size limit for shortfin mako sharks of 108 inches FL in the recreational fishery. This would have the most severe economic impacts of all the alternatives considered, as almost all of the reported shortfin mako sharks landed (99.5 percent) were smaller than the proposed 108 inch FL size limit and would have to be released. This alternative would basically create a catch-and-release fishery for shortfin mako sharks. The impacts of alternative E2b would be less severe than alternative E2a, as it would set a minimum size limit for shortfin mako sharks of 73 inches FL in the recreational fishery. This would result in a 60.3 percent overall reduction in recreational shortfin mako shark landings. Under this alternative, economic impacts would be greater on the non-tournament recreational mako shark fishery, as 81 percent of those landings would fall below the 73 inch FL size limit. The percentage of recreational landings during tournaments that would be released under alternative E2b would be less than the non-tournament recreational landings (51.7 percent to 81 percent, respectively). According to LPS data, 41 percent of shortfin mako sharks caught are kept; therefore, size limits in alternatives E2 may have a substantial economic impact on the recreational fishery. Thus, NMFS does not prefer E2a or E2b at this time.

Under alternative E3, NMFS would take action at the international level to end overfishing of shortfin mako sharks through participation in international fisheries organizations such as ICCAT. This alternative would not result in any changes in the current recreational regulations regarding bag or size limits for shortfin mako sharks. Therefore, this alternative would likely not result in any negative economic impacts for recreational fishermen and the small businesses that support those recreational fishing activities in the short term as compared to the No Action alternative, E1. In addition, this alternative could help end overfishing of shortfin mako sharks in the long term through an international plan to conserve shortfin mako sharks. Therefore, NMFS prefers this alternative at this time.

Under alternative E4, NMFS would promote the live release of shortfin mako sharks in the recreational shark fishery, but this alternative would not result in any changes in the current recreational regulations regarding bag or size limits for shortfin mako sharks. Therefore, this alternative would likely not result in any economic impacts compared to the No Action alternative, alternative E1. However, it would encourage the live release of shortfin mako sharks, and could help reduce fishing pressure on this species. Therefore, NMFS prefers this alternative at this time.

Under alternative E5, NMFS would remove shortfin mako sharks from the authorized species list and add them to the prohibited species list. Placing shortfin mako sharks on the prohibited species list would make the recreational fishery for shortfin mako sharks a catch-and-release fishery. Although a small number of shortfin mako sharks were landed in the recreational fishery from 2004 to 2007, it is also an important fishing tournament species. Fishing tournaments are an important component of HMS recreational fisheries. In 2008, there were 42 shark tournaments throughout the U.S. Atlantic Coast, including the Gulf of Mexico and the Caribbean Sea. Therefore, adding this species to the prohibited species list could lead to negative economic impacts for tournament operators since they may have to modify their tournament rules and could face reduced demand for participation, and thus reduce revenues from entry fees. A recreational catch-and-release fishery for shortfin mako may also reduce demand for CHB trips that target shortfin mako sharks. In addition, since the United States only contributes to a small portion of the overall mortality for shortfin mako sharks, prohibiting them in the recreational fishery would not end overfishing for this species. Given these reasons and the economic impacts of this alternative are estimated to be higher than that of the preferred alternatives, NMFS does not prefer this alternative at this time.

8.6.3 Smooth Dogfish

NMFS also considered alternatives regarding the potential inclusion of smooth dogfish under NMFS management. Smooth dogfish are currently not managed by NMFS, and stock data are sparse. Therefore, there is limited stock status information, participant information, and effort data for this fishery.

Under alternative F1, the no action alternative, NMFS estimates that there would not be any economic impacts to small entities beyond the status quo. This alternative would have the lowest costs alternative to small entities. However, applying the No Action alternative would not meet the objectives of this rule since it would preclude gathering fishery participant information. Therefore, NMFS does not prefer this alternative at this time.

Implementing federal management of smooth dogfish through alternative F2 would focus on characterizing the fishery and stock status, but would not actively change catch levels or rates. Therefore, this alternative would likely have minor economic impacts on small entities. Business entities that fish commercially for smooth dogfish would have to purchase an open access smooth dogfish commercial fishing permit, and

dealers would have to report smooth dogfish landings. The costs to small entities would include the costs of obtaining the permit, the time involved in completing the permit form, and the administrative costs associated with reporting landings. In addition, recreational anglers that would want to retain smooth dogfish in federal waters would need to purchase an HMS Angling category permit. While this alternative results in more costs to small entities than alternative F1, it helps meet the objectives of this rule of gathering more information on participation in this fishery, and therefore is preferred at this time.

Sub-alternatives F2 a1, which would establish a smooth dogfish quota that is equal to the average annual landings from 1998-2007, and F2 a2, which would establish a smooth dogfish quota equal to the maximum annual landing between 1998-2007, could potentially have negative economic impacts on fishermen if the associated quotas reflect a significantly underreported fishery. If the actual landings are higher than these two quotas, fishermen would be prevented from fishing at status quo levels, and thus experience negative economic impacts. Thus, NMFS does not prefer these two sub-alternatives at this time.

Sub-alternative F2 a3, which would establish a smooth dogfish quota above the maximum annual landing between 1998-2007, is anticipated to have neutral economic impacts. Establishing a quota of maximum historical annual landings plus one standard deviation between the years 1998 and 2007 would allow a buffer for potential unreported landings during that time. This would allow the fishery to continue in the future without having to be shut down prematurely, which may not be warranted given smooth dogfish sharks have not been assessed. Thus, NMFS prefers sub-alternative F2 a3 at this time.

There are no negative economic impacts anticipated with alternative F2 b1. There is no charge associated with fishermen and researchers obtaining an EFP, SRP, display permit, or LOA for research or the collection for public display. In addition, NMFS would establish a smooth dogfish set aside that would accommodate current and future research activities. Thus, NMFS does not anticipate any negative economic impacts associated with alternative F2 b1, and NMFS prefers sub-alternative F2 b1 at this time.

As with sub-alternative F2 b1, there are no negative economic impacts anticipated with sub-alternative F2 b2. There is no charge associated with fishermen and researchers obtaining an EFP, SRP, display permit, or LOA for research or for the collection for public display. In addition, NMFS would establish a smooth dogfish set-aside that would accommodate current and future research activities. Thus, NMFS does not anticipate any negative economic impacts associated with sub-alternative F2 b1.

Alternative F3, which would implement management measures for smooth dogfish that complement the ASMFC plan, would likely have neutral to slightly positive economic impacts. Most of the ASMFC regulations would not change the smooth dogfish fishery, and would therefore, would have neutral impacts on fishermen. In addition, the ASMFC's consideration of removing the two hour-net check provision and allowing fishermen to process smooth dogfish while at sea would allow fishermen to

conduct the fishery as they have in the past, and therefore, result in neutral or slightly positive economic impacts. However, since NMFS considers the requirements for gillnet checks and maintaining shark fins naturally attached through offloading necessary conservation tools for protected resources and to prevent shark finning, NMFS does not prefer this alternative at this time.

Chapter 8 References

NMFS. 2007. SEDAR 13 Stock Assessment Report: Small Coastal Sharks, Atlantic Sharpnose, Blacknose, Bonnethead, and Finetooth Shark. Highly Migratory Species Management Division, 1315 East West Highway, Silver Spring, MD 20910. 375 pp.

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9.0 COMMUNITY PROFILES

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 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 NS 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." (§301(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

A complete description of the updated community profiles and assessments can be found in Chapter 6 of the 2008 SAFE Report (NMFS, 2008). Chapter 6 of the 2008 SAFE Report consolidated all of the communities profiled in previous HMS FMPs or FMP amendments and updated the community information where possible. Of the communities profiled in the 2008 SAFE Report, ten 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. The remaining 14 communities, although not selected initially, have been identified as communities that could be impacted by changes to the current HMS regulations because of the number of HMS permits associated with these communities, and their community profile information has been incorporated into the document. The descriptive community profiles in the 2008 SAFE Report are organized by state and include information provided by Wilson, *et al.* (1998), Kirkley (2005), Impact Assessment, Inc. (2004), and recent information obtained from MRAG Americas, Inc. (2008).

In addition, please refer to the Description of the Affected Environment in Chapter 3, Environmental Justice analysis in Chapter 4, the Economic Evaluation in Chapter 6, the RIR in Chapter 7, and the IRFA in Chapter 8 of this document for additional information. Furthermore, each of the management alternatives in Chapter 4 includes an assessment of the potential social

and economic impacts associated with the preferred alternatives. The preferred alternatives were 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 Overview of the Shark Fishery

The shark fisheries of the Atlantic and Gulf of Mexico extend from Maine to Texas, and include Puerto Rico and the U.S. Virgin Islands. The geographic extent of the shark directed and incidental commercial permit holders is large, but is currently concentrated in the waters off four states; Florida (55 percent of shark permits), New Jersey (11 percent of shark permits), Louisiana (8 percent of shark permits), and North Carolina (6 percent of shark permits). The shark fishery is notable for the degree of flexibility of the commercial fishing fleet. Of the 499 vessels in the 2008 fleet, 214 vessels (43 percent) held directed shark fishery permits. The remaining 57 percent (285 vessels) held incidental catch permits that target species other than sharks. Vessels which engage in the directed shark fishery do so on a seasonal basis, depending on area and the length of the fishing season, and fish for other species at other times of the year.

Shark directed and incidental permit holders also possess permits in other HMS and non-HMS fisheries (Table 3.32). As of March 18, 2009, there are 100 federally permitted shark dealers, the majority of which are located in Florida (39 percent). Table 3.35 shows the number of shark dealers permitted in each state as of March 18, 2009. Dealers that possess shark permits also often hold dealer permits for other species such as swordfish, dolphin/wahoo, reef fish and snapper/grouper. The additional permits that the commercial shark fishermen and dealers possess may help mitigate economic and social impacts of the preferred management measures. For additional information on the directed and incidental shark fishery, please refer to Chapter 3, Description of the Affected Environment.

Chapter 9 References

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10.0 OTHER CONSIDERATIONS

10.1 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 earlier chapters.

NS 1 requires NMFS to prevent overfishing while achieving, on a continuing basis, OY from each fishery for the U.S. fishing industry. As summarized in other chapters, over the past several years, NMFS has undertaken numerous management actions, including the 2006 Consolidated HMS FMP and Amendment 2 to the 2006 Consolidated HMS FMP, to address overfishing and to rebuild HMS stocks. The preferred alternatives in this document are consistent, to the greatest extent practicable, with ongoing management efforts to rebuild, manage, and conserve target species in accordance with the NSG1.

- The Magnuson-Stevens Act requires FMPs to include a mechanism for specifying ACLs and AMs for all fisheries. ACLs and AMs must be effective for species or complexes subject to overfishing by 2010 and for all other species or complexes no later than 2011. The 2006 Consolidated HMS FMP does not presently include such a mechanism or a practice of specifying annual ACLs. Therefore, the 2006 Consolidated HMS FMP needs to be amended to meet this requirement by the statutory deadline for species and complexes it manages. In addition, it must also consider whether it needs to propose or amend implementing regulations to specify ACLs annually and apply AMs. This amendment develops an appropriate mechanism for specifying ACLs to prevent and end overfishing within the constraints of existing data and annually set ACLs and apply AMs to ensure that ACLs are not exceeded.
- The preferred commercial and recreational SCS alternatives would be consistent with NS 1 because they implement mortality reductions consistent with the 2007 SCS stock assessments to end overfishing and rebuild the blacknose shark stock. Furthermore, the preferred commercial SCS alternative would establish a separate blacknose shark quota and non-blacknose SCS quota. This will meet the OY for blacknose sharks along with rebuilding the stock; however catch of non-blacknose SCS will decrease since they are caught in the same manner as blacknose sharks.
- The commercial gear restrictions preferred alternative would be another measure by which recommended reductions in blacknose shark mortality would be achieved. This would serve as a way to stop overfishing of this species, consistent with NS 1. The shark gillnet gear closure would be implemented within the blacknose shark's range, thereby providing the opportunity for the harvest of shark stocks that are healthy and not currently overfished.
- Consistent with NS 1, the domestic commercial and recreational pelagic shark preferred alternatives to promote live release of shortfin mako in conjunction with existing management measures would potentially reduce overfishing of the shortfin mako shark. This species, however, has an Atlantic-wide distribution, and U.S. landings are a small percentage of the total international landings. Therefore, working at the international level to develop management measures for other nations to adopt and implement would support

ending overfishing of shortfin mako sharks. Domestically, encouraging the live release of shortfin mako sharks would help reduce the mortality within U.S. waters.

- The preferred alternative for smooth dogfish would be consistent with NS 1 as it would provide federal management of the species. The management measures would require a federal permit for commercial and recreational fishermen in order to retain smooth dogfish in federal waters. In addition, it would implement a commercial quota for this species at a level that could prevent overfishing. These measures should not affect how the fishery is currently prosecuted, rather, it would help characterize the fishery and identify its participants. Beyond the new federal permit and associated quota, no new restrictions would be placed on the fishery.

NS 2 requires that conservation and management measures be based on the best scientific information available. The preferred alternatives in this document are consistent with NS 2 guidelines.

- The preferred commercial and recreational SCS alternatives are consistent with NS2 because they are based on the latest SCS stock assessments. Results from the 2007 SCS stock assessments represent the best available science.
- The commercial gear restrictions preferred alternative would be consistent with NS2 since the mortality reductions are based on the 2007 SCS stock assessments. NMFS used the best available data in terms of dealer reports, observer reports, and logbook data to analyze the impacts associated with the commercial gear restrictions alternatives.
- Consistent with NS2, the commercial and recreational shortfin mako shark preferred alternatives are based on the latest SCRS stock assessment for shortfin mako sharks
- The preferred alternative for smooth dogfish management measures would be consistent with NS2. Due to the lack of previous federal management, data regarding catch levels and the number of participants in the fishery are sparse. Quotas established within this preferred alternative are based upon the best available landings data from VTR, logbook, and ACCSP data. While these data are not robust, they constitute the best scientific information available at this time.

NS 3 requires that, to the extent practicable, an individual stock of fish be managed as a unit throughout its range and interrelated stocks of fish be managed as a unit or in close coordination. The preferred alternatives in this document are consistent with this NS.

- The preferred commercial and recreational SCS alternatives are consistent with NS3 as blacknose sharks would be managed throughout their ranges to the extent of federal jurisdiction from Virginia through the Gulf of Mexico.
- The commercial gear restrictions preferred alternative would be consistent with NS3 as it would apply gillnet gear restrictions within the area where blacknose sharks interact with gillnet gear (South Carolina south).
- The shortfin mako shark range extends beyond U.S. waters. NMFS would work with other nations at the international level to establish appropriate management measures to reduce fishing pressure on shortfin mako sharks across its range.
- The preferred alternative for smooth dogfish management measures would be consistent with NS3 as they would manage the species throughout its range from Maine to Texas,

including the Caribbean. Federal permit requirements and quotas would apply to all shark fishermen wanting to retain smooth dogfish in these areas.

NS 4 requires 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 share of such privileges. The preferred alternatives in this document are consistent with this NS.

- The commercial SCS effort control preferred alternative would apply to all fishermen in the Atlantic, Gulf of Mexico, and the Caribbean Sea.
- The commercial gear restrictions preferred alternative is limited in its geographic scope from South Carolina south. This measure is based on the range of blacknose sharks and does not directly allocate fishing privileges, nor does it discriminate between residents of different states. While it is true that the effect of the gear restriction will result in a disproportionate adverse effect to shark fishermen using gillnets for shark fishing south of South Carolina, the measure was based on the blacknose shark's distribution range and will serve an important conservation purpose for the species and is therefore consistent with NS4.
- The recreational SCS preferred alternative, and both the recreational and commercial pelagic shark preferred alternatives, apply to the entire U.S. EEZ within the Atlantic, Gulf of Mexico, and the Caribbean Sea. Therefore, these measures do not discriminate between residents of different states, nor do they allocate fishing privileges and are consistent with NS4.
- The smooth dogfish management preferred alternative, which entails a federal smooth dogfish permit and quota, is consistent with NS4 because it is an open access permit and does not allocate fishing privileges. Additionally, the measure would apply in the entire U.S. EEZ within the Atlantic, Gulf of Mexico, and Caribbean, and would not discriminate between residents of different states.

NS 5 requires 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 alternatives in this document are consistent with this NS.

- Consistent with NS 5, the conservation and management measures in both the commercial SCS and commercial gear restrictions preferred alternatives were analyzed for changes in the efficiency of utilization of the fishery resource. Closure of the shark directed gillnet fishery could lead to a significant reduction in blacknose shark harvest and could result in a decrease in efficiency of harvesting other SCSs. However, removing gillnets from the approved list of gears for the directed shark fishery would help prevent overfishing of blacknose sharks. Furthermore, the gear would only be prohibited within the blacknose shark's range (*i.e.*, South Carolina south, Gulf of Mexico, and the Caribbean Sea), thereby minimizing its impact in the utilization of the fishery resource. Consistent with NS 5, neither of these preferred alternatives has economic allocation as their sole purpose.

