Final Consolidated Atlantic Highly Migratory Species Fishery Management Plan

Volume II

Including:
A Final Environmental Impact Statement,
A Final Regulatory Impact Review,
A Final Regulatory Flexibility Analysis,
A Final Social Impact Assessment,
Framework Actions, and
the 2006 Stock Assessment and Fishery Evaluation Report

DEPARTMENT OF COMMERCE
National Oceanic and Atmospheric Administration
National Marine Fisheries Service
Office of Sustainable Fisheries
Highly Migratory Species Management Division

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CHAPTER 4 TABLE OF CONTENTS

Chapter 4 Table Of Contents **4-i**
Chapter 4 list of Tables **4-ii**
Chapter 4 List of Figures **4-x**
4.0 Environmental Consequences of Alternatives **4-1**
4.1 Bycatch Reduction 4-1
4.1.1 Workshops 4-1
4.1.2 Time Area Closures 4-25
4.2 Rebuilding and Preventing Overfishing 4-128
4.2.1 Northern Albacore Tuna 4-128
4.2.2 Finetooth Sharks 4-131
4.2.3 Atlantic Billfish 4-158
4.3 Management Program Structure 4-211
4.3.1 Atlantic Bluefin Tuna Quota Management 4-211
4.3.2 Timeframe for Annual Management of HMS Fisheries 4-230
4.3.3 Authorized Fishing Gear 4-239
4.3.4 Regulatory Housekeeping 4-254
4.4 Impacts on Essential Fish Habitat 4-289
4.4.1 Workshops 4-290
4.4.2 Time/Area Closures 4-290
4.4.3 Northern Atlantic Albacore Tuna 4-290
4.4.4 Finetooth Sharks 4-290
4.4.5 Atlantic Billfish Management Measures 4-291
4.4.6 Bluefin Tuna Management Measures 4-291
4.4.7 Calendar Year/ Fishing Year 4-291
4.4.8 Authorized Fishing Gears 4-291
4.4.9 Regulatory Housekeeping 4-291
4.5 Impacts on Protected Resources 4-291
4.6 Environmental Justice 4-294
4.7 Coastal Zone Management Act 4-296
4.8 Cumulative Impacts 4-297
4.8.1 Past, Present, and Reasonably Foreseeable Actions 4-297
4.8.2 Cumulative Ecological Impacts 4-298
4.8.3 Cumulative Economic and Social Impacts 4-304
Chapter 4 References **4-323**

CHAPTER 4 LIST OF TABLES

Table 4.1 Extrapolated Total Sea Turtle and Marine Mammal Interactions in the HMS PLL fishery for 1999-2005 and the 3 Year ITSs for 2004-2006 and 2007-2009. Sources: Yeung, 2001; Garrison, 2003; Garrison and Richards, 2004; Garrison, 2005; NMFS, 2004b; Walsh and Garrison, 2006 4-3

Table 4.2 Extrapolated (1994-2002) and Observed (2003-2005) Takes and Five Year ITS for Sea Turtles and Sawfish in the HMS Bottom Longline Fishery*. Source: NMFS, 2005, Smith *et al.*, 2006 4-4

Table 4.3 Extrapolated (1999-2002) and Observed (2003-2005) Takes and Five Year ITS for Protected Resources in the Shark Gillnet Fishery*. Source: Carlson, 2003; NMFS, 2003a; Carlson *et al*., 2004; Carlson and Bethea, 2005 4-4

Table 4.4 Percent change in discards of white marlin, blue marlin, sailfish, spearfish, leatherback, loggerhead, and other sea turtles, and bluefin tuna kept and discards combined, based on various time/area closure alternatives without redistribution of effort. + = increase and - = decrease in discards or bycatch. Three year totals are shown; one year averages can be obtained by dividing the three year total by three. Source: Pelagic Observer Program data (2001 – 2003). 4-82

Table 4.5 Percent change in discards of white marlin, blue marlin, sailfish, spearfish, leatherback, loggerhead, and bluefin tuna based on various time/area closure alternatives with and without redistribution of effort. + = increase and - = decrease in discards or bycatch. Three year totals are shown; one year averages can be obtained by dividing the three year total by three. Source: HMS Logbook data (2001 – 2003). 4-83

Table 4.6 Total number of swordfish, bluefin tuna, yellowfin tuna, bigeye tuna, total BAYS (bigeye, albacore, yellowfin and skipjack tuna), reported landed or discarded in the U.S. Atlantic PLL fishery, 1997 – 2003. Pred [1] = without redistribution of effort, Pred [2] = with redistribution of effort. Predictions were predicted back in 2000. Source: HMS Logbook data 4-85

Table 4.7 Total number of pelagic sharks, large coastal sharks, dolphin (mahi mahi), and wahoo reported landed or discarded and number of billfish (blue and white marlin, sailfish, spearfish) and sea turtles caught and discarded in the U.S. Atlantic PLL fishery, 1997 – 2003. Pred [1] = without redistribution of effort, Pred [2] = with redistribution of effort. Predictions were predicted back in 2000. Source: HMS logbook data. 4-86

Table 4.8 Reported distribution of hooks set by area, 1995-2003 (CAR=Caribbean, GOM=Gulf of Mexico, FEC=Florida East Coast, SAB=South Atlantic Bight, MAB=Mid-Atlantic Bight, NEC=Northeast Coastal, NED=Northeast Distant, SAR=Sargasso, NCA=North Central Atlantic, and TUNS=Tuna North & Tuna South). Source: HMS logbook data. 4-87

Table 4.9 Number of bluefin tuna (BFT), swordfish (SWO), sharks (PEL-pelagic; LCS-Large Coastal Sharks), billfish, and turtles kept and/or discarded in the Mid-Atlantic Bight (MAB) and Northeast Coastal (NEC) areas combined versus all

other areas as reported in the pelagic logbook data, 1995-2003. Source: HMS logbook Data. 4-88

Table 4.10 Alternative B2(a). Example of temporal variation in effectiveness of the closure on discards from May through November with redistribution of effort in (a) all open areas and (b) in the Gulf of Mexico only. Totals and percent changes are for months of May-Nov only. * excluding the NED. + = increase and - = decrease in discards or bycatch. Three year totals are shown; one year averages can be obtained by dividing the three year total by three. Source: HMS Logbook data (2001-2003). 4-89

Table 4.11 Alternative B2(a). Percent change in incidental bluefin tuna and target catch and discards with and without redistribution of effort year-round and May-November with redistribution of effort into (a) all open areas and (b) in the Gulf of Mexico only. * excluding the NED. - + = increase and - = decrease in discards or retained catch. Three year totals are shown; one year averages can be obtained by dividing the three year total by three. Source: HMS Logbook data (2001-2003). 4-91

Table 4.12 Alternative B2(b). Percent change in incidental bluefin tuna and target catch and discards without redistribution of effort. * excluding the NED. + = increase and - = decrease in discards or retained catch. Three year totals are shown; one year averages can be obtained by dividing the three year total by three. Source: HMS Logbook data (2001-2003). 4-93

Table 4.13 Alternative B2(c). Percent change in incidental bluefin tuna and target catch and discards without redistribution of effort. * excluding the NED. + = increase and - = decrease in discards or retained catch. Three year totals are shown; one year averages can be obtained by dividing the three year total by three. Source: HMS Logbook data (2001-2003). 4-94

Table 4.14 Alternative B2(b). Example of temporal variation in effectiveness of the closure on discards in June. Totals and percent decreases are for month of June only. * excluding the NED. + = increase and - = decrease in discards or bycatch. Three year totals are shown; one year averages can be obtained by dividing the three year total by three. Source: HMS Logbook data (2001 – 2003). 4-95

Table 4.15 Percent change in kept and discarded catch based on different time/area closure alternatives with and without redistribution of effort. - = decrease and + = increase in kept and discarded catch; * with redistribution of effort assumes no reduction in the number of hooks set. Three year totals are shown; one year averages can be obtained by dividing the three year total by three. Source: HMS Logbook data (2001-2003). 4-96

Table 4.16 Alternative B2(c). Example of temporal variation in effectiveness of the time/area closure on discards from April through June. Totals and percent changes are for month of June only. * excluding the NED. + = increase and - = decrease in discards or bycatch. Three year totals are shown; one year averages can be obtained by dividing the three year total by three. Source: HMS Logbook data (2001 – 2003). 4-97

Table 4.17 Alternative B2(d). Example of temporal variation in effectiveness of the time/area closure on discards. * excluding the NED. + = increase and - = decrease in

discards or bycatch. Three year totals are shown; one year averages can be obtained by dividing the three year total by three. Source: HMS Logbook data (2001 – 2003). 4-98

Table 4.18 Alternative B2(d). Percent change in incidental bluefin tuna and target catch and discards without redistribution of effort. * excluding the NED. + = increase and - = decrease in discards or retained catch. Three year totals are shown; one year averages can be obtained by dividing the three year total by three. Source: HMS Logbook data (2001-2003). 4-99

Table 4.19 Alternative B2(e). Example of temporal variation in effectiveness of the time/area closure on discards. * excluding the NED. + = increase and - = decrease in discards or bycatch. Three year totals are shown; one year averages can be obtained by dividing the three year total by three. Source: HMS Logbook data (2001-2003)..... 4-100

Table 4.20 Alternative B2(e). Percent change in incidental bluefin tuna and target catch and discards without redistribution of effort. * excluding the NED. + = increase and - = decrease in discards or retained catch. Three year totals are shown; one year averages can be obtained by dividing the three year total by three. Source: HMS Logbook data (2001-2003). 4-101

Table 4.21 B2(a) and B2(b) Combined. Example of temporal variation in effectiveness of the time/area closure on discards for combined alternatives B2(a) and B2(b) year-round, and from May through November for B2(a) and in June for B2(b). * excluding the NED. + = increase and - = decrease in discards or bycatch. Three year totals are shown; one year averages can be obtained by dividing the three year total by three. Source: HMS Logbook data (2001-2003)..... 4-102

Table 4.22 B2(a) and B2(b) Combined. Percent change in incidental bluefin tuna and target catch and discards without redistribution of effort. * excluding the NED. + = increase and - = decrease in discards or retained catch. Three year totals are shown; one year averages can be obtained by dividing the three year total by three. Source: HMS Logbook data (2001-2003)..... 4-103

Table 4.23 B2(d) and B2(e) Combined. Example of temporal variation in effectiveness of the time/area closure on discards for combined alternatives B2(d) and B2(e)year-round. * excluding the NED. + = increase and - = decrease in discards or bycatch. Three year totals are shown; one year averages can be obtained by dividing the three year total by three. Source: HMS Logbook data (2001-2003). 4-104

Table 4.24 B2(d) and B2(e) Combined. Percent change in incidental bluefin tuna and target catch and discards without redistribution of effort. * excluding the NED. + = increase and - = decrease in discards or retained catch. Three year totals are shown; one year averages can be obtained by dividing the three year total by three. Source: HMS Logbook data (2001-2003)..... 4-105

Table 4.25 Alternative B3(a) Charleston Bump modification. Discards of white marlin, blue marlin, sailfish, spearfish, leatherback, loggerhead and other sea turtles from the portion of the Charleston Bump to remain closed and the portion of the area considered for reopening. * excluding the NED. + = increase and - = decrease in discards or bycatch. Three year totals are shown; one year averages can be

obtained by dividing the three year total by three. Source: HMS Logbook 1997-1999..... 4-109

Table 4.26 Alternative B3(b) Northeastern U.S. closure modification. Discards of white marlin, blue marlin, sailfish, spearfish, leatherback, loggerhead and other sea turtles from the portion of the Northeastern U.S. closure to remain closed and the portion of the area considered for reopening. * excluding the NED. + = increase and - = decrease in discards or bycatch. Three year totals are shown; one year averages can be obtained by dividing the three year total by three. Source: HMS Logbook 1997 - 1999..... 4-110

Table 4.27 Alternative B3(a) Charleston Bump modification. Catches and discards of incidental bluefin tuna and target species in the portion of the area considered for reopening. * excluding the NED. + = increase and - = decrease in discards or retained catch. Three year totals are shown; one year averages can be obtained by dividing the three year total by three. Source: HMS Logbook 1997-1999..... 4-111

Table 4.28 Alternative B3(b) Northeastern U.S. closure modification. Catches and discards of incidental bluefin tuna and target species in the portion of the area considered for reopening. * excluding the NED. + = increase and - = decrease in discards or retained catch. Three year totals are shown; one year averages can be obtained by dividing the three year total by three. Source: HMS Logbook 1997-1999..... 4-112

Table 4.29 Comparison of discards of white marlin, blue marlin, sailfish, spearfish, leatherback and loggerhead sea turtles in the portion of the areas considered for reopening. * excluding the NED. + = increase and - = decrease in discards or bycatch. Three year totals are shown; one year averages can be obtained by dividing the three year total by three. Source: HMS Logbook 1997-2000..... 4-113

Table 4.30 Comparison of of swordfish, incidental bluefin tuna, yellowfin tuna, bigeye tuna, and BAYS in the portion of the areas considered for reopening. * excluding the NED. + = increase and - = decrease in discards or retained catch. Three year totals are shown; one year averages can be obtained by dividing the three year total by three. Source: HMS Logbook 1997-1999..... 4-114

Table 4.31 Average swordfish lengths (cm LJFL) in the portion of the areas to remain closed and the portion of the areas considered for reopening. The minimum size limit for swordfish is 119 cm LJFL. The mature size is > 180 cm LJFL. Source: Pelagic Observer Program 1992-1999..... 4-115

Table 4.32 Landings by region from the PLL fishery for swordfish, bluefin tuna, yellowfin tuna and bigeye tuna. The 2004 gross fishing revenues was calculated by converting the 2003 total gross revenues into 2004 dollars (2003 value was multiplied by 1.0266). Source: NMFS, 2004..... 4-117

Table 4.33 Average annual change in gross revenues by species for each of the alternatives in comparison to landings from the Atlantic and Gulf of Mexico. Note: 2003 gross revenues are based on 2003 ex-vessel prices. 2004 gross revenues are based on 2004 ex-vessel prices. The total 2004 annual loss or gain to the fishery was calculated by converting the 2003 total gross revenues into 2004 dollars (2003 value was multiplied by 1.0266). - = decrease and + = increase. Source: NMFS, 2005..... 4-118

Table 4.34 Average annual change in gross revenues by species for each of the modifications to the existing time/area closures in comparison to landings from the Atlantic and Gulf of Mexico. Note: 2003 gross revenues are based on 2003 ex-vessel prices. 2004 gross revenues are based on 2004 ex-vessel prices. The total 2004 annual loss or gain to the fishery was calculated by converting the 2003 total gross revenues into 2004 dollars (2003 value was multiplied by 1.0266). - = decrease and + = increase; * excluding the NED. Source: NMFS, 2005. 4-122

Table 4.35 Average annual change in gross revenues by species for the B2(a) time/area closures in comparison to landings from the Gulf of Mexico only. Note: 2003 gross revenues are based on 2003 ex-vessel prices. 2004 gross revenues are based on 2004 ex-vessel prices. The total 2004 annual loss or gain to the fishery was calculated by converting the 2003 total gross revenues into 2004 dollars (2003 value was multiplied by 1.0266). - = decrease and + = increase. Source: NMFS, 2005..... 4-123

Table 4.36 Total number of individual vessels and sets by year in some of the time/area closures. Alternative B4 was not included due to confidentiality concerns. Note: 2004 data is only from January through June 2004. Source: HMS Logbook 2001-2003..... 4-124

Table 4.37 Total number of vessels by state for some of the time/area closures from 2001 through 2003, and 2001 through June of 2004. Alternative B4 was not included due to confidentiality concerns. Source: HMS Logbook 2001-2004 (first six months of 2004). 4-125

Table 4.38 Percent of total landings and discards in the Gulf of Mexico (GOM) in comparison to all areas. * excluding the NED. Three year totals are shown; one year averages can be obtained by dividing the three year total by three. Source: HMS Logbook 2001-2003. 4-126

Table 4.39 Percent of total discards in the Gulf of Mexico (GOM) in comparison to all areas (excluding the NED). * excluding the NED. Three year totals are shown; one year averages can be obtained by dividing the three year total by three. Source: HMS Logbook 2001-2003. 4-127

Table 4.40 Finetooth shark landings in lb dw (mt dw) by gear type in the Gulf of Mexico (GOM) and South Atlantic (SA), 1999-2003, as reported in the General Canvass (CN) and Coastal Fisheries (CL) Logbooks. Source: Enric Cortes, pers. comm. . 4-150

Table 4.41 Summary of Small Coastal Shark quotas and landings in commercial and recreational fisheries between 1999-2005. Sources: Data from 1998-2000,Cortés, pers. comm., data from 2001-2004, Cortés, 2005; Carlson and Baremore, 2001; Carlson and Baremore, 2002; Carlson and Baremore, 2003; Carlson *et al*., 2004; NMFS, 2005; Cortés and Neer, 2005; Carlson and Bethea, 2006. 4-150

Table 4.42 Total pounds (lb ww) and percent of total landings by weight of species landed on gillnet trips that landed finetooth sharks, 1999-2004. Species and landings in bold are those currently managed by the HMS Management Division. Species with landings under 10 lbs ww were omitted. Source: Coastal Fisheries Logbook (CFL)..... 4-151

Table 4.43 Total pounds (lb ww) and percent of total landings by weight of species landed on bottom longline trips that landed finetooth sharks, 1999-2004. Species and landings in bold are those currently managed by the HMS Management Division. Species with landings under 10 lbs ww were omitted. Source: CFL..... 4-152

Table 4.44 Number of trips with finetooth shark landings (all gears) by NMFS Statistical Reporting reas, 1999 - 2004. A copy of the map indicating the NMFS Statistical Reporting Areas can be found in Figure 4.18. Bolded areas had more than 20 trips with landings of finetooth sharks. Source: Coastal Fisheries Logbook..... 4-153

Table 4.45 State information on commercial fisheries that may be landing finetooth sharks. 4-155

Table 4.46 Finetooth landings reported from the Florida Trip Ticket program 1999-2004 by area and gear type. All landings in the Exclusive Economic Zone are denoted as EEZ. Source: Steve Brown, Florida Fish and Wildlife Commission Trip Ticket Program..... 4-156

Table 4.47 U.S. Pelagic Longline Dead Discards and Rod & Reel Landings of Atlantic Billfish (MT). *Source: Pelagic U.S. National Reports to ICCAT 2003; 2004; 2005*..... 4-160

Table 4.48 U.S. Landings of Atlantic Blue and White Marlin as Reported to ICCAT in Numbers of Fish. Source: U.S. National Reports to ICCAT 2003; 2004; 2005; and Erika Carlsen, NMFS Office of International Affairs, pers. comm..... 4-162

Table 4.49 Tournament Landings and Releases 1999 - 2004 in Number of Fish. Source: NMFS Recreational Billfish Survey (RBS) Database 4-162

Table 4.50 MRFSS Estimated Aggregate Landings and Releases of Atlantic Billfish 1999-2004 in Number of Fish (includes Puerto Rico, excludes Texas). Source: NMFS MRFSS Database..... 4-163

Table 4.51 Large Pelagics Survey Estimated Aggregate Landings and Releases of Atlantic Billfish (Virginia to Maine) 1999-2004 in Number of Fish. Source: NMFS LPS Database..... 4-164

Table 4.52 Estimated Post-Release Mortality of White Marlin in Numbers of Fish Based on J-hooks and 35 Percent Post-Release Mortality Rate as derived from Data from the RBS, MRFSS, and LPS. Source: Recreational Billfish Survey; Marine Recreational Fisheries Statistics Survey; and Large Pelagic Survey..... 4-165

Table 4.53 Estimated Post-Release Mortality of Blue Marlin in Numbers of Fish Based on J-hooks and 11 Percent Post-Release Mortality Rate as derived from Data from the RBS, the MRFSS, and LPS. Source: Recreational Billfish Survey; Marine Recreational Fisheries Statistics Survey; and Large Pelagic Survey..... 4-166

Table 4.54 White Marlin Estimated Net Circle Hook Mortality Benefit in Numbers of Fish. Source: RBS, MRFSS, LPS 4-170

Table 4.55 Cumulative number of white and blue marlin landed below each minimum size in tournaments from 1999-2004 between the current minimum size for blue (99”) and white (66”) marlin and the potential increased minimum sizes indicated. A minimum size would be selected between 68-71 inches for WHM and 103-106 for BUM. Source: NMFS RBS Database. 4-178

Table 4.56 Catch per unit effort and numbers of blue and white marlin kept and released 1999-2004. Source: Billfish Tournament Database, Southeast Fisheries Science Center. 4-179
Table 4.57 Average Number of Boats per Tournament by Month and State, 1999-2004. Source: Recreational Billfish Survey 4-200
Table 4.58 Average Number of Billfish Tournaments by Month and State 1999-2004*. Source: Recreational Billfish Survey 4-200
Table 4.59 Alternative F1: Gross revenues associated with the No Action alternative regarding the General Category time-period subquota allocation.* 4-214
Table 4.60 Alternative F3(a): Gross revenues associated with the even sub-allocation of the General Category quota between the 8-month fishing season. 4-217
Table 4.61 Alternative F3(b): Gross revenues associated with the proposed sub-allocation of the General Category quota, providing a BFT winter fishery in the South Atlantic 4-218
Table 4.62 Alternative F3(c) (preferred): Gross revenues associated with the proposed sub-allocation of the General Category quota, providing a BFT winter fishery in the South Atlantic. 4-219
Table 4.63 Alternative F3(d): Gross revenues associated with the proposed sub-allocation of the General Category quota, providing a BFT winter fishery in the South Atlantic. 4-220
Table 4.64 Alternative F8: Gross revenues associated with the proposed rollover cap of 100 percent of the baseline quota allocation. 4-227
Table 4.65 Fishing years by HMS proposed for Alternatives G1-G3. 4-230
Table 4.66 Average number of commercially harvested BFT by month for 1999-2004. Data source: NERO BFT landings database. 4-232
Table 4.67 Graphic representation of the distribution of U.S. domestic BFT quota by year. . 4-236
Table 4.68 Reported Atlantic Commercial Green-stick Gear Catch for 1999-2003*, in Numbers of Fish. Source: PLL Logbook Data 4-242
Table 4.69 Reported U.S. Pacific Commercial Green-stick Gear Catch for 2002-2004, in Numbers of Fish and Weight in Pounds. Source: State of Hawaii, 2006 4-243
Table 4.70 Handline catches, in Numbers of Fish, for 2000 – 2004. Source: HMS Logbook. Note that confidential data cannot be released and are marked by an *. 4-246
Table 4.71 List of "Indicator" Species to Determine Composition of Catch. 4-261
Table 4.72 Historical Per Trip Average Catch Composition of "Indicator" Species. Source: NMFS Coastal Logbook 4-262
Table 4.73 Historical Per Trip Average Catch Composition of "Indicator" Species. Source: Pelagic Longline Logbook 4-262
Table 4.74 Numbers of Trips Reported as Using Handline Gear in the HMS Logbook and Numbers of Those Trips that were "Handline-Only." Source: HMS Logbook. Note that confidential data cannot be released and are marked by an *. 4-274

Table 4.75 Impacts of alternatives considered. The symbols +, –, and 0 refer to positive, negative, and zero impacts respectively. The expected impacts should be compared to other alternatives within that issue, not to the impacts between issues. See preceding section for details of impacts of each alternative..... 4-308

CHAPTER 4 LIST OF FIGURES

Figure 4.1 Existing time/area closures in HMS fisheries. Inset shows extent of the Northeast Distant restricted fishing area. All closures except the Mid-Atlantic are applicable to PLL gear only. The Mid-Atlantic Closure is applicable to bottom longline gear only. Note: the Northeast Distant (NED) was a closed area to all vessels as of 2001. It became the NED Restricted Fishing Area on June 30, 2004 when it was opened to those participating in the NED experiment. 4-69

Figure 4.2 Map showing areas being considered for new time/area closures to reduce non-target HMS and protected species interactions. 4-70

Figure 4.3 Map showing areas being considered for modifications to existing closures.... 4-71

Figure 4.4 Pelagic and Bottom Longline Sets in the Madison-Swanson (upper left) and Steamboat Lumps (lower right) Marine Reserves. Note: one set for the CSFOP was in 2005. Although not indicated, no new sets were recorded for the CSFOP in 2004. Source: HMS Logbook, Pelagic Observer Program, Shark Observer Program. The Desoto Canyon closure is also shown for reference. 4-72

Figure 4.5 Map showing the potential closed area to bottom longline gear to reduce bycatch of endangered smalltooth sawfish. Grey dots are locations of observed bottom longline sets. Source: CSFOP 1994 – 2006. 4-73

Figure 4.6 Map showing all reported sets and white marlin interactions: a) shows the number of interactions in absolute numbers, b) shows CPUE (per 1,000 hooks). Source: HMS Logbook 2001-2003. 4-74

Figure 4.7 Map showing all observed sets and white marlin interactions. Source: Pelagic Observer Program 2001-2003. 4-75

Figure 4.8 Map showing all reported sets and bluefin tuna discards: a) shows the number of interactions in absolute numbers, b) shows CPUE (per 1,000 hooks). Source: HMS Logbook 2001-2003. 4-76

Figure 4.9 Map showing all observed sets and bluefin tuna discards. Source: Pelagic Observer Program 2001-2003. 4-77

Figure 4.10 Map showing all reported sets and leatherback sea turtle interactions: a) shows the number of interactions in absolute numbers, b) shows CPUE (per 1,000 hooks). Source: HMS Logbook 2001-2003. 4-78

Figure 4.11 Map showing all reported sets and loggerhead sea turtle interactions: a) shows the number of interactions in absolute numbers, b) shows CPUE (per 1,000 hooks). Source: HMS Logbook 2001-2003. 4-79

Figure 4.12 Map showing all observed sets and sea turtle interactions. Source: Pelagic Observer Program 2001 – 2003. 4-80

Figure 4.13 Map showing discards of bluefin tuna in the Atlantic and Gulf of Mexico from 2001-2003. The large box is not a proposed time/area closure, but is shown for illustrative purpose only to delineate an area with high bluefin tuna discards. The bluefin tuna discards are listed by month below the box. Source: HMS Logbook 2001-2003. 4-81

Figure 4.14 Map showing areas being considered for modifications to existing closures and juvenile swordfish data (<180 cm LJFL). The minimum size limit for swordfish is 119 cm LJFL. Source: Pelagic Observer Program 1997-1999. 4-106

Figure 4.15 Map showing areas being considered for modifications to existing closures and adult swordfish data (>180 cm LJFL) from the Pelagic Observer Program. Source: Pelagic Observer Program 1997-1999 4-107

Figure 4.16 Map showing modification to the existing Northeast United States closure and bluefin tuna discards. Source: HMS Logbook 1997-1999..... 4-108

Figure 4.17 Map showing smalltooth sawfish bycatch. Numbers in parentheses in the legend are the number of sawfish interactions. Gray dots indicate the location of each observed bottom longline set. Source: CSFOP 1994-2006. 4-116

Figure 4.18 NMFS Statistical Reporting Areas. Areas 3, 23, 2780, 2880, 2980, 3079, and 3379 all had greater than 20 trips that reported finetooth shark landings in the Coastal Fisheries Logbook between 1999-2004 as indicated in Table 4.44 Number of trips with finetooth shark landings (all gears) by NMFS Statistical Reporting reas, 1999 - 2004. A copy of the map indicating the NMFS Statistical Reporting Areas can be found in Figure 4.18. Bolded areas had more than 20 trips with landings of finetooth sharks. Source: Coastal Fisheries Logbook. 4-154

Figure 4.19 Finetooth shark trips by month and gear type between 1999-2004. E/H = Electric Reel, Bandit Gear, Handline; GN = Gillnet; and LL = Longline. Source: Coastal Fisheries Logbook..... 4-155

Figure 4.20 U.S. Pelagic Longline Dead Discards and Rod & Reel Landings of Atlantic Billfish. Source: U.S. National Reports to ICCAT 2003; 2004; 2005..... 4-160

Figure 4.21 Number of blue marlin landed in tournaments between 1999-2004 by size (inches, LJFL). Source: NMFS RBS database. 4-178

Figure 4.22 Number of white marlin landed in tournaments between 1999-2004 by length (inches, LJFL). Source: NMFS RBS Database..... 4-179

Figure 4.23 Map of the East Florida Coast closed area (solid shaded area) and the boundary of the U.S. EEZ (thin line wrapping around the coast). The inset is a close-up of the closed area depicting both the old and proposed (new) boundary coordinates. The small grey dots represent locations of longline sets from the year 2000 through the first half of 2004..... 4-271

4.0 ENVIRONMENTAL CONSEQUENCES OF ALTERNATIVES

4.1 Bycatch Reduction

4.1.1 Workshops

The 1999 FMP identified reducing bycatch and bycatch mortality as a critical management goal pursuant to National Standard 9 of the Magnuson-Stevens Fishery Conservation and Management Act (MSA). The October 29, 2003, Biological Opinion (BiOp) for the Atlantic shark fishery and the June 1, 2004, BiOp for the Atlantic pelagic longline fishery recommend and in some cases require further actions to reduce bycatch and bycatch mortality of protected resources in the HMS fisheries. The following sections evaluate a number of alternatives to meet these goals. Workshops enabling fishermen to become more proficient with the techniques, protocols, and equipment for dehooking and disentanglement of protected resources, as well as proper identification of these species, are an integral component to ensuring that the post-release mortality reduction goals are realized.

4.1.1.1 Protected Species Safe Handling, Release, and Identification Workshops for Pelagic Longline, Bottom Longline, and Gillnet Fishermen

The October 2003 Biological Opinion for the Atlantic shark fishery determined that the shark fishery (*i.e.*, bottom longline and drift gillnet) is not likely to jeopardize the continued existence of endangered green, leatherback, and Kemp's ridley sea turtles, endangered smalltooth sawfish, threatened loggerhead turtles, or adversely affect marine mammals. However, it requires the implementation of workshops or other programs to distribute information on gear handling techniques, protocols for gear entanglements and the safe release of protected species, information on smalltooth sawfish, and HMS requirements and regulations to reduce serious injuries or mortalities (NMFS, 2003). The June 2004 BiOp for the Atlantic pelagic longline fishery required that all captains or operators be proficient with the safe release and disentanglement gears and protocols due, in part, to a jeopardy conclusion for leatherback sea turtles (NMFS, 2004a). The protected species release, disentanglement and identification workshops are intended to help further reduce the mortality of sea turtles, smalltooth sawfish, and other protected resources captured incidentally in the HMS pelagic (PLL) and bottom (BLL) longline and shark gillnet fisheries. Through these workshops, participants would be trained to safely disentangle, resuscitate, release, and identify protected species, as per the current NMFS standards for the pelagic and bottom longline fisheries. Participants may also receive instruction on disentanglement and release for protected resources that lack formal protocols. The incidental take statements issued in the October 2003 and June 2004 BiOps were contingent upon fishermen becoming increasingly proficient with required release equipment and protocols, while reducing the number of sea turtle mortalities resulting from longline and gillnet interactions over time. The dissemination of this information is an important element in further reducing post-release mortality of protected resources in the PLL, BLL, and shark gillnet fisheries.

In addition to BiOp requirements, the Pelagic Longline Take Reduction Team has recommended the implementation of a mandatory certification program for owners and operators of pelagic longline vessels, as one measure for reducing the bycatch and bycatch mortality of

long-finned pilot whales (*Globicephala melas*), short-finned pilot whales (*Globicephala macrorhynchus*), common dolphins (*Delphinus delphis*), and other protected species in the Atlantic pelagic longline fishery. Specifically, the recommendation suggests that the certification program incorporate safe handling and release techniques; disseminate information on relevant regulations; provide guidelines specific to marine mammal bycatch in the fishery; an explanation of information that needs to be recorded in log books and auxiliary forms; provideguidelines for operator communications; provide updates on NMFS observer program; description of research and monitoring projects aimed to reduce marine mammal bycatch; and species identification.

The protected species safe handling, release, and identification workshops would be held at several locations to minimize travel costs for most participants and during non-peak fishing times to minimize disruptions to fishing activities. The workshops would be held in areas where there is a high concentration of permit holders, according to the addresses provided when applying for an HMS permit. A schedule of workshops would be released in advance to provide fishermen with an opportunity to attend the workshop most convenient to them. The Agency may provide an opportunity for the industry to schedule one-on-one training at the expense of the individual, if they are unable to attend any of the previously scheduled workshops.

The individuals that attended the PLL industry-sponsored safe handling and release workshops would be grandfathered-in to the requirements for all of the preferred alternatives, meaning all owners and operators that attended and successfully completed the industry certification workshops, as documented by workshop facilitators, held on April 8, 2005, in Orlando, Florida, and on June 27, 2005, in New Orleans, Louisiana, would automatically receive valid protected species workshop certificates. To the extent practicable, anyone who attends and successfully completes the hands on training could be certified (*e.g.*, enforcement, crew, environmentalists, and recreational fishermen). Priority would be given to those who are required to be certified if space is an issue.

In order to ensure that fishery participants are able to use the release and disentanglement equipment effectively, workshop participants would be given hands-on instruction and a practical examination. Participants who successfully complete the workshops would receive a multi-year certification. A certificate would be required to be on board each longline and gillnet vessel during fishing operations and would serve as proof that the participant completed the necessary training workshop.

The Agency received public comment both in support of and opposed to the protected species workshops. Some commenters were concerned about potential lost revenue on longline trips if bycatch were to be handled correctly. Some comments supported extending the workshop requirements to include all HMS fishermen, as well as expanding the release techniques to include additional species. NMFS received many comments suggesting that various combinations of owners, operators, and crew members be required to participate in the workshops. And if the crew members are not required to attend, then the operators should be responsible for training the crew. A few comments supported grandfathering in the industry certified individuals, so that they do not need to attend the mandatory workshops. Additionally, the Agency received comment on the recertification timeframes, and provided recommendations

for scheduling and selecting venues to mitigate any negative impacts to participants. The Agency has considered all of these comments when selecting the final alternatives.

As described in Chapter 2, the alternatives considered for pelagic longline, bottom longline, and gillnet fishery workshops are:

A1 Voluntary protected species safe handling, release, and identification workshops for longline fishermen (No Action)

A2 Mandatory protected species safe handling, release, and identification workshops and certification for all HMS pelagic or bottom longline vessel owners – Preferred Alternative

A3 Mandatory protected species safe handling, release, and identification workshops and certification for vessel operators actively participating in HMS pelagic and bottom longline fisheries – Preferred Alternative

A4 Mandatory protected species safe handling, release, and identification workshops and certification for all HMS longline vessel owners, operators, and crew

A5 Mandatory protected species safe handling, release, and identification workshops and certification for shark gillnet vessel owners and operators – Preferred Alternative

A6 Protected species safe handling, release, and identification certification renewal (every 3-years) – Preferred Alternative

Ecological Impacts

A summary of protected species interactions in the HMS PLL, BLL, and gillnet fisheries are found in Table 4.1, 4-4Table 4.2, and Table 4.3, respectively. More information on gear-specific HMS fisheries as well as observed and extrapolated takes of protected species is provided in Chapter 3. The June 2004 BiOp sets specific post-release mortality (PRM) targets for the PLL fishery that decrease each year starting at 32.8 in 2004 and declining to 13.1 percent in 2007 for leatherback turtles and from 21.8 to 17 percent for loggerhead sea turtles during the same years. While NMFS does not have estimates of PRM for BLL and gillnet gears, observed estimates of protected species takes are available and are summarized in Table 4.2 and Table 4.3.

Table 4.1 Extrapolated Total Sea Turtle and Marine Mammal Interactions in the HMS PLL fishery for 1999-2005 and the 3 Year ITSs for 2004-2006 and 2007-2009. Sources: Yeung, 2001; Garrison, 2003; Garrison and Richards, 2004; Garrison, 2005; NMFS, 2004b; Walsh and Garrison, 2006

PLL	1999	2000	2001+	2002+	2003+	2004	2005	Average*	3 year ITS, 2004-2006 / 2007-2009	
									Total	Per Year
Leatherback	1,016	769	1,208	962	1,112	1,359	351	969	1,981 / 1,764	660 / 588
Loggerhead	994	1,256	312	575	727	734	274	696	1,869 / 1,905	632 / 635
Other/Unidentified Sea Turtles	66	128	N/A	50	N/A	N/A	N/A	N/A	105 / 105	35 / 35
Marine Mammals	N/A	403	177	201	300	164	372	N/A	N/A	N/A

* An average was not provided for species without an estimate for all seven years.

+ The extrapolated total interactions in this table do not include any interactions associated with the NED experiment, 2001-2003.

Table 4.2 Extrapolated (1994-2002) and Observed (2003-2005) Takes and Five Year ITS for Sea Turtles and Sawfish in the HMS Bottom Longline Fishery*. Source: NMFS, 2005, Smith *et al.*, 2006

BLL	1994 - 2002		2003	2004	2005	5 year ITS, (mortality) (starting in 2004)	
	Total	Per Year				Total	Per Year
Leatherback	269	30 (17)	0	0	1(1)	150 (85)	30 (17)
Loggerhead	2,003	222 (123)	8(3)	5(2)	1(1)	1,360 (754)**	272 (150)
Unidentified Sea Turtles	503	56	1	1	0	30 (5) +	6 (1)
Sawfish	466	52	1	0	2	260 (0)	52

* All values include total takes with mortalities listed in parentheses, when available.
** 1,360 = 1,110 + 250 of the expected 280 unidentified, which are most likely loggerhead sea turtles.
+ 30 for all species (i.e., hawksbill, green, and Kemp's ridley sea turtles), remaining 30 of the expected 280 unidentified. Five lethal takes per species.

Table 4.3 Extrapolated (1999-2002) and Observed (2003-2005) Takes and Five Year ITS for Protected Resources in the Shark Gillnet Fishery*. Source: Carlson, 2003; NMFS, 2003a; Carlson *et al*., 2004; Carlson and Bethea, 2005

GILLNET	1999	2000	2001	2002	2003	2004	2005	5 year ITS (starting in 2004)	
								Total	Per Year
Leatherback	0	0	14 (2)	3.4	0	0	1	22 (3)	4.4
Loggerhead	0	5.4 (1)	1	1.7	0	0	5 (1)	10 (1)	2
Sawfish	0	0	0	0	1	0	0	1 (0)	<1
Bottlenose Dolphin	12.4 (12.4)	2 (2)	4 (4)	6.7 (6.7)	2 (1)	0	0	N/A	N/A
Spotted Dolphin	1(1)	2	0	0	0	0	0	N/A	N/A

* All values include total takes with mortalities listed in parentheses. Extrapolated estimates of the drift gillnet fishery were provided for the 1999-2002 period and 2003-2005 are observed interactions for the entire shark gillnet fishery.

Under alternative A1, the No Action alternative, NMFS would continue to provide voluntary workshops for longline fishermen and continue to distribute wheelhouse placards, the safe release protocols, and educational videos, as well as additional information through the activities of the NMFS PLL Point of Contact (POC). Two separate PLL industry-sponsored workshops were held on April 8, 2005, in Orlando, Florida, and on June 27, 2005, in New Orleans, Louisiana, to teach the safe handling and release protocols for sea turtles. NMFS hosted a series of nine voluntary workshops in June 2005 that included instruction on the safe handling and release of protected resources in the commercial shark fishery; however, these voluntary workshops were poorly attended. Furthermore, the Agency is engaged in a proposed rulemaking (March 29, 2006, 71 FR 15680) that would update the requirements for dehooking equipment that must be possessed, maintained, and utilized by participants in the Atlantic shark BLL fishery, and additional training in the use of this new equipment may be necessary.

This alternative could provide some positive ecological impacts by continuing to provide voluntary workshops and outreach activities through the NMFS PLL POC. A critical component of achieving the post-release mortality targets is to ensure that participants in the PLL fisheries are proficient with the safe handling, dehooking, and resuscitation techniques, including the proper use of all the required equipment. These efforts would increase the amount of gear removed from sea turtles, increasing their probability of survival. To comply with the BiOps, voluntary hands-on training would be provided for participants in the longline fisheries. Additionally, NMFS would continue to distribute wheelhouse placards, safe release protocols, educational videos, and additional information as needed.

Alternative A1 would not maintain compliance with the October 2003 or June 2004 BiOps because attendance at these workshops would not be mandatory and may not result in the certification of operators. Alternative A1 might reduce the post-release mortality of protected species captured in HMS fisheries; however, the voluntary nature of the workshops and minimal attendance observed thus far may limit the dissemination of the safe release, disentanglement, and protected resource identification information, reducing potential ecological benefits. Furthermore, it is essential that fishermen are able to properly identify the protected resources with which they interact, in order to comply with regulations. In the past, voluntary workshops have not been well attended. The post-release mortality targets established for the PLL fishery would not likely be met because current rates under the status quo exceed those targets, which could further jeopardize threatened or endangered sea turtles and result in negative ecological impacts to these species.

Alternative A2, a preferred alternative, would require mandatory protected species safe handling, release, and identification workshops and certification for all vessel owners that have pelagic or bottom longline gear on board their vessel and that have been issued or are required to be issued HMS limited access permits. To further strengthen the requirement for longline vessel owners to attend the protected species workshops, their attendance and demonstrated understanding of the handling, disentanglement, resuscitation, release, and identification techniques would be linked to the renewal of their HMS permit(s). Mandatory attendance and the link to the permit renewal would increase industry participation compared to the poorly attended voluntary workshops. Longline vessel owners would be required to obtain the workshop certification prior to renewing their HMS permit(s) in 2007. Proof of successful completion of a workshop would need to be submitted in order to renew a HMS permit(s), and those without a workshop certification would be prohibited from participating in HMS fisheries. Public comment both supported and opposed alternative A2, stating that mandatory owner attendance may discourage them from hiring inexperienced operators who may not know how to properly handle sea turtles and other protected resources, handling protected resources wastes time on money making trips, and owners of a vessel may not always be the vessel operator.

Alternative A2 would ensure that owners are aware of the certification requirement and the need for the PLL and BLL fisheries to meet or achieve the post-release mortality targets set in the 2004 BiOp (NMFS, 2004a). Alternative A2 would likely have positive ecological impacts. The ecological benefits of reduced post-release mortality would depend upon the number of longline owners who are active in the fishery and/or take the initiative to properly train the operators and crew working on their vessel. Longline vessels can have several different

operators in any given year; therefore, the owner may not always be on board the vessel and able to disseminate the information and skills learned during the protected species workshops.

NMFS believes that allowing proxies to attend workshops on behalf of longline and gillnet vessel owners would reduce the likelihood that those involved in the operation of individual vessels would be the ones attending the workshops. NMFS is concerned that vessel owners would select proxies that are not involved in the day-to-day operation of their fishing operations, thus compromising the goal of these workshops. If permit holders were to send proxies involved with the day-to-day activities of the vessel (i.e., crew or operators), the permit holder runs the risk of having no proxy available on the boat due to the high turnover of crew and operators. The proxy may not be employed on permit holder's vessel for the entire three years that the permit is valid. Additionally, NMFS does not have the means to validate a connection between the permit holder and the proxy. It is important for vessel owners that are not actually involved in the day-to-day operations of their vessels to be aware of the regulations and management of the fisheries in which their vessels are participating in order to fully and effectively implement the techniques taught at the workshops. Vessel owners should be aware of the concepts and breadth of material, as well as the tools and techniques, that would be covered in the workshops to understand the requirements for engaging fishing activities with PLL, BLL or gillnets on board the vessel and to understand what is expected of the vessel's crew. Non-compliance with the requirements of the 2003 and 2004 BiOps could result in additional, more restrictive management measures in the future.

Based on the estimated takes presented in Table 4.1, there were an average of 969 leatherback and 696 loggerhead sea turtles interactions per year in the PLL fishery between 1999 and 2005. Until mid-2004, the standard hooks used by the industry were 7/0 and 9/0 J-hooks. In mid-2004, NMFS implemented mandatory circle hook and bait requirements in the fishery intended to reduce sea turtle bycatch and bycatch mortality. J-hooks can increase the number of sea turtle interactions and increase the likelihood of hook ingestion, compared to using circle hooks and specific baits (NMFS, 2004b). The post-release mortality target identified in the 2004 BiOp would require a 4.8 and 19.7 percent decrease in post release mortality for loggerhead and leatherback sea turtles, respectively, between 2004 and 2007 (NMFS, 2004a). Decreasing the post-release mortality is dependent upon vessel owners disseminating information from the workshops to operators and crew involved in fishing activities. As a result of the jeopardy finding for leatherback sea turtles, the 2004 BiOp included additional requirements for PLL closures or other comparable actions if the sea turtle incidental take and post-release mortality targets are not met (NMFS, 2004a). The potential for additional regulations imposed upon the fishery may provide adequate incentive for vessel owners to informally train their operators and crew. The Agency received public comment in favor of owners/operators being required to train all crew members onboard. NMFS encourages all workshop participants to disseminate this information to all crew members involved with haul-back or fishing activities, however, is not preferring an alternative requiring owners to train crew members at this time.

The October 2003 BiOp estimates that 42 percent of sea turtles die as a result of interactions with BLL gear. Table 4.2 shows the extrapolated estimates in the BLL fishery (1994 - 2002) and the observed interactions for 2003 and 2004. The post-release mortality has not been estimated for sea turtle interactions in the BLL fishery; therefore, it is difficult to estimate the

post-release mortality reduction benefits of this alternative, but there may be positive ecological impacts from the transfer of safe release and disentanglement protocols to owners in the BLL fishery. NMFS is in the process of a rulemaking (March 29, 2006, 71 FR 15680) that would update the safe handling, release and disentanglement equipment for sea turtles and other non-target catch in this fishery. The current preferred alternative would require participants in the BLL fishery to possess, maintain, and utilize the same equipment and protocols currently required for the PLL fishery. While the available data show that the BLL fishery has fewer interactions with sea turtles than the PLL fishery, the BLL fishery is not currently required to use circle hooks or specific baits to reduce sea turtle interactions.

In addition to providing information and ensuring proficiency with the safe handling, dehooking, and release of sea turtles, these workshops would also include information on the proper techniques for safe release of smalltooth sawfish. Extrapolated estimates indicate that, on average, the BLL fishery interacts with 52 smalltooth sawfish a year (Table 4.2). The October 2003 BiOp found that Atlantic shark fisheries would result in the temporary disturbance of behavior and short term injury of smalltooth sawfish, but fishing activities are not expected to affect the reproduction of the individuals that are caught, nor result in mortality. Alternative A2 would ensure BLL vessel owners understand safe release techniques, which would likely reduce any mortality of smalltooth sawfish. Ecological benefits would likely be increased if vessel owners are involved in fishing activities or successfully train their operators and crew members in safe techniques covered in the workshops.

There have been no documented interactions between PLL gear and smalltooth sawfish to date. However, if PLL owners are aware of safe handling and release techniques, this information would likely benefit them in case of future interactions or if they participate in other fisheries. Since PLL fishermen are required to possess at least an incidental shark permit and because of the relative ease of modifying pelagic to bottom longline, fishermen could set bottom longline gear on their way back to port, target sharks or other species, and potentially interact with smalltooth sawfish.

In addition to safe release and disentanglement protocols, alternative A2 would also provide information related to the proper identification of protected species. The proper identification of protected species listed under the ESA or MMPA is an important skill for PLL and BLL vessel owners to possess. The MMPA classifies the PLL and BLL fishery as Category I and III, respectively. A Category I fishery results in frequent serious injuries and mortalities of marine mammals, whereas a Category III fishery has a remote likelihood or no known serious injuries or mortalities. Most longline interactions with marine mammals are in the PLL fishery. Species commonly encountered include: Risso's dolphin; pilot whales; pygmy sperm whales; beaked whales; spotted dolphins; common dolphin; and, Minke whales. Table 4.1 contains the estimated interactions with marine mammals in the PLL fisheries. The shark BLL fishery has only interacted with two marine mammals (Delphinids) between 1994 and 2002. Improved identification skills may increase the accuracy of logbook data and assist fishermen in complying with the regulations.

Protected species can be difficult to identify, especially since interactions with them are a relatively rare occurrence. Alternative A2 would provide information on key morphological

characteristics, distribution, and basic life history to improve identification of protected resources. Positive identification of sea turtles and marine mammals in fishermen's logbook reports could reduce uncertainty and increase the accuracy of extrapolated estimates of interactions by species. This is essential information for agency biologists, managers, and law enforcement officials who seek to increase the knowledge of home range, habitat use, and abundance. Furthermore, interactions with specific longline configurations (depth, hook type, bait, target-fish species) may assist fishermen, managers, gear experts, and scientists in designing experiments and gear to reduce interactions. Positive ecological impacts would likely occur as a result of disseminating this information to the longline vessel owners. In addition to benefiting protected resources, alternative A2 could benefit non-target HMS and other finfish by reducing post-release mortality by increasing the proficiency with the currently required dehooking and disentanglement equipment for sea turtles. Alternative A2 would likely result in positive ecological impacts, however, the extent of these impacts are dependent upon the dissemination of this information between owners and their operators and crew.

Alternative A3, a preferred alternative, would require mandatory protected species safe handling, release, and identification workshops and certification for HMS PLL and BLL vessel operators before the vessel's permit expires in 2007. This alternative would have ecological benefits similar to alternative A2; however, these benefits would be greater in magnitude as operators are generally directly involved in fishing activities, including gear retrieval, when sea turtles or other protected resources are most likely to be encountered. The initial operator certification would be linked to the renewal of the vessel's HMS LAP(s) in 2007; therefore, an operator would need to attend a workshop and receive the certification prior to the owner renewing any of the vessel's HMS LAP(s) in 2007. If the vessel owner holds multiple HMS LAPs, the operator would need to be certified prior to the earliest expiration date on any of the permits in 2007. After the initial certification, the operator's certification is no longer linked to the renewal of a vessel's HMS LAP and would need to be renewed prior to the expiration date on the operator's workshop certificate. The workshop certification would not be transferable any other person and would have the operator's name on the certificate. This alternative would ensure that at least one person directly involved with a vessel's fishing activities would be certified in the safe handling and release protocols and identification of protected resources.

Alternative A3 was supported by public comment. Commenters suggested that vessel operators should be certified and that they should, in turn, train each individual crew member working aboard their vessel to ensure that the crew is informed and that proper procedures are followed. Operators are encouraged to transfer the knowledge and skills obtained from successfully completing the workshops to the crew members, potentially increasing the proper release, disentanglement, and identification of protected resources. While this alternative would not require crew members to attend the workshops, to the extent practicable, the workshops would be open to anyone who wishes to attend and receive certification.

Alternative A4 would require owners, operators, and crew to attend protected species safe handling, release, and identification workshops and become certified. This alternative would certify the largest group of individuals involved with fishing activities, and therefore, would likely have the greatest positive ecological impact. Alternative A4 would provide similar benefits to those of alternatives A2 and A3 combined, in addition to including all crewmembers

associated with a vessel's fishing activities. Vessel crew members are generally directly involved during gear retrieval activities as the operator may be operating the vessel from the wheelhouse. Furthermore, all of these participants would be provided with protected resource identification information, which would have positive ecological impacts, likely increasing proportionally to the number of individuals who attain certification. NMFS anticipates having several operators and/or crew members per HMS vessel permit attend these workshops, as vessels often have two operators and multiple crew members. Ensuring that operators and/or crew are skilled at handling and release of sea turtles and adept at identification of protected resources would increase the likelihood of achieving the post-release mortality targets prescribed by the 2004 BiOp. The Agency received several comments opposing the requirement to have crew certified because of their transient nature and the fact that some crew members are not U.S. citizens and may not be available to attend workshops.

An indirect positive ecological benefit of involving vessel owners, operators, and/or crew in these safe handling, resuscitation, release, and protected resource identification workshops, may be to promote or transfer this technology to other countries that also target HMS and other species with longline gear. Because of the migratory nature of most sea turtle species, these animals frequently travel thousands of miles and may enter into the jurisdiction of other nations or the high seas. Longline gear employed by different nations is relatively similar between countries, therefore, the protocols discussed and materials employed in these workshops could be translated by interested nations into languages appropriate for their use. Some materials are already available in English, Spanish, and Vietnamese. Since many HMS are managed by an international Atlantic-wide commission (ICCAT), there are numerous opportunities for transfer of technology between the United States and other ICCAT contracting parties, reinforcing the United States' role as a leader in global marine conservation.

Alternative A5, a preferred alternative, would mandate that all gillnet vessel owners issued a shark permit and operators of vessels employing this gear attend workshops on the safe release and disentanglement of protected resources, including sea turtles, smalltooth sawfish, and marine mammals and obtain certification before the vessel's HMS permit expires in 2007. The shark gillnet fishery currently has several requirements intended to reduce interactions and mortalities of protected species, such as observer coverage, net checks, and Atlantic Whale Take Reduction Plan (ALWTRP) requirements. This alternative may provide positive ecological impacts by reducing the mortality of protected species and teaching fishermen how to identify, disentangle, and safely release protected species. The Agency received public comment supporting alternative A5; however, requiring both owners and operators of these vessels to be certified was a concern. The Agency realizes that many vessel owners may not operate or be present on the vessels during fishing trips; therefore, certifying vessel owners ensures that they are aware of the certification requirements and protocols. The owners would then be accountable for having a certified operator on board while engaged in fishing activities.

As with the PLL and BLL requirements, the initial operator certification for gillnet vessels would be linked to the vessel's HMS permit renewal. An operator would be required to attend a workshop and receive the certification prior to the owner renewing the vessel's certification in 2007. The owner would be required to submit proof of certification before the HMS permit would be renewed. The initial operator certification would be linked to the renewal

of the vessel's HMS LAP(s) in 2007. If the vessel owner holds multiple HMS LAPs, the operator would need to be certified prior to the earliest expiration date on any of the permits in 2007. After the initial certification, the operator's certification is no longer linked to the renewal of a vessel's HMS LAP and would need to be renewed prior to the expiration date on the operator's workshop certificate. The workshop certification would not be transferable any other person and would have the operator's name on the certificate. This alternative would ensure that at least one person directly involved with a vessel's fishing activities would be certified in the safe handling and release protocols and identification of protected resources.

This alternative may result in positive ecological impacts by increasing the industry awareness of the need to reduce protected species interactions, post-release mortality, and keep the number of interactions and mortalities below the five year ITS for sea turtles and smalltooth sawfish (Table 4.3). The combination of hands-on experience with the safe release and disentanglement protocols for sea turtle interactions with gillnets, as well as proper sea turtle identification and information on Atlantic shark regulations, would likely lead to decreased post-release mortalities in the shark gillnet fishery. Workshops will help train operators to safely handle and release sea turtles and reduce mortalities. While the interactions between gillnet gear and marine mammals are relatively low, the workshops could also provide a positive ecological impact through the education of vessel owners and operators regarding protected resource identification and release techniques for marine mammals (Table 4.3). Furthermore, the gillnet vessel owners and operators, who properly identify protected resources, would be able to apply the appropriate safe release and resuscitation protocols. Finally, proper species identification may improve the accuracy and usefulness of logbooks, as well as quota monitoring and stock assessments.

The Southeastern U.S. Atlantic shark gillnet fishery is listed as a Category II fishery under the MMPA indicating that occasional mortalities and serious injuries occur in this fishery (69 FR 48407). The listing is attributed to interactions with bottlenose dolphins, North Atlantic right whales, and Atlantic spotted dolphins. Category II fisheries are required to report incidental injuries and mortalities of marine mammals, accommodate an observer, if requested, and comply with the provisions of Take Reduction Plans (TRPs). Marine mammals are often difficult to identify due to the infrequency with which they are encountered in the gillnet fishery. It is essential for fishermen to know the morphological characteristics and distribution of protected resources to positively identify these animals to the species level. When marine mammals are encountered and properly recorded, the logbook reports provide significant information regarding home range, habitat use, and abundance. All of this information is important to Agency biologists, managers, and law enforcement officials because it may improve accuracy of stock assessments and quota monitoring. For these reasons, the protected resources identification component of these workshops would likely have positive ecological impacts for marine mammals.

On February 16, 2006, NMFS issued a temporary rule (February 16, 2006, 71 FR 8223) that prohibited the use of all gillnet gear in the Atlantic Right Whale Calving Area until March 31, 2006, because of a right whale calf interaction with gillnet gear. Dissemination of information related to release and disentanglement of marine mammals from gillnet gear may

prevent additional closures in the future and would result in positive ecological impacts to endangered Atlantic right whales.

Mandatory workshops for HMS gillnet vessel owners and operators could increase the likelihood of the safe release of the rarely encountered and endangered smalltooth sawfish. In the case of the one observed interaction with gillnet gear and the smalltooth sawfish, the sawfish was cut from the net and released alive with no visible injuries (Carlson and Baremore, 2003). If the entangled gear is sacrificed, smalltooth sawfish can be removed safely. The workshops would inform owners and operators that smalltooth sawfish are listed as an endangered species, enable them to identify the species, and educate them on the safe-handling and release techniques to reduce potential sawfish mortalities occurring as a result of encounters with gillnet gear.

An additional ecological benefit of training the vessel owners and operators on the safe handling and release techniques for gillnet fishing gear is to potentially reduce the mortality of non-target species, such as red drum, manta and cownose rays, king mackerel, great barracuda, billfish, and little tunny. This alternative would likely benefit non-target species by increasing post-release survival of all species discarded.

Alternative A6, a preferred alternative, considered several different timetables for renewing the workshop certification under alternative A6 (*e.g.*, two, three, or five year timetable). The Agency may also consider additional recertification options in the future as new information arises related to safe handling and release of protected resources. Requiring renewal of mandatory workshop certification every two years would likely have slightly positive ecological impacts. NMFS assumes that participants engaged in a hands-on, day-long, workshop that requires participants to pass a practical examination demonstrating proficiency at the culmination of the workshop would maintain familiarity with the protocols for a reasonable period of time afterward. All new participants in the fishery would still be required to attain certification before being able to attain their permit and permit holders would need to renew their certification within two years of their original attendance to maintain an HMS permit.

Requiring re-certification every three years may have slightly less positive ecological impacts than every two years. Recertification every three years is a reasonable frequency to ensure that participants are kept abreast of the safe handling and release protocols and to also maintain awareness of new research and development related to workshop curricula. Permit holders would be required to recertify every three years before being able to renew their shark, swordfish, or tuna permits that allow the use of longline or gillnet gear.

Requiring re-certification every five years would likely have less positive ecological impacts than the two previously mentioned timeframes. Recertification every five years would allow a more time to lapse between certification workshops than necessary to maintain proficiency and provide updates on research and development of handling and dehooking protocols. These impacts may be mitigated somewhat by also selecting alternative A3 (certification for operators) or A4 (certification for owners, operators, and crew) which ensures that both operators and vessel owners are certified, thereby, increasing the number of fishery

participants who interact with sea turtles and/or other protected species and are aware of how to safely handle and release them.

NMFS received several comments in support of alternative time periods for renewal of certification; however, the Agency prefers to maintain the original preferred alternative of recertification every three years. NMFS would require owners and operators of HMS longline and shark gillnet vessels to renew the mandatory workshop certification every three years. A three year period for recertification would likely maintain proficiency in the release, disentanglement and identification protocols, and allow NMFS to update owners and operators on new research and developments related to the subject matter while not placing an excessive burden on the participants (*e.g.*, lost fishing time and travel to attend workshops).

Social and Economic Impacts

Under alternative A1, there may be some negative economic impacts, related to protected species safe handling, release, and identification workshop travel costs and lost fishing time, which may be incurred by fishery participants who choose to attend; however, the travel costs and lost fishing time for participants attending the voluntary workshops are discretionary, and not mandatory. In addition to the participant cost, there is an Agency cost associated with the implementation of these workshops as well. Determining the Agency cost for holding these workshops is somewhat uncertain because no decision has been made on the instructors, locations, curriculum, or materials for the course. Based on the voluntary workshops held in 2005, NMFS estimates that one protected species workshop would cost about $3,500. The hands on training component would limit the number of participants in each workshop to a maximum of about 48 people. Due to the voluntary nature of alternative A1, it is uncertain how many workshops would be held. If one workshop were held each month, then the Agency cost would be about $42,000 per year. In addition to running the workshops, materials would need to be developed and reproduced for distribution at these workshops. Because the materials have not yet been developed, this aspect of the Agency cost is unknown at this time.

Voluntary workshops hosted by NMFS or industry may be viewed more favorably by the affected public than mandatory workshops; however, past experience has shown that these workshops are generally not well attended. Poor attendance, and the resulting impact on post-release mortality of threatened and endangered species, may hinder achieving the targets issued for protected resources due to lack of proficiency with the dehooking techniques and equipment on the behalf of the participants. Failure to achieve the target post-release mortality rates may result in future time/area closures as specified in the BiOp, including a closure of the entire Gulf of Mexico, which would result in extensive negative social and economic impacts to the pelagic and bottom longline fisheries. Voluntary workshops may improve communication between constituents and the Agency and would improve awareness of Agency actions.

Alternatives A2 - A4 would also likely result in some negative economic and social impacts, as a result of traveling to the protected species safe handling, release, and identification workshops and the fact that lost fishing time may be incurred by participants that would be required to attend these mandatory workshops. In order to provide fishermen and vessel owners time to prepare for economic costs associated with this mandatory requirement, owners and operators would have until their permit expires in 2007 to obtain the workshop certification.

Additionally, the Agency will strive to host a number of workshops in regional fishing hubs to minimize travel and lost fishing time. The workshops would be held during periods when the fishery is typically inactive, effectively minimizing lost fishing time to the extent practicable. For example, the workshops may be held when the fishery is closed and prior to the start of the next trimester for sharks. However, since the Agency does not know what other fisheries fishermen may be participating in, the Agency cannot guarantee that all workshops will be held at appropriate times to minimize all lost fishing opportunities. The timing and location of these workshops should lessen the negative social and economic impacts of taking the time away from fishing, work, or other responsibilities. While these alternatives would have an economic impact to the industry, these impacts may be mitigated by the benefits associated with increased industry education (*i.e.*, increased compliance, skills, and stewardship). These alternatives could result in some social benefits.

NMFS conducted an opportunity cost analysis to determine the economic costs associated with attending the various workshop alternatives. This analysis utilized the economic information gathered in the PLL Logbook, and in particular the information in the economic costs section that is required to be completed by selected vessels. For the vessels that completed the economic portion of the PLL Logbook in 2004, revenues per trip were estimated by taking the number of fish caught per trip, multiplying the number of fish by average weight for each species harvested, and multiplying the total weight for each species by average prices for each species as reported in the dealer landings system. The costs reported for each trip were then subtracted from the estimated revenue for each trip. Then the number of days at sea, as reported in logbooks, was used to determine the average net revenue per day at sea for each trip taken. Finally, the information provided on crew shares was used to allocate the net revenue per day at sea to owner, captain, and crew. The BLL cost earnings data set is limited compared to the PLL cost earnings data in the HMS Logbook, therefore, the sample size is not as significant for BLL trips. Information from the HMS permits database was then used to estimate the potential number of participants in each of the workshop alternatives. Since information on the number of operators per permitted vessel was not available, NMFS conservatively estimated that there could be two operators per permit for PLL vessels, and one captain for all others. Net revenues per day for owners, operators, and crew was then multiplied by the number of participants expected for each workshop alternative to estimate the opportunity cost for a one day workshop. The economic impacts (*i.e.*, out of pocket cash costs) associated with attending workshops is likely to be less than the economic opportunity costs estimated since NMFS intends to schedule workshops on less productive fishing days to avoid lost time at sea.

As of February 2006, there are about 549 vessel owners permitted to fish for HMS with pelagic and bottom longline gear, which would be the estimated number of participants included in the workshops for alternative A2. According to an analysis of 2004 cost-earnings information as reported in HMS logbooks, the median opportunity cost for individual, bottom and pelagic longline vessel owners to participate in a one-day workshop would be $281 and $448, respectively. Alternative A3 would apply to vessel operators. NMFS assumed there are approximately two operators per vessel owner (permit), resulting in a total of 1,098 participants. According to the cost-earnings analysis mentioned above, the median opportunity cost for individual, bottom and pelagic longline vessel operators to participate in a one-day workshop would be $345 and $149, respectively. Alternative A4 would include vessel owners, operators,

and crew. Based on logbook data, an estimated average of four crewmembers is associated with any particular vessel. These workshops would have 3,843 participants, thus, alternative A4 would have the largest economic impacts. According to the cost-earnings analysis mentioned above, the median opportunity cost for individual, bottom, and pelagic longline vessel crewmembers to participate in a one-day workshop would be $90 and $109, respectively. These individual costs when added to the individual opportunity costs of owners and operators, results in a combined individual opportunity cost of $716 for bottom longline fishery participants and $706 for pelagic longline fishery participants to participate in a one-day workshop. These opportunity cost estimates should be considered upper bounds on the potential economic costs associated with attending workshops. Information quantifying the economic value of time spent at the workshops is not currently available to further refine the upper bound cost estimates used in the economic analysis of workshop alternatives. Additional information regarding economic impacts for each of these alternatives can be reviewed in Chapter 6.

The cost to the Agency varies for each of these alternatives due to the number of people that would be required to attend and achieve the workshop certification. Alternative A2 calls for at least 549 workshop participants. If each workshop can accommodate 45 people, then a minimum of 12 workshops would need to be held. At a cost of $3,500 per workshop, alternative A2 has an Agency cost of about $42,000 plus the cost of outreach materials. Alternative A3 requires 1,098 owners and operators to obtain the workshop certification. The Agency would need to hold about 23 workshops at a total cost of $80,500 plus materials. Alternative A4 requires 3,843 owners, operators, and crew members to obtain a workshop certification; therefore, the Agency would need to hold at least 81 workshops at total cost of $283,500 plus materials. The greater the number of people certified, the greater the number of copies that need to be made for the outreach materials.

Under alternative A5, shark gillnet vessel owners and operators would be required to attend workshops discussing safe release and disentanglement protocols, protected resources identification, and current regulations. The administrative costs for workshops are high, but may be mitigated by the benefits associated with increased industry education (*i.e.*, increased compliance, skills, and stewardship). This alternative would likely result in social benefits. On February 14, 2006, NMFS issued a temporary rule that banned the use of all gillnet gears in the Atlantic Right Whale Calving Area until March 31, 2006, because of a right whale calf that interacted with gillnet gear on January 22, 2006. A closure results in a negative economic impact to the fishery. Dissemination of information related to release and disentanglement of marine mammals from gillnet gear may prevent additional closures in the future.

The costs incurred by vessel owners and operators would be related to travel and time to attend the workshop, resulting in out of pocket expenses and lost opportunity costs. NMFS estimates that there are approximately 20 participants in the shark gillnet fishery that would attend workshops; 80 percent of the identified shark gillnet permit holders and operators are located in Florida, and 20 percent are in North Carolina and New Jersey. As mentioned earlier, NMFS conducted an analysis of 2004 cost-earnings information as reported in HMS logbooks. Individual opportunity costs are not available for gillnet vessel owners and operators due to confidentiality concerns, however the median opportunity cost for vessel owners and operators of all gear types combined, including gillnets, to participate in a one-day workshop would be

$578 ($424 owner's share plus $154 captain's share). Additional information regarding economic impacts of this alternative can be reviewed in Chapter 6. To minimize cost to the owners and operators, NMFS would offer workshops in the areas where the shark gillnet fishery participants are located. Workshops would be held during periods when the shark gillnet fishery is typically inactive, effectively minimizing lost fishing time to the extent practicable. For example, the workshops may be held when the fishery is closed and prior to the start of the next season. However, the Agency does not know what other fisheries the fishermen may be participating in when the shark gillnet fishery is closed. The timing and location of these workshops should lessen the negative social and economic impact of taking time away from fishing, work, or other responsibilities. Additionally, owners and operators would have until the vessel's HMS permit expires in 2007 to receive the workshop certification. This delayed effectiveness would provide fishermen and vessel owners with time to prepare for economic costs associated with this mandatory requirement.

While there are only 20 participants associated with alternative A5, the participants are spread out between Florida, North Carolina, and New Jersey. To reduce the burden to the industry, three workshops would need to be held, which would cost the Agency about $10,500. If the all three preferred alternatives A2, A3, and A5 are considered together, the Agency would likely hold at least one workshop in Florida, North Carolina, and New Jersey, which could accommodate the additional 20 participants associated with the gillnet fishery. The Agency cost for all three workshops would be about $126,000 plus the cost of materials.

Most trades and professions require practitioners to obtain licenses demonstrating competence; however, there is still an economic opportunity cost associated with any required activity that would not otherwise be taken voluntarily. When analyzing the economic costs associated with workshop alternatives, the next best activity that workshop participants would be engaged in would be fishing. In the economic literature, it is common practice to use wage rates from primary job activities as the opportunity cost of engaging in other activities.

Workshop attendance may increase the time spent away from family, particularly if the workshops are scheduled during the fishery's downtime. Because the workshops would be scheduled where the permit holders are located in significant concentrations, attending the workshop should not take more than a day to a day and a half away from their family, responsibilities, or other fishing activities. The owners and operators would benefit from participating in the workshop by advancing their knowledge and skills in their industry. The training provided by workshops would be valuable to fishermen and could offset some unquantifiable portion of the estimated opportunity costs.

These workshops would provide a forum for discussion and education. The vessel owners and operator would have an opportunity learn about the latest advances in safe release and disentanglement protocols, as well as protected species identification and the latest regulations pertaining to their fishery. This knowledge also translates into a skill that could be used to increase operators' bargaining position for employment. Finally, these workshops are a dedicated opportunity for the Agency to interact and communicate with the industry.

Recertification every two years would likely have the greatest economic impact on participants; however, the extent of the impacts would depend on the mechanism for recertification: in-person workshops versus the use of alternative sources of media including CD-ROM, DVDs, or web-based media that would not result in travel costs or lost fishing time. The Agency will consider ways to moderate the cost involved with recertification for all of the alternatives considered. The potential economic impacts of having to get recertified in-person would increase proportionately as the number of participants increase. Certifying the participants every five years would result in the least negative economic impacts to the fishing community because potentially it would result in the most infrequent recertification schedule. If in-person recertification workshops were selected, travel costs, and lost fishing time would be minimized.

Under the preferred alternatives, the Agency cost to recertify all HMS longline and gillnet owners and operators every three years is difficult to estimate. Every three years, there would likely be a large pulse of individuals that would need to be recertified in order for the owners to renew their HMS permits. In these years, the Agency cost may be similar to the initial year. During the interim years, there may be an unquantifiable number of new entrants to the fishery or latent permit holders that would need to be certified. Because the number of individuals is unknown, it is difficult to determine the number of workshops that would be needed. At a minimum, one workshop each month would be held at total cost of $42,000 per year plus materials.

A recertification frequency of three years would allow for sufficient retraining to maintain proficiency and update fishermen on new research and development related to the subject matter while not placing an excessive economic burden on the participants due to lost fishing time and travel resulting from attending a recertification workshop in person.

Conclusion

Mandatory protected species safe handling, release, and identification workshops for PLL, BLL, and gillnet vessel owners and operators would result in positive ecological impacts by reducing the mortality of protected resources. These workshops are essential for complying with BiOp requirements by reducing the post-release mortality of sea turtles and other protected resources. Workshop certification would be linked to the renewal of the vessel's permit, ensuring well attended workshops. Requiring certification for vessel operators would guarantee at least one person on board the vessel during fishing activities trained in the safe handling and release protocols. Educating vessel owners and operators on the proper identification of protected resources would enable them to apply the appropriate safe handling and release protocols, improve compliance with regulations, and enhance the utility of vessel logbook data. To the extent that interactions cannot be avoided, the safe handling and release workshops should result in increased survival rates of protected resources hooked or entangled by HMS fishing gears. None of the alternatives considered for workshops on safe release, disentanglement, and identification of protected resources are expected to have any impacts on EFH. The one-day workshops are not expected to result in excessive economic impacts as they would be scheduled at numerous locales along the Atlantic coast, minimizing travel, lost fishing time, and other opportunity costs. The Agency would delay the workshop certification deadline to facilitate the attendance of owners and operators. Requiring that owners and operators in

longline and gillnet fisheries to recertify every three years would balance the ecological benefits of maintaining familiarity with the protocols and the economic impacts of workshop attendance due to travel costs and lost fishing opportunities. Owners and operators of longline and gillnet vessels would be required to recertify every three years in an effort to maximize ecological benefits and minimize economic impacts of attending workshops.

4.1.1.2 HMS Identification Workshops

The purpose of HMS identification workshops is to enhance the ability of individuals involved in the HMS fisheries to identify sharks at the species level. Participants who successfully complete the workshops would receive a multi-year certification, which would serve as proof that the participant has completed the necessary training. To the extent practicable, these workshops would be open to other interested individuals (*e.g*,, individuals participating in the shark fishery, port agents, law enforcement officers, and state shark dealers) on a voluntary basis, but mandatory for Federally permitted shark dealers.

Accurate species identification is important for compliance with HMS fishery regulations, including the avoidance of prohibited species, maintaining quota limits, and accurate data collection. Species data collected on vessels and by dealers are entered into vessel logbooks and dealer reports, and are used to establish and monitor quotas and for stock assessments. It is important that fishery scientists and managers have the most reliable data possible for assessing the status of stocks and for formulating appropriate fishery management strategies based on this information, both to prevent overfishing and to rebuild those stocks that are already overfished. However, a large proportion of commercially landed sharks are reported as "unclassified" (*i.e*., unidentified), creating gaps in data collection in terms of actual species. As shown in Tables 3.40, 3.41, and 3.42, 19 percent of total 2004 LCS landings were unidentified, 0.3 percent of total 2004 SCS landings were unidentified, and 53 percent of the pelagic shark landings were unidentified. Of the total 2004 shark landings, 71 percent were unclassified shark species. Species identification workshops could reduce this problem by improving species specific reporting, thereby enhancing the quality of the data used in setting quotas and for stock assessments.

As described in Chapter 2, the alternatives considered for conducting species identification workshops are:

A7 No HMS identification workshops (No Action)

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

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

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

A11 Mandatory HMS identification workshops for all commercial longline vessel owners

A12 Mandatory HMS identification workshops for all commercial longline vessel operators

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

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

A15 Mandatory HMS identification workshops for all HMS Angling permit holders

A16 HMS identification certification renewal (every 3-years) – Preferred Alternative

Ecological Impacts

Under alternative A7, the No Action alternative, NMFS would continue to make available for purchase the HMS identification manual, *Guide to Sharks, Tunas, & Billfishes of U.S. Atlantic & Gulf of Mexico*, and distribute wheelhouse placards at no cost, as well as other related educational materials. Although these materials enhance fishery participants' ability to identify HMS commonly caught in U.S. fisheries, discerning subtle identification features using these materials is less effective compared to hands-on workshops, particularly when attempting to distinguish species that are similar in appearance (*e.g.*, certain sharks). Furthermore, this guide does not contain pictures or information that may be beneficial for HMS carcass identification, which is generally how the catch is offloaded to HMS dealers. Also, there is no assurance that fishery participants will utilize or fully understand the materials distributed. As species identification data is entered into fisheries logbooks and dealer reports, which are used in quota monitoring and in preparing stock assessments, identification inaccuracies could be reflected in the resulting quotas and assessments, thereby affecting associated fishery management strategies.

Implementing voluntary workshops under alternative A8 could provide some ecological benefits, provided fishery participants attend the voluntary workshops. In the past, however, voluntary workshops conducted by NMFS have not been well attended, and could also be the case if future identification workshops are voluntary. The hands-on approach of workshops would enhance understanding of identification features so that those who do attend would be better able to identify HMS and thus provide more accurate information in logbooks and dealer reports. This, in turn, could provide some level of improvement in the accuracy of data used for quota monitoring and stock assessments. In addition, those who attend and gain a better understanding of identification features would be in a better position to comply with fishery regulations, such as identifying prohibited species. All of these factors would indirectly contribute to stock rebuilding efforts and, therefore, result in positive ecological effects on HMS fishery resources.

Under alternative A9, a preferred alternative, HMS identification workshop attendance and certification would be required for all Federally permitted shark dealers by December 31, 2007, with successful completion and mandatory recertification linked to the dealer's ability to obtain and renew their Federal dealer permit. Mandatory attendance by shark dealers is the preferred alternative because: (1) a single dealer must identify offloaded catches from a number of vessels, involving not only large numbers of fish but many different species of fish, as well; (2) not only are some shark species difficult to distinguish from one another, but dealers need to identify fish that have been dressed, making accurate identification even more difficult; and, (3) while both logbook and dealer data are used for stock assessments, the dealer is ultimately responsible for identifying the sharks, and their data is used for both quota monitoring and stock assessments. Additionally, sharks on the prohibited species list are not to be purchased by shark

dealers. The shark identification workshops would improve dealer identification of prohibited species, leading to the reduction of the number of prohibited species landed and purchased. Without a market for prohibited shark species, shark fishermen would have greater pressure to correctly identify sharks at the species level and land more non-prohibited sharks. The identification workshops would help reduce the number of prohibited sharks landed and possibility differentiate between SCS and LCS, thus facilitating dealer compliance with preferred alternatives, I3b, to make it illegal for dealers to purchase sharks in excess of the 4,000 pound LCS retention limit. With accurate shark identification, there may be a better understanding of shark bycatch in the fleet.

The Agency received comment regarding the need for proxies; flexibility in certifying newly hired proxies, and the need for multiple proxies. Shark dealers would be encouraged to send as many proxies as is necessary to train the individuals responsible for shark species identification within the dealer's business. As all permitted dealers may not be geographically located where vessels unload their catches, a proxy could attend the workshop to allow the permitted dealer to meet mandatory attendance requirements. If a dealer opts to send a proxy, then the dealer would be required to designate a proxy from each place of business covered by the dealer's permit. A proxy would be a person who is employed by a place of business, covered by a dealer's permit, a primary participant in identification, weighing, or first receipt of fish as they are offloaded from a vessel, and involved in filling out dealer reports.

Public comment on the HMS Identification Workshops were supportive of mandatory workshops for Federally permitted shark dealers, but also suggested that these workshops be available to others, such as the recreational and commercial fishery, law enforcement, port agents, and state shark dealers. While these workshops would be mandatory for Federally permitted shark dealers, NMFS will accommodate other interested individuals when it is feasible. The ecological benefits of alternative A9 would be similar to those described in alternative A8, voluntary workshops, but would be expanded in magnitude, as a greater number of individuals would be trained in identification, thereby substantially improving the accuracy of data entered into dealer reports. Mandatory workshops for shark dealers, in turn, would contribute to improved stock assessments, quota monitoring, and stock rebuilding efforts.

Under alternative A10, mandatory HMS identification workshops and certification would be required not only for shark dealers, but for swordfish and tuna dealers as well. Benefits of this alternative are that training would be increased to include additional participants compared to only including shark dealers, in which case training would include identification of commercially fished HMS as well as sharks. Although ecological benefits would be similar to those described under alternative A9, they would be expanded to include other HMS fisheries, and would likely result in greater ecological benefits. As with alternative A9, a proxy could attend the workshop in order for the dealer to meet mandatory attendance requirements.

Under alternative A11, HMS identification workshops and certification would be required for vessel owners issued limited access permits and using pelagic or bottom longline gear during fishing operations. Workshop completion and mandatory periodic recertification would be tied to Federal shark dealer permit issuance and renewal. Training of vessel owners could serve to improve species data entry in vessel logbooks, but only if owners are on board the

vessel. In some cases, the vessel owner may not be the vessel operator, and thus not involved in daily fishing activities or be available to identify catches. Because of the potentially limited involvement of longline vessel owners in the vessel's fishing activities, ecological benefits would likely be narrower in scope than expected under alternatives A8, A9, and A10.

Under alternative A12, HMS identification workshops would be required for all commercial pelagic or bottom longline vessel operators. Ecological benefits to the fisheries, although similar in nature to those expected under alternative A11, would be expanded in magnitude, because operators are more actively involved in fishing activities and fish identification. This would result in increased accuracy of species-specific data reported in logbooks. Ecological benefits would be similar in nature as described for the alternatives above, resulting in improved stock assessments and indirect benefits to stock rebuilding.

Under alternative A13, attending HMS identification workshops and obtaining a certification in HMS identification would be required for all HMS permitted commercial fishing vessel owners. Participants who have more than one permit would only be required to attend one workshop. Successful workshop completion and mandatory periodic recertification would be tied to the issuance and renewal of Federal HMS permits. Under this alternative, training and identification accuracy would be significantly expanded in magnitude beyond that conducted under alternatives A8 through A12. However, this alternative would only improve species data entered into reports if the owners are on board the vessel, involved in daily fishing activities, and available to identify fish landed. Given that in many cases the vessel owner is the operator aboard the vessel during fishing activities, ecological benefits to HMS fishery resources could be expanded beyond that expected under the other alternatives listed above, resulting in increased indirect benefits to stock rebuilding.

Under alternative A14, mandatory HMS identification workshops and certification would be required for all HMS permitted commercial fishing vessel operators. For the CHB, General category, and handgear/Harpoon categories the Agency assumes that the vessel owners (permit holders) are also the primary operators. Participants who are operators on multiple vessels fishing under different permits would only be required to attend one identification workshop. Due to the large number of participants, training and identification skills would be significantly expanded beyond that under the other alternatives, resulting in a greater indirect benefit to HMS fishery resources. This includes an improvement over alternative A13, as well, since in all cases it can be expected that the vessel operator is on board the vessel, involved in daily fishing activities, and available to identify catches. Therefore, training of all commercial vessel operators could serve to significantly improve species data for fishing activities that are required to submit a logbook and thereby improve the basis for quotas and stock assessments, as well as regulatory compliance. Accordingly, ecological benefits to HMS fishery resources would also be expanded beyond that expected under the previous alternatives, as a result of more accurate species catch data, and improved regulatory compliance.

Under alternative A15, mandatory HMS identification workshops and certification would be required for all HMS Angling category permit holders. The number of individuals trained would be significantly greater than under the other alternatives, resulting in potentially greater positive ecological benefits for HMS fisheries. NMFS received public comment in support of

HMS identification workshops for the angling community; however, this alternative does not resolve the data quality issues associated with commercial vessel logbooks and dealer reports. Thus, quota monitoring, commercial regulatory compliance, and stock assessments would not benefit as they would under the other alternatives.

Alternative A16 requires HMS identification workshop certification renewal every three years. The Draft Consolidated HMS FMP considered and analyzed three timetables for certification renewal - two, three, or five-year timetables. NMFS assumes that participants engaged in a hands-on, day-long workshop that requires participants to pass a practical examination demonstrating proficiency at the culmination of the workshop would maintain familiarity with identification protocols for a reasonable period of time afterward. All new entrants/owners into the fishery would still be required to obtain HMS identification workshop certification before acquiring the Federal HMS permit, and permit holders would need to renew their certification within three years of their prior attendance to maintain an active Federal HMS permit. Requiring renewal of workshop certification every two years would likely have the most positive ecological impacts. Requiring re-certification every three years would have somewhat less positive ecological impacts. Requiring re-certification every five years would likely have the least positive ecological impact, as this would allow a more extensive period of time to lapse between certification workshops than may be necessary to maintain species identification proficiency. Requiring workshops recertification every three years strikes a balance between ecological benefits and economic costs.

Social and Economic Impacts

Under alternative A7, the No Action alternative, the social and economic impacts would not change, positively or negatively, primarily because current activities related to the dissemination of information to assist in identifying HMS would remain the same. Alternative A7 would not have any additional Agency costs as it is the No Action alternative.

Under the remaining alternatives, the identification workshops would serve an educational purpose and as a forum where the industry could also exchange information about their business. This atmosphere could provide attendees with more information about their fisheries and create a forum for participants to express their comments regarding fisheries management and regulations. This communication could lead to better working relationships with the Agency.

Under alternative A8, voluntary HMS identification workshops, there would be neither positive nor negative social and economic impacts, primarily because attendance would be voluntary and at the convenience of the participants. For those who do attend, there would be some social benefit related to sharing of fishery information. Any associated travel costs would be minimal, as it is not likely that participants would go to substantial expense and trouble for this type of voluntary training. In the past, voluntary workshops conducted by NMFS have not been well attended, and this could also be the case if identification workshops are voluntary.

The voluntary nature of the workshops proposed in alternative A8 makes it difficult to estimate the number of individuals that would attend the workshops. As with the protected species workshops, the number of workshops held is driven by the number of participants with

the maximum being 30 people and the location of the individuals. Determining the Agency cost for holding these workshops is also uncertain at this time because the instructors, locations, curriculum, and materials have not yet been determined. At this time, the NMFS estimates one HMS identification workshop to cost about $2,100 including the cost of outreach materials and staff time. If the Agency held one workshop per month, the Agency cost associated with alternative A8 would be $25,200.

Under alternatives A9 through A15, social and economic impacts would be similar in nature, the main difference being the number of attendees and the associated overall total costs, taking all individuals into consideration. On an individual basis, the costs anticipated to be incurred by fishermen would be those related to travel and time to attend the workshops, resulting in out of pocket expenses and lost opportunity costs. Alternative A9 would require that approximately 336 shark dealers attend mandatory workshops, alternative A10 would also require tuna and swordfish dealers to attend, raising the total to 1,037 dealers. Daily opportunity cost estimates for dealers are not currently known. Alternative A11 would require approximately 549 pelagic and bottom longline vessel owners to participate in identification workshops, resulting in an individual opportunity cost ranging between $448 (median pelagic longline owner's share) and $281 (median bottom longline owner's share) per day. Alternative A12 would include longline vessel operators. With 549 permitted vessels and an estimated two operators per vessel, alternative A12 would call for about 1,098 participants in addition to the owners (1,647 total). This estimated number of operators may be an overestimate because some owners also operate the vessel, and not all vessels have two operators. Alternative A12 would result in an individual opportunity cost ranging between $149 (median pelagic longline captain's share) and $345 (median bottom longline captain's share) per day. Alternative A13 would include all commercial HMS owners (longline, CHB, General category, and handgear/harpoon) and would require approximately 9,636 participants to attend mandatory workshops. This alternative would result in an individual opportunity cost of $424 (median owner's share for all gear types combined). Daily opportunity cost estimates for CHB owners are not currently known. Alternative A14 would include operators of commercial HMS vessels. Alternative A14 would have an additional 1,098 participants as the Agency estimates two operators per vessel in the longline fisheries for a total of 10,374 operators. Alternative A14 would result in a combined opportunity cost of $578 (median owner's share $424 plus median captain's share $154 for all gear types combined). Daily opportunity cost estimates for CHB owners/operators are not currently known. Alternative A15 would require all HMS Angling permit holders to attend workshops, which is the largest single category of HMS permit holders, including approximately 25,238 participants. Daily opportunity cost estimates for HMS Angling permit holders are not currently known. Additional information regarding economic impacts of these alternatives can be reviewed in Chapter 6.

To minimize costs to fishermen, NMFS intends to offer workshops at a variety of locations near high concentrations of dealers, according to the addresses listed on the permits. NMFS would also try to hold workshops during off-peak times to minimize interruption to the businesses. However, since the Agency does not know what state fisheries dealers may be involved with, the Agency cannot guarantee that all workshops will be held at appropriate times to minimize all lost opportunities. Further, the requirement to obtain workshop certification would be delayed until December 31, 2007, to provide dealers more time to prepare for the

economic costs associated with this mandatory requirement. The administrative costs to NMFS for the workshops is high, but may be exceeded by the benefits associated with the possible impacts from increased education. Before implementation, NMFS would attempt to identify ways to minimize costs to attendees as much as possible.

As with the protected species workshops, the Agency cost will vary depending upon the number of participants required to obtain a workshop certification. Alternative A9, the preferred alternative, requires the attendance of all Federally permitted shark dealers, which is about 336 individuals, plus any additional proxies involved with shark identification. At a minimum the Agency would need to hold 12 workshops, accommodating a maximum of 30 people per workshop. At a cost of $2,100 per workshop, 12 workshops would cost the Agency an estimated $252,000. Alternative A10 would require all Federal HMS dealers or about 701 individuals to be workshop certified; holding 24 workshops would cost the Agency about $50,400. Alternative A11 would certify 549 commercial longline vessel owners at about 19 different workshops for an Agency cost of $39,900. To certify all commercial longline operators (alternative A12), the Agency would need to hold about 37 workshops with an estimated Agency cost of $77,700. Expanding the universe of certified individuals in alternative A13 to all commercial HMS permit holders would require at least 322 workshops and the Agency cost would be about $676,200. The Agency would need to hold at least 346 workshops to accommodate all 10,374 commercial HMS operators. Alternative A14 would have an estimated Agency cost of $726,600. The largest number of individuals would be certified under alternative A15 with 25,328 Angling permit holders. This alternative would cost the Agency an estimated $1,768,200.

Alternative A16 has a range of social and economic impacts depending on the frequency of recertification workshop attendance. In the Draft Consolidated HMS FMP, NMFS considered requiring the workshop certification renewal every two, three, or five years. The two additional years of a five-year timetable may compromise dealer proficiency in shark identification and may have greater economic impacts to dealers because of the expense of one-on-one training, as well as the cost of travel to the trainer location. In an effort to reduce economic impacts to shark dealers, the schedule for HMS Identification Workshops would be available in advance to allow dealers to select workshops close to them and most convenient to their schedule. If a dealer and/or proxy is unable to attend a scheduled workshop, NMFS will consider granting one-on-one training at the expense of the dealer. The Federally permitted shark dealer would be held accountable for ensuring that the appropriate individuals receive the required training in shark identification. The attendance of multiple proxies per shark dealer may ensure that the dealer has at least one certified staff member and the skills to properly identify sharks if another certified employee is terminated. According to public comment, NMFS should anticipate turnover in dealer proxies. These one-on-one training sessions would accommodate the replacement of a proxy whose employment was terminated on short notice, but, again, these sessions would be at the expense of the permit holder. If dealer employee turnover is high and the renewals are scheduled every five-years, a dealer may pay for a greater number of one-on-one training sessions than with a three-year timetable.

In addition to the frequency, economic impacts would be dependent on the type of recertification selected by the Agency, such as hands-on, in-person or training via the Internet, DVD, and/or printed materials. In the future, the Agency intends to investigate the use of alternative media to train shark dealers and/or renew the shark identification workshop

certification, however the initial training would be in-person and hands-on. If NMFS does transition to Internet training, the Agency will look at the option of making any online training available to all interested parties. Hands-on, in-person recertification workshops would result in additional travel costs and lost fishing time. To the extent possible, NMFS would schedule recertification workshops so as to minimize these factors, but the negative economic impacts would be greater for hands-on, in-person recertification due to more frequent travel costs and potential increased fishing down time.

Under the preferred alternative, to recertify every three years, there would likely be a large pulse of individuals seeking to be recertified every three years when certificates expire. In these years, the Agency cost may be similar to the initial year as discussed above. During the interim years, there may be an unquantifiable number of new entrants to the industry or business or latent permit holders that would need to be certified. Because the number of individuals needing the workshop certification in the interim years is unknown, it is difficult to determine the number of workshops that would be needed. At a minimum, one workshop each month would be held at total annual cost of $25,200.

Conclusion

Alternative A9, mandatory workshops for all Federally permitted shark dealers, is the preferred alternative because species-specific identification of offloaded shark carcasses is much more difficult than for other HMS as evidenced by the large proportion of "unclassified" sharks listed on shark dealer reports. This uncertainty compromises quota monitoring and stock assessment efforts. Dealers are a focal point for gathering shark landings information as sharks from numerous vessels are offloaded at each individual dealer. Positive identification is often less difficult for fishermen than dealers as they know exactly where (depth, type of habitat, etc) a shark has been caught and often see the sharks alive and intact. These workshops would be open to other interested individuals (*e.g.*, individuals participating in the shark fishery, port agents, law enforcement officers, and state shark dealers) on a voluntary basis, but would be mandatory Federally permitted shark dealers. Federally permitted shark dealers would be required to receive this training in an effort to reduce unclassified shark landings and improve species-specific landings data. Improvements in shark dealer data could improve the existing quota monitoring program, as well as future stock assessments. The HMS identification workshops are also not expected to have any impacts on EFH. Additionally, these workshops are not expected to alter existing fishing effort or practices, and therefore, should not result in increased interactions with protected resources. The Agency would attempt to minimize economic impacts to shark dealers by delaying the date of effectiveness until January 1, 2007, meaning shark dealers would need to be certified by December 31, 2007. Additionally, workshops would be held at fishing ports to minimize travel costs and during non-peak fishing times to minimize perturbations to business activity, to the extent possible. Based on the Draft Consolidated HMS FMP analyses and public comment, the Agency has determined that the HMS identification workshop certification for all Federally permitted shark dealers would be most appropriately renewed on a three-year timetable. Recertification every three years is a reasonable frequency to ensure that participants are kept abreast of identification protocols.