- The preferred alternative for the SCS recreational measures would prohibit the retention of blacknose sharks by recreational fishermen as a way to help rebuild blacknose sharks. Given blacknose sharks rarely, if ever, reach the current minimum size, this should not have an impact on the utilization of fishery resource. Consistent with NS 5, this preferred alternative does not have economic allocation as its sole purpose.
- Both the commercial and recreational pelagic shark preferred alternatives were analyzed for changes in the efficiency in the utilization of the fishery resource, consistent with NS 5. Encouraging the live release of shortfin mako sharks within the commercial and recreational fisheries will purposefully not impact the efficiency of fishery resource extraction. Measures promoted at the international level would similarly work to reduce fishing pressure, but likely maintain a certain level of catch. Consistent with NS 5, neither of these preferred alternatives have economic allocation as their sole purpose.
- Establishing federal management measures for smooth dogfish would not affect the efficiency of utilization of the fishery resource, consistent with NS 5. The preferred alternative would require a permit for fishermen fishing for smooth dogfish in federal waters and establish a commercial quota. The smooth dogfish fishery would remain an open access fishery with no new gear restrictions. Consistent with NS 5, this preferred alternative does not have economic allocation as its sole purpose.

NS 6 states that conservation and management measures shall take into account and allow for variations among, and contingencies in, fisheries, fishery resources, and catches. The preferred alternatives in this document are consistent with this NS.

- Each of the preferred alternatives implements measures that consider the variations among, and contingencies in, fisheries, fishery resources, and catches. The measures proposed relate to either fishing effort/retention restrictions, including gear restrictions and prohibition of blacknose sharks in the recreational sector, or quotas, as is in the case of the commercial blacknose shark and the smooth dogfish fisheries. Measures are already in place to ensure quotas are not exceeded in the presence of variations in the fishery and catches; however, quotas could change in the future if warranted by new stock assessments. Timely reporting of catch data and the requirement to close the fishery after 80 percent of the quota utilized would allow for these measures to adjust to variations and contingencies, consistent with NS 6.

NS 7 states that conservation and management measures shall, where practicable, minimize costs and avoid unnecessary duplication. The preferred alternatives in this document are consistent with this NS.

- The costs associated with most of the preferred alternatives are minimal as they would implement measures restricting fishing effort and/or retention. The only preferred alternative to have an associated cost is the establishment of a smooth dogfish federal permit. A minimal fee would be required upon applying for the permit, but would not introduce a significant barrier to the fishery. Consistent with NS 7, the preferred alternatives were analyzed to avoid unnecessary duplication.

NS 8 states 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 in this document are consistent with this NS.

- The preferred alternatives are necessary to allow rebuilding and end overfishing of blacknose sharks consistent with NS 1. There are substantial social and economic impacts associated with the preferred alternatives as a result of the management measures needed to reduce fishing mortality and effort as prescribed by recent stock assessments. NMFS considered a range of alternatives with varying environmental, economic, and social impacts but only certain alternatives would accomplish the goals necessary to rebuild overfished shark species and prevent overfishing. The preferred alternatives would strike an appropriate balance between positive ecological impacts that must be achieved to rebuild and prevent overfishing on depleted stocks while minimizing, to the extent practicable, the severity of negative social and economic impacts that will occur as a result.
- Closure of the shark gillnet fishery from South Carolina south is limited to the range of the blacknose shark. The preferred alternatives minimized impacts on the greatest number of fishermen possible.
- Encouraging the live release of shortfin mako sharks in both the recreational and commercial fisheries would still allow for retention.
- The smooth dogfish permit would be open access and should not create any significant barriers to entering or remaining in the fishery.
- The preferred alternative for the SCS recreational measures would prohibit the retention of blacknose sharks by recreational fishermen as a way to help rebuild blacknose sharks. Given blacknose sharks rarely, if ever, reach the current minimum size, this should not have an impact on federally permitted fishermen.
- Communities may be negatively affected by the need to reduce quotas and retention limits consistent with NS 1. While it is true that the effect of the gear restriction will result in a disproportionate adverse effect to shark fishermen using gillnets for shark fishing south of South Carolina, the measure was based on the blacknose shark's distribution range and will serve an important conservation purpose for the species and is therefore consistent with NS8. SCS quota reductions will not disproportionately affect any one community or region.

NS 9 states 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. The preferred alternatives in this document are consistent with this NS.

- The SCS and commercial gear restrictions preferred alternatives would minimize bycatch as it is expected to reduce overall fishing effort targeting sharks with gillnets. Gillnets have historically had bycatch rates larger than other types of gear, and the elimination of this gear type within a portion of the U.S. EEZ would likely reduce bycatch of sharks and protected species.
- The recreational SCS preferred alternative to prohibit landings of blacknose sharks in the recreational fishery does not directly address bycatch reduction; however, it is unlikely that this measures would increase bycatch. Management measures currently in place would

continue to address bycatch and reduce it the extent practicable.

- The commercial and recreational shortfin mako shark preferred alternatives will encourage the live release of the species including when caught incidentally; these management measure will minimize mortality.
- The smooth dogfish preferred alternatives do not directly address bycatch reduction; however, it is unlikely that these measures would increase bycatch. Management measures currently in place would continue to address bycatch and reduce it the extent practicable.

NS 10 states that conservation and management measures shall, to the extent practicable, promote the safety of human life at sea. The preferred alternatives in the document are consistent with this NS.

- No impact to safety of life at sea is anticipated to result from these preferred alternatives. The management measures in the preferred alternatives would not require fishermen to travel greater distances, fish in bad weather, or otherwise fish in an unsafe manner.

10.2 Consideration of Magnuson-Stevens 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. The summary of the requirements of Section 304(g) and an explanation of how NMFS is consistent with these requirements are below. The impacts of the preferred alternatives and how it meets these requirements are described in more detail in Chapters 2 and 4 of the document. This section provides only a summary of how each of the requirements is met.

1. *Consult with and consider the views of affected Councils, Commissioners, and advisory groups*

NMFS published a Notice of Intent on May 7, 2008 (73 FR 25665) announcing the intent to initiate an amendment to the 2006 Consolidated HMS FMP. On July 2, 2008 (73 FR 37932), NMFS published a Notice of Availability to inform the public of the issues and options presentation that was available on the HMS website. This Notice also announced NMFS' intent to hold five public scoping meetings to discuss and collect comments on issues described in the presentation. A Predraft of Amendment 3 to the 2006 Consolidated HMS FMP (Amendment 3) was developed and released to consulting parties and HMS Advisory panel (AP) members in February 2009. NMFS presented the Predraft to the HMS AP members at the February 2009 AP meeting to discuss and receive comments. Written comments received on the issues and options presentation, during the scoping meetings, and at the HMS AP meeting were considered at all stages when preparing this document. NMFS will send the document and its proposed rule to consulting parties including all five of the Atlantic Regional Fishery Management Councils, both the Atlantic and Gulf States Marine Fisheries Commissions, and the HMS AP. NMFS is also requesting time on the agenda to discuss this Amendment during the Council and Commission meetings that occur during the comment period.

2. *Establish an advisory panel for each FMP*

As part of the 2006 Consolidated HMS FMP, NMFS combined the Atlantic Billfish and HMS APs into one panel. This combined HMS AP provided representation from the commercial and recreational fishing industry, academia, non-governmental organizations, state

representatives, representatives from the Regional Fishery Management Councils, and the Atlantic and Gulf States Marine Fisheries Commissions. This amendment will not change the HMS AP, and NMFS convened a meeting of the HMS AP during the public comment period of the Predraft of Amendment 3 to discuss and collect comments and proposed shark management measures.

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.*

Throughout this document, NMFS has described the effects of the management measures and any impacts on U. S. fishermen. The preferred alternatives in this document are necessary to meet Magnuson-Stevens Act mandates to rebuild overfished stocks and prevent overfishing, which in the long-term are not expected to disadvantage U.S. fishermen in relation to foreign competitors. Because the United States contribution to the total fishing mortality of shortfin mako sharks in the North Atlantic is only about 10 percent, the preferred alternative for shortfin mako sharks would not change domestic regulations but would look to establish international management measures to end overfishing on an international level.

4. *With respect to HMS for which the United States is authorized to harvest an allocation, quota, of 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.*

There is currently no international agreement on blacknose shark, or smooth dogfish quotas, allocations, or fishing mortality levels. Therefore, this requirement is not applicable for these species. However, shortfin mako sharks are managed both domestically and internationally at ICCAT. Because of the small U.S. contribution to Atlantic shortfin mako shark mortality, domestic reductions on shortfin mako shark mortality would not end overfishing of the entire North Atlantic stock. Therefore, NMFS believes that ending overfishing and preventing an overfished status would be better accomplished through international action where other countries that have large takes of shortfin mako sharks could participate in mortality reduction discussions.

5. *Review on a continuing basis, and revise as appropriate, the conservation and management measures included in the FMP.*

NMFS continues to review the need for any revisions to the existing regulations for HMS. Draft Amendment 3 to the 2006 Consolidated HMS FMP is the culmination of one of those reviews.

6. *Diligently pursue, through international entities, comparable international fishery management measures with respect to HMS.*

NMFS continues to work with the ICCAT and other international entities such as the Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES), to implement comparable international fishery management measures. To the extent that some of the management measures in this amendment are exportable, NMFS works to provide foreign nations with the techniques and scientific knowledge to implement similar management measures.

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.

All of the objectives of the document 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. The management measures in the preferred alternatives in this document are expected to meet these goals.

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11.0 LIFE HISTORY ACCOUNTS AND ESSENTIAL FISH HABITAT DESCRIPTIONS

11.1 Shark

As discussed in chapters 2 and 4, EFH must be designated as a statutory condition of establishing federal management for any species. Thus, NMFS is proposing EFH for smooth dogfish in this draft amendment. Amendment 1 to the 2006 Consolidated HMS FMP extensively analyzed methods for determining EFH, and NMFS considers the conclusions in Amendment 1 to the 2006 Consolidated HMS FMP to be the best available science. As such, no alternatives were considered for designating EFH other than the method used in Amendment 1 to the 2006 Consolidated HMS FMP as explained below.

11.1.1 Smooth Dogfish

Smooth Dogfish (*Mustelus canis*) Smooth dogfish is a common coastal shark species found in the Atlantic Ocean from Massachusetts to northern Argentina. They are primarily demersal sharks that inhabit continental shelves and are typically found in inshore waters down to 200m depth (Compagno, 1984). Smooth dogfish is a migratory species that responds to changes in water temperature. They primarily congregate between southern North Carolina and the Chesapeake Bay in the winter. In the spring, smooth dogfish move along the coast when bottom water warms up to at least 6 to 70°C. As temperatures get colder, smooth dogfish move offshore to their wintering areas (Compagno, 1984). Smooth dogfish have diets that are dominated by invertebrates (Scharf *et al.*, 2000). They primarily feed on large crustaceans, consisting mostly of crabs (Gelsleichter *et al.*, 1999), but also rely heavily on American lobsters. In the New England waters during the spring, smooth dogfish feed on small bony fish, including menhaden, stickleback, wrasses, porgies, sculpins, and puffers (Compagno, 1984).

Taxonomy: Emerging molecular and morphological research has determined that Florida smoothhounds have been misclassified as a separate species from smooth dogfish (Jones, pers. comm.). Thus, NMFS is considering Florida smoothhounds and smooth dogfish as one species for the purpose of designating EFH.

Reproductive potential: The maximum size limit for smooth dogfish is 150 cm TL. Males mature at 2-3 years old (about 82 cm TL) and females mature between 4-7 years old, which is about 90 cm TL (Compagno, 1984; Conrath *et al.*, 2002). The length at 50 percent maturity for females is 102 cm TL, while males reach 50 percent maturity at 86 cm TL. Female smooth dogfish have an 11–12 month gestation period with mating occurring between May and September. The fecundity of smooth dogfish ranges between 3 and 18 pups per litter (Conrath and Musick, 2002). The size range at birth is between 28 and 39 cm (Rountree and Able, 1996). Marsh creeks may be particularly important to newborn smooth dogfish during June and July. Young-of-year (YOY) pups grow rapidly in these areas to a size of 55-70 cm TL, prior to migration from the estuaries by the end of October. The abundance of YOY within estuaries strongly suggests that estuaries are critically important nursery habitats for smooth dogfish within the Mid-Atlantic Bight (Rountree and Able, 1996).

Impact of fisheries: Smooth dogfish are primarily caught in the northeast U.S. from Maine to South Carolina. They are primarily caught with gillnets, but are also captured in the longline fishery. Smooth dogfish are caught consistently throughout the year with peak catch rates in the late spring and early summer. According to the ACCSP, approximately 3,485,101 lb dw of smooth dogfish were landed from 2004-2007. The majority of these sharks were collected off the coast of North Carolina (1,796,867 lb dw). An average of about 213 vessels/year retained smooth dogfish according to VTR data, although most of these were the result of incidental landings. It is likely that less than a quarter of these vessels were directing effort on this species. Draft Amendment 3 proposes to establish federal management.

***Essential Fish Habitat for Smooth Dogfish*:**

- **Neonate/YOY (≤59 cm TL):** Coastal areas in the Atlantic Ocean from the Chesapeake Bay to South Carolina (Rountree and Able, 1996). Please refer to Figure 11.2 for detailed EFH map.

- **Juveniles (60 to 80 cm TL):** At this time, available information is insufficient for the identification of EFH for this life stage within the U.S. EEZ. Please refer to Figure 11.2 for detailed EFH map.

- **Adults (≥81 cm TL):** At this time, available information is insufficient for the identification of EFH for this life stage within the U.S. EEZ. Please refer to Figure 11.2 for detailed EFH map.

11.1.2 Methodology for Determining Smooth Dogfish EFH

Smooth dogfish EFH boundaries are based on the 95 percent probability boundary using ESRI ArcGIS and Hawth's Analysis Tools (www.spatialecology.com) using data from fisheries independent surveys. The probability boundary was created by taking all of the available distribution points for the species at all life stage and creating a percent volume contour (PVC or probability boundary). A detailed description of the tool and the analytical approach used to create the boundary is provided in Amendment 1 to the 2006 Consolidated Atlantic HMS FMP. The probability boundary takes into account the distance between each point and the next nearest point, thereby excluding the least dense points (outliers) where the species occurred in relatively low numbers. The 95 percent probability boundary would include, on average, 95 percent of the points used to generate the probability boundary. Note that the specific EFH boundaries are the edited (*i.e.*, clipped) 95 percent probability boundaries. In some areas the 95 percent probability boundary overlapped with the shoreline due to buffers that are created while generating the probability boundaries. The EFH was further adjusted by including specific areas deemed important through a primary literature review.

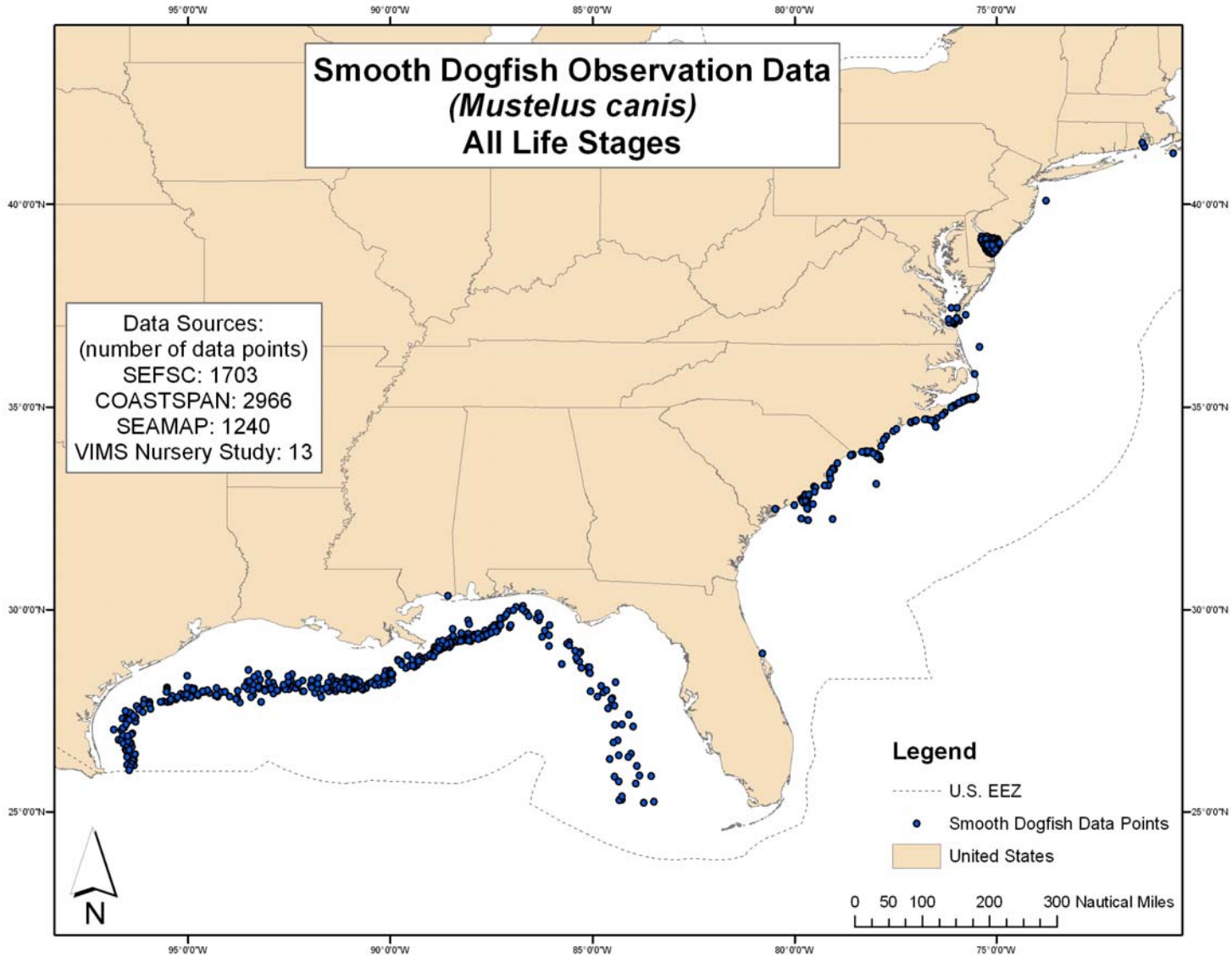

Figure 11.1 **Smooth dogfish observations from fisheries independent surveys.**
Note: The map includes data points for smooth dogfish and Florida smoothhounds. Data sources: SEFSC, COASTSPAN, SEAMAP, VIMS Nursery Study

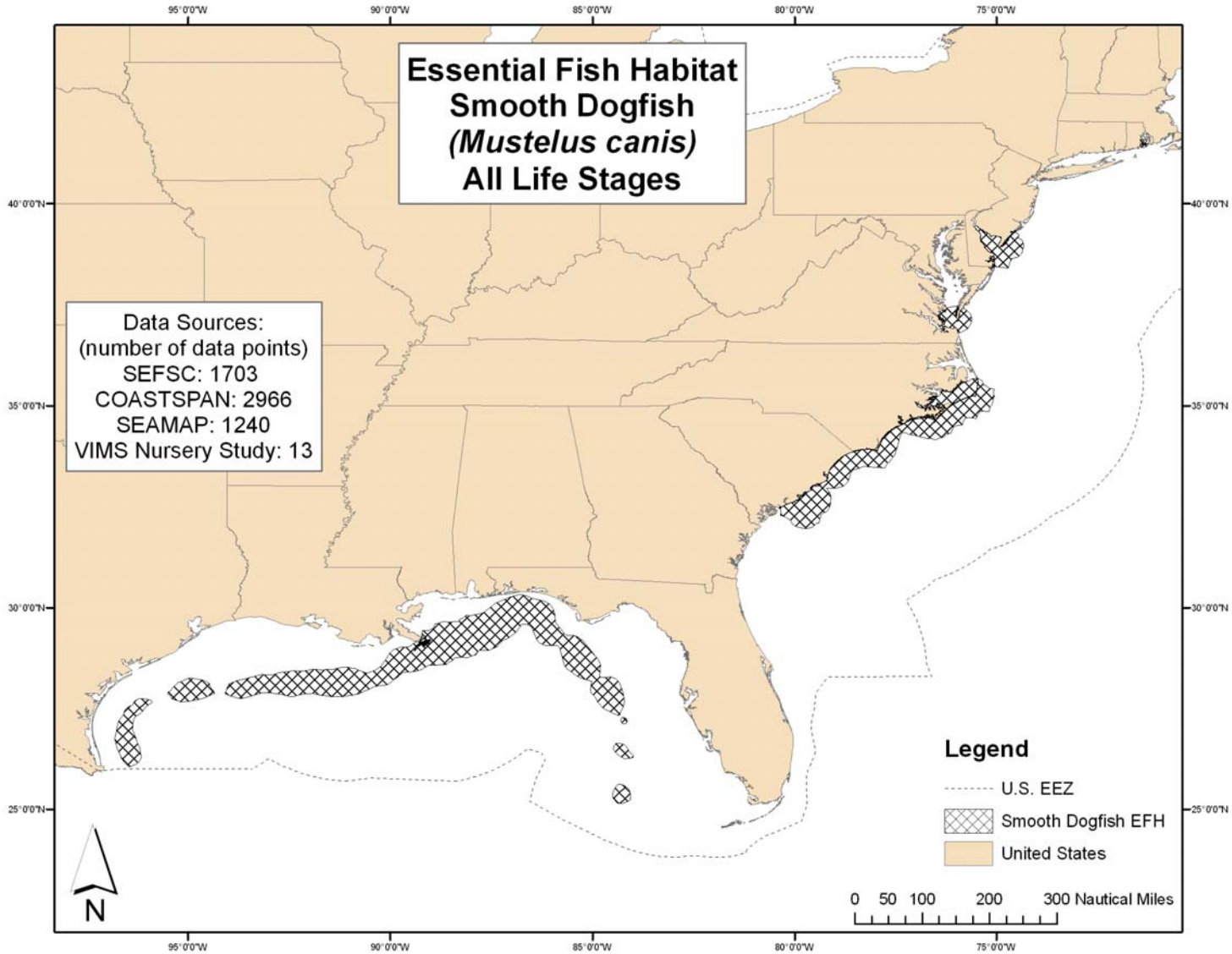

Figure 11.2 **Smooth dogfish EFH designation based on fisheries independent surveys.**
Note: all life stages combined; Florida smoothhound data points were included in EFH designation for smooth dogfish.

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12.0 LIST OF PREPARERS

The development of this rulemaking involved input from many people within NMFS, NMFS contractors, and input from constituent groups including the HMS AP. Staff and contractors from the HMS Management Division, in alphabetical order, who worked on this document include:

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- The Northeast Fisheries Science Center (Dr. Nancy Kohler, Dr. Cami McCandless, and Dr. Lisa Natanson);
- The Southeast Regional Office (David Bernhart, Jenny Lee, Andrew Herndon, Steve Branstetter, and Roy Crabtree);
- The Office of Law Enforcement (Jeff Radonski, and Paul Raymond)
- NOAA General Counsel (Meggan Engelke-Ros, Caroline Park, Megan Walline, and Scott Farley); and;
- NMFS NEPA coordinator (Steve Kokkinakas and Aileen Smith).

12.1 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 APs established under the Magnuson-Stevens Act regarding amendments to a FMP. As described below, NMFS provided documents and met with the consulting parties and to the ASMFC and Gulf States Marine Fisheries Commission at various stages throughout the process. Hard copies and/or CDs of these documents were also provided to anyone who requested copies.

NMFS announced its intent to prepare an EIS on May 7, 2008 (73 FR 25665). In this notice, NMFS asked for comments on existing commercial and recreational shark management measures that would assist the Agency in determining options for conservation and management of Atlantic sharks consistent with relevant federal statutes. On July 2 (73 FR 37932) and September 13 (73 FR 53407), NMFS announced the availability of a scoping document and five scoping meetings were held from July through September 2008. During the scoping meetings, NMFS described the results of recent stock assessments, issues that need to be addressed concerning shark management, and options or alternatives that may be implemented to achieve objectives.

NMFS released a Predraft of Amendment 3 to the 2006 Consolidated HMS FMP and a summary of the scoping comments to the HMS AP in February 2009. This document was also put on the HMS website. NMFS requested that the HMS AP and consulting parties (New England, Mid-Atlantic, South Atlantic, Gulf, and Caribbean Fishery Management Councils, Marine Fisheries Commissions, U.S. Coast Guard, and other State and Federal Agency representatives) submit comments on the Predraft by March 16, 2009. While some of the options changed between the Predraft and draft stages of Amendment 3 to the 2006 Consolidated HMS FMP, the overall list of issues to be addressed has not changed. A summary of the comments received during scoping (May 7, 2008 to November 14, 2008) can be found on the HMS website:
http://www.nmfs.noaa.gov/sfa/hms/newslist/2009/02-12-09_Predraft_for_Amendment_3.pdf. A summary and the transcripts of the February 2009 AP meeting can also be found on the HMS website at: http://www.nmfs.noaa.gov/sfa/hms/.

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A. APPENDIX: QUOTAS AND RETENTION LIMIT CALCULATIONS

For alternatives A2 through A4, NMFS calculated quotas and retention limits for blacknose sharks based on the TAC recommended in the 2007 blacknose shark stock assessment. Fishing effort from 2004 to 2007 in the Coastal Fisheries Logbook, discards from the BLL and gillnet observer reports from 2005-2008, and landings reported through HMS shark dealer reports (*i.e.*, southeast and northeast general canvass and SEFSC quota monitoring databases) were used for the retention limit analyzes. In all cases, NMFS accounted for total mortality from all fishing sectors (*e.g.*, commercial and recreational) within the Atlantic shark fishery, including landings and discards. As explained in Chapter 4, NMFS is working with the GMFMC and SAFMC to reduce blacknose shark discards in the shrimp trawl fisheries in addition to the management measures analyzed in this document. Thus, for the alternatives considered below, NMFS assumes that bycatch of blacknose sharks in shrimp trawl fisheries is being reduced via Council action. By reducing the commercial quota below the commercial allowance for the Atlantic shark commercial fishery, NMFS would reduce fishing mortality below the level that would cause overfishing and allow blacknose sharks to rebuild. The quotas and retention limits in this rulemaking are specific to the 2007 blacknose shark stock assessment, but NMFS anticipates changing these quotas and retention limits via framework actions in the future, as necessary. In subsequent rulemakings, NMFS would determine quotas and retention limits based on the recommendations from the most recent stock assessments and/or estimates of landings, discards, and effort in fisheries that interact with sharks using the same process used in this rulemaking as outlined below.

A.1 Alternative A2

The 2007 blacknose shark stock assessment assessed blacknose sharks separately and recommended a blacknose-specific TAC of 19,200 blacknose sharks per year. The assessment stated that this TAC would provide a 70 percent chance of rebuilding blacknose sharks by the year 2027. Based on this recommendation, NMFS is proposing to remove blacknose sharks from the SCS quota. This would allow blacknose sharks to be managed separately and would give NMFS the ability to track this separate quota more efficiently, which is critical given the overfished and overfishing status of blacknose sharks.

To determine the proportion of the 19,200 blacknose shark TAC that would be available to the Atlantic shark commercial fishery, NMFS accounted for mortality of blacknose sharks in all sectors of recreational and commercial fisheries. First, the TAC of 19,200 blacknose sharks is a 78-percent reduction in mortality compared to the average annual mortality blacknose sharks experienced from 1999-2005 (86,381 blacknose sharks/year; Table 4.1 in Chapter 4). In order to attain the needed mortality reductions within the Atlantic shark commercial fisheries, NMFS would establish an Atlantic shark commercial fishery allowance. This commercial allowance would be a 78-percent reduction in blacknose shark mortality in the Atlantic shark commercial fishery. The average annual landings of blacknose sharks within the Atlantic shark commercial fishery was 27,484 blacknose sharks from 1999-2005 (136,595 lb dw), and average annual discards were 5,007 blacknose sharks over that same time period (27,038 lb dw). A 78-percent reduction in blacknose shark landings (6,046 blacknose sharks/year) and discards (1,102 blacknose sharks/year) in the Atlantic shark fisheries would be a total of 7,148 blacknose sharks

per year (6,046 + 1,102 = 7,148). This is equivalent to 45,032 lb dw (20.4 mt dw), assuming the average commercial blacknose weight across all commercial gears (shark longline, shark gillnet, and shrimp trawl) is 6.3 lb dw (7,148 blacknose sharks x 6.3 lb dw = 45,032 lb dw).

However, blacknose sharks are also taken in the exempted fishing program. Therefore, to determine the commercial allowance for the Atlantic shark commercial fishery, NMFS subtracted the amount of blacknose sharks that are caught in the exempted fishing program. On average, 54 blacknose sharks are taken (*i.e*., kept or discarded dead) under the exempted fishing program. Given the average weight of blacknose sharks taken under the exempted fishing program is 3.3 lb dw, this equals approximately 178.2 lb dw of blacknose sharks taken under the exempted fishing program. Thus, the commercial allowance available to Atlantic shark commercial fishermen would be 44,853.8 lb dw (45,032 lb dw - 178.2 lb dw) or 7,094 blacknose sharks (7,148 blacknose sharks – 54 blacknose sharks taken in the EFP program = 7,094 blacknose sharks).

Under alternative A2, the blacknose shark quota would be 13.5 mt dw per year, which is a 78-percent reduction in the average annual landings of blacknose sharks from 1999-2005 (Table 4.1 in Chapter 4). This is equivalent to approximately 2,834 blacknose sharks per year, assuming an average commercial shark fishery weight (*i.e*., shark BLL and gillnet gear) of blacknose sharks of 10.5 lb dw. Based on this quota, NMFS analyzed the impact of different retention limits for directed and incidental shark permit holders, taking into account discards and the inclusion and exclusion of certain gear types. By doing this, NMFS was able to evaluate whether or not a particular retention limit would result in total mortality above or below the commercial shark fishery allowance as described above.

To determine a particular retention limit, NMFS first divided the number of blacknose sharks available to the commercial shark fishery under alternative A2 by the average number of historical trips taken per year estimated from the Coastal Fisheries Logbook from 2004-2007 for directed and incidental permit holders. NMFS recognizes that this level of effort may have changed with the implementation of Amendment 2 to the 2006 Consolidated HMS FMP; however, NMFS currently does not have the data to estimate the number of trips taken per directed and incidental vessels since the implementation of Amendment 2 to the 2006 Consolidated HMS FMP (July 24, 2008). Therefore, NMFS is relying on Coastal Fisheries logbook data from 2004-2007 as a proxy for the number of trips taken by directed and incidental shark fishermen for this rulemaking.

NMFS determined the retention limit for the different scenarios shown in Table A.1 by dividing the number of blacknose sharks available to Atlantic shark commercial fishermen (*i.e.*, 2,834) by the number of directed and/or incidental trips. For example, under scenario one, incidental permit holders would not be allowed to retain blacknose sharks. Thus, NMFS divided 2,834 blacknose sharks by the average number of directed trips that landed blacknose sharks in the past (*i.e*., 251.3 trips), which would result in a directed trip limit of 11 blacknose sharks per trip (2,834 blacknose sharks / 251.3 trips = 11 blacknose sharks/trip). Under scenario two, incidental shark permit holders would be allowed to retain what they currently catch, or an average of one blacknose shark per trip, as well as directed shark permit holders would be allowed to retain blacknose sharks. Therefore, NMFS subtracted the number of blacknose sharks caught by incidental shark permit holders (1 blacknose shark x 222 incidental trips = 222

blacknose sharks) from the number of total blacknose sharks available to commercial sharks fishermen (*i.e*., 2,834 blacknose sharks), which resulted in 2,612 blacknose sharks available to directed shark permit holders (2,834 blacknose sharks - 222 blacknose sharks = 2,612 blacknose sharks). NMFS then divided the 2,612 blacknose sharks available to directed shark permit holders by the number of average directed shark trips that landed blacknose sharks in the past (*i.e*., 251.3 trips), which would result in a retention limit of 10 blacknose sharks per trip for directed permit holders. NMFS used the same approach for scenarios three and four. Scenarios five and six assumed no retention of blacknose sharks by all permit holders.

Next, NMFS calculated the number of discards associated with each trip limit. On average, all directed shark vessels that landed blacknose sharks caught 64.3 blacknose sharks per trip (*i.e*., blacknose sharks retained and discarded dead). Directed shark vessels that did not use gillnet gear caught, on average, 84.5 blacknose sharks per trip (*i.e*., blacknose sharks retained and discarded dead). On average, all incidental shark vessels that landed blacknose shark caught 0.6 blacknose sharks per trip, whereas incidental vessels that did not use gillnet gear caught, on average, 1.2 blacknose sharks per trip. Based on the different catch rates, NMFS determined the number of blacknose sharks that would be discarded dead for each trip under the different scenarios (Table A.1). For instance, under scenario one, directed shark vessels would be allowed to retain 11 blacknose sharks per trip; however, on average, they caught 64.3 blacknose sharks per trip (Table A.1). Therefore, they would discard 53.3 blacknose sharks per trip with an 11 blacknose shark per trip retention limit. NMFS then multiplied the number of discards per trip by the total number of directed shark trips that landed blacknose sharks in the past (*i.e.*, 251.3) to get the total number of directed discards or 13,392 blacknose sharks (53.3 blacknose sharks/trip x 251.3 directed trips = 13,392 blacknose shark discards) (Table A.1). NMFS then determined the number of discards expected from incidental vessels, given they would not be able to retain blacknose sharks under scenario one. Given all incidental vessels caught, on average, 0.6 blacknose sharks per trip, with a zero retention limit, they would discard 0.6 blacknose sharks per trip. This would result in a total number of incidental discards of 133.2 blacknose sharks (0.6 blacknose sharks/trip x 222 incidental trips = 133.2 blacknose shark discards). NMFS used the same approach to determine the number of directed and incidental discards per trip under the remaining scenarios in Table A.1.

Finally, NMFS determined the total mortality anticipated under each scenario. NMFS added the total number of directed and incidental discards as well as the total number of sharks that would be harvested (*i.e.*, 2,834) to estimate total morality in numbers. Total mortality was also calculated in weight by multiplying the total number of sharks killed under each scenario by the average blacknose weight anticipated under each scenario. For instance, the average commercial blacknose weight caught on gillnet and BLL gear is 10.5 lb dw, and the average blacknose weight caught on BLL gear only (*i.e*., when gillnet gear is excluded) is 5.4 lb dw (Table A.1). Based on this, NMFS was able to compare total mortality in terms of the number of blacknose sharks and weight of blacknose sharks under the different scenarios to the commercial allowance for the commercial shark fishery (44,853.8 lb dw or 7,094 blacknose sharks). As shown in Table A.1, all scenarios would result in mortality higher than the commercial allowance for the commercial shark fishery, even if the blacknose sharks were prohibited in the Atlantic shark commercial fishery and gillnet gear was not allowed for the harvest of sharks. Thus, NMFS does not prefer the retention limits analyzed under alternative A2 at this time.