4.1.2 Time Area Closures

NMFS considered alternatives ranging from maintaining existing closures (No Action) to a complete prohibition of pelagic longline (PLL) gear in all areas in order to reduce the bycatch and bycatch mortality of non-target HMS and protected species, such as sea turtles, in Atlantic HMS fisheries. While NMFS primarily focused on pelagic and bottom longline gear in this section, other gear types and other approaches to reduce bycatch and bycatch mortality are considered in other sections (*e.g.*, Workshops in Section 4.1.1.1; restrictions on recreational gears in Section 4.2.3). Alternatives B4 (complementary closures in Madison-Swanson and Steamboat Lumps) and B5 (criteria to use when implementing or modifying area closures) are the preferred alternatives. The No Action alternative (B1) is shown in Figure 4.1. Alternatives B2(a) through B2(e) are shown in Figure 4.2. Alternatives B3(a) and (b) are shown in Figure 4.3. and alternatives B4 and B6 area shown in Figure 4.4 and Figure 4.5.

The alternatives were grouped according to the primary objectives of the time/area closure. Alternatives B2(a) through B2(e) consider new closures for PLL gear to primarily address white marlin, bluefin tuna (BFT), and sea turtle bycatch. Alternatives B3(a) and B3(b) consider modifying existing closures for PLL gear. Regardless of the grouping, bycatch of non-target species and protected species, such as sea turtles, was taken into consideration for all of the alternatives. Alternatives B4 through B7 consider either complementary measures, criteria for time/area closures, closures for bottom longline (BLL) gear, or complete closure of the HMS PLL fishery. Several other alternatives, B2(f) – (k) and B3(c) – (d), were initially considered for new closures and modifications to existing closures but were not further analyzed (See Chapter 2 and Appendix A). Explanations of why certain alternatives were not further analyzed are included in Chapter 2, and tables summarizing data for each of the alternatives that were considered are included in Appendix A. The time/area closure alternatives considered are:

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

B2(a) Prohibit the use of PLL gear in HMS fisheries in the central portion of the Gulf of Mexico from May through November (7 months), annually

B2(b) Prohibit the use of PLL gear in HMS fisheries in an area of the Northeast during the month of June (1 month), each year

B2(c) Prohibit the use of PLL gear in HMS fisheries in the central Gulf of Mexico from April through June (3 months), annually

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

B2(e) Prohibit the use of PLL gear in HMS fisheries in an area of the Northeast to reduce sea turtle interactions year-round

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

B3(b) Modify the existing Northeastern U.S. time/area closure to allow the use of PLL gear in areas west of 72º 47’ W. Long. during the month of June each year

B4 *Implement complementary HMS management measures in Madison-Swanson and Steamboat Lumps Marine Reserves year-round – Preferred Alternative*

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

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

B7 Prohibit the use of PLL gear in HMS fisheries in all areas

Ecological Impacts

Brief Summary of the Analyses for New Closures

As described below, each of the alternatives would have varying degrees of ecological impacts. To help identify potential benefits and impacts of the various alternatives, NMFS conducted analyses using available data. These analyses are fully explained in Appendix A and a summary is provided below. Within this section, NMFS presents summary tables that were created to show the changes in the numbers of discards of white marlin, blue marlin, sailfish, spearfish, leatherback sea turtles, loggerhead sea turtles, other sea turtles, and BFT based on data from the Pelagic Observer Program (POP) (Table 4.4) or the Highly Migratory Species (HMS) Logbook (this is the logbook used by the PLL fleet) (Table 4.5) for the various time/area closure alternatives. In addition, individual tables for each of the alternatives are presented to show the monthly discards or landings of non-target or target HMS respectively, that include pelagic and large coastal sharks, and the percent reduction in numbers of hooks set. Data are also presented for the estimated change in targeted and retained catch of swordfish, bluefin, bigeye, albacore, yellowfin, and skipjack tunas (BAYS).

The analyses of the time/area closure alternatives utilized data from the POP, the HMS logbook, and the Commercial Shark Fishery Observer Program (CSFOP). Data from the observer program is referred to in the text as "observed," and data from the HMS Logbook is referred to as "reported" or "logbook" data. To determine the effectiveness of the current closures, NMFS compared data prior to implementation of the closed areas (1997 – 1999) with effort and catch data from 2001 – 2003 for various species. The analyses of the new time/area closures considered data primarily from the POP and HMS logbook from 2001 – 2003. Data from 2001 – 2003 were used because they include data after the most recent closures went into effect in 2000. For the alternatives considering modifications to existing time/area closures, NMFS compared data prior to implementation of the closed areas (1997 – 1999) for various species. In all cases, the POP and HMS logbook data were used to summarize monthly U.S. PLL catches throughout the operational range of the U.S. fleet in the Atlantic Ocean, Gulf of Mexico, and Caribbean (throughout the rest of this Section, the range of the PLL fishery is considered the Atlantic Ocean, Gulf of Mexico, and the Caribbean, although all three areas may not be explicitly referenced).

Complete, finalized data from 2004 were not available for the analyses presented in the Draft HMS FMP. Once the 2004 POP and HMS logbook data became available, NMFS conducted an analysis of a subset of the HMS logbook dataset from 2001 – 2004 (first six months of 2004 only) to determine whether there were any substantial differences from the 2001

– 2003 data presented in the Draft HMS FMP. NMFS took this approach because the 2001 – 2003 data are based largely on the use of J-hooks (as are the data for the first six months of 2004 before the circle hook requirement went into effect (July 6, 2004, 69 FR 40734)) whereas the second six months of 2004 are based on circle hook data. The results of the analyses on the subset of this dataset (*i.e.*, the first half of 2004) are included in Appendix A. In general, the inclusion of the January through June 2004 data with the 2001 – 2003 HMS logbook data did not change the predicted percent change in bycatch and discards for the different closures. Therefore, the inclusion of the additional six months of data from 2004 did not substantially alter any of the data presented in the Draft HMS FMP, or result in any changes to the overall conclusions or preferred alternatives in the Draft HMS FMP. Because these analyses were based on data (*i.e.*, 2004 HMS logbook data) that became available during the public comment period, these additional analyses were not available for public comment and are not included in this section (but are included in Appendix A). Given the additional six months of 2004 did not change the results of the time/area analyses done in the Draft HMS FMP, NMFS used 2001 – 2003 HMS logbook and POP data for the analyses throughout the rest of this section, except where other years are explicitly discussed.

NMFS used a Geographic Information System (GIS) program to plot observed (POP) and reported (HMS logbook) effort and catches of all non-target HMS (white marlin, blue marlin, sailfish, spearfish, and BFT), protected species (leatherback, loggerhead, and other sea turtles comprised of green, hawksbill, and Kemp's ridley sea turtles), and retained HMS species (swordfish, BFT, yellowfin, bigeye, and all BAYS tunas combined). Data for each of the species were mapped and compared spatially to one another in order to select the areas of highest concentration of bycatch. The areas of highest concentrations of bycatch for all species were then selected for further analysis. For these analyses, estimates of discards of all target and non-target HMS are comprised of both live and dead discards. All of the areas presented in this section and Appendix A were initially selected by examining the HMS logbook and POP data from 2001 - 2003 and identifying areas and times where bycatch was concentrated. NMFS has provided maps of bycatch for individual species (Figure 4.6 through Figure 4.13). In response to a specific request, NMFS has provided a map showing the spatial overlap of BFT, white marlin, and sea turtle bycatch in appendix A (Figure A-9 in Appendix A). For the spatial overlap analysis, NMFS combined the bycatch data from the HMS logbook for BFT, white marlin, and sea turtles into one combined dataset, and then joined them to a 10 x 10 minute grid (which is equivalent to approximately 100 nm^2) to get the number of discards for all species combined per 100 nm^2. A color scale is included to show the number of observations per 100 nm^2. The map shows the areas of highest bycatch for the three species combined. Monthly interactions for the different species (*i.e.*, temporal variability) were considered in the redistribution of effort analyses and can be seen in Table 4.13 and Table 4.16.

NMFS also took into account a closure area and time period received in a petition for rulemaking and considered an additional closure to reduce BFT discards in a reported spawning area in the Gulf of Mexico (Blue Ocean Institute *et al*., 2005; Block *et al*., 2005) (see alternative B2(c) discussion below). In addition, NMFS took into account a settlement agreement relating to white marlin, which was approved by the court in Center for Biological Diversity v. NMFS, Civ. Action No. 04-0063 (D.D.C.). With regard to the settlement agreement, NMFS specifically took into account five suggested white marlin time/area closures in the U.S. EEZ described on

page 10 in a February 14, 2002, letter from the Biodiversity Legal Foundation, re: Atlantic White Marlin Critical Habitat Designation (see alternatives B2(g) – (k) in Section 2.1.2). The data used to analyze these potential closure areas include more recent data than was presented in the February 14, 2002, letter that relied on data from 1994 – 1996. All other time/area closure boundaries were selected based on the areas of highest interactions for a number of species (primarily white marlin, BFT, and leatherback and loggerhead sea turtles) (Figure 4.6 through Figure 4.12).

Following the selection of specific areas, NMFS performed spatial analyses to determine the fishing effort (number of hooks) and number of each species observed and reported caught inside each time/area closure in comparison to the rest of the Atlantic, Gulf of Mexico, and Caribbean, excluding the Northeast Distant restricted fishing area (NED). The NED data were not included in the analyses because the area was closed to commercial PLL fishing, except for a research experiment, during the period 2001 through 2003 (the years used in the analyses).

NMFS analyzed both absolute numbers of discards as well as areas of highest catch and catch per unit effort (CPUE: number of animals per 1,000 hooks) for non-target HMS and protected resources (white marlin, BFT, and sea turtles). In some cases these areas overlapped, in others, they did not (Figure 4.6, Figure 4.8, Figure 4.10, and Figure 4.11). This may be due to the fact that there are localized areas of high CPUE that may not necessarily represent the areas of highest bycatch in terms of absolute numbers. In order to avoid underestimation of bycatch reduction, in cases where the highest CPUE did not overlap with the areas of highest absolute numbers of discards, NMFS decided to further analyze the area that had the highest overall discards (in absolute terms), rather than areas with the highest CPUE. Thus, NMFS based the analyses on absolute numbers to maximize the reduction in overall number of discards. Under this approach, the projected number of discards may actually increase when redistribution of fishing effort is taken into account because high levels of effort are displaced into open areas with high CPUEs. Unlike other research on time/area closures (*e.g.*, Block *et al*., 2005), NMFS did not analyze CPUE in terms of soak hours (*i.e.*, the number of animals caught per hour of a longline set; soak time could be calculated by subtracting the time recorded when hooks were set in the water from the time recorded when hooks were pulled out of the water). Because of the variability between fishermen in reporting the soak time per set, NMFS felt the uncertainty associated with this measure was too high to accurately calculate effort in terms of soak hours (*i.e.*, was the start time recorded when the first hook went in the water or when the entire set was placed in the water? Or, similarly, was the end time recorded when the first hook was brought back onboard or when the entire set was retrieved?). Rather, NMFS used absolute numbers of catch as the most appropriate measure to assess time/area closures for bycatch reduction.

For all of the alternatives, NMFS compared monthly observed and reported catch and CPUE in each of the potential time/area closures to catch and CPUE fleet-wide, excluding the NED. Changes in bycatch and incidental catch resulting from time/area closures are thus expressed as a percentage of total U.S. Atlantic PLL catch, calculated on a monthly basis. NMFS evaluated the impacts of the closures both with and without redistribution of effort. The full redistribution of effort model assumed that fishing effort in a closure would be redistributed to all the remaining open areas. Therefore, evaluating impacts of a closure with and without redistribution of effort provides NMFS the potential range for which changes in catch could

occur as a result of the closure(s). One end of the range assumes that all fishing effort within a given closed area will be eliminated (*e.g.*, fishermen will completely stop fishing in the closed area not displace that effort into other areas for the duration of the closure). Thus, the number and percent reduction in catch of both non-target and targeted species in these analyses represents the highest possible expected reduction. This would also represent the greatest negative social and economic impact that is anticipated for the industry. The other end of the spectrum assumes that all fishing effort in a closed area is distributed to open areas (*e.g.*, fishermen will move out of the closed area but continue fishing in surrounding open areas, move their business, or sell their permits to someone near an open area). The method used to calculate the resulting catch of target and non-target species is to multiply the effort that is being redistributed due to the closure by the CPUE for each species in all remaining open areas (for a complete description of the methodology used for redistribution of effort, please see Appendix A.) This end of the continuum would be expected to provide the least amount of bycatch reduction for a given closure depending on the CPUE of each species in all remaining open areas, which often provides mixed results regarding impacts on catch and bycatch and the economic and social impacts. In reality, the actual result may lie between the results obtained from these two different scenarios. In addition, if fishermen switch to different fisheries, this in turn, may have unanticipated consequences from gear interactions with other gear types and increased exploitation of other species not caught by PLL. Predicting fishermen's behavior is difficult, especially as some factors that may determine whether to stay in the fishery, relocate, or leave the fishery are beyond NMFS' control (fuel prices, infrastructure, hurricanes, etc.). While some fishermen will continue to fish in open areas of the Atlantic and Gulf of Mexico, others may be forced to leave the fishery entirely as a result of the closure.

During the comment period on the Draft HMS FMP, a number of commenters expressed concern over the effort redistribution model. These commenters felt that PLL vessels were not mobile enough to redistribute effort uniformly and that vessels in a certain area would move to adjacent areas (*e.g.*, vessels homeported in the Gulf of Mexico would stay in the Gulf of Mexico and would not move into the mid-Atlantic bight). Thus, the commenters felt that NMFS' "random" redistribution model did not accurately reflect the reality of the fleet.

As described in the Draft HMS FMP, the fleet-wide redistribution of effort model approach was used because an analysis of the mobility of the PLL fleet, completed in 2001 as part of a remand document regarding the implementation of a vessel monitoring system (NMFS, 2001), indicated that PLL vessels generally exhibit a high degree of mobility and are as likely to fish in areas away from their homeport as they are to fish in areas immediately adjacent to their homeport. This approach is also consistent with the methods used to analyze other time/area closures for the PLL fishery (NMFS, 2000; NMFS, 2004). The 1999 closure in the Northeastern United States to reduce BFT discards considered an effort displacement model for areas immediately adjacent to the closures because it was small in geographic size and short in duration compared to other time/area closures, and it was presumed fishermen would remain in this general area to retain incidentally-caught BFT while targeting other species. In the Draft HMS FMP, a similar approach of limiting the redistribution of effort to adjacent areas (Gulf of Mexico only) was used for alternative B2(a). NMFS analyzed redistribution of effort in the Gulf of Mexico only for alternative B2(a) because it is the smallest of the three closures considered in the Gulf of Mexico and represents the most likely case in which fishermen would stay in the

Gulf of Mexico. Since there would still be open areas left to fish in the Gulf of Mexico during this period (May through November), fishermen may turn to those areas rather than move out of the Gulf of Mexico and into the Atlantic.

Due to the difficulty with predicting fishermen's behavior once a closure is implemented, NMFS cannot predict with precision where fishing effort will be displaced. As described above, the effort redistribution model multiplied the effort seen in a potential closed area by the CPUE for each species in all remaining open areas. Thus, under this scenario, fishing effort is as likely to be displaced into areas with high bycatch rates as into areas with low bycatch rates, which could potentially result in an increase in bycatch of certain species. For example, interactions with leatherback sea turtles tend to be higher in the Gulf of Mexico, whereas interactions with loggerhead sea turtles tend to be higher along the Atlantic coast. If fishing effort is redistributed from the Gulf of Mexico into the Atlantic, there may be an increase in loggerhead sea turtle interactions. Conversely, if fishing effort is redistributed from the Atlantic to the Gulf of Mexico, leatherback turtle interactions may increase. Similar positive and negative results occur with the redistribution of effort model for other species. This indicates that, as fishing effort is squeezed into smaller open areas, bycatch of one species may decrease, while bycatch of another species may increase.

While the current redistribution of effort model could be improved in the future, the model used by NMFS in this rulemaking has been successfully used by NMFS in past rulemakings and is the based on the best science currently available for the Atlantic HMS PLL fishery. The current redistribution of effort model accounts for displaced effort due to a closure, and provides quantitative estimates of changes in bycatch, discards, and retained catch as a result of a closure. Other models have been used for time/area analyses; however, in many cases, these models did not consider redistribution of fishing effort (*e.g.*, SCRS/2005/011; Block *et al.*, 2005). Those models that have investigated redistribution of effort as a result of time/area closures have been random utility models (RUMs) that have been used for the Hawaiian PLL fishery (*e.g.*, Curtis and McConnell, 2004), and a closed area model used by the New England Fishery Management Council (NEFMC) to evaluate closures for the groundfish fishery (NEFMC, 2003). Both types of models are econometric models, which predict where fishermen will reallocate effort based on maximizing revenues and/or profits. However, neither model is currently designed to be used for the HMS PLL fishery, and in order for either framework to be applicable to a time/area analysis for the Atlantic HMS PLL fishery, NMFS would have to develop a specific model for the PLL fleet based the current economics, fishing grounds, and fishing effort of the Atlantic HMS PLL fleet. Such development will take additional time and effort. An additional RUM was developed for HMS (Strand, 2004) based on 1996 data. While NMFS considered using this model, it was not used for the current analyses because it was based on very large areas that were not applicable to the current time/area closures being considered, and because the data were outdated (*i.e.*, 1996 versus 2001 – 2003). In addition, the Strand (2004) model was based on J-hook bycatch and economic data. Given the current PLL fishery regulations require circle hooks, and that the applicability of J-hook data is questionable, NMFS may want to develop a random utility model once it has circle hook bycatch and economic data. Once NMFS has complete and finalized circle hook data, NMFS may consider revising the model in the future to make it applicable to the current closed areas. In the meantime, NMFS has chosen to use the current redistribution of effort model that has been used in past rulemakings.

As noted in earlier chapters, the Office of Management and Budget (OMB) issued a directive requiring Federal Agencies to have "influential scientific information" and "highly influential scientific assessments" peer reviewed. Since NMFS decided that sections of the HMS FMP, including the time/area section, could be classified as "influential scientific information," NMFS had three independent (*i.e.*, people not involved in the drafting of the document) scientists review these sections pursuant of the OMB directive. Two of the peer reviewers were NOAA scientists and one peer reviewer was an independent scientist outside of NOAA. One of the peer reviewers (Appendix E) stated that, "The model is based on generally accepted principles in fisheries science. In general, such models rely on a set of assumptions related to static patterns of relative abundance at some temporal and spatial resolution, limited consideration of fish movements, and incomplete understanding of the effects of closure areas on redistribution of effort. Nonetheless, such models can provide useful insights for comparison of alternative management strategies. Without such a model there would be no such pragmatic way of comparing the potential closed areas. In general, it is probably safe to assume that the limitations of the model will be comparable across alternatives. Thus, the rankings of each alternative should be relatively insensitive to the assumptions." Another OMB reviewer suggested testing "other plausible assumptions" or "redistribution scenarios." The third OMB reviewer stated that, "Given the assumption of effort redistribution, it is difficult to believe that NMFS will be able to implement a time/area closure that does not have ecological impacts that counter gains. Hence, for time/area closures to be effective, assumptions on effort redistribution need to be rigorously tested…[and] reality likely lies between no effort redistribution and complete redistribution."

In response to the public comments received and to some of the comments by the OMB peer reviewers, NMFS investigated the movement of the PLL fleet from 2001 through June of 2004 to see where vessels fished in relation to their reported homeports. This mobility analysis broke the Atlantic, Caribbean and Gulf of Mexico into six distinct areas, with one area, Area 2, split along the west and east coasts of Florida (Areas 2A and 2B, respectively; Figure A.5). Using GIS, NMFS plotted vessels according to where they fished (*i.e.*, made sets) in those six different areas in relation to their reported homeport. This provided NMFS with a spatial understanding of the distance different vessels could move. Figure A.6 shows the results of this analysis. Overall, most of the movement and effort (in terms of hooks) out of the Gulf of Mexico (Areas 1 and 2A) went to Area 6, the high seas, but some other effort was also moved up along the eastern seaboard (Figure A.7). Conversely, a few vessels that fished along the eastern seaboard also moved into the Gulf of Mexico, although the movement was somewhat limited.

NMFS also investigated the physical characteristics of vessels to see if there were any differences in the vessels that reported fishing only in the Gulf of Mexico compared to vessels that reporting fishing out of the Gulf of Mexico. NMFS found no significant differences in the vessels' length ($t_{104} = 0.43$, $P = 0.35$) or vessels' horsepower ($t_{104} = 0.43$, $P = 0.66$) for vessels that fished only in the Gulf of Mexico versus those that fished out of the Gulf of Mexico (Table A.36). These results indicate that vessels that fish exclusively in the Gulf of Mexico have the physical capability (in terms of vessel size and horsepower) to fish outside of the Gulf of Mexico. Furthermore, despite the upgrading restrictions, this indicates that the vessel owners could sell their permits and/or boats to fishermen who may like to fish outside the Gulf of Mexico.

NMFS also provided maps showing where the PLL sets have occurred inside and outside the U. S. EEZ (Figure A.8a). These maps show the true extent of fishing effort by the U.S. PLL fleet whereas most of the other figures in Chapter 4 and Appendix A are focused on the U.S. EEZ. Figure A.8b shows the size of closures B2(a) and B2(c) in the Gulf of Mexico relative to the entire Gulf of Mexico and shows that the U.S. PLL fleet has been fishing within and outside the U. S. EEZ. Figure A.8c shows that PLL vessels can relocate to distant ports and fish outside of their immediate homeport region (in some cases, up to 4,000 miles) whereas movement from the Gulf of Mexico to the Mid-Atlantic Bight is only 1,500 miles (Figure A.8d).

Based on these analyses, NMFS evaluated several different scenarios of the redistribution of fishing effort model for some of the closed areas where each scenario had different assumptions regarding how fishing effort would be redistributed into open areas. NMFS evaluated different scenarios for redistribution of fishing effort for B2(a) since it was the smallest closure in the Gulf of Mexico. NMFS also evaluated different scenarios of redistribution of effort for the B2(c) based on substantive issues identified during from public comments on this alternative. Finally, NMFS also evaluated different scenarios for the redistribution of effort model for B2(b) because it was the smallest closure along the eastern seaboard. Specifically, NMFS calculated redistribution of effort only to open areas along the eastern seaboard for a closure in the Northeast [B2(b)]. NMFS also redistributed fishing effort in the open areas of the Gulf of Mexico and Area 6 for two closures in the Gulf of Mexico (B2(a) and B2(c); see Appendix A). By doing this, NMFS was able to investigate how different assumptions of redistribution of fishing effort for different size closures in different regions of the Gulf of Mexico and Atlantic would effect predictions of bycatch, discards, and retained catch.

Taken with the results from both no redistribution of effort and the full redistribution of effort model, these additional scenarios provide estimates of changes in bycatch and retained catch somewhere in-between the two base scenarios (*i.e.*, some movement is expected, and thus, some redistribution of effort is expected into a particular area (in this case, Area 6)). However, these additional scenarios assume that the same amount of effort is moved out of the Gulf of Mexico regardless of the size of the closure in the Gulf of Mexico, when in reality, larger closures may result in more movement out of the Gulf of Mexico since a smaller area in the Gulf of Mexico will be open for fishing. These scenarios also assume that fishermen do not relocate, possibly due to community ties to unloading docks, processing plants, etc. However, it should be noted that while fishermen may prefer not to disrupt ties to their communities, the available data indicate that fishermen from the Gulf of Mexico already fish outside of the Gulf of Mexico. If a large closure were implemented in the Gulf of Mexico, it is likely that additional fishermen would move their fishing locations or sell their permits rather than go out of business. However, in the future, NMFS intends to investigate the choices fishermen have made regarding previous closures (*i.e.*, did they move, sell their permits, go out of business, retain their permit but fish for something else, etc?). This type of analysis could help NMFS improve the redistribution of effort models used in the future.

Data for each of the new closures (alternatives B2(a) through (e)) were analyzed with and without redistribution of effort. Both POP and HMS logbook data were used to analyze bycatch and discards without redistribution of effort. However, only the HMS logbook data were used to

estimate bycatch with redistribution of effort because these data are collected for the entire fleet and provide an effort estimate for the entire fleet needed for redistribution calculations, whereas the POP data are only collected from a portion of the fleet. NMFS is aware that discards may be underreported in the HMS logbook data compared to the POP data. However, if there are no differences in underreporting for different species between different regions, then the relative effect of each closure on bycatch reduction for each species should be comparable across alternatives. Cramer (2000) compared dead discards from the HMS logbook and POP data. In her paper, Cramer used POP data to estimate dead discards of undersized swordfish, sailfish, white and blue marlin, and pelagic sharks from the PLL fishery operating in the U.S. Atlantic, Caribbean and Gulf of Mexico. Cramer (2000) provided the ratio of catch estimated from the POP data divided by the reported catch in the HMS logbooks. This ratio indicated the amount of underreporting for different species in a given area. Due to public comment that expressed concern over using HMS logbook data rather than POP, NMFS analyzed the ratios in Cramer (2000) to test whether underreporting varied for different species in different parts of the Atlantic, Caribbean and Gulf of Mexico. NMFS used a Kruskal-Wallis test (a non-parametric test equivalent to a parametric Analysis of Variance) to account for small sample sizes and non-normally distributed data. NMFS found that there was no difference in the ratio of estimated catch versus reported catch for undersized swordfish, sailfish, blue marlin, white marlin, or pelagic sharks (undersized swordfish: Chi-square = 3.63; *d.f.* = 5; $P = 0.60$; sailfish: Chi-square = 1.72; *d.f.* = 5; $P = 0.89$; blue marlin: Chi-square = 3.89; *d.f.* = 5; $P = 0.57$; white marlin: Chi-square = 2.97; *d.f.* = 5; $P = 0.70$; pelagic sharks: Chi-square = 4.78; *d.f.* = 5; $P = 0.44$). Therefore, there were no differences in underreporting between the POP and HMS logbooks for the above species in the Atlantic, Caribbean, or Gulf of Mexico. Based on the available information, NMFS believes HMS logbooks may underestimate the amount of bycatch, however, the relative effect of each closure for each species should be comparable across alternatives. While the data used in the Cramer (2000) study represented an earlier time period (1997 – 1998) compared to the 2001 – 2003 data used here, it gives some indication that the use of HMS logbook data over POP data should not invalidate or bias the results of the time/area analyses. NMFS will continue to investigate potential differences in reporting between HMS logbook and POP data for all discarded species as well as potential biases in reporting between geographical areas for different species.

Results of the Analyses

The No Action alternative, B1, would maintain the existing time/area closures (Figure 4.1) and would not implement any new time/area closures. These areas include the June Northeastern U.S. closure (effective June 1, 1999), the DeSoto Canyon (effective November 1, 2000), the Charleston Bump and Florida East Coast closures (effective March 1, 2001), and the Northeast Distant closed area (effective July 9, 2002, and modified July 6, 2004). The Northeast Distant area is currently a restricted fishing area with specific gear requirements (69 FR 40734, July 6, 2004). Since most of the time/area closures were implemented in 2001 or earlier, data from 2001 – 2003 provide the basis for evaluating the effectiveness of the closures. The following sections provides an overview of the effectiveness of the existing time/area closures at reducing discards and bycatch and in maintaining target catches for the entire fishery. These analyses are ongoing and additional data are collected and reviewed annually.

Data used in these analyses were taken from the HMS logbook database administered through the NMFS Southeast Region. The reported catch and discards for each species and the number of hooks set were pooled by month (Table 4.6 and Table 4.7). The monthly and annual Atlantic wide totals catch and discards were calculated for each species. A reference period of 1997 – 1999 was chosen for the initial comparisons to examine the effect of closures implemented in 2000 – 2001. The percent change from 1997 – 1999 to 2001 – 2003 in numbers kept and discarded were calculated for the domestic PLL fleet for the entire Atlantic basin (Table 4.6 and Table 4.7). Changes in the numbers of fish caught and discarded were compared to the predicted changes presented in Regulatory Amendment 1 to the 1999 FMP (NMFS, 2000). The reported distribution of hooks set by area each year was examined to evaluate trends and/or shifts in fishing effort (Table 4.8). In addition, the reported number of fish kept and discarded in the MAB and NEC was compared to the reported numbers for all other areas combined in order to evaluate the effectiveness of the June Northeastern U.S. closure (Table 4.9).

The analyses showed that the existing closures have been effective at reducing bycatch of protected species and non-target HMS and have provided positive ecological benefits. For example, the overall number of reported discards of swordfish, BFT and bigeye tunas, pelagic sharks, blue and white marlin, sailfish, and spearfish have all declined by more than 30 percent. The reported discards of blue and white marlin declined by about 50 percent and sailfish discards declined by almost 75 percent. The reported number of sea turtles caught and released declined by almost 28 percent (Table 4.6 and Table 4.7). Thus, the No Action alternative would continue to have a positive ecological impact by maintaining a low overall byctach of non-target and protected species.

The closures have had an impact on landings of target species as well. For example, from 1997 to 2003, the number of swordfish kept declined by nearly 28 percent, the number of yellowfin tuna kept declined by 23.5 percent, and the total number of BAYS kept (including yellowfin tuna) declined by 25.1 percent (Table 4.6). The reported declines (without redistribution of effort) in swordfish kept and discarded, large coastal sharks kept and discarded, and dolphins kept were similar to the predicted values developed for Regulatory Amendment 1. Reported discards of BFT, pelagic sharks, all billfish (with the exception of spearfish for which no predicted change was developed in Regulatory Amendment 1) and total BAYS kept have all declined more than the predicted values. Thus, the existing closures appear to have had a positive ecological impact on these species as well. However, such declines in landings may also have had negative economic impacts on commercial fisheries as discussed later in this section.

Overall effort in the Atlantic PLL fishery based on reported number of hooks set declined by 15 percent during the pre- to post-closure period (Table 4.8). The distribution of effort does not indicate a major shift in fishing effort as a result of the time/area closures (Table 4.8). The average number of hooks reported set in 2001 – 2003 by area was compared to the average for 1997 – 1999. Declines in effort were reported for the majority of the areas. However, fishing effort increased during the pre- to post-closure period in the Gulf of Mexico, by slightly more than eight percent (Table 4.8). This increase could be the result of a shift in effort attributable to the implementation of East Florida Coast closure area. Reported effort also increased in the Sargasso (SAR) and North Central Atlantic (NCA) statistical areas where little activity had been

reported prior to 2002. This increase could also represent a shift in effort due to implementation of the East Florida Coast closed area, and possibly the seasonal Charleston Bump closure. Effort in the South Atlantic Bight, where the Charleston Bump closure is located, declined by 30 percent from the 1997 – 1999 level. Effort in the MAB and NEC also declined, 26 and 31 percent, respectively. The June Northeastern U.S. closed area is located within these two areas.

The June Northeastern U.S. closed area (64 FR 29090, May 28, 1999) was implemented in order to decrease BFT discards in the Atlantic PLL fishery. The closure spans a portion of two statistical reporting areas, the MAB and the NEC. The reported effort, catch, and discards were combined for these two areas to evaluate the effectiveness of the closure (Table 4.9). The reported effort, catch, and discards for the remaining areas were also combined and presented.

It appears that BFT discards in the MAB and NEC have been considerably reduced since the implementation of the June closure in 1999 (Table 4.9). Reported discards of BFT prior to implementation of the closure ranged from 558 to over 2,700 per year. Since 1999, the number of BFT reported discarded has remained below 500 per year. The number of swordfish kept in the MAB and NEC has increased since the closure was implemented while the number of billfish discarded has declined.

Analysis of the change in effort and bycatch after implementation of existing closures indicates that reduction in bycatch may have been greater than predicted with redistribution of effort, and in some cases, without redistribution of effort. There are several possible explanations for the higher than predicted decline in bycatch and effort resulting from time/area closures that may have ecological impacts as well as economic repercussions on fishing behavior and the PLL fishing industry: (1) stocks may be declining; (2) time/area closures may have acted synergistically with declining stocks to produce greater declines in catch than predicted; (3) fishermen may have left the fishery; and (4) fishing effort may have been displaced into areas with lower CPUEs. With regard to the last point, the redistribution of effort model is incapable of making predictions based on a declining CPUE. Instead the model assumes a current CPUE that remains constant in the remaining open areas when estimating reductions. It is possible that one or more of these factors, or others, may have contributed to the observed decline in landings and bycatch in recent years. However, despite these declines, several species continue to be overfished with overfishing still occurring, warranting further consideration of closures or the other alternatives described in this Final HMS FMP.

In addition to B1, the No Action alternative, NMFS analyzed several new potential time/area closures. After comparing the potential bycatch reduction for all of the closures that NMFS initially considered (see Chapter 2), NMFS chose five closures with the highest overall bycatch for further analysis in addition to complementary measures in the Madison-Swanson and Steamboat Lumps Marine Reserves and BLL closures to protect smalltooth sawfish. Alternatives B2(a) and B2(b) were chosen for analysis because they had higher overall discards of white marlin, BFT, and most other species than any of the other closures. Alternative B2(c) was chosen for analysis in response to a petition received by NMFS from several conservation organizations requesting consideration of a closure of the "Gulf of Mexico bluefin spawning area" (Figure 4.2) (Blue Ocean Institute *et al*., 2005). The area analyzed was obtained directly from the petition. Alternatives B2(d) and B2(e) were chosen for analysis in order to determine if

any other closure, or combination of closures, would be more effective at reducing bycatch than the alternatives B2(a), B2(b), or B2(c). The analyses indicated that almost all of the closures and combinations of closures considered for white marlin, BFT, or sea turtles would result in a net increase in bycatch for at least some of the primary species considered when redistribution of fishing effort was taken into account (Table 4.5). In addition, the predicted reduction in bycatch when redistribution of fishing effort was taken into account was typically less than 30 percent for any given species, with overall reduction in the number of individual species being very low (Table 4.5 and Table A.1 in Appendix A).

Currently, in terms of new closures, NMFS has chosen to go forward with only the complementary measures in the Madison-Swanson and Steamboat Lumps Marine Reserves. This is due, in part, to all the available data used in the time/area analyses being based on J-hook data. A circle hook requirement for the PLL fishery went into effect on June 30, 2004, in the NED (69 FR 40734), and in all remaining areas on August 6, 2004. NMFS currently only has finalized data on the catch associated with circle hooks from July through December of 2004 (see Appendix A). Based on the NED experiment, it is expected that circle hooks likely have significantly different catch rates than J-hooks. However, since the impact of circle hooks on bycatch is uncertain for most species (except sea turtles and swordfish), further investigation is required to determine the impact of any new time/area closures. NMFS anticipates that 2005 HMS logbook data will become available in the summer of 2006, and NMFS will continue to monitor and analyze the effect of circle hooks and bycatch reduction. NMFS is also awaiting additional information regarding the status of the PLL fleet after the devastating hurricanes that occurred in the Gulf of Mexico during the fall of 2005. The number of active vessels and level of fishing effort will be assessed beginning in the summer of 2006, when the 2005 HMS logbook final data becomes available.

Alternative B2(a) would prohibit the use of PLL gear by all U.S. flagged-vessels permitted to fish for HMS in an 11,991 nm^2 area of the central Gulf of Mexico (Figure 4.2) from May through November of each year (7 months). The effectiveness of alternative B2(a), and all subsequent closure alternatives, was evaluated by determining the percent reduction in bycatch of non-target HMS, protected species, and retained species on a monthly basis with and without redistribution of effort. Without redistribution of effort, the observer program data indicate that the alternative B2(a) from May through November would potentially reduce discards (live and dead combined) of all non-target HMS and sea turtles from 4.0 percent for loggerhead sea turtles to 19.6 percent for sailfish (Table 4.4). Without redistribution of effort, the logbook data indicate that alternative B2(a) from May through November would potentially reduce discards from 3.4 percent for loggerhead sea turtles to 17.6 percent blue marlin discards (Table 4.5). Thus, the percent reductions in most bycatch species were very similar for both the observed and reported data.

Data from monthly catches and discards were examined for both a year-round closure and a seven-month closure (Table 4.4 and Table 4.5). The annual seven-month closure was selected for further analysis because the reductions in bycatch were similar to the year-round closure without redistribution of effort, except for BFT. In some cases, reductions in bycatch were higher than the year-round closure with redistribution of effort (Table 4.5). For example, white marlin discards (live and dead combined) increased 0.9 percent with redistribution of effort

for the year-round closure, as did sailfish (1.1 percent), spearfish (4 percent), and BFT discards (7.9 percent). The May through November closure, on the other hand, would reduce discards of all species except loggerhead sea turtles and BFT.

With redistribution of effort, the logbook data indicate that there would be a reduction in bycatch for some species, but an increase in others. For example, the bycatch of leatherback sea turtles would be decreased by eight percent (76 leatherback sea turtles over a three year period, or 25 per year; yearly averages can be calculated by dividing the numbers in the tables by three), whereas loggerhead sea turtle interactions would potentially increase by 7.9 percent (six loggerhead sea turtles over a three year period, or two per year) (Table 4.5), pelagic and LCS discards would increase by 14.5 percent and 11.7 percent, respectively (Table 4.10a), and BFT discards would increase by 10.3 percent (75 discards over a three year period, or 25 per year; Table 4.11a). For some of the species, the percent reduction in discards was minimal. For example, white marlin discards are predicted to decrease by only 2.7 percent. This amounts to a projected decrease of 85 white marlin over three years, or 28 white marlin per year (3,143 x 0.027 = 85) (Table 4.5 and Table 4.10a). When compared to the overall annual reported white marlin discards (1,047 annually; Table 4.10a), this reduction would provide minimal benefit. Thus, while there may be an ecological benefit for some species, such as leatherback sea turtles and blue marlin, the benefits to other species as a result of this closure are less clear.

As explained above, NMFS considered redistribution of effort in the Gulf of Mexico only for alternative B2(a) because it was the smallest closure in the Gulf of Mexico and the most likely scenario where fishermen would stay in the Gulf of Mexico while this closure was in place (*i.e.*, there would still be enough fishing areas open in the Gulf of Mexico to fish in unlike the larger closures). The result was a predicted increase in bycatch for some species and reductions in bycatch for others (Table 4.10b). Interactions with spearfish and discards of LCS, for example, could increase by 3.3 percent and 3.6 percent, respectively (Table 4.10b), whereas BFT discards could decrease by 1.2 percent (Table 4.11b). Interestingly, the catch of all targeted species, with the exception of BFT, are predicted to increase as a result of the closure (Table 4.11b). With redistribution of effort in the Gulf of Mexico and Area 6 combined, the logbook data from 2001 – 2004 indicated that there could be reductions in bycatch for some species, but increases in others. For example, bycatch could range from a 15.4 percent decrease for other sea turtles to an increase of 4.7 percent for sailfish (Table A.37). Bluefin tuna discards could increase by 1.6 percent with redistribution of effort (Table A.38). These results indicate that for alternative B2(a), even when effort was assumed to be redistributed in the Gulf of Mexico only, or in the Gulf and Area 6, there was still a potential for increased discards of certain species.

Alternative B2(b) would prohibit the use of PLL gear by all U.S. flagged-vessels permitted to fish for HMS in a 2,251 nm^2 area of the Northeast in June primarily to reduce BFT discards (Figure 4.2). NMFS decided to further analyze this area because it had a high concentration of BFT discards, with a greater number of discards than any other area in the Atlantic or the Gulf of Mexico. For example, from 2001 – 2003, there were 461 reported BFT discards in this comparatively small area, compared to 470 reported discards in the entire Gulf of Mexico (~300,000 nm^2) (Figure 4.13). Furthermore, approximately 80 percent of the discards in alternative B2(b) (365 BFT discards) occurred in the month of June only (Table 4.12). In

contrast, the majority of BFT discards in the Gulf of Mexico occurred over a three-month period from March through May and were much more randomly and broadly distributed (Table 4.13).

Additionally, alternative B2(b) had a lower number of BFT kept (34 over three years; Table 4.12) than the B2(a) closure in the Gulf of Mexico (133 over three years; Table 4.11b), which may have potential social and economic consequences for both areas, as discussed in greater detail later in this section. NMFS considered both a year-round and a June only closure, but decided not to analyze a year-round closure because the percent reductions were similar to the June only closure for most of the species considered (Table 4.5). The following information thus pertains to the June only closure.

According to observer program data, alternative B2(b) would reduce BFT discards by 15.4 percent and loggerhead sea turtles by 6.0 percent. All other non-target HMS and protected resources would experience zero-percent reductions (Table 4.4). Without redistribution of effort, the logbook data indicate that alternative B2(b) would result in a 22.6 percent decrease in BFT discards (461 BFT over 3 years, or an average of 154 per year) (Table 4.12) and an 11.2 percent decrease in loggerhead sea turtle interactions (Table 4.14). Therefore, the percent reductions predicted from HMS logbook and POP data were similar. While not large, most other species would have reductions in bycatch as predicted from the logbook data as well, ranging from a zero-percent reduction in sailfish and spearfish discards to 14.9 percent for pelagic sharks (Table 4.14). With redistribution of effort, the area would result in a 21.9 percent reduction in BFT discards (354 BFT over three years or 118 per year) (Table 4.15 and Table A.5 in Appendix A), but relatively small increases in bycatch for nearly all of the other species except leatherback (-1.3 percent; Table 4.14) and loggerhead sea turtles (-10.3 percent; Table 4.14).

Although there may be an ecological benefit for BFT and loggerhead sea turtles as a result of this closure, the benefits to other species are less clear and may, in fact, be negative. Clearly, alternative B2(b) would reduce BFT discards, but would potentially increase the bycatch of other species. This is likely the result of a lower than average CPUE for most of the other species in the area. When redistribution of effort is considered, there may be an increase in bycatch of species such as blue and white marlin, spearfish, sailfish, and LCS.

As explained above, NMFS considered redistribution of effort in the Atlantic only for alternative B2(b) given its small size and temporal duration (as opposed to redistribution of effort in all areas of the Atlantic and Gulf of Mexico). The result was a predicted slight increase in bycatch for some species and slight reductions in bycatch for others. Interactions with leatherback and loggerhead sea turtles could decrease by 0.8 percent and 5.9 percent, respectively, whereas blue and white marlin discards could increase by 0.9 and 2.0 percent, respectively (Table A.39). However, BFT discards could decrease by 15.1 percent resulting in 333 fewer discards over three years or 111 fewer per year (Table A.40).

Alternative B2(c) would prohibit the use of PLL gear by all U.S. flagged-vessels permitted to fish for HMS in a 101,670 nm^2 area in the Gulf of Mexico from April through June (three months) each year (Figure 4.2). According to observer program data, without redistribution of effort alternative B2(c) would reduce discards of all non-target HMS and protected resources from a minimum of 2.3 percent for spearfish to a maximum of 25.0 percent

for other sea turtles (Table 4.4). Without redistribution of effort, the logbook data indicate that alternative B2(c) would potentially reduce discards of all of the species being considered from a minimum of 0.8 percent for pelagic sharks to a maximum 21.5 percent for BFT (Table 4.5 and Table 4.16). With redistribution of effort, however, bycatch is predicted to increase for all species except leatherback and other sea turtles (Table 4.16). Even BFT discards, which showed a fairly dramatic decline without redistribution of effort, are predicted to increase by 9.8 percent with redistribution of effort (for an overall increase of 158 BFT over three years or an average increase of 53 per year) (Table 4.13 and Table A.5 in Appendix A). The apparent increase in predicted BFT discards with redistribution of effort is likely due to the fact that BFT are caught in months other than April through June in the Gulf of Mexico, as well as the high number of BFT discards in other areas, as described in alternative B2(b) above. However, it must be noted that the increase of BFT discards in other areas outside of the Gulf of Mexico are most likely discards of non-spawning BFT such as non-spawning adults, juveniles, and sub-adults. Therefore, there is not necessarily a 1-to-1 equivalency between benefits to individual spawning BFT in the Gulf of Mexico and individual non-spawning BFT outside of the Gulf of Mexico. However, increasing the number of discards of BFT in areas outside the Gulf of Mexico could still be detrimental to the stock. Bluefin tuna kept (landed), on the other hand, would be reduced by 18.3 percent (a decrease of 110 BFT kept over three years, or an average of 37 per year), indicating that the Gulf of Mexico has a high number of BFT landed in addition to BFT discards (Table 4.13 and Table A.5 in Appendix A). As with the alternatives described above, with redistribution of effort, there may be an ecological benefit to some species, but negative impacts on others. For example, LCS discards are predicted to increase 25.9 percent and loggerhead sea turtles by 23.5 percent under this alternative Table 4.16.

NMFS also performed a second scenario of the redistribution of effort analysis where effort was redistributed to open areas of the Gulf of Mexico and Area 6 of the Atlantic only (see Figure A.5 in Appendix A). The results of this analysis indicated a potential reduction in bycatch for white marlin, leatherback and other sea turtles, and pelagic shark discards, bluefin discards, yellowfin discards, and BAYS tuna discards, with the largest being for BFT (19.3 percent decrease over 3 ½ years or ~ 122 discards per year) (Tables A.41 and A.42, Appendix A). However, the analysis also predicted an increase in bycatch of blue marlin, sailfish, spearfish and large coastal sharks (Table A.41 in Appendix A). The largest expected increase would be for LCS of 12.8 percent or 2,454 LSC over 3 ½ years. Interestingly, the analysis suggested that this closure could result in an increase in the amount of swordfish kept. This is expected to be from more fishermen utilizing the area around the Desoto Canyon closure, since effort in the western portion of the Gulf of Mexico would be squeezed into the eastern portion of the Gulf of Mexico where swordfish catch rates are higher. However, it is unknown how realistic this result is; if increased effort in the eastern portions of the Gulf of Mexico could occur, more fishermen may leave the Gulf of Mexico to fish in Area 6 due to overcrowding in the Gulf of Mexico.

According to the full redistribution of effort model, the petition to close 101,670 nm^2 in the Gulf of Mexico from April through June each year (alternative B2(c)) was predicted to decrease the number of BFT kept by an average of 37 fish per year and is predicted to increase the number of BFT discards by an average of 53 fish per year (Table A.5 in Appendix A). Alternative B2(b), on the other hand, would close 2,251 nm^2 in the Northeast for the month of

June only, and would potentially reduce the number of BFT discards by 118 per year (Table A.5 in Appendix A). Although alternative B2(b) is not considered a BFT spawning area, data from the observer program indicate that large fish (>171 cm TL) are present in the area (2001 – 2003 POP data). Additionally, there is evidence to indicate that the area is utilized as a feeding and staging area by BFT prior to migrating to the Gulf of Mexico to spawn (Block *et al*., 2005). Pop-up satellite tags on BFT tagged in feeding areas of the Northeast show fairly rapid (~ one month) migrations from the Northeast to the Gulf of Mexico (Block *et al*., 2005). Hence, while NMFS recognizes that the same proportion of western spawning BFT would not be protected from a closure in the Northeast as one in the Gulf of Mexico, potentially a small proportion of western spawning-size BFT could be protected by a closure like B2(b), especially given the prevalence of larger individuals in Northeast area from the POP data. Therefore, a closure like B2(b) may be able to protect a few spawning-size individuals as well as pre-spawners, or sub-adults, which are also valuable age classes with regard to the stock (although, presumably, there is a mixture of eastern and western origin fish in this area, and a closure in this area may protect sub-adults of western as well as eastern origin). Furthermore, the total proportion of dead discards in the Northeast was similar to the Gulf of Mexico. In the Northeast, 48 percent (219 out of 461) of all BFT discards from 2001 – 2003 were discarded dead, whereas 53 percent (249 out of 470) of all BFT discards from the Gulf of Mexico were discarded dead (as reported in the 2001 – 2003 HMS Logbook). Given the high number of discards in the Northeast, a closure there may provide similar ecological benefits compared to a closure in the Gulf of Mexico (depending on post-release survival in the two areas). In addition, a small closure in the Northeast would minimize the economic impacts when compared to a closure of 101,670 nm^2 in the Gulf of Mexico, as discussed in more detail later in this section.

Alternative B2(d) would prohibit the use of PLL gear by all U.S. flagged-vessels permitted to fish for HMS in a 162,181 nm^2 area in the Gulf of Mexico west of 86 degrees W. Long. year-round (Figure 4.2), thus closing an area where approximately 50 percent of all domestic effort (Atlantic, Gulf of Mexico, and Caribbean) and 90 percent of all domestic effort in the Gulf of Mexico has been reported in recent years (2001 – 2003). According to observer program data, alternative B2(d) would have the greatest positive ecological impact of all the alternatives considered (Table 4.4). It would potentially reduce discards (live and dead combined) of all non-target HMS and protected resources by a minimum of 14 percent for loggerhead sea turtles to a maximum of 75 percent for other sea turtles (Table 4.4). Similarly, the logbook data without the redistribution of effort indicated that there could be large reductions in all non-target HMS, ranging from a 10.1 percent reduction in loggerheads to 83.5 percent reduction in spearfish discards (Table 4.5 and Table 4.17).

With redistribution of effort, alternative B2(d) is predicted to reduce discards of blue marlin, sailfish, spearfish, and leatherback sea turtles, but increase discards of white marlin, BFT, pelagic sharks, LCS, and loggerhead sea turtles (Table 4.5, Table 4.17, and Table 4.18). Loggerhead sea turtles, in particular, would be of great concern since interactions could potentially increase by 65.5 percent (117 over three years, or an average of 39 per year; Table A.1 in Appendix A). BFT discards could increase by 38 percent (614 over three years or 205 per year; Table A.5 in Appendix A), and pelagic shark discards could increase by 88 percent (30,194 over three years, or an average of 10,064 per year; Table 4.17). The reason for the dramatic increase in discards for some species with redistribution of effort is that these species are more

commonly encountered in the Atlantic than the Gulf of Mexico. With nearly 50 percent of overall effort predicted to redistribute into open areas of the Atlantic, the discards of these species would likely increase. Given approximately 90 percent of the fishing effort in the Gulf of Mexico has in recent years occurred in this area, if this closure were implemented, very few areas would be left open for fishing in the Gulf of Mexico. As a result, in order to stay in business, fishermen would likely have to move out of the Gulf of Mexico. Fishermen might also sell their permits to fishermen outside of the Gulf, resulting in a further increase in fishing effort in open areas. For an example of the impact of redistribution of effort, see Table A.28 in Appendix A. Since a majority of leatherback sea turtles interactions occur in the Gulf of Mexico, and a majority of loggerhead interactions occur in the Atlantic, closing an area of this size in the Gulf of Mexico could potentially redistribute effort to areas of the Atlantic where loggerhead interactions are higher.

Alternative B2(e) would prohibit the use of PLL gear by all U.S. flagged-vessels permitted to fish for HMS in a 46,956 nm^2 area in the Northeast year-round (Figure 4.2). The area was primarily considered to reduce loggerhead sea turtle interactions, which occur with greater frequency there than in nearly all other areas. Without redistribution of effort, the closure is predicted to decrease bycatch and discards of all non-target HMS and protected species by a minimum of 0.3 percent for spearfish, to a maximum of 40.7 percent for BFT discards (Table 4.5, Table 4.19, and Table 4.20). However, with redistribution of effort, bycatch of all species except pelagic sharks, BFT, leatherback, and loggerhead sea turtles, is predicted to increase (Table 4.19).

Given the mixed results for some of the species in each of the alternatives analyzed individually above, NMFS considered combining alternatives B2(a) and B2(b), as well as alternatives B2(d) and B2(e) to maximize bycatch reduction. Combining these areas could potentially reduce the number of discards beyond what could be achieved by a single closure. For alternatives B2(a) and B2(b), NMFS considered both a year-round closure and a closure during the months of May through November for alternative B2(a), combined with a closure during June only for alternative B2(b), similar to the individual closures described previously. For alternatives B2(d) and B2(e), NMFS considered a year-round closure only. It should be noted that percent reduction in discards and retained catch without redistribution of effort for the combination of closures is simply the addition of percent reduction without redistribution of effort for the individual closures (Table 4.5 and Table 4.15). Therefore, only a discussion of predicted impacts of combinations of closures with redistribution of effort is included below.

With redistribution of effort, combining alternatives B2(a) and B2(b) year-round would increase discards of most species except BFT and sea turtles (Table 4.5 and Table 4.21). Thus, a year-round closure of both of these areas could have a positive ecological impact on BFT and all sea turtle species, but a negative impact on blue and white marlin, sailfish, spearfish, pelagic sharks, and LCS. Combining alternatives B2(a) and B2(b) on a seasonal basis from May through November for B2(a) and June only for B2(b), as described above, would result in reductions in discards of all species except sailfish (which would increase 1.5 percent, or 15 over three years), pelagic sharks (which would increase 9.6 percent or 3,276 over three years), LCS (which would increase 10.1 percent or 1,680 over three years), and other sea turtles (which would increase 7.1 percent or one sea turtle over three years) (Table 4.21 and Table 4.22). The net ecological

benefit of combining the closures with redistribution of effort would be an 8.4 percent decline in leatherback sea turtle interactions (~41 leatherback sea turtles from 2001 – 2003, or 14 per year), a 3.1 percent decline in loggerhead interactions (~ six loggerheads from 2001 – 2003, or two per year), a 13.6 percent decline in BFT discards (~220 BFT from 2001 – 2003, or 73 per year), a 1.7 percent decline in white marlin discards (~53 white marlin from 2001 – 2003, or 18 per year), and a 6.7 percent decline in blue marlin discards (~164 blue marlin from 2001 – 2003, or an average of 55 per year) (Table 4.21 and Table 4.22). Thus, the overall benefit would be greater for a seasonal closure than a year-round closure. In particular, the seasonal closure would potentially decrease leatherback and loggerhead sea turtle interactions, BFT discards, and blue and white marlin discards. However, the overall reduction in bycatch for most species was relatively low when combining closures, resulting in some ecological benefit to most species. Although discards of some species may decline with combined seasonal closures of alternatives B2(a) and B2(b), the positive ecological impacts would be offset by an increase in discards of other species. In addition, NMFS must also consider the social and economic impacts of such combination of closures (see discussion below).

With redistribution of effort, combining alternative B2(d) and B2(e) year-round would increase discards of white marlin, spearfish, pelagic sharks, LCS, and loggerhead sea turtles (Table 4.5 and Table 4.23). Discards of pelagic sharks and LCS, in particular, are predicted to increase by 65 percent and 102 percent, respectively, because these species are discarded at much higher rates in the Atlantic than in the Gulf of Mexico. Redistributing a large amount of effort from the Gulf of Mexico into the Atlantic would thus increase discards of these and other species. The only species for which there would be a substantial positive benefit would be BFT and leatherback sea turtles; 35.2 fewer dead discards of BFT are predicted, and leatherback sea turtle interactions would decrease by 30.2 percent over three years or an average of 50 fewer interactions per year (Table 4.5, Table 4.15, Table 4.23, and Table 4.24).

In addition to proposing new closed areas, NMFS initially considered modifying current or existing time/area closures (alternatives B3(a) and B3(b); see Section 2.1.2). In general, closed areas considered for modification (*i.e.*, partial re-opening) were chosen based on examining the HMS logbook and POP data from 1997 through 1999. The data were analyzed in GIS, allowing NMFS to identify areas associated with minimal bycatch within current time/area closures for re-opening (*e.g.*, Figure 4.3, Figure 4.14, and Figure 4.15). The overall goal was to modify existing areas, if possible, using the latest analysis techniques and technology available to NMFS, while minimizing bycatch and maximizing catch of retained species. This is especially pertinent for target species such as swordfish, where the United States is currently not fully utilizing its swordfish quota. In addition, due to the natural variability of many of the HMS fisheries, it may be necessary to change or refine the boundaries of time/area closures over time to reduce bycatch of non-target species.

Given that fishing effort and landings have declined in recent years, NMFS considered modifying existing closures to increase the opportunity to harvest the swordfish quota (Figure 4.3). In addition, if new time/area closures were to be implemented, then NMFS wanted to consider possible ways to offset those additional economic impacts by lifting restrictions in areas that had minimal bycatch. Originally four modifications to existing time/area closures were considered: B3(a) (the Charleston Bump), B3(b) (the Northeastern United States (NEC)), B3(c)

(the Florida East Coast (FEC)), and B3(d) (DeSoto Canyon) (Figure A.2 in Appendix A). However, only alternatives B3(a) and B3(b) were further analyzed because they minimized bycatch while maximizing retained catch when compared to the other two alternatives (see Chapter 2 and Tables A.22 through A.27 in Appendix A). For each modification further analyzed, NMFS considered the bycatch and retained species catch that would be affected by re-opening a portion of a current closure (Table 4.25 through Table 4.30). In addition, NMFS considered the size of swordfish caught in the portions that would remain closed to the size of swordfish in the areas that were considered for reopening (Table 4.31).

Alternative B3(a) would modify the Charleston Bump time/area closure boundary to include only those areas shoreward of the axis of the Gulf Stream. The remaining areas seaward of the axis of the Gulf Stream would be reopened from February 1 through April 30. The B3(a) modification area (*i.e.*, the hatched area in Figure 4.3) was chosen because a minimal increase in bycatch would be expected with the 0.5 percent predicted increase in fishing effort associated with this re-opening, based on 1997 – 1999 logbook data and fishing practices from that time. For instance, the largest increase in discards would be for blue marlin (0.7 percent; Table 4.25) whereas no increase is predicted for interactions for leatherback or other sea turtles (Table 4.25). In addition, there was minimal increase in retained catch associated with modifying the Charleston Bump. There was a predicted increase in swordfish catches of 1.1 percent and yellowfin tuna catches of 0.16 percent (Table 4.27). The majority of the bycatch from 1997 – 1999 occurred in the portion that would remain closed (*i.e.*, the shaded area of Figure 4.14 and Figure 4.15; Table 4.25). For instance, the highest increase in bycatch would be expected for sailfish (3.0 percent), spearfish (2.4 percent), and white marlin (2.0 percent) (Table 4.25). On average, the area considered for re-opening in B3(a) would have an increase in bycatch of 0.5 percent whereas the predicted average bycatch associated with the area that would remain closed was 2.7 percent (Table 4.25). Thus, by using refined GIS maps (see Figure 4.14 and Figure 4.15) that were not available to NMFS when the time/area closures were first implemented, NMFS is now able to identify and refine areas of higher bycatch within current time/area closures.

As described above, NMFS considered re-opening existing closures in conjunction with new time/area closures (Table 4.5). Such combinations would help balance social and economic impacts of additional closures, while mitigating any potential negative ecological impacts of opening or modifying existing time/area closures. Year-round closures of B2(a) and B2(b) in combination with the B3(a) modification would potentially result in increases of bycatch of all species considered except sea turtles and BFT. Leatherback sea turtles interactions and BFT discards would decline by slightly more than 20 percent (Table 4.5). However, seasonal closures of the B2(a)/B2(b) in conjunction with the B3(a) modification would result in a decrease, albeit small (on average, 5.5 percent), in bycatch of all species considered except sailfish (Table 4.5). This could result in small, but net positive ecological impacts. Similarly, NMFS considered B3(a) in conjunction with the B2(d)/B2(e) year-round closure. This combination could result in decreases of discards for blue marlin, sailfish, spearfish, leatherback sea turtles and BFT (Table 4.5). However, it could also result in increases of discards for white marlin, and loggerhead sea turtles (Table 4.5). Therefore, the ecological effects of such a combination would be variable.

Alternative B3(b) would modify the existing Northeastern U. S. closed area to allow the use of PLL gear in areas west of 72º 47’ W Longitude during the month of June. This area was

mainly considered as a way to refine the Northeastern U. S. closed area and re-open areas where there were few swordfish or BFT discards (Figure 4.14 through Figure 4.16; Table 4.28). Based on fishing effort from 1997 – 1999 before the closures went into effect (taken from logbook data from 1997 – 1999), there could be an estimated 0.2 percent increase in fishing effort associated with this modification. However, this modification could result in additional fishing effort given management actions that have taken place since 2000 (*i.e.*, time/area closure put into place in 2000). While there is a predicted minimal increase in retained catch, there would be virtually no increase in bycatch associated with this modification (Table 4.26 and Table 4.28). For example, there is only one predicted BFT discard associated with this modification (Table 4.28). Discards of sailfish and sea turtles are not predicted to increase. Thus, such a modification would have minimal to no ecological impact.

Since the bycatch associated with B3(b) was essentially zero (Table 4.5 and Table 4.26), combinations of this modification with any time/area closure would mirror the benefits in bycatch reduction associated with the particular time/area closure. For instance, seasonal closures of B2(a)/B2(b) in conjunction with the B3(b) modification could result in small decreases (on average, six percent), in bycatch of all species considered except sailfish (Table 4.5). This could result in a small, but net positive ecological impact. NMFS also considered a combination of B3(b) with year-round closures of B2(a)/B2(b). However, this combination resulted in a higher number of discards (with the exception of sea turtles and BFT) than the combination with seasonal closures (Table 4.5). When B3(b) was considered in conjunction with the B2(d)/B2(e) closure, there could be increases in bycatch for white marlin, spearfish, and loggerhead sea turtles (Table 4.5). Decreases in bycatch could be seen for blue marlin, sailfish, leatherback sea turtles, and BFT. So, as with the B2(d)/B2(e) closure, this modification in combination with this closure could have variable ecological effects.

As described in Chapter 2, alternative B4 would implement year-round complementary HMS management measures in the Madison-Swanson and Steamboat Lumps Marine Reserves, consistent with the recommendations of the Gulf of Mexico Fishery Management Council (GMFMC) (Figure 4.4). Specifically, this alternative would prohibit all HMS-permitted vessels from fishing or deploying any fishing gear in the marine reserves from November through April. From May through October, surface trolling would be the only HMS fishing activity allowed. Surface trolling is defined as fishing with lines trailing behind a vessel that is in constant motion, at speeds in excess of four knots, and with a visible wake (in accordance with the Southeast regional regulations, 622.34(k)(5), NMFS is adopting the same definition for surface trolling in the final rule associated with this document). Such surface trolling may not involve the use of down riggers, wire lines, planers, or similar devices. The two marine reserves are located shoreward of the Desoto Canyon Closed Area (see Section 2.1.2).

At a July 14 – 17, 2003, meeting, the Gulf Council approved a six-year extension of these two marine reserves, originally implemented in 2000, to protect spawning aggregations of gag grouper. An Environmental Assessment (EA) describing the ecologic, economic, and social impacts associated with the marine reserves was prepared and submitted to the Secretary in August 2003. On September 3, 2003, NMFS received a formal request from the Gulf Council for the Secretary to implement "compatible" regulations for HMS fisheries in these two areas. The final rule, effecting non-HMS fishing activities, published in the Federal Register on May 4,

2004 (69 FR 24532), and became effective on June 3, 2004. It will expire on June 16, 2010. The complementary HMS management measures described above in alternative B4 would similarly expire on June 16, 2010.

The purpose of this alternative is to implement compatible HMS regulations in the Madison-Swanson and Steamboat Lumps Marine Reserves to provide, as described in the EA prepared by the GMFMC (August 2003), protection for spawning aggregations of gag grouper to prevent overfishing, improve spawning success, protect a portion of the offshore population of male gag grouper, and facilitate continued evaluation of the effect and usefulness of marine reserves as a fishery management tool. These two marine reserves were originally implemented in 2000 by the Gulf Council (for Gulf species) in response to a determination by NMFS that gag grouper were experiencing overfishing and scientific information indicating that the proportion of male gag had declined substantially since the 1970s. A four-year timeframe for the reserves was initially established in 2000, so that their effects could be evaluated before deciding whether to continue with the marine reserves. In 2002, NMFS reclassified gag grouper as neither overfished, nor undergoing overfishing. However, the stock was not at optimum yield. Therefore, the Gulf Council voted to extend the marine reserves an additional six years, for a total of ten years, and to request compatible HMS management measures. This alternative would significantly reinforce the protections afforded gag grouper and other Gulf reef species by closing a potential loophole whereby vessels can currently fish for HMS in the marine reserves. Closing this loophole should provide a better opportunity to evaluate the effectiveness of the marine reserves as a fishery management tool.

As described in the EA (GMFMC, 2003), anticipated conservation benefits of the marine reserves include the protection of seasonal spawning aggregations of gag grouper, and the year-round protection of a portion of the male gag grouper population. Other reef species that may also benefit from the marine reserves include red grouper, snowy grouper, red snapper, silk snapper, vermillion snapper, scamp, speckled hind, red porgy, knobbed porgy, triggerfish, greater amberjack, honeycomb moray, and bank sea bass. A complete description of the ecological benefits for Gulf reef fish is provided in the EA (GMFMC, August 2003) and is not repeated here. Although this alternative is not specifically intended to provide protection for HMS, it could provide some minor ancillary conservation benefits for HMS as a result of the year-round prohibition on HMS fishing activities in the reserves (except for surface trolling from May through October). Any positive ecological impacts on HMS are expected to be minimal because there has been little reported or observed HMS fishing effort in the area in recent years; however, such complementary management measures would help prevent future potential increases in fishing efforts, thus offering protection to the gag grouper spawning aggregations until 2010. From 1997 to 2003, only one PLL set and one bottom longline set were reported in the HMS logbook in these areas. Both sets occurred in the Madison-Swanson site. Four swordfish were kept on the PLL set, and eight swordfish were discarded. There were no reported HMS caught on the bottom longline set, and there were no new PLL or bottom longline sets recorded in 2004. One bottom longline vessel carried an observer onboard in the Madison-Swanson site. The observed set occurred in 1996 and kept eight sandbar sharks (CSFOP data). No new sets were recorded for the CSFOP in 2004. In summary, NMFS anticipates positive ecological benefits for gag grouper and other Gulf reef species. Any conservation benefits for HMS, however, are expected to be minor for several reasons, but are expected to enhance the

protection for spawning gag grouper aggregations. Because the closure areas are relatively small, any HMS fishing activity that otherwise would have occurred in these areas would likely relocate to nearby open areas with similar catch rates. Furthermore, because possession of Gulf reef species is already prohibited within the areas (except when transiting), bottom longline sets targeting both sharks and Gulf reef species have already likely decreased since initial implementation of the reserves in 2000. Finally, recreational and charter/headboat fishing trips for HMS in the marine reserves are not likely to be significantly curtailed due to the allowance for surface trolling from May through October, which are the prime fishing months.

Preferred alternative B5 would establish criteria for regulatory framework adjustments to implement new time/area closures or make modifications to existing time/area closures. These adjustments would allow NMFS would to implement and/or modify time/area closures through proposed and final rulemaking through a framework action rather than adjusting the HMS FMP amendment. The criteria would provide a more definitive process for the establishment or modification of time/area closures while allowing for greater transparency and predictability in the decision making process. Criteria that would be considered may include, but are not limited to, the following: any ESA-related issues, concerns, or requirements including applicable Biological Opinions; bycatch rates of protected species, prohibited HMS, or non-target species both within the specified or potential closure area (s) and throughout the fishery; bycatch rates and post-release mortality rates of bycatch species associated with different gear types; applicable research; new or updated landings; bycatch and fishing effort data; social and economic impacts; and the practicability of implementing new or modified closures, including consistency with the FMP, Magnuson-Stevens Act, ATCA, and other applicable law. If the species is an ICCAT managed species, NMFS would need to determine the overall effect of the United States' catch on that species before implementing time/area closures. In these cases, other factors that NMFS would consider before implementing time/area closures include, but are not limited to, gear types and the location and timing of a closed area. NMFS would attempt to balance the ecological benefits with economic and social impacts. NMFS would also consider alternatives to closed areas, such as reducing quotas, mandatory gear modifications, or alternative fishing practices such as designated fishing days. Thus, before the implementation of a time/area closure, NMFS would determine that such a closure would be the best option for a given set of management goals, consistent with the FMP, the Magnuson-Stevens Act, and applicable law.

Ultimately, the criteria are aimed to develop smaller, more focused time/area closures that maximize bycatch reduction and catch of retained species. While new time/area closures or modifications to current closures may have ecological, social, and economic impacts, the criteria themselves would not be expected to have positive ecological impacts and minimal, to the extent practicable, economic and social impacts.

The primary goals of time/area closures are to maximize the reduction of bycatch or non-target and protected species while minimizing the reduction in the catch of target species. However, closures are not the only means of addressing bycatch and in some cases may increase bycatch (see Table 4.5). Bycatch in and of itself would not necessitate implementation of a time/area closure. However, if the HMS stock was either overfished and/or experiencing overfishing; the bycatch is a prohibited, threatened or endangered species; no other option exists

to reduce interactions in the time period required; and analyses indicate that an appropriate time/area could be designed that would not significantly increase bycatch of other species, then NMFS may consider a time/area closure. In such cases, NMFS could include time/area closures as part of a rebuilding plan for overfished species and/or serve as a method for decreasing interactions with protected species.

If the public believes that modification to an existing time/area closure or the establishment of a new time/area closure is warranted based on these criteria, they can submit a petition for rulemaking to NMFS. A petition for rulemaking should contain sufficient information for NMFS to consider the substance of the petition. For a petition regarding a new time/area closure or a change or modification to an existing time/area closure, pursuant to 5 U.S.C. § 553(e), the petition should, at a minimum:

- Indicate the area that should be considered as a time/area closure or the current time/area closure that should be modified
- Identify which criteria warrant the addition or modification of a time/area closure
- Provide data, information, etc., relevant to those identified criteria
- State the resources necessary to develop the proposed regulations
- Explain the interest of the petitioner in the action requested
- Indicate the size of the population affected (*i.e.*, who is affected by the action)
- Indicate the public interest in the proposed regulation
- Explain the importance of the action requested to promoting NMFS' established priorities and policies.

During the comment period, NMFS heard from commenters and the peer reviewers that the Agency should design a "decision matrix" that could help to guide the choices that NMFS would have to make between different closures and different species. This request is interpreted to mean that NMFS should decide whether, for example, it is more important to protect spawning BFT during particular times and areas than leatherback sea turtles. If NMFS decided that were the case, then an area would be closed to protect spawning BFT even though it could potentially increase takes of leatherback sea turtles. Related to this idea of a decision matrix, some commenters noted that NMFS should set bycatch reduction goals. For example, NMFS would need to reduce BFT discards by some set percent; under this concept, NMFS would need to find ways to reduce BFT discards by the appropriate percent, possibly to the detriment of other species. Once that percent reduction was made, NMFS would no longer need to reduce BFT discards. Similarly, if NMFS implements measures that reduce BFT discards by more than the decided amount, NMFS could potentially relax some of the measures to bring the reduction down to the pre-decided level. Finally, NMFS received comments from commercial interests indicating that the bycatch reduction goals of the existing closures have already been met and, therefore, the Agency should reopen at least portions of the current closures.

During the rulemaking process that implemented the East Florida Coast, the DeSoto Canyon, and the Charleston Bump closures, NMFS heard similar comments from all interested

parties (commercial, recreational, and environmental) that the Agency should establish bycatch reduction goals for all species. At that time, NMFS did not establish such goals, and stated that establishing pre-determined target reduction goals for specific species is inappropriate because it does not consider the impact on the remaining portion of the catch. This statement remains valid. While not a formalized decision matrix, NMFS used the analyses in the time/area closure section, which considered all species, to evaluate the effects of the potential time/area closures, including all species for a combination of closures. NMFS used the results of the analyses to guide the Agency in determining which management measures are appropriate at this time. NMFS, however, cannot place more value on one species over another species and believes that setting pre-determined or pre-set reduction goals in bycatch and/or discards will compromise NMFS' ability to consider multiple species. Consideration of the overall catch is critical when implementing a multispecies or ecosystem-based approach to management. Furthermore, while the Magnuson-Stevens Act provides NMFS the authority to manage all species, NMFS must balance the impacts of management measures on all managed species and my choose protections for one species to the detriment of protected or overfished species (*e.g.*, choosing to protect BFT even if sea turtle interactions may increase substantially). National Standard 1, which requires NMFS to prevent overfishing while achieving on a continuing basis, the optimum yield from each fishery for the United States fishing industry, clearly applies to all species and all fisheries. Similarly, National Standard 9, which requires NMFS to minimize bycatch and bycatch mortality to the extent practicable, applies to all species and fisheries. By not choosing a specific threshold or establishing a decision matrix, NMFS retains the flexibility to balance the needs of all the species encountered and the fishery as a whole. If NMFS is given a specific goal (*e.g.*, a jeopardy conclusion regarding the PLL fishery and leatherback sea turtles), this flexibility allows NMFS to close certain areas or take other actions to protect that specific species while also protecting, to the extent practicable, the other species and the rest of the fishery. Absent this flexibility, NMFS might potentially have to implement more restrictive measures to protect one species causing potential cascade effects (*e.g.*, closing one area may increase the bycatch of another species which could result in closing another area, etc.). This approach also provides NMFS with the flexibility to re-examine the need for existing closures and modify them appropriately based on the analyses rather than the attainment of a specific goal (*e.g.*, NMFS would not have to wait for 30 percent to be met; it could open the closure at 25 percent, depending on the result of reducing bycatch of other species or other consideration, as appropriate). This does not preclude NMFS from considering the establishment of a more formalized decision matrix in the future if such a matrix could be designed that would provide for the flexibility to consider all the species involved. This may be more appropriate when NMFS has a longer temporal dataset on the simultaneous effect of circle hooks and the current time/closures. At this time, NMFS believes that the criteria contained in the preferred alternative B5 provides the guidance needed, consistent with the Magnuson-Stevens Act and this FMP, to help NMFS make the appropriate decisions regarding the use of time/area closures in HMS fisheries.

Alternative B6 would prohibit the use of all bottom longline gear targeting HMS in an area southwest of Key West to protect endangered smalltooth sawfish (Figure 4.5). Smalltooth sawfish were listed under the ESA in 2001, but critical habitat has not yet been designated. NMFS has assembled a Smalltooth Sawfish Recovery Team (SSRT) comprised of researchers, managers, and representatives from constituent groups to develop a recovery plan for the U.S.

population of smalltooth sawfish. Once a plan is completed, NMFS may consider time/area closures to reduce sawfish interactions. Preliminary analysis of some of the SSRT data (Burgess, unpublished data) documented approximately 178 smalltooth sawfish interactions, mainly in state and Federal waters off the state of Florida, between 1990 and 2004. Of the 178, three (1.7 percent) were caught on hook and line, five (2.8 percent) were caught in shrimp trawl gear, and three were observed while people were swimming. All other interactions (167 out of 178 or 94 percent) occurred with shark bottom longline gear. The data represents a comprehensive data set that the SSRT has accumulated over time; however, it is preliminary and anecdotal in nature and will be formally analyzed by the SSRT. Therefore, NMFS focused on smalltooth sawfish interactions from the CSFOP, Gillnet, and POP, which represents more recent and well-documented data. In addition, most interactions with smalltooth sawfish have occurred with bottom longline gear. From 1994 – 2006, these combined observer programs only documented one interaction of smalltooth sawfish with gillnet gear in 2003 off the southeast coast of Florida, and only one smalltooth sawfish interaction was documented in the POP, which occurred during a bottom longline set. Therefore, since smalltooth sawfish seem to be much more susceptible to bottom longline gear, only bottom longline would be prohibited in this closure.

The interactions with smalltooth sawfish from 1994 to 2006 during the CSFOP are shown in Figure 4.5 (these interactions were specific to observed interactions from the CSFOP and bottom longline gear unlike the SSRT data). A total of 12 smalltooth sawfish were observed on bottom longline gear (out of 1,563 total observed sets) from South Carolina to the west coast of Florida. Given how widely dispersed and few in number the interactions with smalltooth sawfish were, NMFS tried to choose the smallest area possible that would encompass the highest number of interactions. The result was a 49 nm^2 area off the southwest tip of the Key West (Figure 4.5). This area encompasses 18 of the 1,563 total observed sets and is where five of the 12 smalltooth sawfish were observed caught with bottom longline gear from 1994 to 2006.

While this area is small compared to the other closures being considered for other species and could have a positive ecological impact percentage-wise (*i.e.*, upwards of 42 percent or five out of 12 observed interactions), it still translates into five individuals. In addition, this high percentage of bycatch reduction would depend on whether sawfish occur regularly in the area or whether the high number of interactions observed during 1997 was an anomaly. There have been no observed interactions in the area since 1997 (*i.e.*, nine years), and only a total of seven observed interactions occurred since 1997 through 2006 in different areas (1 in 1999, 1 in 2002, 1 in 2003, 2 in 2005 and 2 in 2006; Figure 4.17). Of the five observed sawfish interactions that occurred in this area on BLL gear, four were on a single set, highlighting the episodic nature of sawfish interactions. Additionally, 11 of 12 sawfish were released alive, and one was released in unknown condition. The one sawfish observed caught in the shark gillnet fishery was also released alive. Given the limited amount of data available, it is difficult to determine whether the area being considered would result in overall reduction in interactions, or whether sawfish exhibit a higher degree of mobility, and are as likely to be caught in other areas. If the latter is the case, then such a closure could redistribute effort into areas where there are higher interactions with smalltooth sawfish and cause increases in these interaction rates. The SSRT is currently in the process of identifying sawfish critical habitat, which may be helpful in determining an appropriate closure area in the future.

Alternative B7 would prohibit the use of PLL gear in all HMS fisheries. Prohibiting the use of PLL gears would likely have positive ecological benefits on HMS, non-target HMS, and protected species. The number of discards would potentially be reduced by 1,047 white marlin, 816 blue marlin, 343 sailfish, 141 spearfish, 11,340 pelagic sharks, 5,524 LCS, 165 leatherback sea turtles, 60 loggerhead sea turtles, and 539 BFT annually (Table 4.11; annual discards were estimated by dividing the total from 'All Areas' by three). The number of retained species would also be reduced by a significant amount. The number of fish kept would be reduced by 42,500 swordfish, 200 BFT, 55,734 yellowfin tuna, 12,378 bigeye tuna, and 75, 385 BAYS annually (Table 4.11). However, elimination of this retained catch would result in substantial negative social and economic impacts as described below. In addition, any ecological benefits may be lost if ICCAT reallocates U.S. quota to other countries that may not implement comparable bycatch reduction measures as the United States. The PLL fishery has undergone many management measures to reduce bycatch including circle hooks implementation, live bait restrictions in the Gulf of Mexico, no targeted catch of billfish and BFT, time/area closures, and safe handling and release protocols for protected resources. These restrictions have been successful. Methods that have been employed and designed by U.S. PLL fishermen, such as circle hooks and safe handling and release protocols for protected resources, are being transferred around the world to reduce bycatch world-wide. Therefore, this alternative could ultimately provide support for the fisheries of other countries that do not implement conservation and bycatch reduction measures.

Lastly, the alternatives considered in this section are not expected to have any negative impacts on essential habitat or protected resources. The preferred alternative, B4, will help protect spawning aggregations of gag grouper, and therefore, would be expected to have a positive impact on essential fish habitat for these species. In addition, any potential impacts to protected resources (*i.e.*, leatherback and loggerhead sea turtles) were discussed for each alternative. However, since no closures were preferred at this time, except the Madison-Swanson and Steamboat Lumps Marine Reserves, and the other preferred alternative, B5, would establish criteria to implement and/or modify closed areas in the future, no impacts on protected resources are anticipated at this time.

Social and Economic Impacts

Each of the alternatives considered for time/area closures would have varying degrees of social and economic impacts. To determine the potential impacts, NMFS estimated the amount of fishing effort (number of hooks), total number of vessels, landings of retained species, and total loss or gain in gross revenues for each species that would be affected by any new closure with and without redistribution of fishing effort. A similar approach was used to predict the economic impact of any potential modifications to existing closures. To estimate the loss (or gain) in gross revenues for a single species, NMFS first estimated the total weight (lb dw) of each species harvested by PLL gear only (Table 4.32) based on data from Section 3.4.5, and then calculated the total weight lost or gained for each species as a result of the closure. Total weight for each species was then multiplied by the average ex-vessel price ($/lb dw) by area based on 2003 prices (Section 3.5.1). The gross revenues for all species were then added together to estimate a total annual loss or gain in gross revenues as a result of the closure. As described above, not considering redistribution of fishing effort assumes that all fishing effort within the time/area closures alternative is eliminated (and not transferred outside the closure). While this

may not be realistic, it provides a worst-case scenario of the potential economic impacts of any new closure(s). The redistribution of effort analysis, on the other hand, assumes that all fishing effort is displaced into open areas, which also may not be realistic given that a closure of a prime fishing area may force some fishermen out of business, to switch fisheries, or that some fishermen may relocate nonrandomly, etc. Overall effort may also increase slightly if there is a need to compensate for increased operating costs. Therefore, the actual result may lie somewhere in between. NMFS considered both estimates because they provide a range of potential economic impacts depending upon the response of the PLL industry. As mentioned above, the NEFMC is aware of different econometric optimization models to predict impacts of time/area closures (*e.g.*, NEFMC, 2003). However, such models are not currently designed to be used for the current HMS PLL fishery. Therefore, NMFS chose to evaluate the economic impacts of different closures based on the redistribution of effort model described in this rulemaking.

During the Draft HMS FMP, 2004 ex-vessel prices and 2004 dollars were not available. However, subsequent to the Draft HMS FMP, these values have become available, and NMFS analyzed the potential cost and/or gain to the PLL fishery associated with the implementation of each closures and modification. Total weight for each species was multiplied by the average ex-vessel price ($/lb dw) by area based on 2004 prices (Section 3.5.1). The total 2004 annual loss or gain to the fishery was calculated by converting the 2003 total gross revenues into 2004 dollars (2003 value was multiplied by 1.0266). Therefore, the total gain or loss associated with 2004 is similar to what was seen in 2003. These results are shown in Table 4.33, Table 4.34, and Table 4.35.

The estimates of gross revenues lost or gained as a result of a closure do not take into account additional costs that may be incurred by having to relocate to new fishing grounds. These costs may be substantial. For example, alternative B2(d), a closure of nearly the entire Gulf of Mexico, would likely require fishermen to move to the Atlantic, resulting in relocation costs, additional travel and fuel costs, additional crew costs, losses to fish dealers and distributors, and other associated social and economic costs. Other impacts may include intense competition for existing resources as fishermen are forced into smaller open areas resulting in potential gear conflicts, shifting to other fisheries, or fishermen going out of business. There may also be a concern for species whose landings are predicted to rise substantially with redistribution of effort, and whether those species can sustain a large increase in harvest.

NMFS also examined the impacts of each of the alternatives on gross vessel revenues based on the number of vessels that reported fishing in potential closed areas from 2001 to 2003 (Table 4.36), as well as the number of vessels per state potentially impacted by a particular closure (Table 4.37). This information was also updated with finalized data from January through June 2004 when J-hooks were still being used. However, since this is only six months of data, the information is provided in Table 4.36 and Table 4.37, but is not included in the discussion below.

Alternative B1, the No Action alternative that would maintain existing closures has, and would likely continue to have, negative economic impacts on the PLL industry revenues, relative to pre-closure revenues. As described earlier, when comparing pre- and post-closure logbook

reported data, the existing closures may have contributed to the reported 15 percent decline in fishing effort (Table 4.8), and the ten percent decline in the number of directed and incidental limited access permits from 1,275 permits in 2001 to 1,144 permits in 2005 (Table 3.92 in Section 3.9.2). The number of retained species kept has declined by 37.4 percent for bigeye tuna, 27.9 percent for swordfish, 23.5 percent for yellowfin tuna, and 25.1 percent for BAYS tunas (Table 4.6). In addition, there are a number of other species that are frequently retained by PLL fishermen, and landings of these species have also been declining (Table 4.7). For example, the number of pelagic sharks kept declined by 18.9 percent, LCS by 38.9 percent, dolphin by 25.9 percent, and wahoo by 25 percent. Although an exact figure is not available, the estimated annual loss in gross fishery revenues when compared to other alternatives with similar reductions in retained species may have been in the millions of dollars. However, the decline in landings reflect the period immediately after the closures were implemented, and do not reflect continuing loss of revenue into the future for the fishery.

Another factor which may have impacted the landings and effort is the implementation of a mandatory circle hook requirement for the PLL fishery in 2004 (69 FR 40734). Preliminary analyses of the logbook data from July to December of 2004 against the same time period for 1997 – 1999 (pre-closures) and 2001 – 2003 (post-closures) indicate that landings and discards of most retained species and bycatch have declined (Tables A.34 and A.35 in Appendix A). Percent declines reported in this analysis should be considered preliminary as it is based on only six months of data post circle hook implementation.

A number of factors may be contributing to the decline in permits and overall fishing effort including, but not limited to: (1) the time/area closures implemented in 1999 to 2002; (2) a decline in ex-vessel prices for swordfish and some tunas (Table 3.65 in Section 3.5) in combination with increasing fuel and operational costs that may have forced fishermen to curtail fishing effort; and (3) fishermen transitioning to other fisheries to adjust for declining revenues. It is unclear at this point whether the decline in fishing effort and number of permits will continue, or whether the fishery has stabilized at its current level. Given the North Atlantic swordfish stock is estimated to be at 94 percent of B_{MSY} (SCRS, 2004), overfishing is no longer occurring, and there have been large underharvests in recent years resulting in an ever larger quota, it is possible that effort may stabilize and possibly increase despite the existence of current time/area closures.

Alternative B2(a), a closure in the Gulf of Mexico from May through November each year, would potentially impact a total of 61 vessels that reported fishing in the area from 2001 – 2003, or an average of 46 vessels per year (Table 4.36). A total of 2,918 sets were reported from 2001 – 2003, or an average of 973 sets per year (Table 4.36). Without redistribution of effort, alternative B2(a) would potentially result in an 11.4 percent decline in fishing effort, and reductions in landings of retained species ranging from a minimum of 1.1 percent for bigeye tuna to a maximum 14.3 percent for yellowfin tuna. For yellowfin tuna, the most lucrative species affected by a Gulf of Mexico closure, this would amount to a loss of $1,796,654 in annual gross revenues based on Gulf of Mexico prices (Table 4.33). Swordfish landings would potentially decrease by 3.1 percent for a loss of approximately $423,382, BFT landings would decrease by 6.7 percent for a loss of $60,791, and bigeye tuna landings would decrease by 1.1 percent for a loss of approximately $18,190 (Table 4.33). Thus, the combined total loss in gross revenues for

alternative B2(a) without redistribution of effort would be approximately $2,299,018 annually (Table 4.33), or $49,978 per vessel annually ($2,299,018 / 46 vessels). Of the three major states bordering the Gulf of Mexico with vessels permitted to fish for HMS with PLL gear (Florida, Louisiana, Texas), Louisiana had the highest number of vessels (40 out of 61, or 66 percent) that fished in the area from 2001 – 2003 (Table 4.37). The vessels with homeports in Louisiana also reported a majority (88 percent) of all sets in the area. There were some changes in anticipated losses from B2(a) when 2004 prices were considered. The ex-vessel price for BFT went down in the Gulf region for 2004, unlike the price of swordfish, yellowfin or bigeye tuna (Table 4.33). Therefore, the loss associated with BFT was less using 2004 ex-vessel prices, whereas the greatest loss was anticipated for yellowfin tuna followed by swordfish (Table 4.33).

With redistribution of fishing effort, alternative B2(a) is predicted to result in an increase in all retained species landings and gross revenues except yellowfin tuna, which are predicted to decrease by 1.1 percent for a loss of approximately $138,204 annually (Table 4.33). Swordfish landings, on the other hand, would potentially increase by 9.1 percent for a gain in gross revenues of $1,242,832. Similarly, bluefin and bigeye tuna gross revenues are predicted to increase by $27,871 and $42,997 respectively (Table 4.33). Thus, the combined total gain in gross revenues for alternative B2(a) with redistribution of effort would be approximately $1,175,496 annually (Table 4.33), or $25,554 per vessel annually ($1,175,496 / 46 vessels). The analysis based on 2004 prices indicated that the largest gain in gross revenues would come from increase swordfish catch whereas the biggest loss in gross revenues would be from decreased yellowfin tuna landings (Table 4.33). Gross revenues from increased landings of BFT would be less in 2004 compared to 2003, but there would be an increase in gross revenues with 2004 ex-vessel prices associated with bigeye tuna landings (Table 4.33).

These results reflect differences in abundance and CPUEs for different HMS in different regions, and the variability in landings and economic estimates with redistribution of effort. For example, the entire Gulf of Mexico accounted for 68.8 percent of all yellowfin tuna landings, 57.6 percent of all BFT landings, but only 22.8 percent of all swordfish landings from 2001 – 2003 (Table 4.38). As a consequence, with redistribution of effort outside of the Gulf of Mexico, yellowfin tuna landings would be expected to decrease and swordfish landings to increase. However, one potential economic incentive would be reducing the interaction with non-target HMS and protected species. For instance, the Gulf of Mexico also accounted for the highest interactions of non-target HMS species, such as 62.8 percent of the leatherback sea turtle interactions (Table 4.39). Moving fishing effort out of this area could reduce interactions with protected resources; however, this may result in unanticipated interactions with other non-target and/or protected species in the Atlantic and high seas. In the event that effort is displaced into open areas of the Gulf of Mexico only, NMFS analyzed the landings from alternative B2(a) in comparison to landings from the Gulf of Mexico only (as opposed to overall landings from the Atlantic and Gulf of Mexico). Without redistribution of effort, landings of all retained species are predicted to decrease with a total loss in gross revenues of $5,003,298 (Table 4.35), or $108,767 per vessel annually ($5,003,298 / 46 vessels). This equated to -$5,136,386 in 2004. With redistribution of effort, there would be an increase in all retained species kept except bigeye tuna resulting in a predicted increase in gross revenues of $679,212 (Table 4.35), or $14,765 per vessel annually ($679,212 / 46 vessels). Incidentally caught BFT and targeted bigeye tuna are the only two species for which landings are predicted to decrease by 0.8 percent and 8.7 percent,

respectively, with redistribution of effort in the Gulf of Mexico only. However, since the 2004 ex-vessel price of BFT went down in the Gulf of Mexico, the loss associated with decreased BFT landings was less than in 2003. However, the loss associated with bigeye tuna using 2004 ex-vessel prices was larger, due to the increase in ex-vessel prices for bigeye tuna in the Gulf of Mexico in 2004. Thus, the predicted economic impacts to gross revenues for the fleet could range from a loss of approximately $5.1 million to a gain of approximately $1.2 million (Table 4.35).

The apparent increase in landings and gross revenues for several of the species with redistribution of effort in the Gulf of Mexico only is somewhat surprising, and may point to the fact that tunas other than bluefin and bigeye tuna are more likely to be caught outside the alternative B2(a) area. This may indicate that fishermen are targeting not only yellowfin tuna, which has the highest overall economic value, but also BFT. In other words, even though catches of yellowfin tuna may be higher outside the alternative B2(a) area, fishermen may be targeting the area for the increased opportunity to catch an occasional BFT. The incidental catch limit in all areas, at all times, is 2,000 lb to retain one BFT, 6,000 lb to retain two BFT, and 30,000 lb to retain three BFT. The analysis of both the observer program and logbook data indicates that the central Gulf of Mexico is one of the prime areas for BFT discards, as well as bluefin and yellowfin tuna landings. NMFS is concerned about the potential negative economic impacts of closing this prime fishing ground for tunas as well as indications that PLL vessels may be targeting BFT (as incidental only species). By comparison, alternative B2(b) could result in a much higher reduction in BFT discards, with a much lower decrease in overall landings than alternative B2(a). Additionally, anecdotal information suggests that a proportion of the Gulf of Mexico PLL fishing fleet is comprised of Vietnamese fishermen, who may be reluctant to leave their traditional homeports and would likely stay in the Gulf of Mexico (Wilson *et al*., 1998; NMFS, 2004), perhaps making a redistribution model of effort in the Gulf of Mexico more realistic. Closing this area could thus have potential social impacts in addition to economic impacts.