Table A.1 **Retention limits, discards, and total mortality of blacknose sharks per year under different scenarios for alternative A2. Note: commercial allowance of blacknose shark mortality in the Atlantic shark commercial fishery is 7,094 blacknose sharks or 44,853.8 lb dw per year.**

	Gillnets Included		**Gillnets Excluded**		**No Retention of Blacknose**	
	Scenario 1: Directed Permit Holders Only	**Scenario 2: Directed & Incidental Permit Holders**	**Scenario 3: Directed Permit Holders Only**	**Scenario 4: Directed & Incidental Permit Holders**	**Scenario 5: Gillnets Included**	**Scenario 6: Gillnets Excluded**
Retention Limit/Trip	11	10	22	21	0	0
No. Directed Trips	251.3	251.3	129.3	129.3	251.3	129.3
Directed Discards/Trip	53.3	54.3	62.5	63.5	64.3	84.5
Total Directed Discards	13,392	13,643	8,078	8,207	16,155	10,922
No. Incidental Trips	222	222	92	92	222	92
Incidental Discards/Trip	0.6	0	1.2	0.2	0.6	1.2
Total Incidental Discards	133.2	0	110.6	18.4	133.2	110.6
Total Discards	13,525	13,643	8,189	8,226	16,289	11,032
Total Mortality in Numbers	16,359	16,477	11,023	11,060	16,289	11,032
Average Blacknose Weight (lb dw)	10.5	10.5	5.4	5.4	10.5	5.4
Total Mortality in Weight (lb dw)	171,768	173,007	59,522	59,723	171,030	59,574

A.2 Alternatives A3 and A4

Under alternatives A3 and A4, NMFS determined the level of non-blacknose SCS quota that would allow for the harvest of blacknose sharks but would keep the total mortality of blacknose sharks below the commercial allowance of 44,853.8 lb dw or 7,094 blacknose sharks. From the analysis for alternative A2, NMFS determined that unless overall effort was reduced in the SCS fishery, any retention of blacknose sharks and discards would result in mortality above the commercial shark fishery allowance. Thus, NMFS looked at reductions in the non-blacknose SCS quota to determine the level of non-blacknose SCS harvest that would allow for a limited blacknose fishery and a reduction in discards.

First, NMFS determined the average landings between 2004 and 2007 for finetooth, Atlantic sharpnose, and bonnethead sharks (see Table 4.2 in Chapter 4). NMFS then added the landings of all three species together and calculated various percent reductions of landings under alternatives A3 and A4 (Table A.2 and Table A.3). NMFS then determined the number of trips it would take to harvest the non-blacknose SCS quota, based on past retention of non-blacknose SCS for directed shark permit holders (see below). Based on the percentage of non-blacknose SCS trips taken by directed shark permit holders that landed blacknose sharks in the past (see below), NMFS then determined the number of blacknose sharks that would be caught, kept, and discarded while the different non-blacknose SCS quotas were harvested under alternatives A3 and A4 (Table A.4 and Table A.5). For alternative A3, NMFS assumed all fishing gears that are currently authorized for sharks would continue to be used to harvest sharks. Under alternative A4, NMFS assumed gillnet gear would no longer be allowed to harvest sharks. Because of this, NMFS assumed that directed fishing effort for sharks with gillnet gear would stop; however, incidental fishermen would still use gillnet gear to harvest other fish species and would discard any sharks that were caught. For each alternative, NMFS would not change the trip limits for SCS for directed shark permit holders (*i.e.*, no trip limits for SCS and pelagic sharks for directed shark permit holders). However, incidental permit holders would not be allowed to retain blacknose sharks; they would still be able to retain 16 non-blacknose SCS and pelagic sharks combined per trip. In addition, NMFS assumed that fishermen would fish for non-blacknose SCS in a directed fashion until the non-blacknose SCS and/or blacknose shark quotas reached 80 percent. At that time, both the non-blacknose SCS fishery and the blacknose shark fishery would close, and fishermen would fish for other fish species, and all SCS, including blacknose sharks, would have to be discarded.

For each percent reduction, NMFS determined the number of trips it would take to harvest the reduced non-blacknose SCS quota based on the average number of non-blacknose SCS kept from 2004-2007 (column E in Table A.2 and Table A.3). NMFS determined the average number of non-blacknose SCS kept from Coastal Fisheries logbook data from 2004-2007. For all gear types under alternative A3, 140.9 non-blacknose SCS were kept per trip (Table A.2). With the exclusion of gillnets under alternative A4, fishermen kept, on average, 134.7 non-blacknose SCS per trip (Table A.3). NMFS then determined the number of trips it would take to fulfill the non-blacknose SCS quota by dividing the total number of sharks available under the reduced non-blacknose SCS quota (columns D in Table A.2 and Table A.3) by the average number of non-blacknose SCS kept per trip (columns E in Table A.2 and Table A.3).

NMFS then estimated the number of trips it would take directed shark permit holders to catch blacknose sharks while harvesting the non-blacknose SCS quota (columns E in Table A.4 and Table A.5). To do this, NMFS determined the percentage of trips taken by directed shark permit holders that harvested blacknose sharks from the overall number of trips taken by directed shark permit holders that landed SCS during 2004-2007 (based on the Coastal Fisheries logbook data from 2004-2007). On average, 36 percent of the trips taken by directed shark permit holders landed SCS landed blacknose sharks (251.3 directed trips that landed blacknose sharks / 696.8 directed trips that landed SCS = 36 percent). NMFS then determined the average number of blacknose sharks kept and discarded dead per trip for all gear types under alternative A3 and with the exclusion of gillnet gear under alternative A4 (Table A.4 and Table A.5). NMFS determined the average number of blacknose sharks kept from Coastal Fisheries logbook data from 2004-2007. The average percent of blacknose sharks discarded dead per trip was determined from BLL and gillnet observer program data from 2005-2008. On average, 64.3 blacknose sharks were caught per trip when all gear types were considered under alternative A3 (column B in Table A.4). Of those 64.3 sharks, 60 blacknose sharks were kept and 4.3 were discarded dead (columns C and D in Table A.4). On average, 84.5 blacknose sharks were caught per trip when gillnet gear was excluded, as considered under alternative A4 (column B in Table A.5). Of those 84.5 sharks, 75 blacknose sharks were kept and 9.5 were discarded dead (columns C and D in Table A.5).

By multiplying the average number of blacknose sharks kept (columns C in Table A.4 and Table A.5) and discarded dead (columns D in Table A.4 and Table A.5) by the number of trips estimated to catch blacknose sharks (36 percent of the trips taken to harvest non-blacknose SCS or columns E in Table A.4 and Table A.5), NMFS determined the number of blacknose that would be harvested (columns H, I, and J in Table A.4 and Table A.5) and discarded dead (columns F and G in Table A.4 and Table A.5) while the non-blacknose SCS quota was harvested under alternatives A3 and A4. The blacknose quota is based on the number of blacknose sharks taken while fishermen harvest the non-blacknose SCS quota (columns J in Table A.4 and Table A.5).

Once the non-blacknose SCS and blacknose shark quotas are filled and those fisheries closed, NMFS assumes that all trips taken by directed shark permit holders for non-blacknose SCS and blacknose sharks would stop, and fishermen would target other fish species (*e.g.*, Spanish mackerel, bluefish, etc.). Any SCS caught, including blacknose sharks, would have to be discarded On average, 0.6 blacknose sharks (column B in Table A.4) and 22.7 non-blacknose SCS were caught (kept and discarded dead) on trips taken by incidental permit holders that include gillnet gear under alternative A3. When gillnet gear is excluded under alternative A4, on average, 1.2 blacknose sharks (column B in Table A.5) and 18.7 non-blacknose SCS were caught on trips taken by incidental permit holders. NMFS assumes that the remaining directed SCS effort would target other fish species, and all SCS caught, including blacknose sharks, would have to be discarded. Thus, NMFS estimated the number of blacknose sharks (columns F and G in Table A.4 and Table A.5) that would be discarded for the remaining SCS trips fished in an incidental fashion (columns E in Table A.4 and Table A.5) based on the same methodology as explained above.

In addition, NMFS assumes that fishermen with incidental shark permits would continue to fish for sharks, and would catch and discard blacknose sharks as described above. Since incidental permit holders would not be able to retain blacknose sharks, NMFS determined the number of blacknose sharks that would be discarded by incidental permit holders by multiplying the average number of blacknose caught by incidental permit holders (columns B in Table A.4 and Table A.5) by the number of trips taken by incidental shark permit holders anticipated under alternatives A3 and A4 (columns E in Table A.4 and Table A.5). The number of trips taken by incidental permit holders was estimated from 2004-2007 Coastal Fisheries logbook data, where, on average, there were 222 trips taken by incidental permit holders that landed SCS using all gear types (columns E in Table A.4 and Table A.5). Since incidental permit holders typically do not target sharks, NMFS assumes that incidental permit holders would continue to use gillnet gear, even under alternative A4, when gillnet gear would be prohibited (in combination with alternatives B2 and B3). Thus, NMFS used the average number of blacknose sharks caught across all gear types and the average number of trips taken by incidental permit holders for all gear types estimated from the Coastal Fisheries logbook from 2004-2007 to estimate blacknose shark discards by incidental permit holders.

NMFS also determined the number of discards for non-blacknose SCS by incidental permit holders; however, unlike blacknose sharks, incidental permit holders would be allowed to retain non-blacknose SCS, except for fishermen with incidental shark permits using gillnet gear under alternative A4. NMFS used estimates of percent discards from the BLL and gillnet observer programs from 2005-2008 to estimate the number of discards of non-blacknose SCS by incidental permit holders. On average, incidental permit holders discarded 5.6 non-blacknose SCS per trip. NMFS determined total discards by multiplying the average number of non-blacknose SCS discarded per trip (*e.g.*, 5.6 non-blacknose SCS) by the total number of incidental trips (columns E in Table A.4 and Table A.5). In addition, NMFS included the number of non-blacknose SCS that gillnet fishermen with incidental shark permits would have to discard under alternatives A4 and B2 and B3 by multiplying the average number of non-blacknose SCS kept by gillnet fishermen with incidental shark permits (*e.g.*, 16.1) by the number of gillnet trips under alternatives B2 (*e.g.*, 130 trips) and B3 (*e.g.*, 123.3 trips).

To determine the total mortality of blacknose sharks, NMFS added the weight of blacknose sharks landed and discarded dead under the different non-blacknose SCS quota reductions (columns D in Table A.6 and Table A.7). Total mortality was found by adding up the weight (lb dw) of blacknose sharks discarded and landed by the different permit holders under alternatives A3 and A4 (columns G and I in Table A.4 and Table A.5). To determine the total mortality in number, NMFS divided the total weight of blacknose sharks harvested and discarded (columns D in Table A.6 and Table A.7) by 10.5 lb dw for alternative A3 (which is the average weight of blacknose caught on BLL and gillnet gear), and 5.4 lb dw under alternative A4 (which is the average weight of blacknose caught on BLL gear only since gillnet gear would be excluded under alternative A4) (columns E in Table A.6 and Table A.7). NMFS' preferred alternative was the smallest possible percent reduction of the non-blacknose SCS quota that would result in the smallest difference in the weight and number of blacknose sharks between the commercial allowance for the commercial fishery and the estimated total mortality of blacknose sharks under the different quota reductions (columns F and G in Table A.6 and Table A.7). This resulted in a 42.7 mt dw non-blacknose quota under alternative A3 (an 82 percent reduction on current

landings of non-blacknose SCS), and a 56.9 mt dw non-blacknose SCS quota under alternative A4 (a 76 percent reduction based on current landings of non-blacknose SCS).

Table A.2 **Percent reductions in non-blacknose SCS quotas based on average landings from 2004-2007 under alternative A3. Bold text indicates preferred reduction.**

A Reduction of Non-Blacknose SCS Landings	B Landings with Reduction (lb dw)	C Landings with Reduction (mt dw)	D Landings with Reduction (number)	E Avg. retention/trip (number) of non-blacknose SCS for directed permit holders	F # Trips/Year to Catch Quota	G Reduction in # of Trips/Year
50%	261,431.8	118.6	62,916.1	140.9	446.6	81.2%
60%	209,145.4	94.9	50,332.9	140.9	357.3	84.9%
70%	156,859.1	71.2	37,749.6	140.9	268.0	88.7%
75%	130,715.9	59.3	31,458.0	140.9	223.3	90.6%
78%	115,030.0	52.2	27,683.1	140.9	196.5	91.7%
80%	104,572.7	47.4	25,166.4	140.9	178.6	92.5%
81%	99,344.1	45.1	23,908.1	140.9	169.7	92.8%
82%	**94,115.4**	**42.7**	**22,649.8**	**140.9**	**160.8**	**93.2%**
85%	78,429.5	35.6	18,874.8	140.9	134.0	94.3%

Table A.3 **Percent reductions in non-blacknose SCS quotas based on average landings from 2004-2007 under alternative A4. Bold text indicates preferred reduction.**

A Reduction of Non-Blacknose SCS Landings	B Landings with Reduction (lb dw)	C Landings with Reduction (mt dw)	D Landings with Reduction (number)	E Avg. retention/trip (number) of non-blacknose SCS for directed permit holders	F # Trips/Year to Catch Quota	G Reduction in # of Trips/Year
50%	261,431.8	118.6	62,916.1	134.7	467.2	80.3%
55%	235,288.6	106.7	56,624.5	134.7	420.5	82.3%
60%	209,145.4	94.9	50,332.9	134.7	373.8	84.2%
70%	156,859.1	71.2	37,749.6	134.7	280.3	88.2%
75%	130,715.9	59.3	31,458.0	134.7	233.6	90.1%
76%	**125,487.2**	**56.9**	**30,199.7**	**134.7**	**224.3**	**90.5%**
78%	115,030.0	52.2	27,683.1	134.7	205.6	91.3%
80%	104,572.7	47.4	25,166.4	134.7	186.9	92.1%
85%	78,429.5	35.6	18,874.8	134.7	140.2	94.1%

Table A.4 Blacknose shark harvest and discards under alternative A3. Bold text indicates the preferred reduction.

A Reduction in Non-Blacknose SCS Quota	B Avg # Blacknose Caught/Trip	C Avg. retention/trip (number) of blacknose for directed permit holders	D Discards (number per trip)	E Estimated # of Trips	F Total Discards (total # of sharks for all trips)	G Total Discards (lb dw)	H Total Kept (number of sharks)	I Total Kept (lb dw)	J Total Kept (mt dw)
Directed Trips									
50%	64.3	60	4.3	161.1	692.5	7,271.5	9,663.1	101,462.2	46.0
60%	64.3	60	4.3	128.8	554.0	5,817.2	7,730.5	81,169.7	36.8
70%	64.3	60	4.3	96.6	415.5	4,362.9	5,797.8	60,877.3	27.6
75%	64.3	60	4.3	80.5	346.3	3,635.7	4,831.5	50,731.1	23.0
78%	64.3	60	4.3	70.9	304.7	3,199.4	4,251.7	44,643.3	20.3
80%	64.3	60	4.3	64.4	277.0	2,908.6	3,865.2	40,584.9	18.4
81%	64.3	60	4.3	61.2	263.2	2,763.2	3,672.0	38,555.6	17.5
82%	**64.3**	**60**	**4.3**	**58.0**	**249.3**	**2,617.7**	**3,478.7**	**36,526.4**	**16.6**
85%	64.3	60	4.3	48.3	207.8	2,181.4	2,898.9	30,438.6	13.8
Remaining directed trips that landed SCS (fishing in incidental fashion after quota filled)									
50%	0.6	0	0.6	250.1	140.1	1,470.8	0	0	0
60%	0.6	0	0.6	339.5	190.1	1,996.0	0	0	0
70%	0.6	0	0.6	428.8	240.1	2,521.2	0	0	0
75%	0.6	0	0.6	473.4	265.1	2,783.8	0	0	0
78%	0.6	0	0.6	500.2	280.1	2,941.4	0	0	0
80%	0.6	0	0.6	518.1	290.1	3,046.4	0	0	0
81%	0.6	0	0.6	527.0	295.1	3,099.0	0	0	0
82%	**0.6**	**0**	**0.6**	**536.0**	**300.1**	**3,151.5**	**0**	**0**	**0**
85%	0.6	0	0.6	562.8	315.1	3,309.1	0	0	0
							0	0	0
Trips taken by incidental permit holders									
50%	0.6	0	0.6	222	124.32	1,305.4	0	0	0
60%	0.6	0	0.6	222	124.32	1,305.4	0	0	0
70%	0.6	0	0.6	222	124.32	1,305.4	0	0	0
75%	0.6	0	0.6	222	124.32	1,305.4	0	0	0
78%	0.6	0	0.6	222	124.32	1,305.4	0	0	0
80%	0.6	0	0.6	222	124.32	1,305.4	0	0	0
81%	0.6	0	0.6	222	124.32	1,305.4	0	0	0
82%	**0.6**	**0**	**0.6**	**222**	**124.32**	**1,305.4**	**0**	**0**	**0**
85%	0.6	0	0.6	222	124.32	1,305.4	0	0	0

Table A.5 Blacknose shark harvest and discards under alternative A4. Bold text indicates the preferred reduction.

A Reduction in Non-Blacknose SCS Quota	B Avg # Blacknose Caught/Trip	C Avg. retention/trip (number) of blacknose for directed permit holders	D Discards (number per trip)	E Estimated # of Trips	F Total Discards (total # of sharks for all trips)	G Total Discards (lb dw)	H Total Kept (number of sharks)	I Total Kept (lb dw)	J Total Kept (mt dw)
Directed Trips									
50%	84.5	75	9.5	168.5	1,600.6	8,643.1	12,636.1	68,234.8	31.0
55%	84.5	75	9.5	151.6	1,440.5	7,778.8	11,372.5	61,411.4	27.9
60%	84.5	75	9.5	134.8	1,280.5	6,914.5	10,108.9	54,587.9	24.8
70%	84.5	75	9.5	101.1	960.3	5,185.8	7,581.6	40,940.9	18.6
75%	84.5	75	9.5	84.2	800.3	4,321.5	6,318.0	34,117.4	15.5
76%	**84.5**	**75**	**9.5**	**80.9**	**768.3**	**4,148.7**	**6,065.3**	**32,752.7**	**14.9**
78%	84.5	75	9.5	74.1	704.3	3,803.0	5,559.9	30,023.3	13.6
80%	84.5	75	9.5	67.4	640.2	3,457.2	5,054.4	27,293.9	12.4
85%	84.5	75	9.5	50.5	480.2	2,592.9	3,790.8	20,470.5	9.3
Remaining directed trips that landed SCS (fishing in incidental fashion after quota filled)									
50%	1.2	0.0	1.2	-202.0	0.0	0.0	0	0	0
55%	1.2	0.0	1.2	-155.2	0.0	0.0	0	0	0
60%	1.2	0.0	1.2	-108.5	0.0	0.0	0	0	0
70%	1.2	0.0	1.2	-15.1	0.0	0.0	0	0	0
75%	1.2	0.0	1.2	31.6	38.0	205.0	0	0	0
76%	**1.2**	**0.0**	**1.2**	**41.0**	**49.2**	**265.6**	0	0	0
78%	1.2	0.0	1.2	59.7	71.6	386.7	0	0	0
80%	1.2	0.0	1.2	78.4	94.0	507.8	0	0	0
85%	1.2	0.0	1.2	125.1	150.1	810.5	0	0	0
Trips taken by incidental permit holders									
50%	0.6	0.0	0.6	222	133.2	719.3	0	0	0
55%	0.6	0.0	0.6	222	133.2	719.3	0	0	0
60%	0.6	0.0	0.6	222	133.2	719.3	0	0	0
70%	0.6	0.0	0.6	222	133.2	719.3	0	0	0
75%	0.6	0.0	0.6	222	133.2	719.3	0	0	0
76%	**0.6**	**0.0**	**0.6**	**222**	**133.2**	**719.3**	0	0	0
78%	0.6	0.0	0.6	222	133.2	719.3	0	0	0
80%	0.6	0.0	0.6	222	133.2	719.3	0	0	0
85%	0.6	0.0	0.6	222	133.2	719.3	0	0	0

Table A.6 **Total blacknose shark mortality under different non-blacknose SCS quota reductions for alternative A3. Bold text indicates the preferred reduction.**

A Reduction in Non-Blacknose SCS Quota	B Blacknose allowance (number of sharks)	C Blacknose allowance (lb dw)	D Total Mortality Under A3 (lb dw)	E Total Mortality Under A3 (number of sharks)	F Difference Between allowance and Total Mortality (lb dw)	G Difference Between allowance and Total Mortality (number of sharks)	H SCS Quota (mt dw)	I Blacknose Quota (mt dw)
50%	7,094	44,853.8	111,509.8	10,620	-66,656.0	-3,526	118.6	46.0
60%	7,094	44,853.8	90,288.3	8,599	-45,434.5	-1,505	94.9	36.8
70%	7,094	44,853.8	69,066.8	6,578	-24,213.0	516	71.2	27.6
75%	7,094	44,853.8	58,456.0	5,567	-13,602.2	1,527	59.3	23.0
78%	7,094	44,853.8	52,089.6	4,961	-7,235.8	2,133	52.2	20.3
80%	7,094	44,853.8	47,845.3	4,557	-2,991.5	2,537	47.4	18.4
81%	7,094	44,853.8	45,723.1	4,355	-869.3	2,739	45.1	17.5
82%	**7,094**	**44,853.8**	**43,601.0**	**4,152**	**1,252.8**	**2,942**	**42.7**	**16.6**
85%	7,094	44,853.8	37,234.5	3,546	7,619.3	3,548	35.6	13.8

Table A.7 **Total blacknose shark mortality under different non-blacknose SCS quota reductions for alternative A4. Bold text indicates the preferred reduction.**

A Reduction in Non-Blacknose SCS Quota	B Blacknose allowance (number of sharks)	C Blacknose allowance (lb dw)	D Total Mortality Under A4 (lb dw)	E Total Mortality Under A4 (number of sharks)	F Difference Between allowance and Total Mortality (lb dw)	G Difference Between allowance and Total Mortality (number of sharks)	H SCS Quota (mt dw)	I Blacknose Quota (mt dw)
50%	7,094	44,853.8	77,597.2	14,370	-32,743.4	-7,276	118.6	31.0
55%	7,094	44,853.8	69,909.4	12,946	-25,055.6	-5,852	106.7	27.9
60%	7,094	44,853.8	62,221.6	11,523	-17,367.8	-4,429	94.9	24.8
70%	7,094	44,853.8	46,846.0	8,675	-1,992.2	-1,581	71.2	18.6
75%	7,094	44,853.8	39,363.3	7,289	5,490.5	-195	59.3	15.5
76%	**7,094**	**44,853.8**	**37,886.3**	**7,016**	**6,967.5**	**78**	**56.9**	**14.9**
78%	7,094	44,853.8	34,932.2	6,469	9,921.6	625	52.2	13.6
80%	7,094	44,853.8	31,978.2	5,922	12,875.6	1,172	47.4	12.4
85%	7,094	44,853.8	24,593.2	4,554	20,260.6	2,540	35.6	9.3

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November 14, 2008

Karyl Brewster-Geisz
HMS Management Division F/SF1
National Marine Fisheries Service
1315 East West Highway
Silver Spring, MD 20910

RE: Scoping Comments on Amendment 3 to the HMS FMP

The Southern Shrimp Alliance (SSA) appreciates the opportunity to provide the following scoping comments on Amendment 3 to the Highly Migratory Species (HMS) Fishery Management Plan (FMP).

SSA has enjoyed a very constructive relationship with the National Marine Fisheries Service (NMFS) in addressing difficult conservation challenges facing the US shrimp fisheries. Working together we have achieved a number of mutually beneficial results including red snapper bycatch conservation in the Gulf of Mexico and deep sea coral habitat protection in the South Atlantic. Like those issues, we look forward to working cooperatively with the Agency in addressing the blacknose shark conservation issues raised by the Agency's determination that this stock is overfished and overfishing is occurring.

Although a product of peer review, we have a number of concerns with the data inputs, assumptions and analyses associated with the 2007 SEDAR stock assessment for blacknose sharks. These issues relate both to the estimates of bycatch attributed to the shrimp fishery and some elements of the stock assessment itself. These issues do not appear trivial and if carefully revisited by the Agency's scientific staff, may well result in significant changes to these bycatch estimates and the resulting status determination of the stock. Before addressing any management options that may be required for the shrimp fisheries, we feel strongly that a cooperative effort to reconsider these scientific issues is warranted. Therefore, we urge that Agency to enter into such a cooperative effort among government and non-government scientists with the objective of reaching consensus.

There follows an informal outline of a number of the scientific issues we have identified and which we hope will be addressed by such a scientific review. We appreciate your consideration and look forward to working with you.

Sincerely,

John Williams,
Executive Director

Southern Shrimp Alliance, Inc

ELEMENTS OF BLACKNOSE SHARK ASSESSMENT THAT WARRANT RECONSIDERATION

DATA INPUTS

- **SEAMAP Data**

  - Seasonal
    - Bycatch estimates are performed on a trimester basis but standard SEAMAP cruises are performed only in the 2nd and 3rd trimesters. There has been some sparse sampling in winter, but the winter estimate may not be very good.

  - Geographical
    - Blacknose shark abundance is highest in the eastern GOM (stat areas 1-9). However, SEAMAP cruises are not routinely conducted in stat areas 1-9, but are conducted in the western GOM areas 10-21. This raises question as to the validity of SEAMAP data to this species.
    - The author of the SEAMAP abundance indices (Nichols) indicated that his model was not "as satisfactory" for species such as blacknose sharks which occur mainly in the eastern GOM as compared to the western GOM where SEAMAP cruises are typically conducted. He also discusses the high cost of imbalanced sampling where the entire range is not sampled. This seems to cast uncertainty on the blacknose shark assessment.

  - Day/Night data
    - Blacknose sharks were taken at depths between 10 and 40 fathoms in the fall SEAMAP studies and between 5 and 50 fathoms in the summer SEAMAP studies. . In the western GOM, these depths are fished by the brown shrimp fishery which is a night fishery. In the eastern GOM, these depths are used by the pink shrimp fishery which is also a night fishery.
    - The SEAMAP data used in the assessment combines catch data for trawls conducted at both night and day. The SEAMAP day trawl blacknose shark catch rate was stated to be 15 times greater than the night trawl catch rate. Only the night trawl data is applicable to the fisheries in question. Therefore, the catch rates used in the assessment are likely much higher than what actually occur in the fisheries.

  - Bycatch reduction from TEDs
    - The Georgia Bulldog video strongly suggests that TEDs are effective in excluding a substantial number of the sharks entering the net. It appears that the video includes

portions during which the net was equipped with the older small TED and portions with the newer larger TED now required for use in our fisheries. Our preliminary review indicates that of the portion where the new larger TED was used, approximate 12 out of 17 sharks (70%) were excluded from the net. This is critical information because SEAMAP nets are not equipped with any TED design and yet SEAMAP data was a major source of data used in the assessment. All shrimp trawl nets operating in the brown and pink shrimp fisheries are equipped with TEDs. Therefore, the number of takes of blacknose sharks in the SEAMAP cruises used in the assessment are likely much higher than what actually occur in the fisheries. (See section on "shrimp trawl video" below)

- Sample size
  - The assessment uses a correlation between a very small sample size of SEAMAP takes (273) and observed takes (27)as a predictor of shrimp trawl bycatch. Validity?

- **Observer Data**
  - Relevance of data to current fishery (age of data)
    - The NMFS observer data used in the assessment is primarily from the 1970s and 1980s shrimp trawl fishery. Only 11 takes of blacknose sharks have been observed in that past 16 years (since 1992). Validity of observer data?

- **Shrimp Trawl Fishing Effort Data**
  - Most Current ?
    - It does not appear that the stock assessment used the most current shrimp trawl fishing effort data.
    - What was the benchmark period used in the assessment for the bycatch estimates?
    - Shrimp trawl fishing effort in the 10-30fm zone in the western GOM (stat areas 10-21) has been reduced by approximately 78 to 80 percent since 2001-2003. Shrimp trawl fishing effort in the eastern GOM has also been reduced by 79 percent. Therefore, the estimates of shrimp trawl bycatch used in the assessment may be significantly higher than what is actually occurring in the fisheries.

LIFE HISTORY ASSUMPTIONS

- **Fecundity**
  - The assessment notes that blacknose sharks in the South Atlantic reproduce every 2 years and that blacknose sharks in the GOM reproduce every year. This is confirmed in the scientific literature.
  - The assessment further notes there were difficulties in running the model using the 2 year assumption for the South Atlantic. Consequently, the assessment scientists

chose to use an average of the two and thereby assumed that blacknose sharks reproduce every 1.5 years in both the GOM and South Atlantic.

- The assumption that reproduction occurs every 1.5 years instead of 1 year in the GOM is likely to have a substantial impact on the intrinsic rate of population increase (r) for the stock. This represents a 33% reduction in the spawning stock fecundity which is a principal measure used for the stock status determination. In other words, the population rate of growth and recruitment used in the assessment is likely to be much lower than what is actually occurring in the GOM population. Consequently, the assessment's conclusions about the status of the blacknose shark are likely to be overly pessimistic.

- **Distribution**
  - SEAMAP data indicates that since 1972 only 273 blacknose sharks were caught in 15,652 tows and that blacknose sharks were present in less than 1 percent of the SEAMAP stations. SEAMAP cruises are conducted in the western GOM. This low number of interactions indicates that the western GOM is not within the primary range of this species. This calls into question the validity of using SEAMAP data for this assessment.

CHOICE OF ASSESSMENT MODEL AND METHODS

The assessment indicates that different models/methods produced different results. The figure of page 16 of the SEDAR Review Panel report indicates that one method resulted in the stock status determination of overfished and overfishing is occurring and the other did not. The model chosen was that which resulted in the overfished/overfishing determination. Neither model produced good fits to the abundance indices. There is also discussion in the Review Panel Report regarding how the age-structured approach fit all of the catch data well except the shrimp bycatch data. And, there are a number of points made about how the results of this assessment may change considerably in the next assessment. This lack of consistency between models begs explanation and suggests uncertainty.

OTHER DATA & ANALYTICAL ISSUES

- **Fish Size & Mortality Assumptions**
  - The assessment appears to use an assumption that blacknose sharks taken in all commercial fisheries average 4.97 lbs dw, and that blacknose sharks taken in all recreational fisheries average 1.5 lbs dw.

    - What is the source of these average fish size assumptions for both commercial and recreational fisheries?

- The assessment presents data indicating that the recreational fisheries landed (killed) 10,408 blacknose sharks. Why would recreational anglers land (kill) sharks that only weigh 1.5 lbs instead of releasing them? Is this really happening or is a product of extrapolation? This really calls into question the validity of the average fish size assumption for recreational fisheries.

- Does the Georgia Bulldog video confirm that a reasonable estimate of the average size of sharks which pass through the TED into the cod end of the net is 4.97 lbs? Our preliminary review suggests that the sharks that pass through the TED and into the net are smaller than 4.97 lbs dw. If the average size of sharks is significantly smaller than 4.97 lb dw, this could have a major impact on the fishing mortality rate for shrimp trawl bycatch. This, in turn, could have a significant impact on the stock status determination.

- The assessment appears to assume that catch = 100% mortality in the commercial fisheries. Does catch = 100% mortality in the commercial fisheries including the shrimp trawl fishery? What is the post-release survival of discarded sharks in these fisheries? If survival is greater than 0 percent than the assessment may be overly pessimistic.

- Does the assessment assume the same fishing mortality rate (F) for 1.5 lb fish taken in the recreational fisheries and 4.97 lb fish taken in the commercial fisheries? In reality, there is likely to be a substantial difference in the F rate associated with these different average sizes (ages).

- What is the sensitivity of the model to differences in each of the assumptions discussed above?

- **SEDAR 13 Review Panel Report Issues**

  - Natural Mortality
    - On page 14 of the Report there is a discussion of the natural mortality rate assumption being the highest pup survival (ie. low M). Is this a valid or reasonable assumption? The choice of M can have a major impact on the assessment results in terms of stock status. Sensitivity analyses need to be conducted using a plausible range of M values.
  - Indices of Abundance
    - The discussion at the bottom of page 14 of the Report seems to suggest that there are serious problems with the selected indices because they cannot all account for the condition of the stock. There is a question of whether the

stock unit is properly defined and a recommendation for using subsets in the future.

- Gear Selectivity
  - The Report indicates that the method used to estimate gear selectivity was "relatively crude" and there was insufficient information for the reviewers to determine if this approach was adequate or not. (see top of p. 15)

- In General
  - How do the following statements in the SEDAR 13 Review Panel Report support the need for a timely review and revision of the current stock assessment? (bold added)

(1) **"Executive Summary:** For **blacknose sharks**, appropriate standard assessment methods based on general production models and on age-structured modeling were used to derive management benchmarks. The current assessment indicates that spawning stock fecundity (SSF) in 2005 and during 2001-2005 is smaller than SSFmsy, i.e. that blacknose shark are overfished. The estimate of fishing mortality rate in 2005 and the average for 2001-2005 is greater than Fmsy, and the ratio is substantially greater than 1 in both cases. Thus, overfishing was occurring and is likely still occurring. **However, because of uncertainties in indices, catches and life history parameters, the status of blacknose shark could change substantially in the next assessment in an unpredictable direction." (See p. 2)**

(2) ***"Schedule for the next assessment of blacknose:*** the current stock status indicates that blacknose shark is being overfished and that overfishing is occurring. Thus, **it would be wise to reassess this stock within two or three years**. **Users of the assessment results should be aware that major differences in the estimated status could be expected in the next assessment if consistent subsets of stock size indices were used. In the current assessment, the stock size indices used are conflicting, and the assessment model takes an average of all the indices. If separate assessments were done with the indices that indicated increases, those that indicated stability, and those that indicated decreases, this would show greater uncertainty in stock status and stock trends." (See p.19)**

SHRIMP TRAWL VIDEO

Southern Shrimp Alliance, Inc

- NMFS HMS Division has distributed a video as part of their scoping presentations to the Councils as supporting evidence that sharks are caught as bycatch in the shrimp trawl fisheries.