Alternative B2(a), and most of the other time/area closures described in this section, could have numerous social impacts ranging from disruption of local fishing communities to relocation of vessels and homeports, loss of crew, and other social hardships associated with loss of income. A majority of the vessels (66 percent) impacted by alternative B2(a) have a homeport in Louisiana (Table 4.37), whereas 23 percent have a homeport in Florida and 11 percent have a homeport in Texas. Depending on the extent of redistributed fishing effort, revenues could range from a loss of $5.1 million to a gain of approximately $1.2 million (Table 4.35). Thus, the homeports and communities associated with those homeports in TX, LA, and FL could experience either loss of fishery revenues and social hardship associated with the loss, or they could potentially benefit from increased revenues. Given that this is the smallest closure considered for the Gulf of Mexico, the types of impacts described above would be similar for most other alternatives, although the scale of impacts from other alternatives considered would likely be greater.

Alternative B2(b), would potentially impact a total of 20 vessels that fished in an area of the Northeast from 2001 – 2003, or an average of 10 vessels per year. There were a total of 226 sets reported from 2001 – 2003, or an average 75 sets per year (Table 4.36). Without

redistribution of effort, alternative B2(b) would potentially result in a 0.9 percent decrease in fishing effort, with reductions in landings of retained species ranging from a minimum of 0.3 percent for yellowfin tuna to a maximum 1.8 percent for incidentally caught BFT (Table 4.15). Swordfish landings would potentially decrease by 1.5 percent for a loss of approximately $231,252, yellowfin tuna landings would decrease by 0.3 percent for a loss of $27,102 and bigeye tuna landings would decrease by 1.5 percent for a loss of approximately $26,011. Thus, the combined total loss in gross revenues for a alternative B2(b) closure without redistribution of effort would be approximately $299,120 annually (Table 4.33), or $29,912 per vessel annually ($299,120 / 10 vessels). In general, the loss associated with decreased landings from B2(b) increased for all species when 2004 prices were considered (Table 4.33). This was due to an increase in ex-vessel prices for these species in 2004 in the North Atlantic region. Vessels with homeports in ten different states reported landings from the area in 2001 – 2003, with the highest number of vessels from New York (Table 4.37).

With redistribution of fishing effort, alternative B2(b) was predicted to result in a decrease in all retained species landings and gross revenues except yellowfin tuna, which are predicted to increase by 0.9 percent for a predicted gain of approximately $81,306 annually (Table 4.33). Swordfish landings would potentially decrease by 0.8 percent for a loss in gross revenues of $123,334, and bigeye tuna and incidental BFT gross revenues are predicted to decrease by $20,809 and $9,837 annually, respectively. Thus, the combined total loss in gross revenues for alternative B2(b) with redistribution of effort would be approximately $72,675 annually (Table 4.33), or $7,267 per vessel annually ($72,675 / 10 vessels). Using 2004 prices, a greater gain in gross revenues was predicted for yellowfin tuna with the consideration of redistribution of effort (Table 4.33). However, a greater loss was predicted for swordfish, BFT, and bigeye tuna, resulting in a total loss of $74, 608 for 2004 (Table 4.33).

Alternative B2(c), would potentially impact a total of 75 vessels that fished in the area from 2001 – 2003, or an average of 64 vessels per year. A total of 12,623 sets were reported from 2001 – 2003, or an average of 4,207 sets per year (Table 4.36). Without redistribution of effort, alternative B2(c) would potentially result in a 13.4 percent decrease in fishing effort, and reductions in landings ranging from a minimum of 0.2 percent for bigeye tuna (kept) to a maximum 29.0 percent for incidentally-caught BFT (kept) (Table 4.15). For yellowfin tuna, the most lucrative species affected by alternative B2(c), a 19.8 percent reduction in landings would amount to an estimated loss of $2,483,678 annually based on Gulf of Mexico prices (Table 4.33). Swordfish landings would potentially decrease by 2.8 percent for a loss of approximately $384,981, and incidental BFT landings would decrease by 29.0 percent for a loss of approximately $263,563 annually (Table 4.33). Thus, the total loss in gross revenues for alternative B2(c) without redistribution of effort would be approximately $3,136,229 annually (Table 4.33), or $49,003 per vessel annually ($3,136,229 / 64 vessels). As with B2(a), there were some changes in anticipated losses from B2(c) when 2004 prices were considered. The ex-vessel price for BFT went down in the Gulf region for 2004, unlike the price of swordfish, yellowfin or bigeye tuna (Table 4.33). Therefore, the loss associated with decreased BFT was less using 2004 ex-vessel prices whereas the greatest loss was anticipated for yellowfin tuna followed by swordfish (Table 4.33). Similar to alternative B2(a), a majority of the vessels that would be affected by the closure were from Louisiana (Table 4.37).

With redistribution of fishing effort, alternative B2(c) is predicted to result in a decrease in bluefin and yellowfin tuna landings of 18.3 and 11.0 percent respectively, for estimated losses of approximately $166,040 and $1,382,042 annually (Table 4.33). Swordfish and bigeye tuna landings would potentially increase by 21.1 and 11.4 percent respectively for a gain in gross revenues of approximately $2,881,732 and $188,520 annually, respectively. Thus, there would be a net gain in gross revenues for alternative B2(c) with redistribution of effort of approximately $1,522,170 annually (Table 4.33), or $23,783 per vessel annually ($1,522,170 / 64 vessels). 2004 ex-vessel prices resulted in a greater gain for bigeye tuna gross revenues and smaller loss in BFT gross revenues (Table 4.33). The largest gain in gross revenues with 2004 ex-vessel prices would be for swordfish landings, and the greatest loss would be for yellowfin tuna (Table 4.33)

Alternative B2(d), closing all areas west of 86 degrees W. Long. to pelagic longlining in the Gulf of Mexico, would potentially impact a total of 78 vessels that fished in the area from 2001 – 2003, or an average of 65 vessels per year. A total of 12,897 sets were reported from 2001 – 2003, or an average 4,299 sets per year (Table 4.36). Without redistribution of fishing effort, alternative B2(d) would potentially result in a 47.4 percent decrease in fishing effort, and reductions in landings ranging from a minimum of 3.5 percent for bigeye tuna to a maximum of 64 percent for yellowfin tuna (Table 4.15). For yellowfin tuna, this would amount to an estimated loss of $8,035,791 annually. The total loss for all species combined would be approximately $10,638,133 annually (Table 4.33), or $163,663 per vessel annually ($10,638,133 / 65 vessels). The estimated losses using 2004 ex-vessel data were even larger than those anticipated in 2003, except for BFT (Table 4.33). The total lost gross revenue in 2004 dollars was estimated as -$10,921,107 (Table 4.33). The closure of a major portion of the Gulf of Mexico would have the largest impact on Louisiana, where approximately 56 percent of all the vessels that reported 72 percent of all sets from the area have their homeports (Table 4.37).

With redistribution of fishing effort, alternative B2(d) is predicted to result in an overall increase in gross revenues of approximately $6,014,934 annually, or $92,537 per vessel, due primarily to the large potential increase in swordfish landings (62.5 percent) and bigeye tuna landings (80.6 percent) that are predicted to occur with redistribution of effort (Table 4.33). 2004 ex-vessel prices indicated largest gross revenues associated with swordfish and yellowfin tuna landings (Table 4.33). Losses associated with decreased BFT landings were less than those predicted by 2003 ex-vessel prices (-$80,601 vs. -$109,786; Table 4.33). As discussed earlier, these estimates do not take into account fishermen who may not relocate to open areas in the Atlantic, but may instead stay in the Gulf of Mexico where competition for existing resource may be intense, potentially resulting in fishermen going out of business.

Alternative B2(e), a 46,956 nm^2 closure in the Northeast, would potentially impact a total of 49 vessels that fished in the area from 2001 – 2003, or an average of 35 vessels per year. A total of 2,587 sets were reported from 2001 – 2003, or an average 862 sets per year (Table 4.36). Without redistribution of effort, total gross revenues losses would amount to approximately $3,234,660 annually (Table 4.33), or $92,418 per vessel annually ($3,234,660 / 35 vessels). 2004 ex-vessel prices indicated an increase in gross losses from those anticipated with 2003 ex-vessels prices for all species without the redistribution of effort (Table 4.33). With redistribution of effort, gross revenues losses are predicted to total $820,132 annually (Table 4.33), or $23,432

per vessel annually ($820,132 / 35 vessels). This translated into a total gross loss of -$841,948 in 2004 (Table 4.33).

NMFS also considered combining alternatives B2(a) and B2(b), as well as alternatives B2(d) and B2(e), as described earlier under ecological impacts, to maximize bycatch reduction. Combining closures B2(a) from May through November and B2(b) in June only, resulted in the highest overall reduction in bycatch for the largest number of species under consideration. Combining these alternatives would potentially impact a total of 81 vessels that fished in the area from 2001 – 2003. A total of 3,144 sets were reported from 2001 – 2003 (Table 4.36). Without redistribution of effort, the economic impact of combining these closures would be a decrease in landings of all retained species for a loss of $5,428,120 annually (Table 4.33), or $96,930 per vessel annually ($5,428,120 / 56 vessels). This was estimated as a loss of -$5,572,508 in 2004 (Table 4.33). With redistribution of effort, the landings of all retained species are predicted to increase. The percent increase ranged from a minimum 0.3 percent for yellowfin tuna to a maximum of 10.0 percent for bigeye tuna. The result would be an increase in total gross revenues of approximately $1,091,570 annually (Table 4.33), or $19,492 per vessel annually ($1,091,570 / 56 vessels). Thus, the overall economic cost of combining alternatives B2(a) and B2(b) could potentially range from a loss of $5.42 million to a gain of $1.09 million. Using 2004 ex-vessel prices, the overall economic cost of combining the two alternatives would be a range of a loss of $5.57 million to an increase of $1.1 million (Table 4.33). Given that the actual decline in overall effort of previously enacted time/area closures was nearly twice what was predicted (Section 3.8.9; Table 4.6 and Table 4.7), the combined closures are likely to have a substantial negative economic impact. When considering the comparatively low numbers of leatherback and loggerhead sea turtle interactions, and BFT and white marlin discards that would be avoided by this closure, the economic costs appear to be high in comparison to the ecological benefits.

Combining closures B2(d) and B2(e) year-round would potentially impact a total of 127 vessels that fished in the area from 2001 – 2003. A total of 15,484 sets were reported from 2001 – 2003. Without redistribution of effort, the economic impact of combining these closures would result in a decrease in landings for a loss of $12.9 million annually (Table 4.33), or $101,633 per vessel annually ($12,907,345 / 127 vessels). In 2004, the total gross loss was estimated as -$13.25 million (Table 4.33). With redistribution of effort, the landings of swordfish and bigeye tuna are predicted to increase, whereas the remaining species are predicted to decrease. The percent increase ranged from a minimum of 63.1 percent for swordfish to a maximum of 78.4 percent for bigeye tuna (Table 4.15). The result would be an increase in total gross revenues of approximately $7,600,258 annually (Table 4.33), or $59,845 per vessel annually ($7,600,258 / 127 vessels). In 2004, the total gross revenues when the redistribution of effort considered was $7,802,425 (Table 4.33). Thus, the overall economic cost of combining alternatives B2(d) and B2(e) could potentially range from a loss of $12.9 million to a gain of $7.8 million.

In addition to any economic impacts, there could be a range of social impacts from disruption of local fishing communities to relocation of vessels and homeports as a result of any additional closures. Anecdotal information suggests that many PLL fishermen own several permits in addition to HMS limited access permits and engage in other fisheries during periods when they are not pursuing HMS. Fishermen may have had to diversify to continue to meet

financial obligations and remain in business due to time/area closures; however, many changes in the HMS fisheries have been out of NMFS' control, such as increases in fuel prices and hurricanes. However, NMFS realizes that any additional economic hardship such as a time/area closure could potentially result in fishermen going out of business.

The modifications to the two closed areas, B3(a) and B3(b), would potentially result in positive social and economic impacts. Re-opening areas of either closure would allow fishermen access to previously closed fishing grounds, potentially resulting in increased landings of retained species. In addition, the modified area of B3(b) would be inshore, which would allow fishermen to have access to nearshore fishing grounds, reducing fuel costs and time at sea. However, this may create gear conflicts between recreational and commercial fishermen. Conversely, the modified area of B3(a) would be along the axis of the Gulf Stream, which would afford recreational fishermen closed portions inshore and allow PLL gear to fish in re-opened areas offshore.

Alternative B3(a), the Charleston Bump modification, would potentially result in a 0.5 percent increase in fishing effort based on 1997 – 1999 logbook data. The most prominent increase in landings would be for swordfish (1.1 percent; Table 4.27). This potential increase could result in increased revenue of $220,806 annually for swordfish alone (Table 4.34). In addition, the modification could result in increased landings of yellowfin tuna (0.16 percent; Table 4.27) and bigeye tuna (0.02 percent; Table 4.27). The total increase in potential revenues from increased landings resulting from this modification would be $234,460 annually (Table 4.34). Using 2004 ex-vessel prices, this translates into $238,417 in swordfish landings, a decrease in yellowfin tuna landings ($11,625 vs. $13,372), and approximately the same for bigeye tuna landings ($282 vs. $281; Table 4.34)

Alternative B3(b), the Northeastern U.S. modification, would potentially result in a very small increase in fishing effort (0.01 percent; Table 4.28). As with B3(a), the largest increase in landings would be for swordfish, which would translate into an increase in an annual revenue of $482 (Table 4.34). There is also a small predicted increase in yellowfin tuna landings, making the total increase in revenue associated with this modification is $550, annually (Table 4.34). 2004 ex-vessel prices predicted a slight increase for both swordfish landings ($588 vs. $482) and yellowfin tuna landings ($74 vs. $68; Table 4.34). While this is small in comparison to B3(a), this modification serves as a way for NMFS to pinpoint areas of high bycatch and refine current closed areas.

While NMFS considered each alternative individually, there is the possibility that a closure, or a combination of closures, could also be implemented in concert with a potential modification to a closed area. Since the potential modifications would most likely have positive social and economic impacts, any combination of closures with potential modifications could result in an increase in revenue. When looking at revenues associated with the potential closures after the consideration of the redistribution of fishing effort (Table 4.33), B3(a), in combination with most of the potential closed areas or combinations of potential closed areas, would result in a net increase in revenue (Table 4.33 and Table 4.34). The largest increase in annual revenue based on 2003 prices would be $7,834,718 for the B2(d)/B2(e) closure combination ($7,600,258; Table 4.33) with the B3(a) modification ($234,460; Table 4.34), or $6,249,394 for the B2(d)

closure ($6,014,934; Table 4.33) and the B3(a) modification ($234,460; Table 4.34). Conversely, the greatest loss in annual revenue would be $-819,582 from the B2(e) closure (-$820,132; Table 4.33) and the B3(b) modification ($550; Table 4.34). One drawback to such combinations of closed areas and modifications would be the difficulty of compliance by the public and subsequent enforcement. Such combinations of closures and modifications during different time periods could add complex regulations for the public to adhere to and enforcement to monitor.

The preferred alternative B4 to implement complementary HMS management measures in Madison-Swanson and Steamboat Lumps Marine Reserves could potentially impact commercial and recreational fishery participants that have (1) traditionally harvested HMS from the two marine reserves, (2) provided charter or headboat trips for HMS to the areas, or (3) would be expected to harvest HMS from the two areas prior to the sunset date associated with this alternative (June 16, 2010).

As described above, from 1997 – 2003, only one PLL set and one bottom longline set were reported in the HMS logbook in these areas (Figure 4.4). No new sets were reported in 2004. Both sets occurred in the Madison-Swanson site. Four swordfish were kept on the PLL set, and eight swordfish were discarded. With regard to observer data, only one set was observed within the areas from 1994 – 2003, out of a total of 1,433 observed sets in the CSFOP during that period. No new sets were reported for the Observer Program in 2004. These data indicate that comparatively little HMS commercial fishing activity has historically occurred within these two areas, although some sandbar sharks and swordfish have been caught. Most HMS fishing activity has been reported to the west of Madison-Swanson and Steamboat Lumps.

The EA prepared by the Gulf Council estimated that the closures could affect 356 commercial fishing vessels that reported fishing in the larger Statistical Areas 6 or 8, in the snapper/grouper logbook and unknown number of for-hire vessels. The Council's closures were projected to reduce total gross revenues of commercial vessels fishing primarily in the snapper-grouper and reef fish fishery by $352,000 annually, based upon pre-closure fishing information. This was estimated to represent approximately one percent to four percent of individual gross vessel revenues if equally divided among the 356 affected vessels, or two percent to five percent of individual gross vessel revenues if 59 trap vessels (which fish in shallower waters) are excluded from the universe of affected vessels. The vast majority of the revenues derived from these areas were from landings of shallow-water groupers and other reef fish. In 2001 and 2002, coastal migratory pelagics represented only 2.1 percent of gross revenues derived from Statistical Areas 6 and 8. Based upon this information, CSFOP data, and reported sets in the HMS Logbook, NMFS does not anticipate any significant reduction in gross vessel revenues of commercial HMS vessels associated with implementing complementary HMS regulations in the Madison-Swanson and Steamboat Lumps marine reserves beyond those already projected in the Gulf Council EA (GMFMC, 2003). Because the preferred closure areas are relatively small, any HMS fishing activity that otherwise would have occurred in these areas would likely relocate to nearby open areas with similar catch rates.

The extent of HMS recreational and charter/headboat fishing activity within the marine reserves is unknown. It is, therefore, not possible to provide an estimate of the impacts of the

two marine reserves on the gross revenues and profits of charter/headboat vessels. However, given the interest that this topic generated among the recreational fishing community during 2003 Gulf Council deliberations on extending the duration of the marine reserves, it may be inferred that traditionally there has been some HMS recreational fishing activity within these areas. The Gulf Council recommended that NMFS implement compatible regulations that would provide for a seasonal allowance (May – October) for surface trolling to partially alleviate any negative social or economic impacts associated with the marine reserves. Because this alternative includes the seasonal surface trolling allowance, it is not expected to substantially impact the HMS recreational or charter/headboat sector. These months coincide with a period of increased HMS recreational fishing activity in the western Gulf of Mexico. This alternative strives to balance the need to ensure adequate conservation benefits for reef species while minimizing regulatory effects on fisheries, which have limited impacts on reef species.

Preferred alternative B5 would establish criteria for regulatory framework adjustments to implement new time/area closures or make modifications to existing time/area closures. This alternative would help provide greater transparency and predictability in the decision making process and would allow fishermen to plan for future changes. Although there are no direct economic impacts resulting from the establishment of the criteria themselves, the implementation of new closures or modification of existing closures could have variable economic impacts. Positive economic impacts could result from modifications or removals of time/area closures, which would reopen areas to commercial fishing. Such modifications could allow fishermen to more readily utilize retained species, resulting in additional economic opportunity for fishermen. However, modifications to current time/area closures (*i.e.*, opening up current closures) could lead to negative social impacts if there is gear conflicts involved between recreational and commercial fishermen. Additional closures could also result in negative economic impacts in the short-term. Since the economic and social impacts related to the criteria are difficult to predict, specific economic and social impacts would be analyzed when a particular closure is contemplated.

There are expected to be minimal negative economic or social impacts due to alternative B6, the closure off the southwest tip of Key West to bottom longline gear to protect smalltooth sawfish. However, calculating the economic and social impact of this closure is more difficult than calculating the impacts of closures for PLL gear; impacts for this closure are based on the CSFOP, which only covers approximately 1.6 percent of the commercial shark bottom longline vessels (based on the number of hooks set). Commercial shark bottom longline vessels typically report their landings in the snapper/grouper logbook, however, these landings are reported according to statistical reporting areas, and not according to locations of individual sets as is reported in the HMS logbook. Therefore, NMFS must extrapolate the number of sets that may have occurred from 2001 – 2003 in the B6 closure from the 1994 – 2006 CSFOP.

Since this closure is small in size, it is expected to affect very few bottom longline fishermen. For instance, 18 sets of the total 1,563 sets observed by the CSFOP from 1994 – 2006 occurred in the potential closed area. The level of observer coverage has ranged from approximately 1.6 percent (based on the number of hooks set) to four percent (based on LCS landings) of the HMS-permitted bottom longline vessels. Using a mid-range value of observer coverage (2.8 percent), it is estimated that approximately 55,821 HMS commercial bottom

longline sets (1,563 sets / 2.8 percent observer coverage) occurred during this time, with 642 sets occurring in the closure area (18 sets / 2.8 percent observer coverage). Since bottom longline vessels in the Gulf of Mexico soak their gear an average of 11.25 hr/set (Burgess and Morgan, 2003), NMFS estimates that each vessel would have made one set per day. Thus, the closed area could affect 1.2 percent (642 sets / 55,821 sets) of the sets based on the number of sets between 1994 – 2006 or approximately 49 fishing days a year for the entire HMS bottom longline fleet (*i.e.*, 642 sets / 13 years ~ 49 sets per year). Given the extrapolated nature of these estimates, NMFS cannot estimate the economic impact of this closure in 2003 or 2004 dollars nor can NMFS determine which state would be most impacted by such a closure.

In addition, the closed area would help reduce the number of interactions with smalltooth sawfish by the bottom longline fishing industry, thereby helping the bottom longline industry stay below their Incidental Take Statement (ITS) for smalltooth sawfish (which is 260 interactions over five years with no reported fishing mortalities). Staying below the ITS will have positive economic and social impacts by keeping the entire bottom longline fishery open and operating, allowing economic gain by the bottom longline fishermen and their associated communities.

Alternative B7, which would prohibit pelagic longlining in all areas, would potentially impact a total of 177 active vessels that made 30,409 sets from 2001 – 2003 (Table 4.36). Active vessels are defined as vessels that reported landings in the HMS logbook during the years in question. It would have immediate and significant economic and social impacts on the longline vessel owners, vessel operators, and crew that would need to re-rig their vessels to continue fishing for HMS, find alternative fisheries, or discontinue fishing. It would also negatively impact dealers that purchase fish from PLL vessels, and families who own the fishing vessels that would either have to re-rig or discontinue fishing. It would also indirectly impact the local communities that support the PLL fishery. Figures 9.4 and 9.7 show the spatial distribution of tuna and swordfish permit holders, and Tables 9.36 and 9.39 show the number of tuna or swordfish permit holders per state. The states with the most tuna permit holders are Massachusetts (31.5 percent), North Carolina (12.9 percent), Maine (10.2 percent), New Jersey (7.0 percent), and New York (6.4 percent) (Table 9.36). The states with the most swordfish permit holders are Florida (32.4 percent), New Jersey (13.9 percent), Louisiana (11.9 percent), Massachusetts (9.1 percent), and New York (8.0 percent) (Table 9.39). In 2004, the total fishery revenue was $21.4 million for tunas (compared to $49.9 million in 2003) and $15.4 million for swordfish (compared to $14.6 million in 2003; Table 3.65 in Section 3.5.1.2). In 2004, the PLL fishery accounted for annual gross revenues of $14.9 million for swordfish, $871,187 for BFT, $9.1 million for yellowfin tuna, and $1.6 million for bigeye tuna based on average ex-vessel prices ($/lb dw) for 2004 (Table 4.32 and Table 3.65 in Section 3.5.1.2). Thus, closing the PLL fishery would result in, at a minimum, a loss of $26.5 million in revenue. However, this does not include revenue lost from sharks and other tunas and finfish landings. In addition, this estimate does not take into account the negative indirect economic and social impacts that small local businesses and fishing communities, which support the PLL industry, will also experience from such an industry closure.

In addition, under ATCA, the United States cannot implement measures that have the effect of raising or lowering quota, although NMFS has the ability to change the allocation of

that quota among different gear groups. The swordfish fishery is confined, by regulation, to three gear types: harpoon, longline, and handlines. Since it is unlikely that the handgear sector would be able to catch the quota given the size distribution of the stock, prohibiting longline gear may reduce the ability of U.S. fishermen to harvest the full quota. It would also have the effect of reducing traditional participation in the swordfish fishery by U.S. vessels relative to the foreign competitors because the United States would harvest a vastly reduced proportion of the overall quota.

Summary of Alternatives

After carefully reviewing the results of all the different time/area closures analyses, including different scenarios of redistributed effort, NMFS is preferring not to implement any new closures, except the complementary measures in the Madison-Swanson and Steamboat Lumps Marine Reserves, and not to modify any existing closures at this time. Alternatives B4 and B5 are the preferred alternatives. Alternative B4 would establish complementary HMS regulations in the Madison-Swanson and Steamboat Lumps Marine Reserves at the request of the GMFMC with minimal ecological, economic, or social impacts. Alternative B5 would establish criteria that would guide future decision-making regarding implementation or modification of time/area closures. This alternative was a preferred alternative because it would provide enhanced transparency, predictability, and understanding of HMS management decisions, allow for more adaptive management, and should result in minimal social and economic impacts. Any impacts for specific closures would be analyzed when those closures are considered.

At this time, the following alternatives are not preferred for a variety of reasons. The ecological benefits of alternatives B2(a) through B2(e) for white marlin, BFT, and sea turtles are predicted to be variable with redistribution of effort, with potential negative ecological impacts to several species. All closures had predicted reductions in bycatch and discards without consideration of redistributed effort. For instance, B2(d) predicted some of the largest decreases in spearfish bycatch (83.5 percent), leatherback turtle interactions (57.5 percent) and yellowfin tuna discards (66.4 percent). However, no redistribution of effort assumes that all fishing effort that occurred in the closed area would cease if a closure was implemented and would not be transferred elsewhere. Therefore, a closure such as B2(d) was also predicted to have large negative economic impacts with a predicted 53.6 percent and 64 percent reduction in retained bluefin and yellowfin tuna, respectively. Under redistribution of effort assumptions, each of these alternatives (B2(a) through B2(e)) was predicted to result in an increase in bycatch of at least one, and in several cases, more than one of the species considered (Table 4.5 and Table A.37 through Table A.42 in Appendix A). For example, alternative B2(a) (May-November), intended primarily to reduce leatherback sea turtle interactions, and white marlin and BFT discards, could result in a 7.9 percent increase in loggerhead sea turtle interactions and a 10.3 percent increase in BFT discards (Table 4.5). Even the modified redistribution of effort model for alternative B2(a) predicted increases in sailfish discards (4.7 percent; Table A.37 in Appendix A), LCS discards (4.4 percent; Table A.37 in Appendix A), BFT discards (1.6 percent; Table A.38 in Appendix A), and BAYS discards (0.7 percent; Table A.38 in Appendix A). When closure areas were combined, the redistribution of effort model predicted similar results with an increase in discards of several species. For example, combining alternatives B2(a) (May – Nov) with B2(b) (June only) would result in a 1.5 percent increase in sailfish, 9.6 percent increase in pelagic sharks, and 10.1 percent increase in LCS discards (Table 4.21). Combining

alternatives B2(d) with B2(e) (year-round) would result in a 6.5 percent increase in white marlin, a 12.1 percent increase in spearfish discards, and a 4.8 percent increase in loggerhead sea turtle interactions (Table 4.23).

Alternatives B3(a) and B3(b) were considered to refine existing closures and to provide additional opportunity to harvest legal-sized swordfish while not increasing bycatch. Additional swordfish catch is desirable because the United States has not lately met its quota under ICCAT. As of April 30, 2006, only 18 percent of the directed North Atlantic swordfish quota and 2 percent of the incidental North Atlantic swordfish quota had been filed, leaving 4,905.9 mt and 294.7 mt of directed and incidental quota, respectively, still available for the 2005 fishing year. NMFS, however, is not preferring any modifications to the existing closures. None of the modifications considered would have resulted in a large enough increase in retained catch to alleviate concerns over uncaught portions of the swordfish and BFT quotas. For instance, B3(a) was predicted to increase retained swordfish catch by only 30.72 mt, and B3(a) was predicted to increase the retained swordfish catch by 0.07 mt. In addition, modifications to existing closures could result in increased bycatch of blue and white marlin, which is a concern given the stock status of blue and white marlin and the scheduled white marlin ESA review. Increased interactions with sea turtles and marine mammals (*e.g.*, pilot whales and Risso's dolphins) are an additional concern.

Finally, all of the analyses (those analyzing the impacts of new closures and those analyzing the impacts of modifications to existing closures) were conducted using J-hook data. New circle hook management measures were put into place in 2004, and NMFS is still assessing the effects of circle hooks on bycatch rates for HMS. Until NMFS can better evaluate the effects of circle hooks on bycatch reduction, especially with regard to sea turtles interactions and bycatch of other non-target HMS, NMFS prefers, at this time, not to modify the current time/area closures. NMFS intends to reconsider modifications to existing closures once further analyses of circle hook data are available as well as the results of stock assessments for blue marlin, white marlin, north and south swordfish, eastern and western BFT, and LCS when they become available. Given the general anticipation that the North Atlantic swordfish stock will be identified as fully rebuilt, per the pending September 2006 stock assessment, a number of fishermen and others have asked NMFS to assist in revitalizing this fishery. One option that has been raised is opening the time/area closures. While NMFS does not prefer modifying any existing closures at this time, under the preferred alternative, NMFS could modify the closed areas and/or allow experiments to test gears or other fishing methods in the closed areas. Similarly, pending the results of the marlin and BFT stock assessments, the criteria could allow for additional closures to be considered for all HMS fisheries.

Alternative B6, to prohibit bottom longline gear in an area southwest of Key West to protect endangered smalltooth sawfish, is not preferred due to the low number of observed interactions of smalltooth sawfish with BLL gear, the highly variable and episodic nature of interactions with smalltooth sawfish, and the fact that almost all of the smalltooth sawfish observed caught on BLL gear were released alive (one was released in unknown condition). Only one smalltooth sawfish has been observed in the shark gillnet fishery, and it was also released alive. There is also a lack of current information on smalltooth sawfish critical habitat. Once critical habitat has been designated by the SSRT, NMFS may consider a closure in areas

where bottom longline or other HMS gears overlap with critical habitat. Until the SSRT and NMFS can coordinate on appropriate areas to close for smalltooth sawfish, NMFS feels it is premature to implement a closure for smalltooth sawfish at this time.

Finally, while alternative B7 (close all areas to PLL gear in HMS fisheries) would result in the greatest short-term ecological benefits of all the alternatives, it would also have severe economic impacts on permit holders in multiple communities and states ranging from Maine to Texas. As described above under social/economic consequences, in recent years there have been 177 active PLL vessels with annual gross fishery revenues in excess of $25 million in 2003. This revenue was ~27 million in 2004. Therefore, this alternative would have a significant impact on communities, individuals, and small businesses. Additionally, fishing mortality of several species of concern (*i.e.*, marlin, BFT, and sea turtles) may increase if the Unites States' quota is reallocated to other ICCAT countries that do not have comparable conservation bycatch reduction methods. NMFS does not prefer eliminating the entire PLL fishery at this time because of the significant economic impacts, the potential effect of shifting quota to other countries, and the likely increase in fishing mortality of both HMS and protected species. NMFS is addressing bycatch and bycatch mortality in other sections of this FMP (Chapters 6, 7, 8, and 9 and other sections within Chapter 4 such as workshops and Atlantic billfish).

Overall Conclusion

NMFS used POP and HMS logbook data to identify new areas for time/area closures and selected alternatives based on these data to further analyze 10 different closures or modifications for this rulemaking. NMFS also considered new time/area closures based on a settlement agreement relating to white marlin, which was approved by the court in Center for Biological Diversity v. NMFS, Civ. Action No. 04-0063 (D.D.C.), and a petition for rulemaking received by the Blue Ocean Institute. NMFS chose to use absolute numbers of discards and bycatch instead of CPUEs to identify areas for closures as well as for the time/area analyses in order to maximize the reduction in the overall number of discards (for further discussion, please see page 4-28). In addition, NMFS used HMS logbook data to analyze redistribution of effort. While NMFS is aware that discards may be underreported in the HMS logbook, the HMS logbook data were collected over the entire PLL fleet and provided an effort estimate for the entire fleet, which is needed for redistribution calculations, whereas POP data are only collected from a portion of the fleet (for further discussion, please see pages 4-32 to 4-33). NMFS also calculated the ecological, social, and economic impacts of each closure with and without the consideration of redistributed effort.

NMFS evaluated the reduction in discards of white marlin, blue marlin, sailfish, spearfish, leatherback sea turtles, loggerhead sea turtles, other sea turtles, and BFT without redistribution of effort based on POP data (Table 4.4) and the HMS logbook data (Table 4.5 and Table 4.15) for the various time/area closure alternatives. In addition, individual tables for each of the alternatives are presented to show the monthly discards or landings of non-target or target HMS respectively, that include pelagic and large coastal sharks, and the percent reduction in numbers of hooks set based on HMS logbook data. A time series of HMS logbook data are also presented for the estimated change in targeted and retained catch of swordfish, bluefin, bigeye, albacore, yellowfin, and skipjack tunas (BAYS) for each closure (please see Table 4.6 and Table 4.19).

NMFS evaluated different scenarios for redistribution of fishing effort, where each scenario had different assumptions regarding how fishing effort would be redistributed into open areas. The model used in this time/area analysis was the same model used in previous time/area rulemakings that resulted in implementation of closed areas (for more information on redistribution of effort model selection, please see page 4-30). Additional redistribution scenarios were considered based on comments received on the Draft Consolidated HMS FMP and the OMB reviews. Considering redistribution of fishing effort is important because fishermen are unlikely to stop fishing as a result of a closure, and are more likely to move to open areas to continue fishing. Thus it is important to take into account any additional effort in open areas that may result in an increase in bycatch. In addition, HMS and protected species are not uniformly distributed throughout the ocean, and tend to occur in higher concentrations in certain areas. Therefore, a closure in one area might reduce the bycatch of one or two species, but may increase bycatch of others as fishing effort in those areas increases.

The scenario(s) used for each closure depend on the spatial size and temporal duration of the individual closure. One scenario assumed that fishing effort (*i.e.*, hooks) from a closed area would be displaced into all remaining open areas. In this case, effort from a closed area was multiplied by the average CPUE for each species from all the remaining open areas (for further discussion, refer to Appendix A and Table A.28). NMFS also considered scenarios that assumed all fishing effort would only be redistributed within a) the Gulf of Mexico only, b) the Gulf of Mexico and the eastern seaboard, and c) the Gulf of Mexico and other areas of the Atlantic. The last scenario assumed that fishing effort would be displaced within the Gulf of Mexico and into another area where the majority of vessels with Gulf of Mexico homeports have reported fishing during 2001 – 2004 (*i.e.*, Area 6). In each of these scenarios, the effort from a closure was multiplied by the CPUE for each species either for the Gulf of Mexico only or for only the eastern seaboard, or by the CPUE for the Gulf of Mexico and Area 6 (for further discussion, please refer to pages 4-32 and 4-33, Appendix A, and Tables A.29 and A.30). These different scenarios were developed after NMFS evaluated the movement of the PLL fleet based on 2001 – 2004 HMS logbook data, which indicated where the fleet has been fishing in the Atlantic, Caribbean, and Gulf of Mexico (for further discussion, please refer to pages 4-32 and 4-33).

Each scenario of the redistribution of effort model had different assumptions. For instance, the scenario where effort from a closed area was redistributed to all open areas assumed that all fishing effort in a closed area would be distributed to open areas in the Gulf of Mexico and the Atlantic (*e.g.*, fishermen will move out of the closed area but continue fishing in surrounding open areas, move their business, or sell their permits to someone near an open area). This scenario also assumed fishermen could fish far away from their homeports, and fishermen have the ability to leave their communities, unloading docks, and other associated infrastructure to fish in the remaining open areas. Other scenarios assumed the movement of fishermen was confined to areas near their homeports assumed that fishermen do not relocate, possibly due to community ties to unloading docks, processing plants, etc. These additional scenarios also assumed that the same amount of effort would be moved out of a given area regardless of the size of the closure implemented. In reality, larger closures may result in more movement in order for fishermen to find open areas to fish and stay in business.

Predicting fishermen's behavior is difficult, especially as some factors that may determine whether to stay in the fishery, relocate, or leave the fishery are beyond NMFS' control (fuel prices, infrastructure, hurricanes, etc.). While some fishermen will continue to fish in the remaining open areas of the Atlantic, Caribbean, and Gulf of Mexico, others may be forced to leave the fishery entirely, such as selling their permits and going out of business, as a result of the closure. In addition, given the limited access restrictions of permits for other fisheries, NMFS predicts that it would be difficult for fishermen to switch to a different gear and different fisheries unless they currently possess other permits. NMFS has looked at the effect of the current closures on a fishery-wide basis (please see the analysis of alternative B1 on pages 4-33 through 4-35). This analysis indicated that there was an overall 15 percent decline in fishing effort between 1997-1999 and 2001 – 2003 or since the existing closures went into place (Table 4.8). However, there was also a reported increase in fishing effort of about eight percent in the Gulf of Mexico during this time period (Table 4.8), suggesting some shift in effort, possibly due to the existing closures. At this time, NMFS cannot precisely predict how individual vessels would move in response to a closure. For the purpose of this analysis, NMFS believes it is reasonable to assume that some redistribution of effort will occur even though NMFS cannot predict how much or where. However, in the future, NMFS intends to investigate the choices fishermen have made regarding previous closures (*i.e.*, did they move, sell their permits, go out of business, retain their permit but fish for something else, etc?). This type of analysis could help NMFS improve the effort redistribution models used in the future.

NMFS' decision to not prefer any new closures, except the complementary measures in the Madison-Swanson and Steamboat Lumps Marine Reserves, and not to modify any existing closures at this time is based primarily upon the analyses described in this section indicating that no single closure or combination of closures would reduce the bycatch of all species considered, assuming there is some redistribution of effort (Table 4.5 and Table 4.15 and Tables A.37 through A.42). NMFS decision assumes that there will be some redistribution of effort if a new closure is implemented. While NMFS recognizes that the analysis of the change in effort and bycatch after implementation of existing closures indicates that reduction in bycatch may have been greater than predicted with redistribution of effort (Table 4.6 and Table 4.7), and in some cases, without redistribution of effort, there was also an increase in fishing effort in the open areas in the Gulf of Mexico after the implementation of the existing closures (Table 4.8), which suggests that fishing effort will be displaced to other areas. In addition, the existing closures were the first round of closures implemented for HMS. The reported reduction in bycatch and discards as a result of these initial closures may not be seen in the future from additional closures, especially given the reduced size of the PLL fleet since 1997 – 1999. Based on the results of these analyses and considering that some level of displaced effort will occur, NMFS does not feel it is appropriate to implement additional closures or modify existing closures at this time. Furthermore, while the Magnuson-Stevens Act provides NMFS the authority to manage all species, NMFS must balance the impacts of management measures on all managed species and may not choose protections for one species to the detriment of protected and overfished species (*e.g.*, NMFS may not choose to protect BFT even if sea turtle interactions or bycatch of overfished species may increase substantially). For instance, even with the additional scenarios of redistributed effort for B2(c), there is a predicted increase for LCS discards (12.8 percent or 2,545 over 3 ½ years), blue marlin discards (0.7 percent or 20 over 3 ½ years), sailfish discards (21.7 percent or 281 over 3 ½ years), and spearfish discards (2 percent or 10 over 3 ½ years)

(Table A.41). Given either the overfished stock status or unknown stock status of these species, NMFS does not prefer to implement a new closure, such as B2(c), at this time. National Standard 1, which requires NMFS to prevent overfishing while achieving on a continuing basis, the optimum yield from each fishery for the United States fishing industry, applies to all species and all fisheries. Similarly, National Standard 9, which requires NMFS to minimize bycatch and bycatch mortality to the extent practicable, applies to all species and fisheries. Furthermore, the economic impacts of each of the alternatives may be substantial, ranging in losses of up to several million dollars annually, depending upon the alternative, and displacement of a significant number of fishing vessels (Table 4.33 and Table 4.35). Thus, NMFS feels that the impact on all species must be considered and any negative impacts must be minimized.

Future Efforts

With regard to the Gulf of Mexico, although NMFS has decided to not move forward with B2(c), or any other closure in the Gulf of Mexico at this time, NMFS will be pursuing alternatives to reduce bycatch in the Gulf of Mexico, especially for BFT. NMFS has currently adopted all of the ICCAT recommendations regarding BFT, a rebuilding plan is in place domestically for this species, and NMFS has implemented measures to rebuild this overfished stock. NMFS is currently trying to assess how protecting one age class at the potential detriment of other age classes will affect the fish stock as a whole. For instance, how will protecting spawning BFT help rebuild the stock if it results in increased discards of non-spawning adults, juveniles, and sub-adult BFT along the eastern seaboard? Therefore, more information is needed to further understand how to manage this species given its complex migratory patterns, life history, and age structure. NMFS is also considering developing incentives that would dissuade fishermen from keeping incidentally caught BFT, particularly spawning BFT, in the Gulf of Mexico. This may involve research on how changes in fishing practices may help reduce bycatch of non-target species as well as the tracking of discards (dead and alive) by all gear types. In addition, sea surface temperatures in the Gulf of Mexico have recently been thought to be associated with congregations of BFT and putative BFT spawning grounds in the Gulf of Mexico (Block, pers. comm.). NMFS intends to investigate the variability associated with sea surface temperatures as well as the temporal and spatial consistency of the association of BFT with these temperatures regimes. By better understanding what influences the distribution and timing of BFT in the Gulf of Mexico, NMFS can work on developing tailored management measures over space and time to maximize ecological benefits while minimizing economic impacts to the extent practicable.

In addition, NMFS prefers not to implement new closures or modify existing closures because all of the data used in the time/area analyses were based on J-hook data. New circle hook management measures were put into place in 2004, and NMFS is still assessing the effects of circle hooks on bycatch rates for HMS. Until NMFS can better evaluate the effects of circle hooks on bycatch reduction, especially with regard to sea turtles interactions and bycatch of other non-target HMS, NMFS prefers not to implement new or modify the current time/area closures at this time. While time/area closures play an important part in resource management, a number of time/area closures have been implemented since 2000. Those closures are beginning to demonstrate their conservation benefits (for further discussion of the effect of current closures, refer to pages 4-33 through 4-35); however, NMFS is still trying to assess the effect of additional management measures, such as circle hooks, that have been implemented since 2000. NMFS

currently only has finalized data on the catch associated with circle hooks from July through December of 2004 (see Appendix A). Based on the NED experiment, circle hooks likely have a significantly different catch rate than J-hooks. Therefore, further investigations are required to determine the potential impact of any new time/area closures as well as assess the cumulative affect of current time/area closures and circle hooks. NMFS anticipates that 2005 HMS logbook final data will become available in the summer of 2006 when the quality control procedures on the 2005 HMS logbook data are complete.

NMFS is also awaiting additional information regarding the status of the PLL fleet after the devastating hurricanes in the Gulf of Mexico during the fall of 2005. A majority of the PLL fleet was thought to be severely damaged or destroyed during the 2005 hurricane season. The amount of PLL fishing effort, especially within the Gulf of Mexico, will be assessed in the summer of 2006 when 2005 HMS logbook final data becomes available. Until NMFS can better estimate the current fishing effort and potential recovery of the PLL fleet, NMFS believes it is premature to implement any new time/area closures at the present time. Additionally, a number of stock assessments will be conducted during 2006 (LCS, blue marlin, white marlin, North and South Atlantic swordfish, and eastern and western Atlantic BFT). NMFS is awaiting the results of these stock assessments to help determine domestic measures with regard to management of these species, especially for North Atlantic swordfish, white marlin and western Atlantic BFT.

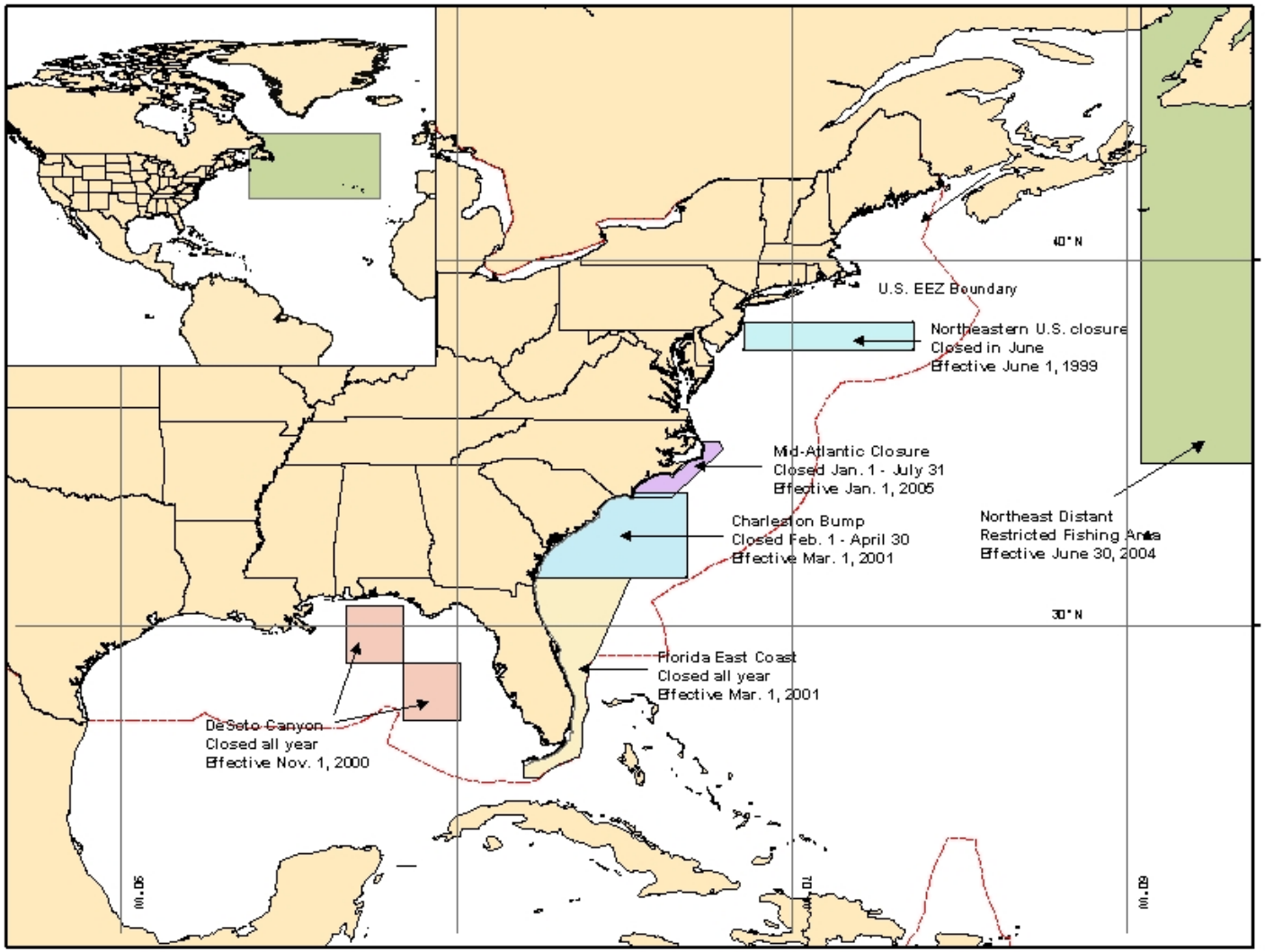


Figure 4.1 **Existing time/area closures in HMS fisheries. Inset shows extent of the Northeast Distant restricted fishing area. All closures except the Mid-Atlantic are applicable to PLL gear only. The Mid-Atlantic Closure is applicable to bottom longline gear only. Note: the Northeast Distant (NED) was a closed area to all vessels as of 2001. It became the NED Restricted Fishing Area on June 30, 2004 when it was opened to those participating in the NED experiment.**

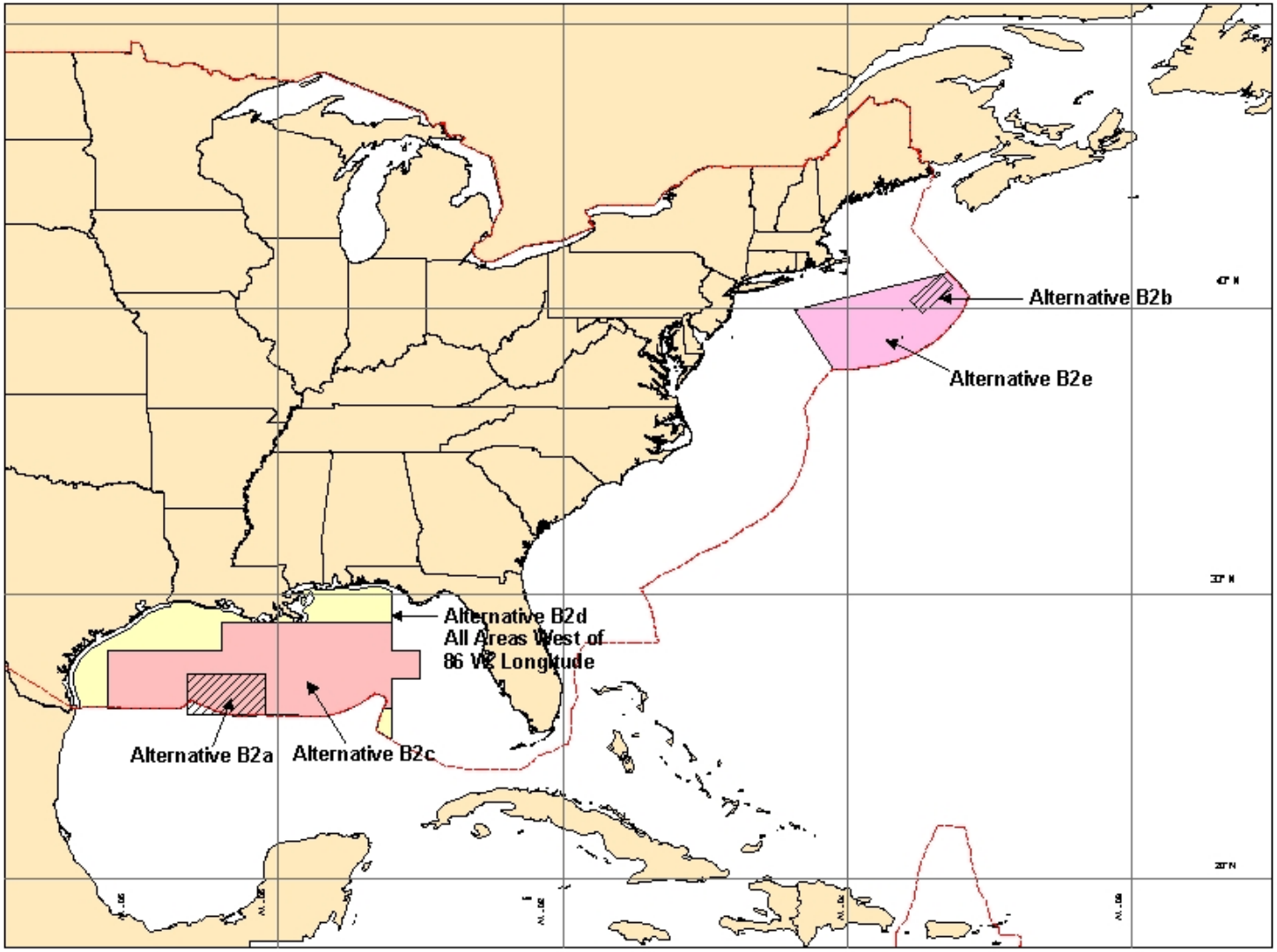


Figure 4.2 Map showing areas being considered for new time/area closures to reduce non-target HMS and protected species interactions.

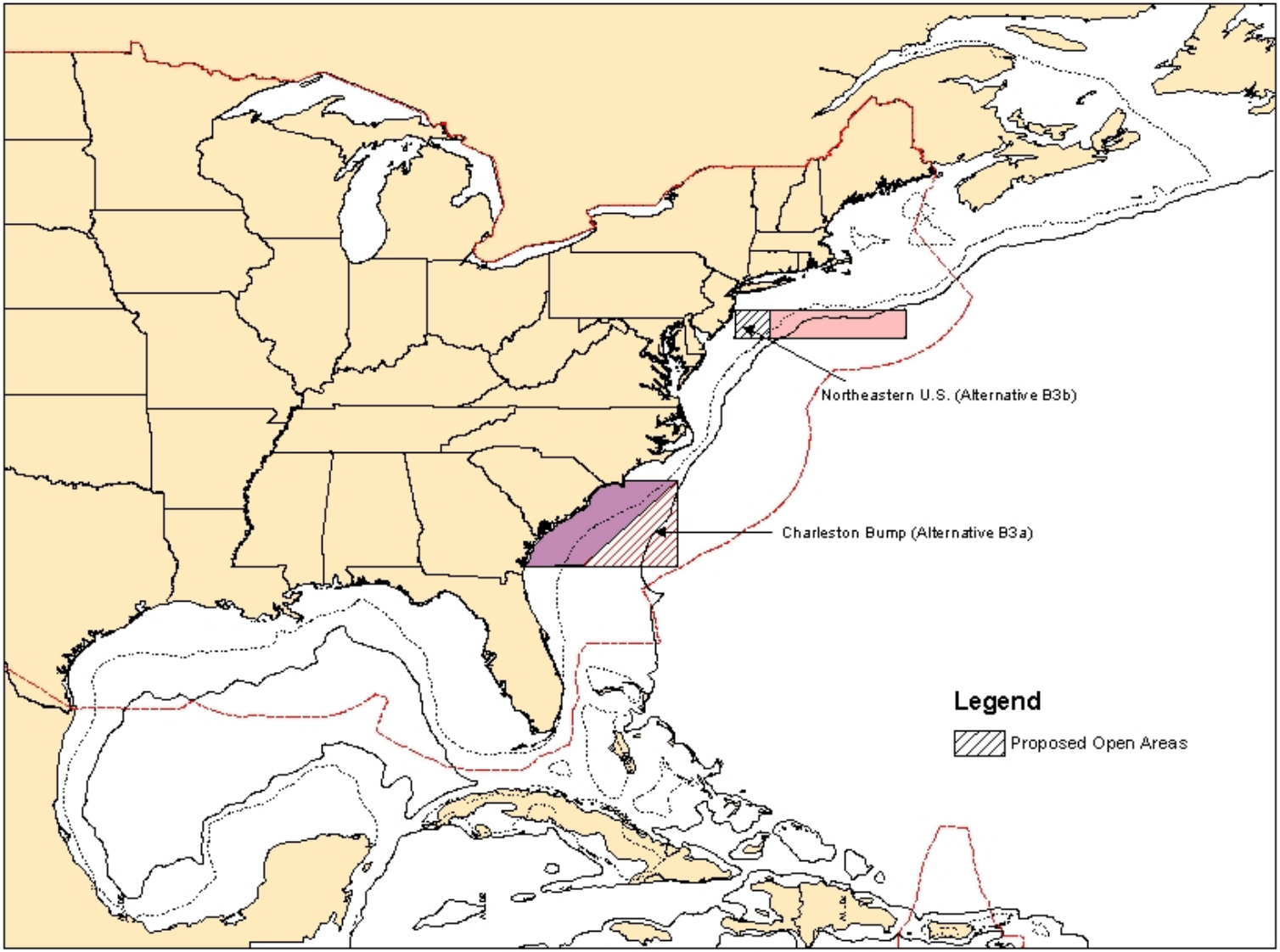


Figure 4.3 Map showing areas being considered for modifications to existing closures.

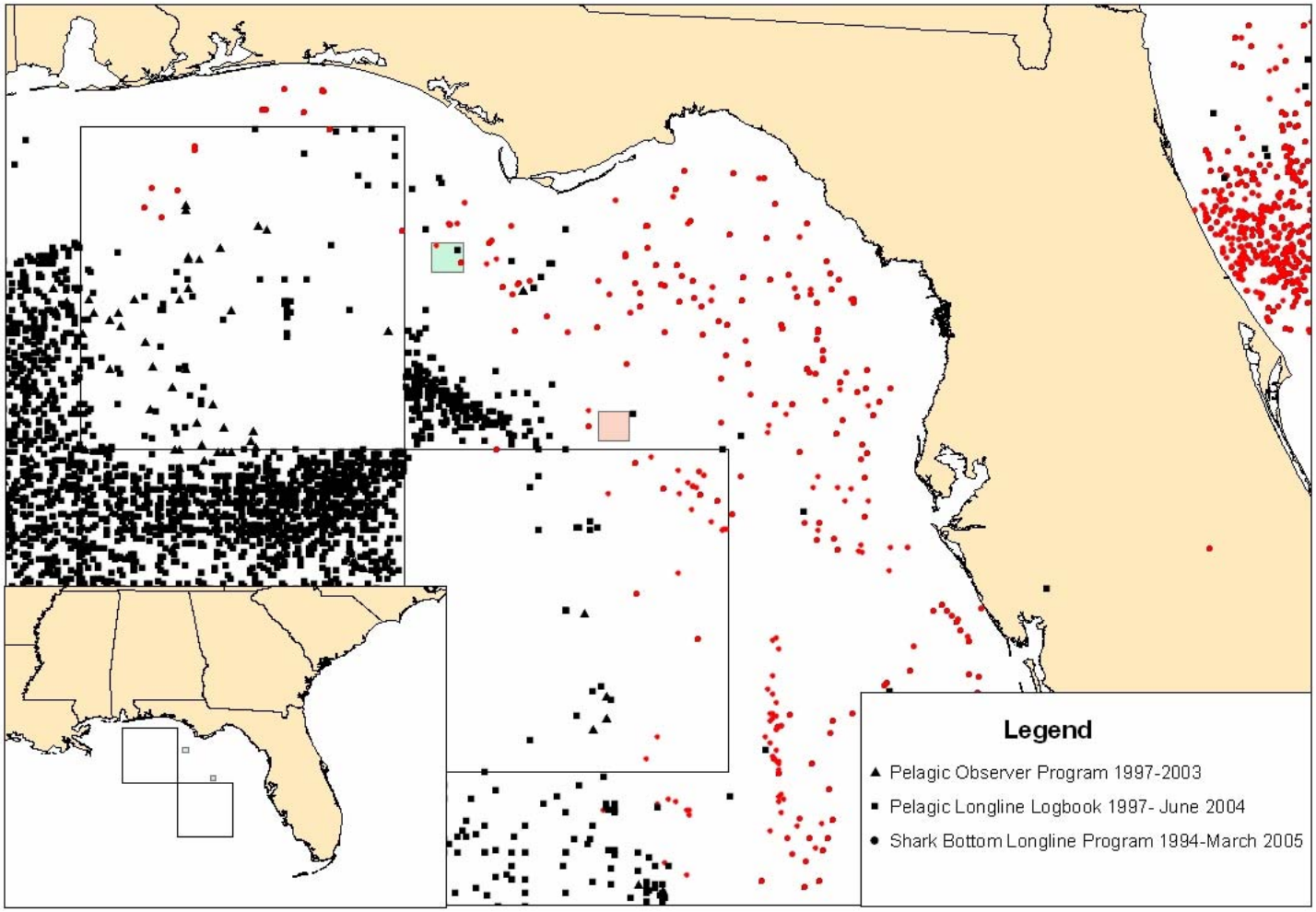


Figure 4.4 **Pelagic and Bottom Longline Sets in the Madison-Swanson (upper left) and Steamboat Lumps (lower right) Marine Reserves. Note: one set for the CSFOP was in 2005. Although not indicated, no new sets were recorded for the CSFOP in 2004.** Source: HMS Logbook, Pelagic Observer Program, Shark Observer Program. The Desoto Canyon closure is also shown for reference.

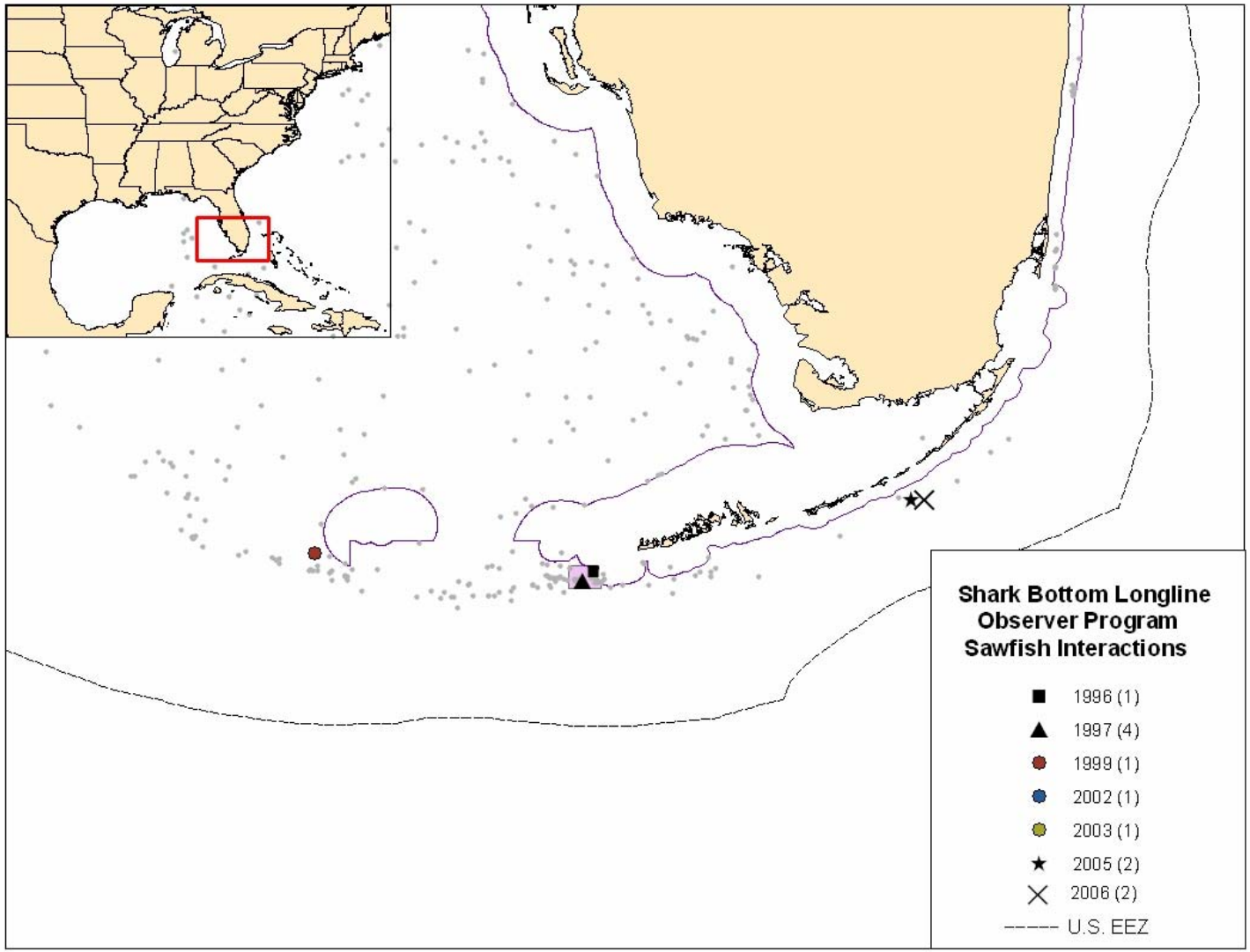


Figure 4.5 **Map showing the potential closed area to bottom longline gear to reduce bycatch of endangered smalltooth sawfish. Grey dots are locations of observed bottom longline sets.** Source: CSFOP 1994 – 2006.

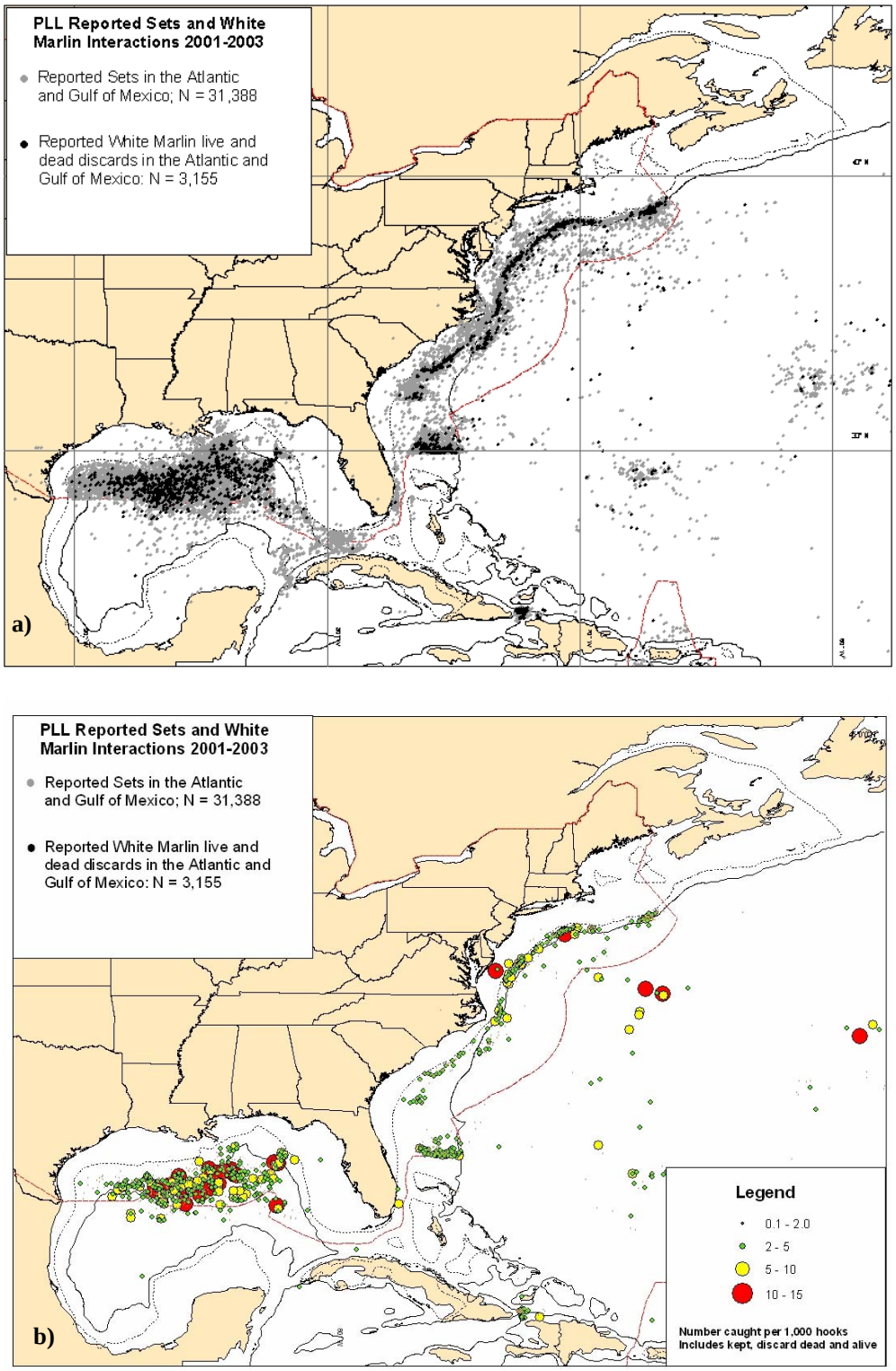


Figure 4.6 **Map showing all reported sets and white marlin interactions: a) shows the number of interactions in absolute numbers, b) shows CPUE (per 1,000 hooks).** Source: HMS Logbook 2001-2003.

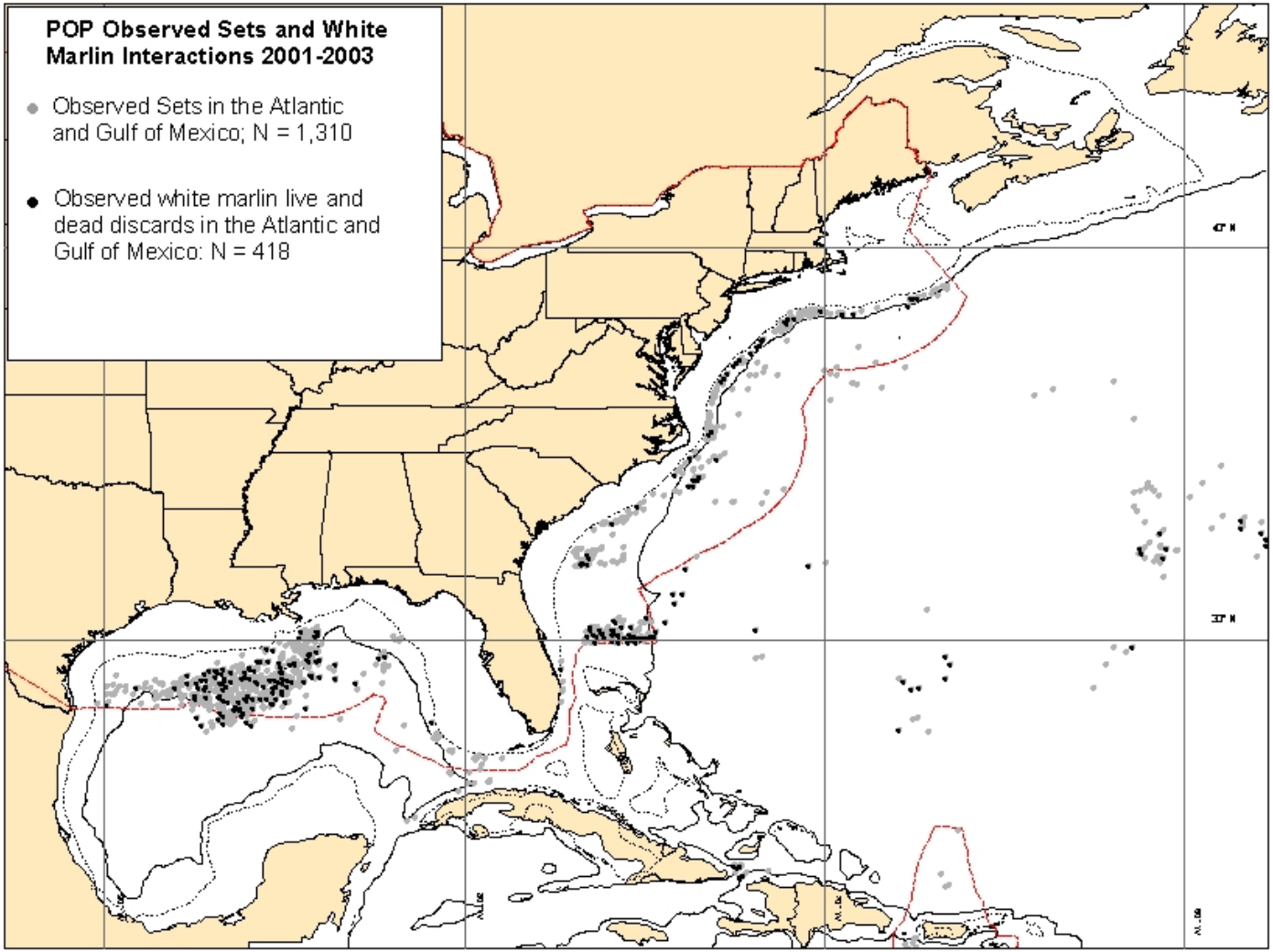


Figure 4.7 Map showing all observed sets and white marlin interactions. Source: Pelagic Observer Program 2001-2003.

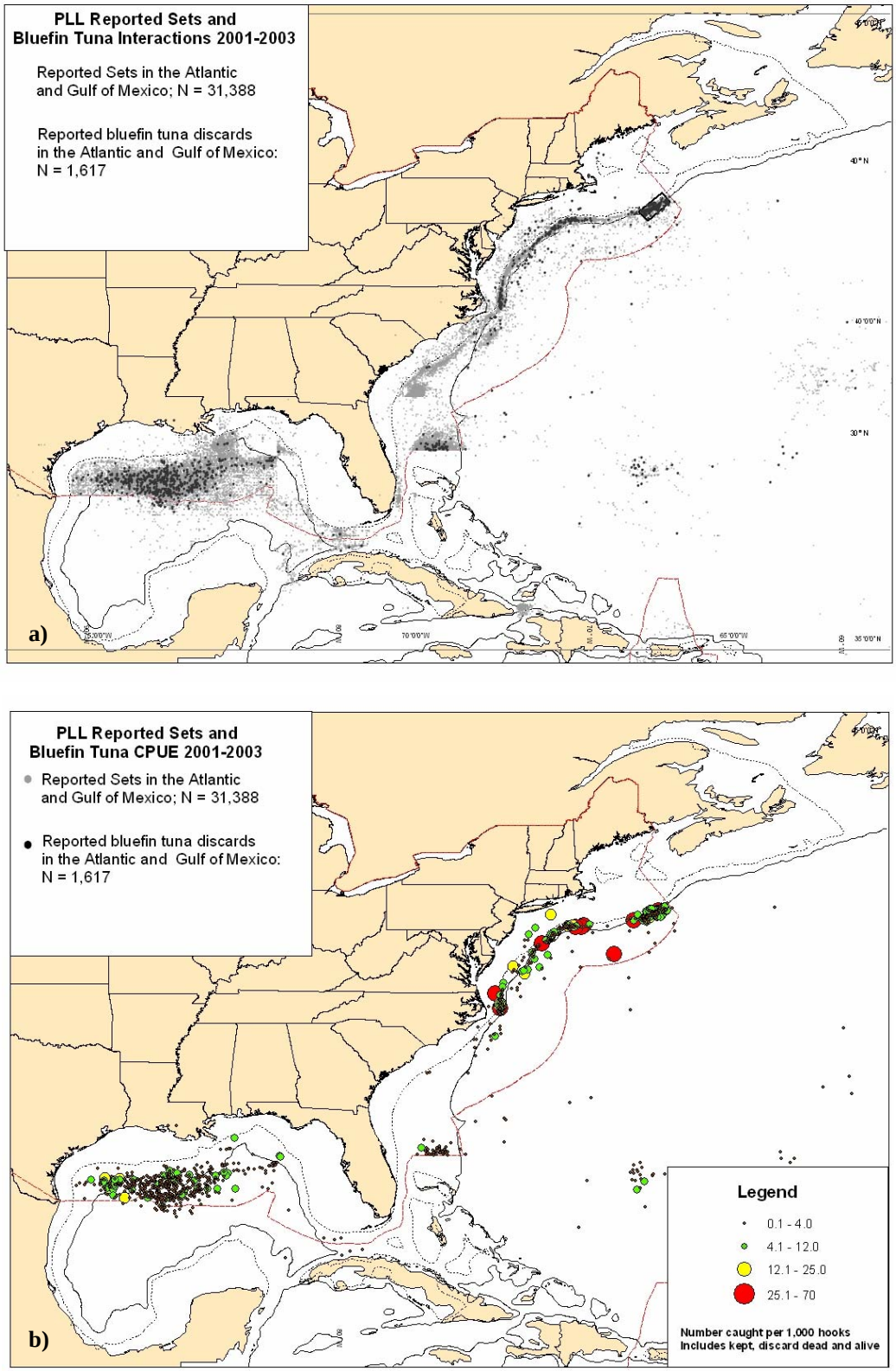


Figure 4.8 **Map showing all reported sets and bluefin tuna discards: a) shows the number of interactions in absolute numbers, b) shows CPUE (per 1,000 hooks).** Source: HMS Logbook 2001-2003.

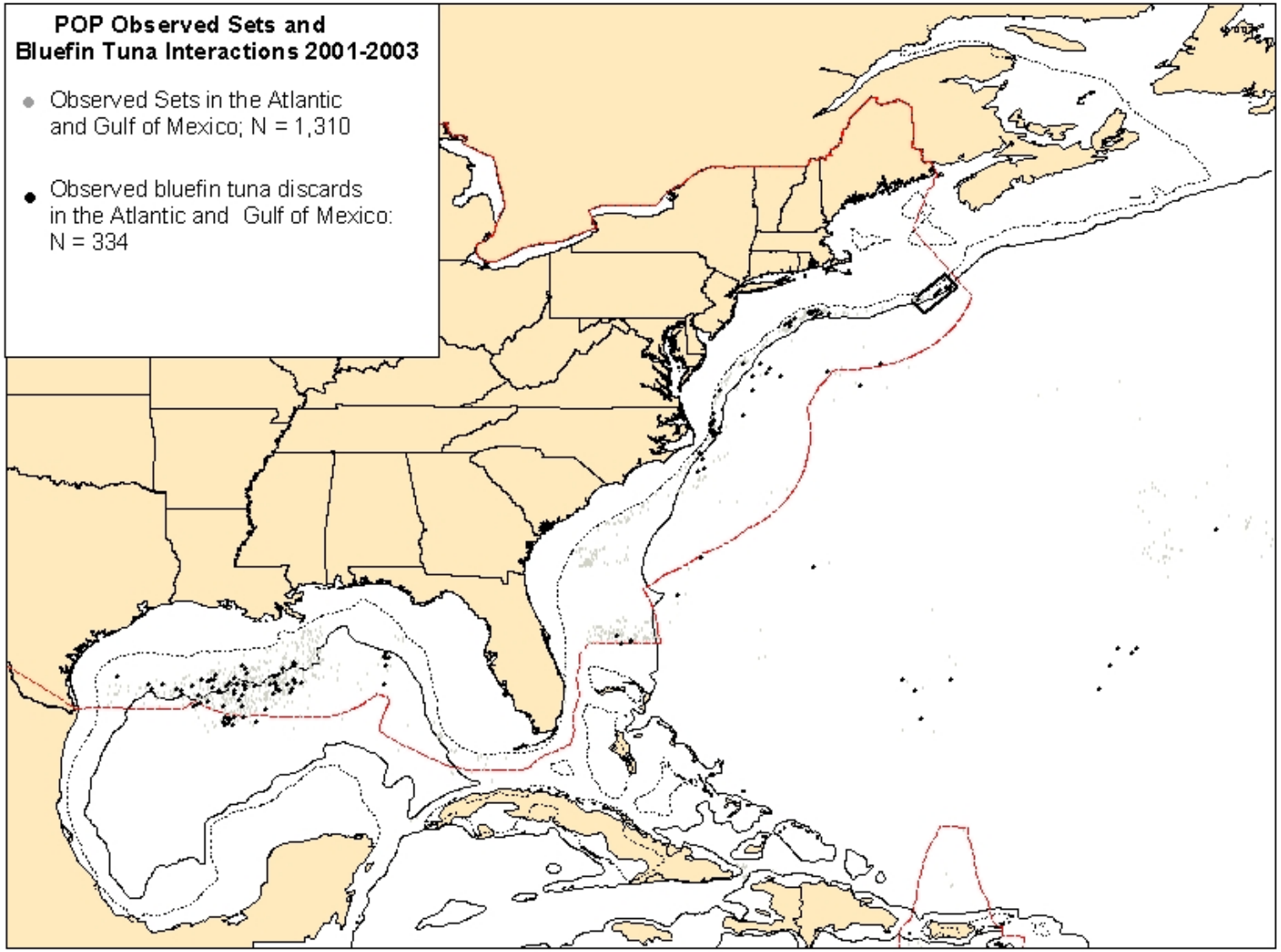


Figure 4.9 Map showing all observed sets and bluefin tuna discards. Source: Pelagic Observer Program 2001-2003.

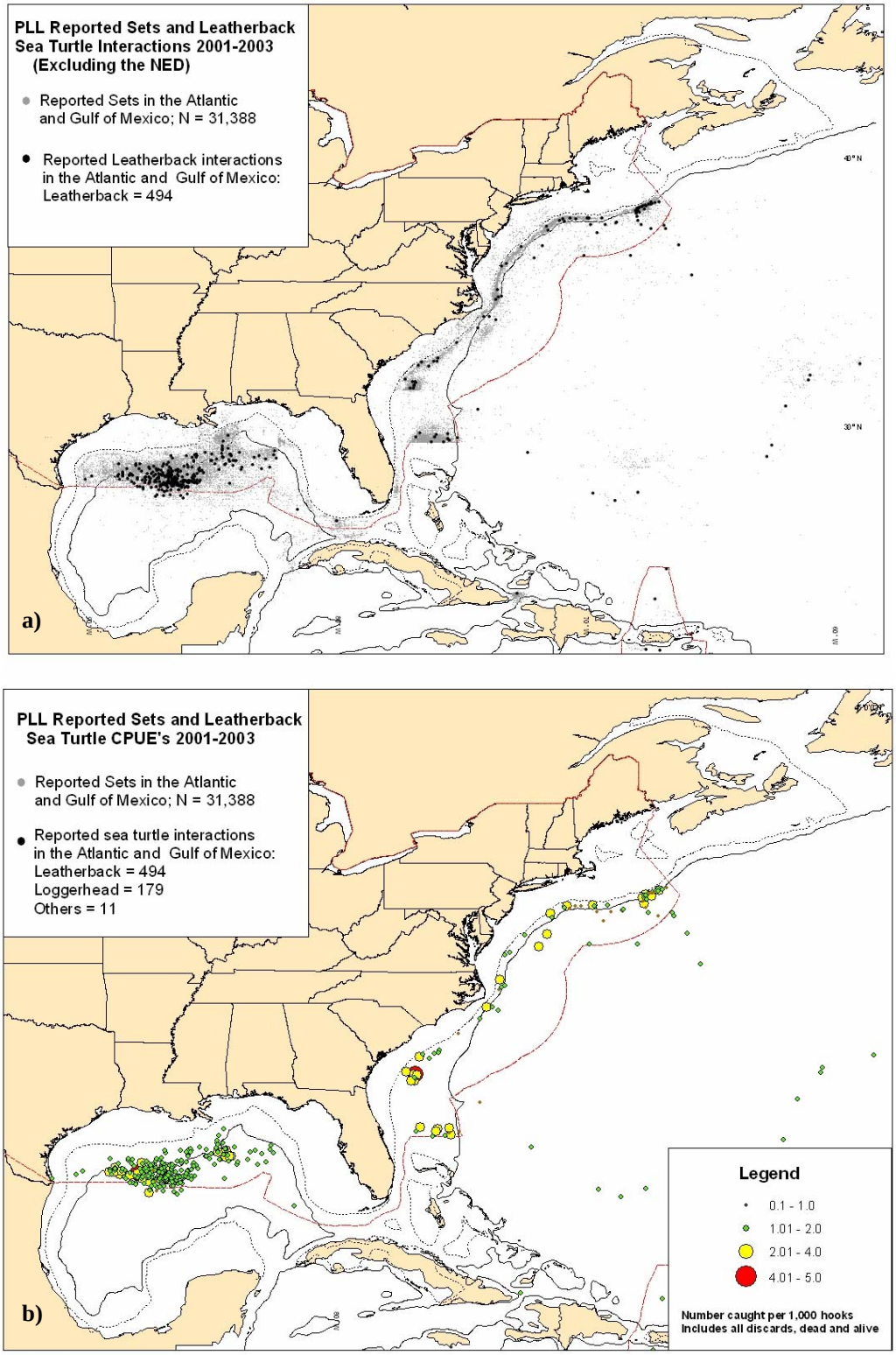
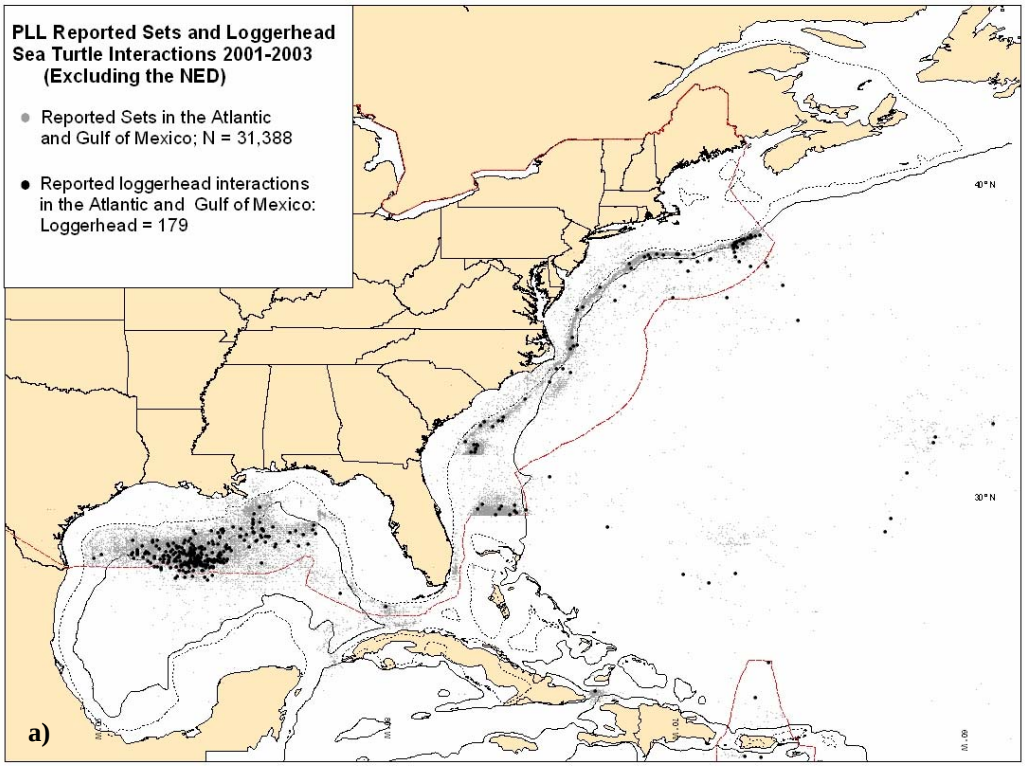


Figure 4.10 Map showing all reported sets and leatherback sea turtle interactions: a) shows the number of interactions in absolute numbers, b) shows CPUE (per 1,000 hooks). Source: HMS Logbook 2001-2003.



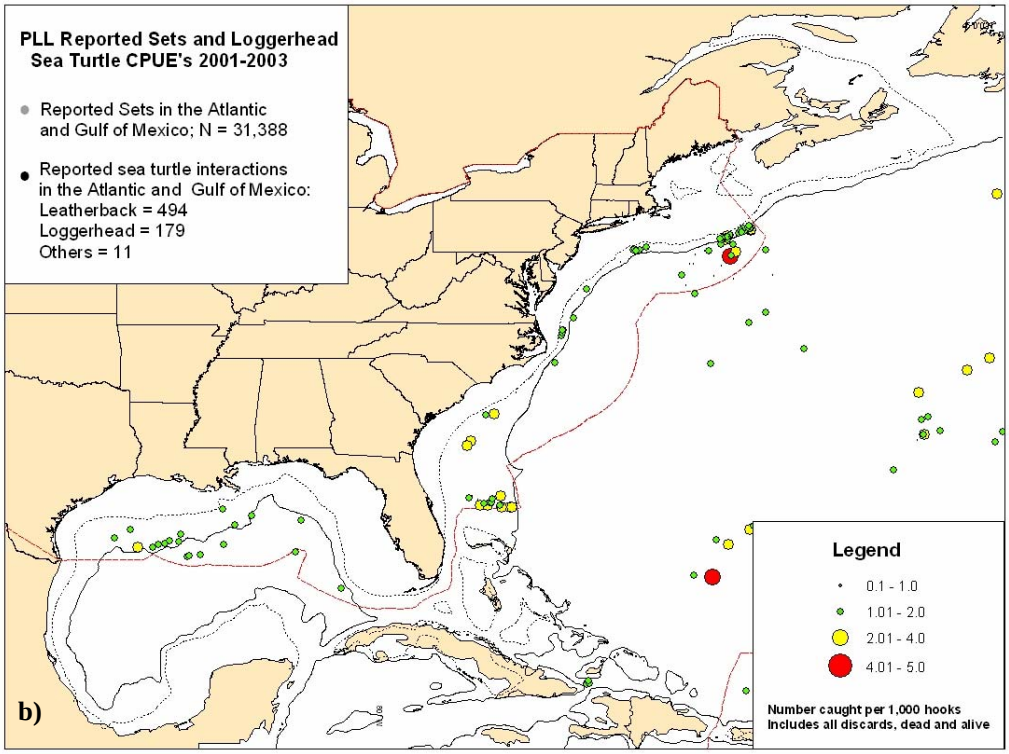


Figure 4.11 Map showing all reported sets and loggerhead sea turtle interactions: a) shows the number of interactions in absolute numbers, b) shows CPUE (per 1,000 hooks). Source: HMS Logbook 2001-2003.

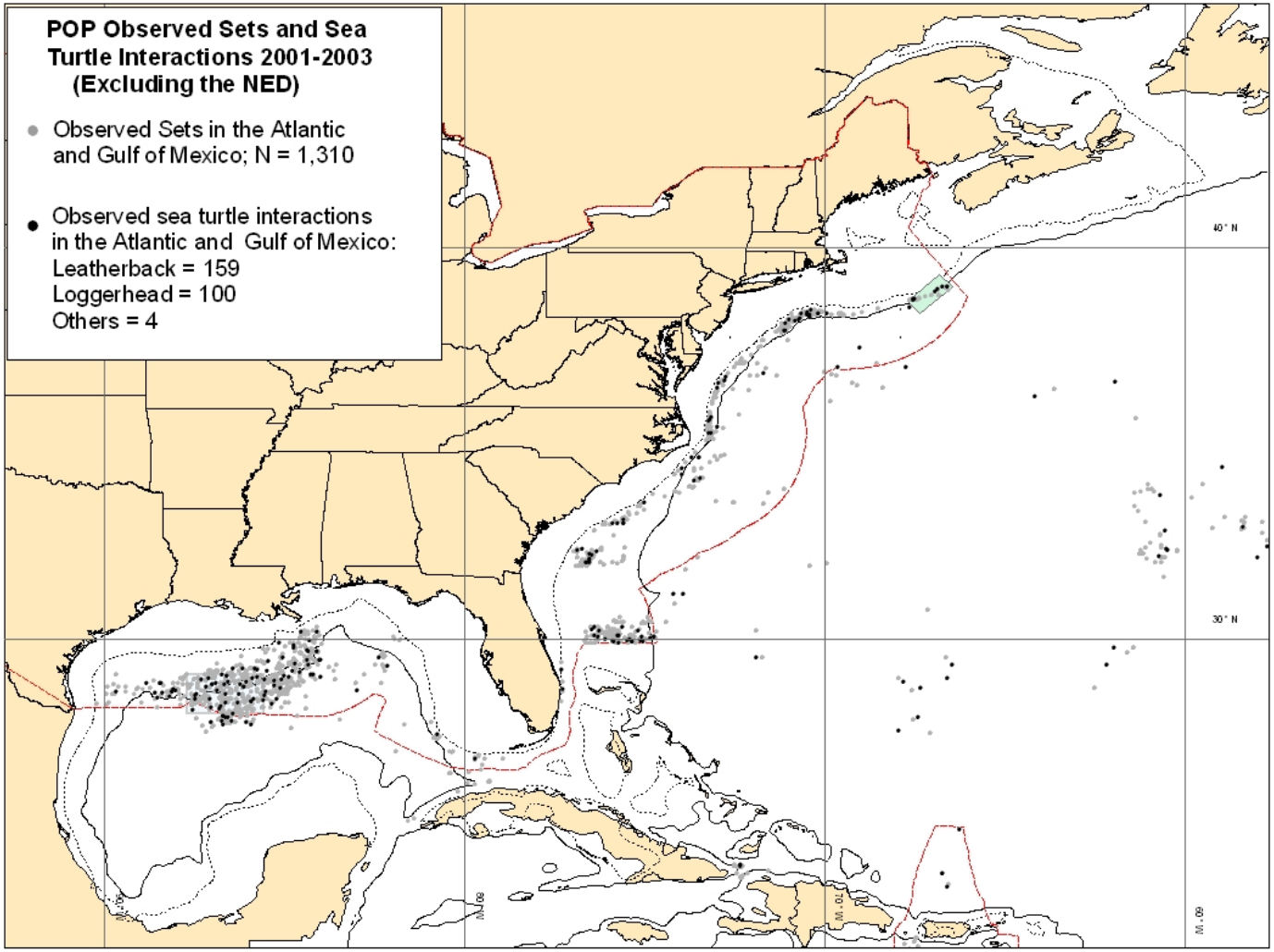


Figure 4.12 Map showing all observed sets and sea turtle interactions. Source: Pelagic Observer Program 2001 – 2003.