- According to NMFS HMS Division:

  "The footage was shot off the coast of Georgia from the R/V Georgia Bulldog. It is a confiscated shrimp trawler operated by the University of Georgia Marine Extension Service. Most of the footage was within 10 miles of shore, in water depths less than 40 feet. All the footage was using TEDs with less than 4 inch bar spacing. There has been no analysis of the shark catch. This work was primarily done to test these TEDs for wild turtle exclusion, and the SEFSC was not working up or identifying the bycatch. However, the SEFC noted that most of these sharks appear to be approximately 2 ½ feet long."

- The video appears to indicate that a very significant number (~70%) of the sharks that enter the net are expelled through the new, large TED opening.

- The SEDAR assessment of blacknose shark (and other coastal sharks) relied heavily on SEAMAP data to estimate shark bycatch in shrimp trawl fisheries. The SEAMAP trawl net is not equipped with a TED. Thus, it appears that the assessment did not account for what appears to be a very substantial shark bycatch reduction effect of TEDs used in 100% of the current brown and pink fisheries where blacknose shark bycatch can occur. If this is true, then the assessment is likely to be overly pessimistic.

- The SEDAR assessment also assumed the average weight of sharks caught in shrimp trawl fisheries was 4.97 lb dw. Is it possible to estimate size of sharks that passed through the TED bars into the cod end of the net used in the video to confirm if that is consistent with 4.97 lb dw assumption in assessment?

- Is there any data that can be retrieved from the Georgia Bulldog testing cruises to determine the mortality/survival rates of sharks found in the cod end? Any species identification possible?

UNITED STATES DEPARTMENT OF COMMERCE
National Oceanic and Atmospheric Administration
NATIONAL MARINE FISHERIES SERVICE
Silver Spring, MD 20910

Dr. Bonnie Ponwith
Director,
Southeast Fisheries Science Center
75 Virginia Beach Drive
Miami, FL 33149

MAR 2 7 2009

Dear Dr. Ponwith,

As you are aware, the Highly Migratory Species (HMS) Management Division is in the process of writing a draft Environmental Impact Statement (EIS) and proposed rule that would implement measures to rebuild overfished stocks and end overfishing of Atlantic shark stocks per the recent small coastal shark assessments completed in 2007.

For this rulemaking, the HMS Management Division released a scoping presentation and request for comments on the EIS on July 2, 2008 (73 FR 37932). The Southern Shrimp Alliance (SSA) provided a comment on the scoping presentation dated November 14, 2008. In their comment was a section entitled "Elements of Blacknose Shark Assessment that Warrant Reconsideration" that contained several comments regarding SEDAR 13 as well as comments regarding a shrimp trawl video that was made by the Southeast Fisheries Science Center (SEFSC) in Pascagoula, Mississippi, and distributed to interested parties by the HMS Management Division. The HMS Management Division distributed this video to simply show that small sharks can go through the turtle exclusion devices (TEDs) found on commercial shrimp trawls.

On February 10, 2009, the HMS Management Division released a Predraft summarizing the comments received during scoping. Some of the SSA comments on the stock assessment were addressed in the Predraft; however, the SSA submitted another comment on March 16, 2009, regarding the Predraft. Their comment included additional analyses on the shrimp trawl video and the shrimp bycatch model used in SEDAR 13. In their March 16, 2009, comment, the SSA stated that the section of the Predraft that responded to their scoping comments regarding SEDAR 13 was not "consistent with the prevailing scientific understanding of the issues raised." In addition, the SSA submitted a powerpoint/report entitled "Potential Effects of Turtle Excluder Devices on Bycatch of Blacknose Sharks." The SSA states that the "report has been submitted by the authors to the SEFSC. It strongly suggests that the blacknose bycatch estimate for the shrimp trawl fisheries that was used in the SEDAR 13 stock assessment did not adequately account for the substantial blacknose shark bycatch reduction effect of TED's currently deployed in the shrimp trawl fisheries. Consequently, the bycatch estimate used in the stock assessment is likely substantially higher than what is actually occurring in the fisheries." The SSA also submitted a datasheet and a report entitled "A Review of Submersible Video Depicting Shark Interaction with various TED types," which analyzes the shrimp trawl video showing interactions of sea turtles, finfish, and sharks with TEDs in the South Atlantic.

Given the many concerns expressed regarding the methods and results derived from the SEDAR 13 assessments on small coastal sharks, I am writing to seek assistance from the SEFSC in

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drafting a response to the November 14, 2008, and March 16, 2009, comments submitted by the SSA. During the Amendment 2 rulemaking, I made a similar request regarding comments we received from Rusty Hudson and Dr. Frank Hester. The response we received from the SEFSC was helpful not only in responding to the comments but also for my staff in analyzing the different management measures.

I feel that a response by the SEFSC in this instance is required given your staff's familiarity with the data and methodology employed during the SEDAR 13 assessments. The SEFSC staff's expertise is needed to address the technical comments raised by the SSA regarding SEDAR 13 in their November 14, 2008, comment (and in particular, the section entitled "Elements of Blacknose Shark Assessment that Warrant Reconsideration), and the alternate analysis proposed in the reported entitled "Potential Effects of Turtle Excluder Devices on Bycatch of Blacknose Sharks." The comments and documents referenced above have already been sent to Katie Andrews, John Carlson, and Enric Cortés.

Furthermore, as we begin conducting analyses of the ecological impacts of the measures considered in the amendment, collaboration with Enric and Katie may be necessary to ensure that data and methods are consistent with past analyses conducted by the SEFSC.

If you have any questions or concerns regarding these requests, please contact Margo Schulze-Haugen, Chief of the HMS Management Division, at (301) 713-2347. I look forward to collaborating with you on this and future endeavors.

Sincerely,

Alan Risenhoover
Director, Office of Sustainable Fisheries

Cc: Roy Crabtree, Assistant Administrator, Southeast Regional Office
Cc: Guy Davenport, Director, Southeast Fisheries Science Center, Panama City Laboratory
Cc: Katie Andrews, Panama City Laboratory
Cc: Enric Cortés, Panama City Laboratory
Cc: John Carlson, Panama City Laboratory

UNITED STATE DEPARTMENT OFCOMMERCE
National Oceanic and Atmospheric Administration
National Marine Fisheries Service
Southeast Fisheries Science Center
75 Virginia Beach Drive
Miami, Florida 33149 U.S.A.

June 2, 2009

MEMORANDUM TO: Alan Risenhoover, Sustainable Fisheries Director

FROM: Bonnie Ponwith, Southeast Fisheries Director

SUBJECT: HMS letter dated 3/27/2009 and conference call on 5/1/2009 requesting additional analyses for blacknose sharks

Attached are two documents in response to 1) the letter you sent on 3/27/2009 seeking SEFSC assistance in responding to SSA comments and 2) the request made during the conference call held on 5/1/2009.

Regarding (1), in document "SEFSC response to comments from SSA for HMS.doc", we have specifically addressed all scientific and technical issues raised in the SSA document "Comments on HMS A3 scoping blacknose sharks 11-14-08.doc". Additional relevant technical comments made by the SSA in document "Comments on HMS Pre-draft A3 blacknose sharks 3-16-09.docx" and other attachments distributed by Jackie Wilson from HMS are essentially addressed in our response or are being addressed through a collaborative effort with LGL Ecological Associates.

Regarding (2), the request to carry out additional analyses to assess the influence that different assumptions on the level of bycatch reduction may have on blacknose shark stock status, we ran three scenarios in which the shrimp bycatch series from the baseline stock assessment conducted in 2007 was reduced by 25%, 50% and 75%, respectively, to account for the introduction of TEDs in the shrimp trawl fishery starting in 1990. The attached spreadsheet ("Blacknose shark assessment scenarios with bycatch reduction.xls" summarizes the results of the new model runs. Essentially, there is no change in stock status (see cells highlighted in blue, F_{2005}/F_{MSY} and N_{2005}/N_{MSY}). Although stock status improves, despite reductions of 25% to 75% in shrimp bycatch, the stock continues to be overfished (N_{2005}/N_{MSY}=0.66 to 0.74 vs. 0.48 in the baseline assessment run from the 2007 blacknose shark stock assessment) and overfishing is still occurring (F_{2005}/F_{MSY}=2.67 to 2.21 vs. 3.77 in the baseline assessment run from the 2007 blacknose shark stock assessment). For reference, the anticipated post-TED (1990 on) reduction in bycatch from the model currently in development is approximately 50%.

Let us know if you need clarification on any of our answers to the comments posed by the SSA or on the results of the additional assessment runs.

Attachments

Cc: Roy Crabtree

SEFSC response to comments from Southern Shrimp Alliance on blacknose shark bycatch and assessment

by Drs. Katie Andrews and Enric Cortés

Below are our responses to technical comments submitted by the Southern Shrimp Alliance (SSA) to the NMFS HMS Division in document "Comments on HMS A3 Scoping blacknose sharks 11-14-08.docx". Comments follow the question text as copied from the SSA document.

ELEMENTS OF BLACKNOSE SHARK ASSESSMENT THAT WARRANT RECONSIDERATION

DATA INPUTS

- **SEAMAP Data**
  - Seasonal
    - Q: Bycatch estimates are performed on a trimester basis but standard SEAMAP cruises are performed only in the 2nd and 3rd trimesters. There has been some sparse sampling in winter, but the winter estimate may not be very good.
      A: Bycatch estimates are provided on an annual scale, but trimester estimates are available if needed. The comment was that the winter estimates may not be very good because there is sparse sampling in winter (i.e. no SEAMAP data). The data are sparse for the bycatch estimates in general. This may lead to an over or underestimation of bycatch depending on the encounter rate. When there are no SEAMAP data, the observer data are used alone to provide the estimate, therefore it is the best science available given the data.
  - Geographical
    - Q: Blacknose shark abundance is highest in the eastern GOM (stat areas 1-9). However, SEAMAP cruises are not routinely conducted in stat areas 1-9, but are conducted in the western GOM areas 10-21. This raises question as to the validity of SEAMAP data to this species.
      A: We do not know of any sources that verify that blacknose abundance is greater in the eastern GOM than the western GOM. The SEAMAP data supplement the sparse observer data in the GOM. Since the SEAMAP data cover half the GOM spatially, they are valid data for such a calculation.
    - Q: The author of the SEAMAP abundance indices (Nichols) indicated that his model was not "as satisfactory" for species such as blacknose sharks which occur mainly in the eastern GOM as compared to the western GOM where SEAMAP cruises are typically conducted. He also discusses the high cost of imbalanced sampling where the entire range is not sampled. This seems to cast uncertainty on the blacknose shark assessment.

A: The question raised is whether SEAMAP data are valid for blacknose shark assessment. The SEAMAP data presented by Nichols were not used to provide an estimate of relative abundance for the assessment (i.e. CPUE) because they were not accepted by the WG; they were used to provide bycatch estimates only.

- Day/Night data
  - Q: Blacknose sharks were taken at depths between 10 and 40 fathoms in the fall SEAMAP studies and between 5 and 50 fathoms in the summer SEAMAP studies. In the western GOM, these depths are fished by the brown shrimp fishery which is a night fishery. In the eastern GOM, these depths are used by the pink shrimp fishery which is also a night fishery. The SEAMAP data used in the assessment combines catch data for trawls conducted at both night and day. The SEAMAP day trawl blacknose shark catch rate was stated to be 15 times greater than the night trawl catch rate. Only the night trawl data is applicable to the fisheries in question. Therefore, the catch rates used in the assessment are likely much higher than what actually occur in the fisheries.
    A: The factor, *depth*, is included in the model to estimate bycatch in the shrimp fishery rather than a *day/night* factor. There are data we plan to use to determine the proportion of shrimping that occurs during the day versus night. We also plan to re-examine *depth* simultaneously to determine if *day/night* would better describe the distribution of shrimping effort in the GOM.

- Bycatch reduction from TEDs
  - Q: The Georgia Bulldog video strongly suggests that TEDs are effective in excluding a substantial number of the sharks entering the net. It appears that the video includes portions during which the net was equipped with the older small TED and portions with the newer larger TED now required for use in our fisheries. Our preliminary review indicates that of the portion where the new larger TED was used, approximate 12 out of 17 sharks (70%) were excluded from the net. This is critical information because SEAMAP nets are not equipped with any TED design and yet SEAMAP data was a major source of data used in the assessment. All shrimp trawl nets operating in the brown and pink shrimp fisheries are equipped with TEDs. Therefore, the number of takes of than what actually occur in the fisheries. (See section on "shrimp trawl video" below)
    A: It is apparent that TEDs reduce, but do not eliminate, the number of sharks that are caught as bycatch in the shrimp fishery. We are currently working with consultants from LGL Ecological Associates to explicitly incorporate a TED effect into the bycatch estimation model. Also, we repeat that SEAMAP data were only used in shrimp trawl bycatch estimation, not as a CPUE time series or any other data inputs used in the stock assessment.

- Sample size
  - Q: The assessment uses a correlation between a very small sample size of SEAMAP takes (273) and observed takes (27)as a predictor of shrimp trawl bycatch. Validity?

A: Using the SEAMAP data and observer data to estimate the number of blacknose sharks captured as bycatch is not only valid, but also warranted. It is widely accepted that a considerable amount of bycatch of a number of species are taken by the shrimp trawl nets. That bycatch must be quantified. It is more difficult to provide robust estimates with limited data, but we are using the best available science to analyze the data that are available.

- **Observer Data**
  - Relevance of data to current fishery (age of data)
    - Q: The NMFS observer data used in the assessment is primarily from the 1970s and 1980s shrimp trawl fishery. Only 11 takes of blacknose sharks have been observed in that past 16 years (since 1992). Validity of observer data?

      A: The observer data are a valid source of information about the bycatch in the shrimp fishery and cover the entire modern time series of the assessment model (1972-2005). The low number of observed blacknose are much more likely due to observers not being required to record sharks to species for the majority of the time there has been an observer program. Also, there is approximately 1% coverage in the fishery, and that number should be greatly increased in order to provide a better picture of what is caught as bycatch.

- **Shrimp Trawl Fishing Effort Data**

  Most Current ?
    - Q: It does not appear that the stock assessment used the most current shrimp trawl fishing effort data.
    - Q: What was the benchmark period used in the assessment for the bycatch estimates?
    - Q: Shrimp trawl fishing effort in the 10-30fm zone in the western GOM (stat areas 10-21) has been reduced by approximately 78 to 80 percent since 2001-2003. Shrimp trawl fishing effort in the eastern GOM has also been reduced by 79 percent. Therefore, the estimates of shrimp trawl bycatch used in the assessment may be significantly higher than what is actually occurring in the fisheries.

      A: The shrimp trawl effort data used were current at the time of the assessment. The years of effort data available were 1981-2006, but we only used the data through 2005 to match all the other inputs of the assessment. Keep in mind that the assessment began in 2006 and concluded in 2007.

LIFE HISTORY ASSUMPTIONS

- **Fecundity**
  - Q: The assessment notes that blacknose sharks in the South Atlantic reproduce every 2 years and that blacknose sharks in the GOM reproduce every year. This is confirmed in the scientific literature.

- Q: The assessment further notes there were difficulties in running the model using the 2 year assumption for the South Atlantic. Consequently, the assessment scientists chose to use an average of the two and thereby assumed that blacknose sharks reproduce every 1.5 years in both the GOM and South Atlantic.
- Q: The assumption that reproduction occurs every 1.5 years instead of 1 year in the GOM is likely to have a substantial impact on the intrinsic rate of population increase (r) for the stock. This represents a 33% reduction in the spawning stock fecundity which is a principal measure used for the stock status determination. In other words, the population rate of growth and recruitment used in the assessment is likely to be much lower than what is actually occurring in the GOM population. Consequently, the assessment's conclusions about the status of the blacknose shark are likely to be overly pessimistic.

  A: Assuming a combined reproductive cycle of 1.5 years for the GOM and South Atlantic (SA) was decided at the Data Workshop (DW). The rationale for this decision, as explained in the DW report, was that genetic data were not conclusive despite reproductive cycles appearing to be different in the two areas. The growth model used was also a composite for the two areas (GOM and SA) because of the lack of younger individuals in the growth model from the SA and the lack of larger animals from the GOM. As a result, combined maturity ogives for the two areas were also used. Average litter size for the areas combined was 3.3 pups per litter. Assuming a 2-year reproductive cycle for blacknose sharks in the SA with the other life history inputs resulted in a negative population growth rate in a demographic model, which the WG deemed as unlikely. Hence, the WG decided to use the 1.5-year reproductive cycle for the two areas combined. Assuming a 1-yr, as opposed to a 1.5-yr, reproductive cycle obviously increases the reproductive output. However, a sensitivity analysis incorporating a 1-yr reproductive cycle had little effect on stock status criteria (scenario S3 in Table 4.4. of stock assessment).

- **Distribution**
  - Q: SEAMAP data indicates that since 1972 only 273 blacknose sharks were caught in 15,652 tows and that blacknose sharks were present in less than 1 percent of the SEAMAP stations. SEAMAP cruises are conducted in the western GOM. This low number of interactions indicates that the western GOM is not within the primary range of this species. This calls into question the validity of using SEAMAP data for this assessment.

    A: The SEAMAP data were not used as an estimate of relative abundance in the stock assessment, so this concern does not apply.

CHOICE OF ASSESSMENT MODEL AND METHODS

Q: The assessment indicates that different models/methods produced different results. The figure of page 16 of the SEDAR Review Panel report indicates that one method resulted in the

stock status determination of overfished and overfishing is occurring and the other did not. The model chosen was that which resulted in the overfished/overfishing determination. Neither model produced good fits to the abundance indices. There is also discussion in the Review Panel Report regarding how the age-structured approach fit all of the catch data well except the shrimp bycatch data. And, there are a number of points made about how the results of this assessment may change considerably in the next assessment. This lack of consistency between models begs explanation and suggests uncertainty.

A: Uncertainty is pervasive in all stock assessments. The WG opted for the age-structured production model as the "best" model to assess the status of blacknose sharks because it allows more direct incorporation of biological and fishery data than biomass dynamic models. The choice was done prior to running the assessment models. However, as was noted in the Assessment and Review Panel reports (e.g., see phase plot on page 18 of Review Panel report), some of the surplus production models also resulted in an overfished stock status (Bayesian Surplus Model using inverse CV weighting and the WinBUGS state-space model) and overfishing (Bayesian Surplus Model using inverse CV weighting). As noted by the reviewers, results may change if different subsets of relative abundance indices are chosen, but that is true for most stock assessments. Part of the reason for having SEDAR meetings is to convene a group of experts that choose the indices more likely to reflect stock status based on a set of criteria. The assessment actually considered sensitivity analyses in which all CPUE indices were included or using an alternative weighting method, none of which resulted in any substantial change in stock status.

OTHER DATA & ANALYTICAL ISSUES

- **Fish Size & Mortality Assumptions**
  - Q: The assessment appears to use an assumption that blacknose sharks taken in all commercial fisheries average 4.97 lbs dw, and that blacknose sharks taken in all recreational fisheries average 1.5 lbs dw.

    - What is the source of these average fish size assumptions for both commercial and recreational fisheries?

    - The assessment presents data indicating that the recreational fisheries landed (killed) 10,408 blacknose sharks. Why would recreational anglers land (kill) sharks that only weigh 1.5 lbs instead of releasing them? Is this really happening or is a product of extrapolation? This really calls into question the validity of the average fish size assumption for recreational fisheries.

    - Does the Georgia Bulldog video confirm that a reasonable estimate of the average size of sharks which pass through the TED into the cod end of the net is 4.97 lbs? Our preliminary review suggests that the sharks that pass through the

TED and into the net are smaller than 4.97 lbs dw. If the average size of sharks is significantly smaller than 4.97 lb dw, this could have a major impact on the fishing mortality rate for shrimp trawl bycatch. This, in turn, could have a significant impact on the stock status determination.

- The assessment appears to assume that catch = 100% mortality in the commercial fisheries. Does catch = 100% mortality in the commercial fisheries including the shrimp trawl fishery? What is the post-release survival of discarded sharks in these fisheries? If survival is greater than 0 percent than the assessment may be overly pessimistic.

- Does the assessment assume the same fishing mortality rate (F) for 1.5 lb fish taken in the recreational fisheries and 4.97 lb fish taken in the commercial fisheries? In reality, there is likely to be a substantial difference in the F rate associated with these different average sizes (ages).

- What is the sensitivity of the model to differences in each of the assumptions discussed above?

A: There appear to be several misunderstandings or confusions in this section:

We are unsure of the source for the cited 4.97 lb dw average weight for blacknose sharks in the commercial fisheries. As explained in the DW report, the assessment unit is numbers. Table 4 in document SEDAR-13-DW15 shows the average weights used to transform commercial landings (not catches) from weight to numbers for 1995-2005. Average weights come from the shark bottom longline and drift gillnet observer programs. Recreational catches are reported in numbers so no average weights are used. Recreational catch estimates, as explained at length in the DW and other reports, come from the Marine Recreational Fishery Statistics Survey (MRFSS), the NMFS Headboat Survey, and the Texas Parks and Wildlife Department Recreational Survey and include fish retained and discarded dead. Very few animals are measured, but some length and weight information is available (e.g., see Table 9 in document SEDAR-13-DW15).

The sources of mortality from commercial fisheries in Table 4 of the assessment, also found in more detail in the DW report, correspond to *landings*, not catches. Hence, the inclusion separately of bottom longline discards (which come from observed proportions of sharks discarded dead). The bycatch estimates from the shrimp fishery are assumed to be 100% dead. It is very unlikely that any animals would survive capture in the codend. Also, according to observer reports, there is little effort to quickly return live bycatch to the sea.

The difference in fishing mortalities across fisheries comes from the use of fleet-specific selectivities. A different selectivity function was used for longlines, gillnets, etc. Those selectivity curves model the different sizes/ages that each fleet preferentially takes. The surplus production age-structured model estimates a separate F for each fleet (see equations 7 and 8 in stock assessment report).

- **SEDAR 13 Review Panel Report Issues**

  - Q: Natural Mortality
    - On page 14 of the Report there is a discussion of the natural mortality rate assumption being the highest pup survival (ie. low M). Is this a valid or reasonable assumption? The choice of M can have a major impact on the assessment results in terms of stock status. Sensitivity analyses need to be conducted using a plausible range of M values.

      A: The low estimates of M (high survival) used in the baseline demographic and stock assessment analyses are intended to simulate a more realistic, density-dependent response and result in higher production (higher r, higher spawning stock fecundity, etc.). Thus, any sensitivity analyses would necessarily include higher values of M (lower survivorship) resulting in a less productive stock and likely worsened stock status. M values were also age-specific (decreasing with increasing age), which is more realistic than using a fixed value of M for all ages.

  - Q: Indices of Abundance
    - The discussion at the bottom of page 14 of the Report seems to suggest that there are serious problems with the selected indices because they cannot all account for the condition of the stock. There is a question of whether the stock unit is properly defined and a recommendation for using subsets in the future.

      A: The reviewers' advice was that consistent subsets of indices be used to counteract the mixed signals given by multiple, contradicting indices. As of the SEDAR 13 Data Workshop, there was no formal protocol for accepting or rejecting indices of abundance. The WG did so as objectively as possible, and the indices that were used in the assessment were the best available information about the stock at the time based on several selection criteria mentioned earlier. The WG selected those indices to be included in the assessment by considering both positive and negative aspects of each index as well as its perceived utility for the assessment (see Table 3.1 in Data Workshop Report). All selected indices were statistically standardized with GLM techniques. Note also that a sensitivity analysis incorporating all available indices resulted in no change in stock status (scenario S1 in Table 4.4. of stock assessment).

We do not think that using only the increasing or only the decreasing indices is appropriate. The decision to use an index should be made regardless of whether it shows a positive or negative trend over time. The assessment then, in turn, quantifies the stock based on the collection of accepted indices.

- Q: Gear Selectivity
  - The Report indicates that the method used to estimate gear selectivity was "relatively crude" and there was insufficient information for the reviewers to determine if this approach was adequate or not. (see top of p. 15)

  A: The procedure for estimating gear-specific selectivity was briefly described on page 27 of the DW report. After examination of the length frequency data presented at the DW, age-length keys were used to transform length frequencies into age frequencies, from which gear-specific selectivity was estimated prior to the AW using the methodology mentioned. The method for estimating selectivity is explained in detail in document SEDAR-13-AW-02, which was also distributed to the peer reviewers. As to the quality and quantity of the data, the reviewers were presented the attached Powerpoint presentation to explain in detail what was written in the report. The method was accepted by the reviewers as the best method available given the data.

- Q: In General
  - How do the following statements in the SEDAR 13 Review Panel Report support the need for a timely review and revision of the current stock assessment? (bold added)

(1) **"Executive Summary:** For **blacknose sharks**, appropriate standard assessment methods based on general production models and on age-structured modeling were used to derive management benchmarks. The current assessment indicates that spawning stock fecundity (SSF) in 2005 and during 2001-2005 is smaller than SSFmsy, i.e. that blacknose shark are overfished. The estimate of fishing mortality rate in 2005 and the average for 2001-2005 is greater than Fmsy, and the ratio is substantially greater than 1 in both cases. Thus, overfishing was occurring and is likely still occurring. **However, because of uncertainties in indices, catches and life history parameters, the status of blacknose shark could change substantially in the next assessment in an unpredictable direction." (See p. 2)**

(2) ***"Schedule for the next assessment of blacknose:*** the current stock status indicates that blacknose shark is being overfished and that overfishing is occurring. Thus, **it would be wise to reassess this stock within two or three years**. **Users of the assessment results should be aware that major differences in the estimated status could be expected in the next assessment if consistent subsets of stock size indices were used. In the current assessment, the stock size indices used**

are conflicting, and the assessment model takes an average of all the indices. If separate assessments were done with the indices that indicated increases, those that indicated stability, and those that indicated decreases, this would show greater uncertainty in stock status and stock trends." (See p.19)

A: The blacknose assessment and that for the other small coastal sharks was completed in 2007; thus an updated or benchmark assessment scheduled for 2010 would fall within the three-year timeframe mentioned.

Q: SHRIMP TRAWL VIDEO

- NMFS HMS Division has distributed a video as part of their scoping presentations to the Councils as supporting evidence that sharks are caught as bycatch in the shrimp trawl fisheries.

- According to NMFS HMS Division:

  "The footage was shot off the coast of Georgia from the R/V Georgia Bulldog. It is a confiscated shrimp trawler operated by the University of Georgia Marine Extension Service. Most of the footage was within 10 miles of shore, in water depths less than 40 feet. All the footage was using TEDs with less than 4 inch bar spacing. There has been no analysis of the shark catch. This work was primarily done to test these TEDs for wild turtle exclusion, and the SEFSC was not working up or identifying the bycatch. However, the SEFC noted that most of these sharks appear to be approximately 2 ½ feet long."

- The video appears to indicate that a very significant number (~70%) of the sharks that enter the net are expelled through the new, large TED opening.

- The SEDAR assessment of blacknose shark (and other coastal sharks) relied heavily on SEAMAP data to estimate shark bycatch in shrimp trawl fisheries. The SEAMAP trawl net is not equipped with a TED. Thus, it appears that the assessment did not account for what appears to be a very substantial shark bycatch reduction effect of TEDs used in 100% of the current brown and pink fisheries where blacknose shark bycatch can occur. If this is true, then the assessment is likely to be overly pessimistic.

- The SEDAR assessment also assumed the average weight of sharks caught in shrimp trawl fisheries was 4.97 lb dw. Is it possible to estimate size of sharks that passed through the TED bars into the cod end of the net used in the video to confirm if that is consistent with 4.97 lb dw assumption in assessment?

- Is there any data that can be retrieved from the Georgia Bulldog testing cruises to determine the mortality/survival rates of sharks found in the cod end? Any species identification possible?

A: The Georgia Bulldog footage was provided simply to determine whether *any* sharks still get through the TED bars and are retained in the codend. It has been previously stated that there was an expectation that TEDs would exclude a large proportion of sharks and that NMFS is working with consultants hired by the shrimping industry to explicitly model the TED effect in shrimp fishery bycatch. We do not recommend that the Georgia Bulldog footage be used to show percent escapement or retention as it was a small sample taken in the SA during the off-shrimping season. If a study were to be carried out, it should be done on a shrimping vessel during true operational conditions. The species assemblage, fish behavior and environmental conditions will all be different than during the Georgia Bulldog sample trawls.

Each of the reductions is taken after 1990 to reflect a potential magnitude for the TED effect

Summarized stock status	Base assessment results	% Reduction in bycatch 25%	50%	75%
SSF_{2005}/SSF_{MSY}	0.48	0.62	0.65	0.70
F_{2005}/F_{MSY}	3.77	2.67	2.46	2.21
N_{2005}/N_{MSY}	0.48	0.66	0.70	0.74
MSY	89415	77768	73835	69458
B_{2005}/B_0	0.17	0.24	0.25	0.27
Pup-survival	0.78	0.77	0.77	0.76
steepness	0.34	0.33	0.33	0.33

75% reduction in bycatch

New catch series

Year	bycatch
1950	11509
1951	14783
1952	14964
1953	17204
1954	17772
1955	16105
1956	14640
1957	13157
1958	13073
1959	14664
1960	15706
1961	7878
1962	10328
1963	15560
1964	13915
1965	14953
1966	14114
1967	17335
1968	15807
1969	16546
1970	18233
1971	18674
1972	16797
1973	17085
1974	8716
1975	22969
1976	14957
1977	12863
1978	24171
1979	14823
1980	9759
1981	11475
1982	8964
1983	10731
1984	8201
1985	11025
1986	22764
1987	13656
1988	12270
1989	29999
1990	5651
1991	10495
1992	10750

50% reduction in bycatch

New catch series

Year	bycatch
1950	11509
1951	14783
1952	14964
1953	17204
1954	17772
1955	16105
1956	14640
1957	13157
1958	13073
1959	14664
1960	15706
1961	7878
1962	10328
1963	15560
1964	13915
1965	14953
1966	14114
1967	17335
1968	15807
1969	16546
1970	18233
1971	18674
1972	16797
1973	17085
1974	8716
1975	22969
1976	14957
1977	12863
1978	24171
1979	14823
1980	9759
1981	11475
1982	8964
1983	10731
1984	8201
1985	11025
1986	22764
1987	13656
1988	12270
1989	29999
1990	11302.5
1991	20989.5
1992	21499.5

25% reduction in bycatch

New catch series

Year	bycatch
1950	11509
1951	14783
1952	14964
1953	17204
1954	17772
1955	16105
1956	14640
1957	13157
1958	13073
1959	14664
1960	15706
1961	7878
1962	10328
1963	15560
1964	13915
1965	14953
1966	14114
1967	17335
1968	15807
1969	16546
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1973	17085
1974	8716
1975	22969
1976	14957
1977	12863
1978	24171
1979	14823
1980	9759
1981	11475
1982	8964
1983	10731
1984	8201
1985	11025
1986	22764
1987	13656
1988	12270
1989	29999
1990	16953.75
1991	31484.25
1992	32249.25

75% reduction in bycatch (continued)
New catch series

Year	bycatch
1993	4366
1994	7697
1995	11346
1996	9933
1997	16410
1998	9592
1999	7728
2000	8881
2001	12831
2002	7148
2003	15270
2004	18447
2005	5789

50% reduction in bycatch (continued)
New catch series

Year	bycatch
1993	8732
1994	15394.5
1995	22692
1996	19866
1997	32819.5
1998	19183.5
1999	15456.5
2000	17761.5
2001	25662.5
2002	14296.5
2003	30539.5
2004	36893
2005	11577

25% reduction in bycatch (continued)
New catch series

Year	bycatch
1993	13098
1994	23091.75
1995	34038
1996	29799
1997	49229.25
1998	28775.25
1999	23184.75
2000	26642.25
2001	38493.75
2002	21444.75
2003	45809.25
2004	55339.5
2005	17365.5

APPENDIX C TABLE OF CONTENTS

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09-006008

MID-ATLANTIC FISHERY MANAGEMENT COUNCIL

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Executive Director

April 22, 2009

Secretary Gary Locke
Department of Commerce
1401 Constitution Ave., NW
Washington, DC 20230

2009 APR 23 AM 9:11
OS EXECUTIVE SECRETARIAT

Dear Mr. Secretary:

At its April 2009 meeting the Mid-Atlantic Fishery Management Council (Council) passed the following motion:

> "Move that the Mid-Atlantic Fishery Management Council staff draft a letter to the Secretary of Commerce requesting management authority for smooth dogfish."

Further to the Council's motion, the Council hereby requests management authority for smooth dogfish (*Mustelus canis*) in the Atlantic Exclusive Economic Zone (EEZ). The Atlantic States Marine Fisheries Commission currently manages the smooth dogfish fishery in state jurisdictional waters. As you are aware, at the present time there is no management oversight for this species in federal waters.

The above motion was made in the context of a broader action taken by the Council at its April meeting to authorize the initiation of Amendment 1 to the federal Spiny Dogfish Fishery Management Plan (FMP). The Council believes the inclusion of smooth dogfish in Amendment 1 to the Spiny Dogfish FMP is justified on both practical and legal grounds.

As a practical matter, the participants in the smooth dogfish fishery comprise a subset of active participants in the spiny dogfish fishery. The smooth dogfish fishery occurs primarily in the Mid-Atlantic region, and both fisheries (spiny dogfish and smooth dogfish) use the same gear to commercially harvest these species. The directed smooth dogfish fishery falls within the geographic range of the much larger fishery for spiny dogfish, and the two fisheries are separated temporally as a function of water temperature. From a practical perspective, the smooth dogfish fishery closely overlaps the spiny dogfish fishery and adding smooth dogfish to the Spiny Dogfish FMP would enable the Council to manage the fishery more efficiently than the current HMS proposal to include smooth dogfish with the small coastal shark (SCS) complex in Amendment 3, which is geographically removed from the smooth dogfish fishery, and involves a different set of constituents. The Councils already have standing committees and advisory panels in place for spiny dogfish management.

The Council questions the finding in a recent letter (March 18) from Alan Risenhoover of NMFS' Office of Sustainable Fisheries regarding its preliminary determination that smooth dogfish should be classified as a highly migratory species. Our concern centers on the definition of smooth dogfish as a "highly

migratory species." Section 3 (21) of the Magnuson - Stevens Fishery Conservation and Management Act (Act) defines these species as "tuna species, Marlin (*Tetrapturus spp* and *Maikaira spp.*), oceanic sharks, sailfishes (*Istiophorus spp.*), and swordfish (*Xiphias gladias*)." Smooth dogfish can only meet these criteria if it is determined to be an oceanic shark. The literature does not support this conclusion. The distribution of smooth dogfish is primarily near shore in depths of less than 18 meters with occasional entry into fresh water (Bigelow and Schroeder 1948, Castro 1983, Compagno 1984). Additionally, and unlike highly migratory oceanic shark species such as shortfin mako which may migrate throughout entire ocean basins, the migration patterns of the Mid-Atlantic smooth dogfish population is described in the literature as regionally discrete. Specifically, the literature indicate that the regional population of smooth dogfish along the Mid-Atlantic coast winters between southern North Carolina and Chesapeake Bay, moving northward along the coast to New England and southward to South Carolina as water temperatures warm in the springtime, then withdrawing to their wintering area at the end of the summer (Compagno, 1984). The species is also encountered offshore. However, like spiny dogfish, because of the low value of the product, harvest is typically concentrated in state jurisdictional waters.