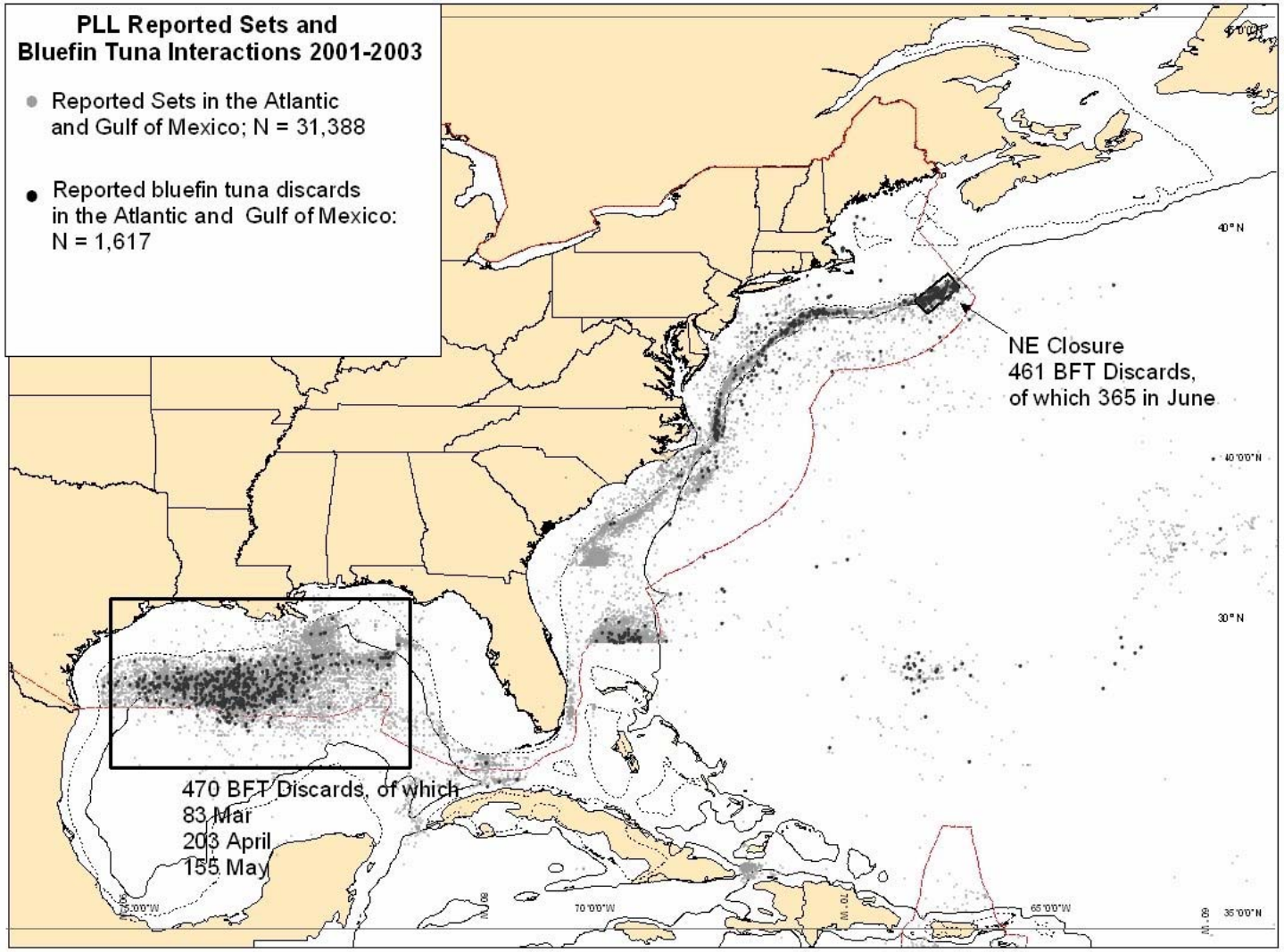


Figure 4.13 **Map showing discards of bluefin tuna in the Atlantic and Gulf of Mexico from 2001-2003. The large box is not a proposed time/area closure, but is shown for illustrative purpose only to delineate an area with high bluefin tuna discards. The bluefin tuna discards are listed by month below the box.** Source: HMS Logbook 2001-2003.

Table 4.4 **Percent change in discards of white marlin, blue marlin, sailfish, spearfish, leatherback, loggerhead, and other sea turtles, and bluefin tuna kept and discards combined, based on various time/area closure alternatives without redistribution of effort. + = increase and - = decrease in discards or bycatch. Three year totals are shown; one year averages can be obtained by dividing the three year total by three.** Source: Pelagic Observer Program data (2001 – 2003).

Alternative	**White Marlin discards**	**Blue Marlin discards**	**Sailfish discards**	**Spearfish discards**	**Bluefin Tuna Discards**	**Leatherback Sea Turtles**	**Loggerhead Sea Turtles**	**Other Sea Turtles**
Alternative B2(a) (year-round)	-14.6%	-11.1%	-20.9%	-4.5%	-12.2%	-18.9%	-7.0%	-25.0%
Alternative B2(a) (May-Nov)	-13.2%	-9.3%	-19.6%	-4.5%	-7.0%	-11.3%	-4.0%	0.0%
Alternative B2(b) (year-round)	-1.4%	-0.7%	0.0%	0.0%	-16.2%	-0.6%	-9.0%	0.0%
Alternative B2(b) (June only)	0.0%	0.0%	0.0%	0.0%	-15.4%	0.0%	-6.0%	0.0%
Alternative B2(c) (April-June)	-8.4%	-11.1%	-14.2%	-2.3%	-18.4%	-15.1%	-7.0%	-25.0%
Alternative B2(d) (year-round)	-38.8%	-26.8%	-52.0%	-15.9%	-24.3%	-52.8%	-14.0%	-75.0%
Alternative B2(e) (year-round)	-3.3%	-1.1%	0.0%	-2.3%	-44.3%	-6.9%	-16.0%	0.0%

Table 4.5 **Percent change in discards of white marlin, blue marlin, sailfish, spearfish, leatherback, loggerhead, and bluefin tuna based on various time/area closure alternatives with and without redistribution of effort. + = increase and - = decrease in discards or bycatch. Three year totals are shown; one year averages can be obtained by dividing the three year total by three.** Source: HMS Logbook data (2001 – 2003).

Alternative	White Marlin discards	Blue Marlin discards	Sailfish discards	Spearfish discards	Leatherback Sea Turtles	Loggerhead Sea Turtles	Bluefin Tuna discards
	WITHOUT REDISTRIBUTION OF EFFORT						
Alternative B2(a) (year-round)	-16.0%	-19.9%	-15.8%	-14.9%	-34.6%	-5.0%	-12.2%
Alternative B2(a) (May-Nov)	-14.7%	-17.6%	-14.2%	-11.3%	-15.4%	-3.4%	-4.6%
Alternative B2(b) (year-round)	-3.9%	-0.9%	-0.1%	-0.5%	-5.7%	-20.7%	-28.5%
Alternative B2(b) (June only)	-0.4%	-0.2%	0.0%	0.0%	-2.0%	-11.2%	-22.6%
Alternative B2(c) (April-June)	-10.3%	-10.0%	-12.1%	-8.3%	-11.1%	-3.9%	-21.5%
Alternative B2(d) (year-round)	-47.3%	-57.0%	-62.4%	-83.5%	-57.5%	-10.1%	-27.1%
Alternative B2(e) (year-round)	-8.7%	-1.6%	-0.3%	-1.9%	-9.9%	-36.3%	-43.3%
	WITH REDISTRIBUTION OF EFFORT						
Alternative B2(a) (year-round)	0.9%	-4.0%	1.1%	4.0%	-20.0%	15.0%	7.9%
Alternative B2(a) (May-Nov)	-2.7%	-7.3%	-0.8%	-2.1%	-8.0%	7.9%	10.3%
Alternative B2(b) (year-round)	3.5%	6.7%	8.3%	4.8%	-1.7%	-18.5%	-27.0%
Alternative B2(b) (June only)	1.0%	0.9%	1.7%	0.8%	-1.3%	-10.3%	-21.9%
Alternative B2(c) (April-June)	7.0%	2.0%	4.4%	13.2%	-2.6%	23.5%	9.8%
Alternative B2(d) (year-round)	0.3%	-20.3%	-26.8%	-73.3%	-21.3%	65.5%	38%
Alternative B2(e) (year-round)	6.0%	14.7%	17.7%	9.1%	-0.6%	-33.3%	-40.7%
	COMBINATIONS WITH REDISTRIBUTION OF EFFORT						
Alternative B2(a)/B2(b) (year-round)	4.3%	3.3%	11.9%	8.6%	-22.7%	-7.3%	-19.1%
Alternative B2(a) (May-Nov)/B2(b) (June)	-1.7%	-6.7%	1.5%	-2.3%	-8.4%	-3.1%	-13.6%
Alternative B2(d)/B2(e) (year-round)	6.5%	-3.5%	-3.1%	12.1%	-30.2%	4.8%	-35.2%

Alternative	White Marlin discards	Blue Marlin discards	Sailfish discards	Spearfish discards	Leatherback Sea Turtles	Loggerhead Sea Turtles	Bluefin Tuna discards
	COMBINATIONS W/ REDISTRIBUTION OF EFFORT & REOPENED AREAS						
B3(a): Partial Reopening of Charleston Bump and:							
Alternative B2(a)/B2(b) (year-round)	4.9%	4.0%	12.9%	9.5%	-22.7%	-6.7%	-24.3%
Alternative B2(a) (May-Nov)/B2(b) (June)	-1.4%	-6.1%	2.5%	-1.4%	-8.4%	-2.5%	-13.6%
Alternative B2(d)/B2(e) (year-round)	6.8%	-3.6%	-2.4%	-13.1%	-30.2%	5.4%	-35.2%
B3(b): Partial Reopening of Northeastern U.S. closure and:							
Alternative B2(a)/B2(b) (year-round)	4.3%	3.3%	11.9%	8.6%	-22.7%	-7.3%	-24.24%
Alternative B2(a) (May-Nov)/B2(b) (June)	-1.7%	-6.7%	1.5%	-2.3%	-8.4%	-3.1%	-13.54%
Alternative B2(d)/B2(e) (year-round)	6.5%	-3.5%	-3.1%	12.1%	-30.2%	4.8%	-35.14%

Table 4.6 **Total number of swordfish, bluefin tuna, yellowfin tuna, bigeye tuna, total BAYS (bigeye, albacore, yellowfin and skipjack tuna), reported landed or discarded in the U.S. Atlantic PLL fishery, 1997 – 2003. Pred [1] = without redistribution of effort, Pred [2] = with redistribution of effort. Predictions were predicted back in 2000.** Source: HMS Logbook data.

Year	Number of hooks set (x1000)	Swordfish kept	Swordfish discards	Bluefin Tuna kept	Bluefin Tuna discards	Yellowfin Tuna kept	Yellowfin Tuna discards	Bigeye Tuna kept	Bigeye Tuna discards	Total BAYS kept	Total BAYS discards
1997	9,637.8	68,691	20,433	178	681	74,035	1,847	21,405	1,611	102,706	4,223
1998	8,019.2	70,310	23,234	231	1,320	54,662	2,628	19,259	874	81,610	3,932
1999	7,901.8	67,120	20,558	263	604	83,619	2,885	22,467	906	114,438	4,384
2000	7,975.5	62,978	17,074	235	737	72,385	1,769	13,678	344	94,136	2,944
2001	7,564.0	47,560	13,993	177	348	52,337	1,798	18,216	554	80,466	3,757
2002	7,150.2	49,320	13,035	178	585	59,255	1,635	13,826	277	79,917	2,552
2003	7,008.1	51,835	11,829	273	881	50,817	1,987	7,473	337	63,321	2,763
1997-99	8,519.6	68,707	21,408	224	868	70,772	2,453	21,044	1,130	99,585	4,180
2001-03	7,240.8	49,572	12,952	209	605	54,136	1,807	13,172	389	74,568	3,024
% dif	-15.0	-27.9	-39.5	-6.7	-30.3	-23.5	-26.3	-37.4	-65.6	-25.1	-27.7
Pred 1		-24.6	-41.5		-1.0					-5.2	
Pred 2		-13.0	-31.4		10.7					10.0	

Table 4.7 **Total number of pelagic sharks, large coastal sharks, dolphin (mahi mahi), and wahoo reported landed or discarded and number of billfish (blue and white marlin, sailfish, spearfish) and sea turtles caught and discarded in the U.S. Atlantic PLL fishery, 1997 – 2003. Pred [1] = without redistribution of effort, Pred [2] = with redistribution of effort. Predictions were predicted back in 2000.** Source: HMS logbook data.

Year	Number of hooks set (x1000)	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	9,637.8	5,078	81,518	13,217	7,762	62,770	1,201	4,503	90	2,290	2,422	1,735	380	267
1998	8,019.2	3,717	44,516	6,401	5,470	23,503	298	5,253	305	1,295	1,506	843	103	886
1999	7,901.8	2,894	28,967	6,382	5,442	31,536	320	5,136	128	1,253	1,969	1,407	151	631
2000	7,975.5	3,065	28,046	7,896	6,973	29,125	292	4,193	46	1,443	1,261	1,091	78	271
2001	7,564.0	3,460	23,813	6,478	4,836	27,586	325	3,068	62	635	848	356	137	424
2002	7,150.2	2,987	22,828	4,077	3,815	30,384	185	4,188	32	1,175	1,438	379	148	465
2003	7,008.1	3,037	21,705	5,326	4,813	29,372	451	3,919	126	595	809	277	108	399
1997 – 1999	8,519.6	3,896	51,667	8,667	6,225	39,270	606	4,964	174	1,613	1,966	1,328	211	595
2001 – 2003	7,240.8	3,161	22,782	5,294	4,488	29,114	320	3,725	73	802	1,032	337	131	429
% dif	-15.0	-18.9	-55.9	-38.9	-27.9	-25.9	-47.2	-25	-58.1	-50.3	-47.5	-74.6	-37.9	-27.9
Pred 1		-9.5	-2.0	-32.1	-42.5	-29.3				-12.0	-6.4	-29.6		-1.9
Pred 2		4.1	8.4	-18.5	-33.3	-17.8				6.5	10.8	-14.0		7.1

Table 4.8 Reported distribution of hooks set by area, 1995-2003 (CAR=Caribbean, GOM=Gulf of Mexico, FEC=Florida East Coast, SAB=South Atlantic Bight, MAB=Mid-Atlantic Bight, NEC=Northeast Coastal, NED=Northeast Distant, SAR=Sargasso, NCA=North Central Atlantic, and TUNS=Tuna North & Tuna South). Source: HMS logbook data.

Year	**CAR**	GOM	FEC	SAB	MAB	NEC	NED	SAR	NCA	TUNS	Total
1995	688,754	2,662,303	646,841	852,230	2,394,364	1,072,433	765,485	16,430	785,727	297,730	10,182,297
1996	651,673	3,530,127	574,284	1,588,944	1,039,594	1,137,229	588,782	87,285	501,674	611,116	10,310,708
1997	473,500	3,402,436	784,920	946,220	1,203,832	1,226,406	688,344	21,640	209,946	680,563	9,637,807
1998	333,766	3,003,054	667,592	719,125	1,319,860	883,059	503,579	3,500	247,457	338,191	8,019,183
1999	177,628	3,619,402	709,809	769,738	1,276,008	587,225	338,719	17,795	117,031	288,434	7,901,789
2000	259,369	3,648,345	700,505	810,272	1,032,173	610,103	544,549	10,959	236,864	122,390	7,975,529
2001	196,733	3,453,533	467,155	725,951	1,092,030	865,531	316,559	11,437	256,383	178,639	7,563,951
2002	169,562	3,577,753	495,245	435,231	1,011,138	550,096	456,668	104,165	215,121	135,252	7,150,231
2003	137,315	3,808,066	494,113	537,660	692,196	448,438	576,727	112,787	132,205	68,600	7,008,107
1997 – 1999	328,298	3,341,631	720,774	811,694	1,266,567	898,897	510,214	14,312	191,478	435,729	8,519,593
2001 – 2003	167,870	3,613,117	485,504	566,281	931,788	621,355	449,985	76,130	201,236	127,497	7,240,763
% dif	-48.9	8.1	-32.6	-30.2	-26.4	-30.9	-11.8	431.9	5.1	-70.7	-15.0

Table 4.9 **Number of bluefin tuna (BFT), swordfish (SWO), sharks (PEL-pelagic; LCS-Large Coastal Sharks), billfish, and turtles kept and/or discarded in the Mid-Atlantic Bight (MAB) and Northeast Coastal (NEC) areas combined versus all other areas as reported in the pelagic logbook data, 1995-2003.** Source: HMS logbook Data.

			SPECIES									
Area	**Year**	**Hooks set (x1000)**	**BFT kept**	**BFT discards**	**SWO kept**	**SWO discards**	**PEL shark kept**	**PEL shark discards**	**LCS kept**	**LCS discards**	**Billfish discards**	**Turtle interactions**
MAB & NEC	1995	3,466.8	95	2,755	5,824	5,382	2,647	36,395	7,717	2,121	1,454	80
	1996	2,176.8	74	1,596	3,108	871	2,456	37,638	6,433	1,975	1,179	20
	1997	2,430.2	71	558	6,247	3,642	3,043	40,085	6,423	928	800	52
	1998	2,209.2	93	1,156	9,659	4,943	2,136	27,889	1,837	907	399	54
	1999	1,863.2	70	335	8,168	4,308	1,727	12,468	1,974	746	816	174
	2000	1,892.5	29	437	11,168	3,756	2,229	15,689	4,796	1,433	262	39
	2001	1,957.6	45	200	10,559	3,981	2,506	8,903	4,383	991	307	69
	2002	1,561.2	18	380	10,704	4,212	2,324	7,005	2,331	1,207	311	40
	2003	1,140.6	67	471	10,752	2,951	2,135	6,875	2,761	1,384	169	42
All Other Areas (non-MAB/NEC)	1995	6,715.5	137	96	66,795	24,367	3,007	53,787	17,469	6,121	6,165	1,047
	1996	8,137.3	124	105	70,168	23,514	2,978	47,388	13,815	8,246	6,445	472
	1997	7,210.6	107	123	62,470	16,801	2,037	41,433	6,794	6,834	6,029	215
	1998	5,816.3	138	164	60,651	18,291	1,581	16,627	4,564	4,563	3,348	832
	1999	6,038.6	193	269	58,952	16,250	1,167	16,499	4,408	4,696	3,964	457
	2000	6,333.2	209	382	54,319	13,743	970	15,038	3,106	5,563	3,633	241
	2001	5,606.4	132	148	37,001	10,012	954	14,910	2,095	3,845	1,669	355
	2002	5,589	160	205	38,616	8,823	663	15,823	1,746	2,608	2,829	425
	2003	5,867.5	206	410	41,083	8,878	902	14,830	2,565	3,429	1,620	357

Table 4.10 **Alternative B2(a). Example of temporal variation in effectiveness of the closure on discards from May through November with redistribution of effort in (a) all open areas and (b) in the Gulf of Mexico only. Totals and percent changes are for months of May-Nov only. * excluding the NED. + = increase and - = decrease in discards or bycatch. Three year totals are shown; one year averages can be obtained by dividing the three year total by three.** Source: HMS Logbook data (2001-2003).

a) Month	Number of hooks set	White Marlin discards	Blue Marlin discards	Sailfish discards	Spearfish discards	Pelagic Shark discards	Large Coastal Shark discards	Leatherback Sea Turtles	Loggerhead Sea Turtles	Other Sea Turtles
1	354,851	14	16	5	4	19	24	11	1	0
2	183,157	2	4	1	0	18	61	9	0	0
3	239,525	3	4	2	3	19	56	18	1	0
4	337,802	7	13	5	5	27	27	16	0	2
5	412,790	37	21	14	5	25	35	10	5	0
6	343,018	124	89	26	7	15	45	12	0	0
7	287,935	121	127	37	13	10	24	9	1	0
8	354,682	67	66	22	5	13	24	5	0	0
9	277,354	45	58	21	4	15	31	7	0	0
10	329,758	40	49	13	11	10	38	18	0	0
11	341,643	29	22	13	3	11	24	15	0	0
12	347,767	14	18	4	3	20	21	41	1	3
Total (May-Nov)	2,347,180	463	432	146	48	99	410	76	6	0
All Areas*	21,148,706	3,143	2,449	1,029	424	34,020	16,573	494	179	11
% Reduction without redistribution of effort	-11.1%	-14.7%	-17.6%	-14.2%	-11.3%	-0.3%	-2.5%	-15.4%	-3.4%	0.0%
% Reduction with redistribution of effort	0.0%	-2.7%	-7.3%	-0.8%	-2.1%	14.5%	11.7%	-8.0%	7.9%	-7.1%

b) Month	Number of hooks set	White Marlin discards	Blue Marlin discards	Sailfish discards	Spearfish discards	Pelagic Shark discards	Large Coastal Shark discards	Leatherback Sea Turtles	Loggerhead Sea Turtles	Other Sea Turtles
1	354,851	14	16	5	4	19	24	11	1	0
2	183,157	2	4	1	0	18	61	9	0	0
3	239,525	3	4	2	3	19	56	18	1	0
4	337,802	7	13	5	5	27	27	16	0	2
5	412,790	37	21	14	5	25	35	10	5	0
6	343,018	124	89	26	7	15	45	12	0	0
7	287,935	121	127	37	13	10	24	9	1	0
8	354,682	67	66	22	5	13	24	5	0	0
9	277,354	45	58	21	4	15	31	7	0	0
10	329,758	40	49	13	11	10	38	18	0	0
11	341,643	29	22	13	3	11	24	15	0	0
12	347,767	14	18	4	3	20	21	41	1	3
Total (May-Nov)	2,347,180	463	432	146	48	99	221	76	6	0
All Areas*	21,148,706	3,143	2,449	1,029	424	34,020	16,573	494	179	11
% Reduction without redistribution of effort	-11.1%	-14.7%	-17.6%	-14.2%	-11.3%	-0.3%	-1.3%	-15.4%	-3.4%	0.0%
% Reduction with redistribution of effort		-4.4%	-5.8%	1.8%	3.3%	0.3%	3.6%	-9.4%	-1.4%	0.0%
No. reduced with redist. of effort		-139	-142	18	14	112	598	-46	-3	0

Table 4.11 Alternative B2(a). Percent change in incidental bluefin tuna and target catch and discards with and without redistribution of effort year-round and May-November with redistribution of effort into (a) all open areas and (b) in the Gulf of Mexico only. * excluding the NED. - + = increase and - = decrease in discards or retained catch. Three year totals are shown; one year averages can be obtained by dividing the three year total by three. Source: HMS Logbook data (2001-2003).

a) Month	Number of hooks set	Swordfish kept	Swordfish discards	Bluefin tuna kept	Bluefin tuna discards	Yellowfin tuna kept	Yellowfin tuna discards	Bigeye tuna kept	Bigeye tuna discards	BAYS kept	BAYS discards
1	355,191	1,110	488	9	2	3,425	105	95	1	3,563	110
2	193,937	928	361	14	2	853	13	40	1	904	14
3	242,885	718	468	29	36	1,678	42	9	0	1,691	48
4	347,360	556	656	32	82	3,726	121	10	0	3,738	122
5	424,810	526	991	31	71	3,923	335	2	0	3,928	345
6	352,129	597	543	7	3	4,333	176	17	0	4,350	198
7	304,242	414	241	0	0	3,978	103	33	0	4,017	120
8	351,376	602	239	0	0	3,184	85	46	0	3,249	96
9	281,104	452	262	0	1	2,515	45	34	0	2,553	80
10	337,578	635	396	0	0	3,053	139	121	2	3,226	166
11	351,773	733	316	2	0	2,860	69	147	0	3,097	147
12	356,739	1,098	484	9	1	3,369	77	130	1	3,622	140
Total	3,899,124	8,369	5,445	133	198	36,897	1,310	684	5	37,938	1,586
All Areas*	21,148,706	127,500	36,748	599	1,617	167,203	5,486	37,133	1,006	226,156	8,990
% Reduction	-18.4%	-6.6%	-14.8%	-22.2%	-12.2%	-22.1%	-23.9%	-1.8%	-0.5%	-16.8%	-17.6%
MAY THROUGH NOVEMBER ONLY											
5	424,810	526	991	31	71	3,923	335	2	0	3,928	345
6	352,129	597	543	7	3	4,333	176	17	0	4,350	198
7	304,242	414	241	0	0	3,978	103	33	0	4,017	120
8	351,376	602	239	0	0	3,184	85	46	0	3,249	96
9	281,104	452	262	0	1	2,515	45	34	0	2,553	80
10	337,578	635	396	0	0	3,053	139	121	2	3,226	166
11	351,773	733	316	2	0	2,860	69	147	0	3,097	147
Total	2,403,012	3,959	2,988	40	75	23,846	952	400	2	24,420	1,152
All Areas*	21,148,706	127,500	36,748	599	1,617	167,203	5,486	37,133	1,006	226,156	8,990
% Reduction w/out redistribution	-11.4%	-3.1%	-8.1%	-6.7%	-4.6%	-14.3%	-17.4%	-1.1%	-0.2%	-10.8%	-12.8%
% Reduction with redistribution		9.1%	4.4%	3.4%	10.3%	-1.1%	3.0%	2.6%	11.6%	2.6%	0.0%

b) Month	Number of hooks set	Swordfish kept	Swordfish discards	Bluefin tuna kept	Bluefin tuna discards	Yellowfin tuna kept	Yellowfin tuna discards	Bigeye tuna kept	Bigeye tuna discards	BAYS kepts	BAYS discards
1	355,191	1,110	488	9	2	3,425	105	95	1	3,563	110
2	193,937	928	361	14	2	853	13	40	1	904	14
3	242,885	718	468	29	36	1,678	42	9	0	1,691	48
4	347,360	556	656	32	82	3,726	121	10	0	3,738	122
5	424,810	526	991	31	71	3,923	335	2	0	3,928	345
6	352,129	597	543	7	3	4,333	176	17	0	4,350	198
7	304,242	414	241	0	0	3,978	103	33	0	4,017	120
8	351,376	602	239	0	0	3,184	85	46	0	3,249	96
9	281,104	452	262	0	1	2,515	45	34	0	2,553	80
10	337,578	635	396	0	0	3,053	139	121	2	3,226	166
11	351,773	733	316	2	0	2,860	69	147	0	3,097	147
12	356,739	1,098	484	9	1	3,369	77	130	1	3,622	140
Total	3,899,124	8,369	5,445	133	198	36,897	1,310	684	5	37,938	1,586
All Other Areas	21,148,706	127,500	36,748	599	1,617	167,203	5,486	37,133	1,006	226,156	8,990
% Reduction	-18.4%	-6.6%	-14.8%	-22.2%	-12.2%	-22.1%	-23.9%	-1.8%	-0.5%	-16.8%	-17.6%
MAY THROUGH NOVEMBER ONLY											
5	424,810	526	991	31	71	3,923	335	2	0	3,928	345
6	352,129	597	543	7	3	4,333	176	17	0	4,350	198
7	304,242	414	241	0	0	3,978	103	33	0	4,017	120
8	351,376	602	239	0	0	3,184	85	46	0	3,249	96
9	281,104	452	262	0	1	2,515	45	34	0	2,553	80
10	337,578	635	396	0	0	3,053	139	121	2	3,226	166
11	351,773	733	316	2	0	2,860	69	147	0	3,097	147
Total	2,403,012	3,959	2,988	40	75	23,846	952	400	2	24,420	1,152
All GOM only	11,138,444	29,070	14,517	345	470	114,961	4,025	1,505	34	117,172	5,313
% Reduction w/out Redist. of effort	-21.6%	-13.6%	-20.6%	-11.6%	-16.0%	-20.7%	-23.7%	-26.6%	-5.9%	-20.8%	-21.7%
% Reduction with Redist. of effort		0.6%	4.4%	-0.5%	-1.2%	2.7%	22.3%	-0.4%	0.4%	11.8%	1.0%
No. reduced **with** redist. of effort		703	1,635	-3	-20	4,571	1,224	-131	4	4,365	91

Table 4.12 Alternative B2(b). Percent change in incidental bluefin tuna and target catch and discards without redistribution of effort. * excluding the NED. + = increase and - = decrease in discards or retained catch. Three year totals are shown; one year averages can be obtained by dividing the three year total by three. Source: HMS Logbook data (2001-2003).

Month	Number of hooks set	Swordfish kept	Swordfish discards	Bluefin tuna kept	Bluefin tuna discards	Yellowfin tuna kept	Yellowfin tuna discards	Bigeye tuna kept	Bigeye tuna discards	BAYS kept	BAYS discards
YEAR-ROUND											
1	0	0	0	0	0	0	0	0	0	0	0
2	0	0	0	0	0	0	0	0	0	0	0
3	0	0	0	0	0	0	0	0	0	0	0
4	0	0	0	0	0	0	0	0	0	0	0
5	648	7	0	0	0	0	0	0	0	0	0
6	183,851	1,867	256	11	365	505	11	557	0	1,337	15
7	256,598	2,712	394	14	43	552	5	197	0	929	8
8	235,512	2,327	499	3	2	2,625	12	157	2	3,019	16
9	225,096	2,875	509	2	48	3,407	51	373	3	4,167	54
10	78,630	1,076	207	1	0	524	2	180	0	980	3
11	10,086	85	124	3	3	39	0	159	0	266	1
12	1,500	25	8	0	0	10	0	4	0	15	0
Total	991,921	10,974	1,997	34	461	7,662	81	1,627	5	10,713	97
All Areas*	21,148,706	127,500	36,748	599	1,617	167,203	5,486	37,133	1,006	226,156	8,990
% Reduction	-4.7%	-8.6%	-5.4%	-5.7%	-28.5%	-4.6%	-1.5%	-4.4%	-0.5%	-4.7%	-1.1%
JUNE ONLY											
6	183851	1,867	256	11	365	505	11	557	0	1,337	15
Total	183851	1,867	256	11	365	505	11	557	0	1,337	15
All Areas*	21,148,706	127,500	36,748	599	1,617	167,203	5,486	37,133	1,006	226,156	8,990
% Reduction w/out redistribution	-0.9%	-1.5%	-0.7%	-1.8%	-22.6%	-0.3%	-0.2%	-1.5%	0.0%	-0.6%	-0.2%
% Reduction with redistribution		-0.8%	-0.1%	-1.2%	-21.9%	0.9%	1.1%	-1.2%	0.3%	0.4%	0.9%

Table 4.13 **Alternative B2(c). Percent change in incidental bluefin tuna and target catch and discards without redistribution of effort. * excluding the NED. + = increase and - = decrease in discards or retained catch. Three year totals are shown; one year averages can be obtained by dividing the three year total by three.** Source: HMS Logbook data (2001-2003).

Month	Number of hooks set	Swordfish kept	Swordfish discards	Bluefin tuna kept	Bluefin tuna discards	Yellowfin tuna kept	Yellowfin tuna discards	Bigeye tuna kept	Bigeye tuna discards	BAYS kept	BAYS discards
	YEAR-ROUND										
1	734,991	2,334	1,052	26	2	8,144	278	212	6	8,454	303
2	480,238	2,512	931	31	4	2,274	91	72	3	2,371	98
3	533,964	1,872	1,104	49	73	3,657	122	22	0	3,688	134
4	814,452	1,288	1,176	92	189	7,772	370	20	0	7,796	380
5	1,075,255	1,185	1,520	64	151	11,768	571	13	0	11,804	641
6	954,628	1,121	925	18	8	13,513	539	57	2	13,576	656
7	1,102,300	1,294	994	3	0	15,432	528	84	0	15,545	714
8	1,101,773	1,412	752	0	5	13,612	300	76	1	13,716	436
9	807,867	1,002	663	20	1	8,615	147	77	0	8,715	254
10	818,964	1,132	726	0	1	7,728	234	198	5	7,992	340
11	715,282	1,186	600	2	4	5,745	163	264	1	6,166	281
12	714,878	1,747	894	13	1	6,780	235	199	1	7,194	344
Total	9,854,592	18,085	11,337	318	439	105,040	3,578	1,294	19	107,017	4,581
All Areas*	21,148,706	127,500	36,748	599	1,617	167,203	5,486	37,133	1,006	226,156	8,990
% Reduction	-46.6%	-14.2%	-30.9%	-53.1%	-27.1%	-62.8%	-65.2%	-3.5%	-1.9%	-47.3%	-51.0%
	APRIL THROUGH JUNE ONLY										
4	814,452	1,288	1,176	92	189	7,772	370	20	0	7,796	380
5	1,075,255	1,185	1,520	64	151	11,768	571	13	0	11,804	641
6	954,628	1,121	925	18	8	13,513	539	57	2	13,576	656
Total (Apr-Jun)	2,844,335	3,594	3,621	174	348	33,053	1,480	90	2	33,176	1,677
All Areas*	21,148,706	127,500	36,748	599	1,617	167,203	5,486	37,133	1,006	226,156	8,990
% Reduction w/out redistribution	-13.4%	-2.8%	-9.9%	-29.0%	-21.5%	-19.8%	-27.0%	-0.2%	-0.2%	-14.7%	-18.7%
% Reduction with redistribution		21.1%	6.0%	-18.3%	9.8%	-11.0%	-18.3%	11.4%	1.7%	-5.4%	-11.8%

Table 4.14 Alternative B2(b). Example of temporal variation in effectiveness of the closure on discards in June. Totals and percent decreases are for month of June only. * excluding the NED. + = increase and - = decrease in discards or bycatch. Three year totals are shown; one year averages can be obtained by dividing the three year total by three. Source: HMS Logbook data (2001 – 2003).

Month	Number of hooks set	White Marlin discards	Blue Marlin discards	Sailfish discards	Spearfish discards	Pelagic Shark discards	Large Coastal Shark discards	Leatherback Sea Turtles	Loggerhead Sea Turtles	Other Sea Turtles
1	0	0	0	0	0	0	0	0	0	0
2	0	0	0	0	0	0	0	0	0	0
3	0	0	0	0	0	0	0	0	0	0
4	0	0	0	0	0	0	0	0	0	0
5	648	0	0	0	0	21	0	0	0	0
6	184,435	12	4	0	0	1,302	7	10	20	0
7	256,598	31	3	0	0	1,720	196	7	9	0
8	235,512	49	6	0	0	645	85	5	3	0
9	224,296	26	7	1	2	603	41	1	3	0
10	78,130	6	2	0	0	457	13	0	1	0
11	10,086	0	0	0	0	310	2	4	0	0
12	1,500	0	0	0	0	13	0	1	1	0
Total (June)	184,435	12	4	0	0	5,071	344	10	20	0
All Areas*	21,148,706	3,143	2,449	1,029	424	34,020	16,573	494	179	11
% Reduction without redistribution of effort	-0.9%	-0.4%	-0.2%	0.0%	0.0%	-14.9%	-2.5%	-2.0%	-11.2%	0.0%
% Reduction **with** redistribution of effort		1.0%	0.9%	1.7%	0.8%	-2.6%	2.2%	-1.3%	-10.3%	0.0%

Table 4.15 Percent change in kept and discarded catch based on different time/area closure alternatives with and without redistribution of effort. - = decrease and + = increase in kept and discarded catch; * with redistribution of effort assumes no reduction in the number of hooks set. Three year totals are shown; one year averages can be obtained by dividing the three year total by three. Source: HMS Logbook data (2001-2003).

Alternative	Number of hooks set	Swordfish kept	Swordfish discards	Bluefin tuna kept	Bluefin tuna discards	Yellowfin tuna kept	Yellowfin tuna discards	Bigeye tuna kept	Bigeye tuna discards	BAYS kept	BAYS discards
	WITHOUT REDISTRIBUTION OF EFFORT										
Alternative B2(a) (year-round)	-18.4%	-6.6%	-14.8%	-22.2%	-12.2%	-22.1%	-23.9%	-1.8%	-0.5%	-16.8%	-17.6%
Alternative B2(a) (May-Nov)	-11.4%	-3.1%	-8.1%	-6.7%	-4.6%	-14.3%	-17.4%	-1.1%	-0.2%	-10.8%	-12.8%
Alternative B2(b) (year-round)	-4.7%	-8.6%	-5.4%	-5.7%	-28.5%	-4.6%	-1.5%	-4.4%	-0.5%	-4.7%	-1.1%
Alternative B2(b) (June only)	-0.9%	-1.5%	-0.7%	-1.8%	-22.6%	-0.3%	-0.2%	-1.5%	0.0%	-0.6%	-0.2%
Alternative B2(c) (April-June)	-13.4%	-2.8%	-9.9%	-29.0%	-21.5%	-19.8%	-27.0%	-0.2%	-0.2%	-14.7%	-18.7%
Alternative B2(d) (year-round)	-47.4%	-15.1%	-31.5%	-53.6%	-27.1%	-64.0%	-66.4%	-3.5%	-1.9%	-48.2%	-51.8%
Alternative B2(e) (year-round)	-10.1%	-13.7%	-11.0%	-12.4%	-43.3%	-7.6%	-3.6%	-19.7%	-13.8%	-12.0%	-8.3%
	WITH REDISTRIBUTION OF EFFORT										
Alternative B2(a) (year-round)	*	15.3%	5.4%	-3.9%	7.9%	-4.6%	-6.9%	21.2%	20.8%	2.3%	1.4%
Alternative B2(a) (May-Nov)	*	9.1%	4.4%	3.4%	10.3%	-1.1%	3.0%	2.6%	11.6%	2.6%	0.04%
Alternative B2(b) (year-round)	*	-5.5%	-1.9%	-3.5%	-27.0%	1.3%	4.1%	-0.5%	5.6%	0.7%	4.5%
Alternative B2(b) (June only)	*	-0.8%	-0.1%	-1.2%	-21.9%	0.9%	1.1%	-1.2%	0.3%	0.4%	0.9%
Alternative B2(c) (April-June)	*	21.1%	6.0%	-18.3%	9.8%	-11.0%	-18.3%	11.4%	1.7%	-5.4%	-11.8%
Alternative B2(d) (year-round)	*	62.5%	31.9%	-12.1%	38.0%	-29.8%	-35.6%	80.6%	84.8%	-0.6%	-6.9%
Alternative B2(e) (year-round)	*	-6.8%	-2.9%	-7.6%	-40.7%	5.5%	8.3%	-11.9%	-2.5%	-0.3%	4.1%
	COMBINATIONS WITH REDISTRIBUTION OF EFFORT										
Alternative B2(a)/B2(b) (year-round)	*	9.8%	3.6%	-7.4%	-19.1%	-3.2%	-2.9%	20.8%	26.5%	2.9%	5.9%
Alternative B2(a) (May-Nov)/B2(b) (June)	*	5.8%	4.4%	5.4%	-13.6%	0.3%	2.2%	10.0%	11.8%	3.2%	3.5%
Alternative B2(d)/B2(e) (year-round)	*	63.1%	36.1%	-22.0%	-35.2%	-25.1%	-21.6%	78.4%	117.4%	-0.4%	5.6%

Table 4.16 Alternative B2(c). Example of temporal variation in effectiveness of the time/area closure on discards from April through June. Totals and percent changes are for month of June only. * excluding the NED. + = increase and - = decrease in discards or bycatch. Three year totals are shown; one year averages can be obtained by dividing the three year total by three. Source: HMS Logbook data (2001 – 2003).

Month	Number of hooks set	White Marlin discards	Blue Marlin discards	Sailfish discards	Spearfish discards	Pelagic Shark discards	Large Coastal Shark discards	Leatherback Sea Turtles	Loggerhead Sea Turtles	Other Sea Turtles
1	734,991	19	29	17	10	60	93	11	1	0
2	480,238	8	6	4	0	55	138	12	0	0
3	533,964	6	9	3	5	44	161	17	1	0
4	814,452	22	28	12	6	71	130	19	0	2
5	1,075,255	78	54	36	9	147	294	15	6	0
6	954,628	225	162	76	20	69	195	21	1	0
7	1,102,300	545	547	178	58	58	123	65	3	0
8	1,100,973	248	187	110	23	52	102	28	1	0
9	807,867	110	146	71	26	41	96	25	1	0
10	818,964	120	92	42	13	60	132	29	0	0
11	715,282	53	44	20	6	30	228	19	1	0
12	714,878	35	34	5	9	46	64	67	3	3
Total April-June	2,844,335	325	244	124	35	287	619	55	7	2
All Areas*	21,148,706	3,143	2,449	1,029	424	34,020	16,573	494	179	11
% Reduction without redistribution of effort	-13.4%	-10.3%	-10.0%	-12.1%	-8.3%	-0.8%	-3.7%	-11.1%	-3.9%	-18.2%
% Reduction with redistribution of effort		7.0%	2.0%	4.4%	13.2%	17.1	25.9	-2.6%	23.5%	-18.2%

Table 4.17 **Alternative B2(d). Example of temporal variation in effectiveness of the time/area closure on discards. * excluding the NED. + = increase and - = decrease in discards or bycatch. Three year totals are shown; one year averages can be obtained by dividing the three year total by three.** Source: HMS Logbook data (2001 – 2003).

Month	Number of hooks set	White Marlin discards	Blue Marlin discards	Sailfish discards	Spearfish discards	Pelagic Shark discards	Large Coastal Shark discards	Leatherback Sea Turtles	Loggerhead Sea Turtles	Other Sea Turtles
1	739,191	19	29	17	13	60	101	11	1	0
2	488,238	8	6	5	0	58	175	12	0	0
3	546,944	6	9	3	6	47	188	17	1	0
4	825,627	22	28	12	9	78	146	19	0	2
5	1,085,255	78	55	37	17	149	309	14	6	0
6	978,848	224	173	108	49	70	197	18	1	0
7	1,136,250	547	583	209	108	59	347	47	3	0
8	1,125,483	248	188	110	59	52	138	21	1	0
9	820,167	126	151	74	46	43	97	14	1	0
10	828,954	120	95	42	28	60	132	26	0	0
11	725,772	53	46	20	10	30	233	19	1	0
12	720,028	36	34	5	9	47	80	67	3	3
Total	10,020,757	1,487	1,397	642	354	753	2,143	285	18	5
All Areas*	21,148,706	3,143	2,449	1,029	424	34,020	16,573	494	179	11
% Reduction without redistribution of effort	-47.4%	-47.3%	-57.0%	-62.4%	-83.5%	-2.2%	-2.5%	-57.7%	-10.1%	-45.5%
% Reduction with redistribution of effort		0.3%	-20.3%	-26.8%	-73.3%	88.8%	66.9%	-21.3%	65.5%	-3.3%

Table 4.18 Alternative B2(d). Percent change in incidental bluefin tuna and target catch and discards without redistribution of effort. * excluding the NED. + = increase and - = decrease in discards or retained catch. Three year totals are shown; one year averages can be obtained by dividing the three year total by three. Source: HMS Logbook data (2001-2003).

Month	Number of hooks set	Swordfish kept	Swordfish discards	Bluefin tuna kept	Bluefin tuna discards	Yellowfin tuna kept	Yellowfin tuna discards	Bigeye tuna kept	Bigeye tuna discards	BAYS kept	BAYS discards
1	739,191	2,354	1,067	26	2	8,158	278	214	6	8,470	305
2	488,238	2,746	986	31	4	2,274	91	72	3	2,371	98
3	547,564	2,230	1,168	50	73	3,660	122	22	0	3,691	134
4	825,627	1,591	1,248	93	189	7,780	370	20	0	7,804	380
5	1,085,255	1,260	1,530	64	151	11,836	571	14	0	11,873	641
6	978,848	1,134	924	18	8	14,310	582	56	2	14,372	705
7	1,136,250	1,304	998	3	0	15,687	530	84	0	15,800	716
8	1,127,083	1,442	758	0	5	13,864	301	77	1	13,969	446
9	820,167	1,023	668	20	1	8,832	154	78	0	8,933	261
10	828,954	1,140	727	0	1	7,839	234	199	5	8,104	340
11	725,772	1,243	610	3	4	5,829	169	264	1	6,250	287
12	720,028	1,748	895	13	1	6,872	239	199	1	7,286	348
Total	10,022,977	19,215	11,579	321	439	106,941	3,641	1,299	19	108,923	4,661
All Areas*	21,148,706	127,500	36,748	599	1,617	167,203	5,486	37,133	1,006	226,156	8,990
% Reduction w/out Redistribution	-47.4%	-15.1%	-31.5%	-53.6%	-27.1%	-64.0%	-66.4%	-3.5%	-1.9%	-48.2%	-51.8%
% Reduction with redistribution		62.5%	31.9%	-12.1%	38.0%	-29.8%	-35.6%	80.6%	84.8%	-0.6%	-6.9%

Table 4.19 **Alternative B2(e). Example of temporal variation in effectiveness of the time/area closure on discards. * excluding the NED. + = increase and - = decrease in discards or bycatch. Three year totals are shown; one year averages can be obtained by dividing the three year total by three.** Source: HMS Logbook data (2001-2003).

Month	Number of hooks set	White Marlin discards	Blue Marlin discards	Sailfish discards	Spearfish discards	Pelagic Shark discards	Large Coastal Shark discards	Leatherback Sea Turtles	Loggerhead Sea Turtles	Other Sea Turtles
1	9,800	0	0	0	0	157	2	0	1	0
2	6,300	0	0	0	0	90	0	0	1	0
3	4,200	0	0	0	0	65	0	0	2	0
4	999	0	0	0	0	35	0	0	0	0
5	8,913	0	0	0	0	72	0	1	0	0
6	247,068	16	5	0	1	1750	11	11	27	0
7	476,917	52	3	1	2	2257	284	9	10	0
8	515,418	121	10	1	4	1290	204	9	6	0
9	395,521	71	19	1	1	1192	75	3	3	0
10	277,781	9	2	0	0	1755	102	3	8	0
11	137,838	4	1	0	0	1724	18	10	6	0
12	46,755	1	0	0	0	372	2	3	1	0
Total	2,127,510	274	40	3	8	10,759	698	49	65	0
All Areas*	21,148,706	3,143	2,449	1,029	424	34,020	16,573	494	179	11
% Reduction without redistribution of effort	-10.1%	-8.7%	-1.6%	-0.3%	-1.9%	-31.6%	-2.5%	-9.9%	-36.3%	0.0%
% Reduction with redistribution of effort		6.0%	14.7%	17.7%	9.1%	-23.9%	5.8%	-0.6%	-33.3%	5.7%

Table 4.20 Alternative B2(e). Percent change in incidental bluefin tuna and target catch and discards without redistribution of effort. * excluding the NED. + = increase and - = decrease in discards or retained catch. Three year totals are shown; one year averages can be obtained by dividing the three year total by three. Source: HMS Logbook data (2001-2003).

Month	Number of hooks set	Swordfish kept	Swordfish discards	Bluefin tuna kept	Bluefin tuna discards	Yellowfin tuna kept	Yellowfin tuna discards	Bigeye tuna kept	Bigeye tuna discards	BAYS kept	BAYS discards
1	9,800	37	36	0	0	27	0	72	0	187	0
2	7,700	28	23	0	2	0	0	10	0	70	0
3	4,200	5	4	0	2	1	0	9	0	16	0
4	999	0	1	0	40	2	0	0	0	3	0
5	8,913	45	9	0	12	6	0	12	1	39	2
6	247,068	2,344	322	13	388	729	17	705	0	1,762	21
7	475,917	4,016	590	20	66	1,313	10	450	5	2,188	23
8	515,418	3,532	838	5	2	3,997	32	1,463	48	6,345	91
9	394,621	3,856	805	2	52	4,175	88	1,592	62	6,786	187
10	277,781	2,648	897	11	49	1,548	41	1,350	14	5,357	105
11	138,463	647	495	23	86	690	10	1,109	2	3,111	205
12	46,755	264	34	0	1	204	2	531	7	1,277	114
Total	2,127,635	17,422	4,054	74	700	12,692	200	7,303	139	27,141	748
All Areas*	21,148,706	127,500	36,748	599	1,617	167,203	5,486	37,133	1,006	226,156	8,990
% Reduction w/out Redistribution	-10.1%	-13.7%	-11.0%	-12.4%	-43.3%	-7.6%	-3.6%	-19.7%	-13.8%	-12.0%	-8.3%
% Reduction with Redistribution		-6.8%	-2.9%	-7.6%	-40.7%	5.5%	8.3%	-11.9%	-2.5%	-0.3%	4.1%

Table 4.21 **B2(a) and B2(b) Combined. Example of temporal variation in effectiveness of the time/area closure on discards for combined alternatives B2(a) and B2(b) year-round, and from May through November for B2(a) and in June for B2(b). * excluding the NED. + = increase and - = decrease in discards or bycatch. Three year totals are shown; one year averages can be obtained by dividing the three year total by three.** Source: HMS Logbook data (2001-2003).

Month	Number of hooks set	White Marlin discards	Blue Marlin discards	Sailfish discards	Spearfish discards	Pelagic Shark discards	Large Coastal Shark discards	Leatherback Sea Turtles	Loggerhead Sea Turtles	Other Sea turtles
1	352,141	14	16	5	4	19	24	11	1	0
2	176,609	2	4	1	0	18	61	9	0	0
3	232,645	3	4	2	3	19	56	18	1	0
4	330,682	7	13	5	5	27	27	16	0	2
5	397,942	37	19	13	5	46	35	10	5	0
6	514,590	135	90	20	8	1,317	52	22	20	0
7	524,443	149	128	35	13	1,730	220	16	10	0
8	564,244	107	65	16	5	658	109	10	3	0
9	489,540	71	64	22	5	618	72	8	3	0
10	399,058	46	50	12	11	467	51	18	1	0
11	344,368	29	22	13	3	321	26	18	0	0
12	341,864	14	13	4	2	33	21	41	2	2
Total	4,668,126	614	488	148	64	5,273	754	197	46	4
All Areas*	21,148,706	3,143	2,449	1,029	424	34,020	16,573	494	179	11
% Decrease without redistribution of effort	-22.1%	-19.5%	-19.9%	-14.4%	-15.1%	-15.5%	-4.5%	-39.9%	-25.7%	-36.4%
% Decrease with redistribution of effort (Year-round)		4.3%	3.3%	11.9%	8.6%	9.2%	21.9%	-22.7%	-7.3%	-20.3%
% Decrease with redistribution of effort B2(a) (May-Nov) and B2(b) (June)		-1.7%	-6.7%	1.5%	-2.3%	9.6%	10.1%	-8.4%	-3.1%	7.1%
No. reduced with redist. of effort		-53	-164	15	-10	3,276	1,680	-42	-6	1

Table 4.22 B2(a) and B2(b) Combined. Percent change in incidental bluefin tuna and target catch and discards without redistribution of effort. * excluding the NED. + = increase and - = decrease in discards or retained catch. Three year totals are shown; one year averages can be obtained by dividing the three year total by three. Source: HMS Logbook data (2001-2003).

Month	Number of hooks set	Swordfish kept	Swordfish discards	Bluefin tuna kept	Bluefin tuna discards	Yellowfin tuna kept	Yellowfin tuna discards	Bigeye tuna kept	Bigeye tuna discards	BAYS kept	BAYS discards
1	355,191	1,110	488	9	2	3,425	105	95	1	3,563	110
2	193,937	928	361	14	2	853	13	40	1	904	14
3	242,885	718	468	29	36	1,678	42	9	0	1,691	48
4	347,360	556	656	32	82	3,726	121	10	0	3,738	122
5	425,458	533	991	31	71	3,923	335	2	0	3,928	345
6	535,980	2,464	799	18	368	4,838	187	574	0	5,687	213
7	560,840	3,126	635	14	43	4,530	108	230	0	4,946	128
8	586,888	2,929	738	3	2	5,809	97	203	2	6,268	112
9	506,200	3,327	771	2	49	5,922	96	407	3	6,720	134
10	416,208	1,711	603	1	0	3,577	141	301	2	4,206	169
11	361,859	818	440	5	3	2,899	69	306	0	3,363	148
12	358,239	1,123	492	9	1	3,379	77	134	1	3,637	140
Total	4,891,045	19,343	7,442	167	659	44,559	1,391	2,311	10	48,651	1,683
All Other Areas	21,148,706	127,500	36,748	599	1,617	167,203	5,486	37,133	1,006	226,156	8,990
% Reduction w/out Redistribution	-23.1%	-15.2%	-20.3%	-27.9%	-40.8%	-26.6%	-25.4%	-6.2%	-1.0%	-21.5%	-18.7%
% Reduction with Redistribution (year-round)		9.3%	3.4%	-7.6%	-24.3%	-3.1%	-2.2%	21.6%	29.0%	3.2%	7.1%
% Reduction with Redistribution B2(a) (May-Nov) and B2(b) (June)		5.8%	4.4%	5.4%	-13.6%	0.3%	2.2%	10.0%	11.8%	3.2%	3.5%
No. reduced with redist. of effort		7,350	1,635	32	-221	458	118	3,695	119	7,209	314

Table 4.23 B2(d) and B2(e) Combined. Example of temporal variation in effectiveness of the time/area closure on discards for combined alternatives B2(d) and B2(e)year-round. * excluding the NED. + = increase and - = decrease in discards or bycatch. Three year totals are shown; one year averages can be obtained by dividing the three year total by three. Source: HMS Logbook data (2001-2003).

Month	Number of hooks set	White Marlin discards	Blue Marlin discards	Sailfish discards	Spearfish discards	Pelagic Shark discards	Large Coastal Shark discards	Leatherback Sea Turtles	Loggerhead Sea Turtles	Other Sea Turtles
1	748,991	19	29	17	10	217	103	11	2	0
2	494,538	8	6	5	0	148	175	12	1	0
3	551,144	6	9	3	5	112	188	17	3	0
4	826,626	22	28	12	6	113	146	19	0	2
5	1,094,168	78	55	37	9	221	309	15	6	0
6	1,225,916	240	178	108	21	1820	208	29	28	0
7	1,615,167	599	586	210	60	2322	631	56	13	0
8	1,640,901	369	198	111	27	1342	342	30	7	0
9	1,215,688	197	170	75	28	1235	172	17	4	0
10	1,106,735	129	97	42	13	1815	234	29	8	0
11	863,610	57	47	20	6	1754	251	29	7	0
12	766,783	37	34	5	9	419	82	70	4	3
Total	12,150,267	1,761	1,437	645	194	11,518	2,841	334	83	5
All Areas*	21,148,706	3,143	2,449	1,029	424	34,020	16,573	494	179	11
% Reduction without redistribution of effort	-57.5%	-56.0%	-58.7%	-62.7%	-45.8%	-33.9%	-17.1%	-67.6%	-46.4%	-45.5%
% Reduction with redistribution of effort		6.5%	-3.5%	-3.1%	12.1%	65.0%	102.0%	-30.2%	4.8%	18.3%
No. reduced with redist. of effort		205	-86	-32	51	22,098	16,970	-149	9	2

Table 4.24 **B2(d) and B2(e) Combined. Percent change in incidental bluefin tuna and target catch and discards without redistribution of effort. * excluding the NED. + = increase and - = decrease in discards or retained catch. Three year totals are shown; one year averages can be obtained by dividing the three year total by three.** Source: HMS Logbook data (2001-2003).

Month	Number of hooks set	Swordfish kept	Swordfish discards	Bluefin tuna kept	Bluefin tuna discards	Yellowfin tuna kept	Yellowfin tuna discards	Bigeye tuna kept	Bigeye tuna discards	BAYS kept	BAYS discards
1	748,991	2,391	1,103	26	2	8,185	278	286	6	8,657	305
2	495,938	2,774	1,009	31	6	2,274	91	82	3	2,441	98
3	551,764	2,235	1,172	50	75	3,661	122	31	0	3,707	134
4	826,626	1,591	1,249	93	229	7,782	370	20	0	7,807	380
5	1,094,168	1,305	1,539	64	163	11,842	571	26	1	11,912	643
6	1,225,916	3,478	1,246	31	396	15,039	599	761	2	16,134	726
7	1,615,167	5,355	1,589	23	66	17,006	540	538	5	17,998	739
8	1,642,501	4,974	1,596	5	7	17,861	333	1,540	49	20,314	537
9	1,214,788	4,879	1,473	22	53	13,007	242	1,670	62	15,719	448
10	1,106,735	3,788	1,624	11	50	9,387	275	1,549	19	13,461	445
11	864,235	1,890	1,105	26	90	6,519	179	1,373	3	9,361	492
12	766,783	2,012	929	13	2	7,076	241	730	8	8,563	462
Total	12,153,612	36,672	15,634	395	1,139	119,639	3,841	8,606	158	136,074	5,409
All Other Areas	21,148,706	127,500	36,748	599	1,617	167,203	5,486	37,133	1,006	226,156	8,990
% Reduction w/out Redistribution	-57.5%	-28.8%	-42.5%	-65.9%	-70.4%	-71.6%	-70.0%	-23.2%	-15.7%	-60.2%	-60.2%
% Reduction with Redistribution		63.1%	36.1%	-22.0%	-35.2%	-25.1%	-21.6%	78.4%	117.4%	-0.4%	5.6%
No. reduced with redist. of effort		80,468	13,262	-132	-570	-41,986	-1,186	29,114	1,181	-980	502

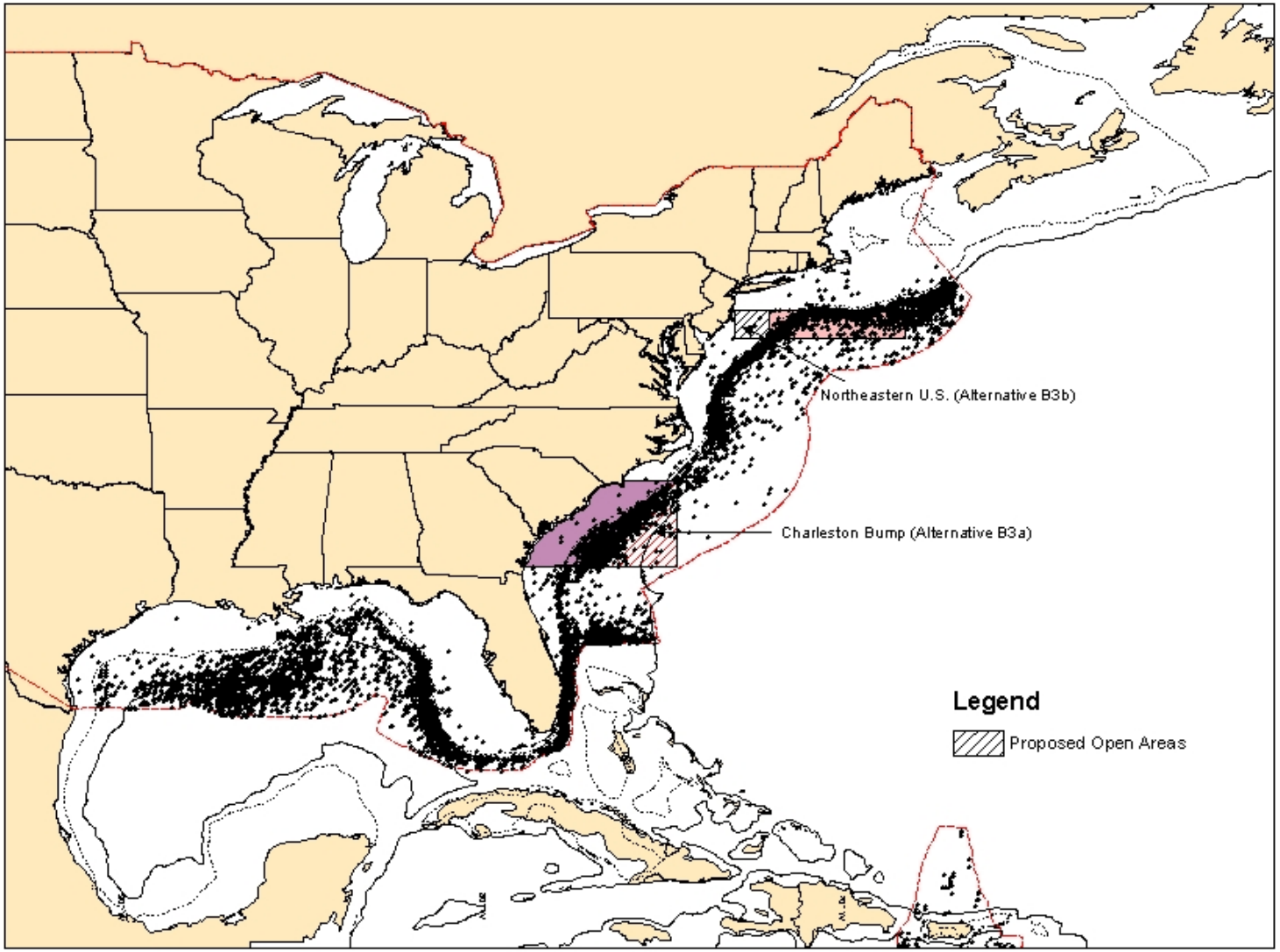


Figure 4.14 Map showing areas being considered for modifications to existing closures and juvenile swordfish data (<180 cm LJFL). The minimum size limit for swordfish is 119 cm LJFL. Source: Pelagic Observer Program 1997-1999**.**

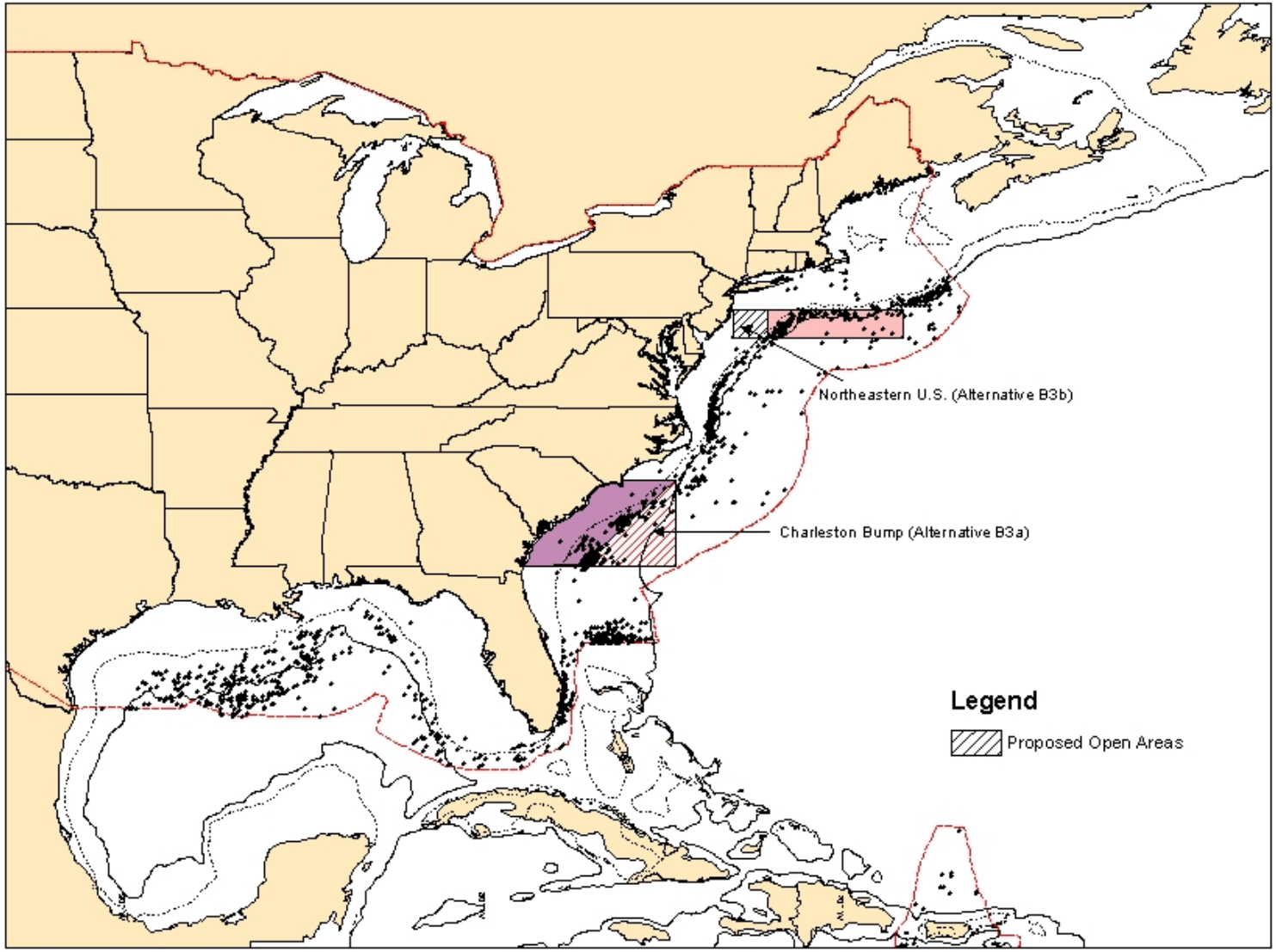


Figure 4.15 Map showing areas being considered for modifications to existing closures and adult swordfish data (>180 cm LJFL) from the Pelagic Observer Program. Source: Pelagic Observer Program 1997-1999

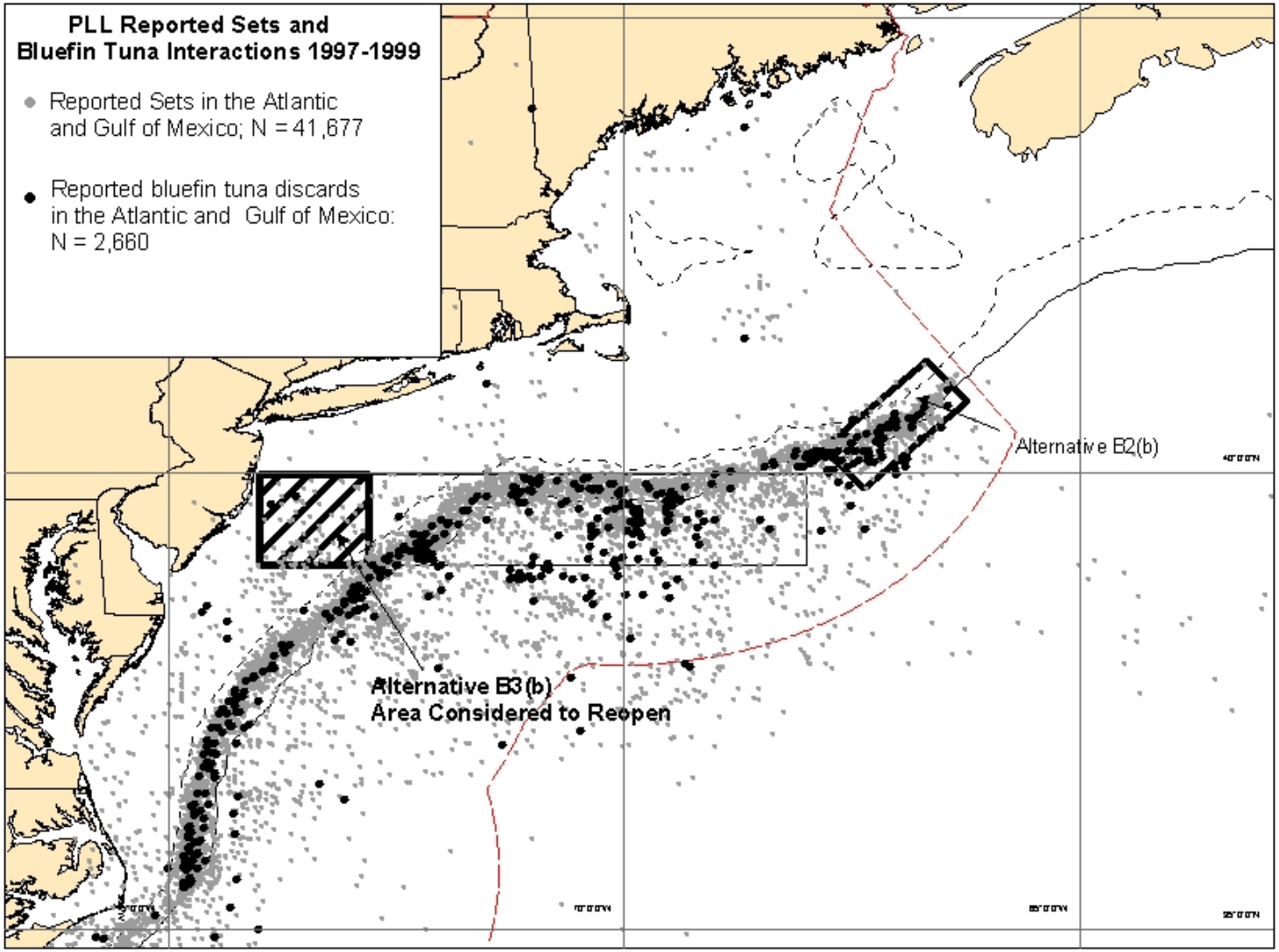


Figure 4.16 Map showing modification to the existing Northeast United States closure and bluefin tuna discards. Source: HMS Logbook 1997-1999.

Table 4.25 Alternative B3(a) Charleston Bump modification. Discards of white marlin, blue marlin, sailfish, spearfish, leatherback, loggerhead and other sea turtles from the portion of the Charleston Bump to remain closed and the portion of the area considered for reopening. * excluding the NED. + = increase and - = decrease in discards or bycatch. Three year totals are shown; one year averages can be obtained by dividing the three year total by three. Source: HMS Logbook 1997-1999.

Month	Number of hooks set	White Marlin discards	Blue Marlin discards	Sailfish discards	Spearfish discards	Leatherback Sea Turtles	Loggerhead Sea Turtles	Other Sea Turtles
	PORTION OF AREA TO REMAIN CLOSED							
1	154,536	7	4	7	2	0	0	1
2	156,595	11	7	5	3	0	1	1
3	302,955	35	7	15	1	0	1	0
4	117,133	18	17	11	6	0	0	0
5	229,426	24	26	16	2	0	0	0
6	210,309	53	54	45	7	6	3	1
7	99,983	11	27	45	0	1	1	0
8	42,198	3	17	31	0	1	0	0
9	24,456	2	11	10	0	1	0	0
10	28,830	4	7	6	1	1	0	0
11	26,455	4	5	7	0	2	0	0
12	30,934	1	9	5	0	0	0	0
Total (Feb - April)	576,683	64	31	31	10	0	2	1
All Areas*	21,148,706	3,143	2,449	1,029	424	494	179	11
% of All Areas*	2.7%	2.0%	1.3%	3.0%	2.4%	0.0%	1.1%	9.1%
	PORTION OF AREA CONSIDERED FOR REOPENING							
1	28,429	2	3	4	1	0	1	0
2	35,545	4	7	2	1	0	0	0
3	29,920	8	2	5	1	0	1	0
4	42,938	7	8	3	2	0	0	0
5	50,773	7	3	2	0	0	0	0
6	84,298	33	15	18	5	0	0	0
7	42,229	2	7	21	1	0	0	0
8	33,900	1	15	24	3	0	0	0
9	57,915	4	38	27	2	0	0	0
10	69,360	6	23	19	1	0	1	0
11	27,882	3	10	4	1	0	1	0
12	26,765	0	8	3	0	0	0	
Total (Feb - April)	108,403	19	17	10	4	0	1	0
All Areas*	21,148,706	3,143	2,449	1,029	424	494	179	11
% of All Areas*	0.5%	0.6%	0.7%	1.0%	0.9%	0.0%	0.6%	0.0%

Table 4.26 Alternative B3(b) Northeastern U.S. closure modification. Discards of white marlin, blue marlin, sailfish, spearfish, leatherback, loggerhead and other sea turtles from the portion of the Northeastern U.S. closure to remain closed and the portion of the area considered for reopening. * excluding the NED. + = increase and - = decrease in discards or bycatch. Three year totals are shown; one year averages can be obtained by dividing the three year total by three. Source: HMS Logbook 1997 - 1999.

Month	Number of hooks set	White Marlin discards	Blue Marlin discards	Sailfish discards	Spearfish discards	Leatherback Sea Turtles	Loggerhead Sea Turtles	Other Sea Turtles
	PORTION OF AREA CONSIDERED FOR REOPENING							
1	0	0	0	0	0	0	0	0
2	0	0	0	0	0	0	0	0
3	0	0	0	0	0	0	0	0
4	0	0	0	0	0	0	0	0
5	0	0	0	0	0	0	0	0
6	2,400	0	0	0	0	0	0	0
7	32,535	0	0	0	0	0	0	0
8	2,550	4	1	0	0	0	0	0
9	8,739	0	1	0	0	0	0	0
10	1,200	0	0	0	0	0	0	0
11	0	0	0	0	0	0	0	0
12	0	0	0	0	0	0	0	0
Total	47,424	4	2	0	0	0	0	0
All Areas*	21,148,706	3,143	2,449	1,029	424	494	179	11
% of All Areas*	0.2%	0.1%	0.1%	0.0%	0.0%	0.0%	0.0%	0.0%
	PORTION OF AREA CONSIDERED FOR REOPENING (June only)							
6	2,400	0	0	0	0	0	0	0
Total	2,400	0	0	0	0	0	0	0
All Areas*	21,148,706	3,143	2,449	1,029	424	494	179	11
% of All Areas*	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%

Table 4.27 Alternative B3(a) Charleston Bump modification. Catches and discards of incidental bluefin tuna and target species in the portion of the area considered for reopening. * excluding the NED. + = increase and - = decrease in discards or retained catch. Three year totals are shown; one year averages can be obtained by dividing the three year total by three. Source: HMS Logbook 1997-1999.

Month	Number of hooks set	Swordfish kept	Swordfish discards	Bluefin tuna kept	Bluefin tuna discards	Yellowfin tuna kept	Yellowfin tuna discards	Bigeye tuna kept	Bigeye tuna discards	BAYS kept	BAYS discards
	PORTION OF AREA CONSIDERED FOR REOPENING (Year-round)										
1	28,429	644	196	0	0	65	11	0	0	65	11
2	35,545	484	164	0	0	97	3	5	0	105	3
3	29,920	461	181	0	0	53	3	3	1	57	4
4	42,938	426	203	0	0	125	13	0	0	135	14
5	50,773	359	77	1	1	118	4	6	0	134	4
6	84,298	963	202	2	0	323	7	9	0	339	8
7	42,229	969	227	0	0	85	7	1	0	86	7
8	33,900	787	199	0	0	54	10	2	0	56	10
9	57,915	2,192	540	0	0	282	13	16	0	301	14
10	69,360	2,864	1,007	0	0	536	17	4	3	540	20
11	27,882	880	312	1	2	150	12	0	2	152	14
12	26,765	717	157	0	0	115	15	1	2	116	17
Total	529,954	11,746	3,465	4	3	2,003	115	47	8	2,086	126
All Areas*	21,148,706	127,500	36,748	599	1,617	167,203	5,486	37,133	1,006	226,156	8,990
% Increase	2.5%	9.2%	9.4%	0.7%	0.2%	1.2%	2.1%	0.1%	0.8%	0.9%	1.4%
	PORTION OF AREA CONSIDERED FOR REOPENING (Feb-April)										
2	35,545	484	164	0	0	97	3	5	0	105	3
3	29,920	461	181	0	0	53	3	3	1	57	4
4	42,938	426	203	0	0	125	13	0	0	135	14
Total	108,403	1,371	548	0	0	275	19	8	1	297	21
All Areas*	21,148,706	127,500	36,748	599	1,617	167,203	5,486	37,133	1,006	226,156	8,990
% Increase	0.51%	1.1%	1.5%	0.0%	0.0%	0.16%	0.35%	0.02%	0.1%	0.13%	0.23%

Table 4.28 Alternative B3(b) Northeastern U.S. closure modification. Catches and discards of incidental bluefin tuna and target species in the portion of the area considered for reopening. * excluding the NED. + = increase and - = decrease in discards or retained catch. Three year totals are shown; one year averages can be obtained by dividing the three year total by three. Source: HMS Logbook 1997-1999.

Month	Number of hooks set	Swordfish kept	Swordfish discards	Bluefin tuna kept	Bluefin tuna discards	Yellowfin tuna kept	Yellowfin tuna discards	Bigeye tuna kept	Bigeye tuna discards	BAYS kept	BAYS discards
	PORTION OF AREA CONSIDERED FOR REOPENING (Year-round)										
1	0	0	0	0	0	0	0	0	0	0	0
2	0	0	0	0	0	0	0	0	0	0	0
3	0	0	0	0	0	0	0	0	0	0	0
4	0	0	0	0	0	0	0	0	0	0	0
5	0	0	0	0	0	0	0	0	0	0	0
6	2,400	3	0	0	1	1	0	0	0	1	0
7	32,535	0	1	0	1	9	0	0	0	10	0
8	2,550	27	2	0	0	13	0	12	0	28	0
9	8,739	20	20	0	0	129	0	29	1	161	1
10	1,200	6	0	0	0	9	0	5	0	18	0
11	0	0	0	0	0	0	0	0	0	0	0
12	0	0	0	0	0	0	0	0	0	0	0
Total	47,424	56	23	0	2	161	0	46	1	218	1
All Areas*	21,148,706	127,500	36,748	599	1,617	167,203	5,486	37,133	1,006	226,156	8,990
% Increase	0.2%	0.0%	0.1%	0.0%	0.1%	0.1%	0.0%	0.1%	0.1%	0.1%	0.0%
	PORTION OF AREA CONSIDERED FOR REOPENING (June only)										
6	2,400	3	0	0	1	1	0	0	0	1	0
Total	2,400	3	0	0	1	1	0	0	0	1	0
All Areas*	21,148,706	127,500	36,748	599	1,617	167,203	5,486	37,133	1,006	226,156	8,990
% Increase	0.01%	0.002%	0.0%	0.0%	0.06%	0.001%	0.0%	0.0%	0.0%	0.0004%	0.0%

Table 4.29 Comparison of discards of white marlin, blue marlin, sailfish, spearfish, leatherback and loggerhead sea turtles in the portion of the areas considered for reopening. * excluding the NED. + = increase and - = decrease in discards or bycatch. Three year totals are shown; one year averages can be obtained by dividing the three year total by three. Source: HMS Logbook 1997-2000.

	Number of hooks set	White Marlin discards	Blue Marlin discards	Sailfish discards	Spearfish discards	Leatherback Sea Turtles	Loggerhead Sea Turtles	Other Sea Turtles
	PORTION OF AREA CONSIDERED FOR REOPENING							
B3(a) Charleston Bump (Feb - Apr)	108,403	19	17	10	4	0	1	0
B3(b) Northeastern U.S. (June)	2,400	0	0	0	0	0	0	0
All Areas*	21,148,706	3,143	2,449	1,029	424	494	179	11
	% of All Areas							
B3(a) Charleston Bump (Feb - Apr)	0.3%	0.6%	0.7%	1.0%	0.9%	0.0%	0.6%	0.0%
B3(b) Northeastern U.S.	0.01%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%

Table 4.30 Comparison of of swordfish, incidental bluefin tuna, yellowfin tuna, bigeye tuna, and BAYS in the portion of the areas considered for reopening. * excluding the NED. + = increase and - = decrease in discards or retained catch. Three year totals are shown; one year averages can be obtained by dividing the three year total by three. Source: HMS Logbook 1997-1999.

	Number of hooks set	Swordfish kept	Swordfish discards	Bluefin tuna kept	Bluefin tuna discards	Yellowfin tuna kept	Yellowfin tuna discards	Bigeye tuna kept	Bigeye tuna discards	BAYS kept	BAYS discards
	PORTION OF AREA CONSIDERED FOR REOPENING										
B3(a) Charleston Bump (Feb-Apr)	108,403	1,371	548	0	0	275	19	8	1	297	21
B3(b) Northeastern U.S. (June)	2,400	3	0	0	1	1	0	0	0	1	0
All Areas*	21,148,706	127,500	36,748	599	1,617	167,203	5,486	37,133	1,006	226,156	8,990
	% of All Areas										
B3(a) Charleston Bump (Feb-Apr)	0.51%	1.1%	1.5%	0.0%	0.0%	0.16%	0.35%	0.02%	0.1%	0.13%	0.23%
B3(b) Northeastern U.S. (June)	0.01%	0.002%	0.0%	0.0%	0.06%	0.001%	0.0%	0.0%	0.0%	0.0004%	0.0%

Table 4.31 Average swordfish lengths (cm LJFL) in the portion of the areas to remain closed and the portion of the areas considered for reopening. The minimum size limit for swordfish is 119 cm LJFL. The mature size is > 180 cm LJFL. Source: Pelagic Observer Program 1992-1999.

Closed Area	**Portion Considered for Reopening**	**Sample Size**	**Portion to Remain Closed**	**Sample Size**	***t*-test**
	1992-1999				
B3(a) Charleston Bump	124	3,374	125	1,664	$P = 0.372$
B3(b) Northeastern U.S.	96	1695	71 cm LJFL	2	$P = 0.34$
	1997 - 1999				
B3(a) Charleston Bump	125	2,067	126	455	$P = 0.10$
B3(b) Northeastern U.S.	112	409	71	2	$P = 0.05$

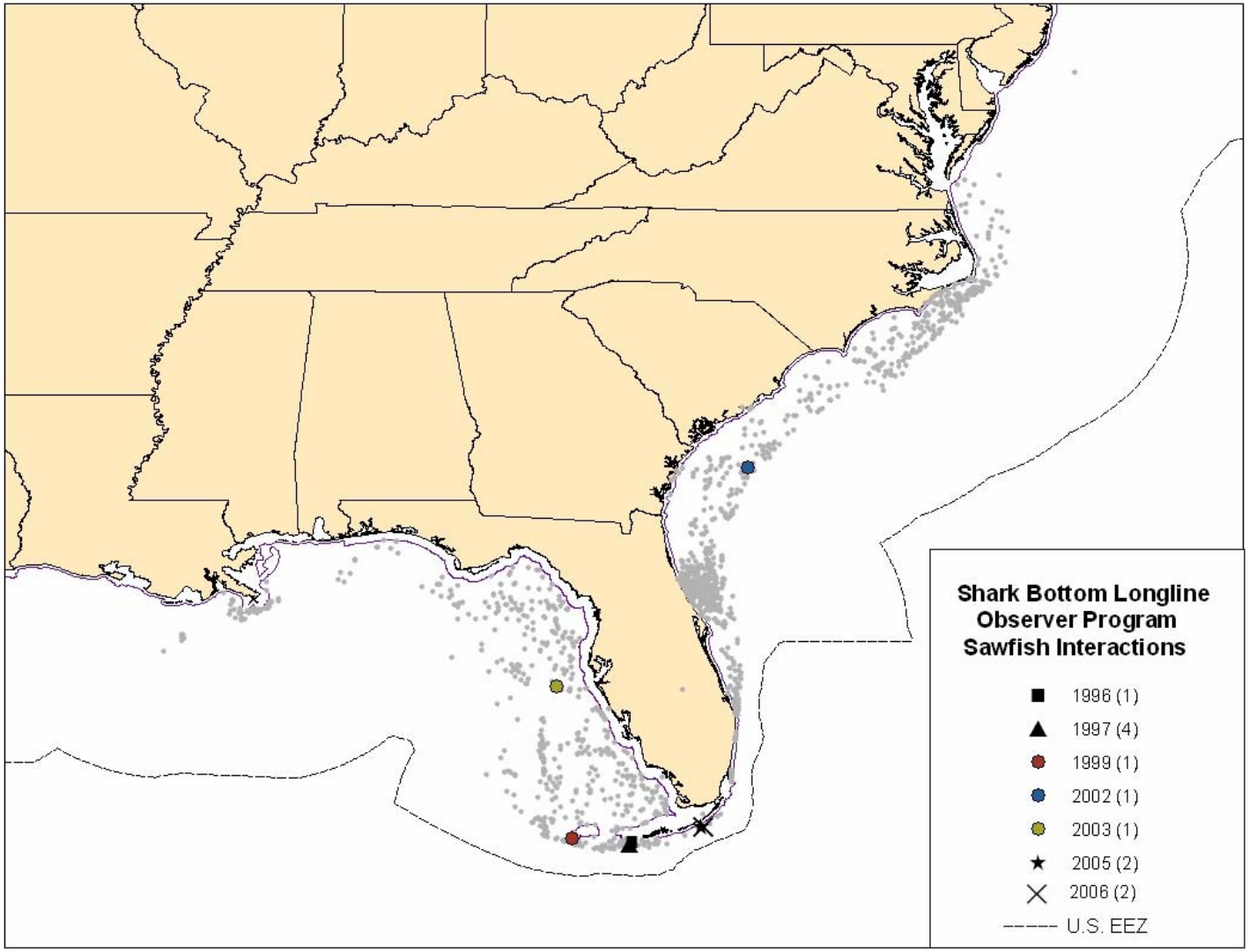


Figure 4.17 Map showing smalltooth sawfish bycatch. Numbers in parentheses in the legend are the number of sawfish interactions. Gray dots indicate the location of each observed bottom longline set. Source: CSFOP 1994-2006.

Table 4.32 Landings by region from the PLL fishery for swordfish, bluefin tuna, yellowfin tuna and bigeye tuna. The 2004 gross fishing revenues was calculated by converting the 2003 total gross revenues into 2004 dollars (2003 value was multiplied by 1.0266). Source: NMFS, 2004.

Region	PLL Landings (mt)	2003 Gross Fishing Revenues	2004 Gross Fishing Revenues
SWORDFISH			
Northwest Atlantic	1,347		
Gulf of Mexico	515.8		
Caribbean	276.4		
NC Area 94a	632.9		
Southwest Atlantic	20.9		
Total (mt)	2,793		
Total (lb)	6,157,448		
Total (lb dw)	4,629,660		
Percent of all landings	**99.2%**	**14,481,889**	**14,867,107**
BLUEFIN TUNA			
Northwest Atlantic	16.3		
Gulf of Mexico	53.8		
Caribbean	0		
NC Area 94a	11.3		
Southwest Atlantic	0		
Total	81.4		
Total (lb)	179,454		
Total (lb dw)	143,564		
Percent of all landings	**5.7%**	**848,614**	**871,187**
YELLOWFIN TUNA			
Northwest Atlantic	272		
Gulf of Mexico	1828		
Caribbean	7		
NC Area 94a	5		
Southwest Atlantic	42		
Total	2154		
Total (lb)	4,748,708		
Total (lb dw)	3,795,775		
Percent of all landings	**28.0%**	**8,891,195**	**9,127,700**
BIGEYE TUNA			
Northwest Atlantic	168.7		
Gulf of Mexico	27.5		
Caribbean	7.2		
NC Area 94a	36.9		
Southwest Atlantic	44.6		
Total	284.9		
Total (lb)	628,091		
Total (lb dw)	502,637		
Percent of all landings	**59.4%**	**1,601,921**	**1,644,532**
TOTAL		**25,823,620**	**26,510,526**

Table 4.33 Average annual change in gross revenues by species for each of the alternatives in comparison to landings from the Atlantic and Gulf of Mexico. Note: 2003 gross revenues are based on 2003 ex-vessel prices. 2004 gross revenues are based on 2004 ex-vessel prices. The total 2004 annual loss or gain to the fishery was calculated by converting the 2003 total gross revenues into 2004 dollars (2003 value was multiplied by 1.0266). - = decrease and + = increase. Source: NMFS, 2005.

Alternative	Swordfish kept	Swordfish discards	Bluefin tuna kept	Bluefin tuna discards	Yellowfin tuna kept	Yellowfin tuna discards	Bigeye tuna kept	Bigeye tuna discards	BAYS kept	BAYS discards	2003 Total	2004 Total
	WITHOUT REDISTRIBUTION OF EFFORT											
Alternative B2(a) (May-Nov)	-3.1%	-8.1%	-6.7%	-4.6%	-14.3%	-17.4%	-1.1%	-0.2%	-10.8%	-12.8%		
Weight	-143,519		-9,619		-542,796		-5,529					
2003 Gross Revenues	-$423,382		-$60,791		-$1,796,654		-$18,190				-$2,299,018	-$2,360,172
2004 Gross Revenues	-$475,048		-$44,632		-$2,035,485		-$25,102					
Alternative B2(b) (June only)	-1.5%	-0.7%	-1.8%	-22.6%	-0.3%	-0.2%	-1.5%	0.0%	-0.6%	-0.2%		
Weight	-69,445		-2,584		-11,387		-7,540					
2003 Gross Revenues	-$231,252		-$14,755		-$27,102		-$26,011				-$299,120	-$307,077
2004 Gross Revenues	-$281,947		-$19,173		-$30,176		-$33,327					
Alternative B2(c) (Apr-June)	-2.8%	-9.9%	-29.0%	-21.5%	-19.8%	-27.0%	-0.2%	-0.2%	-14.7%	-18.7%		
Weight	-130,502		-41,703		-750,356		-1,218					
2003 Gross Revenues	-$384,981		-$263,563		-$2,483,678		-$4,008				-$3,136,229	-$3,219,653
2004 Gross Revenues	-$431,962		-$193,502		-$2,813,835		-$5,530					
Alternative B2(d)	-15.1%	-31.5%	-53.6%	-27.1%	-64.0%	-66.4%	-3.5%	-1.9%	-48.2%	-51.8%		
Weight	-697,717		-76,935		-2,427,731		-17,583					
2003 Gross Revenues	-$2,058,265		-$486,227		-$8,035,791		-$57,849				-$10,638,133	-$10,921,107
2004 Gross Revenues	-$2,309,443		-$356,978		-$9,103,991		-$79,827					

Alternative	Swordfish kept	Swordfish discards	Bluefin tuna kept	Bluefin tuna discards	Yellowfin tuna kept	Yellowfin tuna discards	Bigeye tuna kept	Bigeye tuna discards	BAYS kept	BAYS discards	2003 Total	2004 Total
Alternative B2(e)	-13.7%	-11.0%	-12.4%	-43.3%	-7.6%	-3.6%	-19.7%	-13.8%	-12.0%	-8.3%		
Weight	-632,611		-17,736		-288,129		-98,854					
2003 Gross Revenues	-$2,106,596		-$101,271		-$685,746		-$341,047				-$3,234,660	-$3,320,702
2004 Gross Revenues	-$2,568,401		-$131,601		-$763,542		-$436,935					
	COMBINATIONS WITH REDISTRIBUTION OF EFFORT											
Alternative B2(a) (May-Nov)/B2(b) (June)	-15.2%	-20.3%	-27.9%	-40.8%	-26.6%	-25.4%	-6.2%	-1.0%	-21.5%	-18.7%		
Weight	-703,708		-40,054		-1,009,676		-31,163					
2003 Gross Revenues	-$2,209,644		-$240,926		-$2,872,529		-$105,021				-$5,428,120	-$5,572,508
2004 Gross Revenues	-$2,593,164		-$241,526		-$3,230,963		-$139,610					
Alternative B2(d) /B2(e) (year-round)	-28.8%	-42.5%	-65.9%	-70.4%	-71.6%	-70.0%	-23.2%	-15.7%	-60.2%	60.2%		
Weight	-1,329,360		-94,990		-2,722,984		-118,935					
2003 Gross Revenues	-$4,174,190		-$571,840		-$7,760,504		-$400,811				-$12,907,345	-$13,250,680
2004 Gross Revenues	-$4,905,338		-$572,790		-$8,713,549		-$532,829					
	WITH REDISTRIBUTION OF EFFORT											
Alternative B2(a) (May-Nov)	9.1%	4.4%	3.4%	10.3%	-1.1%	3.0%	2.6%	11.6%	2.6%	-0.04%		
Weight	421,299		4,881		-41,754		13,069					
2003 Gross Revenues	$1,242,832		$27,871		-$138,204		$42,997				$1,175,496	$1,206,764
2004 Gross Revenues	$1,394,500		$22,648		-$156,578		$59,333					
Alternative B2(b) (June only)	-0.8%	-0.1%	-1.2%	-21.9%	0.9%	1.1%	-1.2%	0.3%	0.4%	0.9%		
Weight	-37,037		-1,723		34,162		-6,032					

Alternative	Swordfish kept	Swordfish discards	Bluefin tuna kept	Bluefin tuna discards	Yellowfin tuna kept	Yellowfin tuna discards	Bigeye tuna kept	Bigeye tuna discards	BAYS kept	BAYS discards	2003 Total	2004 Total
2003 Gross Revenues	-$123,334		-$9,837		$81,306		-$20,809				-$72,675	-$74,608
2004 Gross Revenues	-$150,370		-$12,785		$90,529		-$26,661					
Alternative B2(c) (Apr-June)	21.1%	6.0%	-18.3%	9.8%	-11.0%	-18.3%	11.4%	1.7%	-5.4%	-11.8%		
Weight	976,858		-26,272		-417,535		57,301					
2003 Gross Revenues	$2,881,732		-$166,040		-$1,382,042		$188,520				$1,522,170	$1,562,660
2004 Gross Revenues	$3,233,400		-$121,902		-$1,565,756		$260,147					
Alternative B2(d)	62.5%	31.9%	-12.1%	38.0%	-29.8%	-35.6%	80.6%	84.8%	-0.6%	-6.9%		
Weight	2,893,538		-17,371		-1,131,141		405,125					
2003 Gross Revenues	$8,535,936		-$109,786		-$3,744,077		$1,332,861				$6,014,934	$6,174,931
2004 Gross Revenues	$9,577,611		-$80,601		-$4,241,779		$1,839,268					
Alternative B2(e)	-6.8%	-2.9%	-7.6%	-40.7%	5.5%	8.3%	-11.9%	-2.5%	-0.3%	4.1%		
Weight	-314,817		-10,911		208,768		-59,814					
2003 Gross Revenues	-$1,048,340		-$62,301		$496,867		-$206,358				-$820,132	-$841,948
2004 Gross Revenues	-$1,278,157		-$80,960		$553,235		-$264,378					
	COMBINATIONS WITH REDISTRIBUTION OF EFFORT											
Alternative B2(a) (May-Nov)/B2(b) (June)	5.8%	4.4%	5.4%	-13.6%	0.3%	2.2%	10.0%	11.8%	3.2%	3.5%		
Weight	268,520		7,752		11,387		50,264					
2003 Gross Revenues	$843,154		$46,631		$32,397		$169,389				$1,091,570	$1,120,606
2004 Gross	$989,496		$46,745		$36,438		$225,183					

Alternative	Swordfish kept	Swordfish discards	Bluefin tuna kept	Bluefin tuna discards	Yellowfin tuna kept	Yellowfin tuna discards	Bigeye tuna kept	Bigeye tuna discards	BAYS kept	BAYS discards	2003 Total	2004 Total
Revenues												
Alternative B2(d) /B2(e) (year-round)	63.1%	36.1%	-22.0%	-35.2%	-25.1%	-21.6%	78.4%	117.4%	-0.4%	5.6%		
Weight	2,921,315		-31,584		-952,740		394,067					
2003 Gross Revenues	$9,172,931		-$190,136		-$2,710,544		$1,328,007				$7,600,258	$7,802,425
2004 Gross Revenues	$10,779,652		-$190,452		-$3,048,768		$1,765,420					

Table 4.34 Average annual change in gross revenues by species for each of the modifications to the existing time/area closures in comparison to landings from the Atlantic and Gulf of Mexico. Note: 2003 gross revenues are based on 2003 ex-vessel prices. 2004 gross revenues are based on 2004 ex-vessel prices. The total 2004 annual loss or gain to the fishery was calculated by converting the 2003 total gross revenues into 2004 dollars (2003 value was multiplied by 1.0266). - = decrease and + = increase; * excluding the NED. Source: NMFS, 2005.

	Swordfish kept	Swordfish discards	Bluefin tuna kept	Bluefin tuna discards	Yellowfin tuna kept	Yellowfin tuna discards	Bigeye tuna kept	Bigeye tuna discards	BAYS kept	BAYS discards	2003 Total	2004 Total
B3(a) Charleston Bump (Feb-Apr)	1.1%	1.5%	0.0%	0.0%	0.2%	0.4%	0.2%	0.1%	0.1%	0.2%		
Number	1,371	548	0	0	275	19	8	1	297	21		
Weight	67,732		0		7,598		126					
2003 Gross Revenues	$220,806		$0		$13,372		$281				$234,460	$241,025
2004 Gross Revenues	$238,417		$0		$11,625		$282					
B3(b) Northeastern U.S. (June)	0.002%	0.000%	0.000%	0.062%	0.001%	0.000%	0.000%	0.000%	0.000%	0.000%		
Number	3	0	0	1	1	0	0	0	1	0		
Weight	145		0		28		0					
2003 Gross Revenues	$482		$0		$68		$0				$550	$565
2004 Gross Revenues	$588		$0		$74		$0					
All Other Areas*	127,500	36,748	599	1,617	167,203	5,486	37,133	1,006	226,156	8,990		

Table 4.35 Average annual change in gross revenues by species for the B2(a) time/area closures in comparison to landings from the Gulf of Mexico only. Note: 2003 gross revenues are based on 2003 ex-vessel prices. 2004 gross revenues are based on 2004 ex-vessel prices. The total 2004 annual loss or gain to the fishery was calculated by converting the 2003 total gross revenues into 2004 dollars (2003 value was multiplied by 1.0266). - = decrease and + = increase. Source: NMFS, 2005.

Alternative	Swordfish kept	Swordfish discards	Bluefin tuna kept	Bluefin tuna discards	Yellowfin tuna kept	Yellowfin tuna discards	Bigeye tuna kept	Bigeye tuna discards	BAYS kept	BAYS discards	2003 Total	2004 Total
	WITHOUT REDISTRIBUTION OF EFFORT											
Alternative B2(a) (May-Nov)												
Number caught in B2(a)	3,959	2,988	40	75	23,846	952	400	2	24,420	1,152		
% Reduction vs. Overall	-3.1%	-8.1%	-6.7%	-4.6%	-14.3%	-17.4%	-1.1%	-0.2%	-10.8%	-12.8%		
% Reduction vs. GOM only	-13.6%	-20.6%	-11.6%	-16.0%	-20.7%	-23.7%	-26.6%	-5.9%	-20.8%	-21.7%		
Weight	-629,634		-16,653		-785,725		-133,701					
2003 Gross Revenues	-$1,857,420		-$105,249		-$2,600,751		-$439,878				-$5,003,298	-$5,136,386
2004 Gross Revenues	-$2,084,089		-$77,270		-$2,946,469		-$60,700					
	WITH REDISTRIBUTION OF EFFORT											
Alternative B2(a) (May-Nov)												
Number caught in B2(a)	11,590	1,635	20	166	-1,881	166	4,393	117	5,897	-4		
% Reduction vs. Overall	9.1%	4.4%	3.4%	10.3%	-1.1%	3.0%	2.6%	11.6%	2.6%	-0.04%		
% Reduction vs. GOM only	2.4%	11.3%	-0.8%	-4.3%	4.0%	30.4%	-8.7%	10.4%	3.7%	1.7%		
Weight	111,112		-1,149		151,831		-43,729					
2003 Gross Revenues	$327,780		-$7,259		$502,561		-$143,870				$679,212	$697,279
2004 Gross Revenues	$367,781		-$5,331		$569,366		-$198,530					

Table 4.36 Total number of individual vessels and sets by year in some of the time/area closures. Alternative B4 was not included due to confidentiality concerns. Note: 2004 data is only from January through June 2004. Source: HMS Logbook 2001-2003.

Alternative	Number of Vessels	Number of Sets
Alternative B2(a)		
2001	47	1,092
2002	42	880
2003	50	946
2004	40	968
Total No. Vessels 01-03	61	2,918
Total No. Vessels 01-04	101	3,886
Alternative B2(b)		
2001	12	97
2002	10	78
2003	7	51
2004	5	39
Total No. Vessels 01-03	20	226
Total No. Vessels 01-04	25	265
Alternative B2(c)		
2001	62	3,946
2002	65	4,201
2003	63	4,476
2004	53	2,466
Total No. Vessels 01-03	75	12,623
Total No. Vessels 01-04	128	15,089
Alternative B2(d)		
2001	62	4,046
2002	66	4,312
2003	66	4,539
2004	54	2,470
Total No. Vessels 01-03	78	12,897
Total No. Vessels 01-04	132	15,367
Alternative B2(e)		
2001	41	1,156
2002	36	764
2003	28	667
2004	10	86
Total No. Vessels 01-03	49	2,587
Total No. Vessels 01-04	59	2,673
Alternative B7		
2001	123	10,857
2002	145	9,847
2003	157	9,705
2004	109	4,968
Total No. Vessels 01-03	177	30,409
Total No. Vessels 01-04	286	35,377

Table 4.37 Total number of vessels by state for some of the time/area closures from 2001 through 2003, and 2001 through June of 2004. Alternative B4 was not included due to confidentiality concerns. Source: HMS Logbook 2001-2004 (first six months of 2004).

State	Number of Vessels		Number of Sets	
	2001 - 2003	*2001 - 2004*	*2001 - 2003*	*2001 - 2004*
Alternative B2(a)				
FL	14	19	262	277
LA	40	74	2,574	3,521
TX	7	8	88	94
Total	61	101	2,924	3,892
Alternative B2(b)				
DE	1	1	3	3
FL	1	1	7	7
MD	1	1	18	18
NC	1	3	7	18
NJ	4	6	91	116
NY	7	8	66	69
PA	4	4	32	32
RI	1	1	2	2
Total	20	31	226	265
Alternative B2(c)				
AL	1	1	46	46
FL	21	35	2,145	2,640
LA	44	79	9,214	11,111
MA	0	1	0	7
TX	9	12	1,218	1,285
Total	75	128	12,623	15,089
Alternative B2(d)				
AL	1	1	50	50
FL	24	39	2,266	2,764
LA	44	79	9,258	11,156
MA	0	1	0	7
TX	9	12	1,323	1,390
Total	78	132	12,897	15,367
Alternative B2(e)				
CT	1	1	15	15
DE	2	4	30	45
FL	6	7	309	324
MA	4	4	127	127
MD	1	2	62	70
NC	5	7	189	207
NJ	9	12	510	537
NY	11	12	1,014	1,017
PA	6	6	223	223
RI	1	1	70	70
SC	1	1	9	9
TX	1	1	18	18
VA	1	1	11	11
Total	49	59	2,587	2,673

Table 4.38 Percent of total landings and discards in the Gulf of Mexico (GOM) in comparison to all areas. * excluding the NED. Three year totals are shown; one year averages can be obtained by dividing the three year total by three. Source: HMS Logbook 2001-2003.

Month	Number of hooks set	Swordfish kept	Swordfish discards	Bluefin tuna kept	Bluefin tuna discards	Yellowfin tuna kept	Yellowfin tuna discards	Bigeye tuna kept	Bigeye tuna discards	BAYS kept	BAYS discards
1	856,057	3,454	1,514	27	4	8,633	333	246	6	8,982	364
2	578,574	3,853	1,397	34	5	2,453	111	89	3	2,570	118
3	679,555	3,865	1,578	61	83	4,061	151	56	10	4,128	173
4	928,458	2,783	1,452	97	203	8,097	402	31	3	8,132	415
5	1,187,637	2,310	1,862	68	155	12,663	588	36	0	12,726	658
6	1,092,622	1,857	1,237	18	8	15,719	669	73	2	15,798	836
7	1,253,510	1,882	1,151	3	0	16,878	610	99	0	17,006	857
8	1,218,704	1,674	905	0	5	15,014	334	82	1	15,124	522
9	872,529	1,482	803	20	1	9,352	169	87	0	9,463	294
10	901,145	2,005	883	0	1	8,419	244	212	5	8,698	372
11	795,768	1,811	762	3	4	6,324	173	283	3	6,764	313
12	773,885	2,094	973	14	1	7,348	241	211	1	7,781	391
Total in GOM	11,138,444	29,070	14,517	345	470	114,961	4,025	1,505	34	117,172	5,313
All Areas*	21,148,706	127,500	36,748	599	1,617	167,203	5,486	37,133	1,006	226,156	8,990
Percent of Total	52.7%	22.8%	39.5%	57.6%	29.1%	68.8%	73.4%	4.1%	3.4%	51.8%	59.1%

Table 4.39 Percent of total discards in the Gulf of Mexico (GOM) in comparison to all areas (excluding the NED). * excluding the NED. Three year totals are shown; one year averages can be obtained by dividing the three year total by three. Source: HMS Logbook 2001-2003.

Month	Number of hooks set	White Marlin discards	Blue Marlin discards	Sailfish discards	Spearfish discards	Pelagic Shark discards	Large Coastal Shark discards	Leatherback Sea Turtles	Loggerhead Sea Turtles	Other Sea Turtles
1	748,991	27	37	19	10	78	147	16	1	0
2	494,538	11	16	12	2	92	307	14	1	0
3	551,144	10	26	7	5	91	621	19	1	0
4	826,626	30	39	17	6	92	278	19	0	2
5	1,094,168	93	67	54	10	173	440	15	6	0
6	1,225,916	253	200	126	22	88	386	24	1	0
7	1,615,167	574	604	218	58	82	762	49	3	0
8	1,640,901	269	214	118	23	62	162	22	1	0
9	1,215,688	140	171	79	29	63	126	14	1	0
10	1,106,735	131	100	43	14	66	151	26	1	0
11	863,610	58	52	22	6	50	279	20	1	0
12	766,783	42	42	7	9	58	104	72	3	3
Total	12,150,267	1,638	1,568	722	194	995	3,763	310	20	5
All Areas*	21,148,706	3,143	2,449	1,029	424	34,020	16,573	494	179	11
Percent of Total	57.5%	52.1%	64.0%	70.2%	45.8%	2.9%	22.7%	62.8%	11.2%	45.5%

4.2 Rebuilding and Preventing Overfishing

4.2.1 Northern Albacore Tuna

ICCAT assumes three Atlantic albacore stocks for assessment purposes: northern and southern Atlantic stocks, separated at 5° N latitude, and a Mediterranean stock (See Section 3.2.3.3). ICCAT's SCRS conducted a stock assessment for the northern stock in 2000, using data from 1975 through 1999. Based on the results of this stock assessment, at its November 2000 meeting, ICCAT recommended a total allowable catch (TAC) of 34,500 mt ww with an allocation to the United States of 607 mt ww. Subsequent ICCAT recommendations have extended both the 34,500 mt ww TAC, and the U.S. share of 607 mt ww, through 2006.

In 2004, SCRS advice was based on the 2000 assessment as updated with CPUE trends through 2003. SCRS concluded that the northern stock is probably about 30 percent below B_{MSY}, but the possibility of a lower B_{MSY} could not be dismissed. It was further concluded that northern albacore was not being growth overfished[1] and that spawning stock biomass could be increased if catches do not exceed 31,000 mt (ww) (SCRS, 2004). SCRS plans to conduct the next stock assessment in 2007. ICCAT does not currently have a rebuilding plan for this species.

U.S. harvest of Atlantic Northern albacore tuna has historically been less than two percent of the recorded total international landings, based on 1997 through 2004 data. Approximately 98 percent of total U.S. landings are harvested primarily by rod and reel and pelagic longline fisheries in the Northwest Atlantic (See Table 3.60). Since the 2000 ICCAT recommendation of a 607 mt TAC was implemented, U.S. fishing year landings have been well below the annual TAC of 607 mt (ww) until 2004. In 2004, U.S. calendar year landings of 645.9 mt remained 16 percent below the adjusted annual quota of 765.2 mt. The United States had a domestic adjusted quota in the 2005 fishing year of 728.8 metric tons.

As described in Chapter 2, the alternatives considered for a rebuilding plan are:

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

C2 Unilateral proportional reduction of United States northern albacore fishing mortality

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

Ecological Impacts

The SCRS has determined that, under the current exploitation limits, the total catch has remained below the 34,500 metric ton TAC for 2001-2003, although they have not been able to assess the effect of this limit on the stock. However in 2004, a northern albacore tuna stock

[1] Growth overfishing occurs when animals are harvested at an average size that is smaller than the size required to produce the maximum yield per recruit. The total yield from the fishery is therefore less than it would be if the fishing mortality rate was lower. In such a case, less fishing would produce higher landings. This is true even when the resource is abundant. Stock depletion and stock collapse are caused by recruitment overfishing. This means that the adult population was fished so heavily that the number and size of the adult population (spawning biomass) was reduced to the point that it did not have the reproductive capacity to replenish itself.

update using CPUE trends through 2003 indicated the stock was probably about 30 percent below MSY.

Alternative C1, the No Action alternative, would not be expected to result in any ecological impacts, as no changes in the stock status, bycatch, or catch rates are expected. This alternative would not establish a foundation to develop an international rebuilding plan for overfished northern albacore tuna and would be inconsistent with Magnuson-Stevens Act, which requires rebuilding plans for overfished stocks.

Alternative C2, which would implement unilateral U.S. restrictions in albacore landings, would not be expected to result in any changes in the stock status. The U.S. harvest is so low relative to the international 34,500 mt TAC that any positive ecological impacts resulting from decreased albacore landings would be expected to be negligible. NMFS received comment supporting unilateral action and the implementation of bag limits and seasonal limits on albacore landings. It is likely that a unilateral rebuilding plan would require reductions in landings from both the commercial and recreational sectors. Such an action could potentially change fishing behavior and/or increase dead discards because albacore are an incidental catch when directing for other species. NMFS also received a comment opposing unilateral action because such restrictions would only create unnecessary waste and discards, and that such actions would weaken the U.S. negotiating position at ICCAT. The agency agrees that implementation of an ineffective unilateral rebuilding plan may weaken the U.S. negotiation position at ICCAT to implement an effective international rebuilding plan, potentially resulting in continued international fishing on a stock biomass below MSY. Furthermore, setting the U.S. quota above or below current ICCAT recommendations would not be consistent with Magnuson-Stevens Act §304(g) (1) (d) and ATCA.

Alternative C3, a preferred alternative to establish a foundation for an international rebuilding plan, would have no immediate ecological impacts, as ICCAT would probably develop an international rebuilding plan following the next scheduled stock assessment in 2007. This alternative would allow for international discussions and the creation of a comprehensive rebuilding plan for all three Atlantic stocks of albacore. Following implementation of rebuilding plan recommendation(s), some negative impacts would be possible as changes in fishing practices may be necessary to reduce fishing mortality, which may result in an increase in dead discards in U.S. fisheries due to quotas, size limits, or other restrictions. However, engaging all concerned ICCAT parties in the rebuilding would be expected to generate long term positive ecological impacts. As the stock rebuilds and more resource becomes available to the fleet, U.S. quotas would likely increase and dead discards may decline.

Under the preferred alternative C3, the United States would work through ICCAT to establish a foundation for an international rebuilding program for northern albacore tuna. Implementation of this alternative would include a thorough analysis of the ICCAT Rebuilding Program to ensure that it contains a specified recovery period, biomass targets, fishing mortality rate limits, and explicit interim milestones expressed in terms of measurable improvements of the stock. Each of these components would comply with the objectives of this FMP and the intent of the Magnuson-Stevens Act. If successful, an Atlantic-wide TAC for northern albacore tuna, along with other conservation and management measures, would be adopted by ICCAT to

rebuild the stock. The United States would then implement the ICCAT Rebuilding Program for northern albacore tuna through appropriate management measures such as quotas and/or increased minimum sizes and retention limits in domestic fisheries. Such a rebuilding plan would be expected to reduce harvest levels, which could increase discards of northern albacore tuna because the pelagic longline fishery primarily targets other species. Fishermen may increase fishing effort to compensate for lost revenues from northern albacore that would have to be discarded. Therefore, reduction in landings of northern albacore tuna could also cause a shift in both commercial and recreational fishing effort, and perhaps mortality, towards other species. Overall, however, alternative C3 would likely result in long term positive ecological impacts on the stock because current international catch rates exceed the levels needed to produce MSY.

Social and Economic Impacts

There would essentially be no impact from alternative C1, the No Action alternative, as the U.S. fleets are currently fishing below their ICCAT allocation. For commercial fisheries, alternative C2, implementation of a unilateral rebuilding plan, would likely result in a reduction in income, as incidental catches of northern albacore tuna would have to be discarded rather than landed. However, expected reductions in income would be small since the level of landings for northern albacore is two orders of magnitude smaller than pelagic longline target species (e.g., swordfish, other tunas). For the recreational fishery, alternative C2 would likely result in shifts for other opportunistic target species and catch and release of northern albacore tuna. Economic impacts would be difficult to evaluate for the recreational fishery since there is high variation in the catch from year to year. As ICCAT has not yet adopted a rebuilding program for northern albacore tuna, a complete analysis of the social and economic impacts of alternative C3 cannot be conducted at this time. If the ICCAT Rebuilding Program involves a substantial reduction in allowable catch, minimum size restrictions, or effort restrictions, there would likely be a short-term reduction in economic benefits to the pelagic longline fishery until the stock recovers. Since northern albacore tuna are targeted by recreational fishermen in certain times of the year and in certain areas, it is difficult to estimate the effect that a reduction in allowable landings of northern albacore would have on angler consumer surplus. It might be reduced, but to an unknown extent, because many recreational trips targeting northern albacore tuna often target other tuna species. Overall, however, ICCAT recommendations for stock rebuilding tend to be long term and so any negative social and economic impacts may be mitigated in the short term.

Conclusion

The preferred alternative for northern albacore tuna is C3, which would establish a foundation with ICCAT for developing an international rebuilding plan. This alternative appears to be an effective plan for meeting the objectives of the Magnuson-Stevens Act, ATCA, and this FMP. NMFS will continue to work with ICCAT member nations to develop and adopt an appropriate international rebuilding plan for northern albacore tuna with a specified recovery period, biomass targets, fishing mortality rate limits, and explicit interim milestones. The U.S. harvest of the North Atlantic stock is proportionally so low that the socio-economic impacts to the United States would likely be minimal but would depend upon the specifics of the rebuilding plan adopted by ICCAT. The other alternatives of no action or unilateral action would not be consistent with the Magnuson-Stevens Act or ATCA. Also, alternative C2 would not be consistent with Magnuson-Stevens Act §304(g)(1)(d) and ATCA because it would set the U.S.

quota above or below the current ICCAT recommendation. Furthermore, implementation of an ineffective unilateral rebuilding plan may weaken the U.S. negotiation position at ICCAT to implement an international rebuilding plan, potentially resulting in continued international fishing on a stock biomass below MSY.

4.2.2 Finetooth Sharks

NMFS determined that overfishing of finetooth sharks is occurring based on the 2002 stock assessment for SCS (Cortes, 2002). More detailed information on the stock assessment can be found in the Status of the Stocks section (Section 3.2.5) of this document. National Standard 1 of the Magnuson-Stevens Act requires NMFS to prevent overfishing. As described in Chapter 2, the alternatives considered to address overfishing of finetooth sharks are:

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

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

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

D4 Identify sources of finetooth fishing mortality to target appropriate management actions. (Preferred Alternative).

Ecological Impacts

None of the alternatives analyzed for preventing overfishing of finetooth sharks would have any additional negative impacts on protected resources or EFH. The alternatives considered are not expected to modify fishing techniques, fishing effort, or fishing gears in any way that has not already been considered in relevant BiOp's. Furthermore, the measures are not expected to have "more than minimal and not temporary" impacts on areas that have designated as EFH for finetooth sharks.

Alternative D1 is the No Action alternative and would maintain the existing regulations. This alternative would likely maintain fishing mortality of finetooth sharks at current levels, and therefore, may have negative ecological impacts. Over 80 percent of finetooth sharks harvested commercially are landed with either drift gillnets, strikenets, encircling nets, or sinknets. Finetooth sharks are susceptible to these net gears as they have a tendency to "roll" upon contact with gillnets. This rolling behavior means that they become entangled by a wide range of gillnet mesh sizes and are often brought to the vessel dead (Carlson and Cortes, 2003). Currently, commercial gillnets are banned in most states' waters throughout the finetooth sharks' range, including: Georgia, Florida, Texas, and Louisiana. South Carolina allows the use of gillnets less than 100' long (30.4 m) in state waters. South Carolina's gillnet fishery is primarily a recreational fishery. Between 1997 and 2003, 95 and 99 percent of the finetooth landings reported to the General Canvass and Coastal Fisheries logbooks, respectively, were from the South Atlantic region (Table 4.40). Finetooth sharks are generally found in shallow coastal waters (Castro, 1993) in predominantly state, but also in Federal waters. For more information on finetooth shark life history, please see Section 3.2.5.

The ecological impacts of the alternatives are difficult to quantify because it is difficult to determine exactly which fisheries are contributing to commercial and recreational landings of finetooth sharks because Federal dealer logbooks (General Canvass) are not linked to a specific vessel; rather, they are an aggregation of shark purchases from various fishermen and submitted every 14 days. Recreational landings of finetooth sharks in state and Federal waters do not have to be reported, therefore, it is difficult to quantify these landings. Vessel logbooks submitted by shark and other Federal permit holders indicate which vessels are landing finetooth sharks, however, these landings only represent a fraction of the total dealer landings (General Canvas landings) for finetooth sharks (Table 4.40 and Table 4.41). This discrepancy may be a result of landings in state waters by non-Federally permitted fishermen, landings by Federally permitted fishermen who are not reporting all their catch in logbooks, misidentification of finetooth sharks by the dealers, or landings of finetooth sharks by vessels that are targeting unmanaged species and therefore are not required to report landings in logbooks.

Based on observer reports, the directed shark fishery landed an average of 685 finetooth sharks (approximately 2.9 mt dw) per year between 1999 and 2004 (Table 4.41). The range of annual landings varied widely from 65 to 1,615 individual finetooth sharks per year. The average number of finetooth observed landed per year equates to approximately 3.6 percent of the average number of finetooth landings reported by dealers to the General Canvass system during the same time period (1999-2004). There are several reasons why there is a discrepancy between observed landings and landings reported by dealers. One reason could be because historically there were more directed (*i.e.*, Federally permitted) shark gillnet vessels (11) subject to observer coverage. Overtime, the number of gillnet vessels specifically targeting sharks has decreased. Currently, there are between 5 and 6 vessels targeting sharks with gillnet gear that are subject to extensive observer coverage. However, there are other vessels that use gillnet gear, target other species, and land sharks. In 2003, there were approximately 15 gillnet vessels with directed shark permits that reported landing finetooth sharks. These vessels also possessed permits for, and targeted, Spanish mackerel. Because these vessels were not specifically targeting sharks, observer coverage may not have been required if fishermen claimed they were targeting non-HMS (Spanish mackerel or unmanaged species) or not using shark gillnet gear. These vessels may be using gillnets that have stretched mesh smaller than 5 inches. Under the regulations for the Atlantic Large Whale Take Reduction Plan (ALWTRP), gillnets with stretched mess smaller than 5 inches are not considered shark gillnet vessels. Thus, while these vessels are able to land finetooth sharks opportunistically under their directed shark permit, they were not previously observed as part of the shark gillnet fishery.

In 2005, NMFS modified the criteria for selection of gillnet vessels for observer coverage requirement outside of the right whale calving season (Nov. 15 – March 31) when 100 percent coverage in the Southeast U.S. Restricted Area is required. New criteria outside of the calving season included all vessels with a directed shark permit that reported fishing for sharks with gillnet gear and reported greater than 25 percent of their total landings from sharks during the previous year. This modification does not include those vessels selected for 100 percent observer coverage based on the ALWTRP. The 100 percent observer coverage under that plan only includes vessels that have stretched mesh gillnets five inches or greater. While observer coverage is extensive during the right whale calving season (100 percent from November 15 –

March 31), it does not include all of the vessels that can land sharks with gillnet gear. Additionally, observer coverage outside the Atlantic Right whale calving season (April 1 – November 14) is reduced to approximately 30 percent. Figure 4.18 indicates that the majority of trips landing finetooth occur between October and March every year. Increasing the pool of vessels that are subject to observer coverage has led, and would continue to lead, to improved understanding of finetooth shark landings outside of the current 5-6 boats that comprise the directed shark gillnet fishery universe.

As described in Section 3.4. and in the 2005 Directed Shark Gillnet Fishery Observer Program Report, the gear and soak time deployed by drift gillnet, strike gillnet, and sink gillnet fishermen are varied. Set duration was generally 0.3 hours and haulback averaged 2.9 hours. The average time from setting the net through completion of haulback was 10.2 hours. The most frequently used mesh size for drift gillnets was 12.7 cm. Strikenetters use the largest mesh size (22.9 cm) and the set times were 2.7 hours. The primary difference between sink gillnets and other gillnets (drift gillnets and strikenets) is the species being targeted. Sink gillnets can be used to target sharks, Spanish mackerel, and kingfish. These sink gillnets are generally weighted with a lead line in 10-20 m (33-65 ft.) of water, with the net being checked every 15-20 minutes. Sink gillnet gear is fished slightly differently depending the target species (sharks vs. non-sharks). If targeting Spanish mackerel or southern kingfish, vessels deploy a 68-912 m long net that is 1-9 m deep. Mesh sizes range from 6.4-12.7 cm with 7.6 cm being the most common. Vessels targeting sharks deployed sink gillnets between 137 and 1,824 m in length and 2-8 m deep with mesh sizes ranging from 7.3-20.3 cm (17.8 cm most common) and set at an average depth of 18.9 m (Carlson and Bethea, 2006). The No Action alternative would not affect or modify any of the gillnet gear that currently being deployed for finetooth sharks, other HMS and non-HMS species.

The No Action alternative (D1) may not result in the acquisition of additional landings data or information about fisheries that may be landing finetooth sharks. By taking no action, the Agency may not be able to obtain the additional information on fisheries that may be harvesting finetooth sharks. This could prevent the Agency from identifying further management measures to prevent overfishing of finetooth sharks, and may reduce the certainty associated with the stock status of finetooth sharks and other SCS in the upcoming stock assessment. Furthermore, the No Action alternative would not result in the development of collaborative efforts between management entities, which may be the most effective means of preventing overfishing of finetooth sharks.

While the No Action alternative is not expected to have positive ecological benefits, NMFS recently published a temporary rule under the authority of the ALWTRP and the Endangered Species Act (February, 16, 2006, 71 FR 8223) that prohibited, through March 31, 2006, any vessel from fishing with any gillnet gear in the Atlantic Ocean between 32º N and 27º 51’ N and extended the Southeast U.S. Restricted Area out to 80º W. This action was based on NMFS’ determination that a right whale mortality, documented on January 22, 2006, was the result of an entanglement by gillnet gear within the Southeast U.S. Restricted Area. The action was necessary to protect north Atlantic right whales from further serious injury or mortality from entanglement in gillnet gear. Because this six-week gillnet closure occurred at a time when finetooth sharks are generally present in the Southeast U.S. Restricted Area, it is expected that

the closure would result in positive ecological impacts for finetooth sharks. The actual impact will likely not be known until dealer and logbook data are analyzed. In addition to this temporary rule, the Atlantic Large Whale Take Reduction Team (ALWTRT) is likely to initiate further rulemaking prior to re-opening the Southeast U.S. Restricted Area next year during this six-week time period (Feb. 14 – March 31) to address this take. NMFS would expect that any recommendations that reduce the use of gillnet gear during that time period would have positive ecological benefits for fineooth sharks. The actual benefit is not quantifiable at this time.

Alternative D2 would implement commercial fishery management measures (directed trip limits for SCS, gillnet gear restrictions, prohibiting the use of gillnet gear for targeting sharks, and/or reducing the SCS quota) to reduce fishing mortality of finetooth sharks. As described above, the majority of finetooth sharks are landed by commercial fishermen deploying gillnet gear in the South Atlantic region. This alternative might potentially affect all participants in possession of a commercial shark permit who are involved in gillnet fisheries in the south Atlantic or Gulf of Mexico regions.

A directed shark gillnet vessel is defined as a vessel that possesses directed shark permits and fishes with gillnets greater than 5 inch (12.7 cm) stretched mesh. These vessels are prohibited from deploying shark drift gillnet gear in the Southeast U.S. Restricted Area (roughly between Sebastian Inlet, FL, and Savannah, GA) during the right whale calving season between November 15 and March 31, unless they are fishing with strikenets and maintain 100 percent observer coverage. Also, during right whale calving season, directed shark gillnet vessels fishing outside the restricted area are subject to 100 percent observer coverage. Any vessel that has been issued a directed shark permit and that has gillnet gear onboard, regardless of location or mesh size, must have an operating VMS unit onboard during right whale calving season.

Currently, there are five directed shark gillnet vessels targeting sharks with drift gillnets, strikenets, and sinknets in Federal waters. These five gillnet vessels are responsible for less than 10 percent of the commercial finetooth shark landings based on observer reports (Table 4.41). The remaining finetooth sharks are likely being landed in state waters or by fishermen pursuing other species in Federal waters, such as those managed by the Gulf of Mexico or South Atlantic Fishery Management Councils (*e.g.*, Spanish and king mackerel) or species that are not currently managed (*e.g.*, kingfish). Since some of these fishermen may also possess directed shark permits, they can keep all finetooth sharks. However, because their harvest of finetooth sharks is incidental to landing of other non-HMS species or they are deploying gillnet gear with stretched mesh sizes less than five inches, these vessels are not subject to the stringent regulations implemented for the Southeastern U.S. Restricted Area, which are only applicable for vessels targeting sharks using shark gillnets (>5” stretched mesh) or strikenets. Vessels in the directed shark gillnet fishery also possess other permits and may modify gillnets to target other non-HMS. Thus, the measures under alternative D2 may have positive ecological impacts in general, but because they would not impact fishermen who do not *target* finetooth sharks, may not have an impact on the commercial fisheries that are the largest source(s) of finetooth shark fishing mortality. In fact, it is likely that some of the measures under alternative D2 would increase dead discards of finetooth sharks by preventing fishermen targeting other fish from landing finetooth sharks, thereby increasing the effort they expend in order to land enough permissible species to cover fishing costs.

One of the management measures considered under alternative D2 is a trip limit for directed shark permit holders. Currently, there is no directed trip limit for SCS. A directed trip limit for SCS or one specific to finetooth sharks could potentially reduce the number of finetooth sharks landed per trip. However, since the overall SCS quota has never been taken in any single year, fishermen would likely compensate for missed income as a result of the trip limit by increasing the number of trips taken and discarding any sharks fish harvested in excess of the trip limit. Given that gillnets are the predominant gear type used to harvest finetooth sharks and finetooth sharks tend to roll and die in gillnets, this alternative may result in an increased number of finetooth sharks dying by increasing the number of finetooth sharks that are discarded dead, by increasing the number of gillnet trips by vessels to maintain economic viability, or both. Additionally, gillnet gear is generally non-selective, and it is difficult for fishermen to deploy sets that would not also catch finetooth sharks. Thus, the net effect of this measure may increase, rather than prevent, overfishing on finetooth sharks which would result in negative ecological impacts.

Other management measures possible under alternative D2 are gear restrictions, specifically those that would modify mesh size and/or limit gillnet soak times. Soak times and mesh sizes deployed in this fishery are described above and in Section 3.4. Currently, for directed shark fisheries, the 50 CFR Part 635 regulations do not define a minimum or maximum mesh size requirement. Vessels targeting king and Spanish mackerel already have minimum mesh size restrictions of 4.75 and 3.5 inches (12.1 and 8.9 cm), respectively. The ALWTRP regulations define shark gillnet as having a minimum of 5 inches mesh size. For many species, limiting the mesh size is effective at reducing interactions because the fish swim through the net (the mesh is too big), are "gilled" by the net (if the mesh size is appropriate for that fish), or the fish swims into the net and swims away (the mesh size is too small). However, as noted under alternative D1, finetooth sharks are highly susceptible to entanglement in gillnet gear regardless of mesh size. Thus regulating the mesh size used in directed shark fisheries may have little impact on reducing finetooth shark fishing mortality. Similarly, while limiting the soak time (*i.e.*, the time the gillnet gear is in the water) may reduce the number of finetooth sharks harvested per trip as well as the catch of other SCS and LCS, fishermen may simply increase the number of sets made per trip to compensate for reduced catches which could potentially negate any benefit gained by reduced soak times. Thus, NMFS does not believe that modifying gillnet mesh size and/or limiting gillnet soak times would reduce finetooth shark fishing mortality or result in any significant ecological benefits.

Another management measure possible under alternative D2 would be a reduction in the overall SCS quota. Since it was established in 1999, the SCS annual quota has not been caught and finetooth sharks are the only species in the SCS complex that are experiencing overfishing. Between 1999 and 2002**,** total commercial landings of all SCS ranged from 263-330 mt dw per year. This was well below the 1,760 mt dw quotas established for SCS during this time period. In 2003, the quota was reduced to 326 mt dw, a reduction of 1,434 mt dw. The current quota of 454 mt dw was established in 2004. From 1999 – 2004, commercial landings of finetooth sharks averaged 34 percent of the SCS landings (Table 4.41). Given that the existing quota for SCS has never been reached and that finetooth sharks represent approximately a third of the SCS that are landed, a reduction in the overall quota may have minimal beneficial impacts on reducing the

mortality of finetooth sharks. Furthermore, even if the quota were reduced, it may not necessarily mean that landings of finetooth sharks would decrease because the quota includes all SCS.

Lastly, under alternative D2, NMFS could close the shark gillnet fishery and remove gillnet gear from the list of authorized gears. The Agency received numerous comments during this rulemaking, including one from the State of Georgia, indicating support for closing the directed shark gillnet fishery. A similar alternative was analyzed in Amendment 1 to the Fishery Management Plan for Atlantic Tunas, Swordfish, and Sharks. As was determined at that time, banning gillnets in HMS fisheries would likely have positive ecological impacts on finetooth sharks and other species (including HMS and non-HMS species) by reducing bycatch and bycatch mortality, and may reduce gillnet fishing effort in areas that are designated as right whale critical habitat. However, because very few vessels use drift gillnets, strikenets, and sinknets to target sharks and may only be responsible for a small portion of the finetooth shark fishing mortality, closing this fishery would not likely prevent overfishing because other vessels would continue to land (or discard dead) finetooth sharks while targeting other non-HMS. Most of the directed shark gillnet vessels also possess Spanish mackerel permits and would continue deploying gillnet gear in that fishery. Regarding gillnet fishing effort in the Southeastern U.S. restricted area, unauthorized gillnets would continue to be deployed in this area in other fisheries and the potential for interactions with right whales would continue to exist despite removal of gillnet gear from the authorized gear for sharks. Moreover, a permanent closure of the shark gillnet fishery may displace fishing effort to other fisheries, resulting in unknown ecological impacts. Vessels may shift to BLL gear, which is the primary gear used to target LCS but also can be used to harvest finetooth sharks. Therefore, these species might be subject to additional fishing pressure from the vessels that used to fish primarily with gillnet gear.

NMFS also received a comment indicating support for initiating a cap on the number of vessels that can use gillnet gear to target sharks. NMFS does not currently issue gear-based permits for shark fisheries. Rather, permit holders possess either directed or incidental permits and both permits are valid for use with any authorized gear for sharks (gillnet, bottom and pelagic longlines, handline, rod and reel, or bandit gear). Additionally, logbook and permit data does not indicate that there has not been a significant increase in recent years in the number of vessels targeting sharks with gillnet gear. The majority of shark fishermen employ bottom longline gear. NMFS did not consider gear based permitting endorsements in this rulemaking but may consider gear-based permits in another rulemaking (see Chapter 1). Such a rulemaking could consider limiting vessel participation in the shark gillnet fishery.

The Agency received several comments in support of seasonal commercial gillnet fishing restrictions to reduce finetooth shark fishing mortality, including one from the South Atlantic Fishery Management Council. Seasonal closures of commercial gillnet fisheries landing finetooth shark were not analyzed as part of alternative D2, however, these closures may be considered in the future, as necessary, to reduce fishing mortality of finetooth sharks. Trips that landed finetooth sharks, by gear and month, between 1999 - 2004 were analyzed from the Coastal Fisheries Logbook data. This data indicates that there is an increase in the number of trips landing finetooth sharks in October and November. This could be due to finetooth sharks

moving southward from the Carolinas to warmer waters off of Florida in these months. Furthermore, the expansion of effort targeting Spanish mackerel as they are also moving south to Florida in October and November each year might also be a factor behind elevated finetooth shark landings. Finetooth sharks tend to move in schools north and south along the coast, depending on water temperatures and forage availability. Initiating annual geographic closures based on these paramaters would be confounding as oceanographic conditions are difficult to predict. Furthermore, initiating seasonal closures based on logbook data indicating where finetooth sharks have historically been landed (Table 4.44 and Figure 4.18) may not reduce fishing mortality because gillnet gear would likely continue to be deployed in these same areas for fisheries that are pursuing other species (*i.e.,* Spanish mackerel)**.** Since most of the fishing pressure on finetooth sharks occurs on finetooth sharks after they have pupped in the coastal waters (2-7 m (water depth) surrounding Bulls Bay, SC in May it is difficult to use protection during pupping as a justification for seasonal closures as most states in the region have already banned gillnet gear for commercial fisheries. Seasonal commercial gillnet fishing restrictions were not considered in this rulemaking but may result in positive ecological impacts and may be considered in a future rulemaking. These closures would have to be for all gillnets as fishermen are not able to exclude finetooth sharks from being caught in this gear.

Alternative D3 would implement recreational management measures (*e.g*., mandatory use of circle hooks and/or increasing the minimum size) to reduce fishing mortality of finetooth sharks. The current Federal minimum size is already approximately 15-20 cm (six to eight inches) greater than the size at maturity. Some states have smaller minimum size requirements, more liberal bag limits, and do not require compliance with Federal regulations when fishing in state waters. Babcock and Pikitch (2002) claim that the majority of sharks (LCS, SCS, and Pelagic sharks) sampled by the MRFSS survey were below the existing minimum size limits. Ecological impacts of increasing the minimum size would be contingent upon compliance with existing and or future regulations. Since finetooth sharks are predominantly found in inshore waters under states' jurisdiction, where additional Federal regulations traditionally may have limited impact, the positive ecological impacts of increasing the minimum size further might be minimized.

A preferred measure (alternative I11 (b)) included in this action would require all recreational anglers with an HMS Angling, CHB, or General Category permit to abide by Federal regulations regardless of where they are fishing, unless a particular state has more stringent regulations. This measure could have positive ecological impacts because it would compel recreational fishermen to abide by the more stringent Federal minimum sizes and bag limits for recreational shark harvest. If more stringent Federal measures, regardless of where one were fishing, were implemented as a result of alternative I11 (b), improved consistency between Federal and state regulations might occur as a result. Improved compliance with existing and future regulations is necessary to prevent overfishing of finetooth sharks. Similar analyses related to increasing the minimum size were conducted in Amendment 1 to the 1999 HMS FMP. Additional consideration of increasing the minimum size has produced no new information/data on which to base a change in the current minimum size because most landings of finetooth sharks are likely in state waters, finetooth sharks only comprise a small portion of recreational SCS landings (1.4 percent), and the minimum size is already well above the size at first maturity for finetooth sharks. The results from the next SCS stock assessment should be available in 2007

and further information regarding the status of finetooth shark stocks may warrant reconsideration of this alternative at that time.

Although NMFS received several comments supporting more aggressive conservation measures to protect finetooth sharks in recreational fisheries, measures affecting the minimum size in Federal waters may have negligible ecological impacts since recreational fisheries are already regulated under a conservative bag limit and minimum size well under size at first maturity. Furthermore, since finetooth sharks only comprised 1.4 percent of recreational SCS landings between 1999 and 2004, it does not seem that there are many participants targeting finetooth sharks.

Another management measure under alternative D3 is a requirement to use circle hooks when targeting SCS in the recreational fishery. Currently, there are no other recreational HMS fisheries that have a circle hook requirement. However, a preferred alternative in this action (alternative E3) would restrict all billfish tournament participants issued an HMS permit to using circle hooks when using natural baits. Requiring circle hooks when targeting SCS may have some ecological benefits by reducing the post-release mortality of finetooth sharks, assuming that similar decreases in post-release mortality may be achieved for finetooth sharks as for other HMS that have been studied. Cooke and Suski (2004) suggest that overall post-release mortality rates are often lower when using circle hooks compared to J-hooks because of the reduced likelihood of fish ingesting the hook. However, they also recommend that management agencies implement circle hook requirements only in instances in which appropriate scientific data for similar species exists. While there have been numerous studies evaluating ecological benefits of circle hook usage in recreational fisheries, including several HMS, these studies have not been conducted in recreational fisheries that specifically target sharks to demonstrate decreases in post- release mortality compared to J-hooks for these fishes. In general, sharks caught in recreational fisheries are thought to have low post-release mortalities if they are kept in the water, handled properly, not deeply hooked, and not fought for extensive periods of time because many species of sharks are considered relatively hardy based on tag recaptures. Gurshin and Szedlmayer (2004) recently documented high post-release survival (nine out of ten hooked fish) of Atlantic sharpnose sharks on 9/0 J-hooks. The absence of similar research on circle hooks, coupled with reports of low post-release mortality for similar species caught with J-hooks, precludes a quantitative estimate of the ecological benefits to finetooth sharks that may occur as a result of requiring circle hooks.

Alternative D4, the preferred alternative, is expected to result in positive long-term ecological impacts. This alternative, while it does not prevent overfishing immediately, would implement a plan to prevent overfishing of finetooth sharks, through determining which fisheries catch finetooth sharks, and to what extent, those fisheries are responsible for mortality of finetooth sharks. NMFS believes that the measures contained in alternative D4 comprise an appropriate plan to implement at this time for the following reasons: information regarding finetooth shark landings is currently incomplete; landings or dead discards of finetooth sharks would continue to occur or could increase in other fisheries if stringent measures directed at commercial shark permit holders were implemented; the lack of catch series and bycatch data included in the 2002 SCS stock assessment (Section 3.2.5) impacted the results and conclusions drawn from that assessment; and that collaborative management measures among fisheries

management entities may be the most effective means of preventing overfishing of finetooth sharks. A better understanding of where finetooth sharks are being landed, by whom, and which management entities are responsible for the fisheries in which they participate, could direct future management initiatives.

Table 2.1 lists activities, anticipated outcomes, and a timeline that constitute the plan to prevent overfishing of finetooth sharks as a result of alternative D4. This table and the actions it describes were produced in response to public and HMS Advisory Panel dissatisfaction related to the activities that had been undertaken to prevent overfishing of finetooth sharks and serves as a road map detailing how the Agency is engaged in current and future activities related to this end. Some of the activities described have already been initiated to attain a better understanding of how NMFS should proceed to prevent overfishing of finetooth sharks. The activities described in this table are not an exhaustive list and the Agency intends to explore other viable alternatives that would prevent overfishing if necessary. NMFS received several comments stating that the Agency needs to work harder to find sources of finetooth shark mortality in state-managed, Federally managed, and/or unmanaged fisheries. The following paragraphs provide a summary of NMFS' findings since the publication of the Draft Consolidated HMS FMP. In order to attempt to understand which fisheries may be interacting with finetooth sharks it is necessary to understand which permits (if any) that vessels maintain; what other species were being landed simultaneously or on the same trip as finetooth sharks based on Federal logbook data; the seasonality and geography of finetooth shark landings; and, to establish contacts with individual states, Councils, and Commissions to get more information on fisheries nder their jurisdiction that may be interacting with finetooth sharks, among other activities. Acquiring this information could focus future management initiatives which may result in positive ecological impacts if they can be employed to prevent further overfishing of finetooth sharks.

A recent analysis of landings data submitted via the Fishing Vessel Logbook Record for Gulf of Mexico Reef Fish, South Atlantic Snapper-Grouper, King and Spanish Mackerel, and Shark (Coastal Fisheries Logbook) between 1999-2004 indicate that a total of 46 vessels reported landings of finetooth sharks. Of these, 17 vessels only had a shark limited access permit, 17 vessels had both a directed shark permit and a Spanish mackerel permit (managed under the Coastal Pelagics FMP and its amendments by the South Atlantic Fishery Management Council), and 12 vessels had neither permit. In 2003, 15 vessels reported landings of finetooth sharks, all of which had both a shark directed permit and a Spanish mackerel permit. Management measures for shark fishing under commercial Federal shark permits would effectively only address finetooth shark fishing mortality by the 34 (17 vessels with a shark permit only + 17 vessels with a shark permit in addition to a Spanish mackerel permit) vessels that have a shark limited access permit. Preventing overfishing of finetooth sharks will be facilitated by understanding what permits that participants currently possess because that provides insight as to what regulations might be most effective at modifying current practices. Since the South Atlantic Fishery Management Council manages Spanish mackerel under the Coastal Pelagics FMP, and many participants possess this permit, the Agency is engaging in collaborative efforts with the South Atlantic Fishery Management Council, and may propose specific management measures in the future as new information warrants. Collaborative management measures may be the most viable option to ensure sustained long-term positive ecological impacts and prevent overfising of finetooth sharks.

Observed finetooth shark landings in 2005 included 1,556 finetooth sharks landed by strike gillnet gear, 413 finetooth sharks landed by drift gillnet gear, and 37 finetooth sharks landed by sink gillnet gear. On trips deploying sinknet gear and not targeting sharks, southern kingfish and Spanish mackerel were the most commonly encountered species. However, these trips interacted with 13 finetooth sharks, all of which were landed. The average size of finetooth sharks landed in 2005 was 123 cm, based on measurements attained from 38 individuals (Carlson and Bethea, 2006). As mentioned previously, many of the Federally managed gillnet vessels in the South Atlantic that were observed possess both Spanish mackerel and directed or incidental shark permits, thereby limiting the effectiveness of regulations directed at only one of these fisheries, and suggesting the need for collaborative strategies between management entities.

Expansion of this program was initiated in 2005 and will continue in the future, yielding valuable fisheries dependent data on finetooth shark landings, distribution, and interactions with vessels outside of the vessels traditionally covered by this observer program resulting in positive ecological impacts. Furthermore, data from observers on protected species interactions and other bycatch has utility for fisheries managers, scientists, and law enforcement officials. Vessels strictly targeting unmanaged species (and not in possession of a directed shark permit) such as kingfish are not subject to observer coverage under the regulations at 50 CFR Part 635 and are not required to submit logbooks, but may still be harvesting finetooth sharks. These vessels could be selected for observer coverage under the ALWTRP regulations which could further enhance efforts to document landings of finetooth sharks in non-HMS or unregulated fisheries, resulting in positive ecological impacts. The ALWTRP is currently engaged in efforts to better address gillnet vessels that are participating in unmanaged fisheries in the Southeast U.S. Restricted Area.

The Agency has been actively involved in gathering more information about fisheries that may be interacting with finetooth sharks, especially off the coast of Florida where most finetooth sharks are landed. NMFS collected some anecdotal information describing gillnet fisheries for Spanish mackerel and kingfish at a recent meeting of the Atlantic Large Whale Take Reduction Team in St. Augustine, FL, April 10-12, 2006, to better understand the fisheries that may be harvesting finetooth sharks. The intent of this meeting was to determine if additional management measures may be necessary to further regulate gillnet fisheries in the Southeast U.S. Restricted Area because of the right whale calf mortality that occurred on January 22, 2006. The fisheries information that was gathered is critical to understanding the potential for interactions with finetooth sharks in fisheries where finetooth sharks are not being targeted. The Spanish mackerel gillnet fishery deploys gillnets that are a minimum of 3.5 inch stretched mesh and the fishery occurs predominantly between September and December, until the water temperature drops below 69ºF. Fishermen fish one net at a time, at one hour intervals, and the soak ends when the nets are hauled onboard. Buoys are marked with permit numbers every 100 yards, and fishermen are allowed to possess two, 800 yard nets, per vessel. These participants may also target Spanish mackerel at night (fire fishing) when conditions are such that phosphorescence in the water is activated by schools of Spanish mackerel. Gillnet sets for Spanish mackerel that also harvest sharks, including finetooth sharks, are not uncommon. Spanish mackerel fishermen report their harvests in the same logbooks that shark fishermen use

to report their landings (Coastal Fisheries Logbook). The Agency will be participating in the Spanish mackerel species working group at an upcoming South Atlantic Fishery Management council meeting in June, 2006, to gain additional information about this fishery and to determine how future collaborative regulations might address finetooth shark fishing mortality, resulting in positive ecological impacts.

NMFS also obtained anecdotal information on the kingfish (whiting) fishery that is occurring off the northeast coast of Florida at the St. Augustine meeting of the ALWTRT. The Agency learned about this fishery from staff at the Southeast Fisheries Science Center and from HMS fishermen in 2004, however, the meeting in St. Augustine provided additional substantive information about how the fishery is conducted, gear deployed, set duration, etc. This fishery started in 2004 and includes approximately 15 vessels, three of which possess directed shark permits. This fishery deploys sinknets in 60-70 feet of water (in Federal waters) as the kingfish prefer cooler water temperatures. Fishing methods are essentially the same for most vessels, however, there is some variation in how nets are retrieved. Soak times vary; however, nets are generally set at dawn for 4-6 hours. Gear may be left overnight and retrieved the next morning. Fishermen may deploy 2-3 nets at a time. The majority of gillnets are less than 3 inch stretched mesh, approximately 1.22 m (4 feet) high, with variable gillnet lengths. Since only three of these vessels possess directed shark permits, NMFS does not have complete information on landings of finetooth sharks in this fishery. Vessels participating in this fishery can't be selected for observer coverage under HMS regulations if they do not possess a limited access HMS permit. Participants in this fishery do not currently need to possess Federal permits for kingfish, therefore, there is no requirement for them to report any of their landings in logbooks. Gillnets deployed for kingfish are in areas that finetooth sharks likely inhabit, however, these fishermen would not be able to possess or land sharks legally without a limited access shark permit. Including the kingfish fishery within some type of management regime would result in positive ecological impacts for finetooth sharks and other species of incidental catch or bycatch that this fishery may be interacting with. The Agency will continue to stay engaged in the deliberations of the ALWTRT and any potential management measures they may implement to regulate gillnet fishing in the Southeast U.S. Restricted Area and minimize interactions between gillnet gear and right whales.

NMFS has learned more about other fisheries that may be landing finetooth sharks by analyzing the Coastal Fisheries Logbook data which describes the non-HMS species that were landed with finetooth sharks by Federally permitted vessels between 1999 - 2004 (Table 4.42 and Table 4.43). These data indicate that the majority of finetooth sharks are landed with gillnet gear (81 percent) or bottom longline gear (19 percent). Trips landing finetooth sharks generally included 21.5 and 8.3 percent non-HMS, in gillnet and bottom longline trips, respectively. Non-HMS species landed on gillnet trips included (in descending order): Spanish mackerel (13.6 percent), bluefish (2.73 percent), blue runner (1.51 percent), little tunny (0.59 percent), king whiting (kingfish) (0.42 percent), and cobia (0.32 percent). These data may be somewhat misleading, however, since they indicate the percent of total landings by *weight*, on trips that also landed finetooth sharks. Generally speaking, the HMS listed in these tables may have a greater whole weight on average than the non-HMS species and may not be representative of the number of individuals (HMS or non-HMS) landed. Furthermore, the Coastal Fisheries Logbook is a trip report (versus a set report) that fishermen complete upon returning to port and therefore does not

provide set-specific information that would indicate whether or not fishermen are able to "target" HMS or non-HMS on individual sets, or simply opportunistically land whatever species they are permitted to keep. Understanding the catch composition of trips that are landing finetooth sharks may assist the Agency in determining potential management measures that prevent overfishing of finetooth sharks and reduce incidental or non-target catch. NMFS has, and will continue to place observers on vessels targeting non-HMS and in possession of a commercial shark permit to get more information on this fishery via the DSGFOP. Since gillnets are generally a non-selective gear, it is important to understand other species that fishermen may be landing when they harvest finetooth sharks so that potential future regulations are not circumvented by participants claiming they are targeting species other than finetooth sharks (or other HMS).

Coastal Fisheries Logbook data also indicated the geographic location of where the majority of finetooth sharks were landed between 1999 and 2004. Gillnets are banned, or restricted in many states' waters in the southeast region and the majority of finetooth shark landings are reported in Statistical Reporting areas immediately adjacent to Florida and South Carolina's state waters. Table 4.44 describes the number of trips landing finetooth sharks by NMFS statistical reporting area. A map of the statistical reporting areas is also provided (Figure 4.18). The majority of the trips landing finetooth sharks take place off Florida and South Carolina where gillnet gear is banned or limited to 100' total length, respectively.

Finetooth shark trips by gear and month for the years 1999 - 2004 (total) from the Coastal Fisheries Logbook are provided in Figure 4.18. This figure depicts the seasonality of when finetooth sharks are being landed with various gear types. It is interesting to note that the finetooth sharks landings with gillnet gear seem to spike in the month of November. This could be attributed to finetooth sharks moving southward from the Carolinas to warmer waters off of Florida (Castro, 1993) leading to an increase in finetooth shark abundance at this time. Spanish mackerel also generally move south to Florida in October –November each year. During the months of April through November, the trip limit for Spanish mackerel is 3,500 lbs/vessel/trip, whereas between December and March, it is unlimited in Florida's Atlantic EEZ. The fact that finetooth shark and Spanish mackerel fisheries may be spatially and/or temporally linked reiterates the importance of collaborative management measures to address overfishing of finetooth sharks because finetooth sharks may still be landed by gillnet vessels participating in other fisheries, despite measures implemented for commercial shark fishing.

NMFS contacted individual states between Texas and North Carolina (the presumed range of finetooth sharks) and created a table describing applicable fisheries regulations, whether or not the state allows gillnets to be deployed in state waters, commercial fisheries that may landing finetooth sharks, and the species code for finetooth sharks (if applicable) (Table 4.45). Contacts were also made with states responsible for monitoring of trip ticket or general dealer data to determine whether there were finetooth sharks being landed and reported in state waters that may not be included in General Canvass (Federal) dealer reports. Some of these state landings data are more comprehensive in that they can be traced to an individual vessel's identification number. NMFS is also awaiting additional trip ticket landings data from other states who participate in the Gulf of Mexico's Fisheries Identification Network (FIN) program, administered by the Gulf States Marine Fisheries Commission, which will provide more detailed landings information for finetooth sharks by state. While NMFS does not have jurisdiction over

state waters, understanding the extent to which state fisheries may be interacting with finetooth sharks, and how these landings are accounted for, is essential to foster collaborative relationships between the Federal government and individual states to prevent overfishing of finetooth sharks. The Agency is interested in having finetooth sharks included in any fisheries observer programs operating in state waters to attain additional catch series data for stock assessments and explore collaborative management strategies. Attaining more data on state landings of finetooth sharks and inclusion of finetooth sharks for bycatch sampling in observer programs in state waters would result in additional landings data; in turn, resulting in positive ecological impacts.

Table 4.46 describes landings data from Florida's Trip Ticket program which include all dealers with a state Saltwater Products License. These landings would include all finetooth sharks landed and sold in the state of Florida between 1999 - 2004 and would include landings in state waters and/or landings that were not offloaded by a Federally permitted vessel or to a Federally permitted dealer. The advantage of these landings data compared to the General Canvass data submitted by Federally permitted shark dealers is that they include landings in state waters by vessels that may not have a Federal permit and, since 2000, provide the vessel ID of the vessel that reported landing the fish.

The Florida Trip Ticket landings include a higher proportion of finetooth sharks being landed in gillnet gears (92.8 percent) compared to the Coastal Fisheries Logbook (81 percent). Furthermore, they also indicate that finetooth sharks are being landed by several types of gillnet (runaround, generic, drift) starting in 2003. The majority of the landings occur within Federal waters (EEZ), however, 44,142 lbs dw (20 mt dw) of finetooth shark were listed as being landed in Florida, South Carolina, or Georgia's state waters. Landings included in the Florida Trip Ticket data may include landings of finetooth sharks that were caught by vessels using gillnet gear in Federal waters to target kingfish, however, it is difficult to differentiate because these trip tickets are not set-specific, rather, reflect the total landings sold to individual dealers. Of the vessels that were associated with these landings, six vessels had only a shark permit, three vessels had no permit, and eight vessels had both a shark and a Spanish mackerel permit reiterating the need for potential collaborative management efforts between HMS and the South Atlantic Fishery Management Council. Since the majority of commercially harvested finetooth sharks are landed and sold at dealers in Florida, it is critical that the Agency maintain close relations with personnel at the Florida Fish and Wildlife Commission and continue to receive updates on landings of finetooth sharks in order to determine the extent of finetooth shark mortality.

Alternative D4 would also expand data collection efforts by listing finetooth sharks as a select species with the Shrimp Trawl Fishery Observer Program, meaning that finetooth sharks will be included in observer sampling of bycatch in this fishery. Shrimp trawl vessels operate in shallow, inshore waters that are habitat for finetooth sharks. Including finetooth sharks as a select species would result in subsamples of bycatch, including identification, measurement, and estimates of interactions in this fishery which may facilitate future management actions to minimize bycatch of finetooth sharks in this fishery. Furthermore, since there was a lack of bycatch catch series data for finetooth sharks available for review during the 2002 SCS assessment, including this data in the future could improve precision of the model outputs for the next stock assessment and thereby the management recommendations. Increased attention to

finetooth sharks on the behalf of the observers may result in inclusion of other HMS as select species in this observer program in the future, thereby, potentially improving estimates of interactions between HMS and trawl fisheries in the Gulf of Mexico and resulting in positive ecological impacts.

The United States Coast Guard (USCG) and Texas Parks and Wildlife Department (TXPWD) have informed NMFS that another source of undocumented finetooth shark fishing mortality occurs as a result of illegal fishing by Mexican gillnet vessels in the U.S. EEZ in the Gulf of Mexico. Seized catches have included finetooth sharks and NMFS would like to increase collaborative efforts to reduce this mortality as it may be impacting other species (HMS and non-HMS) as well.

De Silva *et al*. (2001) conducted a profile of shark bycatch in the U.S. Gulf of Mexico menhaden fishery in 1994 and 1995. Their findings indicate that finetooth sharks were landed in this fishery. They sampled 30 percent of the sets and found ten species of sharks, including six finetooth sharks. The authors indicate that small slender sharks (SCS and juvenile LCS) were less likely to be detected and identified in their sampling protocols. Since menhaden are a primary forage species of finetooth shark (Bethea *et al*., 2004), it is likely that some proportion of the small, unidentified bycatch in this fishery are finetooth sharks. This fishery is predominately located in state waters between Texas and Alabama and is not subject to observer coverage at this time. If observer coverage or some other means of monitoring bycatch were implemented in this fishery, it would be helpful to understand the extent to which finetooth sharks are being landed. However, NMFS does not have jurisdiction over state waters and can not implement these monitoring programs.

Finetooth sharks are difficult to properly identify; therefore, the shark dealer workshops preferred in this action (alternative A9) that focus on species identification may facilitate improved quota monitoring and ensure that data received from shark dealers are more accurate. Furthermore, since the SCS fishery is generally open year-round, and rarely approaches its allotted quota, there may be an incentive for shark dealers to intentionally misidentify LCS as finetooth sharks or other SCS to avoid exceeding regional trimester quotas for LCS. The Agency anticipates that outreach on the positive identification of sharks would provide shark dealers with the necessary tools and skills to be able to properly identify what they are purchasing from vessels, resulting in positive ecological impacts.

Alternative D4 would likely have long-term positive ecological impacts as it would implement a plan to prevent overfishing of finetooth sharks. Short-term ecological impacts would likely be neutral. Improved coordination between NMFS and Regional Fishery Management Councils, Interstate Marine Fisheries Commissions, states, and other management bodies would result in better collaborative efforts to manage fish that move between jurisdictional boundaries. Furthermore, since there may be fisheries that are lacking an FMP or other management measures and incidentally catching finetooth sharks (*i.e*., the fishery for kingfish), increased collaboration with other management entities may result in the inclusion of these fisheries into existing management initiatives, thereby, improving management and conservation efforts. Without knowing all of the sources of finetooth shark mortality, any action taken by NMFS may be misdirected and could result in negative ecological impacts if fishing

effort were shifted to other fisheries. The activities detailed within the preferred alternative would implement an effective plan for preventing overfishing by first identifying sources of fishing mortality before implementing additional collaborative management measures, as appropriate, to avoid initiating actions that may be easily circumvented or may simply result in additional dead discards of finetooth sharks.

Social and Economic Impacts

Alternative D1 would likely not result in any adverse economic or social impacts as the status quo would not substantially modify or alter commercial or recreational fishing practices for finetooth sharks or other shark species.

Alternative D2 would implement trip limits, reduce quotas, and/or modify gear and gear deployment, all of which could have negative social and economic impacts. Implementing trip limits on directed SCS trips under alternative D2 may impose negative economic and social impacts on a gillnet vessels that target sharks or land them incidentally when targeting non-HMS. Vessels that possess directed shark permits but are targeting other finfish species may also experience negative economic and social impacts. However, because they are not targeting sharks, NMFS assumes that finetooth shark landings would comprise a small proportion of their landings and their economic and social impacts would be less those of fishermen targeting sharks. Both fishermen targeting sharks and those targeting other species may need to conduct additional trips in order to maintain current profits. Thus, these fishermen may have increased costs such as travel time and fuel. If fishermen do spend more time fishing as a result of the trip limit, this could have negative social impacts.

Modifying gillnet mesh size may result in negative economic impacts to a small number of gillnet vessels that target sharks. These vessels would have to replace existing gear in order to comply with any new mesh size requirements, as there is not currently a mesh size requirement in place outside of the Southeast U.S. Restricted Area. The Agency estimates that shark gillnet gear may range in cost from $8,000 to $20,000 (2004 dollars). Gillnet vessels not targeting sharks may be unaffected by new mesh size requirements and might experience a positive economic effect at the expense of the directed shark vessels, however, this would depend on whether gear restrictions were linked to possession of a shark permit. Vessels targeting king and Spanish mackerel already have minimum mesh size restrictions of 4.75 and 3.5 inches (12.1 and 8.9 cm), respectively. ALWTRT regulations define shark gillnet as being a minimum of 5 inches mesh size. Specifying maximum soak times for gillnet vessels targeting sharks may impose a negative economic effect as vessels would have to work longer hours and make more sets in order to maintain their current catch levels. Furthermore, a maximum soak time would also encourage fishermen to simply re-deploy gear after it has been hauled back if they had not yet caught enough fish. Fisheries targeting king and Spanish mackerel in Federal waters already have a one-hour maximum soak time for gillnets. Additional restrictions, coupled with increased fuel prices, would have negative economic impacts on the fishery.

Finally, alternative D2 would reduce the SCS quota. This may have a negative economic impact on the fishery depending on the amount of the quota reduction. A small reduction in the overall SCS quota may have no effect since the SCS quota has never been reached in a single year. Landings of SCS were 76.4 percent of the SCS quota of 326 mt dw in 2003 and, prior to

that, SCS landings were less than 20 percent of the quota. The current SCS quota is 454 mt dw. The highest landings of SCS occurred in 1999 at 330 mt dw, or approximately 73 percent of the current quota. Therefore, the SCS quota would have to be reduced by more than 25 percent to have economic impacts on the shark gillnet fishery, or future landings would have to increase before a reduced quota would actually inhibit landings of SCS based on historical data. Furthermore, catch rates and restrictions implemented in other fisheries may also have economic impacts on the shark gillnet fishery. Reductions in the SCS quota of less than 25 percent would appear to have no negative impact on the fishery based on the current level of landings. However, since most finetooth sharks are observed dead or in poor condition at haulback, increasing the number of dead discards as a result of reducing the quota may have negative economic and social impacts.

Closing the shark gillnet fishery and removing gillnet gear from the list of authorized gear types would likely have significant negative economic impacts on the vessels currently engaged in this fishery but minimal impacts on the shark fishery as a whole. It would likely cause economic dislocation of at least five individuals or small entities and may put them out of business if there are not other fisheries from which they can substitute lost revenues as a result of this closure. However, as mentioned previously, there were 15 vessels that reported landing finetooth sharks in Federal logbooks in 2003. Furthermore, if gillnet were no longer an authorized gear for sharks, than presumably vessels that possess a commercial shark permit would not be able to possess sharks when gillnet gear is on board, even when targeting another species such as Spanish mackerel. Conversely, participants may sell their shark permits, target non-HMS, and discard any finetooth sharks that are landed. The economic impacts of closing the shark gillnet fishery are difficult to estimate as most of the vessels engaged in the directed shark gillnet fishery possess other permits. Furthermore, they would still be able to harvest sharks with other authorized gear types. The costs of refitting vessels to fish with BLL or other authorized gears would be extensive.

The five vessels participating in the directed shark drift gillnet (and/or strikenet) fishery are concentrated in the Ft. Pierce/Cape Canaveral region of southeast Florida. Therefore, there might be proportionately greater negative social or economic impacts on these vessels because a significant portion of their income comes from the harvest of sharks. Furthermore, these vessels may incur significant costs as they shift to other fisheries in order to maintain financial viability. Also, regulations in other fisheries may prohibit an increase in fishing effort.

Alternative D3 considers implementing recreational management measures such as a requirement to use circle hooks when targeting SCS in the recreational fishery. A circle hook requirement may result in negative economic impacts to the shark recreational fishery and related industries because a proportion of the fishery would have to switch to circle hooks from J-hooks. The Agency is not aware of the proportion of the recreational fishery that actually targets sharks in Federal waters since an HMS Angling permit allows participants to land tunas, certain species of sharks, swordfish, and billfish. A limited survey of hook prices indicated that J-hooks of the sizes and styles used by HMS recreational fishermen ranged in price from a low of $0.50 to a high of $7.50 each, with an average price of $2.70 (2004 dollars). Similarly, circle hooks of the sizes and styles used by HMS recreational fishermen ranged in price from a low of $0.30 to a high of $7.00 each, with an average price of $2.24 (2004 dollars). The Agency does

not have information regarding the proportion of the recreational shark fishing community that is currently using circle hooks. It is assumed that fishing effort for sharks would remain relatively constant, as mandating circle hook use would not result in prohibitively high costs to remain in the fishery. Generally, the purchase of hooks represents only a minor capital expenditure relative to other costs associated with participating in marine fisheries, including the purchasing, equipping, maintaining, and running of vessels, which can cost thousands of dollars.

Under alternative D3, the Agency would increase the existing recreational size limit for finetooth sharks, which may have some negative social and economic impacts on near shore anglers and the supporting recreational industry. The social and economic impacts may vary depending on the willingness of anglers to release finetooth sharks caught and/or substitute harvested fish with other similar species. Angler expenditure data attained from MRFSS during 1998 – 2000 indicate that expenditures on excursions targeting small coastal sharks averaged $83.47/person/day (2004 dollars). NMFS does not believe that a minimum size increase would have an adverse impact on angler consumer surplus or satisfaction in recreational fisheries because finetooth sharks only comprise approximately 1.5 percent of the overall SCS recreational harvest. Encounters are relatively rare and few fishermen would target finetooth sharks. This alternative would not affect revenues to charterboat owners, captains, and others who rely on the recreational shark fishery. Tournaments would still be able to offer prize categories for finetooth sharks provided they are above the minimum size. In the long-term, as overfishing of finetooth sharks is eliminated, revenues may increase as less time would be required to catch finetooth sharks and as larger sharks increase in abundance. This alternative would not jeopardize participant safety, as recreational fishermen already have to determine the length of finetooth sharks relative to the existing minimum size.

Alternative D4 would not likely have significant social and economic impacts in the short-term as it primarily expands Agency efforts to discern sources of finetooth fishing mortality and would not enact additional management measures on fishing activities in recreational or commercial sectors at this time. The expansion of DSGFOP in 2005 resulted in an additional 88 sets on 30 trips from eight vessels. As per 50 CFR § Part 635.7, NMFS may select, for at sea observer coverage, any vessel that has an Atlantic HMS, tunas, shark or swordfish permit under §§ 635.4 or 635.32. Therefore, a stipulation of maintaining a commercial HMS shark permit requires that permit holders could be subject to observer coverage at any time. Selecting additional vessels for this coverage would not impart additional economic burden that has not already been analyzed. Furthermore, most gillnet trips targeting sharks or other non-HMS are in smaller vessels that generally do not stay out for extended periods of time, reducing the costs to individual vessel owners of providing food and accommodation comparable to their crew members. The number of additional vessels that fish with gillnet gear, possess a directed shark permit, and are not currently subject to observer coverage is estimated to be approximately ten vessels. It is difficult to estimate future numbers of vessels that might be subject to observer coverage as directed or incidental shark permit holders could deploy gillnet gear and become subject to observer coverage at any time. Vessels would be expected to attain the proper safety certification decals from the United States Coast Guard and ensure that there are adequate accommodations on board for observers prior to taking an observer; however, these requirements are already in place for the commercial shark fishery.

Efforts to record data on finetooth shark landings on shrimp trawl vessels would not result in any social or economic impacts because observer coverage would not be expanded. This observer program already exists and adding finetooth sharks to the select species list would not significantly impact the time required for observers to complete their sampling of bycatch in the trawl fishery. Furthermore, coordination with Regional Fishery Management Council, Interstate Marine Fisheries Commissions, and state agency staff regarding fisheries that may be contributing to finetooth shark fishing mortality would not result in any negative social or economic impacts to the public in the short term, and would likely result in long term social and economic benefits by determining where management measures should be enacted to reduce finetooth fishing mortality. Furthermore, collaboration with these entities may increase future collaborative efforts and result in additional landings information for other HMS species and protected resources that may be harvested in other fisheries.

Conclusion

The preferred alternative implements an effective plan to prevent overfishing by collecting data and identifying all sources of finetooth shark fishing mortality, expanding observer coverage in non-HMS fisheries, and creating a foundation for management measures that will effectively prevent overfishing of finetooth sharks. The majority of finetooth shark landings occur in commercial fisheries deploying a non-selective gear (gillnets) in a region (south Atlantic) where other non-HMS fisheries also deploy gillnets. Thus, measures that prohibit the use of gillnets for landing sharks (alternative D2), if aimed exclusively at the commercial shark gillnet fishery, would not prevent overfishing of finetooth sharks. Most of the five vessels that comprise the commercial shark gillnet fishery also possess Spanish mackerel permits. If gillnets were not allowed for the harvest of sharks the vessels could continue to deploy gillnets to catch other species, including Spanish mackerel, catch finetooth sharks incidentally, and then discard dead finetooth sharks. Without cooperative measures vessels may be able to circumvent any additional regulations that would be enacted for the commercial shark fishery when pursuing Spanish mackerel. Finetooth sharks are caught in a wide range of gillnet mesh sizes and are often dead at haulback, rendering trip limits and/or gear modifications (alternative D2) ineffective at preventing overfishing because dead sharks would continue to be discarded. Mortality of finetooth sharks in fisheries outside the jurisdiction of HMS (state waters) or in unregulated fisheries in Federal waters (*i.e*, kingfish) would also be unaffected. The preferred alternative will provide additional information on finetooth shark landings to allow enactment of comprehensive, collaborative measures that effectively reduce finetooth shark fishing mortality.

NMFS continues to explore which vessels may be engaged in fisheries that may harvest finetooth sharks and intends to conduct a new SCS stock assessment following the Southeast Assessment, Data, and Review process starting in 2007. Reducing finetooth shark fishing mortality via regulations targeting commercial shark permit holders is further confounded by the fact that finetooth sharks are one of the species in the SCS complex, which is not currently overfished or experiencing overfishing, and commercial fishermen have only caught, on average, 28.5 percent of the SCS quota between 1999 – 2003. Measures aimed at the recreational fishery (alternative D3) would only impact a small portion of the overall finetooth shark landings and, until comparative research on the merits of circle hooks versus J-hooks for reducing post-release mortality exists for sharks, implementing a circle hook requirement may be ineffective.

Furthermore, a conservative bag limit of one shark (including finetooth shark) and a minimum size above the age at first maturity for males and females is already in place.

As described in Table 2.1. and in this section, the plan for preventing overfishing of finetooth sharks detailed in the preferred alternative would first continue to identify fisheries contributing to finetooth shark mortality. This information may result in long-term positive ecological impacts not only on finetooth sharks but also other species. Information gathering and research have, and will continue to, provide valuable contacts, landings information, and improved understanding of fisheries that are being conducted in other management jurisdictions and may be beneficial for future collaborative measures between states, Regional Fishery Management Councils, Interstate Marine Fisheries Commissions, and NMFS. This plan also includes expanding observer coverage in the South Atlantic gillnet fisheries that are landing sharks incidentally and in the Gulf of Mexico shrimp trawl fishery which would provide substantive information on which fisheries are currently contributing to the majority of finetooth shark landings and would also provide bycatch data. Furthermore, working directly with the Regional Fishery Management Councils, Interstate Marine Fisheries Commissions, and states to identify all fisheries that may be interacting with finetooth sharks is a critical step to discern appropriate management options. Lastly, since finetooth shark carcasses can be difficult for shark dealers to positively identify, the workshops on shark identification, which would be implemented in alternative A9, would provide indirect benefits by improving the ability of shark dealers to positively identify finetooth sharks to species, and thus improve the accuracy of General Canvass logbooks received from dealers.

By first identifying sources of finetooth shark fishing mortality, the plan outlined in alternative D4 would facilitate potential collaborative, informed management measures that can best meet conservation and management goals while avoiding significant, and potentially unnecessary, economic and social impacts. Alternatives D2 and/or D3 (commercial and recreational management measures) may be considered in the future depending on any new information collected regarding finetooth shark landings, changes in the finetooth sharks status per the upcoming SCS stock assessment, new data on post-release mortality benefits of using circle hooks in recreational shark fisheries, or other relevant information that becomes available or is collected as a result of alternative D4.

As summarized in Appendix D, NMFS received a wide-range of comments from the public both supporting and opposing the preferred management measures. NMFS believes that the preferred alternative is a prudent means of developing comprehensive and collaborative regulations to prevent finetooth shark fishing mortality. NMFS received a range of public comments indicating support and opposition to alternatives D2-D4, and additional comments, including, but not limited to: comments on gillnet fisheries in general, the use of VMS, the results of the 2002 SCS stock assessment, reporting of HMS by dealers, identification of finetooth sharks, and the accuracy of data attained from MRFSS. All of these comments were considered prior to selection of the final preferred alternatives for preventing overfishing of finetooth sharks. Additional measures, possibly the commercial and recreational measures analyzed in this document, or others, may be necessary to prevent overfishing of finetooth sharks in the future.

Table 4.40 Finetooth shark landings in lb dw (mt dw) by gear type in the Gulf of Mexico (GOM) and South Atlantic (SA), 1999-2003, as reported in the General Canvass (CN) and Coastal Fisheries (CL) Logbooks. Source: Enric Cortes, pers. comm.

Year	Gillnet Gear				Longline Gear				Other			
	GOM		SA		GOM		SA		GOM		SA	
	CN	CL	CN	CL	CN	CL	CN	CL	CN	CL	CN	CL
1999	2,560 (1.2)	0	269,685 (122.3)	17,837 (8.1)	671 (0.3)	0	12,897 (5.9)	7,435 (3.4)	565 (0.3)	0	3,250 (1.5)	0
2000	0	0	185,907 (84.3)	29,241 (13.2)	11	2,820 (1.27)	17,678 (8.0)	5,847 (2.7)	0	0	633 (0.3)	0
2001	0	0	296,897 (134.6)	50,389 (22.9)	600 (0.27)	0	4,919 (2.2)	6,392 (2.9)	83	0	889 (0.4)	0
2002	0	0	152,507 (69.2)	70,388 (31.9)	894 (0.4)	1,704 (0.8)	7,708 (3.5)	6,780 (3.1)	0	0	732 (0.3)	129
2003	0	0	123,791 (56.1)	28,717 (13.0)	2,654 (1.20)	6,994 (3.2)	7,449 (3.4)	5,437 (2.5)	0	14	4,181 (1.9)	14
Total (%)	2,560 (100%)	0	1,028,787 (83%)	196,572 (17%)	4,830 (29%)	11,518 (71%)	50,651 (61%)	31,891 (59%)	648 (98%)	14 (2%)	9,685 (98.5%)	143 (1.5%)

Table 4.41 Summary of Small Coastal Shark quotas and landings in commercial and recreational fisheries between 1999-2005. Sources: Data from 1998-2000,Cortés, pers. comm., data from 2001-2004, Cortés, 2005; Carlson and Baremore, 2001; Carlson and Baremore, 2002; Carlson and Baremore, 2003; Carlson ***et al***., 2004; NMFS, 2005; Cortés and Neer, 2005; Carlson and Bethea, 2006.

Year	SCS quota, mt dw	SCS landings, mt dw	Commercial Finetooth Landings, mt dw (General Canvass) *General Canvass*	Recreational Finetooth Landings, mt dw; (numbers of fish) *MRFSS and TX Parks and Wildlife*	Finetooth Observed Landings, mt dw*; (numbers of fish) [a]
1999	1760	330	129.4	0.38 (78)	1.69** (340)
2000	1760	269	92.6	7.2 (1438)	0.83 (168)
2001	1760	329	137.6	33.4 (6701)	6.5 (1302)
2002	1760	263	73.4	14.7 (2952)	8.05 (1615)
2003	326	241	74.1	8.85 (1774)	3.09 (621)
2004	454	204	54.9	2.68 (38)	0.32 (65)
2005	454	N/A	N/A	9.1 [c] (1830)	9.94[b] (1995)

* Numbers of fish multiplied by 11 lb (4.3 kg) (mean weight of finetooth sharks used in 2002 SCS assessment) then divided by 2204.6 to attain mt dw

** 1998 and 1999 combined

[a] Obtained from 100% observer coverage (November 15-April 1) and approximately 30% observer coverage April 2 – November 14, values not extrapolated. Includes observed strikenet and drift gillnet trips from DSGFOP[b] 2005 data includes landings observed from vessels using sink net gear to target other non-HMS species (*Menticirrhus spp*. and Spanish mackerel)

[c] Estimates from MRFSS January-October 2005, are preliminary and subject to change

Table 4.42 Total pounds (lb ww) and percent of total landings by weight of species landed on gillnet trips that landed finetooth sharks, 1999-2004. Species and landings in bold are those currently managed by the HMS Management Division. Species with landings under 10 lbs ww were omitted. Source: Coastal Fisheries Logbook (CFL).

Species	Total Landings (1999 - 2004)	Percent of Total Landings by Weight
Barracuda	4,293	0.40
Blue Runner	16,201	1.51
Bluefish	29,292	2.73
Bonito, Atlantic	298	0.03
Butterfish, unclassified	148	0.01
Cero	1,733	0.16
Cobia	3,459	0.32
Crevalle	362	0.03
Croaker, Atlantic, unclassified	394	0.04
Dolphinfish	32	0.00
Finfish, unclassified	675	0.06
Flounder, unclassified	651	0.06
Grunt, white	2,620	0.24
Jacks, unclassified	313	0.03
King Mackerel and Cero	5,393	0.50
King Whiting/Kingfish	4,551	0.42
Moonfish, Atlantic	174	0.02
Pompano	145	0.01
Seatrout, Grey, unclassified	146	0.01
Seatrout, spotted	3,557	0.33
Seatrout, white	63	0.01
Shark, Atlantic Sharpnose	**57,776**	**5.39**
Shark, Bignose	**797**	**0.07**
Shark, Blacknose	**187,186**	**17.45**
Shark, Blacktip	**183,853**	**17.14**
Shark, Bonnethead	**50,137**	**4.67**
Shark, Bull	**56**	**0.01**
Shark, Finetooth	**345,210**	**32.18**
Shark, Hammerhead	**10,828**	**1.01**
Shark, Sandbar	**2,089**	**0.19**
Shark, unclassified	**3,098**	**0.29**
Shark Fins, unclassified	**5**	**0.00**
Shark, Bignose	**64**	**0.01**
Snapper, Blackfin	447	0.04
Snapper, Mangrove	12	0.00

Species	Total Landings (1999 - 2004)	Percent of Total Landings by Weight
Spanish Mackerel	146,211	13.63
Tenpounder	637	0.06
Tripletail	15	0.00
Tuna, Blackfin	536	0.05
Tuna, Little Tunny	6,280	0.59
Wahoo	84	0.01
Total	**1,072,551**	**100.0**
Total HMS	**841,546**	**78.5**
Total Non-HMS	**231,005**	**21.5**

Table 4.43 Total pounds (lb ww) and percent of total landings by weight of species landed on bottom longline trips that landed finetooth sharks, 1999-2004. Species and landings in bold are those currently managed by the HMS Management Division. Species with landings under 10 lbs ww were omitted. Source: CFL**.**

Species	Total Landings (1999-2004)	Percent of Total Landings by Weight
Amberjack, Greater	1,059.40	0.14
Cobia	2,714.20	0.35
Dolphinfish	120.00	0.02
Grouper, Black	552.30	0.07
Grpouper, Gag	7,588.40	0.97
Grouper, Red	30,036.00	3.84
Grouper, Snowy	510.90	0.07
Grouper, Warsaw	534.50	0.07
Grouper, Yellowedge	3,317.00	0.42
Hind, Speckled	1,942.20	0.25
Margate	282.90	0.04
Scamp	572.40	0.07
Shark, Atlantic Sharpnose	11,579.70	1.48
Shark, Bignose	93.20	0.01
Shark, Blacknose	81,964.70	10.47
Shark, Blacktip	256,071.80	32.70
Shark, Bonnethead	7,574.30	0.97
Shark, Bull	24,597.70	3.14
Shark, Dusky	4,068.70	0.52
Shark, Finetooth	81,281.70	10.38
Shark, Hammerhead	8,233.10	1.05
Shark, Lemon	41,030.20	5.24

Species	Total Landings (1999-2004)	Percent of Total Landings by Weight
Shark, Mako	2,649.30	0.34
Shark, Sandbar	194,996.50	24.90
Shark, Sandtiger	517.10	0.07
Shark, Scalloped Hammerhead	47.00	0.01
Shark, Silky	442.10	0.06
Shark, Tiger	1,091.20	0.14
Shark, Fins	901.00	0.12
Snapper, Blackfin	900.20	0.11
Snapper, Mutton	769.20	0.10
Snapper, Silk	103.20	0.01
Tilefish	13,695.50	1.75
Tilefish, Bluefin	198.20	0.03
Tuna, Blackfin	208.80	0.03
Total	782,244.60	100.0
Total HMS	717,139.30	91.7
Total Non-HMS	65,105.30	8.3

Table 4.44 Number of trips with finetooth shark landings (all gears) by NMFS Statistical Reporting reas, 1999 - 2004. A copy of the map indicating the NMFS Statistical Reporting Areas can be found in Figure 4.18. Bolded areas had more than 20 trips with landings of finetooth sharks. Source: Coastal Fisheries Logbook.

Area	Number of Trips Landing Finetooth Sharks, 1999-2004
1	3
2	5
3	**23**
4	5
5	8
6	2
7	2
9	2
11	8
18	1
2480	2
2679	4
2680	6
2778	1
2779	**23**
2780	**127**
2879	6

2880	**213**
2979	6
2980	**37**
3079	**64**
3080	8
3179	14
3180	11
3279	1
3379	**50**
3476	3
Total	635

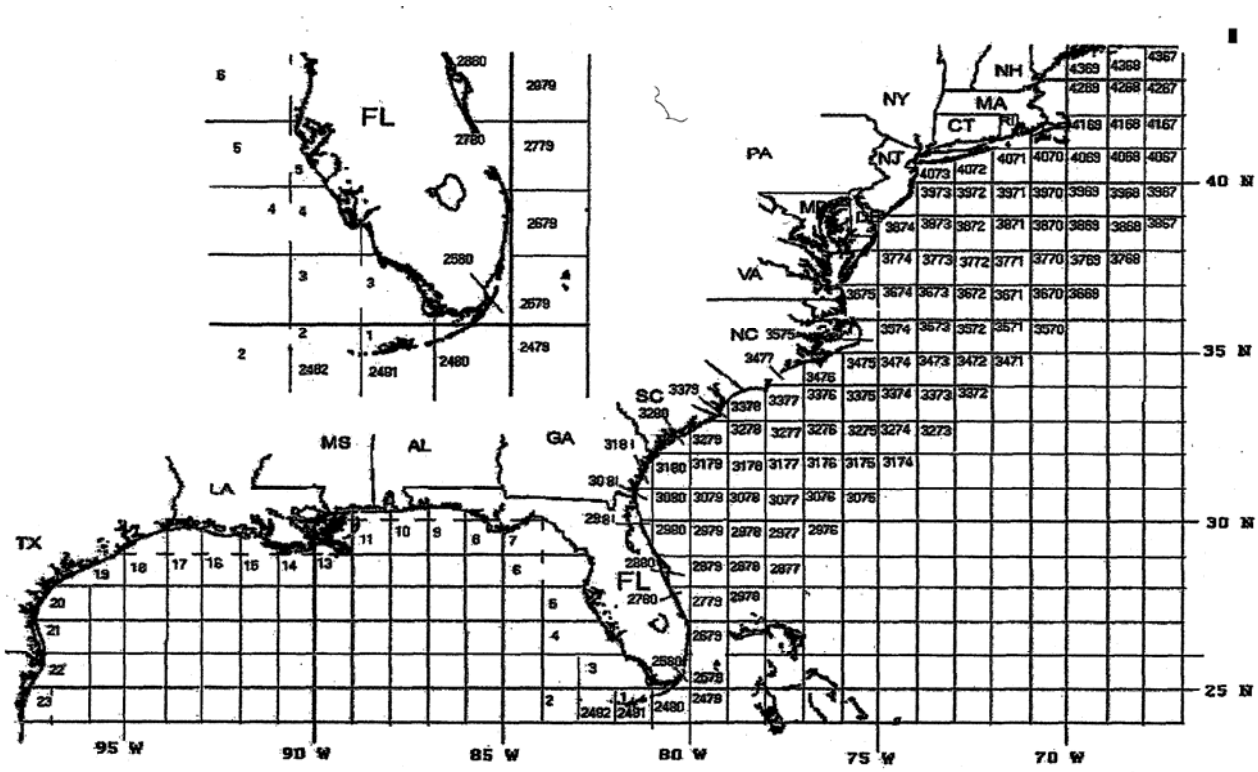


Figure 4.18 **NMFS Statistical Reporting Areas. Areas 3, 23, 2780, 2880, 2980, 3079, and 3379 all had greater than 20 trips that reported finetooth shark landings in the Coastal Fisheries Logbook between 1999-2004 as indicated in Table 4.44** Number of trips with **finetooth shark landings (all gears) by NMFS Statistical Reporting reas, 1999 - 2004. A copy of the map indicating the NMFS Statistical Reporting Areas can be found in 423HFigure 4.18. Bolded areas had more than 20 trips with landings of finetooth sharks.** Source: Coastal Fisheries Logbook.

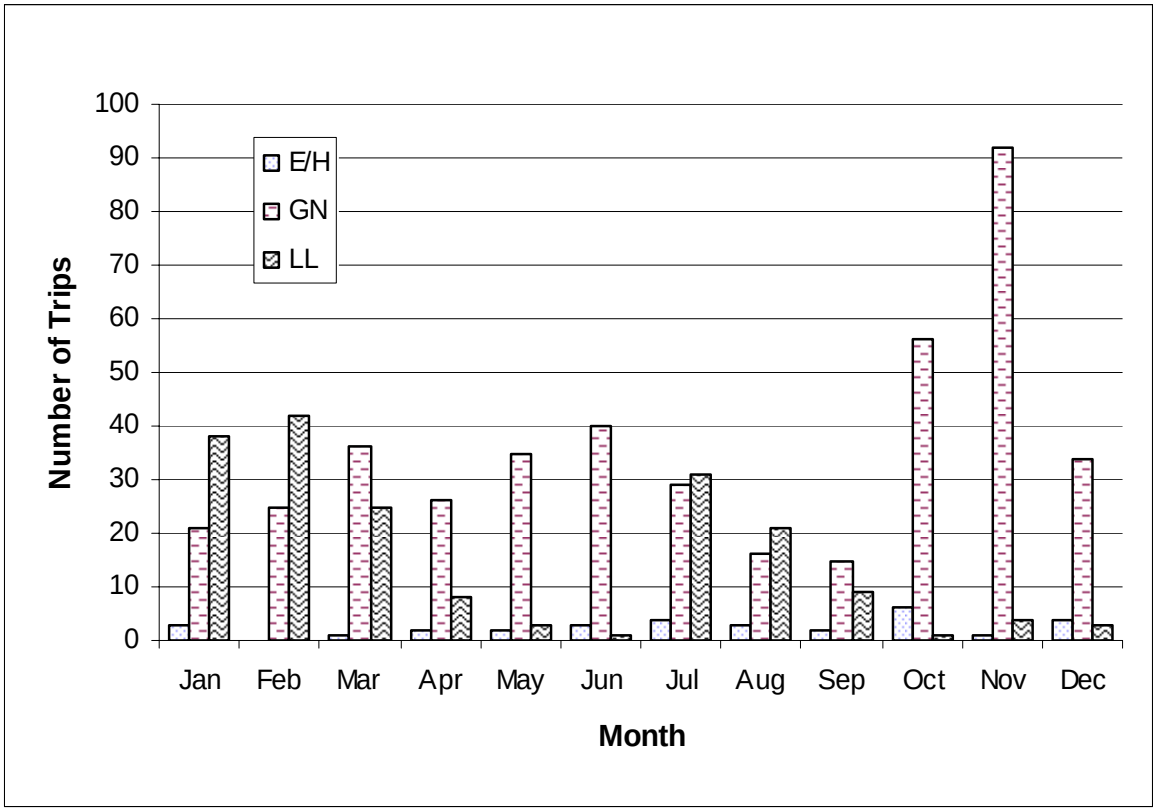


Figure 4.19 Finetooth shark trips by month and gear type between 1999-2004. E/H = Electric Reel, Bandit Gear, Handline; GN = Gillnet; and LL = Longline. Source: Coastal Fisheries Logbook.