The commercial fishery for smooth dogfish along the Atlantic States of the U.S. is highly concentrated within the jurisdiction of the Mid-Atlantic Fishery Management Council. Specifically, 98.3 percent (10,870,677 pounds) of the total coastal landings of smooth dogfish from the Atlantic States were landed in the Mid-Atlantic States (North Carolina through New York - reference Table 1). The balance was landed in New England, principally in Rhode Island and Massachusetts. Like the migratory patterns of the species, the commercial landings are regional in nature. This regional fishery does not raise the typical array of issues associated with highly migratory pelagic shark species, which may have vast migratory ranges that raise international resource-sharing considerations, Transboundary Resource Assessment Committee (TRAC) issues, or related complexities.

Table 1. Pounds of Smooth Dogfish Commercially Landed on the Atlantic Coast

Year	NC	NJ	VA	NY	MD	RI	MA	CT	DE	ME	TOTAL
1997	526,998	212,643		3,014	74,530	2,802	11,245				831,232
1998	489,451	184,220	80,753	21,556	300,240	15,896					1,092,116
1999	504,943	309,100	337,891	4,570	124,749	43,873					1,325,126
2000	335,282	409,592	264,465	23,146	36,458	4,052					1,072,995
2001	510,383	280,883	289,600	116,853	6,864			1,919		270	1,206,772
2002	341,672	248,077		148,996	17,780	3,366			131		760,022
2003	373,056	86,428		164,876	14,193	4,833			273		643,659
2004	623,697	213,565		96,093		3,954	1,281	6,459	475		945,524
2005	647,578	97,978	351,403	80,878	9,286	8,544	15,263				1,210,930
2006	610,248	89,614	254,309	114,165	14,433	4,063	45,156	4,066			1,136,054
2007	641,888	77,658		103,743		14,058		1,961			839,308
TOTAL	5,605,196	2,209,758	1,578,421	877,890	598,533	105,441	72,945	14,405	879	270	11,063,738

Source: http://www.st.nmfs.gov/st1/commercial/landings/annual_landings.html, last accessed 21 April, 2009

We recognize and respect the fact that Section 302 (a)(3) of the Act states that "[t]he Secretary shall have authority over any highly migratory species fishery that is within the geographical area of authority of more than one of the following Councils: New England Council, Mid-Atlantic Council, South Atlantic Council, Gulf Council, and Caribbean Council." While the Mid-Atlantic Council would also agree that smooth dogfish are distributed among several Council areas of authority, over 98 percent of the

Council, Gulf Council, and Caribbean Council." While the Mid-Atlantic Council would also agree that smooth dogfish are distributed among several Council areas of authority, over 98 percent of the commercial landings occur within the Mid-Atlantic States. Furthermore, we would point out that the Spiny Dogfish FMP is a joint plan for coastal sharks that was developed and is carried out cooperatively with the New England Council. The spiny dogfish fishery has been rebuilt in large part due to very restrictive management measures put in place since 2000 when the Councils first assumed jurisdictional authority over this previously unmanaged and overfished stock. The Councils' history of recovering the spiny dogfish stock is evidence of their ability to successfully manage and recover coastal shark species, and we request that you take this successful history into consideration in weighing the determination of management authority.

Because of the strong overlap of the spiny and smooth dogfish fisheries, in terms of geographical distribution, management partners, stakeholders and gear, and the fact that we believe the species does not meet the criteria for being classified as a highly migratory species, the Council has concluded that incorporation of management authority for this species into the current Spiny Dogfish FMP would greatly serve the sustainable management of this species in Federal waters and also provide an effective and efficient mechanism for constituent input into the management process.
Your positive consideration and approval of this request will be appreciated.

Sincerely,

for Richard B. Robins, Jr.
Chairman

cc: Jane Lubchenco, NOAA Administrator
James Balsiger, Assistant Administrator for NMFS
Alan Risenhoover, Chief, Office of Sustainable Fisheries, NMFS
Patricia Kurkul, NMFS, NE Regional Administrator
John Pappalardo, Chairman, New England Fishery Management Council

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Bigelow, H.B., and W.C. Schroeder. 1953. Fishes of the Gulf of Maine. Fish. Bull. 74(53):1- 577.

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UNITED STATES DEPARTMENT OF COMMERCE
National Oceanic and Atmospheric Administration
NATIONAL MARINE FISHERIES SERVICE
1315 East-West Highway
Silver Spring, Maryland 20910

THE DIRECTOR

MAY 1 4 2009

Mr. Richard B. Robins, Jr.
Chairman
Mid-Atlantic Fishery Management Council
Room 2115 Federal Building
300 South New Street
Dover, Delaware 19904

Dear Mr. Robins:

Thank you for your letter to Secretary Gary Locke regarding the Mid-Atlantic Fishery Management Council's request for management authority for smooth dogfish.

NOAA's National Marine Fisheries Service (NMFS) is reviewing your request and will provide a formal determination in the near future. As noted in your letter, the biology of smooth dogfish and the requirements of the Magnuson-Stevens Fishery Conservation and Management Act will need to be carefully assessed to determine proper jurisdiction over the species. NMFS has begun reviewing fishery and life history data of smooth dogfish to inform our determination.

I appreciate your commitment to fishery management.

Sincerely,

for James W. Balsiger, Ph.D.
Acting Assistant Administrator
for Fisheries

THE ASSISTANT ADMINISTRATOR
FOR FISHERIES

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UNITED STATES DEPARTMENT OF COMMERCE
National Oceanic and Atmospheric Administration
NATIONAL MARINE FISHERIES SERVICE
Silver Spring, MD 20910

Richard B. Robins, Jr.
Mid-Atlantic Fishery Management Council
Room 2115 Federal Building
300 South New Street
Dover, Delaware 19904

JUL 08 2009

Dear Mr. Robins:

Thank you for your letter to Secretary Locke regarding the Mid-Atlantic Fishery Management Council's (MAFMC) request for management authority for smooth dogfish.

The National Marine Fisheries Service (NMFS) has carefully considered the MAFMC request and analyzed each of the points presented in your letter. NMFS approached the issue with a firm belief that the stock would be well served either under Secretarial or MAFMC management. With this belief, I directed my staff to perform an analysis of the lawful placement of smooth dogfish management. As detailed in the attached document (Smooth Dogfish Management Authority Analysis), NMFS has determined that smooth dogfish falls within the congressional directive regarding highly migratory species (HMS) and should be managed under the Secretary's authority.

The Magnuson-Stevens Fishery Conservation and Management Act (Magnuson-Stevens Act) is the primary statute giving fishery management authority to NMFS, on behalf of the Secretary, and the Regional Fishery Management Councils. In most cases, Regional Fishery Management Councils have authority for fisheries management for stocks and species within each Council's geographic jurisdiction due to the Council's close cooperation with constituents, fishery experience and knowledge, and consensus building process. The only exception to this management authority is for Atlantic HMS that are more effectively managed as a single unit. For this reason, management of HMS was unified by the Magnuson-Stevens Act under the Secretary of Commerce.

Smooth dogfish are found in each of the five Atlantic Regional Fishery Management Council regions and recreational and commercial catches have been reported in four of these regions. While the fisheries in these regions are not currently as developed as that in the mid-Atlantic, the species is currently caught and fishing effort on smooth dogfish could expand in these other regions. If federal smooth dogfish management measures are implemented, including commercial and recreational permit requirements, through Amendment 3 to the 2006 Consolidated HMS FMP, the full impact of the fishery outside of the mid-Atlantic will likely be clarified. Such a wide distribution and range necessitates singular authority resulting in NMFS' determination that smooth dogfish, an oceanic shark, should be managed by the Secretary.

As you noted in your letter, the current commercial fishery is highly concentrated within the mid-Atlantic region and overlaps with the spiny dogfish fishery. As such, I have asked the HMS staff to work closely with the MAFMC to develop specific management measures to ensure

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complementary management between smooth dogfish and other fisheries under your authority. I encourage you to submit specific draft management measures and plans relative to the mid-Atlantic portion of the fishery directly to NMFS where they will be reviewed and implemented to the greatest extent practicable in an appropriate rulemaking.

Your commitment to fishery management is sincerely appreciated, and I look forward to close collaboration on federal smooth dogfish management.

Sincerely,

James W. Balsiger, Ph.D.

cc: Daniel Furlong, Executive Director, MAFMC
Patricia Kurkul, NMFS, NE Regional Administrator
Alan Risenhoover, Chief, Office of Sustainable Fisheries, NMFS
John Pappalardo, Chairman, New England Fishery Management Council

Smooth Dogfish Management Authority Analysis

Magnuson-Stevens Fishery Conservation and Management Act

Two subsections and one National Standard in the Magnuson-Stevens Fishery Conservation and Management Act (Magnuson-Stevens Act) are particularly relevant for determining legal authority and are as follows:

- Section 302 (3):
The Secretary shall have authority over any highly migratory species fishery that is within the geographical area of authority of more than one of the following Councils: New England Council, Mid-Atlantic Council, South Atlantic Council, Gulf Council, and Caribbean Council.
- Section 3 (21):
The term "highly migratory species" means tuna species, marlin (*Tetrapturus* spp. and *Makaira* spp.), oceanic sharks, sailfishes (*Istiophorus* spp.), and swordfish (*Xiphias gladius*).
- Section 301(3) (National Standard 3)
To the extent practicable, an individual stock of fish should be managed as a unit throughout its range, and interrelated stocks of fish shall be managed as a unit or in close coordination.

Magnuson-Stevens Act Section 3 (21) defines highly migratory species (HMS). Unlike other HMS, sharks are not defined by family or species. Rather, the term "oceanic shark" is used. The statute does not further expound upon or define this term. Given the broad application of the term in conjunction with the habitat, migratory patterns and geographic distribution of the species, smooth dogfish is fairly characterized as an oceanic shark.

NMFS examined Section 302 (3) and Section 301 (3) (National Standard 3). Both of these sections relate to management authority based on the distribution of the species. The Compagno (1984) reference included in the MAFMC letter states that smooth dogfish inhabit the geographical area of all five Atlantic Regional Fishery Management Councils, and across international boundaries to South America and Mexico.

Based upon the distribution, occurrence, and seasonal patterns of the smooth dogfish, NMFS has concluded that the smooth dogfish is properly considered highly migratory. According to Compagno (1984), smooth dogfish tend to be found inshore during the warmer months. However, thermally stable, deep offshore waters are preferred in the colder months (up to 200m) and Caribbean populations occupy waters deeper than 200m. Based on distribution maps provided in Compango (1984), smooth dogfish are found along the eastern seaboard, in the Gulf of Mexico, and in the Caribbean Sea. Their distribution further extends to the northern South American coast.

Smooth dogfish observation data from research cruises supports this conclusion. The following map summarizes nearly 6,000 NMFS and university observations of smooth dogfish from the Cooperative Atlantic States Shark Pupping and Nursery (COASTSPAN) and the Southeast Area Monitoring and Assessment Program (SEAMAP) surveys, as well as data from Southeast Fisheries Science Center (SEFSC) and a Virginia Institute for Marine Sciences (VIMS) shark nursery area study (Figure 1).

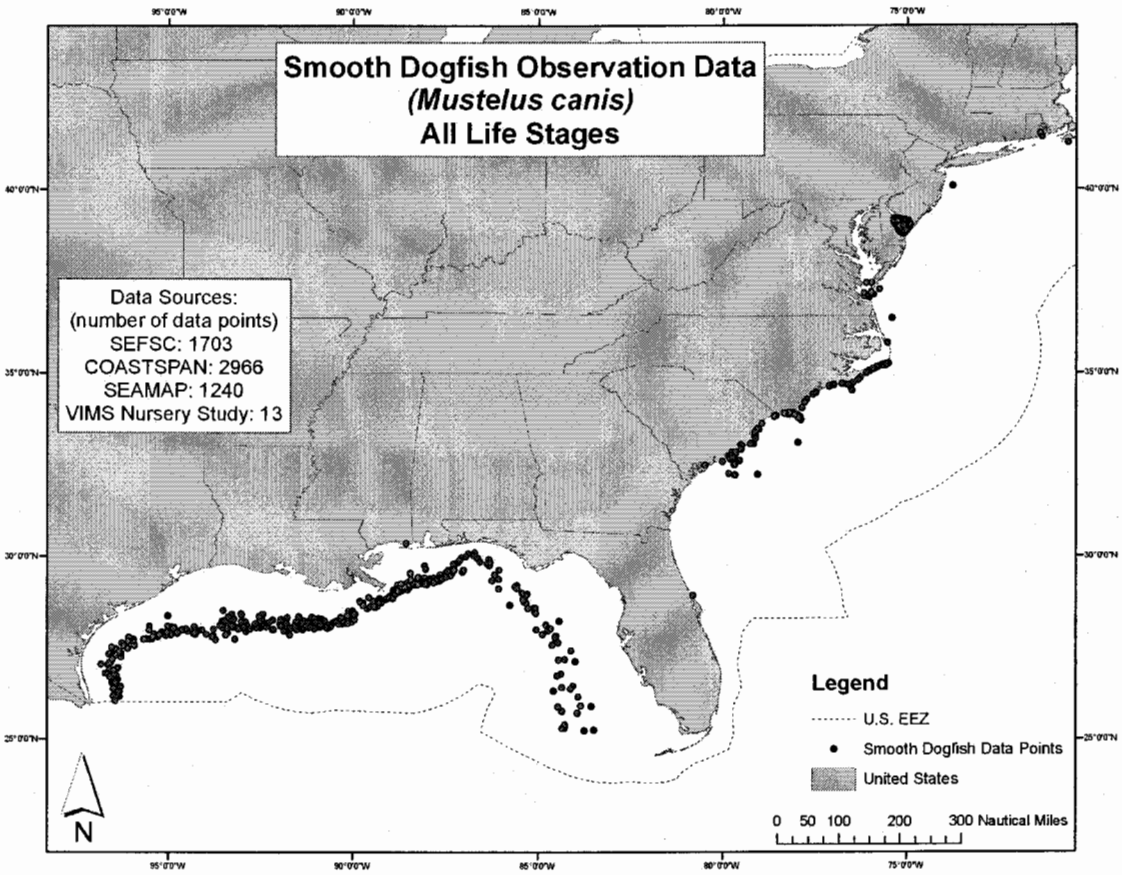

Figure 1 **Smooth dogfish observation data across all life stages**

Emerging research indicates that there have been taxonomic classification errors relating to smooth dogfish. The Florida smoothhound (*Mustelus norrisi*), found in the Gulf of Mexico, has been found to be the same species as smooth dogfish as determined by genetic analysis (Driggers, pers. comm.). This misclassification has likely led to under-representation of smooth dogfish in data from the Gulf of Mexico. Once this taxonomic misclassification is addressed, NMFS expects that our understanding of the proportion of the smooth dogfish stock within the Gulf of Mexico to increase relative to the mid-Atlantic. Amendment 3 to the 2006 Consolidated HMS FMP will address this misclassification within the smooth dogfish management measures.

In order to comply with Section 302 (3) and National Standard 3, smooth dogfish, an oceanic shark, should be managed as an HMS across its entire distribution which spans multiple Councils. Due to this wide distribution, smooth dogfish is appropriately managed by the Secretary under its statutory HMS authority.

Smooth dogfish overlap with the spiny dogfish fishery

The April 22 2009, MAFMC request noted a high degree of overlap between the smooth and spiny dogfish fisheries including participants, gear types and geographic range. NMFS has concluded that while there is overlap, smooth dogfish fishermen are not simply a subset of spiny dogfish fishermen. Based on vessel trip report (VTR) data between 2004 and 2007, NMFS found that:

a) Of vessels that reported landing spiny dogfish, approximately 20 percent also landed smooth dogfish in the same year; spiny dogfish fishermen land about 44 percent of the total smooth dogfish landings.
b) Of vessels that reported landing smooth dogfish, approximately 35 percent also landed spiny dogfish in the same year; smooth dogfish fishermen land about 2.4 percent of the total spiny dogfish landings
c) Vessels that retain both smooth and spiny dogfish in the same year do not necessarily land both species consistently year after year. Of the vessels that catch both species within a year, approximately 35-45 percent are the same year to year.
d) Both fisheries utilize trawl and gillnet gear for the majority of the landings.

NMFS also found that there is some geographic overlap between the spiny and smooth dogfish commercial landings. However, the spiny dogfish fishery is primarily concentrated in the north (64 percent of the landings occur in New Hampshire, Massachusetts, and Rhode Island), and the smooth dogfish fishery is primarily concentrated in the south (72 percent of the landings occur in Virginia and North Carolina). There is also some temporal distinction between the fisheries with smooth dogfish landings peaking in May, and spiny dogfish landings peaking in July, staying consistent through December, and tapering off through January and February.

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