Table 4.45 State information on commercial fisheries that may be landing finetooth sharks.

State (Limit)	Gillnets Allowed in State Waters?	Commercial Fisheries/Gear	General Species Specific Information?	Finetooth Shark Specific Information?
NC	Yes, 2-6" stretched mesh depending on target spp. and time of year	Hook and Line; trap; trawls; Gillnet	Yes	No
SC	Yes, up to 100 ft. in length, recreational only, shark retention with gillnet gear prohibited	Shrimp trawls; shark Fishery (hook and line)	Yes	Yes
GA	No	Shrimp trawls	Yes	Yes
FL (3 nm – Atlantic, 9 nm Gulf of Mexico)	No	Traps; hook and line	Yes	Yes
AL	Yes	Gillnet; shrimp trawls	Yes	Yes
LA	No	Trot line; commercial shrimp trawls	Yes	Yes
MS	No contact	N/A	No	No
TX (9 nm)	No	Shrimp trawls	No	Yes

Table 4.46 Finetooth landings reported from the Florida Trip Ticket program 1999-2004 by area and gear type. All landings in the Exclusive Economic Zone are denoted as EEZ. Source: Steve Brown, Florida Fish and Wildlife Commission Trip Ticket Program.

Year	Area	Gear	Pounds (dw)	Gear Sum	Gear Percentage
1999	East Florida EEZ	Longline	1,1437		
	Northwest Florida EEZ	Longline	671	12,108	4.2
	East Florida EEZ	Hook and Line	3,868		
			565	4,433	1.5
	Northeast Florida EEZ	Trawl	38	38	0.0
	East Florida EEZ	Gillnet	189,944		
	Georgia EEZ	Gillnet	25,024		
	Northeast Florida	Gillnet	15,813		
	Northeast Florida EEZ	Gillnet	15,554		
	Northwest Florida EEZ	Gillnet	2,561		
	South Carolina/Georgia	Gillnet	18,810	267,706	92.4
	East Florida EEZ	Mixed	5,298	5,298	1.8
	East Florida EEZ	Castnet	8	8	0.0
Total				**289,591**	
2000	East Florida EEZ	Longline	10,644		
	Northeast Florida EEZ	Longline	1,114		
	South Carolina/Georgia	Longline	6,432		
	Southwest Florida EEZ	Longline	11	18,201	8.9
	East Florida	Hook and Line			
	East Florida EEZ	Hook and Line	595	598	0.3
	East Florida EEZ	Gillnet	169,563		
	Northeast Florida EEZ	Gillnet	14,911		
	South Carolina/Georgia	Gillnet	631	185,105	90.6
	East Florida EEZ	Mixed	57		
	Northeast Florida EEZ	Mixed	75	132	0.1
	East Florida	Castnet	11		
	East Florida EEZ	Castnet	182	193	
Total				**204,229**	
2001	East Florida EEZ	Longline	4,618		
	Georgia EEZ	Longline	204		
	Northeast Florida EEZ	Longline	77		
	Southwest Florida EEZ	Longline	600	5,499	1.8
	East Florida EEZ	Hook and Line	799		
	Northwest Florida	Hook and Line	42		
	West Florida EEZ	Hook and Line	18	859	0.3
	East Florida EEZ	Gillnet	264,609		
	Northeast Florida EEZ	Gillnet	32,282	296,891	97.9
	East Florida EEZ	Mixed	19	19	0.0
	Northwest Florida EEZ	Lampara Net	23	23	0.0
	East Florida	Castnet	90	90	0.0
Total				**303,381**	

Year	Area	Gear	Pounds (dw)	Gear Sum	Gear Percentage
2002	East Florida EEZ	Longline	7,079		
	Northeast Florida EEZ	Longline	228		
	Southwest Florida EEZ	Longline	893	8,200	5.1
	East Florida EEZ	Hook and Line	649	649	0.4
	East Florida EEZ	Gillnet	111,810		
	Northeast Florida	Gillnet	2,301		
	Northeast Florida EEZ	Gillnet	38,724	152,835	94.4
	East Florida	Mixed	21		
	East Florida EEZ	Mixed	72	93	0.1
	East Florida	Castnet	47		
	East Florida	Castnet	8	55	0.0
Total				**161,832**	
2003	East Florida EEZ	Longline	3,796		
	Southwest Florida EEZ	Longline	474	4,270	3.1
	East Florida EEZ	Hook and Line	21	21	0.0
	East Florida EEZ	Gillnet	12,424		
	East Florida EEZ	Gillnet	2,922		
	Northeast Florida EEZ	Gillnet, generic	105,025		
	East Florida EEZ	Gillnet, generic	1,962		
	Northeast Florida EEZ	Gillnet, runaraound	48		
	East Florida EEZ	Gillnet, drift	5,200	127,581	92.4
	East Florida EEZ	Hook and Line	212	212	0.2
	East Florida EEZ	Longline, sfc	237		
	East Florida EEZ	Longline, bottom	3,416		
	Southwest Florida EEZ	Longline, bottom	2,179	5,832	4.2
	East Florida	Castnet	65		
	East Florida EEZ	Castnet	85	150	0.1
Total				**138,066**	
2004	East Florida EEZ	Gillnet	1,202		
	Northeast Florida EEZ	Gillnet	42,089		
	Southeast Florida EEZ	Gillnet	21		
	East Florida EEZ	Gillnet, generic	21,417		
	East Florida EEZ	Gillnet, runaround	287	65,016	89.0
	East Florida EEZ	Hook and Line	149		
	East Florida EEZ	Charterboat	1,658	1,807	2.5
	East Florida EEZ	Longline	4,117		
	East Florida EEZ	Longline, bottom	1,026		
	Southwest Florida EEZ	Longline, bottom	604		
	West Florida EEZ	Longline,	469	6,216	8.5

Year	Area	Gear	Pounds (dw)	Gear Sum	Gear Percentage
		bottom			
	East Florida EEZ	Castnet	22	22	0.0
Total				**73,061**	
Total Finetooth Landings 1999-2004				**1,170,160 lbs dw 530.8 mt dw**	

4.2.3 Atlantic Billfish

As described in Chapter 2, the alternatives considered for the management of the directed Atlantic billfish fishery are:

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

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

E3 Effective January 1, 2007, limit all HMS permitted vessels participating in Atlantic billfish tournaments to deploying only non-offset circle hooks when using natural baits or natural bait/artificial lure combinations – Preferred Alternative

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

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

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

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

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

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

Ecological Impacts

Alternative E1 would maintain the *status quo* in the domestic recreational billfish fishery. This alternative would retain all existing regulations regarding recreational billfish fishing in the Atlantic Ocean, including permit requirements, minimum size limits, prohibited species, catch and release fishery management program, landing form, allowable gear, and reporting requirements, unless otherwise modified during this rulemaking. As discussed in additional detail below, alternative E1 would likely continue to provide minor ecological benefits for Atlantic billfish populations stemming from mandatory permitting requirements and minimum legal size limits. However, the No Action alternative would allow for the continued use of J-hooks in all segments in the fishery, which, as discussed in detail below, have been shown to have higher post-release mortality rates than previously estimated.

The two primary domestic sources of Atlantic billfish mortality include the Atlantic pelagic longline fishery and the directed recreational billfish fishery. Bycatch and discards of blue marlin, white marlin, and sailfish in the pelagic longline fishery show an overall decrease from 1999 to 2004, as seen in Table 3.20. There is no discernable trend for Atlantic spearfish. As seen in Figure 4.20 and Table 4.47, data reported to ICCAT for the period 1999 – 2004 shows a noticeable overall decrease in dead discarded Atlantic blue and white marlin and sailfish in the domestic pelagic longline fishery, with noticeable inter-year fluctuation for the marlins.

Trends in recreational landings of Atlantic billfish also show an overall decrease for the period 1999 - 2004, with substantial inter-year fluctuations, as shown in Figure 4.20 and Table 4.47. Landings of blue marlin clearly show an initial downward trend from 1999 - 2001 and a steady increasing trend from 2001 - 2004. Recreational landings of Atlantic blue marlin decreased from 1999 – 2001 from 36.9 mt to 16.4 mt. However, while the 2004 landings of Atlantic blue marlin were still below 1999 landings levels, landings of blue marlin increased steadily from 16.4 mt in 2001 to 24 mt in 2004.

As shown in Figure 4.20 and Table 4.47, during the period 1999 – 2004, mortality of Atlantic blue marlin resulting from pelagic longline dead discards exceeded recreational mortality attributable to recreational landings, in most years. The exception was in 2003 when pelagic longline dead discards and recreational landings were equivalent. Dead discards of Atlantic white marlin from pelagic longline fishing substantially exceeded recreational landings of white marlin each year during this period. Conversely, recreational landings of Atlantic sailfish substantially exceeded pelagic longline dead discards each year during this period. From 1999 to 2004, the difference between pelagic longline dead discards and recreational landings has narrowed.

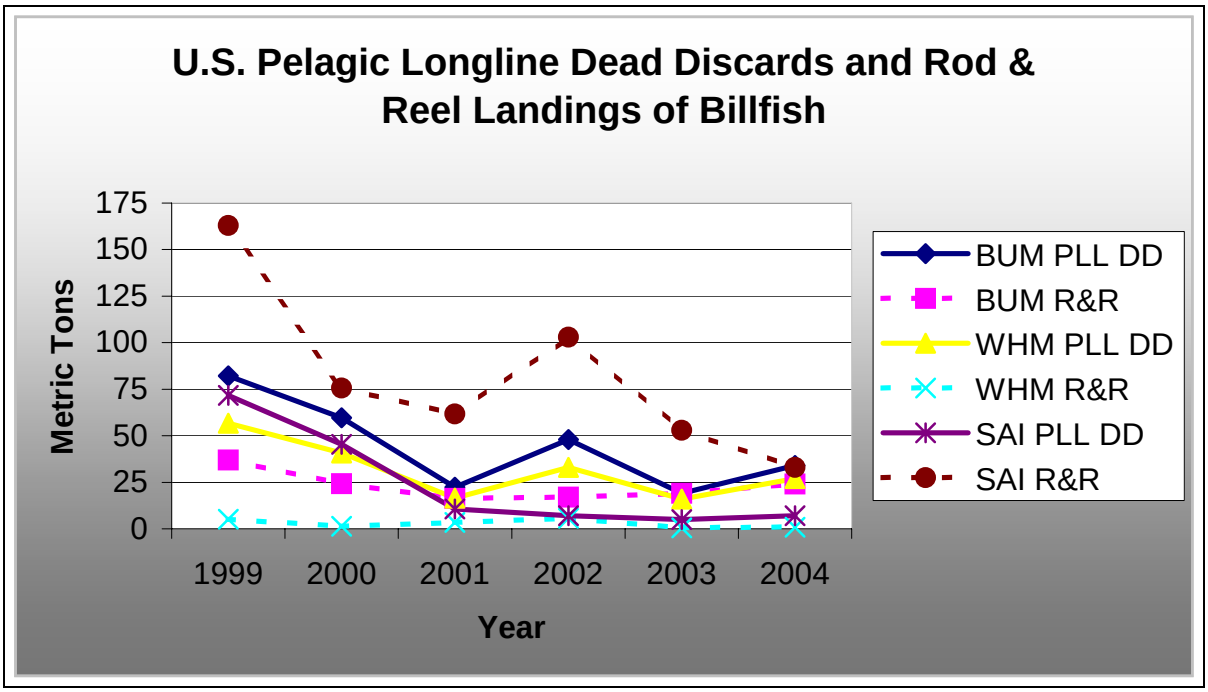


Figure 4.20 **U.S. Pelagic Longline Dead Discards and Rod & Reel Landings of Atlantic Billfish.** Source: U.S. National Reports to ICCAT 2003; 2004; 2005.

Table 4.47 **U.S. Pelagic Longline Dead Discards and Rod & Reel Landings of Atlantic Billfish (MT).** ***Source: Pelagic U.S. National Reports to ICCAT 2003; 2004; 2005***

	BUM		WHM		SAI	
Year	**PLL DD**	**R&R**	**PLL DD**	**R&R**	**PLL DD**	**R&R**
1999	82.1	36.9	56.7	5.2	71.6	163.0
2000	59.6	24.2	40.8	1.3	45.4	75.7
2001	22.4	16.4	16.5	3.4	10.7	61.7
2002	48.0	17.1	33.0	5.6	7.0	103.0
2003	19.0	19.0	17.0	0.6	5.0	53.0
2004	34.0	24.0	27.0	0.8	7.0	33.0

Domestic recreational Atlantic billfish catch (landing and release) statistics are less robust than commercial catch statistics. This is due to a number of factors including the sheer number of recreational vessels (*e.g.*, 25,238 Angling category permits; 4,173 CHB permits), the widespread and diffuse nature of the fishery, less stringent reporting requirements in the recreational HMS fishing sector than the commercial sector, a lack of observer coverage on recreational vessels, and significant non-compliance with recreational non-tournament reporting requirements. Identifiable gaps in self-reported non-tournament landings data include, but are not limited to, blue marlin landings in Puerto Rico and swordfish landings in the mid-Atlantic region. An examination of the Atlantic recreational billfish and swordfish reporting database shows that non-compliance or limited compliance with reporting requirements is occurring

throughout the recreational swordfish and billfish fishery. For example, in 2004, swordfish landings were reported in only Florida, Alabama, and Rhode Island. A review of sportfishing magazines, local newspapers, and internet fishing websites indicates non-reported landings in many states. Further, NMFS staff are regularly informed by participants in the sportfishing community that compliance with non-tournament HMS reporting requirements is low. Similar comments were also received during the public comment period on the Draft Consolidated HMS FMP. As a result, non-tournament recreational billfish statistics are considered minimum estimates and actual landings may, in fact, be higher. NMFS is working to improve compliance with reporting requirements through various outreach efforts, including distribution of outreach materials, participating in national, regional, and local meetings with constituents, and increasing enforcement of reporting violations.

Minimum size limits are the primary management measure currently in effect to limit landings and potentially limit total fishing mortality in the directed fishery for Atlantic billfish. The current minimum size limits can reduce the number of fish that qualify for landing. Current minimum size limits were implemented to decrease domestic landings in an effort to comply with ICCAT Recommendation 97-09. In addition to limiting fishing mortality by potentially reducing the number of fish landed, if set appropriately, minimum sizes can also ensure some level of reproductive potential remains in the fishery by allowing fish to reach the size at sexual maturity before recruiting into the fishery, where they are eligible for landing. Current domestic minimum sizes are set above the size at maturity for Atlantic blue marlin, white marlin, and sailfish, and, as such, assure that some level of reproductive potential is maintained in the fishery. Additional increases in minimum sizes or a shift to catch and release fishing, as per preferred alternative E6, while potentially increasing the number of released fish would further assure that some level of reproductive potential is maintained in the fishery. Minimum size limits do not, in and of themselves, guarantee that landings will remain at any given level or have a direct impact on post-release mortality of billfish. Billfish that are released in the recreational fishery are not considered as bycatch because of the catch-and-release fishery management program that was established in Amendment 1 to the Atlantic Billfish FMP (NMFS, 1999).

Known recreational landings of Atlantic billfish have remained at relatively low levels since 1999 due to minimum sizes requirements and a strong voluntary adherence to the practice of catch and release fishing. Recent recreational landings, as reported to ICCAT in metric tons, can be seen in Table 4.47 above, and as previously noted, reflect a steady increase in estimated landings of Atlantic blue marlin from 2001 - 2004. The number of recreationally landed Atlantic blue and white marlin, as reported to ICCAT, since adoption of the annual 250 recreationally caught marlin landing limit (Recommendation 00-13), can be seen in Table 4.48. In 2002, the United States exceeded its combined annual limit of 250 recreationally landed blue and white marlin, but carried forward underharvest from 2001, per ICCAT Recommendation 00-14. ICCAT Recommendation 00-14 allows for the carryover of underharvest and mandates carryover of overharvest from a previous fishing year to a subsequent fishing year for any species under quota or catch limit management. It should be noted that the accounting methodology upon which the 2003 numbers reported to ICCAT were based differs from the methodology used to generate the 2002 and 2001 numbers that were reported to ICCAT. The methodology used to generate the 2001 and 2002 landings shown in Table 4.48 resulted in higher landings being reported to ICCAT for those years than would have been reported if the 2003

methodology had been applied. For additional information on this methodological issue, please see Van Voorhees *et al*., 2004.

Table 4.48 U.S. Landings of Atlantic Blue and White Marlin as Reported to ICCAT in Numbers of Fish. Source: U.S. National Reports to ICCAT 2003; 2004; 2005; and Erika Carlsen, NMFS Office of International Affairs, pers. comm.

Year	BUM	WHM	Total	Annual Over/Underharvest
2001	77	116	193	57
2002	191	88	279	-29
2003	113	23	136	114
2004	118	31	149	101
Total	499	258	757	

Table 4.49 Tournament Landings and Releases 1999 - 2004 in Number of Fish. Source: NMFS Recreational Billfish Survey (RBS) Database

	BUM			WHM			SAI		
Year	Retained	Released	Live Release Rate	Retained	Released	Live Release Rate	Retained	Released	Live Release Rate
1999	172	1,527	0.899	36	1,456	0.976	30	1,907	0.985
2000	117	1,467	0.926	8	975	0.992	18	2,198	0.992
2001	75	1,038	0.933	22	1,306	0.983	11	3,073	0.996
2002	84	1,132	0.931	33	2,207	0.985	14	3,117	0.996
2003	96	1,133	0.922	20	614	0.968	24	4,171	0.994
2004	110	1,538	0.931	25	1,349	0.982	9	4,467	0.998

As previously discussed, recreational billfish data are less robust than commercial data. There are several sources of recreational data with overlapping samples. Each data source provides a unique view of billfish fisheries, including both landed and released fish. Recreational Billfish Survey (RBS) data represent the majority of verifiable domestic Atlantic billfish landings and can be seen in Table 4.49. The RBS was designed to provide a complete census of tournament landings, and as such, it is considered to be both accurate and precise in this regard. However, it is important to note that the RBS represents a subset of total billfish landings and, as such, includes certain biases. Because the RBS captures only tournament landings it is, by design, a subset of aggregate U.S. landings. Further, given that tournament fishermen do not, as a general rule, land a fish that is smaller than one that has already been landed in a tournament, both the size of tournament reported fish and the release percentages that can be calculated from RBS data are likely biased high relative to the fishery as a whole.

Another source of recreational billfish data is the Marine Recreational Fishery Statistics Survey (MRFSS). MRFSS includes Atlantic HMS, but was not specifically designed for HMS fisheries, which are considered rare event fisheries in comparison to inshore fisheries such as red drum. Further, MRFSS does not cover the State of Texas. For these reasons, the MRFSS data are not considered to be highly accurate in determining the exact number of landings or releases of Atlantic HMS, but it does provide useful additional data for purposes of comparison with

other data sets. The Large Pelagics Survey (LPS) is another statistical sampling survey that includes Atlantic HMS. This survey was designed to intercept BFT and operates only from Virginia to Maine on the Eastern seaboard from June through October. As such, LPS landings data are known to be a subset of aggregate U.S. Atlantic landings. Both the MRFSS and LPS can overlap with the RBS data, which must be accounted for when attempting to quantify aggregate landings. Finally, the HMS Management Division operates the Atlantic HMS non-tournament billfish and swordfish reporting line which is intended to capture non-tournament landings of all billfish and swordfish. With the exception of billfish or swordfish landed in the States of North Carolina and Maryland, anglers landing Atlantic billfish or swordfish outside of tournaments are required to report those landings to NMFS with 24 hours of landing. The States of North Carolina and Maryland have landing card programs in place and provide their landings data to NMFS.

The directed billfish fishery is primarily catch and release in nature. Fisher and Ditton (1992) estimate that between 74 and 99 percent of all billfish are released by billfish anglers in general. RBS data, as presented in Table 4.49, indicate Atlantic HMS tournament release rates of 89.9 to 93.3 percent for blue marlin, 96.8 to 99.2 percent for white marlin, and 98.5 to 99.6 percent for sailfish for the period 1999 - 2004. MRFSS data, as presented in Table 4.50, indicate release rates of 75.8 to 100 percent for blue marlin, 99.6 to 100 percent for white marlin, and 93.5 to 99 percent for sailfish, for this same period. LPS data, as presented in Table 4.51 indicate release rates of 87 to 100 percent for blue marlin, 89.4 to 99.4 percent for white marlin, and zero to 100 percent for sailfish, for the same period. Obviously, the estimates pertaining to sailfish (0 to 100 percent) indicate the wide variability in some data sets. Nevertheless, the preponderance of available data indicate a strong adherence by Atlantic billfish anglers, whose activities are captured by these data collection systems, to catch and release fishing, both within and outside of tournaments.

Table 4.50 MRFSS Estimated Aggregate Landings and Releases of Atlantic Billfish 1999-2004 in Number of Fish (includes Puerto Rico, excludes Texas). Source: NMFS MRFSS Database.

Year	BUM				WHM				SAI			
	Landings	Releases	Dead Discards	Live Release Rate	Landings	Releases	Dead Discards	Live Release Rate	Landings	Releases	Dead Discards	Live Release Rate
1999	N/A	3,265*	0*	N/A	N/A	3,475*	58*	0.984	5,238*	75,752*	90*	0.935
2000	0	2,492	0	1.0	26	7,069	0	0.996	1,000	41,905	171	0.977
2001	0	6,525	0	1.0	0	11,255	0	1.0	981*	35,509*	0*	0.973
2002	556	6,956	0	0.926	N/A	4,633*	N/A	N/A	541	53,474	625	0.99
2003	0	4,344	0	1.0	N/A	339*	N/A	N/A	2,821	46,105	18	0.942
2004	1,101	3,447	0	0.758	N/A	7,060*	N/A	N/A	N/A	42,638*	0*	N/A

* Incomplete data available for these fields

Table 4.51 Large Pelagics Survey Estimated Aggregate Landings and Releases of Atlantic Billfish (Virginia to Maine) 1999-2004 in Number of Fish. Source: NMFS LPS Database.

Year	BUM				WHM				SAI			
	Retained	Released	Dead Discard	Live Release Rate	Retained	Released	Dead Discard	Live Release Rate	Retained	Released	Dead Discard	Live Release Rate
1999	3	28	0	0.903	6	156	0	0.963	0	3	0	1
2000	0	1,886	0	1.000	4	705	0	0.994	6	0	0	0
2001	0	302	0	1.000	4	703	0	0.994	N/A	N/A	N/A	N/A
2002	0	568	0	1.000	218	5,616	0	0.963	0	60	0	1
2003	101	673	84	0.870	365	3,069	0	0.894	0	68	0	1
2004	45	1,112	0	0.961	78	5,573	0	0.986	0	27	0	1

Despite the widespread practice of catch and release fishing in the Atlantic billfish fishery, as discussed above, recent data on post-release mortality rates of recreationally caught billfish indicate that the adverse ecological impacts of recreational activities on billfish resources may be greater than previously recognized. Post-release survival of recreationally caught and released Atlantic billfish was previously estimated to be 90 percent or greater (NMFS, 1999). Conversely, this means that post-release mortality of recreationally caught and released billfish was previously estimated to be ten percent or lower. This estimate was derived from a review of the relevant literature at the time, which consisted primarily of studies examining catch and release mortality of bluefin tuna and sharks and Gulf of Mexico longline post-release survivorship. Since that time, there have been a number of pertinent studies examining both J-hook and circle performance and effects on billfishes.

A recent study by Horodysky and Graves (2005) examining the post-release mortality in the recreational fishery for Atlantic white marlin strongly suggests that mortality levels using traditional J-hooks may be higher than previously assumed. Horodysky and Graves found that the mortality rate of white marlin associated with J-hooks was 35 percent. This number was higher than post-release mortality rates for other billfish species. Horodysky and Graves (2005) noted post-release mortality rates (from other studies)of 11 percent for blue marlin and 29 percent for striped marlin caught with this hook type. Given sample sizes of the studies examined, there is no statistical difference between the Horodsyky and Graves 35 percent post-release mortality rate for Atlantic white marlin and the 29 percent estimate identified for Pacific striped marlin. As discussed above, previous post-release survival estimates for billfish were thought to be in excess of 90 percent. The recent white marlin post-release mortality statistics, when combined with estimates for the number of Atlantic blue and white marlin released by U.S. anglers, form the basis for NMFS' conclusion that the mortality contribution of the recreational billfish fishery is higher than previously estimated.

Table 4.52 presents the estimated number of white marlin mortalities resulting from catch and release fishing activities based on NMFS' RBS, MRFSS, and LPS databases. In deriving these estimates, an assumption was made that all billfish anglers use J-hooks. NMFS acknowledges that some unquantified portion of billfish anglers currently use circle hooks, and, as such, this assumption could bias the estimates to higher than actual levels. NMFS currently does not have an estimate of the proportion of billfish anglers that regularly use circle hooks. However, uncertainty in billfish landings stemming from under-reporting, as well as additional

uncertainty stemming from landings estimates in the Commonwealth of Puerto Rico and the U.S.V.I., may result in underestimates of recreational mortality. Mortality estimates were derived by applying a post-release mortality rate of 0.35 (Horodysky and Graves, 2005) to the reported number of releases (*e.g.*, 100 $_{\text{releases}}$ * 0.35 $_{\text{post-release mortality rate}}$ = 35 $_{\text{mortalities}}$). Using this methodology, estimated release mortalities of Atlantic white marlin range from 215 to 773 based on RBS data (1999 – 2004), 119 to 3,939 based on MRFSS data (1999 – 2004), and 55 to 1,966 for LPS data (1999 – 2004). For the reasons discussed above, actual post-release mortalities of white marlin likely fall somewhere between these estimates. As previously discussed, each of these databases has particular limitations, however, taken in combination, the data provide some indication of the magnitude of U.S. induced recreational white marlin mortalities.

Table 4.52 Estimated Post-Release Mortality of White Marlin in Numbers of Fish Based on J-hooks and 35 Percent Post-Release Mortality Rate as derived from Data from the RBS, MRFSS, and LPS. Source: Recreational Billfish Survey; Marine Recreational Fisheries Statistics Survey; and Large Pelagic Survey.

	RBS		MRFSS		LPS	
Year	**Live Releases**	**Estimated Post-Release Mortalities**	**Live Releases**	**Estimated Post-Release Mortalities**	**Live Releases**	**Estimated Post-Release Mortalities**
1999	1,456	510	3,475*	1,216	156	55
2000	975	341	7,069	2,474	705	247
2001	1,306	457	11,255	3,939	703	246
2002	2,207	773	4,633*	1,622	5,616	1,966
2003	614	215	339*	119	3,069	1,074
2004	1,349	472	7,060	2,471	5,573	1,951

*Incomplete data available for these years for this data set.

Table 4.53 presents the estimated number of Atlantic blue marlin mortalities resulting from catch and release fishing activities based on the RBS, MRFSS, and LPS databases. Estimates were derived by applying a post-release mortality rate of 0.11 (Graves 2002) to the reported number of releases (*e.g.*, 100 $_{\text{releases}}$ * 0.11 $_{\text{post-release mortality rate}}$ = 11 $_{\text{mortalities}}$). Consistent with the calculations for white marlin above, NMFS assumed that all billfish anglers use J-hooks. NMFS acknowledges that some billfish anglers currently use circle hooks, and, as such, this assumption could bias the estimates to higher than actual levels. NMFS currently does not have an estimate of the proportion of billfish anglers that regularly use circle hooks. However, uncertainty in billfish landings stemming from under-reporting, as well as additional uncertainty stemming from landings estimates in the Commonwealth of Puerto Rico and the U.S.V.I., may result in underestimates of recreational mortality. Between 1999 and 2004, estimated post-release mortalities of Atlantic blue marlin range from 114 to 169 fish based on RBS data, and 274 to 765 fish based on MRFSS data. Between 1999 and 2004, estimated post-release mortalities of Atlantic blue marlin ranged from 3 to 207 fish for LPS data. It is likely that the true post-release mortalities of blue marlin fall somewhere between these estimates. As previously discussed, each of these databases has particular limitations, however, taken in combination, the data indicate that U.S. induced mortalities of Atlantic blue and white marlin are likely higher than previously assumed in Amendment 1 to the Billfish FMP (NMFS, 1999).

Table 4.53 Estimated Post-Release Mortality of Blue Marlin in Numbers of Fish Based on J-hooks and 11 Percent Post-Release Mortality Rate as derived from Data from the RBS, the MRFSS, and LPS. Source: Recreational Billfish Survey; Marine Recreational Fisheries Statistics Survey; and Large Pelagic Survey.

	RBS		MRFSS		LPS	
Year	**Live Releases**	**Estimated Post-Release Mortalities**	**Live Releases**	**Estimated Post-Release Mortalities**	**Live Releases**	**Estimated Post-Release Mortalities**
1999	1,527	168	3265*	359*	28	3
2000	1,467	161	2,492	274	1,886	207
2001	1,038	114	6,525	718	302	33
2002	1,132	125	6,956	765	568	62
2003	1,133	125	4,344	478	673	74
2004	1,538	169	3,447	379	1,112	122

*Incomplete data available for these years for this data set.

As previously stated, alternative E1 would likely continue to provide only minor ecological benefits, given the limited measures (permit requirements and minimum size limits) currently in place to limit fishing mortality by limiting landings. Nevertheless, the ecological benefits of alternative E1 would be substantially below those of other billfish alternatives presented in this document. Minimum sizes alone cannot directly limit landings or mortalities, but can indirectly limit landings by limiting the available pool of legal sized fish. Continuation of existing management measures would likely provide a low level of positive ecological impacts for Atlantic billfish by constraining increases in billfish landings and thereby limiting mortality to some extent. However, new data on the post-release mortality of white marlin, as discussed above, indicate a larger contribution by U.S. recreational anglers to Atlantic-wide white marlin mortality rates than assumed in Amendment 1 to the Atlantic Billfish FMP (NMFS, 1999). Alternative E1 would not likely result in any substantial change in the number of Atlantic billfish landed, released, or discarded dead, or result in any significant change in the current levels of post-release mortality in the near future. Under the No Action alternative, landings, dead discards, and post-release mortality attributable to the directed billfish fishery could increase or decrease depending on angler behavior, with negative or positive ecological impacts given that there are no management measures currently in place to directly control landings or effort. However, no shifts in angler behavior are anticipated under the No Action alternative. NMFS received limited public comment in support of the No Action alternative, which generally cited existing domestic regulations as being appropriate and suggested the additional regulation would be inappropriate. Commenters further suggested that voluntary use of circle hooks could increase. However, as previously, discussed the No Action alternative would allow for the continued and restricted use of J-hooks in the recreational fishery, which are associated with significantly higher post-release mortality rates than previously estimated. Alternative E1 would likely not reduce or reverse the current United States' or Atlantic-wide fishing mortality rates for either blue or white marlin. Further, the No Action alternative cannot, in and of itself, ensure compliance with the ICCAT marlin landing limit. For these reasons, despite limited public support for it, NMFS is not preferring the No Action alternative. Alternative E1 is not anticipated to increase or decrease interactions with protected resources including sea turtles,

seabirds, or marine mammals, or impact non-target species because no changes in fishing effort or practices would be expected.

Alternative E2 would require the use of non-offset circle hooks in all segments of HMS recreational fisheries, for all species, whenever natural baits or natural bait/artificial lure combinations are used, beginning on January 1, 2007. This includes HMS Angling category permitted vessels, Charter/Headboat permitted vessels when on a for-hire trip or fishing recreationally, and all General category permitted vessels participating in registered HMS tournaments. Circle hooks are defined in 50 CFR §635.2 as "a fishing hook originally designed and manufactured so that the point is turned perpendicularly back to the shank to form a generally circular, or oval, shape." Natural bait/artificial lure combinations would include, but would not be limited to, rigs such as natural baits used in combination with artificial hoods, heads, and/or skirts. This alternative could reduce the overall mortality rates of Atlantic white marlin, blue marlin, sailfish, and other species with which HMS fishermen interact by reducing post-release mortality rates. Alternative E2 would allow the use of J-hooks with artificial lures. NMFS received public comment during scoping, on the pre-draft document, and on the Draft Consolidated HMS FMP, that fishermen tend to target white marlin and sailfish with natural baits while either drifting or slow trolling and target blue marlin by trolling at a higher rate of speed with the fish striking at the lure. Because of these fishing practices and feeding habits, it is believed that blue marlin have less opportunity to deeply ingest baits, therefore resulting in a higher proportion of hook-ups in the mouth with less damage to vital tissues and lower rates of post-release mortality. In a study evaluating pop-up satellite tags for estimating post-release survival of blue marlin from a recreational fishery, Graves *et al.,* (2001) mouth hooked seven of nine blue marlin tagged by trolling at high speed using high speed lures or skirted dead baits with J-hooks. The remaining two fish were foul hooked. Commenters also strongly suggested that given the feeding habits of blue marlin, mandating circle hooks on artificial lures would significantly reduce the viability of trolling for blue marlin. Given the relatively low post-release mortality rate of recreationally released Atlantic blue marlin (approximately 11 percent) and substantial public comment requesting continued use of J-hooks for targeting Atlantic blue marlin, NMFS developed alternatives to allow the continued use of J-hooks with artificial lures.

Alternative E2 would likely provide positive ecological benefits for most, if not all HMS species with which recreational fishermen interact. This alternative would be expected to reduce mortality in the directed billfish fishery by reducing post-release mortality. There is mounting evidence that hook choice can significantly impact fishing mortality rates. In a review and analysis of 43 previous post-release circle hook studies, Cooke and Suski (2004) found that circle hooks resulted in lower fishing mortality than other types of hooks and that mortality was consistently higher for J-hook caught fish. Factors identified as affecting mortality of released fish included hooking depth, anatomical hooking location, bleeding, and ease of hook removal. Cooke and Suski (2004), Prince *et al.* (2002), and Horodsky and Graves (2005) found that J-hook caught fish were more likely to be deep hooked than circle hook caught fish, circle hooks were more likely to result in jaw hooking than J-hooks, and J-hooks were more likely to cause tissue trauma resulting in bleeding. The reduced occurrence of deep hooking associated with circle hooks as compared to J-hooks reduces the opportunity for damage to vital organs and excessive bleeding. Cooke and Suski (2004) found that, in general, hooking mortality rates were reduced by approximately 50 percent by using circle hooks relative to J-hooks. The authors

attributed the mortality reduction associated with the use of circle hooks to the tendency of circle hooks to jaw-hook fish, resulting in shallow hooking depths. Cooke and Suski (2004) also recommend that management agencies implement circle hook requirements only in instances in which appropriate scientific data for similar species exists. Nevertheless, taken in aggregate, the available science indicates that hook type can have a significant effect on survival of released fish.

In another recently released study on circle hooks, J-hooks, and drop-back time, Prince *et al.*, (2006), evaluated the performance of non-offset circle hooks and a similarly sized J-hook used in the south Florida recreational live bait fishery for Atlantic sailfish. Sampling a total of 766 sailfish (392 caught on circle hooks; 374 caught on J-hooks), Prince *et al.* (2006) found that in terms of catch, hook locations, bleeding, and release condition, the traditionally-shaped circle hooks had the best performance with respect to conservation benefit for promotion of live release. Further, Prince *et al.* (2006) found that traditional circle hooks, those with curvature of the shank which allows for a generally circular or oval shape, as opposed to J-hooks that simply have the point of the hook turned back toward the shank and labeled circle hooks, performed well with drop back times of varying intervals. While the Prince *et al.* (2006) did not examine post-release mortality data, the findings of the study reinforce the findings of other studies that traditionally shaped circle hooks may contribute to reductions in post-release mortality rates of Atlantic billfish by improving hooking locations, reducing bleeding, and improving release condition. As stated in Prince *et al.*(2006); "The general conclusion to be drawn from both studies [Horodysky and Graves 2005 and Prince *et al.* 2006] is that non-offset circle hooks promote live release in dead bait troll fisheries targeting white marlin and sailfish and that J-hooks do not." The study further found comparable catch rates between circle and J-hooks, which is key to acceptance of circle hooks among anglers.

Also as previously discussed, Horodysky and Graves (2005) identified a post-release mortality rate of 35 percent (range 15 – 59 percent) for recreationally caught Atlantic white marlin when J-hooks were used. During this study, 7 of 20 white marlin caught on J-hooks died, while none of the 20 white marlin caught on circle hooks died. It is not a reasonable assumption that all circle hook caught white marlin will survive the catch and release experience, in every instance. Based on data from the same study, Dr. John Graves (pers. comm.) indicated that the research team identified a post-release mortality rate of 0 - 12 percent for Atlantic white marlin caught on circle hooks based on use of a statistical model and 10,000 runs of the data. This provides an estimated post-release survival rate of 88 - 100 percent. Assuming a worst case scenario where 12 percent of all Atlantic white marlin caught on circle hooks die, this provides an overall net mortality benefit to the fishery of approximately 23 percent (35 percent J-hook post-release mortality estimate - 12 percent circle hook post-release mortality benefit) for circle hook caught white marlin over J-hook caught marlin. In a relative sense, J-hook mortality versus circle hook mortality, it provides a 65.7 percent reduction ($12_{\text{percent circle hook post-release mortality estimate}}/35_{\text{percent J-hook post release mortality estimate}} = .343$ percent). NMFS received public comments concerned that the Agency had drawn conclusion regarding the impacts of circle hooks on billfish based on the limited sample size in some studies, however, the research utilized in this document represents the best available science, including sample size and accurate replication of standard billfish angling methods.

Table 4.54 provides a retroactive estimate of the net mortality benefit for Atlantic white marlin of switching the entire recreational Atlantic white marlin fishery to circle hooks from J-hooks. In developing these estimates, NMFS applied the median post-release mortality rate of 35 percent (range 15 – 59 percent) for Atlantic white marlin caught recreationally on J-hooks against the upper bound post-release mortality estimate for Atlantic white marlin caught on circle hooks of 12 percent, as identified by Horodysky and Graves through modeling. NMFS received comment that a more statistically appropriate comparison would be to compare "central tendencies" of the post-release mortality estimates derived for J-hook and circle hook post-release mortality, *e.g.* the 35 percent estimate for J-hook mortality and 0 percent for circle hook mortality. However, for purposes of analysis in this Final Consolidated HMS FMP, NMFS believes that comparison of the median or central tendency, 35 percent value and the upper bounds of the circle hook post-release mortality estimates are appropriate for the reasons discussed below. NMFS agrees that the median 35 percent estimate developed for J-hook caught fish is most appropriate to use in developing estimates of post-release mortality of Atlantic white marlin in the fishery. For circle hooks, the observed rate mortality rate was 0. However, it is not realistic to assume that every fish will survive the catch and release experience when circle hooks are used, despite the observed rate of 0 during the study. Through statistical modeling, the researchers developed an upper estimate of 12 percent post-release mortality. The "central tendency" estimate generated from the modeling was zero. Given the fact that some fish caught and released on circle hooks will die, NMFS believes that, for purposes of analysis, it is appropriate to use the more biologically precautionary 12 percent estimate figure in combination with the 35 percent estimate for J-hook caught fish. NMFS will continue to refine its mortality estimates as new data become available.

In applying the circle hook mortality benefit to previous release estimates, the estimated mortality benefit (fish conserved) for white marlin ranged from 141 to 508 fish using RBS data, 78 to 2,589 fish using MRFSS data, and 36 to 1,292 fish using LPS data. Under alternative E2, NMFS estimates that approximately 88 percent of future released white marlin would survive as a result of being caught on circle hooks. Averaging the annual mortality reduction benefits identified in Table 4.54, NMFS estimates that alternative E2 could result in the annual savings of approximately 303 (range: 141 – 508) Atlantic white marlin according to RBS data, 1,297 (range: 78 – 2,589) white marlin based on MRFSS data, and 607 (range: 36 – 1,292) white marlin using LPS data, when compared to continuing use of J-hooks throughout the fishery (alternative E1). Again, estimates are based on the assumption that all or nearly all white marlin are currently caught on J-hooks. Presently, NMFS cannot accurately estimate the proportion of anglers using J-hooks or circle hooks. Given that some unquantified subset of Atlantic white marlin is currently captured on circle hooks, the actual ecological benefits may be somewhat below these estimates. However, unquantified non-compliance with landings reporting requirements may have the opposite effect and the actual ecological benefits may be somewhat above these estimates. Some limited but unquantified proportion of white marlin may become tail-wrapped and suffocate, suffer predation from sharks, or be caught on J-hook rigged artificial lures, which could also reduce post-release benefits. Tail-wrapping and predation occur in association with J-hook caught fish also.

The ecological benefits ultimately derived from circle hooks are somewhat dependent upon angler behavior and fishing techniques. Variables include decisions by the angler to retain

a fish caught on a circle hook, off-setting hooks, or allowing circle hooks to be deeply ingested, all of which can influence mortality benefits associated with circle hooks. The use of offset hooks appears to be a key variable influencing mortality levels associated with circle hooks. Prince *et al.* (2002) found that highly offset (15 degrees or greater) hooks were associated with deep hooking, whereas minor (four degrees or less) and non-offset hooks were typically associated with jaw hooking. Overall, Prince *et al*. (2006) found highly offset hooks were approximately three times more likely to result in deep hooking for sailfish. Another variable that likely impacts survival is drop-back time, depending on hook type. When "dropping back", an angler free spools the bait, allowing the fish to deeply ingest the hook prior to setting it. As previously discussed, Prince et al. (2006) found that traditionally shaped circle hooks performed well (meaning they had a low rate of hooking in undesirable locations) under drop-backs of differing periods of time. The study showed that J-hooks and non-traditional circle hooks had elevated rates of undesirable hooking locations associated with drop-back relative to traditionally shaped circle hooks. Drop-back practice may result in higher rates of deep hooking and likely to higher rates of damage to internal organs when used with J-hooks and non-traditional circle hooks.

Table 4.54 White Marlin Estimated Net Circle Hook Mortality Benefit in Numbers of Fish. Source: RBS, MRFSS, LPS

Year	RBS				MRFSS				LPS			
	Live Releases	Estimated J-Hook Post-Release Mortalities	Estimated Circle Hook Post-Release Mortalities	Estimated Net Circle Hook Benefit	Live Releases	Estimated J-Hook Post-Release Mortalities	Estimated Circle Hook Post-Release Mortalities	Estimated Net Circle Hook Benefit	Live Releases	Estimated J-Hook Post-Release Mortalities	Estimated Circle Hook Post-Release Mortalities	Estimated Net Circle Hook Benefit
1999	1,456	510	175	335	3,475*	1,216	417*	799	156	55	19	36
2000	975	341	117	224	7,069	2,474	848	1,626	705	247	85	162
2001	1,306	457	157	300	11,255	3,939	1,351	2,589	703	246	84	162
2002	2,207	773	265	508	4,633*	1,622	556*	1,066	5,616	1,966	674	1,292
2003	614	215	74	141	339*	119	41*	78	3,069	1,074	368	706
2004	1,349	472	162	310	7,060*	2,471	847	1,624	5,573	1,951	669	1,282

* Partial data available this data field.

As mentioned above, alternative E2 would likely result in positive ecological benefits for most, if not all, HMS species with which recreational fishermen interact. Cooke and Suski (2004) found circle hooks to be broadly beneficial in reducing mortality and/or improving hooking location when compared to J-hooks. As discussed, hooking location is a key variable in post-release mortality. Additional studies examined during this analysis reinforce these conclusions, specifically for HMS, including Atlantic white marlin (Horodysky and Graves, 2005), sailfish (Prince *et. al*., 2002), and bluefin tuna (Skomal *et. al*., 2002).

NMFS received substantial public comment opposing and supporting circle hook requirements, as proposed under draft alternatives E2 and E3, for a number of reasons. A prevalent theme contained in comments opposing mandatory circle hook use, in all or portions of the HMS and billfish recreational fisheries, was that the recreational sector has a minor impact on Atlantic billfish populations relative to the commercial pelagic longline fleet. From an

international perspective, data reported to ICCAT indicate that commercial fishing activities are responsible for the majority of Atlantic billfish mortality (Kerstetter, 2006). However, given the relatively small size of the U.S. domestic pelagic longline fleet and the considerable size of the recreational fishing fleet (discussed in detail below), NMFS determined that it was appropriate to examine the issue of pelagic longline versus recreational mortality contributions from the domestic perspective.

To further explore this issue, NMFS examined data from the pelagic longline logbook program and the RBS, MRFSS, and LPS databases. Utilizing new information on recreational and commercial post-release mortality rates (Horodysky, 2005, and Kerstetter, 2006, respectively), an examination of the data by NMFS indicates that, in some years, the total mortality contribution of the domestic recreational billfish fishery may equal or exceed the total mortality contribution of the domestic pelagic longline fleet with regard to Atlantic white marlin. As seen in Appendix C, estimates of total annual recreational white marlin mortality, which combines landings, dead discarded fish, and estimated post-release mortalities of white marlin released alive, vary greatly by data set and year. MRFSS and LPS databases indicate that for the period 2001 – 2004, inclusive, the aggregate level of recreational mortality was approximately three and two times higher, respectively, than the aggregate mortality contribution (dead discards and estimated post-release mortality) of the domestic pelagic longline fleet with regard to Atlantic white marlin. Using RBS data, a known subset of recreational effort and landings, estimated aggregate recreational white marlin mortality appears to be about 71 percent of estimated total domestic pelagic longline white marlin mortality (based on logbook data) for the same period. When taken in combination, and allowing for the limitations and uncertainty associated with each database involved, two conclusions can be drawn; 1) the aggregate recreational fishing mortality contribution is higher than previously thought with regard to Atlantic white marlin and 2) there is more parity between the mortality contributions of the domestic recreational and domestic pelagic longline fleet than previously thought. Cramer (2005) and Kerstetter (2006) examined this same issue to varying degrees. Both papers support the same basic finding drawn in this Final Consolidated HMS FMP, that in some years the domestic recreational billfish fishery may impose equivalent or even greater levels of mortality on Atlantic white marlin populations than the domestic pelagic longline fishery.

Under initial examination, it appears that this may primarily be the result of the size differential between the two fisheries. As of February 1, 2006, there were 25,238 HMS Angling category permit holders and 4,173 HMS Charter/Headboat category permit holders able to legally pursue Atlantic billfish. An additional 4,824 General category permit holders can legally pursue Atlantic marlin while participating in registered HMS tournaments. Further, NMFS believes that the number of HMS Angling category permit holders, and perhaps CHB category permit holders, are lower than the actual number of vessels participating in the fishery *(i.e.* some unpermitted vessel may be illegally participating in the fishery). In contrast, as of February 1, 2006, the total number of vessels that could potentially participate in the pelagic longline fishery for HMS was 277, given the limited access permit system in place. The number of active pelagic longline vessels participating in HMS fisheries in 2004 was just 116, and fell to 110 in 2005. NMFS will continue to examine this issue as additional data become available. This data reinforces NMFS preferred alternative that it is appropriate to implement circle hook

requirements in some segments of the recreational fishery, at this time, to reduce post-release mortality associated with the directed billfish fishery.

A second important theme in comments opposing mandatory circle hook use under alternatives E2 and E3 was the need for NMFS to promulgate more detailed specifications for circle hooks. Current regulations provide a definition of a circle hook: A circle hook means a fishing hook originally designed and manufactured so that the point of the hook is turned perpendicularly back toward the shank to form a generally circular or oval shape. Currently, there are no industry standards with regard to circle hook specifications, including size, degree of circularity, gap width, wire gauge, or other measurements. As such, NMFS is unable to provide an index of detailed hook specifications for each size circle hook that could be used in the recreational billfish fishery, at this time. NMFS is continuing to work on a more refined hook definition for the future. However, as per preferred alternative E3, NMFS finds that it is appropriate to require the use of circle hooks in portions of the recreational billfish fishery at this time in an effort to reduce post-release mortalities in the recreational billfish fishery.

Declines in post-release mortality of any overfished HMS stock would result in positive ecological benefits. Positive ecological gains (*i.e.*, reducing fishing mortality rates) would be relevant to considerations in the anticipated 2007 ESA Status Listing Review for Atlantic white marlin. As shown in Table 4.54, alternative E2 could decrease Atlantic white marlin mortalities by between 303 to 1,297 fish annually, on average, assuming no significant changes in effort or angler behavior, and exclusive use of natural bait/circle hook combinations. NMFS does not expect any significant changes in effort or angler behavior, but acknowledges that not all anglers will always use circle hooks and natural baits when J-hooks with artificial lures remain an option. Given these assumptions, the potential ecological benefits could be somewhat below the numbers stated above. However, given data limitations on recreational catches and releases, the actual number of releases may be higher than those that are presented in the tables above, thereby resulting in a larger ecological benefit than identified above. The overall ecological impact of alternative E2 would be positive, but limited, given the relatively small contribution of U.S. anglers to total Atlantic-wide mortality. As such, alternative E2 would likely reduce the current Atlantic-wide fishing mortality rates for both blue or white marlin to some degree, but would not be capable of decreasing the Atlantic-wide fishing mortality rate to F_{msy}. While the benefits of requiring circle hooks are loosely quantifiable for Atlantic white marlin, the benefits remain unquantifiable at this time for other species. As mentioned, Skomal *et al.* (2002) noted improved hooking location associated with circle hooks, which as discussed, may contribute to a reduced post-release mortality of bluefin tuna as compared to J-hooks. Still, there are relatively few data available on the efficacy and impacts of using circle or J-hooks on sharks, other tunas, and swordfish, which could be used to quantify impacts on these species.

Alterative E2 would likely have limited positive ecological benefits for blue marlin given fishing techniques for, and feeding behavior of, this species. As previously discussed, blue marlin are typically targeted by trolling lures or rigged natural baits at high speed. As a result, blue marlin are often mouth or foul hooked, as they aggressively strike and bat at the lures. As a result, many anglers would likely make use of an artificial lure rigged with a J-hook when fishing for blue marlin to improve the odds of success. This would be allowable under alternative E2. Potential ecological benefits derived from the use of circle hooks stemming from

improved hooking location and reduced tissue damage may be undermined by angler actions including offsetting hooks, or using non-traditional circle hooks which may lead to higher rates of deep hooking and internal injury. Furthermore, as previously discussed, while Cooke and Suski (2004) suggest that overall post-release mortality rates are often lower when using circle hooks compared to J-hooks they also recommend that management agencies implement circle hook requirements only in instances in which appropriate scientific data exists for similar species.

Alternative E2 would not be expected to increase interactions with protected resources. NMFS has little or no data showing interactions between the directed Atlantic billfish fishery and protected species. NMFS' HMS Management Division has received one anecdotal report of such an interaction since late 2002. Thus, interactions between the directed Atlantic billfish fishery and protected species appear to be extremely rare. However, this alternative may contribute to a reduction of interactions as well as the mortality rates associated with any such interactions that may occur based on the hooking mechanics, improved hooking location, and decreased damage of vital tissues generally associated with the use of circle hooks.

Alternative E3, a preferred alternative, would require the use of non-offset circle hooks by anglers fishing from HMS permitted vessels and participating in an Atlantic billfish tournament whenever natural baits or natural bait/artificial lure combinations are deployed, effective January 1, 2007. Any tournament as defined under 50 CFR §635.2 that has an award category, or awards points or prizes for Atlantic billfish is considered a billfish tournament. Natural bait/artificial lure combinations would include, but are not limited to, rigs such as natural baits used in combination with artificial hoods, heads, and/or skirts. This alternative would allow the use of J-hooks with artificial lures in tournaments for the reasons discussed under alternative E2.

As noted in Chapter 2, NMFS has made a slight technical adjustment to the phrasing of alternative E3 in this Final Consolidated HMS FMP. NMFS received public comment expressing concern that HMS circle hook requirements may apply to all tournament participants, even non-HMS fishermen participating in large tournaments that may have award categories for species other than HMS. NMFS appreciates this concern and has refined the phrasing of the alternative to more accurately reflect the intent of this alternative. NMFS did not intend, nor mean to imply, that regulations governing 50 CFR part 635 would apply to fisheries under the jurisdiction of the Regional Councils. It should be noted that NMFS analyzed this alternative from the perspective of applying circle hook requirements to HMS-permitted vessels in billfish tournaments, and as such, the change in phrasing of the alternative has no impact on the analyses conducted herein. To reiterate, circle hook requirements implemented via this rulemaking would apply to Atlantic HMS permitted vessels, and vessels that should possess HMS permits, participating in Atlantic billfish tournaments and deploying natural baits or natural bait/artificial lure combinations.

The ecological impacts of alternative E3 would be similar to those identified under alternative E2, but would be somewhat reduced in scope. This alternative would reduce mortality in the directed billfish fishery by reducing post-release mortality. Under alternative E3, post-release mortality benefits would be primarily realized in the billfish tournament

segment of the recreational fishery, but may also be realized outside of tournaments as anglers become comfortable and proficient with circle hooks and potentially increase their use voluntarily outside of tournaments. Voluntary use of circle hooks outside of tournaments may increase as a result of anglers wanting to maximize fishing experience with circle hooks to increase their expertise with the type of hooks that would be mandated in tournaments where they can win money. Further, many tournament anglers are viewed as leaders in the billfishing community and as they increase their use of circle hooks, non-tournament anglers may follow suit and increase their use as well. As such, based on RBS release data, this alternative would likely result in a decrease of white marlin post-release mortalities by approximately 23 percent over all, resulting in an estimated 303 (range: 141 – 508) fish released alive that would otherwise be expected to die, on average. There would likely be unquantified positive mortality benefits (decreased post-release mortality) for sailfish, blue marlin, tunas, sharks, and, to a lesser extent, swordfish as well other non-HMS species with which billfish tournament anglers interact (blackfin tuna, mahi-mahi, wahoo, etc.), resulting from improved hooking location and decreased damage to vital tissues. See alternative E1 and E2 for more complete discussions of the impacts of J-hooks and circle hooks on target and non-target species. The overall ecological impact of alternative E3 would be positive, but limited, given the relatively small contribution of U.S. anglers to total Atlantic-wide mortality. As such, alternative E3 would likely reduce, but not reverse current trends in Atlantic-wide fishing mortality rates for both blue or white marlin and possibly other species with which billfish tournament anglers interact. The United States will continue to encourage other ICCAT nations to implement circle hooks in their commercial and recreational fleets to reduce post-release mortality of billfish and other HMS. Based on the expectation that some anglers will continue to use J-hooks when targeting Atlantic blue marlin while participating in billfish tournaments, for the reasons described under alternative E2, the positive ecological benefits for blue marlin would likely be less than those anticipated for white marlin under alternative E3. As discussed under alternative E2, potential ecological benefits derived from the use of circle hooks may be undermined by angler actions including offsetting hooks, using non-traditionally shaped circle hooks (*i.e*. circle hooks in name only), and possibly increasing drop-back time.

NMFS received substantial comment supporting and opposing implementation of this preferred alternative. A prevalent theme contained in comments opposing mandatory circle hook use, in all or portions of the HMS and billfish recreational fisheries, was that the recreational sector has a minor impact on billfish populations relative to the commercial pelagic longline fleet. As discussed more fully in the analysis for alternative E2, data reported to ICCAT indicate that commercial fishing activities are responsible for the majority of Atlantic billfish mortality, from an international perspective (Kerstetter, 2006). However, from a domestic perspective a review of the data and two recent studies indicate that, in some years, the total mortality contribution of the domestic recreational billfish fishery may equal or exceed the total mortality contribution of the domestic pelagic longline fishery with regard to Atlantic white marlin. Please see the discussion of this issue under alternative E2 for additional details. These conclusions reinforce the appropriateness of implementing the preferred alternative to implement certain circle hook requirements in billfish tournaments to reduce recreationally induced fishing mortality.

Other comments opposing alternative E3 included suggestions that circle hook use should remain voluntary, that NMFS should allow J-hooks to be used for pursuing Atlantic blue marlin, that mandatory circle hook use in tournaments is not enforceable, and that mandatory circle hook use in tournaments may have large adverse economic impacts. Circle hook use has always been voluntary, and yet significant portions of the fishery continue to use J-hooks. Further, NMFS has actively been encouraging the use of circle hooks in HMS Fisheries since 1999. While there has been some progress in sectors of the fishery, anecdotal evidence suggests that substantial portions of the recreational fishery continue using J-hooks as the standard hook. Based on public comment from scoping and the Draft Consolidated HMS FMP, as well as an examination of post-release mortality data of blue marlin caught on J-hooks, this preferred alternative would allow anglers on HMS permitted vessels in billfish tournaments to continue to use J-hooks with artificial lures. This was clearly stated in the Draft Consolidated HMS FMP. NMFS believes that circle hook requirements in tournaments are enforceable, and public comment received during this rulemaking supports this. In addition to future agency efforts to enforce circle hooks, and the increasing use of tournament observers, NMFS believes that the conservation ethic of billfish anglers and the vested financial interests of billfish tournament participants in ensuring that all tournament participants compete fairly under the same rules and conditions, would result in significant self-enforcement of tournament circle hook requirements. NMFS has not seen evidence that participation in the fishery would decrease as a result of circle hook use or result in economic losses given that all tournaments would operate under the same set of regulations. Importantly, circle hooks have been shown to increase catch rates of some billfish species (Prince *et al.*, 2002), and are, on average, slightly less expensive than J-hooks. Many comments from both sides of the debate stated that circle hooks are effective at reducing mortality of Atlantic billfish. With the substantial conservation benefit associated with the use of circle hooks, recent information suggesting that the post-release mortality rate of Atlantic white marlin caught recreationally on J-hooks is substantially higher than previous estimates, data indicating that the mortality contribution of the recreational community toward Atlantic marlin may equal or exceed that of the domestic pelagic longline fishery in some years (see the discussion of alternative E2 for additional information), and the fact that circle hook requirements are already in place in the pelagic longline fishery, NMFS believes that mandatory circle use is an appropriate management action to implement at this time. Further, this alternative would strike an appropriate balance between achieving conservation goals and allowing the fishery to continue with a minimum of impacts or disruption.

Alternative E3 would not be expected to increase interactions with protected resources. NMFS has little or no data showing interactions between the directed Atlantic billfish fishery and protected species. NMFS' HMS Management Division has received one anecdotal report of such an interaction since late 2002**.** However, this alternative may contribute to a reduction of interactions as well potential mortalities associated with any such interactions based on the hooking mechanics, improved hooking location, and decreased damage of vital tissues generally associated with the use of circle hooks.

Alternative E4(a) would increase the minimum legal size for Atlantic white marlin to a specific size between 68 and 71 inches LJFL (172 – 180 cm) to reduce white marlin landings and the mortalities resulting from such landings. The current minimum size for white marlin is 66 inches LJFL (167 cm) and has been in place since 1998 (63 FR 14030). The aforementioned

range was selected for analysis because, within a relatively small range of minimum sizes, potentially significant reductions in landings (25 – 82 percent) may be attained (Table 4.55). The minimum sizes analyzed represent the upper and lower limits of the sizes analyzed and do not represent a "slot limit" for white marlin. If E4(a) were preferred, a new specific minimum size would be implemented from within the range analyzed based on public comment, potential reductions in landings, the need to comply with ICCAT landing limitations, and other relevant factors. This alternative may also improve the likelihood of consistency with the ICCAT recreational marlin landings limit. In addition, management measures implemented prior to the 2007 ESA status review for white marlin, such as increasing the minimum size to reduce landings, would be relevant considerations during the deliberations of the status review team when they convene.

Alternative E4(b) would increase the minimum size for blue marlin to a specific size between 103 and 106 inches LJFL (261 – 269 cm) to reduce blue marlin landings and mortalities resulting from landings. The current minimum size for blue marlin is 99 inches LJFL (251 cm) and has been in place since 1998 (63 FR 14030). This range was selected for analysis because within this relatively small range of minimum sizes, significant reductions in landings (16-36 percent) could potentially be achieved (Table 4.55). The minimum sizes analyzed represent the upper and lower limits of the sizes analyzed and do not represent a "slot limit" for blue marlin. If E4(b) were to be implemented, a new specific minimum size would be implemented from within the range analyzed based on public comment, the potential reductions in fishing mortality given the overfished status of this species, the need to comply with ICCAT landing limitations, and other relevant factors. This alternative may improve the likelihood of consistency with the ICCAT recreational marlin landings limit.

Alternatives E4(a) and E4(b) would both likely have limited positive ecological impacts because increasing the minimum size would be expected to decrease landings by decreasing the pool of legal sized fish available for landing. The extent of these benefits would be dependent on fishing effort remaining relatively constant relative to current levels, as well as a continuation of the widespread practice of catch and release fishing for Atlantic billfish. In addition to potentially limiting known mortalities via reducing the number of fish landed, increasing the minimum sizes would also ensure that a larger proportion of the billfish population attain sexual maturity and that larger, more fecund, individuals retain the opportunity to spawn.

NMFS received public comments indicating both support and opposition to increasing the minimum size for blue and white marlin based on the rationale of allowing more white and blue marlin to reach sexual maturity, including, increasing the minimum size will force fishermen to target larger, more fecund females and that the Agency should consider a slot limit to protect these larger, more fecund, marlin. Generally speaking, the likelihood of landing a larger, more fecund female may increase by increasing the minimum size for blue marlin. For white marlin, however, there does not seem to be as strong of a correlation between length and age or fecundity as white marlin will first put on length, and then weight. Weight is generally an indicator of fecundity. However, most billfish fishermen tend to be opportunistic because the fisheries for blue and white marlin are characterized by extremely low catch per unit effort (CPUE) rates. These range from between 1.03 and 1.05 fish caught per hundred angler hours for white and blue marlin, respectively. Furthermore, most billfish caught are released. Tournament

data between 1999 - 2004 indicate that, on average, only 8.1 and 1.8 percent of blue and white marlin, respectively, were landed. Increasing the minimum size would not likely result in fishermen targeting larger, more fecund females because of the opportunistic nature of this fishery and the fact that fishermen do not necessarily apply different techniques or attempt to "target" large versus small billfish.

NMFS received a comment asking what data were used to determine billfish size limits. These minimum sizes were selected to reduce the number of billfish that could be landed and to allow for female billfish to be protected from exploitation until after they have spawned. Furthermore, for blue and white marlin these minimum sizes were selected to achieve compliance with an ICCAT recommendation (97-09) adopted in 1997, requiring contracting parties to reduce billfish landings by at least 25 percent by 1999. Size distributions from Atlantic billfish tournaments held from 1995-1997 were used to analyze minimum size alternatives contained in the 1999 HMS FMP and to determine which minimum size corresponded with a 25 percent reduction in landings. NMFS wanted to implement a minimum size that allowed blue and white marlin to achieve the size and first maturity before potentially being removed from the population. It is estimated that the sizes at first maturity are approximately 89–90" LJFL for blue marlin and approximately 52" LJFL for white marlin, which are well below the current minimum sizes. RBS landings data for the period 1999 – 2004 was used for the size analysis contained in this document. Increasing the minimum size is not anticipated to have an effect on post- hooking mortality of released fish because the relationship between the size of a released fish and mortality is not known.

Table 4.55 shows the number of fish landed and cumulative proportion of total landings, providing potential landings reductions for each size with the corresponding ranges for blue and white marlin. Each minimum size within the range would provide unique reductions in landings and conservation benefits. Positive ecological impacts resulting from decreased landings of blue and white marlin increase as the minimum size is increased within the range analyzed. The actual reduction in landings and known mortalities would be dependent on the specific minimum size selected, and future fishing effort. Figure 4.21 and Figure 4.22 show the overall number of tournament landings, by size (inches, LJFL), for blue and white marlin for the years 1999 - 2004 combined.

Between 1999 and 2004, RBS data indicate that there were an average of 92 and 21 blue and white marlin that were landed above the current minimum sizes each year in tournaments, respectively. Under this alternative, the proposed minimum size increases of 68 - 71" LJFL and 103 - 106" for white and blue marlin, respectively, could potentially reduce landings by 25 - 67 percent for white marlin and 16 - 27 percent for blue marlin relative to current minimum sizes, based on historical data. This equates to approximately 15 - 25 blue marlin per year, on average, that might not be landed, should the Agency implement a legal minimum size between 103 - 106" LJFL. Further, under this alternative, a minimum size of 68 - 71" LJFL for white marlin could reduce landings by 6 - 14 fish during an average year. Landings in tournaments make up the majority of landings that are reported to ICCAT in compliance with Recommendation 00-13. In 2004, all but 3 of the 149 billfish reported to ICCAT were landed in tournaments. Some tournaments have a minimum size that is greater than the minimum size required by NMFS and

do not allow the landing of billfish under a certain size that has already been landed in that tournament.

Table 4.55 Cumulative number of white and blue marlin landed below each minimum size in tournaments from 1999-2004 between the current minimum size for blue (99") and white (66") marlin and the potential increased minimum sizes indicated. A minimum size would be selected between 68-71 inches for WHM and 103-106 for BUM. Source: NMFS RBS Database.

Blue Marlin			White Marlin		
Length (inches, LJFL)	Number of Fish < LJFL (cumulative total greater)	Cumulative % of Landings < or = LJFL	Length (Inches, LJFL)	Number of Fish < LJFL (cumulative total number greater)	Cumulative % of Landings < or = LJFL
103	88	16	68	31	25
104	124	22.5	69	75	61
105	149	27	70	82	67
106	203	36	71	100	82

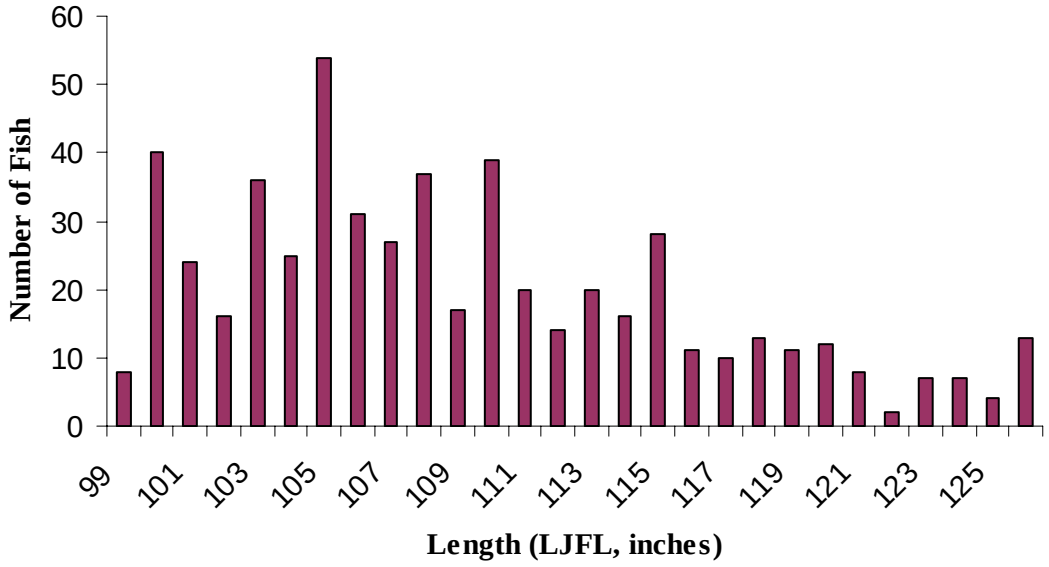


Figure 4.21 Number of blue marlin landed in tournaments between 1999-2004 by size (inches, LJFL). Source: NMFS RBS database.

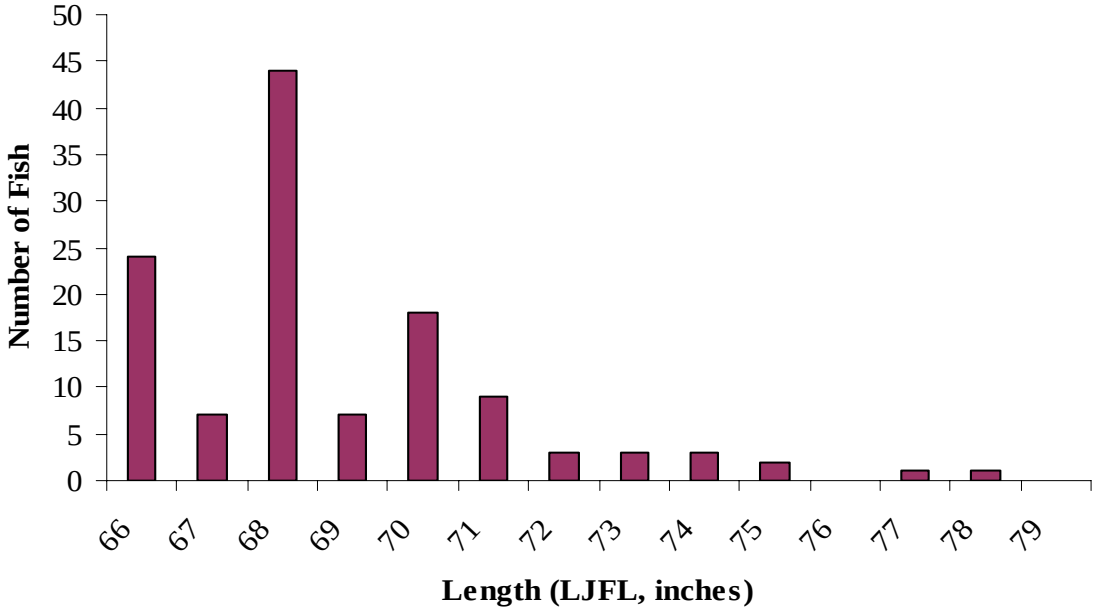


Figure 4.22 Number of white marlin landed in tournaments between 1999-2004 by length (inches, LJFL). Source: NMFS RBS Database.

Catch per unit effort (CPUE) data for blue and white marlin indicate that interactions with these species are a relatively rare event, ranging from 0.5 - 1.7 interactions per 100 hours of fishing between 1999 and 2004, as shown in Table 4.56. Mean CPUE per 100 hours for blue and white marlin during this time period were 1.05 and 1.03, respectively. The conservation benefits of a larger minimum size would be dependent, in part, on fishing effort and practices remaining relatively constant. If fishing effort were to increase significantly, the number of landings could also increase, despite increases to the minimum size. Interactions would likely also increase with increased effort, which would likely increase the number of post-release mortalities of billfish and other species.

Table 4.56 Catch per unit effort and numbers of blue and white marlin kept and released 1999-2004. Source: Billfish Tournament Database, Southeast Fisheries Science Center.

Year	Blue Marlin			White Marlin			Sailfish		
	Kept	Released Alive	CPUE/ 100 hours	Kept	Released Alive	CPUE/ 100 hours	Kept	Released Alive	CPUE/ 100 hours
1999	172	1527	1.4	36	1456	1.3	30	1907	1.6
2000	117	1467	1.1	8	975	0.7	18	2198	1.5
2001	75	1038	0.9	22	1306	1.0	11	3073	2.4
2002	84	1132	0.9	33	2207	1.7	14	3117	2.3
2003	96	1133	0.9	20	614	0.5	24	4171	3.0
2004	110	1538	1.1	25	1349	1.0	9	4467	3.2

Alternatives E4a and E4b are aimed at reducing landings and mortalities that result from landings for billfish, however, fishing mortality of released fish would continue to occur as a result of physical stress and fatigue, hook induced trauma, and physical damage to the gills, esophagus, and/or stomach even if a fish is not landed. Mortality reductions associated with these alternatives would likely be limited, based on the relatively small decrease in the number of fish landed as a result of an increased minimum size as well as the continuation of post-release mortalities. As discussed under alternative E1, minimum sizes do not directly impact the level of post-release mortality. Given the post-release mortality benefits of circle hooks, circle hook requirements (alternative E2 or E3) in combination with this alternative could increase the ecological benefits by reducing post-release mortalities and landings. In an attempt to reduce post hooking mortality of all billfish, NMFS is selecting alternative E3, limiting all HMS permitted anglers to the use of circle hooks when using live bait and participating in tournaments that have a prize category for billfish, as a preferred alternative. For a more detailed discussion of the merits of circle hook use compared to J hooks, see alternatives E1 through E3 above.

While NMFS cannot predict angler behavior, under alternatives E4a and E4b, anglers may choose to reduce effort if they believe that they would be unable to land a marlin given increased minimum sizes. This could result in unquantified positive ecological impacts for Atlantic billfish, other HMS, and non-HMS species with which recreational billfish fishermen interact. These potential impacts would be dependent upon significant shifts in fishing effort to other non-billfish species. If billfish effort were shifted to other species, this reaction could have negative ecological impacts on tunas, swordfish, sailfish, spearfish, sharks, and other species typically interacted with, or targeted by Atlantic billfish fishermen if effort shifts to other fisheries. As mentioned, it is not possible to predict angler response to increased minimum sizes, so the effects are uncertain. This alternative is not anticipated to increase interactions with protected species.

NMFS received several comments in support of increasing the minimum size for blue and white marlin for a variety of reasons, including: compliance with the ICCAT 250 fish limit; reducing the number of billfish that are landed on an annual basis to minimize fishing mortality on these overfished stocks; and, allowing larger more fecund billfish to spawn again by having a larger minimum size in place. NMFS acknowledges that, based on the number of marlin reported as landed to the Agency, the United States is regularly and substantially below the annual ICCAT marlin landings limit and that allowing more fecund fish (generally older, larger, and heavier fish) to spawn may benefit the populations. Nevertheless, there is a limited conservation benefit associated with this alternative given the current small number of landings that are reported on an annual basis. Furthermore, alternative E6, a preferred alternative, would implement an increase in the minimum size and possibly implement catch and release marlin fishing, as necessary, to maintain compliance with the ICCAT landings limit.

NMFS also received numerous comments opposing an increase in the minimum size for blue and white marlin. General themes contained within these comments included: many tournaments already have minimum sizes larger than the current legal minimum size; white marlin weight and length are not closely correlated for fish above 62” LJFL; circle hook requirements will provide equal or greater ecological benefit than an increased minimum size,

and the fact that the United States is substantially below the ICCAT marlin landings limit on a regular basis.

These alternatives were not preferred in the Draft Consolidated HMS FMP, and no new information has been received to alter the Agency's previous decision. As such, the Agency does not prefer alternatives E4(a) and E4(b) in the Final Consolidated HMS FMP, at this time. Other alternatives analyzed in this Final Consolidated HMS FMP would likely achieve the objectives of the rulemaking, however, the Agency may consider minimum size increases in future rulemakings, as necessary and appropriate.

Alternative E5 would implement a recreational bag limit of one Atlantic billfish per vessel per trip. No more than one Atlantic billfish would be allowed to be possessed, retained, or landed on, or by, a vessel regardless of the length of the trip. Alternative E5 would likely have minimal positive ecological impacts. As discussed in the analysis for alternative E4, billfish fisheries have some of the lowest CPUE estimates of any recreational fishery. In 2003, there were 149,412 tournament hours of fishing resulting in 7,926 billfish being caught, or 0.024 billfish caught per angling hour. Fisher and Ditton (1992) found that billfish anglers reported an average of 13 trips/year, ranging from 8.7 - 17.3 depending on the region. On average, each angler landed less than one (0.7) billfish per year, or approximately 1 billfish every 1.4 years. Data collected during the same survey found that only 11 percent of billfish caught during respondents' last tournament were landed (Fisher and Ditton, 1992). NMFS is aware that some anglers continue to land multiple billfish on a single trip, however the Agency has little data on how frequently this occurs. Anecdotal information suggests that this is a rarity for marlins, and may occur more frequently with sailfish. In the 2005 calendar year, there were four fishing trips, as reported to NMFS, that were known to have landed more than a single sailfish. Based on the overall rarity of catching an Atlantic billfish that meets the minimum size requirements, implementing a bag limit of one fish per vessel per trip would have minimal ecological benefits. However, alternative E5 would provide additional protection to these species, which are considered overfished with overfishing still occurring. As with alternative E4, efforts to reduce billfish landings should be considered concurrently with other alternatives that may reduce the post-hooking mortality of billfish via the use of alternatives to J-hooks that reduce the risk of hooks becoming deeply ingested by billfish (alternatives E2 and E3). If anglers shifted effort to other non-billfish species as a result of the implementation of a bag limit, it could adversely impact these species to some unquantifiable extent.

Sailfish are often found closer to shore and travel in schools during winter months. Therefore, the likelihood of anglers catching multiple fish during excursions, especially in areas off the Florida Keys and Southeastern Florida, is increased. Trips landing multiple sailfish were reported to NMFS in 2005, as noted above, however, there are no reports outside of tournaments of vessels landing multiple Atlantic white or blue marlin during a single trip. Nevertheless, information obtained from a brief survey of internet websites (2005) indicates that billfish anglers have retained as many as nine billfish (sailfish) in a single trip. The CPUE for sailfish landed in tournaments between 1999 - 2004 ranged from 1.5 - 3.2 fish per 100 hours fishing, significantly greater than for blue or white marlin. Sailfish were determined to be overfished in 1998. The 2001 stock assessment for sailfish did not estimate MSY or the fishing mortality rate, so it is difficult to discern the exact status of sailfish at this time. Multiple ICCAT resolutions

and recommendations advise that Contracting Parties should consider methods to reduce fishing mortality rates for Atlantic billfish. Implementation of a bag limit of one billfish per vessel per trip would be consistent with this objective by potentially reducing landings and mortalities of Atlantic billfish with attendant positive ecological impacts.

NMFS received comments in support of alternative E5 (bag limit of one billfish/vessel/day) stating that with strict landing limit under which the United States is operating (250 Atlantic blue and white marlin combined), that it would be inappropriate to let one boat come back with more than a single fish on any given day. Given that recent landings of Atlantic blue and white marlin have been substantially below the 250 marlin limit, this issue has not been identified as a major problem to date. However, should it become an issue, the Agency may revisit the issue of bag limits for this or any other appropriate reason. The Agency also received several comments opposing this alternative for various reasons, including that (in the words of commenters): it would encourage the culling of fish [thereby possibly increasing dead discards]; landing a few fish is not the issue; and, a bag limit will not reduce post-release mortality of billfish unless careful handling and release guidelines are followed.

Overall, implementing a bag limit of one Atlantic billfish per vessel per trip is not expected to have substantial positive ecological impacts because multi-billfish excursions, especially for blue and white marlin, are rare events. However, if a multi-fish trip did occur, a bag limit may prevent excessive landings on these exceptional excursions. Data suggest that because of the extremely low catch rates that characterize the billfish fishery, implementing a bag limit may have limited positive ecological impacts. Alternative E5, was not a preferred alternative in the Draft Consolidated HMS FMP, and no new information has been received to alter the Agency's previous decision. As such, NMFS does not prefer alternative E5 in the Final Consolidated HMS FMP, at this time. Other alternatives analyzed in the Consolidated HMS FMP would likely achieve the objectives of the rulemaking, however, the Agency may consider bag limits in future rulemakings, as necessary and appropriate.

Alternative E6, a preferred alternative, would allow NMFS to implement ICCAT recommendations pertaining to recreational marlin landing limits. Alternative E6 would establish an in-season adjustment framework to implement ICCAT marlin landing limits, allow for in-season changes to minimum sizes, and provide the Agency with the ability to shift the billfish fishery to catch and release only for Atlantic marlin, if necessary, to ensure compliance with ICCAT recommended landing limits. As noted earlier, the United States is currently limited to landing 250 recreationally caught Atlantic blue and white marlin, combined. This landing limit may change in the future as a result of future ICCAT recommendations.

As a contracting party to ICCAT, the United States negotiates with other contracting parties to agree upon binding, conservation and management recommendations. Domestically, the Atlantic Tunas Convention Act authorizes the promulgation of regulations as may be necessary and appropriate to implement binding recommendations adopted by ICCAT. This preferred alternative would directly implement ICCAT recommendation 00-13 and subsequent recommendations modifying 00-13.

To provide for maximum utilization of the U.S. recreational Atlantic marlin landing limit without exceeding it, this alternative would allow NMFS to increase the legal minimum size of blue and/or white marlin, as appropriate. The anticipated effect of an in-season minimum size increase would be to slow landings, if necessary, and thereby reduce the probability of having to shift to catch and release fishing only for Atlantic marlins. The ability to increase minimum size limits in-season is intended to minimize potential disruptions in the fishery, by avoiding more dramatic regulatory action requiring catch and release only fishing. Under this alternative, the size range that would be made available to NMFS for in-season management actions is from 117 to 138 inches for Atlantic blue marlin and 70 to 79 inches for Atlantic white marlin. These size ranges differ substantially from those analyzed under alternatives E4(a) and (b). The size ranges selected for analysis under this alternative were intended to ensure compliance with the ICCAT landing limit and would only be implemented if necessary, and once certain thresholds for action (discussed below) were reached. They were selected to minimize the potential for further in-season disruptions to the fishery, such as a requirement to shift to catch and release only fishing. The potential legal minimum size ranges under alternatives E4(a) and (b) were analyzed for general year round implementation as a means to reduce overall landings and mortalities.

The need for action and the specific minimum size temporarily implemented would be based upon a review of landings, time remaining until conclusion of the current fishing year, current and historical landings trends, and any other relevant factors. As a backstop to ensure that U.S. actions remain consistent with the ICCAT landing limit, the fishery would become catch and release only for the remainder of a fishing year if the landing limit was achieved. If marlin minimum sizes were increased to slow landings during a given fishing year, they would revert back to the previous minimum size at the start of the next fishing season.

Consistent with ICCAT recommendations, NMFS would automatically subtract any overharvest from the subsequent fishing year's landing limit, and may carry forward underharvest to the subsequent fishing year. To increase or decrease the annual 250 marlin landings limit as a result of carrying forward future over or underharvest of Atlantic marlins the Agency will publish a notice in the Federal Register. To increase or decrease the 250 marlin recreational landing limit as a result of a new ICCAT recommendation, would require rulemaking under this preferred alternative. NMFS received comment recommending that the Agency automatically carry forward any underharvest to the following management period. As noted above, this alternative allows for carry-forward of underharvest to occur. However, given the uncertainty surrounding landings of Atlantic marlin in the Commonwealth of Puerto Rico and the U.S. Caribbean, the United States has made a commitment not to carry forward underharvest until such time as this uncertainty is resolved.

Alternative E6 would likely have minor positive ecological benefits if implemented on its own. This conclusion holds true whether examined under the existing June 1 – May 31 fishing year management scenario or under the preferred alterative (alternative G2) to shift billfish management to a calendar year management cycle (January 1 – December 31) management cycle. This alternative could reduce mortalities of Atlantic billfish by reducing the mortality associated with landings. The U.S. landings (inclusive of dead discards) of Atlantic blue and white marlin averaged 2.4 percent and 4.5 percent (respectively) of aggregate Atlantic-wide landings for these species, as reported to ICCAT for the period 1999 - 2004. The total

contribution of the U.S. recreational fleet to aggregate Atlantic-wide marlin mortality has not been definitively quantified, but may be larger than previously estimated based on new post-release mortality estimates for white marlin, as discussed under the analyses for alternatives E2 and E3. Since ICCAT adopted the recommendation containing the U.S. recreational limit in 2001, reported U.S. recreational marlin landings have ranged from a high of 279 in 2002 to a low of 136 in 2003, averaging 189 fish per annum. Details can be seen in Table 4.48.

Based on known landings, the ecological benefits of this alternative are likely limited given that during the period 2001 through 2004, the United States has averaged 189 recreationally landed marlins, or approximately 75 percent of the landing limit each year, and that in two of those four years, the United States was more than 100 marlin, or the equivalent of 40 percent, below the U.S. landing limit. However, the relative benefits of this alternative could increase if recreational landings increased substantially. NMFS received comment on the limited ecological impact of this alternative that was categorized into two opposing views and which suggested two different courses of action. Some commenters suggested that the limited ecological impact was not worth any potential adverse economic impact, even a very limited one, while other commenters suggested that the United States must implement the 250 marlin limit to live up to U.S. international obligations and as part of a strategy to implement appropriate measures to help limit billfish mortality. Implementation of this preferred alternative is anticipated to allow the United States to continue to successfully pursue international marlin conservation measures by fully implementing U.S. international obligations and potentially provide minor ecological impacts.

Alternative E6 may prevent future landings in excess of the ICCAT landing limit, and therefore may prevent future increases in mortalities associated with known landings. Again, this statement holds true for either the Fishing Year or Calendar Year management cycle. However, because a landing limit cannot directly control effort or post-release mortality, this alternative cannot directly control fishing mortality, which may increase or decrease with changing effort and fishing practices despite domestic implementation of the ICCAT landing limit. This alternative is not anticipated to have any impact on interactions with protected resources or impact other non-billfish species, but cannot prevent such changes if fishing effort changes to other species. Alternative E6 may result in limited impacts on the landings, discards, and interactions with other HMS, and other finfish species such as dolphin fish, king mackerel, and wahoo that are frequently encountered by HMS fishermen. Positive or negative ecological impacts may occur for these species, and would depend on whether or not the threshold for management action is achieved and subsequent angler response. However, no impacts are anticipated in the near future because, based on the current marlin accounting methodology used for compliance purposes and the widespread practice of catch and release fishing for billfish (75 to 99 percent), it seems unlikely that the threshold for action would be reached. Nevertheless, as noted above, the likelihood of achieving the threshold for action could change with changes in effort, compliance with reporting requirements, or improved accuracy of accounting methodologies.

Under both the Calendar Year or Fishing Year management cycles, alternative E6 may provide minor positive ecological benefits if minimum size increases or catch and release only fishing requirements were implemented for Atlantic blue and white marlin as a result of the

threshold for management action being achieved under this alternative. Impacts on non-billfish species, in terms of landings and post-release mortality may remain the same, increase, or decrease depending on angler response to increased minimum sizes and/or a shift to catch and release only fishing. Given the widespread practice of catch and release fishing for billfish, as discussed in detail under alternative E1, it is likely that most billfish anglers would continue to expend effort fishing for Atlantic marlins, which would result in some level of landings and continuing post-release mortalities under increased minimum sizes or a shift to a catch and release only fishery. Assuming no change in effort or angler behavior given current catch and release rates in the fishery, there would likely be little change in the ecological impacts from the status quo. Alternatively, anglers may reduce effort if they believe that they would be unable to land a billfish given a minimum size increase, or would be prohibited from landing a marlin given a landings prohibition. This could result in unquantifiable ecological benefits for Atlantic billfish, other HMS, and non-HMS species with which recreational billfish fishermen interact. Further, it is also possible that anglers may shift effort to other non-marlin species. This response could increase negative ecological impacts on tunas, swordfish, sailfish, spearfish, sharks, and other species with which Atlantic billfish fishermen typically interact. In conjunction with alternative E3, alternative E6 could expand ecological benefits to Atlantic billfish by reducing post-release mortality and limiting mortalities associated with landings to levels consistent with ICCAT landing limits. Further, the United States may benefit from increased negotiating leverage at ICCAT, and thus allow for more rapid development and implementation of additional international management measures, as deemed appropriate by ICCAT. Positive ecological benefits, specifically reducing fishing mortality, would be relevant considerations in the anticipated 2007 ESA Status Listing Review for white marlin.

Alternative E7 was a preferred alternative in the Draft Consolidated HMS FMP; however, it is not preferred in the Final Consolidated HMS FMP. This alternative would allow only catch and release fishing for Atlantic white marlin effective January 1, 2007 through December 31, 2011. Possession and retention of Atlantic white marlin would be prohibited at all times and under all circumstances by all U.S. flagged vessels. This provision would expire five years from the effective date unless specifically extended by NMFS.

The ecological impacts of eliminating recreational landings of white marlin can be estimated from U.S. landings reported to ICCAT, as well as other domestic fisheries surveys. Alternative E7 would reduce mortalities of white marlin by eliminating mortalities associated with landings. The reported U.S. white marlin landings for 2001 - 2004 can be seen in Table 4.48. In 2001, 2002, 2003, and 2004, there were 116, 88, 23, and 31, respectively, white marlin reported landed in the U.S. Atlantic billfish fishery. The 2004 billfish landings reported to ICCAT were based on tournament reports and MRFSS intercepts. Because non-compliance with many reporting requirements is known to be occuring, NMFS considers all billfish self-reported statistics to be minimum estimates with an unquantified bias toward low estimates. Fishing surveys, such as MRFSS and the LPS, discussed above, provide additional data useful for estimating landings of Atlantic billfish (Table 4.50 and Table 4.51). The MRFSS survey includes HMS, however, it was not designed for these species, which are considered “rare event” species as compared to other recreationally caught species. The LPS survey was designed to intercept HMS fisheries, but because it does not operate in all Atlantic coastal states and operates for only a portion of the year, it is only a subset of aggregate U.S Atlantic landings. The recent

LPS white marlin landings estimates are in some instances substantially lower, and in other instances substantially higher, than those tabulated directly from observed landings. This is a result of extrapolating landings from survey intercepts. A more complete discussion of landings databases is provided in the analysis of alternative E1. For the years 1999 through 2004, the LPS estimated landings of white marlin were six, four, four, 218, 365, and 78, respectively. Additionally, as discussed above, the United States is currently limited to 250 blue and white marlin landings (combined) annually by ICCAT. This recommendation was adopted in 2000 and entered into force in 2001.

Alternative E7 would likely provide limited ecological benefits to Atlantic-wide white marlin stocks by itself, given the limited number of landings. Under this alternative, a large portion of the fish currently landed would likely be conserved, however estimates vary. Table 4.48 through Table 4.50 provides the potential range of mortality reductions that could be achieved if alternative E7 was implemented. Impacts on other species with which HMS fishermen typically interact would depend on angler response to a catch and release fishery for white marlin. Anglers are likely to respond in three ways: 1) no change in effort or target species; 2) decreased effort; and, 3) shift target species. If angler behavior does not change to any appreciable extent, NMFS anticipates that the impacts would be similar to those as discussed under alternative E1. If anglers respond by decreasing effort, alternative E7 could result in positive ecological impacts for HMS and other species by potentially reducing landings and interactions, which could reduce post-release mortality. If anglers respond by shifting effort to other target species, such as sailfish, blue marlin, dolphin, and wahoo, this alternative may result in increased landings and interactions with these and other species. NMFS received public comment indicating that if white marlin landings were prohibited, tournaments and fishermen would likely increase fishing effort on blue marlin. Data are unavailable to allow quantification of these impacts, nevertheless, any one or any combination of the aforementioned responses and their attendant impacts are possible. However, as stated above, the impacts are likely to be limited given current angler ethics as demonstrated by high levels of participation in catch and release fishing, as shown in Table 4.49, Table 4.50, and Table 4.51, which range from 75.8 to 99.4 percent.

Alternative E7 cannot, by itself, reduce post-release mortalities of white marlin. As such, all mortality gains would be expected to occur through the reduction in landings. However, as discussed in the Draft Consolidated HMS FMP, alternative E7, if used in conjunction with alternative E3 (mandatory use of circle hooks in billfish tournaments), could substantially expand possible ecological benefits by reducing landings to zero and considerably reducing the post-release mortality of recreationally captured white marlin. If alternatives E7 and E3 were selected and proven effective, the United States may also benefit from an improved negotiating position at ICCAT. Positive ecological gains, specifically reducing fishing mortality, would also be relevant considerations during the anticipated 2007 ESA Status Listing Review for white marlin.

NMFS received strong public comment opposed to the Atlantic white marlin catch and release alternative. Based on public comment that indicated more significant concerns over potential adverse economic impacts to the fishery if catch and release only fishing for Atlantic white marlin were required, as well as a number of other factors, including but not limited to, the

impending receipt of a new stock assessment for Atlantic white marlin and upcoming international negotiations on Atlantic marlin, NMFS is not preferring to prohibit landings of Atlantic white marlin at this time. Additionally, the Agency received substantial comment in support of this measure. The commenters supporting the landings prohibition stated concerns over white marlin stock status, the ESA listing review, and an interest in maintaining leadership at the international level. The implementation of circle hook requirements (alternative E3) would be an important first step in reducing mortality in the directed billfish fishery. NMFS will consider catch and release only fishing options for Atlantic white marlin as well as other billfish conservation measures in future rulemakings, as necessary and appropriate.

Alternative E8 would allow catch and release only fishing for Atlantic blue marlin effective January 1, 2007. This provision would sunset five years from date of implementation unless specifically extended by NMFS. This alternative would prohibit the possession, retention, and landing of Atlantic blue marlin at all times and under all circumstances by all U.S.-flagged vessels. The ecological benefits of eliminating recreational landings of blue marlin can be estimated from U.S. landings reported to ICCAT, as well as other domestic fisheries surveys. The reported U.S. blue marlin landings for 2001 - 2004 can be seen in Table 4.48. In 2001, 2002, 2003, and 2004, there were 77, 191, 113, and 118 respectively, blue marlin reported landed in the U.S. Atlantic billfish fishery. As discussed above, in 2004, billfish landings reported to ICCAT were based on tournament reports and MRFSS intercepts. Because non-compliance with many reporting requirements is known to occur, NMFS considers all billfish self-reported statistics to be minimum estimates with an unquantified bias toward low estimates. Fishing surveys, such as MRFSS and the LPS, discussed above, provide additional data useful for estimating landings of Atlantic billfish (Table 4.50 and Table 4.51). The recent LPS blue marlin landings estimates are lower than those calculated directly from observed landings. For the years 1999 through 2004, the LPS estimated landings of blue marlin were three, zero, zero, zero, 101, and 45, respectively. Additionally, as discussed above, the United States is currently limited to 250 blue and white marlin landings (combined) annually by ICCAT.

Alternative E8 would likely provide some ecological benefits to blue marlin stocks, however, with the ICCAT marlin landings limit and the currently low recreational landings rate for the species, NMFS believes this alternative would likely provide limited ecological benefits. Alternative E8 would reduce mortalities of blue marlin by eliminating mortalities associated with landings. Under this alternative, a large portion of the fish currently landed would likely be conserved, however estimates vary. Alternative E8 cannot, by itself, reduce post-release mortalities of Atlantic blue marlin. As such, all mortality gains would likely occur through the reduction in landings.

As with alternative E7, impacts on other species with which HMS fishermen typically interact would depend on angler response to a catch and release fishery for blue marlin. Anglers are likely to respond in three ways: (1) no change in effort or target species; (2) decreased effort; and, (3) shift target species. If angler behavior does not change to any appreciable extent, NMFS anticipates that the impacts would be similar to those as discussed under alternative E1. If anglers respond by decreasing effort, alternative E8 could result in positive ecological impacts for HMS and other species by potentially reducing landings and interactions, which could reduce post-release mortality. If anglers respond by shifting effort to other target species, such as

sailfish, white marlin, dolphin, and wahoo, this alternative may result in increased landings and interactions with these and other species. Data are unavailable to allow quantification of these impacts, however, any one or any combination of the aforementioned responses and their attendant impacts are likely. However, as stated above, the impacts are likely to be limited given current angler ethics as demonstrated by high levels of participation in catch and release fishing, as shown in Table 4.49, Table 4.50, and Table 4.51, which range from 75.8 to 99.4 percent.

Additionally, as discussed in the Draft Consolidated HMS FMP, this alternative, if used in conjunction with alternative E3 (mandatory use of circle hooks in billfish tournaments), could maximize the ecological benefits by reducing landings to zero and substantially reducing the post-release mortality of recreationally captured blue marlin. If alternatives E8 and E3 were selected and proven effective, the United States may benefit from an improved negotiating position at ICCAT.

This alternative was analyzed but not preferred in the Draft Consolidated HMS FMP or Final Consolidated HMS FMP due to potentially substantial negative social and economic impacts, public comment, and other reasons. Nevertheless, the Agency may consider catch and release only options for Atlantic blue marlin as well as other billfish conservation measures in future rulemakings, as necessary and appropriate. The United States will continue its efforts to reduce billfish mortality both domestically and at the international level. NMFS has preferred an alternative that would fully implement U.S. international obligations as per ICCAT Recommendation 00-13 and subsequent amendments to it. Additionally, the Agency has alternative E3, which would require the use of non-offset circle hooks in Atlantic billfish tournaments by HMS permitted vessels when deploying natural bait or natural bait/artificial lure combinations, to reduce post release mortality of billfish stocks.

Social and Economic Impacts

Alternative E1, the No Action alternative would likely have no adverse short-term economic impacts. Ditton and Stoll (2003) conservatively estimate the aggregate economic impact of billfish fishing trips in the U.S. Atlantic to be $22.7 million annually, not including Puerto Rico. Please see Section 3.5.2 for additional discussion of the economic status of the directed billfish fishery.

As of February 1, 2006, there were 25,238 HMS Angling category permits, 4,173 CHB category permit holders, and 4,824 General category permits which represent the number of vessels that are legally authorized to participate in the Atlantic billfish fishery. General category permit holders are eligible to fish for, retain, or posses, Atlantic billfish only when participating in a registered HMS tournament. The number of Angling category permit holders, and possibly the number of CHB category permit holders, is thought to be considerably below the number of vessels that should be permitted. See Section 3.9 of this document for additional detail regarding permitting issues. Further, because HMS Angling, CHB, and General category permits are vessel permits and any given vessel could have multiple anglers on board, the number of vessel permits underestimates the actual number of fishery participants. Given the multi-species nature of HMS Angling and CHB permits, and the fact that vessels are permitted rather than individual anglers, NMFS does not have the ability to identify what subset of these permitted vessels, or how many anglers, engage in billfishing based on the best scientific information available.

Ditton and Stoll (2003) estimated that there are 7,915 billfish anglers in the U.S. Atlantic and 1,627 billfish anglers in Puerto Rico.

Alternative E1 would likely result in a continuation of the fishery consistent with current operating patterns. It would not be expected to alter participation rates of private anglers, demand for CHB trips, or to impact participation in billfish tournaments. Alternative E1 would not likely result in any change or redistribution of fishing effort in the short-term or impact hook manufactures, retailers, or other small businesses associated with the recreational billfish fishery.

Alternative E2 would likely have limited adverse social and economic impacts. As discussed in Section 3.9.4, there were 25,238 HMS Angling category permits, 4,173 CHB category permit holders, and 4,824 General category permits as of February 1, 2006. This represents the universe of vessels that could be impacted by circle hook requirements under alternative E2. However, given that these are vessel permits, it is not possible to quantify the number of individual fishermen participating in HMS Fisheries who may be impacted by circle hook requirements.

Hooks employed by recreational anglers while pursuing HMS typically range in size from 5/0 to 14/0 for J-hooks and 7/0 to 20/0 for circle hooks. A limited survey of hook prices (Summer 2005) indicated that J-hooks of the sizes and styles used by HMS recreational fishermen ranged in price from a low of $0.50 to a high of $7.50 each, with an average price of $2.70. Similarly, circle hooks of the sizes and styles used by HMS recreational fishermen ranged in price from a low of $0.30 to a high of $7.00 each, with an average price of $2.24. A comparison of the two indicates that anglers could, on average, save approximately $0.46 for every circle hook purchased for use in place of a J-hook, if mandatory circle hook requirements were implemented in HMS fisheries. As such, initial purchases of circle hooks to comply with circle hook requirements would represent a minor economic cost, however, over the long-term, circle hook requirements associated with this alternative may result in a minor economic benefits, assuming the price differential between circle and J-hooks remains stable. Nevertheless, the purchase of hooks represents only a minor capital expenditure relative to other costs associated with participating in this fishery, including purchasing, equipping, maintaining, and running of vessels, which can run into the hundreds of thousands of dollars or more. As such, any potential economic impacts, either positive or negative, stemming from the purchase hooks are likely to be *de minimus* in nature. As previously discussed, NMFS cannot quantify the number of impacted anglers. Further, the quantity of hooks purchased by individual anglers varies widely from the occasional angler to those who fish regularly, and as a result of these factors, NMFS cannot estimate an aggregate economic cost. The delay in implementation of circle hook requirements, specifically requested by HMS and Billfish Advisory Panel members and the public, would be anticipated to allow hook manufacturers, retailers, and anglers adequate time to utilize current inventories and alter production rates of J-hooks, thereby minimizing any potential adverse economic impacts associated with alternative E2.

Alternative E2 may result in a temporary decrease in angler consumer surplus given anticipated or real loss of fish as fishermen adjust to and become more proficient with the use of circle hooks. However, Prince *et al*. (2002) found that circle hooks were actually 1.83 times more likely to hook a sailfish than a J-hook, and that once hooked, the catch percentage was

virtually identical for each type of terminal gear. Skomal *et al*. (2002) reported similar findings with bluefin tuna, stating that catching success was similar for the two hook types. Skomal *et al*. found that 68 percent of recorded J-hook bites and 74 percent of circle hook bites resulted in landed tuna. Taken in combination, data from these studies suggest that there could potentially be an increase in angler consumer surplus as a result of increased catches, and that any loss of angler consumer surplus may be due to a perceived loss of fish, as opposed to a real loss of fish. However, the true effect of circle hooks on catch rates is not known for other HMS species. Any reduction of angler consumer surplus could be mitigated to an extent by the ability of anglers to continue to utilize J-hooks with artificial lures under alternative E2. In addition, the phase-in period associated with this alternative would allow anglers time to become comfortable and proficient with circle hook use prior to mandatory implementation, further mitigating any potential loss of angler consumer surplus. NMFS received public comment voicing concern that circle hooks may decrease catches of some HMS or non-highly migratory species. The Northeast Distant Statistical Area (NED) Circle Hooks study shows that deployment of circle hooks in the commercial pelagic longline fishery can result in a decrease in the number of swordfish caught under some oceanographic conditions, however, NMFS has only limited data on the impact of circle hooks in the recreational swordfish fishery or other recreationally caught non-HMS species and potential socio-economic effects. NMFS is aware of these concerns and will examine this issue as data becomes available.

Impacts on tournaments would likely be minimal, given the increase in the number of tournaments that provide special award categories or additional points for billfish captured and released on circle hooks. However, it is possible that there could be a decrease in tournament participation and demand for CHB trips, as well as trips taken by individual anglers based on real or perceived declines in catch under this alternative. NMFS cannot predict angler behavior with regard to participation in tournaments, demand for CHB trips, or trips taken by individual anglers in reaction to potential circle hook requirements. As such, if any tournaments are cancelled, demand for CHB trips decreases, or trips taken by individual anglers decline as a result of circle hook requirements, there could be some unquantified economic costs depending on the size of the tournament or the number of CHB trips or individual angling trips that are not taken.

While there may be an initial decrease in angler consumer surplus, alternative E2 may provide long-term positive benefits with regard to increased angler consumer surplus and willingness to pay if circle hooks contribute to rebuilding efforts and result in increased encounter rates. However, given the limited contribution of U.S. fishermen to aggregate Atlantic-wide catches of billfish, the Atlantic-wide benefits to billfish populations of alternative E2 may be limited. This alternative may enhance the United States' negotiating position at ICCAT by demonstrating the United States' commitment to the conservation of recreationally caught HMS at a time when other ICCAT nations are beginning to determine the extent of their domestic recreational fisheries. Improved negotiating position at ICCAT may allow for the more rapid implementation of recreational circle hook requirements Atlantic-wide. Alternative E2 may be difficult to enforce given the ability of anglers to possess both circle and J-hooks onboard at the same time.

The economic and social costs and benefits of alternative E3, a preferred alternative, are anticipated to be similar to, but reduced from the estimated impacts discussed under alternative

E2. As discussed more fully under the ecological analysis for this alternative, NMFS has made a slight technical adjustment in the phrasing of alternative E3 in this Final Consolidated HMS FMP to clarify the universe of affected anglers. NMFS analyzed this alternative from the perspective of applying non-offset circle hook requirements to HMS-permitted vessels in billfish tournaments in the Draft and Final Consolidated HMS FMP, and as such the change in phrasing of the alternative has no impact on the analyses conducted herein.

NMFS also received comment during scoping and the public comment period for the Draft Consolidated HMS FMP that tournament operators would need advance notice of impending circle hook regulations to allow for changes in the production of rules and advertising, and to inform tournament participants of potential circle hook requirements. Given the severe impacts of the 2005 hurricane season, NMFS substantially extended the public comment period and delayed the anticipated publication date of the Final Consolidated HMS FMP. In the meantime, NMFS surveyed a number of tournament operators in the Atlantic, Gulf of Mexico and Caribbean to better understand various aspects of tournament operations. NMFS determined that a delayed date of effectiveness of between four and six months would likely provide adequate time for tournament operators and participants to adjust tournament rules, formats, and advertising, as necessary, as well as to notify anglers of changes, and allow anglers to adjust fishing practices and take other steps appropriate to minimize any potential costs created by a shift to non-offset circle hooks in billfish tournaments. As such, given the anticipated publication date for the Final Consolidated HMS FMP of July 2006, and the anticipated publication date for the Final Rule of August 2006, NMFS prefers to maintain the effective date of January 1, 2007, for preferred alternative E3. This effective date is consistent with the effective date for preferred alternative E3 as contained in the Draft Consolidated HMS FMP.

Vessels with HMS Angling, CHB, or General category permits that participate in Atlantic billfish tournaments represent the universe of potentially affected vessels of alternative E3. However, given the multi-species nature of the HMS permits and the fishery itself, it is not possible to accurately quantify the subpopulation of billfish anglers. Further, NMFS is not able to quantify the exact number of anglers or vessels participating in tournaments that may be impacted. On average, for the period 1999 – 2004, 47 vessels participated per tournament, however the average varies by month and state from 14 to 131. In 2003 and 2004, there were 244 and 214 registered HMS tournaments, respectively. These figures include all HMS tournaments, including billfish and non-billfish tournaments. On average for the period 1999 - 2004, there were approximately 149 U.S. billfish tournaments annually, ranging from a low of 118 to a high of 179, in any given year, based on RBS data. However, combining the number of tournaments with the average number of vessels per tournaments is not a reliable indicator of how many individual vessels participated in tournaments because many vessels participate in multiple tournaments each year. It is possible, but unlikely, that alternative E3 could result in decreased tournament participation based on real or perceived declines in catches. Tournament participation would not be expected to decrease given the high rates of participation in catch and release fishing and the continued availability of fish for landing under this alternative. Further, as discussed under the analysis of alternative E2, circle hooks have been found to actually improve the likelihood of catching some HMS, including some species of billfish. Economic costs to tournaments would likely be minimal, given the increase in the number of all release

tournaments, and tournaments that provide special award categories or additional points for billfish captured and released on circle hooks. As previously discussed, NMFS cannot predict angler behavior with regard to participation in tournaments, demand for CHB trips, or trips taken by individual anglers in reaction to potential circle hook requirements. As such, if any tournaments are cancelled, demand for CHB trips decreases, or trips taken by individual anglers decline as a result of circle hook requirements, there could be some unquantified adverse impacts depending on the size of the tournament or the number of CHB trips that may not be taken.

NMFS received public comment voicing concern that proposed billfish tournament circle hook requirements may decrease catches of some HMS or other species that are landed for prize money. The NED circle hook study shows that deployment of circle hooks in the commercial pelagic longline fishery can result in a decrease in the number of swordfish caught under some oceanographic conditions, however, NMFS has little data on the impact of circle hooks in the recreational swordfish fishery or on other recreationally caught non-HMS species and associated potential socio-economic costs or effects. Importantly, it should be realized that all permitted billfish tournament anglers would be operating under the same Federal regulations, and thus, contrary to concerns expressed by some anglers, there should be no competitive disadvantage relative to one another. Furthermore, the preferred alternative would specifically allow for the deployment of J-hooks with artificial lures in billfish tournaments, which should mitigate some concerns regarding a decrease in catches.

The minor initial economic costs associated with compliance costs of circle hook requirements, and the potential minor long-term positive economic benefit (savings) of approximately $0.46 per hook purchased by anglers for use in HMS fisheries, as discussed under the analysis for alternative E2, would only apply to billfish tournament participants under alternative E3. Billfish tournament participants may be impacted to a slightly greater degree by this requirement, as tournament participants tend to be regular participants in the billfish fishery, and are likely to purchase more hooks than the occasional billfish fisher. Again, however, the purchase of hooks represents only a minor capital expenditure relative to other capital costs in the fishery, including the purchase, equipping, and maintenance of vessels, and tournament registration fees, and thus, the costs are considered *de minimus*.

Impacts of alternative E3 on hook manufactures, retailers, and anglers would likely be limited given that J-hooks would continue to be permitted outside of tournaments, and when using artificial lures in tournaments. As discussed under alternative E2, the delay in implementation of circle hook requirements, specifically requested by HMS and Billfish Advisory panel members and the public during public comment, should allow hook manufacturers, retailers, tournament operators, and anglers adequate time to adjust business practices, become proficient in the use of circle hooks, and utilize current inventories of J-hooks, thereby reducing any economic costs associated with alternative E2. Alternative E3, consistent with the analysis of alternative E2, may result in a temporary decrease or increase in angler consumer surplus, and may result in a long-term increase in angler consumer surplus should this alternative assist in the recovery of Atlantic marlin. Also similar to alternative E2, alternative E3 may result in improved negotiating position at ICCAT, potentially speeding the implementation of recreational circle hooks requirements through ICCAT. As with alternative E2, alternative E3 could present enforcement problems, however, NMFS is confident that between Agency efforts

to enforce circle hooks, the increasing use of tournament observers, the conservation ethic of billfish anglers, and the vested financial self-interests of billfish tournament participants in ensuring that all tournament participants compete fairly under the same rules and conditions, high levels of compliance would be expected.

Alternatives E4a and E4b would increase the minimum size for blue and white marlin, likely reducing the number of legally landed blue and white marlin, respectively. NMFS cannot predict angler behavior, and so cannot be sure if these measures would or would not affect angler participation rates. As previously discussed, catch and release rates are already quite high in the billfish fishery, with anglers often keeping only trophy-sized fish. As such, an increase in minimum sizes is not anticipated to dissuade any substantial portion of billfish anglers from pursuing Atlantic marlins. Furthermore, since many tournament organizers already stipulate higher minimum sizes than current Federal regulations, any potential decrease in angler participation, and resultant economic impacts, would likely be minor. Further, increased minimum sizes do not reduce the number of fish available for landing, simply the odds of landing a fish. As such, anglers could continue to pursue and land marlins, should they choose to, given that the ICCAT landing limit would not be impacted by alternative E4. Table 4.49 indicates that between 1999 and 2004, 92, 98, and 99.4 percent of blue marlin, white marlin, and sailfish were released in tournaments, respectively. Fisher and Ditton (1992) conducted a survey of 1,984 billfish anglers and found that these anglers, on average, released 89 percent of billfish depending on the region (range = 74-95 percent). Further, Ditton and Oh (2004) found that some anglers were willing to pay an additional $71 (2004 dollars) to participate in catch and release fisheries. This reinforces NMFS' belief that there would not likely be any substantial adverse socio-economic impacts stemming from an increased minimum legal size limit of the ranges analyzed under alternatives E4(a) and (b).

High catch and release rates coupled with low CPUE for billfish indicate that an increase in the minimum size of four to seven inches for blue marlin and three to seven inches for white marlin would have negligible impacts on angler participation. Fisher and Ditton (1992) also found that 60 percent of respondents either agree or strongly agree with increased minimum sizes. Eighty-one percent of anglers interviewed stated that that the minimum size limits implemented in 1988 had no effect on their billfishing activity. The Agency received comments during the formulation of Amendment 1 to the Billfish FMP (NMFS, 1999) indicating that increasing the minimum size limits would be preferable to implementing bag limits if additional management action is necessary. If angler participation remains consistent, negative social and economic effects or costs would likely be minor as a result of increasing the minimum size for blue or white marlin.

Alternative E5, establishing a bag limit of one Atlantic billfish per vessel per trip, would likely have minor economic costs. Recreational billfish fisheries have very low CPUE rates, however, it is believed that participation in these fisheries continues to expand. Because of the rarity of catching a billfish and the conservative minimum sizes in place, the chances of landing more than one white or blue marlin on a single trip are low. Sailfish are somewhat of an exception, in that during certain times of the year at several locales off the coast of Florida, anglers may have the opportunity to catch and land several sailfish that meet the minimum size requirements in one trip.

Fisher and Ditton (1992) indicate that 77 percent of anglers would not change their fishing behaviour if a bag limit of one billfish were implemented. Based on this and the high levels of catch and release fishing in the recreational billfish fishery, as the fishery continues to expand it is reasonable to assume that anglers would maintain current levels of participation based on the opportunity of catching and possibly landing one trophy billfish. A bag limit of zero billfish, or implementing catch and release only might affect angler behavior more because anglers would no longer have that opportunity to catch an exceptionally large billfish, which is afforded by a one billfish bag limit.

Furthermore, since this is largely a catch and release fishery, both within and outside of tournaments, NMFS assumes that implementing a bag limit would not deter anglers from participating in billfish excursions, likely minimizing the negative impacts to CHB operators. However, it is possible that there would be an unquantifiable decrease in demand for CHB trips if not all individual anglers on a given trip would have the opportunity to land a billfish. As such, multi-angler, multi-day trips could be impacted to a greater extent than day trips if alternative E5 were selected as a preferred alternative.

Tournament participation would not be expected to decrease in a substantial manner as tournament rules often prohibit participants from entering more than one marlin per day, which would also likely prevent participants from possessing multiple fish. The high catch and release ratio indicates that the majority of billfish anglers are more interested in the experience of "hooking" a billfish rather than landing a billfish. If anglers continue to take marlin trips, as anticipated, then many of the economic costs associated with the landing limit would be minimal or non-existent.

Alternative E5 would be anticipated to assist the United States in maintaining compliance with the 250 fish limit adopted by ICCAT. Eliminating the opportunity for vessels to land several blue and/or white marlin would decrease the likelihood of overages, closures, or increases in the minimum size that may occur as a result of achieving the threshold for action described in alternative E6. However, since multiple landings of blue marlin and white marlin are rare, a bag limit in and of itself may not guarantee compliance.

Alternative E6, which would implement ICCAT recreational marlin landing limits, is anticipated to potentially result in minimal to moderate economic costs depending on catch rates, angler response, and which of the available in-season management actions (no action, minimum size increase, or catch and release only) become necessary. As discussed under the analysis of the ecological impacts of this preferred alternative, and consistent with ICCAT recommendations, NMFS would automatically subtract any overharvest from the subsequent fishing year's landing limit, and may carry forward underharvest to the subsequent fishing year. To increase or decrease the annual 250 marlin landings limit as a result of carrying forward future over or underharvest of Atlantic marlins the Agency will publish a notice in the Federal Register. To increase or decrease the 250 marlin recreational landing limit as a result of a new ICCAT recommendation, would require rulemaking under this preferred alternative.

Available historical data suggest it is unlikely that the United States will achieve the 250 marlin landing limit in the near future. (See Table 4.48 for historical landings data, as reported to ICCAT.) As noted under alternative E1, between 2001 and 2004 (inclusive), the United States remained substantially below the ICCAT landing limit with the exception of 2002, when a post-fishing year adjustment to accounting methodologies indicated a small one-time exceedance of the landing limit. At the 2004 ICCAT meeting, the United States reported landing 131 marlin (108 blue marlin, 23 white marlin) based on data from the RBS, landings cards from the States of North Carolina and Maryland, and self-reported non-tournament landed fish. RBS data represented roughly 88 percent of marlin landings reported to ICCAT in 2004. At the 2005 ICCAT meeting the United States reported 149 blue and white marlin combined (118 blue marlin; 31 white marlin). However, the likelihood of achieving the 250 fish limit may change with improved accuracy in quantifying domestic recreational billfish landings. Further, given the open access nature of the fishery, and relatively low compliance with self-reporting requirements, it is possible for documented landings to increase if effort increases and/or if compliance improves with reporting requirements.

There are several unknowns that currently make an assessment of the socio-economic impacts of alternatives E6 difficult to quantify. These include uncertainty regarding total marlin landings, uncertainty regarding the number of marlin fishermen and absolute effort, uncertainty regarding changes in angler behavior when faced with increased minimum sizes or a catch and release only fishery, and limited socio-economic data. As such, the analysis presented in this Consolidated Final HMS FMP is based on the best available data, and makes use of proxies in the discussions of scenarios two and three below, to assist in evaluating the impacts of this alternative. Socio-economic impacts are discussed for CHBs, tournaments, anglers, and associated businesses under three potential management action scenarios for both the June 1 – May 31 fishing year management cycle and the calendar year management cycle: Scenario (1) no in-season adjustments; Scenario (2) implementation of minimum sizes; and, Scenario (3) shift to catch and release only fishery for Atlantic marlins. Socio-economic effects and costs of alternative E6 under scenarios 2 and 3 would vary depending upon the management cycle finalized for the directed billfish fishery.

Scenario 1: Threshold For In-Season Management Action Not Achieved

Alternative E6 would not be expected to result in impacts to the recreational marlin fishery, under either the June 1 – May 31 fishing year or the calendar year management cycle, if the threshold for action is not reached or projected to be reached. Alternative E6 is intended to slow landings by increasing the minimum size of Atlantic blue and/or white marlin, if necessary, thereby allowing landings to continue for the entire duration of the fishing year, in an effort to prevent a shift to catch and release fishing. If the threshold for action is not achieved or expected to be achieved, NMFS anticipates no impact on demand for CHB trips, tournament participation, or participation in the fishery by non-tournament anglers. Under this scenario, NMFS would not anticipate any adverse socio-economic effects on dependant shoreside businesses, such as tackle shops or marinas. Thus, under the no in-season action scenario of alternative E6 (where the threshold for action is not achieved or anticipated to be achieved), NMFS anticipates few or no positive or negative socio-economic effects, while remaining consistent with ICCAT recommendations. As stated above, this conclusion applies regardless of whether the fishery is

operating under the June 1 – May 31 fishing year or the calendar year management cycle. As such, the impacts would be similar to those discussed under alternative E1

Scenario 2: Threshold For an In-Season Minimum Size Increase Achieved

Alternative E6 would provide NMFS the option of increasing the minimum sizes of Atlantic blue and white marlin to between 117 and 138 inches and 70 and 79 inches, respectively, if in-season evaluation of the action criteria indicate that additional management measures are necessary to ensure consistency with the ICCAT landing limit. As discussed under the ecological evaluation of alternative E6, the action criteria would include a review of landings, time remaining until conclusion of the current fishing year, current and historical landings trends, and any other relevant factors. Based on RBS landings data (1999 - 2004), approximately 14 percent and 18 percent of BUM and WHM landings, respectively, have occurred at or above the low end of size range available to the Agency for in-season action (117 inches for blue marlin and 70 inches for white marlin).

For purposes of analysis only, this document assumes that the threshold for action is reached in a given year when 85 percent of the ICCAT landings limit (213 fish under the current ICCAT landing limit) has been landed. This threshold for action is for purposes of discussion only and is in no way intended to indicate that that 85 percent is the actual threshold for action. The threshold for action would vary by year based on the action criteria identified above. To determine an approximate date at which the 85 percent threshold might be achieved, the Agency increased the historical RBS landings distribution of marlins evenly by month for the period 1999 – 2004 until the threshold for action was achieved. The assumptions involved in determining the action date would include the following, and are made for only purposes of analysis: (1) the temporal distribution of landings will remain roughly similar to the 1999 – 2004 pattern, as identified from RBS data; (2) landings will increase evenly until at least 85 percent of the ICCAT landings limit is achieved; (3) the 85 percent threshold will be achieved when approximately 85 percent of historical landings have occurred; and, (4) that the Agency benchmark for action is 85 percent of the ICCAT landings limit.

Based on the assumptions identified above, NMFS estimates that the threshold for implementing an increased minimum size could occur on approximately May 3rd under the June 1 to May 31 fishing year, or approximately August 22nd, under a calendar year management cycle. This potential action date under the calendar-year management cycle is two days later in the fishing season from the estimated date identified in the Draft Consolidated HMS FMP. The change in date is the result of incorporating 2004 tournament data. Incorporation of the date did not change the estimated action date under the June 1 – May 31 fishing year management cycle. The obvious difference in the length of time from the start of the management period until the action threshold is projected to be achieved (~11 months under the June 1- May 31 fishing year management cycle vs. ~ eight months under the calendar year management cycle) between the two management cycles stems from the dearth of marlin landings during the winter months. As such, because those months with few landings occur during the midst of the June 1 – May 31 fishing year, the time it takes to achieve the threshold for action is lengthened.

In the withdrawn proposed rule (68 FR 54410 September 17, 2003) to implement the ICCAT 250 marlin limit, the date at which 80 percent of landings were projected to occur was

identified as October 15. The difference in the projected dates at which point management actions *may* be required as per this document, under the assumptions identified above and under the Fishing Year management cycle, as compared to the withdrawn 2003 proposed rule (May 3 vs. Oct 15) is due to three factors: (1) use of six years of landings data (1999 - 2004) in this analysis versus use of a single year (2002) of landings data in the September 2003 proposed rule; (2) selection, for purposes of analysis, of the action trigger at 85 percent of the ICCAT landing limit in this analysis versus an 80 percent action trigger in the September 2003 proposed rule, given the generally slow pace of landings; and, (3) a dearth of landings during the late fall and winter. Under the June 1 – May 31 fishing year management cycle, May 3 is later in the fishing year than October 15. The difference in the projected dates under the assumptions identified above and under the Calendar Year management cycle, as compared to the withdrawn 2003 (August 22 vs. Oct 15) is due to use of a calendar year fishing year in this document rather than a June 1 – May 31 fishing year, as well as factors one and two, discussed above.

During the period 1999 - 2004, RBS data indicate that a total of 87 blue marlin 117 inches or larger have been landed in tournaments and 40 white marlin 70 inches or larger have been reported landed in tournaments. These sizes equate to an average of approximately 15 blue marlin (14.5) and seven (6.7) white marlin of their respective size classes being landed annually during this period. Thus, it is anticipated that during an average year the minimum size increase scenario under alternative E6 action would likely have the effect of maintaining compliance with the current ICCAT landing limit ($213_{\text{fish prior to minimum size increase}} + 15_{\text{blue marlin 117 inches or larger}} + 7_{\text{white marlin 70 inches or larger}} = 236_{\text{landed fish}}$), while allowing the fishery to continuously operate. This measure would allow for a "buffer" of roughly 14 marlin during an average year, if an in-season minimum size increase were triggered. Such a buffer would be necessary and appropriate given that the analysis is based on an average year, and because of this, anglers can be expected to exceed estimated landings rates in fifty percent of years, and anglers can be expected to fall below estimated landings estimates in fifty percent of years. The buffer is anticipated to allow compliance with the ICCAT landings limit even in those years when landings exceed an average year. The 14 fish would still be available to anglers for landing, however the buffer allows NMFS a reasonable margin of error in the timing of in-season management actions.

The large minimum size range available to NMFS under alternative E6 would provide NMFS the flexibility to respond to multiple in-season scenarios with a minimum of disruption to the fishery. NMFS would have the ability to slow landings and keep the fishery open by choosing a minimum size limit appropriate to allow maximum utilization of the U.S. landing limit, but not exceed it. While the proposed temporary minimum size increases for Atlantic blue and white marlin that could be imposed under alternative E6 would be substantially larger than current minimum sizes (99" BUM, 66" WHM), NMFS believes that, in most cases, anglers would continue to pursue Atlantic marlin. In a review of the public comment submitted to NMFS on this alternative, Agency staff did not find comment on the appropriateness of the proposed minimum size range. The Agency interprets this lack of comment to mean that there were no strong objections by the public to the proposed range of minimum sizes available to the NMFS for in-season action. NMFS did receive a number of comments indicating concern over the size of potential adverse economic impacts that may stem from implementation of the 250 Atlantic marlin landing limit. NMFS does not believe such minimum size increases would substantially decrease demand for charter/headboat trips, trips by individual anglers, or

participation in billfish tournaments given the catch and release ethic of billfish anglers (87 to 99.2 percent release rate, see alternative E1) as well as the significant number of fish that would still likely be available for landing under the above scenario. However, as discussed in more detail under the ecological benefits of this alternative, there is no way to predict angler behavior. Angler response may be to maintain current effort for marlin, reduce fishing effort, or shift fishing effort to other species. Should effort be maintained or shifted to other species, adverse socio-economic impacts to the fishing community, including CHB operators, tournament operators, tackle shops, marinas, and others would likely be very limited as anglers would continue to make expenditures to pursue fish recreationally. If effort were switched to other species, billfish tournament operators may see a disproportionate adverse impact of the stakeholders identified above, unless points or prizes were awarded for released billfish or non-billfish species. To this point, some billfish tournaments already operate under a catch and release format with most having award categories for non-billfish species. Taken together, these facts reinforce conclusions that impacts would be limited because anglers would likely continue to participate in tournaments. If effort were reduced as a result of marlin minimum size increases, alternative E6 would likely result in small adverse economic impacts for all stakeholders for the reasons previously identified.

The potential impacts of a minimum size increase for Atlantic marlins under alternative E6 could be noticeably affected, either constrained or increased, by the date at which a minimum size increase may occur in a given fishing year. Given the estimated date (May 3) at which a minimum size increase could occur under the June 1 – May 31 fishing year management cycle and the assumptions made in this analysis, some sense of regional impacts can be outlined. An annual average of 25 billfish tournaments occur in the month of May (Table 4.58), and could potentially be impacted, should the ICCAT limit or threshold be reached during a fishing year. The majority of these tournaments occur in Florida (5), South Carolina (4), and North Carolina (4). On average, Louisiana holds three, with Alabama, Georgia, Texas, and the U.S.V.I. each holding two billfish tournaments in May. Not unexpectedly, the South Atlantic and Gulf of Mexico regions have the highest probabilities of being impacted at this time of year. In addition, the relative size of billfish tournaments (as estimated by the number of participating vessels, Table 4.57) in South Carolina, and North Carolina is large, with both averaging greater than the average size of a billfish tournament (47 vessels). However, as previously stated, the impacts to tournaments from minimum size increases are anticipated to be minimal for the reasons discussed above.

Previously stated conclusions that impacts would likely be limited are reinforced by the facts that only 28 days remain in the fishing year after May 3, a minimum size increase would still allow fishermen to continue to land marlins, and there would still likely be approximately 15 percent of the ICCAT landing limit available for landing. Late season tournaments occurring in May, specifically on the Memorial Day weekend, would likely still operate under this scenario for the reasons discussed above, and given reports suggesting that an increasing percentage of tournaments are adopting a catch and release format. As such, NMFS estimates that there would likely be very limited adverse economic impacts for the CHB fleet, individual anglers, or tournaments resulting from an in-season minimum size increase.

In general, under the calendar year management cycle (preferred alternative G2), if landings of Atlantic marlin increase, recreational billfishing effort and tournaments that occur early in the calendar year should have sufficient catch available. However, billfishing effort and tournaments that occur later in the calendar year could be negatively impacted if the management threshold for action is reached in a given year, in-season restrictions are implemented, and anglers exhibit a negative behavioral response. As discussed above, NMFS estimates that, under calendar year management cycle and the previously stated assumptions, in-season action to increase minimum sizes could be required by August 22 to ensure compliance with the 250 fish limit. To reiterate, this would only occur if the rate of recreational marlin landings increases substantially. On average, August has the greatest number of billfish tournaments of any single month (37). Table 4.58, provides a breakdown of the average number of tournaments by state and month for the period 1999 – 2004, inclusive. The higher number of tournaments in the summer months, as identified in Table 4.58, is reflective of the increased in availability of these fish in more temperate regions such as New England and the Mid-Atlantic bight. Under the calendar year management cycle scenario, the months remaining in the fishing year have significantly fewer tournaments, on average: September (14); October (5); November (5); and, December (5). However, not all of these tournaments would necessarily be adversely impacted as some may be sailfish specific tournaments. Sailfish specific tournaments could experience increases in participation, and thus provide limited positive economic impacts to those communities, if in-season management action for marlin became necessary.

Given the estimated date of August 22nd when a minimum size increase could occur, under the calendar year management cycle and the assumptions made in this analysis, some sense of regional impacts can be outlined. Out of these months, impacts in August appear to be of the most regional concern. This is because during an average year the three billfish tournaments that may occur in the state of Massachusetts and two of three billfish tournaments that may occur in the state of Rhode Island occur in August. However, based on 2004 Atlantic HMS Tournament Registration data, there were a total of 34 tournaments that awarded points or prizes for Atlantic marlin that could be impacted if marlin minimum sizes were increased on August 22nd, under the Calendar year management cycle scenario. This includes marlin tournaments operating during the period August 22 – December 31, inclusive. The majority of these tournaments occurred in Florida (10). Puerto Rico held six, Louisiana and Maryland each held four, New Jersey held three, Texas held two, with Alabama, Massachusetts, North Carolina, Virginia and the U.S. Virgin Islands each holding one marlin tournament. This indicates that Florida has the largest probability of being impacted by any potential shift in minimum sizes, although the impacts may be less acute to the state and/or region given the higher number of tournaments that occur in this area.

Prior discussions that impacts of an in-season minimum size increase would likely be limited, under the calendar year management cycle, are reinforced by the facts that a minimum size increase would allow fishermen to continue to land marlins, and that there would still likely be approximately 15 percent of the ICCAT landing limit available for landing. Late season tournaments would likely still operate under this scenario for the reasons previously discussed (high catch and release rate, fish available for landing, etc.) and because anecdotal reports suggest that an increasing percentage of tournaments are adopting a catch and release format. As

such, NMFS estimates that there would likely be limited adverse economic impacts for the CHB fleet, individual anglers, or tournaments.

Tournament data presented in this document are historical and averaged, except where explicitly noted, and do not necessarily reflect the exact time periods of past tournaments or potential future tournaments. Its use as a proxy for interpretation of regional impacts is extremely limited. In some cases, tournament dates could be adjusted to mitigate or avoid potential negative impacts of occurring late in the season with an increased risk for management actions. If, as expected, the potential negative impacts of increasing the size limit is perceived as minor by tournament participants, then tournaments may not be affected at all.

Table 4.57 Average Number of Boats per Tournament by Month and State, 1999-2004. Source: Recreational Billfish Survey

State	Month												State Ave*
	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	
AL	--	--	--	--	88	29	31	136	130	--	--	--	52
FL	34	44	34	77	66	54	67	28	26	38	39	40	45
GA	--	--	--	14	16	15	7	9	4	--	--	--	14
LA	39	--	--	62	26	56	31	21	14	--	--	--	32
MA	--	--	--	--	--	--	34	34	--	--	--	--	34
MD	--	--	--	72	--	23	64	274	17	--	--	--	136
MS	--	--	--	--	--	51	18	21	--	--	--	--	29
NC	--	--	--	--	48	99	30	71	10	--	--	--	61
NJ	--	--	--	--	--	18	47	104	27	--	--	--	56
NY	--	--	--	--	--	--	63	--	--	--	--	--	63
PR	46	13	33	30	38	21	52	84	49	51	22	28	49
RI	--	--	--	--	--	--	14	16	--	--	--	--	16
SC	--	--	--	41	60	61	85	53	--	--	--	--	64
TX	10	--	--	--	11	18	51	52	17	15	--	--	34
VA	--	--	--	--	--	37	35	25	--	--	--	--	31
VI	6	11	13	--	11	10	11	28	10	8	11	--	14
Monthly Ave*	34	38	28	59	46	45	47	67	27	41	28	38	47

*Monthly and State averages may not match individual cell totals because of rounding and averaging effects.

Table 4.58 Average Number of Billfish Tournaments by Month and State 1999-2004*. Source: Recreational Billfish Survey

State	Month												Avg. No. of Tournaments by State**
	JAN	FEB	MAR	APR	MAY	JUNE	JULY	AUG	SEPT	OCT	NOV	DEC	
AL	--	--	--	--	2	2	2	2	1	--	--	--	8
FL	12	4	1	2	5	5	5	5	3	3	2	4	53
GA	--	--	--	0	2	1	0	0	0	--	--	--	4
LA	1	--	--	0	3	4	5	3	3	--	--	0	18
MA	--	--	--	--	--	--	0	3	--	--	--	--	3
MD	--	--	--	0	--	1	3	3	1	--	--	--	9
MS	--	--	--	--	--	1	1	1	--	--	--	--	2
NC	--	--	--	--	4	3	2	4	0	--	--	--	14

State	Month												Avg. No. of Tournaments by State**
	JAN	FEB	MAR	APR	MAY	JUNE	JULY	AUG	SEPT	OCT	NOV	DEC	
NJ	--	--	--	--	--	0	5	2	1	--	--	--	8
NY	--	--	--	--	--	--	1	--	--	--	--	--	1
PR	0	1	0	1	1	1	1	4	2	2	2	1	15
RI	--	--	--	--	--	--	0	2	--	--	--	--	3
SC	--	--	--	1	4	3	2	0	--	--	--	--	9
TX	0	--	--	--	2	4	5	4	2	0	--	--	19
VA	--	--	--	--	--	1	1	2	--	--	--	--	5
VI	0	0	1	--	2	1	1	2	0	0	1	--	9
Avg. # of Tournaments By Month**	14	5	2	4	25	28	34	37	14	5	5	5	179

Cells with a zero had a tournament in at least one year during that month, but the average was less than 0.5.
Cells with a -- had no tournaments in that month at all.
****Totals may not match individual cell totals because of rounding and averaging errors.**

Scenario 3: Threshold for Implementing Catch and Release Only Fishing is Achieved

Under alternative E6, NMFS would be required to shift the entire Atlantic recreational marlin fishery to catch and release if the ICCAT landing limit for any given year is achieved. Under these circumstances, NMFS believes that, in a worst-case scenario, marlin anglers may reduce their demand for charter fishing trips by between 0.4 and 24.2 percent of the available trips remaining during a given season. The range of 0.4 and 24.2 percent is derived from an examination of landings and release data (RBS, MRFSS, LPS) which indicate that between 1999 and 2004, anglers released between 75.8 and 100 percent of blue marlin and between 89.4 and 100 percent of white marlin. Clearly, it is not logical to assume that 100 percent of blue or white marlin are released, given that there have been observed and reported landings during this period. As such, the release estimate of 99.6 percent is used for purposes of analysis as an upper limit of the marlin release rate. This was the highest marlin release rate identified below 100 percent. As such, retention rates of 0.4 percent to 24.2 percent are used as proxies to represent the range of worst-case scenarios of fishermen who do not practice catch and release marlin fishing and completely exit the fishery. The low-end release rate estimate of 75.8 percent used in the Final Consolidated HMS FMP is substantially lower than the 89.4 release rate used in the Draft Consolidated HMS FMP. This is the result of a noticeable drop in the estimated release rate of blue marlin based on updated 2004 MFRSS data. The high-end release rate of 99.6 percent used in this Final Consolidated HMS FMP is slightly higher than the 99.4 percent release rate used in the Draft Consolidated HMS FMP. This is the result of a slighter higher estimate of the white marlin release rate based on updated 2004 MRFSS data.

If the landing limit were achieved earlier in the season, then more trips would logically be impacted as compared with achieving the landing limit later in the season. The average value of a CHB trip was $1,053 (2004 dollars). Data are not available to determine the number of CHB trips targeting marlin in any given month, and, as such, NMFS cannot quantify the impacts of the estimated decrease in participation on CHB operators. While the number of Angling category permits is known, as previously mentioned, it is not possible to determine what proportion of permitted anglers participate in the billfish fishery. As such, it is not possible to quantify an impact on non-CHB billfish anglers. Based on the rationale stated above, NMFS assumes

participation in the directed billfish fishery by individual anglers would also decline by 0.4 to 24.2 percent if the marlin fishery is shifted to catch and release only under alternative E6.

Under preferred alternative E6, NMFS estimates that between 0.8 and 10.1 percent of tournaments may cease to operate in a worst-case scenario. This range was derived from the low and high end billfish tournament release rates (RBS data) of 89.9 and 99.2 percent for use as a proxy, and represents a worst case scenario. Approximately 150 billfish tournaments operated annually, on average, for the period 1999 - 2004. If catch and release fishing for Atlantic marlins was implemented for an entire season, this could equate to between 1 and 15 billfish tournaments ($150_{\text{annual billfish tournaments}} * 0.008$ to $0.101_{\text{estimated reduction in participation}} = 1.2$ to $15.15_{\text{tournaments potentially not operating}}$) not operating, with a potentially minor to substantial direct local and/or regional adverse economic impact. This figure represents an increase of approximately one tournament that may not operate over figures presented in the Draft Consolidated HMS FMP. This change stems from incorporation of 2004 data which had the highest number of billfish tournaments since 1999, and which increased the average number of tournaments per year. The estimated socio-economic impact of one to 15 tournaments ceasing operations ranges from $1,375,439 to $20,631,585 ($1_{\text{tournament stopping operations}} * \$1{,}375{,}339_{\text{estimated value of a tournament}} = \$1{,}375{,}439$; $15_{\text{tournaments stopping operations}} * \$1{,}375{,}339_{\text{estimated value of a tournament}} = \$20{,}631{,}585$. Nevertheless, this scenario is highly unlikely, given that the ICCAT landing limit must be achieved prior to the fishery becoming catch and release. The only way this scenario could occur would be if the previous year's overage was of sufficient magnitude to completely fill the next season's landing allocation (e.g., 500 or more marlin were landed in a single year). Only in 2002 did reported U.S. marlin landings exceed the 250 fish limit, and, as previously discussed, by only 29 fish. Additional information regarding the potential impacts to tournaments of achieving the threshold for implementing catch and release only fishing under alternative E6 are discussed below.

To estimate socio-economic impacts given a scenario where the ICCAT landing limit is achieved, NMFS has used the 2002 reported landings (279 marlin) as a proxy for determining when a future switch to catch and release only fishing may occur in the future. The 2002 reported landings are the only available proxy for estimating impacts of achieving the ICCAT landing limit, as this is the only year the ICCAT limit has been achieved. As such, by examining the historical distribution of RBS marlin landings by month (1999 - 2004) and distributing 2002 landings proportionally across the fishing year according to the historical landings pattern, NMFS estimates that, if landings increase evenly during all months to levels that would match 2002 landings, the ICCAT landings limit could be achieved on May 12 based on the current June 1 to May 31 fishing year, and August 25 based on a potential switch to a calendar year management cycle. Again, based on current landings patterns this is unlikely to occur, but it is possible for recorded landings to increase as per previously discussed factors. For purposes of clarity, it should be noted that the close proximity of the dates at which a minimum size increase could occur (May 3rd under a June – May 31 management cycle; August 22nd under a calendar year management cycle), under scenario two, and the date at which a shift to catch and release could occur (May 12th under a June 1 – May 31 management cycle; August 25th under a calendar year management cycle), under scenario three, is a reflection of the different assumptions made for purposes of analysis. They also do not include the anticipated impacts of an in-season minimum size increase that would occur under scenario two. As such, readers should not draw the conclusion that a minimum size increase would be followed just days later by a shift to catch

and release fishing (under either the June 1 – May 31 management cycle or the calendar year management cycle).

The economic impacts of switching to a catch and release marlin fishery on May 12 (under the June 1 to May 31 fishing year), under the assumptions made for purposes of this analysis, would likely be minor. There are only 19 days left in the June 1 - May 31 fishing year at that point. Using 2004 tournament data for purposes of analysis, there were 16 registered marlin tournaments in May. Of these, three operated prior to May 12th; the point at which catch and release only fishing could be required under this analysis. Of the 13 billfish tournaments occurring after the May 12 "closure" date, it is anticipated that 0.8 to 10.1 percent may cease operations based on the previously discussed assumptions, which equates to between zero and one tournaments based on standard rounding practices, ($13_{\text{tournaments}} * 0.008$ to $0.101_{\text{estimated decrease in participation}} = 0.1$ to $1.3_{\text{tournaments stopping operations}}$). However, even these low numbers may be an over estimate as Ditton and Stoll (2004) suggest that at least some anglers would be willing to pay as much as $71 (2004 dollars) over current entry fees to participate in catch and release tournaments (Ditton, 2004). The estimated date for a shift to catch and release fishing under the June 1 – May 31 management cycle provides a limited ability to identify potential regional impacts. The 13 marlin tournaments occurring late in the 2004 fishing year were held in North Carolina, South Carolina, Louisiana, Texas, Alabama, Florida, Puerto Rico, and Georgia. Four occurred in North Carolina, three in Louisiana, and one each in South Carolina, Texas, Alabama, Puerto Rico, Georgia, and Florida. Most were clustered around the Memorial Day weekend. Depending on which tournaments may potentially cease operating, the impacts could occur in different regions. Given the locations of the tournaments, North Carolina would have the highest probability of being adversely impacted of any single state, followed by Louisiana. The South Atlantic region would have the greatest probability of being adversely impacted with seven of the 13 tournaments that could be among those affected. The Gulf region would have a slightly lower probability of being impacted with five of the 13 tournaments, and Puerto Rico would be least likely to be adversely impacted. While states with the smallest number of tournaments would be less likely to be impacted, they would be expected to realize heightened localized adverse impacts if a tournament were canceled. However, there is no way to accurately predict exactly which tournaments may continue to operate or cease operating. Using an average value of $1,339,800 for an average HMS tournament (Ditton and Clark, 1994, converted to 2003 dollars), should one tournament cease operations as a result of alternative E6, this could result in an estimated adverse economic impact of $1,339,800 dollars to the local community, including tournament operators, CHB operators, marinas, and others. Loss of a single tournament would likely result in some small decrease in angler consumer surplus to the vessels participating in that tournament. Data indicate that on average, approximately 47 vessels participate in Atlantic billfish tournaments (Table 4.57). Impacts on shoreside businesses would likely be minor, but could be increased or decreased depending on angler response and when in the season a shift to catch and release only fishing might occur.

The economic impacts of switching to a catch and release marlin fishery on August 25th, under the calendar year management cycle and the assumptions made for purposes of this analysis, would likely be limited. There are, on average, 66 billfish tournaments that occur between August and December, inclusive. However, for the period 2001 – 2004 (inclusive), 27 of these billfish tournaments, on average, were either sailfish or swordfish tournaments that did

not award points or prizes for Atlantic marlin, or concluded prior to the estimated action date of August 25th. This leaves a universe of approximately 39 tournaments that award points or prizes for Atlantic marlin during an average year that could be impacted by a shift to catch and release fishing on August 25th, if necessary for ICCAT compliance purposes. Of the 39 billfish tournaments occurring after the August 25th "closure" date, it is anticipated that 0.8 to 10.1 percent may cease operations based on the previously discussed assumptions. This equates to between zero and four tournaments being impacted based on standard rounding practices (39 $_{\text{tournaments}}$ * 0.008 to 0.101 $_{\text{estimated decrease in participation}}$ = 0.312 to 3.9 $_{\text{tournaments stopping operations}}$). The estimated universe of tournaments that may be impacted is smaller in this Final Consolidated HMS FMP than was estimated than under the calendar year scenario in the Draft Consolidated HMS FMP. This is the result of further refining the data used in the assessment. In this document, sailfish or swordfish specific tournaments (billfish tournaments that awarded points or prizes only for sailfish or swordfish and thus would not be adversely impacted by a shift to catch and release fishing for marlins) were removed from the universe of potentially affected billfish tournaments. The result is a more accurate accounting of "marlin" tournaments that may possibly be impacted by a shift to catch and release only marlin fishing. As such, the number of tournaments potentially impacted by an inseason shift to catch and release is considered more accurate.

The distribution of potential regional impacts would be similar to those discussed above under Calendar year management cycle scenario two (an in-season minimum size increase) given the proximity of the estimated dates at which a minimum size increase or shift to catch and release only fishing could occur. While states with the smallest number of tournaments would be less likely to be impacted, they would be expected to realize heightened localized adverse impacts if a tournament were canceled. However, there is no way to accurately predict exactly which tournaments may continue to operate or cease operations. Using an average value of $1,375,439 for an average HMS tournament (Ditton and Clark, 1994, converted to 2004 dollars), should zero to four tournaments cease operations as a result of alternative E6, under a worst case scenario this could result in an estimated adverse economic impact of $0 to $5,501,756 dollars to the local community, including tournament operators, CHB operators, marinas, and others (0 $_{\text{tournaments stopping operations}}$ * $1,375,339 $_{\text{estimated value of a tournament}}$ = $0; 4 $_{\text{tournaments stopping operations}}$ * $1,375,339 $_{\text{estimated value of a tournament}}$ = $5,501,756). Loss of up to four tournaments would likely result in some small decrease in angler consumer surplus to the vessels participating in those tournaments. However, even these low numbers may be an over estimate as Ditton and Stoll (2004) suggest that at least some anglers would be willing to pay as much as $71 (2003 dollars converted to 2004 dollars) over current entry fees to participate in catch and release tournaments (Ditton, 2004). Data indicate that on average, approximately 47 vessels participate in Atlantic billfish tournaments (see Table 4.57). Impacts on shoreside businesses would likely be minor, but could be increased or decreased depending on angler response and when in the season a shift to catch and release only fishing might occur. Further, should a marlin fishery "closure" occur as a result of alternative E6, this could result in positive economic impacts for operators of sailfish or swordfish specific tournaments and CHB operators who specifically target these species, if anglers shift effort to these other billfish species. NMFS is unable to quantify these impacts, as angler behavior cannot be predicted.

Under either the June 1 – May 31 management cycle or the calendar year management cycle, Alternative E6 could have smaller long-term adverse socio-economic impacts than Alterative E1, the No Action alternative, if landings increase in the future. Alternative E6 would allow NMFS significant flexibility in determining if and when action should be taken to remain consistent with international obligations. Alternative E6, would allow the response to be tailored to the peculiarities of a given fishing year to ensure maximum utilization of the ICCAT landing limit. This response would likely allow the Agency to avoid disproportionately impacting CHB operators, tournaments, and anglers who fish for marlin late in the fishing year by providing anglers the greatest opportunity to land marlin over the entire length of the fishing year. Alternative E1 would simply result in the shutdown (catch and release fishing only) of the fishery on an emergency basis if the ICCAT landing limit were achieved. The shift to catch and release only fishing under the no action alternative would likely occur at an earlier point in the season than under alternative E6, where landings would first be slowed by increasing the minimum size, and then prohibited if the landings reached the ICCAT landing limit. Alternative E6 is anticipated to allow a shutdown of the marlin fishery to be avoided, and at a minimum, significantly extend the open period of the fishing year prior to a closure, thereby minimizing negative socio-economic impacts. Alternative E6 may result in a temporary decrease in angler consumer surplus if increased minimum sizes or catch and release requirements were implemented for the remainder of a fishing year. The loss of angler consumer surplus should be mitigated to an extent by the ability of anglers to continue to land fish if the minimum size is increased, the availability of other billfish species for landing, and given that existing minimum sizes and the ability to land fish would be restored at the start of the next fishing year.

A number of commenters expressed concern that potential impacts of a shift to catch and release fishing would have dramatic and substantial adverse economic impacts. NMFS fully appreciates these concerns, and recognizes that some areas may have heightened localized impacts. However, this alternative was specifically constructed, in part, to minimize the potential adverse impacts of implementing a non-discretionary international obligation by allowing NMFS substantial flexibility in determining when to respond, and how to respond, should marlin landings approach the international limit. The alternative is designed to allow the fishing season to continue with a minimum of disruption as long as possible, and then when action may be required, implementing management measures that would still allow for the fishery to continue. Between angler's conservation ethic, as witnessed by the high rate of catch and release, the current low rate of marlin landings, the availability of other billfish species for landing, and the flexibility built into this alternative, NMFS anticipates that impacts would be limited, and any unavoidable impacts would be substantially mitigated.

Alternative E7, a shift to catch and release only fishing for Atlantic white marlin for five years, could potentially lead to negative social and economic effects, although the magnitude is difficult to assess. As discussed under alternative E1, the majority of data indicate a strong adherence by Atlantic billfish anglers to catch and release fishing for white marlin. Based on RBS, LPS, and MRFSS data, NMFS estimates that between 0.4 percent and 10.6 percent of all white marlin catches are landed (Table 4.49, Table 4.50, and Table 4.51).

As of February 1, 2006, there were 25,238 Angling, 4,173 CHB, and 4,824 General category permit holders. See Chapter 3 for additional permit information. Given the multi-

species nature of HMS permits, and the fact that vessels are permitted rather than individual anglers, NMFS does not have the ability to identify what subset of these permitted vessels, or how many anglers, participate in the recreational billfish fishery.

It is difficult to estimate the percentage of Angling category fishing trips that would not be taken if catch and release fishing for white marlin was mandatory, however the Agency acknowledges that some percentage of total Angling category trips would likely be canceled due to the inability to land a white marlin. Ditton and Stoll (2003) estimate that there are 7,915 billfish anglers in the U.S. Atlantic and 1,627 billfish anglers in Puerto Rico. Angler expenditures for marlin targeted trips are estimated to be $704.00 per angler (in 2004 dollars), based on a limited sample size. In contrast, angler expenditures for other HMS targeted trips are estimated at $125.00 per angler (in 2004 dollars), based on 621 observations (NMFS, 2001). Ditton and Stoll (2003) report that a 1990 study estimated average expenditures of $2,105.00 ($3,042.00 in 2004 dollars) for Atlantic billfish trips and that a 1994 study estimated a mean expenditures of $1,052.00 ($1,341.00 in 2004 dollars) for Puerto Rico billfish trips. As reported by Ditton and Stoll (2003) the aggregate economic impact of billfish fishing trips in the U.S. Atlantic is conservatively estimated to be $22.7 million annually, not including Puerto Rico. These data indicate that billfish anglers place a high value on billfish fishing. Under alternative E7, Angling category fishermen may reduce the number of trips targeting white marlin. Reduced participation in the billfish fishery would likely result in negative social and economic impacts for this sector. Considering the overwhelming catch and release ethic of billfish anglers (31 white marlin reported landed in 2004), however, NMFS anticipates that any negative social and economic impacts under this alternative would be small. The short-term social impacts of not being able to land trophy or record category fish is difficult to assess, however NMFS anticipates that this alternative could lead to a decrease in angler consumer surplus. The long-term impacts of alternative E7 may result in an increase in net benefits as stocks rebuild and recreational encounters with white marlin become more frequent.

Sutton *et al.* 1999, estimate that CHB operators each take 109 for-hire trips per year on average, with approximately 2.6 percent of those trips targeting billfish. Multiplying the average number of CHB trips by the number of CHB permits ($109_{\text{avg. CHB trips per year}} * 4{,}173_{\text{CHB permits}} = 454{,}857$) and multiplying the product by 0.026 ($454{,}857_{\text{total CHB trips}} * 0.026_{\text{percentage of CHB billfish trips}} = 11{,}826$) provides a rough estimate of the annual number of billfish trips taken by CHB operators. Of the 11,826 CHB trips targeting billfish, between 47 and 1,254 trips may be canceled given the inability to retain white marlin ($454{,}857_{\text{CHB trips}} * 0.026_{\text{percent of CHB trips BLF directed}} * .004_{\text{WHM low retention rate}} = 47.3$) ($454{,}857_{\text{CHB trips}} * 0.026_{\text{percent of CHB trips BLF directed}} * 0.106_{\text{WHM high retention rate}} = 1{,}253.5$). NMFS estimates that the cost of a CHB trip currently averages $1,053.00 (in 2004 dollars). Given this figure, the Agency estimates that alternative E7 could result in between $49,491 and $1,320,462 in lost revenues to CHB vessels ($47_{\text{estimated lost trips}} * \$1{,}053.00_{\text{avg. cost per trip}} = \$49{,}491$) ($1{,}254_{\text{estimated lost trips}} * \$1{,}053.00_{\text{avg. cost per trip}} = \$1{,}320{,}462$). The loss of revenues of this magnitude would likely result in minor to moderate negative social and economic impacts to the CHB sector. While NMFS cannot definitively forecast angler behavior, given the previously discussed catch and release ethic of billfish anglers (31 white marlin reported landed in 2004), NMFS anticipates that most anglers would continue to fish for Atlantic white marlin under catch and release restrictions. As such, NMFS anticipates that negative impacts under this alternative would be less severe than those estimated above. Further, the

continued ability of anglers to pursue and land other Atlantic billfish species, and other non-HMS may further mitigate potential adverse impacts, which may result from this alternative.

General category permit holders are only allowed to fish for, retain, or possess white marlin in registered HMS tournaments; however the Agency does not possess information regarding how many General category permit holders participate and land white marlin in tournaments. Under alternative E7, negative social and economic impacts could occur if General category vessels that normally participate in HMS tournaments cease operations. Potential negative impacts would not likely be realized by those General category vessels that already practice catch and release fishing for white marlin or participate in catch and release tournaments, because NMFS anticipates that these anglers would continue to pursue Atlantic white marlin under a catch and release only fishery.

In 2004, there were 129 registered tournaments that awarded points or prizes for white marlin captures (see Chapter 3). Based on RBS data from 1999 – 2004 (Table 4.49), the retention rates of white marlin in tournaments range from 0.8 percent to 3.2 percent. For purposes of analysis only, NMFS assumes that under a worst-case scenario, that this same percentage (0.8 to 3.2 percent) of tournaments may stop operating. Under these assumptions, NMFS estimates that alternative E7 may result in between one and four tournaments would not continue to operate in a catch and release only fishery for white marlin. As previously discussed, NMFS estimates the average value of an HMS tournament to be $1,375,439 (in 2004 dollars). Assuming that one to four tournaments cease operations, the Agency estimates that alternative E7 could result in negative economic impacts ranging from $1,375,439 to $5,501,756. The loss of revenues of this magnitude would likely result in moderate social and economic impacts for tournaments, tournament participants, and associated businesses. While NMFS cannot definitively forecast angler behavior, given the previously discussed catch and release ethic of billfish anglers, NMFS anticipates that most anglers would likely continue to pursue white marlin under a catch and release only fishery and most tournaments would continue to operate under a revised format. As such, adverse impacts under this alternative would likely be of a lesser magnitude than those estimated above. Additionally, a recent survey based on tournament anglers in Texas, determined that angler willingness to pay is $71.00 (in 2004 dollars) higher for participation in catch and release tournaments than it is for participation kill tournaments (Ditton and Oh, 2004).

Negative social and economic impacts resulting from alternative E7 may be mitigated by a delayed effective date for implementing a catch and release only requirement for Atlantic white marlin of January 1, 2007. A delayed effective date would be anticipated to allow tournament operators limited time to alter tournament rules to provide for a catch and release format and allow anglers to adjust to new requirements.

Angler consumer surplus would likely remain high, given the currently high release rate of white marlin, which is reinforced by the low number of verified landings that occurred in recent years. However, it is possible that angler consumer surplus may decrease given the inability to land white marlin. Further, under alternative E7, anglers would still have the ability to land other billfish, including trophy-sized sailfish and blue marlin. To mitigate negative socio-economic impacts, alternative E7 would delay implementation of catch and release only

fishing requirements to allow the fishery time to adjust to new measures, and would include a sunset provision five years from implementation of catch and release requirements. Alternative E7 would likely provide limited benefit for the species and likely result in lesser socio-economic impacts to the billfish community than alternative E8.

During the public comment period, NMFS received strong comment opposed to the Atlantic white marlin catch and release alternative. Based on public comment that indicated more significant concerns over potential adverse economic impacts to the fishery if catch and release only fishing for Atlantic white marlin were required, as well as a number of other factors, including but not limited to, the impending receipt of a new stock assessment for Atlantic white marlin and upcoming international negotiations on Atlantic marlin, the Agency does not prefer to prohibit landings of Atlantic white marlin, at this time. Additionally, NMFS received substantial comment in support of this measure. The commenters supporting the white marlin landings prohibition stated concerns over stock status, the ESA listing review, and an interest in maintaining leadership at the international level. The implementation of circle hook requirements would be an important first step in reducing mortality in the directed billfish fishery. NMFS will consider catch and release only fishing options for white marlin as well as other billfish conservation measures in future rulemakings, as necessary and appropriate.

Similar to alternative E7, alternative E8 could potentially lead to negative social and economic impacts, although the magnitude is difficult to assess. As discussed under alternative E1, the majority of data indicate a strong adherence by Atlantic billfish anglers to catch and release fishing for blue marlin. Based on RBS, MRFSS, and LPS data, NMFS estimates that between 3.9 percent and 24.2 percent of all blue marlin catches are landed (Table 4.49, Table 4.50, and Table 4.51).

As of February 1, 2006, there were 25,238 Angling, 4,173 CHB, and 4,824 General category permit holders. Given the multi-species nature of HMS permits, and the fact that vessels are permitted rather than individual anglers, NMFS does not have the ability to identify what subset of these permitted vessels, or how many anglers, participate in the recreational billfish fishery. It is difficult to estimate the percentage of Angling category fishing trips that would not be taken if catch and release fishing for blue marlin was mandatory, however the Agency acknowledges that some percentage of total Angling category trips would likely be canceled due to the inability to land a blue marlin.

Under alternative E8, Angling category fishermen may reduce the number of trips targeting blue marlin. Reduced participation in the billfish fishery would likely result in negative social and economic effects and costs for this sector, however, considering the catch and release ethic of billfish anglers (118 blue marlin reported landed in 2004), NMFS anticipates that the economic costs under this alternative would not be large. The short-term social impacts of not being able to land trophy or record category fish is difficult to assess, however NMFS anticipates that this alternative could lead to a decrease in angler consumer surplus. The long-term impacts of alternative E8 may result in an increase in net benefits as stocks rebuild and recreational encounters with blue marlin become more frequent.

Using the same assumptions discussed above, the Agency estimates that of the 454,857 CHB trips occurring yearly, 11,826 of those are billfish directed CHB trips (454,857 * 0.026 Percent of BLF directed CHB trips = 11,826). Of the 11,826 CHB trips targeting billfish, between 461 and 2,862 trips may be canceled given the inability to retain blue marlin (454,857 CHB trips * 0.026 percent of CHB trips BLF directed * 0.039 BUM low retention rate = 461.2) (454,857 CHB trips * 0.026 percent of CHB trips BLF directed * 0.242 BUM high retention rate = 2,862.0). NMFS estimates that the cost of a CHB trip currently averages $1,053.00 (in 2004 dollars). Given this figure, the Agency estimates that alternative E8 would have greater economic costs than alternative E7 and could result in between $485,433 and $3,013,686 in lost revenues to CHB vessels annually. The loss of revenues of this magnitude would likely result in moderate negative social and economic impacts to the CHB sector, however considering the catch and release ethic of billfish anglers, NMFS anticipates that negative impacts under this alternative would be of a lesser magnitude than those calculated above.

General category permit holders are only allowed to fish for, retain, or possess blue marlin in registered HMS tournaments; however the Agency does not possess any information regarding how many General category permit holders participate and land blue marlin in tournaments. Under alternative E8, negative social and economic impacts could occur if General category vessels that normally participate in HMS tournaments cease operations. Potential negative impacts would not likely be realized by those General category vessels that already practice catch and release fishing for blue marlin or participate in catch and release tournaments, because NMFS anticipates that these anglers would continue to pursue blue marlin under a catch and release only fishery. As such, adverse impacts under this alternative would likely be of a lesser magnitude than those estimated above.

In 2004, there were 142 registered tournaments that awarded points or prizes for blue marlin captures (see Chapter 3). Based on RBS data from 1999 – 2004 (Table 4.49), the retention rates of blue marlin in tournaments range from 6.7 percent to 10.1 percent. For purposes of analysis only, NMFS assumes that under a worst-case scenario, that this same percentage (6.7 to 10.1 percent) of tournaments may stop operating. Under these assumptions, NMFS estimates that under alternative E8 between ten and 14 tournaments would not continue to operate in a catch and release only fishery for blue marlin. As discussed above, NMFS estimates the average value of an HMS tournament to be $1,375,439 (in 2004 dollars). Assuming that ten to 14 (142 tournaments * 0.067 to 0.101 decrease in tournament participation = 9.5 to 14.3 tournaments that may cease operations) tournaments cease operations, the Agency estimates that alternative E8 could result in negative economic impacts ranging from $13,754,390 to $19,256,146. The loss of revenues of this magnitude would likely result in sizeable local negative social and economic impacts for tournaments, tournament participants, and associated businesses, however, considering the catch and release ethic of billfish anglers, NMFS anticipates that negative impacts under this alternative would be of a lesser magnitude than those calculated above. Relative to the fishery as a whole, these impacts would be minor, however, as stated; the localized impacts may be felt more acutely. Additionally, a recent survey based on tournament anglers in Texas, determined that angler willingness to pay is $71.00 (2004 dollars) higher for participation in catch and release tournaments than it is for participation kill tournaments (Ditton and Oh, 2004).

Negative social and economic impacts resulting from this alternative may be mitigated by a delayed effective date of implementing a catch and release only requirement for Atlantic blue marlin. A delayed effective date is anticipated to allow tournament operators sufficient time to alter tournament rules to provide for a catch and release format and allow anglers to adjust to new requirements.

Under alternative E8, angler consumer surplus would likely remain high, given the currently high release rate of blue marlin, which is reinforced by the low number of verified landings that occurred in recent year. However, it is possible that angler consumer surplus may decrease given the inability to land blue marlin. Further, under alternative E8 anglers would still have the ability to land other billfish, including trophy-sized sailfish and white marlin. To mitigate negative socio-economic effects and cost, alternative E8 would delay implementation of catch and release only fishing requirements to allow the fishery time to adjust to new measures, and would include a sunset provision five years from implementation of catch and release requirements.

As discussed above, it is appropriate for the Agency to investigate potential options to reduce domestic mortality rates for blue marlin. This alternative was analyzed but not preferred in the Draft Consolidated HMS FMP or in this Final Consolidated HMS FMP due to potentially severe negative social and economic impacts, limited conservation benefits, the anticipated receipt of a new stock assessment in the near future which may provide significant new information on the fishery, and other reasons. The United States will continue its efforts to reduce billfish mortality both domestically and at the international level. Additionally, the Agency may consider catch and release only options for Atlantic blue marlin as well as other billfish conservation measures in future rulemakings, as necessary and appropriate.

Conclusion

As described in Chapter 1, the objectives of this document are multifaceted and include, *inter alia*, reducing mortalities of Atlantic billfish in directed and non-directed fisheries. This can be achieved, in part, by addressing known sources of mortality (including landings and post-release mortalities) in the directed recreational marlin fishery. Preferred alternatives E3 and E6 would strike an appropriate balance between conserving living marine resources and maintaining robust recreational fisheries while achieving the objectives of Consolidated HMS FMP. The preferred alternatives would be anticipated to substantially reduce the post-release mortality of Atlantic white marlin and are likely to provide positive ecological benefits for other species, including blue marlin, sailfish, tunas, and others with which recreational billfish fishermen interact, while maintaining consistency with United States' international obligations. The delayed date of effectiveness for preferred alternative E3 would be anticipated to mitigate, to the extent practicable, adverse economic impacts and losses in angler consumer surplus by allowing: tournament operators adequate time to adjust advertising, rules, business practices, and tournament formats; existing stockpiles of J-hooks to be used; and, anglers time to become comfortable and proficient with newly required gear. High levels of adherence to the practice of catch and release fishing, as well as the ability of anglers to continue to use J-hooks outside of tournaments, or in tournaments when deploying artificial lures, should also further substantially mitigate socio-economic impacts. The suite of preferred alternatives would achieve the purpose and scope of this rulemaking by providing comprehensive and meaningful protection to Atlantic

billfish, maintaining a robust directed fishery for billfish, and achieving legal and policy obligations. Importantly, by providing a successful roadmap for billfish conservation, NMFS may provide the impetus for other nations to adopt similar management measures, thereby improving conservation of Atlantic billfish throughout their entire range.

4.3 Management Program Structure

4.3.1 Atlantic Bluefin Tuna Quota Management

4.3.1.1 BFT Quota Management in the General and Angling Categories

As described in Chapter 2, the alternatives considered for BFT time-period subquotas in the General and Angling categories are:

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

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

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

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

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

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

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

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

Ecological Impacts

Minimal, if any, ecological impacts would be expected as a result of adjusting the General category time-periods and/or associated subquotas and/or amending the school size-class tolerance calculation because the overall quotas and size-classes of BFT being targeted by each domestic quota category would not change. In the case of the General category, only the proportion of the coastwide General category quota assigned to each time-period would be altered. For example, even though the time-period subquota percentage for December and January would be increased, the time-period subquota for June through August would be

decreased. As a result, there might be increased harvest in the later portions of the General category BFT season, but there would also be a corresponding decrease in harvest in the earlier portions of the season. These small orders of change, quantified in either numbers of fish or in weight (mt), or time and/or location of harvest, compared to overall U.S. harvest levels as recommended by ICCAT under the 20-year rebuilding program, equate to ecological impacts that are unlikely to be measurable given the variability in the data used to conduct BFT stock assessments. Additionally, the numbers of BFT harvested from each different size-class would remain consistent with the levels of BFT mortality used in the stock assessment. Therefore, only negligible ecological impacts would be expected from the following alternatives, as they relate to the ICCAT-recommended rebuilding plan for BFT.

Alternative F1 (No Action), would maintain the General category time-period subquota allocation scheme and the Angling category size-class subquota allocation procedures, as stated in the 1999 FMP. The BFT fishery has been managed via these allocations and procedures since the implementation of the 1999 FMP. These allocations and procedures are consistent with the ICCAT recommendations; therefore, NMFS does not expect this alternative to result in any negative ecological impacts beyond those accounted for in the 20-year BFT rebuilding plan.

Alternative F2 would establish General category time-periods, subquotas, and geographic set-asides annually via a framework action, and may have slightly different ecological impacts from alternative F1, as the time-periods, subquotas, and/or geographic set-asides may shift temporally and geographically from one year to the next. These ecological impacts would be expected to be negligible as well. These shifts could decrease or increase protected resource interactions, discards, and incidental catch of other finfish and would likely need to be analyzed each year depending on the changes proposed. However, as compared with other commercial gear types, commercial handgear typically produce relatively low levels of bycatch and bycatch mortality. Bycatch in the commercial handgear fishery can be monitored via the Large Pelagics Survey (LPS), but may be unaccounted for if the fishery is prosecuted in those areas outside LPS coverage or after the LPS sampling season is concluded. The LPS samples private and for-hire vessels and their landings from offshore fishing trips that target HMS in Virginia through Maine from June through October. A separate source of bycatch information can be derived from vessel logbook programs associated with other non-HMS fisheries in which HMS permitted vessel owner/operators may participate. At this time, there is little information on commercial handgear bycatch. Anecdotal reports suggest that there may be low level of tuna discards due to minimum size restrictions. This process of establishing General category time-periods and associated subquotas annually via a regulatory framework action would not noticeably alter current fishing methods or effort. Therefore, no noticeable adverse or positive ecological impacts would be expected from this alternative. For further information/analyses regarding commercial handgear interactions with protected resources, see Section 3.4.3.

Alternative F3, a preferred alternative, would remove specific General category time-period, subquota, and geographic set-aside language from the consolidated HMS FMP. This alternative would also codify the time-periods and the associated subquota allocations, including allocation percentages and the corresponding quota tonnage, in the regulatory text implementing the consolidated FMP and would remove the New York Bight set-aside. The sub-alternatives F3(a) through F3(d) appear to have similar ecological impacts as those presented in alternatives

F1 and F2, in the sense that the BFT baseline quotas would be consistent from one year to the next, provided the ICCAT-recommended U.S. BFT TAC remains consistent. There may be a slight shift in BFT landings, both temporally (to later in the season) and geographically to the South. However, the number of BFT harvested from each different size-class would remain consistent with the levels of BFT mortality used in the stock assessment. These temporal and spatial shifts in landings may present decreases or increases regarding protected resource interactions, discards, and incidental catch of other finfish. However, for the same reasons mentioned in alternative F2, NMFS does not expect any adverse ecological impacts associated with this alternative. For further information/analyses regarding commercial handgear interactions with protected resources, see Section 3.4.3.

Alternative F4, a preferred alternative, would clarify the procedures for calculating the Angling category school size-class BFT subquota allocation. Specifically, the eight percent school BFT tolerance for the Angling category would be determined prior to removing the NED Statistical set-aside allocation, resulting in a slight increase (*i.e.*, 0.02 percent) in the school BFT baseline quota allocation. Public comment supported the procedural change to calculating the school size subquota. Effort on the school size-class BFT would not be expected to increase as a result of this alternative, due to the very minor increase in available quota. Therefore, substantial changes in either current fishing methods or interaction rates with protected resources or other finfish would not be expected. This alternative has been slightly modified from that proposed in the draft HMS FMP. This preferred alternative modifies the proposed alternative in the draft FMP by retaining the North/South Angling category dividing line located at 39º 18 minutes N. latitude (Great Egg Inlet, NJ) (Table 2.1). As this modification to the alternative would not alter the Angling category quota or the overall U.S. BFT TAC, nor the effort expended by recreational participants, NMFS would not expect any adverse ecological impacts associated with this alternative.

NMFS, based on the best scientific information available, is unaware of any definitive ecological impacts on protected resources that would be associated with implementation of any of the alternatives discussed in this section. Limited data are available on the interactions of commercial and recreational handgear with protected resources, marine mammals, and other finfish. NMFS will continue to monitor HMS handgear fishery interactions with protected resources, marine mammals, and non-targeted finfish and will work to resolve any issues that may arise.

Social and Economic Impacts

Alternative F1 would maintain the historical General category time-period and subquota allocation scheme as well as the process used to establish it, *i.e.*, specific details would remain in the 1999 FMP itself. This alternative would require an FMP amendment to adjust these time-periods, subquota percentages, and/or geographic set-asides. This alternative may have both positive and negative social and economic impacts. The positive impacts would be attributed to the General category time-periods and associated subquota allocation percentages remaining consistent with those of prior years (Table 4.59), as well as maintaining the General category New York Bight set-aside allocation for those participants operating in that designated area. The adverse impacts associated with the General category would consist of hindering NMFS' ability to adapt BFT management measures to account for variations inherent to the fishery from one

year to the next due to the timeframes associated with conducting an FMP amendment. The positive impacts, in regards to the Angling category would entail maintaining the North/South dividing line; thereby providing a more equitable geographic and temporal distribution of recreational fishing opportunities by separating each BFT size-class subquota into two geographical regions and ensuring reasonable recreational fishing opportunities in all geographic areas without risking overharvest of the Angling category quota. The adverse impacts associated with maintaining the North/South dividing line would be the continued perception that the Agency has the appropriate recreational data in a timely fashion to use this management tool to adjust daily retention limits thus providing fair and equitable recreational fishing opportunities in real-time.

This alternative would also have some adverse social and economic impacts on fishermen, dealers, and the support industries located in the South Atlantic region. Under the No Action alternative, the General quota allocation is heavily frontloaded in the season and if high catch rates were to occur, the quota could be harvested in full prior to the BFT arriving off the coast of South Atlantic states. This uncertainty regarding the amount of BFT quota available late in the season does not allow for businesses to plan accordingly. For instance it is vital for fishermen to obtain the appropriate gear and outfit the vessel properly; or as a dealer, to maintain the appropriate staff and shipping/packing material as well as maintain leases, etc; or in the case of a support industry like a bait/tackle supplier, to have the appropriate gear pre-ordered so it is available for purchase. These adverse impacts could be mitigated if South Atlantic General category participants were to travel north in the early portion of the season. Overall, the adverse social and economic impacts associated with this alternative would be expected to outweigh the positive impacts.

The potential gross revenues generated under the No Action alternative were calculated for each specific time-period by using the status quo time-period subquota allocation percentages, the whole weight equivalent (in metric tons and pounds), and the average ex-vessel prices (whole weight) for 1999 through 2004, inclusive.

Table 4.59 Alternative F1: Gross revenues associated with the No Action alternative regarding the General Category time-period subquota allocation.*

Time-Period	Percentage	Equivalent in mt*	Approx. Equivalent in lb*	Average Ex-Vessel $ ('99-'04)	Gross Revenues
JUNE - AUG	60.0	413.9	912,483.9	7.71	7,035,250.80
SEPTEMBER	30.0	206.9	456,131.7	7.10	3,238,535.00
OCT - JAN	10.0	69.0	152,117.4	6.85	1,042,004.10
TOTAL	100.0	689.8	1,520,733.0		11,315,789.90

Note: For comparison purposes, this table assumes the New York Bight set-aside is distributed evenly throughout the fishing year.

*Time-period allocations may differ slightly due to rounding.

Alternative F2 would provide NMFS with more flexibility, in comparison to the other alternatives, by establishing the General category time-periods, subquotas, and geographic set-asides annually via a regulatory framework action (*i.e.*, not an FMP amendment). The

administrative burden would increase because the annual BFT specifications, plus the analytical documents, would be conducted annually. Plus, there would be a heightened importance to finalize the specifications prior to January 1 of each year, assuming the preferred CY/FY alternatives contained in Section 2.3.2 are implemented. Under this alternative, the industry would not have the necessary information to devise a business plan for the upcoming year prior to the start of the fishery because the time-periods and associated subquotas would be established each year. For example, each year, permit applicants may choose a quota category in which to permit their vessel, and this decision is usually based on the amount of quota and the rules and regulations that pertain to each individual permit category. As the time-periods, associated subquota allocations, and potential geographic set-asides would be established just prior to the start of the fishing season, fishermen would only have the overall General category quota allocation on which to base their decisions. There may also be positive social and economic impacts attributed to increases in a domestic quota category, time-period subquota, or geographic set-aside quota in a given year. However, the likelihood of experiencing negative social or economic impacts due to a decrease in any of these areas is equally the same.

Alternative F3, a preferred alternative, would blend aspects of alternatives F1 and F2 together to optimize the positive social and economic impacts by enhancing NMFS' flexibility to adapt to the BFT fisheries' inherent variability. This alternative would provide consistent General category time-periods and subquotas, from one year to the next, as the quota tonnage derived from the domestic quota allocations percentages and the ICCAT recommended BFT TAC would be codified in the regulatory text implementing the consolidated HMS FMP. These baseline quota amounts would change when ICCAT modifies or amends the BFT TAC recommendation. This alternative would also authorize adjustments to the General category time-periods, associated subquotas, and geographical set-asides via a regulatory framework action versus an FMP amendment, if warranted, based on changes to the ICCAT BFT quota recommendations. This balance between providing consistent baseline quota allocations and having the flexibility and ability to amend them, if warranted, in a relatively timely fashion would provide positive social and economic impacts because fishermen would be able to plan their business activities in advance while the Agency would have the flexibility to adapt to changing fishery conditions.

This alternative would also adjust the actual General category time-periods and the associated subquotas to reflect historical General category BFT allocations while incorporating recent trends in the fishery, both temporally and geographically. For instance, historically, the General category BFT fishery has been prosecuted in the summer and early fall months primarily in the waters off of New England. However, in recent years, BFT have been available in large numbers during the winter months in waters off the South Atlantic states. Therefore, this alternative would have positive social and economic impacts on the General category as a whole by providing reasonable fishing opportunities to General category BFT fishery participants over a broader geographic and temporal range when BFT are available to them, as well as providing some level of certainty as to the amount of quota that would be available for a given time-period. Any adverse social and economic impacts that may be associated with this alternative would be minor and primarily linked to the slight shifts in General category quota allocation as discussed in further detail under each subalternative.

Under these sub-alternatives, the potential gross revenues are calculated using 1999 through 2004 average monthly ex-vessel prices per pound (whole weight), the quota tonnage for each time-period (based on the preferred allocation percentages), the assumption that catch rates are consistent across time, and that each time-period subquota allocation is harvested in its designated time frame. NMFS is aware that these assumptions may not account for the variability inherent in the fishery (*i.e.*, availability of BFT, skill level of fishermen, weather conditions, etc.); the analyses, however, show the relative impacts of the various alternatives.

All of the following sub-alternatives would allow for the carryover of unharvested General category quota to the subsequent time-period allocation as stated in the No Action alternative (F1) or as stated in alternative F4. Under the alternatives, the break in fishing years would fall in the middle of the current winter fishery, *i.e.*, between December and January. NMFS discusses how this may affect quota rolling over from one time-period to another in more detail in Section 2.3.2. These alternatives also formally respond the Petition for Rulemaking submitted by the NCDMF. The Petition claims that the current General category BFT quota allocation scheme does not provide a reasonable opportunity to harvest BFT with commercial handgear off the South Atlantic coast during the winter months, thereby not ensuring fair and equitable treatment of all General category permit holders.

Subalternative F3(a) would distribute the coastwide General category quota equally, in 12.5 percent shares (Table 4.60), among the eight months that make up the General category BFT season (June-January). This subalternative would have both positive and negative social and economic impacts as it would provide some stability to the constituency by establishing a known amount of quota that would be available at the first of each month. However, if catch rates are high in the early portion of the month, these quotas could be harvested rapidly and may lead to derby style fisheries on the first of each month, which is contrary to NMFS' intent. This subalternative would formalize the General category winter BFT fishery, but would do little to recognize historical General category BFT allocations, thereby potentially excluding a group of long-time participants. This subalternative would result in positive social and economic impacts for those General category participants located in the South Atlantic region due to a 40 percent increase in available quota, compared to the No Action alternative, during the time frame of October through January. This increase in quota would equate to approximately $5.5 million in additional gross revenues for those individuals that participate in the later part of the General category season. However, those General category participants in the New England area, or those participants that pursue BFT in the summer months, might experience some adverse social and economic impacts due to the shift in quota to the later portion of the season. For instance, under this alternative, the status quo June through August time-period subquota allocation would be reduced by approximately 22.5 percent and the September time-period subquota by approximately 17.5 percent. These reductions in allocation would result in decreased gross revenues of approximately $2.8 and $1.8 million, respectively. This totals $4.6 million in losses whereas the gain above is $5.5 million. The difference of $0.9 million is derived from the different average ex-vessel prices at different times of the fishing year. This subalternative would also reduce the need for specific geographic set-asides because quota allocations would be made on a monthly basis. This subalternative would assist in distributing the General category BFT catch, temporally and geographically, which is beneficial for the collection of CPUE data

and may assist in avoiding large scale landings in a constrained time frame, thus reducing market gluts.

Table 4.60 Alternative F3(a): Gross revenues associated with the even sub-allocation of the General Category quota between the 8-month fishing season.

Time-Period	Percentage	Approx. Equivalent in mt*	Approx Equivalent in lb*	Average Ex-Vessel $ ('99-'04)	Approx. Gross Revenues
JUNE	12.5	86.23	190,102.65	6.42	$ 1,220,459.01
JULY	12.5	86.23	190,102.65	8.19	$ 1,556,940.70
AUGUST	12.5	86.23	190,102.65	7.56	$ 1,437,176.03
SEPTEMBER	12.5	86.23	190,102.65	7.10	$ 1,349,728.82
OCTOBER	12.5	86.23	190,102.65	6.66	$ 1,266,083.65
NOVEMBER	12.5	86.23	190,102.65	7.01	$ 1,332,619.58
DECEMBER	12.5	86.23	190,102.65	7.70	$ 1,463,790.41
JANUARY	12.5	86.23	190,102.65	7.76	$ 1,475,196.56
TOTAL	100.0	689.8	1,521,174.0		$11,101,994.76

*Time-period allocations may differ slightly due to rounding.

Subalternative F3(b) would implement General category time-periods, and associated subquota allocation percentages similar to those contained in the 1999 FMP, but would separate the October through January time-period into three distinct time-periods of October through November, December, and January. This would establish a formal General category winter BFT fishery on which fishermen, dealers, and supporting industries could depend and plan. The General category time-period subquota allocation percentages would be adjusted slightly to incorporate the allocations in the winter months, but would still recognize the historical General category allocations during the summer and fall months (Table 4.61).

This subalternative would have positive social and economic impacts to those General category participants located in the South Atlantic region due to a 9.5 percent increase in available quota, compared to the No Action alternative, during the time frame of October through January. This increase in quota would equate to approximately $1.1 million in additional gross revenue for the later part of the General category season. However, those General category participants in the New England area, or those participants which pursue BFT in the summer months, may experience roughly equivalent adverse social and economic impacts due to the shift in quota to the later portion of the season. For instance, under this alternative, the status quo June through August time-period subquota allocation would be reduced by approximately six percent and the September time-period allocation by approximately 3.5 percent. These reductions in allocation would result in decreased early season gross revenues of approximately $0.7 and $0.4 million, respectively. These negative impacts may be mitigated by individuals traveling to where the BFT are located at any time of the season. However, NMFS has little specific information at this time regarding the costs that would be incurred due to this travel.

Table 4.61 Alternative F3(b): Gross revenues associated with the proposed sub-allocation of the General Category quota, providing a BFT winter fishery in the South Atlantic

Time-Period	Percentage	Approx Equivalent in mt*	Approx Equivalent in lb*	Average Ex-Vessel $ ('99-'04)	Approx. Gross Revenues
JUNE - AUG	54.0	372.5	821,213.5	7.71	$6,331,556.09
SEPTEMBER	26.5	182.8	403,000.9	7.10	$2,861,306.39
OCT - NOV	9.0	62.2	137,126.1	6.68	$ 916,002.35
DECEMBER	5.2	35.9	79,145.1	7.70	$ 609,417.27
JANUARY	5.3	36.5	80,467.9	7.76	$ 624,430.90
TOTAL	100.0	689.8	1,520,953.5		$11,342,713.00

*Time-period allocations may differ slightly due to rounding.

Subalternative F3(c) (preferred) would implement the same time-periods as mentioned in subalternative F3(b), but would implement slightly different subquota allocation percentages for the June through August and October through November time-periods (Table 4.62). This subalternative was designed to redistribute the quota from the early time-periods to provide a winter General category BFT fishery during the months of December and January. This subalternative would reduce the allocation to the June through August time-period to a higher degree than subalternative F3(b) and increase the suballocation to the October through November time period, thus shifting more of the potentially adverse social and economic impacts to the earliest portion of the season.

This subalternative would enhance equity among regional General category participants, given that access to fish can vary considerably both temporally and geographically. Because this alternative would allocate General category quota based on a balance between historical General category BFT allocations, recent BFT landing trends, and the NCDMF Petition for Rulemaking, there would be no significant social or economic impacts to the fishery as a whole, however, there may be heighten regional or local impacts. Public comments generally support the preferred alternative to modify the General category time-periods and percentages because it ensures that fishermen in all the South Atlantic states (North Carolina, South Carolina, Georgia, and Florida's East coast) have an opportunity to participate in this fishery. However, this subalternative would have similar positive and adverse social and economic impacts as outlined in subalternative F3(b). The adverse social and economic impacts would be shifted to the earliest portion of the fishery, where the General category subquota allocations have traditionally been the highest. This subalternative would have positive social and economic impacts to those General category participants fishing in the later portion of the season due to a 13.5 percent increase in available quota, compared to the No Action alternative, during the time frame of October through January. This increase in quota would equate to approximately $1.5 million in additional gross revenue for the later part of the General category season. However, those General category participants who pursue BFT in the summer months may experience roughly equivalent adverse social and economic impacts due to the shift in quota to the later portion of the season. For instance, under this alternative, the status quo June through August time-period subquota allocation would be reduced by approximately ten percent and the September time-period by approximately 3.5 percent. These reductions in allocation would result in decreased gross revenues of approximately $1.2 and $0.3 million, respectively, for each of these time periods.

Reallocating more quota from the June through August time-period to the later time-periods would mitigate some of these adverse social and economic impacts because the June through August subquota has the largest allocation under the status quo and the amount of quota that would be reallocated would equate to a smaller percentage of the June through August subquota in comparison to the same amount of quota being reallocated from the other time-period subquotas. This subalternative is preferred due to the balance it strikes between providing all General category BFT fishery participants an equitable opportunity to harvest a portion of the coastwide General category quota, while still recognizing the historical participation in this fishery. Any adverse social or economic impacts associated with this alternative would be minimized and may even be mitigated as fishermen may travel to the geographical location of where the BFT are located at any give time. However, as stated previously, NMFS has little specific information at this time regarding the costs that would be incurred due to this travel.

Table 4.62 Alternative F3(c) (preferred): Gross revenues associated with the proposed sub-allocation of the General Category quota, providing a BFT winter fishery in the South Atlantic.

Time-Period	Percentage	Approx. Equivalent in mt*	Approx. Equivalent in lb*	Average Ex-Vessel $ ('99-'04)	Approx. Gross Revenues
JUNE - AUG	50.0	345.0	760,587.0	7.71	$ 5,864,125.77
SEPTEMBER	26.5	182.8	403,000.9	7.10	$ 2,861,306.39
OCT - NOV	13.0	89.7	197,752.6	6.68	$ 1,320,987.37
DECEMBER	5.2	35.9	79,145.1	7.70	$ 609,417.27
JANUARY	5.3	36.5	80,467.9	7.76	$ 624,430.90
TOTAL	100.0	689.8	1,520,953.5		$11,280,267.70

*Time-period allocations may differ slightly due to rounding.

Subalternative F3(d) would implement the same time-periods as described in sub-alternatives F3(b) and F3(c), but would allocate the General category time-period subquota in accordance with the NCDMF's Petition for Rulemaking (*i.e.*, 150 mt total for the months of December and January or approximately 21.7 percent of the coastwide General category quota (Table 4.63). This alternative would have a greater positive social and economic impact to General category participants in the South Atlantic region due to a 24.7 percent increase in available quota, compared to the No Action alternative, during the time frame of October through January. This increase in quota would equate to approximately $2.8 million in additional gross revenue for the later part of the General category season. However, those General category participants in the New England area, or those participants that pursue BFT in the summer months, may experience roughly equivalent adverse social and economic impacts due to the shift in quota to the later portion of the season. For instance, under this alternative, the status quo June through August time-period subquota allocation would be reduced by approximately 21.3 percent and the September time-period allocation by approximately 3.4 percent. These reductions in allocation would result in decreased gross revenues of approximately $2.5 and $0.3 million, respectively. These negative impacts may be mitigated by individuals traveling to where the BFT are located at any time of the season.

Table 4.63 Alternative F3(d): Gross revenues associated with the proposed sub-allocation of the General Category quota, providing a BFT winter fishery in the South Atlantic.

Time-Period	Percentage	Equivalent in mt*	Equivalent in lb*	Average Ex-Vessel $ ('99-'04)	Gross Revenues
JUNE - AUG	38.7	267	588,628.2	7.71	$4,538,323.42
SEPTEMBER	26.6	183.5	404,544.1	7.10	$2,872,263.11
OCT - NOV	13	89.7	197,752.6	6.68	$1,320,987.37
DECEMBER	10.8	74.5	164,252.7	7.70	$1,264,745.79
JANUARY	10.9	75.2	165,785.9	7.76	$1,286,498.58
TOTAL	100	689.9	1,520,953.5		$11,282,818.27

*Time-period allocations may differ slightly due to rounding.

Alternative F4 (preferred) would clarify the procedures NMFS uses to calculate the ICCAT recommendation regarding the eight percent tolerance for BFT under 115 cm (young school and school BFT). This alternative would have slightly more positive social and economic impacts than the No Action alternative, as it would slightly increase the school size-class BFT quota by approximately 2 mt from the status quota allocation. This alternative would implement the ICCAT recommendation more accurately based on the specific language contained in the recommendation.

In response to public comment, this alternative has been slightly modified from that proposed in the draft HMS FMP. This preferred alternative would maintain, rather than remove, the North/South Angling category dividing line. This alternative may have some positive social and economic impacts attributed to more finite quota management of the recreational BFT fishery, such as NMFS being able to implement different BFT recreational retention limits by geographic area. However, NMFS would require timely BFT landings data from the recreational sector to use this management tool in real-time. If compliance with the current recreational catch monitoring programs improves, the effectiveness of this management tool would increase. Also as recreational catch monitoring programs are improved over time, the effectiveness of this management tool would also likely increase. In the meantime, public comment indicated that maintaining the North/South line would preserve the original intent to ensure reasonable recreational fishing opportunities in all geographic areas without risking overharvest of the Angling category quota.

Conclusion

Alternative F3, sub-alternative F3(c), and alternative F4 are the preferred alternatives under the BFT Quota Management issue. Alternative F3, would amend the management procedures used to establish and adjust the General category time-periods, associated subquotas, as well as geographic set-asides. More specifically, the detailed information regarding the management of the General category, as contained in the 1999 FMP, would be crafted to be more general in nature. The specific details pertaining to management of the General category would be relocated into the regulatory text implementing the consolidated HMS FMP. By moving the specific language from the FMP to the implementing regulations, NMFS would be able to provide consistent time-periods and subquotas, as they would be codified in the regulations, while also gaining the ability to amend these General category time-periods, subquotas, if deemed necessary, in a relative shorter time-frame.

Because ICCAT recommended annual U.S. BFT TACs tend to remain consistent for a multiple year time frame and as the General category baseline quota (calculated from the ICCAT TAC), time-periods, and associated subquotas would be codified in the implementing regulations, the annual BFT specification process would be streamlined as a result of this alternative. The General category subquota allocation percentages would be codified in whole weight, as well as in percentages, the regulatory, environmental, social, and economic analyses conducted for the consolidated HMS FMP would remain relatively consistent and would constitute the supporting documentation for future annual regulatory framework actions specifying the upcoming years BFT quotas, provided the ICCAT BFT TAC recommendation remains consistent. However, if the specific management measures contained in the regulatory text need to be changed, for instance if ICCAT amends the BFT TAC recommendation, then an appropriate analytical document (*i.e.*, EA or EIS, RIR, IRFA, etc.) would need to accompany the proposed and final rule in the regulatory amendment. These analytical documents would replace those that constitute the supporting documentation for future annual regulatory framework actions regarding BFT quota allocations. This alternative is preferred due to the balance it strikes between providing consistent baseline quota allocations and having the flexibility and ability to amend them, if warranted, in a relatively timely fashion. This alternative would also provide positive social and economic impacts to fishermen as they would be able to plan their business activities in advance while the Agency would have the flexibility to adapt to changing fishery conditions.

Sub-alternative F3(c) would remove the New York Bight set-aside allocation and divide the coastwide General category season into five distinct time-periods, June through August, September, October through November, December, and January. The time-periods, and associated subquotas, of this sub-alternative would allocate fishing privileges to further achieve optimum yield without excluding traditional participants in the fishery. Thus, this sub-alternative would establish time-period subquota allocation percentages as follows: 50 percent (June through August), 26.5 percent (September), 13 percent (October through November), 5.2 percent (December), and 5.3 percent (January). This sub-alternative is preferred because it would enhance equity among regional General category participants, given that access to fish varies considerably both temporally and geographically. This sub-alternative is also preferred because it would allocate General category quota based on striking a balance between historical General category BFT allocations, recent BFT landing trends, and the requests contained in the NCDMF Petition for Rulemaking, and there would be no significant social or economic impacts to the fishery as a whole expected as a result of this sub-alternative.

Alternative F4 would clarify the procedure for calculating the ICCAT-recommended eight percent tolerance limit on school size-class BFT for the Angling category quota to be more consistent with the actual language from the ICCAT recommendation and would result in a slight increase of the school size class BFT quota. This alternative would also maintain the North/South Angling category dividing line located at 39º 18 minutes N. latitude (Great Egg Inlet, NJ). This alternative is preferred because it would implement the ICCAT recommendation more accurately based on the specific language contained in the recommendation and it would preserve the original intent of the North/South dividing line as it would provide more equitable geographic and temporal distribution of recreational fishing opportunities by separating each

BFT size-class subquota into two geographical regions, the northern area (allocated 47.2 percent of the size-class subquotas) and the southern area (52.8 percent of the size-class subquotas).

4.3.1.2 Annual BFT Management Measures

As described in Chapter 2, the alternatives considered for amending annual BFT quota adjustment procedures are:

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

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

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

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

Ecological Impacts

One of the conservation and management tools recommended by ICCAT is the use of TAC quotas for a particular species. When the United States accepts an ICCAT recommendation, ATCA provides the Secretary with the necessary authority to implement these binding recommendations. However, no regulation promulgated under ATCA may have the effect of increasing or decreasing any allocation or quota of fish or fishing mortality level to which the United States agreed pursuant to a recommendation of ICCAT.

Alternative F5 (No Action) would implement regulations as outlined in the 1999 FMP. NMFS would conduct an annual rulemaking to allocate ICCAT-recommended baseline BFT quotas, adjust those baseline quotas to account for each domestic quota category's under/overharvests that occurred in the previous fishing year, and establish the General category effort controls for the upcoming fishing year (*e.g.*, an RFD schedule). Under this alternative, NMFS would also be authorized to allocate any remaining quota from the Reserve to cover potential overharvests, consistent with the criteria described in Section 4.3.1.3. The total of the adjusted quotas and the Reserve would need to be consistent with the 20-year ICCAT Rebuilding Program for BFT. These small orders of change, quantified in either numbers of fish or in weight (mt), or time and/or location of harvest, compared to overall U.S. harvest levels as recommended by ICCAT under the 20-year rebuilding program would equate to ecological impacts that would be unlikely to be measurable given the variability in the data used to conduct BFT stock assessments. Additionally, the numbers of BFT harvested from each different size-class would remain consistent with the levels of BFT mortality used in the stock assessment. The under/overharvest accounting procedures contained in this alternative may have some minor

adverse ecological impacts. Specifically, under this alternative, a domestic category could experience excessively slow catch rates in a given fishing year resulting in large amounts of unharvested quota being carried forward from one fishing year to the next, especially if this were to occur in multiple successive years. These rollovers could lead to a quota 'stockpiling' situation in one particular domestic quota category. Stockpiling quota could have implications for the 20-year ICCAT Rebuilding Plan for BFT, as that could allow for excessive pressure or harvest on a particularly sensitive year class.

Alternative F6 (preferred) would codify the ICCAT-recommended U.S. BFT TAC, as well as the domestic allocation percentages and quota equivalents of that TAC, in the regulations implementing the consolidated HMS FMP. The ICCAT BFT quota recommendation is based on the most recent stock assessment of western Atlantic BFT, which in turn incorporates the most up-to-date scientific information submitted annually by its member nations, and typically covers multiple years. This alternative would eliminate the need to allocate the baseline quota to each domestic category every year as the allocation percentages and quota equivalents (in mt) would be codified in the regulations implementing the consolidated HMS FMP, at least until ICCAT alters the U.S. BFT TAC recommendation. NMFS would conduct under/overharvest adjustments annually and may transfer quota among the categories, so long as the results of these actions are consistent with all pertinent ICCAT recommendations, especially the 20-year ICCAT Rebuilding Program for BFT. As the ICCAT-recommended U.S. BFT TAC is based on the most recent scientific data, as incorporated in the western Atlantic BFT stock assessment, and the quota allocations are TACs, NMFS does not anticipate any adverse ecological impacts from this alternative.

This alternative would maintain the default General and Angling category BFT retention limits (described in alternative F1) and would make adjustments to those limits in the annual BFT quota specifications, allowing the public an opportunity to comment on such actions. To provide maximum utilization of the General category quota, NMFS may increase or decrease the daily retention limit of large medium or giant BFT over a range of zero to a maximum of three BFT per vessel. To provide maximum utilization of the Angling category quota, NMFS may increase or decrease the retention limit for any size class BFT or change a vessel trip limit to an angler trip limit and vice versa. NMFS would base any proposed adjustments on the determination criteria discussed in Section 4.3.1.3. NMFS would also maintain the ability to alter the retention limits via an inseason action, if warranted. For further details regarding inseason actions, please see Section 4.3.1.3. These adjustments would be inextricably linked to the available BFT quota and would be consistent with all pertinent ICCAT recommendations, especially the 20-year ICCAT Rebuilding Program for BFT. As the ICCAT-recommended U.S. BFT TAC is based on the most recent scientific data, as incorporated in the western Atlantic BFT stock assessment, and the quota allocations are TACs, NMFS does not anticipate any adverse ecological impacts from adjusting daily retention limits adjustments within the scope outlined above.

Under alternative F6, NMFS may also propose a schedule of RFDs for the upcoming fishing season. Such a schedule would accompany the annual BFT specifications and provide notice of and an opportunity for the public to comment on this type of General category effort control. The number of RFDs proposed could range from zero RFDs to a large number of

consecutive RFDs, blocking out weeks at a time. RFDs, in general, are designed to have positive economic and social impacts, and have neither positive nor negative ecological impacts since they only impact when and where BFT mortality occurs, and not the magnitude. The magnitude of mortality has been dictated by finite quotas established under a 20-year rebuilding plan for BFT and other recommendations by ICCAT. Regulating effort helps achieve optimum yield while considering the social and economic interests of the participants. The limited nature of these effort controls is unlikely to have any differential impacts on the life history or overall biological distribution of the western Atlantic BFT stock. However, it is possible that if too many effort controls are implemented, effort may shift to other species or the pace of the fishery could be slowed to such an extent that the full quota is not attained. This would be contrary to the consolidated HMS FMP and ATCA and any quota underage would be applied to the following year so mortality would only be deferred. Alternatively, if too few effort controls are implemented, it is possible the BFT fisheries would attain their quota rapidly and close prematurely. Fishermen may then turn to other stocks to target, particularly other HMS species, with corresponding impacts to other elements of the ecosystem. However, neither of these scenarios is expected to result from this alternative.

Alternative F7 would have more positive ecological effects, in comparison to the other alternatives, because any underharvests from one fishing year would not carry forward to the subsequent fishing year, thus eliminating the ability for any domestic quota category to 'stockpile' quota. Therefore, this alternative may accelerate the rebuilding plan for western Atlantic BFT, but could ultimately result in adverse ecological impacts if the United States does not fully utilize its ICCAT-allocated TAC. Because the BFT quotas are TACs recommended by ICCAT, it is possible that any unused portion of the U.S. TAC could be reallocated to another member nation. Therefore, this alternative could have some potential adverse ecological impacts in the long-term that would be associated with a reallocation of unutilized U.S. BFT quota to an ICCAT member nation that does not have comparable conservation measures to those of the United States. For instance, a portion of the U.S. BFT TAC could be reallocated to a member nation that has a higher level of interaction with protected resources or has not taken equivalent steps to minimize bycatch.

Alternative F8 (preferred) may reduce potential adverse ecological impacts as it would allow the Agency to limit the amount of unharvested quota a category could carry from one fishing year to the next. This alternative would allow NMFS to curtail excessive amounts of BFT quota from accumulating in any particular domestic quota category due to multiple successive years of underharvest and therefore, may curb the likelihood of a 'stockpiling' situation. This alternative would authorize NMFS to redistribute quota exceeding the 100 percent rollover cap to the Reserve or to other domestic quota categories, if deemed necessary, provided the redistributions are consistent with ICCAT recommendations and the criteria in Section 4.3.1.3. NMFS received public comment concerned about transferring quota from one category to the Reserve, which eventually may be transferred to yet another category that harvests BFT within a different size range than the original category. One metric ton of BFT equals many more fish within the school size range than one metric ton in the giant size class. Therefore, to avoid any potential adverse ecological impacts that may occur, quota origin may need to be tracked to ensure the level of mortality is consistent with those accounted for in the stock assessment. This alternative would provide reasonable fishing opportunities to harvest the

ICCAT-recommended U.S. BFT TAC as close to the timeframe it was originally intended to be harvested and may reduce the likelihood of reallocating U.S. BFT quota to another member nation that does not have comparable conservation measures (see discussion under alternative F7).

Social and Economic Impacts

Alterative F5 (No Action) would maintain the status quo process used to allocate the ICCAT-recommended U.S. BFT TAC domestically, accounting for annual under/overharvest, and establishing General category effort controls. This alternative is unlikely to have any substantial immediate social or economic impacts given that these processes have been in place since prior to the implementation of the 1999 FMP. However, NMFS received public comment in the past regarding the timing of annual BFT specification publication and that administrative or other delays in publishing the annual BFT specifications can have adverse social and economic impacts due to constituents inability to make informed business decisions. Under this alternative, the annual BFT quota specifications would establish baseline domestic quota category allocations, as well as adjust those allocations based on the previous years under/overharvest. Any delay in publishing the annual BFT quota specifications would prolong the establishment of a baseline quota in any of the domestic categories.

Alternative F6, a preferred alternative, would have slightly more positive social and economic impacts, in comparison to alternative F5, as each baseline domestic quota category allocation, quantified in metric tons (not just the percentage of the U.S. BFT TAC) would be codified in the regulatory text implementing the consolidated HMS FMP. Therefore, each established domestic user group would have a quantifiable amount of quota available for harvest at the start of each fishing year (Table 4.64) and the filing and publication of the final annual BFT specifications would not be required to establish the baseline quotas. These baseline quotas would remain consistent from one year to the next, until ICCAT amends the recommendation regarding western Atlantic BFT TACs. If and when ICCAT amends its recommendation regarding western Atlantic BFT TACs, NMFS may need to undertake rulemaking to analyze the impacts associated with the revised recommendation and would codify the results, as they apply to each domestic quota category allocation, in the regulations. This alternative would still require NMFS to conduct an annual rulemaking to account for the previous years under/overharvest, but would provide some level of stability regarding baseline quota availability for each fishing year. This alternative would also establish General category effort controls and establish daily retention limits for the Angling and General categories and any associated time frames in the annual framework action.

This alternative would maintain the default General and Angling category BFT retention limits and would propose adjustments to those limits in the annual BFT quota specifications to provide notice of, and an opportunity for the public to comment, on these sort of actions. To provide maximum utilization of the General category quota, NMFS may increase or decrease the daily retention limit of large medium or giant BFT over a range of zero to a maximum of three BFT per vessel. To provide maximum utilization of the Angling category quota, NMFS may increase or decrease the retention limit for any size class BFT or change a vessel trip limit to an angler trip limit and vice versa. NMFS would base the proposed adjustments on the determination criteria discussed under Section 4.3.1.3 and would maintain the ability to alter the

retention limits via an inseason action, if warranted. For further details regarding inseason actions, please see Section 4.3.1.3.

Under this alternative, NMFS may propose a schedule of RFDs that may be implemented for the upcoming fishing season. Such a schedule would accompany the annual BFT specifications and provide notice of, and an opportunity for the public to comment on, this type of General category effort control. The proposed RFD schedule could range from zero RFDs to a large number of consecutive RFDs, blocking out weeks at a time. In the past, when catch rates have been high, implementing more RFDs has had positive economic impacts by avoiding market gluts and providing access to higher quality fish later in the season. Positive social impacts have also occurred as fishermen have commented that knowing the exact schedule of RFDs prior to the season facilitates planning and scheduling of trips. However, if catch rates are slow and a large amount of RFDs hinder the ability to harvest a time-period subquota, waiving RFDs in mid-season can cause confusion and disrupt fishermen's activity and, although information regarding the canceling is widespread over various electronic and paper media, there may be some negative social impacts as a result. Under this alternative, NMFS would maintain the authority to add or waive RFDs if deemed necessary.

To streamline the annual rulemaking, NMFS would analyze baseline allocations and the range of possible under/overharvests that could occur from the previous years fishing activity (see alternative F8) in the analytical supporting documents of the consolidated HMS FMP. This alternative would have positive social and economic impacts to the domestic BFT fishery as a whole by allowing commercial and recreational BFT fishery participants to make informed decisions on how best to establish a business plan for the upcoming season as well as helping to achieve optimum yield from the BFT fishery.

Alternative F7 would have the most adverse social and economic impacts of all the alternatives considered for this issue. Under this alternative, NMFS would not carry forward unharvested quota from one fishing year to the next. This could result in a perception that domestic quota categories are being penalized for not harvesting their allocated quota in the time provided and may lead to derby style fishing, causing vessels to operate in less than optimal conditions. This alternative could also result in a domestic quota category not receiving a quota transfer from another domestic quota category with large amounts of underharvest to assist in covering an overharvest situation, which could result in quota deducted from that category in the following year. This could result in reduced fishing opportunities, income, and angler consumer surplus for the commercial and/or recreational fleet, as well as the businesses that support those BFT fisheries. This alternative would have adverse social and economic impacts attributed to potential BFT quota reallocations at the ICCAT level, as discussed in the ecological impacts section of this issue.

Alternative F8, a preferred alternative, would have both slightly positive and negative social and economic impacts on BFT fishery participants. Under this alternative, each domestic quota category would be limited in the amount of unharvested quota carried forward from one fishing year to the next. This limit, or cap, would in turn limit the amount of revenue each domestic quota category could generate to no more than the value associated with double the baseline allocation (Table 4.64). These potential adverse economic impacts may be mitigated,

overall, by reallocating the tonnage that exceeds the 100 percent cap to the Reserve or to another domestic quota category using the criteria stipulated in Section 4.3.1.3. In addition, this alternative would not preclude the NMFS from transferring additional quota from the Reserve back to a category that has reached the rollover limit via an inseason action, if warranted.

Table 4.64 Alternative F8: Gross revenues associated with the proposed rollover cap of 100 percent of the baseline quota allocation.

Category	Baseline quota allocation *	Roll-over allotment	Total Potential Annual Quota (mt)	Total Potential Annual Quota (lb)	Average Ex-vessel price (99-04)	Total Potential Gross Revenues
General	689.8	689.8	1,379.6	3,041,466	7.17	$21,807,311.22
Harpoon	57.1	57.1	114.2	251,765	7.17	$1,805,155.05
Purse Seine	272.4	272.4	544.8	1,201,066	4.99	$5,993,319.34
Longline	118.6**	118.6**	237.2	522,931	6.18	$3,231,713.58
Trap	1.5	1.5	3.0	6,614	N/A	N/A
Angling	288.6	288.6	577.2	1,272,495	N/A	N/A

*Based on current ICCAT-recommended U.S. BFT TAC
** Does not include the NED Statistical set-aside annual allocation of 25 mt.
N/A = Not Available

Conclusion

Alternatives F6 and F8, are the preferred alternatives because F6 would revise the annual BFT quota specification process so the supporting analytical documents of the consolidated HMS FMP would be referred back while F8 would establish the authority to implement an individual quota category carryover limit of 100 percent of the baseline allocation, except for the Reserve category, and authorize the transfer of quota exceeding the 100 percent limit to the Reserve or another domestic quota category, while maintaining status quo overharvest provision. Under alternative F6, each baseline domestic quota category allocation, quantified in metric tons (not just the percentage of the U.S. BFT TAC) would be codified in the regulatory text implementing the consolidated HMS FMP. Therefore, each established domestic user group would have a quantifiable amount of quota available for harvest at the start of each fishing year and the filing and publication of the final annual BFT specifications would not be required to establish the baseline quotas. These baseline quotas would remain consistent from one year to the next, until ICCAT amends the recommendation regarding western Atlantic BFT TACs, at which time the impacts to the new recommendation would need to be analyzed. Alternative F8 would allow NMFS to curtail excessive amounts of BFT quota from accumulating in any particular domestic quota category due to multiple successive years of underharvest and therefore, may curb the likelihood of a ‘stockpiling’ situation.

These alternatives were preferred because they would provide participants in the BFT fishery a timely and stable baseline quota allocation from one year to the next, the Agency the ability to address under/overharvests from the previous year, the ability to establish the General category effort controls as well as recreational and commercial handgear daily retention limits for the upcoming season, and streamline the annual rulemaking process. Additionally, they would provide NMFS the authority to implement a cap on the amount of quota that a category may carry forward from one fishing year to the next would allow NMFS to manage the harvest

of BFT with more finite precision and minimize the occurrence of 'stockpiling' in any one quota category.

4.3.1.3 Inseason Actions

As described in Chapter 2, the alternatives considered for amending inseason action procedures are:

F9 Maintain inseason action procedures (No Action)

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

F11 Eliminate BFT inseason actions

Ecological Impacts

Alternatives F9 and F10 would both authorize NMFS to perform inseason adjustments which may include, but would not be limited to, quota transfers between categories, adjustments to daily retention limits, and interim closures of a fishery when deemed necessary. Under these alternatives, NMFS would consider numerous criteria in making a determination, consistent with the objectives of the ICCAT recommended 20-year rebuilding plan, Magnuson-Stevens, ATCA, and the consolidated HMS FMP. As the criteria outlined in this section encompass the objectives of the consolidated HMS FMP, NMFS anticipates neutral ecological impacts from these two alternatives. The consolidation of the criteria considered prior to implementing an inseason adjustment was generally supported by the public comments on the Draft Consolidated HMS FMP.

Under alternative F11, NMFS would not perform any inseason actions, which could result in some negative ecological impacts. For instance, NMFS would not curtail daily retention limits or impose interim closures if BFT catch rates were high, which could lead to premature closures or overharvests in a particular domestic quota category, thus leading to negative ecological impacts. Conversely, catch rates may be slow, which could lead to unharvested quota and excessive quota rollovers from one year to the next, or in the case of General category subquotas, from one time-period to the next, which could lead to a ‘stockpiling situation and therefore potential adverse ecological impacts.

Social and Economic Impacts

Under alternatives F9 and F10, NMFS would conduct inseason management actions, consistent with the determination criteria described in Section 4.3.1.3, which would allow for the flexibility to better meet the objectives of the consolidated HMS FMP, ICCAT recommendations, Magnuson-Stevens Act, and ATCA in a more responsive fashion. Both of these alternatives would allow the Agency to adapt management measures to the inherent variability in the BFT fishery, and thus provide for maximum utilization of the BFT quota. NMFS would have the ability to adjust the daily retention limits in the domestic quota categories with the highest participation rates, namely the Angling and General categories, and to provide fishery participants an opportunity to harvest a portion of their respective quotas while those fish are available, thereby providing reasonable fishing opportunities to those participants. These

alternatives would also allow the Agency to curtail effort, if warranted, either by restricting retention limits or imposing an interim closure to help facilitate reasonable fishing opportunities for all participants across temporal and geographic differences.

For instance, NMFS may adjust the General category daily retention limit between a range of zero and three BFT per vessel per day/trip. When catch rates are low, as they have been in the early portion of the season over the last few years, a liberalized retention limit of two or three fish may have positive social and economic impacts on a vessel that is able to harvest multiple fish, due to the limited supply of U.S. fish on the market at that time. Some of the highest ex-vessel prices have occurred during this time-period when catch rates were slow. Providing a multiple fish retention limit may also assist in offsetting operating costs when there is a long steam time to and from the fishing grounds. Fishermen are able to remain on the fishing grounds longer, and in some cases overnight, instead of running long distances on a daily basis if they are allowed to retain multiple fish. Having the ability to liberalize the daily retention limit also has some potential adverse social and economic impacts as well. For example, if catch rates were to increase dramatically over a short period of time while the retention limits were set at the upper end of the allowable range, large numbers of BFT could be landed in a short time period, thus flooding the market and depressing ex-vessel prices, and harvesting the quota at an accelerated rate. Another potential adverse impact linked to having the ability to adjust these retention limits is the inability to accurately forecast when and for how long the adjustments should be effective. Therefore, NMFS must remain diligent in monitoring the BFT fishery as close to real time as possible.

In regard to the Angling category retention limits, both positive and negative social and economic impacts could be associated with having the flexibility to adjust them inseason, similar to the General category. There may be positive impacts associated with liberalizing the daily retention limits, either by angler, by vessel, or vessel type, due to the enhanced fishing opportunities that would be associated with the increase in retention limits. In past years, NMFS has received comments from the HMS CHB sector that increased retention limits provide additional incentives for individuals to book charters, because the charter party would have the opportunity to retain more fish for the same amount money spent on the charter itself. For those privately owned and operated recreational vessels, a liberalized retention limit also provides some additional incentive to target BFT, due to an increase in Angler Consumer Surplus (ACS) by increasing the amount of BFT that could be retained in relation to the costs incurred running offshore (*i.e.*, in terms of fuel, bait, food, etc.). Potential adverse impacts may be associated with lowering/constraining retention limits or imposing an interim closure to ensure anglers in different temporal or geographical areas are not precluded from a reasonable opportunity to harvest a portion of the Angling category quota. Another potential adverse impact related to having the ability to adjust these retention limits is the inability to accurately predict catch rates and in turn forecast when and for how long the adjustments should be effective. This is especially true when charter trips are booked at a time when more liberal retention limits are in place but are restricted prior to the actual date the trip is taking place. Therefore, NMFS must remain diligent in monitoring the BFT fishery as close to real time as possible.

Therefore, both alternatives F9 and F10 could have both positive and negative economic and social impacts on BFT fishery participants due to the ability to adapt regulations inseason to

meet the objectives of the consolidated HMS FMP and the inherent inability to foresee when a change should take place. Alternative F10 would have slightly more positive economic and social impacts as the criteria NMFS would consider when making an inseason action would be consolidated and consistent, regardless of what type of inseason action is under consideration. This consolidation would minimize confusion regarding how NMFS came to a decision, and thereby provide additional transparency to the management process.

Alternative F11 would constrain NMFS' ability to adjust management actions affecting the BFT fishery and could impact the ability to fully meet the objectives of the consolidated HMS FMP, one of which is providing reasonable fishing opportunities. Fishery participants would experience positive social and economic benefits by knowing that quota allocations and daily retention limits were to remain stable throughout the entire season, which would aid in planning fishing activities. However, participants would also experience adverse social and economic impacts attributed to the limitations imposed on NMFS in providing for maximum utilization of the BFT quota spread over the longest period of time (*i.e.*, limits would need to be more restrictive than under alternatives F9 and F10 to ensure quotas were not exceeded).

Conclusion

Western Atlantic BFT are overfished, and one of the main objectives of the consolidated HMS FMP is to end overfishing and rebuild overfished stocks, while providing reasonable fishing opportunities to harvest the limited quota that is available under the BFT rebuilding plan. Consolidating and refining the criteria that NMFS would consider prior to conducting any inseason, and some annual, actions would assist in meeting the consolidated HMS FMP's objectives in a consistent manner, providing reasonable fishing opportunities, increasing the transparency in the decision making process, and balancing the resource's needs with users' needs. Therefore, alternative F10 is the preferred alternative for this issue.

4.3.2 Timeframe for Annual Management of HMS Fisheries

As described in Chapter 2, the alternatives considered to change the annual management timeframe for HMS fisheries are listed below, and depicted in Table 4.65:

G1 Maintain the current fishing year for all HMS (No Action)
G2 *Shift the fishing year to January 1 – December 31 for all HMS - Preferred Alternative*
G3 Shift the fishing year to June 1 – May 31 for all HMS

Table 4.65 Fishing years by HMS proposed for Alternatives G1-G3.

HMS	Fishing Year		
	Alternative G1 (No Action)	**Alternative G2 (Preferred)**	**Alternative G3**
Tuna	June 1 – May 31	January 1 – December 31	June 1 – May 31
Sharks	January 1 – December 31	January 1 – December 31	June 1 – May 31
Swordfish	June 1 – May 31	January 1 – December 31	June 1 – May 31
Billfish	June 1 – May 31	January 1 – December 31	June 1 – May 31

Ecological Impacts

The three alternatives for changing the annual management timeframe for HMS fisheries are given in Table 1. This action would be largely administrative and each alternative considered would have a minimal ecological impact. From a long-term perspective, the amount of fish harvested and resultant fishing effort would not be expected to change overall. However, there could be some short-term, minor ecological impacts.

The migratory nature of HMS stocks results in seasonal availability in different geographic regions. If a quota is harvested before the end of a fishing year, the geographic area where the fish would normally be located at the end of the fishing year would be expected to experience less fishing effort. Thus, if sensitive life stages such as spawning adults or limited year classes are concentrated in geographic areas that are not fished because a quota is harvested, in general, the stock could experience a positive impact. The converse could also hold true – if a sensitive year class or life history stage were concentrated in a geographic area open to fishing at the beginning of a fishing year, in general, negative impacts to the stock could occur.

HMS stocks that are limited by quotas (BFT, albacore tuna, swordfish, sharks) or subject to catch limits (white and blue marlin) could potentially be impacted in this way. However, for each of these fisheries, there are mitigating circumstances that minimize the potential for these impacts. Neither the albacore tuna nor the swordfish fisheries have been harvesting the entire available quota, so these fisheries have remained open throughout the season. A change in the fishing year should have no impact unless there are changes in these fisheries that would increase landings. BFT, swordfish and sharks are highly regulated with temporal and/or geographic subquotas, intended in part to spread these fisheries out over the entire fishing year and range of the fishery. In addition, the sensitive life stage of spawning BFT in the Gulf of Mexico is already highly regulated.

For blue and white marlin, the ICCAT 250 marlin catch limit proposed to be codified under preferred Alternative E6 has rarely been reached historically. Thus, barring unanticipated and significant changes in recreational fishing effort or practices, these fisheries are expected to continue throughout the year without the need for inseason management actions to increase the minimum size limit, and/or implement catch-and-release restrictions, as per preferred alternative E6. In the unlikely event that a threshold for implementation of these management measures is reached, there is little information available to show that sensitive life stages or year classes of these species are more or less available in different geographic regions. Thus, NMFS does not expect any negative or positive impacts to target species from this perspective as a result of any of the alternatives (G1-G3) considered for this action.

In addition, since this action is largely administrative, few impacts are expected to non-target species, including finfish and protected species, and no impacts would occur to EFH. There is a limited potential for some minimal reduction in fishing effort or minimal shift in fishing effort from targeting marlin to targeting some other species as a result of any of the Alternatives (G1-G3) in combination with implementing a management measure under Alternative E6. If an overall reduction in fishing effort occurred, a small positive ecological impact to non-target species could result under Alternatives G1-G3. This potential minimal positive ecological impact would be expected to be slightly higher under Alternative G2

(preferred alternative) since the number of days that management measures under Alternative E6 are projected to be in place, and thus the number of days that effort could be reduced, would be greater (*e.g.* August 22- December 31 under Scenario 2 or August 25 – December 31 under Scenario 3) than for Alternatives G1 and G3 (*e.g.*, May 3-31 under Scenario 2 or May 12-31 under Scenario 3). See the discussion of social and economic impacts under Alternative E6 in Section 4.2.3 for a description of the scenarios and analyses.

Some small negative impacts could result for non-target species from a shift in fishing effort under each of the Alternatives (G1-G3) in combination with Alternative E6; however, the species and amount of impacts are currently not quantifiable. Contrary to the previous discussion, impacts could be slightly higher to non-target species if a shift in effort to non-HMS species occurred under Alternative G2, since the management measures are expected to be in effect for a longer duration. However, for both these discussions, it is important to remember that it is impossible to predetermine fisherman behavior and that overall impacts are not quantifiable at this time, but are expected to be small.

Alternative G2 would also include implementation of an abbreviated fishing year for BFT and swordfish, which would provide the entire 2007 quotas for harvest from June-December of 2007 (Table 4.67). This compressed fishing year differs from the compressed fishing year described in the Draft HMS FMP by the year in which it would occur. Because the comment period was extended, the compressed fishing year would occur in 2007 rather than 2006 as described in the Draft HMS FMP. The compressed fishing year would allow the ability to harvest quota that is usually harvested from January through May during the period June through December. As noted above, this would be in addition to what is usually harvested from June through December. Although it may appear that fishing effort would be elevated during this compressed six month fishing year as compared to a twelve month fishing year, NMFS expects that this will not be the case. This is illustrated by the average cumulative percentage of BFT that is usually commercially harvested from January through May, which is only 4.3 percent of the overall annual commercial landings (in number of fish, Table 4.66). In addition, the annual quota specification process for both swordfish and BFT allow a roll-over of any unharvested quota from year to year. There could be some small increase in adverse ecological impacts to non-target species from the small increase in fishing effort that could accompany the additional 4.3 percent of BFT quota harvested during the last six months of a calendar year, but it is unlikely that these impacts would vary perceptibly from those that would occur during a twelve month fishing year. Since swordfish fisheries are currently not harvesting the entire annual swordfish quota, the availability of additional quota during a certain time-period would only have minimal effects.

Table 4.66 Average number of commercially harvested BFT by month for 1999-2004. Data source: NERO BFT landings database.

	MONTH (1999-2004)												
	Jan	**Feb**	**Mar**	**Apr**	**May**	**Jun**	**Jul**	**Aug**	**Sep**	**Oct**	**Nov**	**Dec**	**Total**
No. of Fish	66	26	39	50	41	222	547	1014	1579	1214	126	311	5235
% by Month	1.3	0.5	0.7	1.0	0.8	4.2	10.4	19.4	30.2	23.2	2.4	5.9	100
% Cum.	1.3	1.8	2.5	3.5	4.3	8.5	18.9	38.3	68.5	91.7	94.1	100	100

Similarly, Alternative G3 would require a bridge period from January 1, 2008 through May 31, 2008 for sharks, as the shark management cycle would change to a fishing year under this non-preferred alternative. The bridge period would require that the 2007 quota for sharks be stretched to cover an additional six months. This could result in small positive ecological impacts for sharks on a short-term basis, since the overall harvested quota during calendar year 2007 would be slightly reduced. In addition, Alternative G3 would include consideration of shark pupping seasons during development of new quota trimesters in order to avoid negative ecological impacts. A small reduction in directed shark fishing effort could also result in a small reduction in adverse ecological impacts to non-target species in the form of bycatch, but some impacts to finfish could increase if fishing effort were shifted to other species.

Social and Economic Impacts

The "No Action" alternative (G1) would maintain the fishing years for all HMS species that are currently in place (Table 4.65). This alternative is expected to maintain the current level of compliance with regulations and minimize short-term constituent confusion since nothing would change. In addition, Alternative G1 would not result in any anticipated disruption to any of the HMS markets.

Alternative G1 would maintain the current annual shark management cycle, as established in the first shark FMP (1993). If ICCAT should become more involved in shark management, Alternative G1 would provide consistent timing for U.S. domestic and international shark management programs since ICCAT manages on a calendar year cycle. However, this current management regime may be slightly more arduous for fishermen targeting more than one HMS in the long term since sharks are managed on a different timeframe than other HMS, and fishermen would have to be familiar with several administrative calendars including more than one management cycle.

Alternative G1 would continue to allow approximately six months between the annual adoption of ICCAT recommendations (typically in November) and initiation of the fishing year for tuna, swordfish, and billfish on June 1. This six month window was intended to provide time to implement necessary changes to domestic management measures to comply with international obligations. It also allowed time for the affected fisheries to anticipate changes to the management program and adjust fishing activities as needed. However, under this "No Action" alternative, U.S. domestic fishery reporting occurs on a June 1 – May 31 fishing year basis for tunas, swordfish, and billfish, while most ICCAT nations report on a calendar year basis. This situation results in complex U.S. reports to ICCAT, with a confusing structure of analyses in the U.S. National Report. Due to the complexity in reports to ICCAT, the United States' negotiating position during international compliance reviews may be weakened.

As described previously under the ecological impacts section, when a fishery has a finite quota or catch limit, its start date (as well as other factors) can impact quota availability during periods of peak market demand and effort, and the availability of quota for fisheries that occur later in the season. For example, maintaining swordfish management with a June 1 start date would ensure the availability of ample quota for harvest during the summer market. However, since the U.S. fishery is not currently harvesting its full quota, ample swordfish quota is expected

to be available year-round. BFT and sharks are highly regulated with subperiods and subquotas which greatly reduce the potential for negative impacts to fisheries at the tail end of the season.

As described previously, the only quota/catch-limited fishery that could potentially be impacted by harvesting the quota/reaching a catch limit is the fishery for white and blue marlin under the ICCAT 250 limit (Alternative E6). Socio-economic impacts to Atlantic billfish fisheries as a result of moving to a calendar year management cycle (Alternatives G1 and G3) would vary slightly depending upon the management measures chosen for the directed billfish fishery (Section 4.2.3). Specifically, each option under Alternative E6, which would codify an ICCAT-recommended recreational landings limit for white and blue marlin, could result in minor to moderate negative impacts to billfish fisheries that occur at the tail-end of the management cycle. Fisheries and tournaments for billfish that occur early in the fishing year should have sufficient quota available, but tournaments scheduled for later in the fishing year could be negatively impacted if a management threshold is reached and restrictions are implemented before the tournaments occur. As discussed under Alternative E6, once activity within the fishery indicates that more restrictive management measures are necessary (*i.e.*, a management threshold for action is achieved), a restrictive measure would be triggered which would impact marlin fishing for the rest of the year (management period). Discussion in Section 4.2.3 under Alternative E6 explains potential impacts to billfish fisheries managed under a fishing year (*i.e.*, Alternatives G1 and G3) for three scenarios, briefly summarized below. Please see Section 4.2.3 for the full discussion of this analysis. As discussed in Section 4.2.3, historical marlin landings rates show that it is unlikely that the 250 marlin limit will be reached, or that any inseason management actions will be necessary.

Under Scenario 1, when the threshold for inseason management action is not achieved, there would be no management action and, as a result, no impact. In Scenario 2, the threshold for an inseason minimum size increase is achieved. During a fishing year management cycle, inseason size limit increases were projected to potentially occur on May 3. This would leave 28 days of fishing that would operate under an increased size limit for blue and/or white marlin, as determined by NMFS, and could impact approximately 25 tournaments (see Section 4.2.3 for more detail). Under Scenario 3 for a fishing year management cycle, a catch and release fishery was projected to be implemented on May 12, leaving 19 days left in the season and the potential closure of approximately one tournament (see Section 4.2.3 for more detail).

The preferred alternative (G2) would manage all HMS species on a fishing year cycle from January 1-December 31 (calendar year). This would maintain the status quo in the shark management year cycle established in the first shark FMP (1993). Thus, Alternative G2 would not be anticipated to have any social or economic impact on the shark fishery because it currently operates on a calendar year basis.

Use of a consistent calendar year across HMS fisheries would create a less complex management regime for all constituents, and as a result, could potentially increase compliance. In particular, this alternative would reduce confusion overall for constituents participating in a combination of HMS fisheries, although initially there could be some short-term confusion as tuna, swordfish, and billfish quotas and annual Atlantic tunas, HMS CHB, and HMS Angling vessel permits are adjusted to a calendar year basis.

ICCAT recommendations become effective six months after they are adopted. In most cases, this would be in May of the year following the November ICCAT meeting. Thus, Alternative G2 may result in some negative social and economic impacts if ICCAT-related regulations are not in place prior to the start of the fishing year. Since swordfish and billfish landings are relatively low for the first few months of the calendar year, these fisheries would not be impacted, but the January BFT fishery may be over before any changes to the regulations as a result of ICCAT recommendation are implemented. This could negatively impact constituents participating in the January fishery because any ICCAT recommendations with positive impacts may not be in place yet. Conversely, ICCAT recommendations with negative impacts may not be in place, either. Setting annual quotas and other fishery specifications on a multi-year basis, as preferred for the BFT fishery in Section 2.3.1.2, and re-allocating the BFT subquota time-periods (Section 2.3.1.1) could mitigate the potential negative impacts.

Alternative G2 would establish consistent management year cycles for U.S. domestic and international (ICCAT) management programs, which would reduce the complexity of U.S. reports to ICCAT and create more transparent analyses in the U.S. National Report. Reducing complexity in reporting to ICCAT would strengthen the United States' negotiating position during international compliance review.

An abbreviated 2007 fishing year, from June 1, 2007 through December 31, 2007, would be necessary to transition BFT and swordfish from the current fishing year to a calendar year. A transition fishing year is not necessary for marlin since a quota/catch limit is not currently codified, and the calendar year management cycle for marlin would be codified for the first time on January 1, 2007. The Draft Consolidated HMS FMP stated that the abbreviated fishing year for BFT and swordfish would occur in 2006; however, since the initial comment period for this action was substantially extended, it is necessary to shift the abbreviated fishing year from 2006 to 2007 in the final action.

The 1999 FMP switched management of Atlantic tunas and billfish from a calendar year to a fishing year by stretching the 1998 BFT quota through the entire calendar year of 1998 and on through to May 31 of 1999 (Table 4.67). Likewise, a 1996 action shifted swordfish from a calendar year to a fishing year by stretching the 1995 swordfish quota through to May 31, 1996 (61 FR 27304). Thus, NMFS believes it is appropriate to use the full ICCAT 2007 BFT and swordfish quotas during the 2007 abbreviated fishing year. The quotas for these fisheries would be established by the specification process in a separate rulemaking action.

Since BFT and swordfish fisheries are already strictly managed with seasons, size limits, and subquotas, any general impacts as a result of the abbreviated fishing year are expected to be minor. NMFS anticipates minor positive socio-economic impacts to BFT fisheries specifically from the abbreviated fishing year. Having access to the full 2007 quota within a seven month time period could provide a small economic benefit to all BFT fisheries, and may offset any negative socio-economic impacts that occurred when these fisheries were previously shifted from a calendar year to a fishing year and annual quotas were stretched to last 18 months (Table 4.67). In addition, as mentioned under the ecological impacts section, the vast majority of the BFT quota is harvested during June through December (Table 4.66), and any quota that is not

harvested during the abbreviated fishing year can be rolled over into the following year. Impacts to swordfish fisheries are expected to be less since swordfish fisheries have not been fully harvesting the entire annual quota in recent years.

Table 4.67 Graphic representation of the distribution of U.S. domestic BFT quota by year.

ICCAT Quota Yr*	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1997												
1998												
1999												
2000												
2001												
2002												
2003												
2004												
2005												
2006												
2007												
2008												
2009												

*ICCAT Quota yr. = the year following the annual special meeting of ICCAT (usually held in November).

Overall socio-economic impacts to BFT fisheries from Alternative G2 are anticipated to be minimal. As discussed earlier, sectors of the BFT fishery are highly regulated, and time-period subquota allocations and inseason management measures are used to distribute the quota throughout the fishing year, based on guidelines established at 50 CFR 635.27 and 635.28. These guidelines include consideration of the ability of fishery participants in all geographic areas to participate in the fishery; thus, these regulations minimize any potential negative impacts to fisheries at the tail-end of the management cycle. Under the current regulations, the sub-allocation for the winter General category fishery extends between two calendar years from October to January (see Section 2.3.1.1, Alternative F1), and thus an adjusted time-period subquota is necessary to work with this alternative. The subalternatives under Alternative F3 (Section 2.3.1.1) for the BFT fishery address this concern by providing separate time period subquotas for December and January.

During the public comment period, several commentors expressed concern about the effect of a calendar year management cycle on the availability of General category quota rollover from the previous calendar year during the January portion of the south Atlantic fishery. Under changes to the BFT management program included in this Consolidated HMS FMP, the January subperiod would be provided with a quota of 5.3 percent of the annual ICCAT allocation. The HMS regulations at 50 CFR 635.27 state that NMFS will adjust General category subperiod quotas based on under- or overharvest during the previous subperiod. However, the concern relates to the rollover of under- or overharvest from one subperiod to the next between fishing years. The situation of having an active fishery occurring across the change of quota years did not occur prior to the 1999 FMP, which originally adjusted the BFT fishery to a fishing year management cycle. There are several potential scenarios that could occur regarding the disposition of carryover of any under or overharvest that accrues during the December subperiod. In the first scenario, any under or overharvest could be fully rolled over into January of the

following fishing year in addition to the baseline 5.3 percent. Under this scenario, the entire underharvest would be added to the January subperiod quota, or the entire overharvest would be subtracted from the subperiod quota. In another potential scenario, 5.3 percent of the under- or overharvest would be applied to the January subperiod in addition to the baseline 5.3 percent. In a third scenario, no under- or overharvest would be applied in addition to the January subperiod 5.3 percent allocation. NMFS will work with the affected constituents through the annual BFT specification process to determine the most appropriate approach based on constituent needs and Federal requirements.

Socio-economic impacts to Atlantic billfish fisheries as a result of moving to a calendar year management cycle (Alternative G2) would vary slightly depending upon the management measures chosen for the directed billfish fishery, similar to the discussion regarding socio-economic impacts from the fishing year management cycle addressed previously. These impacts are addressed in detail in Section 4.2.3, and a brief summary is included here. Each option under preferred Alternative E6, which would codify an ICCAT-recommended recreational landings limit for white and blue marlin, could result in minor to moderate negative impacts to billfish fisheries that occur at the tail-end of the calendar year management cycle, if recreational landings substantially increase from current levels. Fisheries and tournaments for billfish that occur early in the calendar year should have sufficient catch available, but tournaments scheduled for later in the calendar year could be negatively impacted if a management threshold is reached and restrictions are implemented before the tournaments occur. As indicated in Section 4.2.3, available historical data indicate that it is unlikely that the United States will achieve the 250 limit, and thus unlikely that any of the potential impacts would occur.

The same three scenarios discussed previously under the fishing year management cycle were analyzed to estimate impacts during a calendar year management cycle (see Section 4.2.3 for detailed information). Under Scenario 1, when the threshold for inseason management action is not achieved, no impacts are anticipated. Under Scenario 2, the threshold for an inseason minimum size increase is projected to occur on August 22 and would be expected to be in place for the remainder of the calendar year. Since the inseason action would be in place for a longer period of time under a calendar year management cycle than under a fishing year management cycle, any adverse impacts would be expected to be larger for a calendar year. Under Scenario 3, catch and release fishing was projected to be reached on August 25. Under the assumptions of the analysis, this could potentially result in cancellation of a maximum of four tournaments. See Section 4.2.3 for a full discussion of this analysis.

Alternative G3 would establish a June 1 – May 31 fishing year management cycle for all HMS species (Table 4.65). As with Alternative G2, Alternative G3 would establish a consistent management cycle for all HMS fisheries, resulting in a less complex management regime for all constituents. In particular, this alternative would reduce confusion for constituents participating in a combination of HMS fisheries. While initially there could potentially be short-term confusion as the shark quotas, trimesters, and permits are adjusted to a fishing year basis, overall the HMS management regime would be less complex. A bridge period, from January 1, 2007, through May 31, 2007, would be established to transition the Atlantic shark fishery from a calendar year to a fishing year. Establishing consistent management cycles for all HMS fisheries

would simplify the regulations, making them easier to understand and potentially increasing compliance.

In general, Alternative G3 would have the same impact to the seasonal availability of quota for tunas, swordfish, or billfish fisheries and tournaments as the No Action alternative, since there would be no change to the management cycle for these species. In addition, maintaining the current start dates for the tunas, swordfish, or billfish fisheries would not result in any anticipated disruption in any of these current markets or fishing activities. Alternative G3 could result in some short-term negative economic impacts as shark wholesale and retail markets adjust to the potential disruption in catch rates resulting from the shift to a fishing year and new trimesters.

Under Alternative G3, U.S. domestic fisheries data would be managed on a fishing year basis while most ICCAT nations report on a calendar year basis. ICCAT may become more involved in shark management in the future, at which time, if Alternative G3 is selected, the HMS management cycle for all fisheries would be inconsistent with ICCAT's calendar year reporting. The inconsistent management timeframe would make the structure of analyses in the U.S. National Report confusing and less transparent. The basis for taking assertive action during the international compliance review may be compromised by the inability to interpret the United States' compliance from its own report.

On a fishing year management cycle, approximately six months are available between the adoption of ICCAT recommendations and initiation of the fishing year. Thus, it is more likely that NMFS could complete the regulatory implementation process before the start of the fisheries. As in the current tuna, swordfish and billfish fisheries, NMFS would have six months to implement necessary changes to domestic management measures to comply with international obligations, and the fishery would be able to anticipate changes to the management program and adjust fishing activities as needed.

Conclusion

The preferred alternative is Alternative G2, transferring all HMS fisheries to a calendar year management cycle. The calendar year would be effective for billfish fisheries on January 1, 2007 and for all species other than sharks on January 1, 2008. This alternative is preferred because it would simplify the regulatory process for constituents in the long term by managing all HMS fisheries on a calendar year, and would improve the United States' basis for negotiation at international forums. The primary concern regarding this alternative would be potential impacts to the billfish fishery when examined in combination with the potential implementation of the ICCAT 250 landings limit (Alternative E6). However, since the ICCAT 250 marlin landing limit has only been attained once in the last several years, the likelihood of any impact is low. Although economic estimates of impacts on billfish tournaments appear to be larger and of greater regional concern under preferred Alternative G2 than other alternatives, the discussion in Section 4.2.3 notes that the analysis of historical tournament data is fairly limited as an indicator of potential future impacts. The flexibility provided for implementation of a size limit increase is anticipated to mitigate impacts since the status of the fishery, and any pending tournaments, could be taken into account as appropriate. In some instances, tournaments could modify tournament rules or formats, or potentially be re-scheduled to mitigate or avoid the potential of a

tournament occurring after the threshold for a management action may be reached, which could be more important to more affected regions. However, if several tournaments were rescheduled, the threshold might be reached earlier.

4.3.3 Authorized Fishing Gear

As described in more detail in Chapter 2, the alternatives considered for authorized fishing gear are:

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

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

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

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

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

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

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

Ecological Impacts

Alternative H1 would maintain the status quo for authorized gear in all Atlantic HMS fisheries. The ecological impacts of this alternative can be found in the Description of the Fisheries section of this document (see Chapter 3). Fishing effort and fishing mortality (F) would likely not increase as there would be no new authorized gears and/or participants. Bycatch and discard levels would also not likely increase because there would be no new authorized gears or changes to existing gears. This alternative is not anticipated to result in additional interactions with protected resources. However, this alternative could allow for potential increases in effort in the swordfish handgear fishery, because unlimited numbers of unattached handlines are currently allowed, and may result in additional bycatch of HMS and other bycatch species. Should such increases in effort occur, this alternative may allow for increased interactions with protected resources.

Alternative H2, a preferred alternative, would define and authorize speargun fishing gear in the recreational Atlantic BAYS tuna fishery *(i.e.*, all regulated HMS tuna species except BFT). This preferred alternative would slightly modify the alternative proposed in the Draft Consolidated HMS FMP by not allowing BFT to be fished for, landed, or retained by fishermen

using speargun gear. In addition, this revised alternative would not allow the sale of any BAYS tuna harvested with speargun gear, under any circumstances, including those landed by fishermen aboard HMS CHB permitted vessels. Fishermen using speargun fishing gear would be allowed to freedive, use SCUBA, or other underwater breathing devices, and would be required to be physically in the water when they fire or discharge their speargun. Only free-swimming fish, not those restricted by fishing lines or other means, could be taken. The use of powerheads, or other explosive devices, would not be allowed to harvest or subdue BAYS tunas.

As of February 1, 2006, there were 25,238 permitted vessels participating in the HMS Angling category and 4,173 in the HMS CHB category. Based on public comment and anecdotal information, NMFS anticipates that between 50 and 1,000 individual U.S fishermen may have an interest in using speargun fishing gear to target BAYS tunas. Relative to the current number of participants in the recreational Atlantic tuna fishery, and taking into account the estimated low encounter rates for target species, the additional anticipated effort from spearfishermen would likely result in minimal negative ecological impacts on Atlantic BAYS tunas.

Under this alternative, only Atlantic BAYS tunas would be allowed to be taken by speargun fishing gear. This means that other HMS, such as Atlantic BFT, BLF, LCS, and SWO, could not be taken using speargun fishing gear. Atlantic BFT continue to be overfished and overfishing is occurring despite seven years of strict management under an international rebuilding plan with limited annual quotas. The rate of overfishing is not declining and the number of participants in the recreational HMS fishery continues to increase. Interest and activity in the small, recreational sized BFT fishery continues to grow. Since the publication of the Draft Consolidated HMS FMP in August 2005, NMFS received data on the performance of both the recreational and commercial BFT fishery, which exacerbated concerns over the ecological health and management of this stock. In the case of the commercial fishery, landings were low throughout the 2005 fishing season. The 2005 season was also marked by a noticeable lack of availability of commercial sized BFT throughout their traditional fishing range and, in particular, BFT were largely absent off southern states during the winter of 2005/2006. Although there is a high magnitude of available quota in the commercial size classes, scientists continue to be concerned over the status of this stock, especially the abundance of these larger fish that represent the potential spawners for future recruitment, particularly in the Gulf of Mexico. In the recreational fishery on smaller school size class BFT, data were available at the end of 2005 showing that, due to high landings rates in prior seasons, minimal quota would be available for a 2006 recreational school fishery. A recent publication providing a comprehensive and historical summary of BFT population dynamics, ecology, fisheries, and management concludes that the "current exploitation of BFT has many biological and economic traits that have led several fish stocks to extreme depletion in the past" (Fromentin and Powers, 2005). An international stock assessment on the current status, and future prognosis, of BFT is scheduled this year by the SCRS and new recommendations, if any, by ICCAT would not be available until November 2006. In light of the above and the uncertainty in the status and recovery of the stock, the Agency determined that the use of speargun gear for BFT is not appropriate at this time. BLF, SWO, and LCS are also considered overfished with overfishing occurring. As stock status improves and other factors change, NMFS may reconsider the use of speargun fishing gear in these fisheries, if appropriate.

The potential increase in landings for Atlantic BAYS tunas would be minimal compared with the landings by current participants and would likely result in minimal negative ecological impacts. Public comment supports the Agency's assessment that there are a limited number of additional individual fishermen expected to use this gear type. Further, public comment suggested that few spearfishermen would actually encounter the target species, and that spearfishermen could go months or years without having an opportunity to spear a BAYS tuna in the Atlantic.

In the past, there have been concerns that allowing speargun fishing gear in the Atlantic tunas fisheries could increase discards (fish speared and lost). During scoping, NMFS received comments indicating that spearfishermen often use detachable spear tips called "slip-tips," which are designed to retain speared fish, and use shooting lines, float lines, and floats that are designed to reduce fish loss. Further, the regulatory discards would likely be non-existent as spearfishermen can actively select the species and sizes of the targeted fish. Under alternative H2, NMFS does not anticipate any additional interactions with protected resources or other HMS due to the selectivity of this gear type.

Alternative H3 would authorize the use of speargun fishing gear in the recreational and commercial Atlantic tunas handgear fisheries. As stated in alternative H2 above, fishermen using speargun fishing gear would be allowed to freedive, use SCUBA, or other underwater breathing devices, and would be required to be physically in the water when they fire their speargun. Only free-swimming fish, not those restricted by fishing lines or other means, could be taken. The use of powerheads, or other explosive devices, would not be allowed to harvest or subdue tunas. Under this alternative, no HMS would be allowed to be taken by speargun fishing gear, other than Atlantic tunas. The ecological impacts of alternative H3 would likely be similar to those discussed under alternative H2 above, with the potential for some additional effort from commercial handgear tuna fishing vessels, as well as the inclusion of BFT as an allowable target species. Under this alternative, approximately 25,238 Angling, 214 Tunas Longline, 4,824 General, and 4,173 HMS CHB category vessels would be allowed to use this gear type. However, according to feedback received from HMS AP members, and because of the estimated low encounter rates, the Agency would not anticipate any substantive changes in effort or landings by the commercial handgear sector under this alternative.

Alternative H4 would define green-stick gear and authorize its use in the commercial tuna handgear fishery. This alternative was preferred in the Draft Consolidated HMS FMP but is not preferred in the Final Consolidated HMS FMP. This alternative would define green-stick under the HMS regulations and would authorize commercial tuna permit holders to sell BAYS tunas but prohibit them from possessing or retaining BFT. The definition of green-stick, and introduction of the gear to the fishery, would provide for some increase in effort. The gear is known to increase efficiency beyond that of a standard handline and rod-and-reel gear limited to two hooks per line as it would allow a green-stick line to have up to ten hooks or gangions.

Until publication of the Draft Consolidated HMS FMP, available information indicated that green-stick gear is primarily used to target YFT and other BAYS tunas. However, during public comment on the Draft Consolidated HMS FMP, considerable comment was received expressing interest in using the gear to target other species, including BFT. Green-stick gear, or

variations of the gear, has been used and documented in the PLL fishery for several years. Green-stick gear catches reported in the PLL Logbook Program for 1999 – 2003 can be seen in Table 4.68. Of the 45,712 sets reported between 1999 and 2003, 54 of these sets were reported as green-stick gear. Of the 54 green-stick sets reported, 53 of those were reported from the MAB reporting area and one set was reported from the NEC. Green-stick gear was removed from the PLL Logbook Program in 2003 and has not been replaced.

On the 54 green-stick sets reported between 1999 and 2003, a total of 4 BFT, 4 BET, 678 YFT, and 54 other BAYS tunas were reported captured. Additionally, 9 swordfish, 11 pelagic sharks, and 3 LCS were also reported captured. No blue marlin, white marlin, sailfish, or spearfish were reported captured on any of these sets (Table 4.68).

Table 4.68 Reported Atlantic Commercial Green-stick Gear Catch for 1999-2003*, in Numbers of Fish. Source: PLL Logbook Data

Species	1999	2000	2001	2002	2003*	Total
Swordfish	0	9	0	0	N/A	9
Bluefin tuna	0	2	0	2	N/A	4
Yellowfin tuna	0	344	232	102	N/A	678
Bigeye tuna	0	2	2	0	N/A	4
Other BAYS tunas	0	26	28	0	N/A	54
Blue marlin	0	0	0	0	N/A	0
White marlin	0	0	0	0	N/A	0
Sailfish	0	0	0	0	N/A	0
Spearfish	0	0	0	0	N/A	0
Pelagic sharks	0	1	8	2	N/A	11
Large coastal sharks	0	0	3	0	N/A	3
Dolphin	0	8	2	47	N/A	57
Wahoo	0	0	0	8	N/A	8
Sea turtles	0	0	0	0	N/A	0

* Modified logbook format eliminated green-stick gear data field.

In addition to the above data there is some anecdotal information and record of public comment on prior HMS rulemaking and HMS AP meetings regarding the pros and cons of green-stick but little substantial information. There is also no data available for sectors other than the PLL.

Due to the limited amount of data associated with the use of commercially configured green-stick gear in the Atlantic HMS fisheries, NMFS expanded its analysis to look at other available U.S. data regarding the use of commercial green-stick gear, including catch data from the U.S. Pacific (Table 4.69). NMFS is aware that the following information may not have a direct correlation to the use of commercially configured green-stick gear in the Atlantic tuna fisheries; however, to better understand the implications of authorizing this gear, NMFS took this information into consideration.

Table 4.69 Reported U.S. Pacific Commercial Green-stick Gear Catch for 2002-2004, in Numbers of Fish and Weight in Pounds. Source: State of Hawaii, 2006

Species	2002*		2003		2004		Total	
	No.	Lb.	No	Lb.	No.	Lb.	No.	Lb.
Yellowfin tuna	224	5,285.5	708	48,161.5	453	16,674.5	1385	70,121.50
Skipjack tuna	183	1,503.0	147	873.0	104	906.0	434	3,282.00
Wahoo	13	160.0	13	211.5	4	110.0	30	481.50
Dolphin	7	121.0	26	428.5	3	42.0	36	591.50
Barracuda	1	52.5	0	0.0	0	0.0	1	52.50
Blue marlin	0	0.0	8	1,217.0	1	500.0	9	1,717.00
Albacore	0	0.0	1	40.0	0	0.0	1	40.00
Striped marlin	0	0.0	2	67.0	0	0.0	2	67.00
Short-nosed spearfish	0	0.0	1	20.0	0	0.0	1	20.00
Bigeye tuna	0	0.0	12	184.0	2	24.0	14	208.00
Misc. tuna	0	0.0	4	60.0	1	129.0	5	189.00
Mako	0	0.0	1	70.0	0	0.0	1	70.00
Black skipjack	0	0.0	0	0.0	1	20.0	1	20.00
TOTAL	428	7,122.0	923	51,332.5	569	18,405.5	1920	76,860.00

* October - December only

The amount of effort deployed in the U.S. Pacific commercial green-stick fishery to harvest the catches above is as follows: Calendar Year (CY) 2002 (Oct – Dec only), eight licensees conducted 59 total trips (367.0 hrs), of which 34 were at fish aggregation devices (FADs) (176.0 hours). Six of the total trips were "did not catch" trips. In CY 2003, 19 licensees conducted 188 total trips (1,504.0 hours), of which 35 were at FADs (258.0 hours). Sixteen of the total trips were "did not catch" trips. In CY 2004, 19 licensees conducted 116 total trips (801.5 hours), of which 24 were at FADs (151.5 hours). Twenty of the total trips were "did not catch" trips (Table 4.69).

Data from the Pacific Ocean show that, in addition to tunas, dolphin, and wahoo, the Pacific green-stick fishery has interacted with blue marlin, striped marlin, and short-nosed spearfish (Table 4.69). This indicates that, although no billfish have been reported captured on green-stick gear in the Atlantic commercial HMS fisheries in recent years, interactions with Atlantic blue marlin, white marlin, sailfish, and spearfish could be possible under this alternative. Public comment and historical logbook data illustrate that this gear type has been used in the HMS fisheries for several years and classified by fishermen as either longline or handgear. What is less clear is whether in fact the green-stick gear was configured in conformance with the regulations appropriate to the HMS regulatory vessel permit regime and definition of longline and handgear, (*e.g.*, number hooks, type of hooks, etc.). Also, since these data were collected, regulatory circumstances have changed regarding longline gear. Vessels with pelagic longline gear onboard are now required to use specific circle hooks rather than previously used J hooks, and as the fishing performance of these two hook types varies considerably, it is not possible to project future effectiveness of green-stick gear equipped with circle hooks based on past data

when the gear was deployed with J hooks. During the public comment period, numerous comments were received expressing confusion over the current regulatory regime, unease over the potential impacts and intent of the preferred alternative in the Draft Consolidated HMS FMP, and concern over potential negative impacts of the green-stick gear.

As there is considerable uncertainty in the quality of the data available, a lack of overall data from established monitoring programs, confusion among the public over what is currently allowed, and a potential for increases in fishing effort and landings of YFT and other HMS, NMFS cannot make a determination regarding the ecological impacts of formally introducing this gear type at this time. Thus, alternative H4 is no longer the preferred alternative; rather, the preferred course of action is to clarify the current allowable use of this gear-type. Clarification of the currently authorized configuration of green-stick gear is not expected to have any ecological consequences beyond those already described generally in Chapter 3, specifically under sections describing handgear and longline fisheries. Vessels fishing under the General category (*i.e.*, General category tuna and HMS CHB permit holders) would continue to be subject to all current General category regulations (*e.g.*, size limits), and vessels with PLL gear onboard would continue to be subject to all current PLL regulations, including gear restrictions (*e.g.*, circle hooks) and closed areas. Disseminating information on the various authorized technical configurations of this gear could result in a modest increase in effort, due to an increased understanding of the authorized gear and a limited number of fishermen entering the fishery to use it. However, a minor increase in effort could be offset by a decrease in effort from fishermen who can no longer use this gear as they either had the incorrect vessel permit or were using it in an unauthorized configuration. Available data from historical use of this gear show no reports of sea turtle interactions. Accordingly, the use of this gear in the Atlantic tuna fishery would not be expected to increase interactions with sea turtles or other protected resources. Overall, no major changes in effort are expected with corresponding minimal ecological impacts.

Under alternative H5, a preferred alternative, some positive ecological impacts are anticipated. Current handline restrictions – including requirements that there be no more than two hooks attached to each gear and that the gear be released and retrieved by hand – would be included in the definition of buoy gear. In addition, this alternative would limit the number of floatation devices that would be allowed to be possessed or deployed to 35, thus limiting the maximum number of buoy gears fishermen may deploy. The Agency received public comment requesting that commercial vessels be limited to deploying fewer than 35 individual buoy gears. Additionally, commercial fishermen familiar with this gear type requested that they be allowed to attach multiple floatation devices to buoy gears to aid in monitoring and retrieval, as well as allow them to use "bite indicator" floats that will alert them to gears with fish attached. In response to public comment, NMFS has modified alternative H5 to allow fishermen to attach more than one floatation device to each buoy gear; however, the alternative maintains the maximum limit of 35 floatation devices possessed or deployed. For example, under the modified alternative, fishermen who opt to fish three floatation devices per gear would be limited to deploying approximately 11 buoy gears and fishermen using four floatation devices per gear would be limited to deploying approximately eight buoy gears. This modification would increase the flexibility fishermen have in configuring buoy gear with as many or as few floatation devices as they prefer, as long as it does not exceed 35. Depending on how the gear is configured, this flexibility may reduce the number of gears deployed. If the gear is configured

with a bite indicator, this modification could allow fishermen to easily identify which gears have captured fish and may allow fishermen to release any undersized swordfish or non-target species more quickly and with a greater probability of survival. Additionally, the modification to allow multiple floatation devices per gear may minimize lost gear and potential negative ecologic impacts by making the gears more buoyant and visible.

There are no data indicating how many commercial vessels are currently fishing with unattached handlines, or how many unattached handlines are deployed. Nevertheless, this alternative is not expected to significantly restrict commercial handline fishing effort from current levels, but it does prevent future expansion of effort beyond the maximum of 35 buoy gears. A limit of 35 floatation devices was selected based on support from public comment, and because the Agency identified this number as the manageable upper limit for the commercial sector that would prevent excessive amounts of unattended floating gear from being lost while allowing vessels to possess spare gear onboard.

If vessels currently possess or deploy more than 35 unattached handlines with more than two hooks attached, minor ecological benefits may be realized as effort and deployed gear are curtailed. Relative to the No Action alternative, this modified alternative may provide positive ecological benefits by limiting the future expansion of this gear sector and allowing fishermen flexibility in gear configuration, which may result in additional monitoring methods per gear (bite indicator floats), and reducing bycatch and lost fishing gear. Lost fishing gear may be reduced by the requirement to affix each individual buoy gear with monitoring equipment, the flexibility to use more than one floatation device per gear, and by limiting the overall number of gears a vessel may deploy. If future expansion is limited and the amount of lost gear is reduced, there may be an unquantifiable future reduction in the bycatch of undersized swordfish, other HMS species, protected species, and target and non-target catches. However, with regards to commercial swordfish target catches, the United States has consistently landed less than its ICCAT quota in recent years, and overfishing is not occurring on North Atlantic swordfish. Under this alternative, a maximum of 279 limited access permit holders (88 swordfish handgear and 191 swordfish directed) would be authorized to utilize this gear type to target swordfish.

As mentioned above, there are no data indicating exactly how many commercial vessels are currently fishing with unattached handlines because the HMS logbook currently does not differentiate between “attached” and “unattached.” The handline data presented in this document differs from those published in the Draft Consolidated HMS FMP. A reexamination of the HMS logbook database has resulted in modifications to the handline data for 2000 – 2004 and all handline data from 2000 – 2003 being considered confidential. The refined data are presented in Table 4.70. Although all HMS handline trip data before 2004 are confidential because few vessels participated in the fishery, the data indicate that the number of commercial HMS handline fishing trips has increased approximately 10-fold since 2003. According to 2004 logbook data, 64 commercial handline trips were reported from seven vessels, with 404 swordfish reported caught. Of those 404 swordfish captured, 274 fish (67.8 percent) were retained, 98 fish (24.3 percent) were released alive, and 32 fish (7.9 percent) were discarded dead. Of the 130 swordfish released by this fishery in 2004, 98 fish (75.4 percent) were reported as released alive and 32 fish (24.6 percent) were reported as released dead. No Atlantic marlins

were reported captured on this gear from 2000 through 2004. In 2004, one sailfish was reported caught and released alive. Additionally, no sea turtle interactions were reported for 2000 – 2004.

Table 4.70 Handline catches, in Numbers of Fish, for 2000 – 2004. Source: HMS Logbook. Note that confidential data cannot be released and are marked by an *.

	2000	2001	2002	2003	2004
Number of trips	*	0	*	*	64
Swordfish kept	0	0	0	*	274
YFT kept	*	0	*	0	4
BET kept	0	0	*	0	1
Other BAYS Kept	*	0	0	0	0
LCS kept	0	0	0	0	1
Pelagic shark kept	*	0	0	0	1
Dolphin kept	0	0	*	0	69
Wahoo kept	0	0	*	0	1
Swordfish discarded alive	0	0	0	*	98
YFT discarded alive	0	0	0	0	3
BET discarded alive	0	0	0	0	0
Other BAYS discarded alive	0	0	0	0	0
LCS discarded alive	0	0	0	*	18
Pelagic shark discarded alive	0	0	0	0	1
Dolphin discarded alive	0	0	0	0	0
Wahoo discarded alive	0	0	0	0	0
BUM discarded alive	0	0	0	0	0
WHM discarded alive	0	0	0	0	0
SAI discarded alive	0	0	0	0	1
SPX discarded alive	0	0	0	0	0
Sea Turtles discarded alive	0	0	0	0	0
Swordfish discarded dead	0	0	0	*	32
YFT discarded dead	0	0	0	0	0
BET discarded dead	0	0	0	0	0
Other BAYS discarded dead	0	0	0	0	0
LCS discarded dead	0	0	0	0	3
Pelagic shark discarded dead	0	0	0	0	0
Dolphin discarded dead	0	0	0	0	0
Wahoo discarded dead	0	0	0	0	0
BUM discarded dead	0	0	0	0	0
WHM discarded dead	0	0	0	0	0
SAI discarded dead	0	0	0	0	0
SPX discarded dead	0	0	0	0	0
Sea Turtles discarded dead	0	0	0	0	0

* Confidential data

Under alternative H6, vessels employing buoy gear would be limited to possessing and deploying up to 50 floatation devices, and attaching up to 15 hooks and/or gangions to each buoy gear. This alternative has been modified slightly to allow the use of one or more floatation devices per buoy gear, as discussed above. This alternative would have ecological impacts similar to alternative H5, with some potential for additional negative ecological impacts as compared to alternative H5 stemming from an increase in the allowable number of floatation devices and hooks, and potentially increased soak times. NMFS received substantial public comment opposed to this alternative. At this time, it is not possible to quantify the impacts this alternative could have on handline/buoy gear effort or bycatch. If it is assumed that handline fishermen currently deploy no more than two hooks per gear, then this alternative could increase effort in the fishery. This could lead to increased catches of target and non-target species, and has the potential to increase the probability for interactions with protected resources. Alternative H6 may not increase fishing effort substantially as only seven vessels reported fishing handline trips in 2004. Further, impacts resulting from potential increases in effort may be limited if some commercial handline fishermen currently fish with up to 50 gears and utilize more than the allowed two hooks per gear.

Under alternative H7, the continued use of secondary hand-held cockpit gears may reduce the loss of fish at boat side and aid anglers in subduing large HMS captured on authorized primary gear types. However, the use of these gears may also increase bycatch mortality/dead discards if undersized or non-target species are gaffed or darted and subsequently discarded. NMFS regulations at 50 CFR § 635.21(a) clearly state that any HMS harvested that is not retained must be released in a manner to ensure maximum probability of survival. Under this alternative, NMFS would encourage restraint prior to using a secondary hand-held cockpit gear on fish that may need to be released. This alternative should not increase bycatch mortality as HMS fisheries currently utilize secondary hand-held cockpit gears; however, specifying that secondary gears are allowable may increase their use. The Agency does not expect the use of secondary handheld cockpit gears in the Atlantic HMS fisheries to increase interactions with protected resources. The Agency received public comment in support of this measure.

With regards to impacts on EFH, the 1999 FMP and Amendment 1 to the Atlantic Billfish FMP state that Atlantic HMS occupies pelagic oceanic environments. The use of speargun fishing gear, buoy gear, and handheld cockpit gears will not likely impact bottom structures or otherwise damage habitat. Under all of the above alternatives, NMFS does not anticipate any adverse impacts to EFH.

Social and Economic Impacts

Alternative H1 (No Action) would not be expected to have any additional social or economic impacts because fishermen are already operating under these measures. Similarly, there are no additional significant safety implications anticipated with this alternative. This alternative would, however, not allow the use of speargun fishing gear in the recreational Atlantic BAYS tuna fishery, not allow CHB and General category permit holders to use a defined configuration of green-stick gear for commercial fishing of BAYS tunas, or allow swordfish handgear fishermen to use buoy gear. This alternative would also not address confusion over the allowable use of cockpit gears (*e.g.*, dart harpoon, flying gaff).

Alternative H2 would have positive social and economic impacts for spearfishermen, and may result in negative social and economic impacts for rod and reel fishermen. At the 1993 public hearings on the proposed list of authorized gears in the Atlantic tuna fisheries, no comments were received from spearfishermen and the regulations were finalized without listing speargun fishing gear as an authorized gear. Since implementation of the final rule, NMFS has received written requests, comment at public hearings, and has heard presentations at AP meetings requesting that NMFS authorize the use of speargun fishing gear in the Atlantic tuna fishery. NMFS has received comment that recreational spearfishermen place a high value on spearfishing for tunas and are currently traveling outside of the United States for the opportunity to participate in tuna speargun fisheries.

A range of potential costs for spearfishing gear was estimated by an informal internet search of spearfishing gear distributor sites. These costs may be incurred by individuals who wish to participate in this fishery, but obtaining this gear is not required by this action. The internet search found that new spearguns could be purchased for as little as $65.00 and ranged upward to approximately $1,600.00. Terminal gear, such as shooting lines and floats, could cost an additional $50.00 to $500.00. However, most inexpensive spearguns would not be adequate for targeting large tunas. Anecdotal information suggests that some spearfishermen may fabricate their own spearguns and equipment, and may not purchase this equipment from distributors. Additionally, recreational spearfishermen would only be allowed to fish from vessels having HMS Angling and HMS CHB category permits, currently costing $22.00 per year.

Allowing speargun fishing gear as an authorized gear type in the recreational Atlantic BAYS tuna fishery would likely result in minor positive social impacts to new entrants to the recreational BAYS fishery who wish to have the opportunity to use spearguns to harvest tuna other than BFT. Not allowing BFT to be taken with speargun fishing gear avoids the possibility of further exacerbating quota limited situations in the school size fishery and might avoid gear conflict with other members of the BFT recreational fleet. However, as this activity is not currently allowed under existing regulations, no additional adverse social or economic impacts are anticipated for the recreational HMS CHB or Angling sectors from not allowing retention of BFT.

Prohibiting the sale of tunas harvested with spearfishing gear under an HMS Angling category permit would have no economic impact, as the sale of tunas is currently not authorized for this sector of the fleet. Prohibiting the sale of BAYS tuna landed by HMS CHB fishermen using speargun gear may result in some perceived negative social and economic impacts. However, this activity is not currently allowed under existing regulations, therefore, no additional adverse social or economic impacts are anticipated for the HMS CHB sector.

Rod and reel fishermen may experience a decrease in angler consumer surplus if competition for fishing grounds causes them to travel further and extend their fishing trips. Spearfishermen would likely experience positive social impacts and an increase in angler consumer surplus, as they are currently prohibited from taking BAYS tunas with speargun gear in the Atlantic. Spearfishermen have commented that they currently must travel to the West

coast or out of the United States to target tunas with speargun fishing gear. The HMS CHB sector may experience positive economic impacts as spearfishermen may increase their use of for-hire vessels, increasing revenues to those vessels. Additionally, alternative H2 could increase the club-nature or camaraderie associated with speargun fishing and may result in positive social impacts. Currently, there are many spearfishing clubs along the Atlantic and Gulf of Mexico coasts, as well as in the Caribbean.

The use of speargun fishing gear was discussed at the March 2005 HMS AP meeting as well as during past AP meetings. At the 2005 AP meeting, the Predraft alternative to allow the use of speargun gear in the recreational Atlantic tunas fishery was largely supported. During this meeting, as well as at past AP meetings, AP panel members expressed concerns about the safety of divers and rod and reel fishermen fishing together in the same areas on "hot spots" of fish or over shipwreck sites. There was concern expressed regarding the possibility, in these situations, that an Angling or HMS CHB permitted vessel with spearfishermen aboard might enter a fleet of rod and reel vessels and drop a dive-flag in their midst causing the other recreational vessels to have to leave the area. NMFS has received public comment stating that spearfishermen will likely not attempt to fish near trolling vessels or vessels actively rod and reel fishing for tunas, but instead prefer to raise their own fish using submersible flashers (reflective fish decoys) or other means. Additionally, each spearfisherman tows a series of floats with a dive flag and is closely monitored by people aboard support vessels that also display dive flags. NMFS has also received comment that some spearfishermen and rod and reel fishermen have recently fished together, in close proximity, without incident. This particular commenter also added that spearfishermen were participating in recreational offshore fisheries for dolphin and wahoo in many of the same areas that they would be fishing for tunas, as well as chartering vessels which also cater to the rod and reel sector. This information indicates that gear conflicts are not likely to be problematic.

The social and economic impacts of alternative H3 would likely be similar to those discussed under alternative H2, with additional social and economic benefits associated with the inclusion of BFT as a recreational target species and allowing for the sale of commercially speared tunas by HMS CHB and General category permitted vessels. Allowing BFT to be taken with speargun gear under the Angling category quota could marginally reduce the amount of quota available for rod and reel anglers, which could result in minor negative social impacts for the recreational rod and reel sector, yet would provide positive social impacts for those participants using speargun gear. If BFT are taken with speargun gear, the BFT Angling category season could be shortened with slight potential adverse economic impacts for all Angling category participants. The HMS CHB sector may experience positive economic impacts as spearfishermen may increase their use of for-hire vessels, increasing revenues to those vessels, if BFT were allowed to be targeted recreationally.

Under alternative H3, BAYS tunas taken on HMS CHB vessels with speargun fishing gear, regardless of whether the vessel is operating in a for-hire or non-for-hire manner, may be sold provided the applicable retention limits are abided by. General category vessels would also be allowed to target, land, and sell BAYS commercially with this gear type. In regards to the sale of BFT harvested with speargun gear, HMS CHB and General category vessels would be allowed to target, land, and sell BFT of commercial size classes provided the fishery was open

and all applicable size and retention limits were adhered to. This ability may provide for some negative social impacts attributed to potential gear conflicts that could occur on the water; however, it is not known if commercial tuna handgear fishermen would participate in a commercial speargun fishery for tunas. According to feedback received from HMS AP members, and because of the estimated low encounter rates, the Agency does not anticipate that many tuna handgear fishermen would participate. NMFS does not anticipate any substantive changes in impacts for this sector under this alternative.

Positive economic impacts associated with the sale of Atlantic tunas harvested with speargun gear may also apply to fish houses, gear supply houses, and other associated businesses. Alternative H3 may also increase administrative burden due to additional monitoring and enforcement activities stemming from the retention and sale of commercially speared tunas.

Alternative H4 could have positive social and economic benefits for those fishermen who wish to employ green-stick gear to target Atlantic BAYS tunas commercially in a manner not currently authorized (*i.e.*, deploy with more than two hooks per line on handgear). This alternative was preferred in the Draft Consolidated HMS FMP but is not preferred in the Final Consolidated HMS FMP. It is difficult to quantify the actual increase in the number of commercial vessels that would deploy green-stick gear as a result of this alternative. The vessels that would be authorized to use green-stick gear under alternative H4 would include all permitted Atlantic Tunas Longline, General, and HMS CHB (on non for-hire trips) category vessels, approximately 214, 4,824, and 4,173 vessels, respectively. Based on anecdotal information, some unknown total number of vessels is believed to be already using this gear in some fashion in the HMS fisheries. According to the PLL Logbook data, six longline vessels have recently reported landings under this gear type. These vessels primarily appear to be operating in the MAB area. However, NMFS is aware from public comment that the number of vessels that use this gear type likely exceeds those reporting in the PLL Logbook. Other commercial vessels using this gear type (*i.e.*, General and HMS CHB permit category vessels) likely report landings under the handgear designation.

A range of potential costs associated with rigging a vessel with green-stick gear was estimated by an informal inquiry of gear distributors. These costs may be incurred by individuals who wish to participate in this fishery, but obtaining this gear would not be required by this action. The inquiry found that new green-sticks, the sticks themselves, could be purchased for as little as $1,300.00 and ranged upward to approximately $3,300.00. Complete rigs with a hydraulic spool could cost between $4,000.00 and $6,000.00 depending on the size of the rig and the need for a hydraulic system on the vessel. Anecdotal information suggests that some fishermen may fabricate their own setups by running lines from the fly bridge or from the tuna towers on their vessels. Fishermen would only be allowed to use this type of gear if they were operating from properly permitted vessels. The current cost of a required Federal vessel permit is $22.00 per year.

According to Wescott (1996), vessels using green-stick gear have reported tuna landings of ten to one over traditional fishing techniques. The use of green-stick gear, and a potential increase in BAYS tuna landings, could provide positive economic benefits to commercial fishermen as well as positive economic impacts to fish houses, gear supply houses, and other

associated businesses. Additionally, commercial fishermen have found that tuna caught on green-stick gear offer little resistance, as they are subjected to the pull of the mainline in one direction, the pull of the decoy in the other, as well as the pull from other hooked fish. Because tunas caught on green-stick gear may be landed quickly and with minimal fight, the fish may be less stressed and the meat may be of better quality (Wescott, 1996). Landings of higher quality tunas could lead to higher prices, and therefore increased revenues for those commercial vessels deploying this gear type. The magnitude of this benefit, as a result of this alternative and changes to the regulatory regime, is difficult to determine as it is unclear how this gear has been configured in the past and how catch harvested by this gear has been reported, as well as how many new users would deploy the newly defined and authorized gear type (*i.e.*, quantify the incremental economic increase from an unknown potential new universe of users versus existing users currently deploying the gear under the status quo).

Clarifying the use of green-stick gear without preferring this alternative or modifying the regulations would have modest positive social benefits on those fishermen who are confused about the current regulatory regime. It may also result in minor positive economic benefits to those fishermen who now enter the fishery using this gear type in a manner allowed under current regulations but may not have done so previously as they were concerned it may have been illegal. These positive benefits may be offset by those fishermen who realize that they were using green-stick gear in the configurations that are not authorized under HMS regulations. HMS CHB and General category permit holders would be allowed to use various configurations of green-stick gear (see Section 2.3.3) although limited to two hooks per line under current handgear definitions. PLL vessels may use either configuration with unlimited hooks but need to comply to all other existing PLL regulatory requirements, including the use of circle hooks and avoiding closed areas.

Alternative H5 would allow the commercial swordfish handgear fishery to continue utilizing unattached handlines, redefined as buoy gear, and would likely continue affording positive social and economic benefits to current fishery participants. Under this alternative, a maximum of 279 limited access permit holders (88 swordfish handgear and 191 swordfish directed) would be authorized to utilize this gear type to target swordfish. HMS logbook data indicate that HMS handline trips have increased 10-fold since 2003 (Table 4.70). Based on public comment, the swordfish handgear fishery does not appear to be widespread but instead appears to operate primarily off the East Coast of Florida. While this alternative would limit the maximum number of floatation devices possessed or deployed, the Agency selected an upper limit based on information obtained about the fishery through public comment, and based on what NMFS has identified as the manageable upper limit for the commercial sector. This alternative would require that fishermen using this gear type affix gear monitoring equipment to each individual buoy gear to aid in recovery. NMFS expects that most swordfish handgear fishermen using unattached handlines already possess and utilize some or all of this gear monitoring equipment. If not, minimal compliance costs for the least expensive equipment (*e.g.*, reflective tape and spotlight) could be incurred. Alternative H5 would also allow fishermen some flexibility in configuring buoy gear. In response to public comment, NMFS has modified the preferred alternative to allow fishermen to use more than one floatation device per gear and configure the gear differently depending on vessel and crew capabilities, or weather and sea

conditions. This increased flexibility may result in improved efficiency in complying with the float restriction preferred in the Draft Consolidated HMS FMP and may increase safety at sea.

If vessels are currently fishing with more than 35 free-floating buoyed handlines, there could be some unquantifiable adverse economic impacts for these vessels. NMFS expects that swordfish catches under this alternative would remain large enough for trips to be profitable. Because this alternative may limit or reduce fishing effort, it could potentially produce adverse social and economic impacts, including an unpredictable reduction in catches of swordfish. Based on the limited number of current handline fishery participants, NMFS does not anticipate that this alternative will substantially reduce U.S. swordfish fishing effort; however, if fishing effort is reduced, opportunities for the United States to utilize fully its ICCAT swordfish quota could be slightly reduced.

Alternative I5b, a preferred alternative discussed in the Regulatory Housekeeping Section 4.3.4, would require that all handlines used in HMS fisheries be attached to a vessel. Alternative H5 would allow commercial swordfish handgear fishermen to continue utilizing unattached handlines, redefined as buoy gear. Under alternative H5, the ability to utilize buoy gear represents a positive social and economic opportunity for commercial swordfish handgear and directed swordfish limited access permit holders. Conversely, this alternative could result in perceived negative social impacts by recreational fishermen by continuing to allow commercial swordfishing in areas closed to HMS pelagic longline gear. The Agency received public comment opposed to allowing fishermen deploying this gear type to continue fishing in areas closed to pelagic longline fishing. The pelagic longline closed areas were specifically designed to reduce bycatch and discards attributed to the characteristics of the pelagic longline fishery. Buoy gear is not pelagic longline gear, as it has no more than two hooks or gangions attached, and therefore the same impacts cannot be assumed for this gear type in those closed areas. NMFS believes that the limited scope of this fishery (seven vessels fishing in 2004) does not warrant prohibiting the use of buoy gear in these closed areas, especially considering that this management action places significant restrictions on an activity that is currently unrestricted (*i.e.*, restricts the allowable number of gears deployed). Additionally, NMFS believes the preferred alternative strikes an appropriate balance between allowing a limited harvest of swordfish and preserving the conservation benefits of the pelagic longline closed areas.

Alternative H6 would likely have social and economic benefits similar to those discussed under alternative H5, with some possible additional positive social and economic benefits stemming from the ability to increase the number of floatation devices possessed or deployed, as well as increase the number of hooks attached to each buoy gear. Allowing vessels to possess or deploy up to 50 individual gears and utilize up to 15 hooks per gear could potentially increase catch rates of swordfish, resulting in increased revenues for those vessels deploying this gear type. Due to limited logbook data, NMFS cannot quantify any potential increases in landings at this time. Similarly to alternative H5, and as discussed above, alternative H6 could result in perceived negative social impacts by recreational fishermen by continuing to allow commercial swordfishing in areas closed to HMS pelagic longline gear.

Alternative H7 would likely have positive social benefits for those fishermen who target HMS and wish to employ these secondary gears to aid in the landing or subduing of HMS at boat side. This alternative would also likely reduce confusion over their allowable use. The use of

these gears may also promote safety at sea for HMS fishermen, by allowing fishermen to utilize gears specifically designed to gain control of and subdue large fish from safer distances. Conversely, the use of these gears can be dangerous and may create additional safety hazards for fishermen. Many of these gears have sharp edges or points that may be hazardous to those employing them or to others on board a vessel. Some cockpit gears also incorporate trailing lines that may entangle fishermen and may result in fishermen being pulled overboard, drowning, or suffering other injuries.

Under alternative H7, fishermen who are permitted to sell HMS may experience positive economic benefits stemming from anticipated increased retention rates. Anecdotal information suggests that these gears are currently being used in both recreational and commercial fisheries for HMS. If these gears are being utilized, the resulting benefits from this alternative would likely be less than those discussed above. The Agency received public comment in support of this measure.

Conclusion

Alternative H2 is preferred because it would allow spearfishermen to participate in the Atlantic BAYS tuna fishery and would likely result in positive social and economic benefits. This alternative is responsive to specific public comment and requests from constituents. Although some minimal negative ecological impact is expected on these stocks from authorizing recreational use of speargun gear, the negative impact would be outweighed by the positive social and economic benefits of allowing speargun fishermen the opportunity to participate in this fishery. Alternative H5 is preferred because it would allow the swordfish handgear fishery to continue to utilize individual unattached buoyed gears, and would limit the maximum number of gears deployed by a vessel. Alternative H5 would likely result in positive social benefits and maintain current economic benefits to this sector. This alternative may provide some positive ecological benefits by limiting future expansion of this gear sector and possibly by reducing the amount of lost fishing gear. Additionally, the United States has consistently landed less than its ICCAT swordfish quota in recent years, and although the North Atlantic swordfish stock is currently overfished, overfishing is not occurring. Alternative H5 could aid in the rebuilding of North Atlantic swordfish by limiting an unrestricted fishery and is anticipated to maintain current economic benefits to this sector. Alternative H7 is preferred because it would clarify the allowable use of secondary cockpit gears and would likely result in positive social benefits. This alternative should not result in an increase in bycatch mortality, over current levels, as secondary gears are currently utilized in HMS fisheries. Alternative H7 is also responsive to requests from fishery participants.

Although NMFS preferred alternative H4 in the Draft Consolidated HMS FMP, it is not preferred in the Final Consolidated HMS FMP. The Agency chose to proceed with No Action regarding green-stick gear, and instead chose to clarify the existing regulatory regime and allowable configurations of green-stick gear in an effort to reduce confusion regarding the authorized use of green-stick gear, which may result in positive social impacts. As this action only clarifies the status quo, this alternative would likely not increase landings or landings rates, or has significant adverse ecological impacts.

4.3.4 Regulatory Housekeeping

As described in Section 2.3.4.2, eleven issues are analyzed within this section. These include: (Issue 1) Definitions of pelagic longline (PLL) and bottom longline (BLL) gear; (Issue 2) Shark identification; (Issue 3) HMS retention limits; (Issue 4) Definition of East Florida Coast Closed Area; (Issue 5) Definition of handline; (Issue 6) Possession of billfish on vessels issued commercial permits; (Issue 7) BFT dealer reporting; (Issue 8) "No-fishing", "cost-earnings", and "annual expenditures" reporting forms; (Issue 9) Non-tournament recreational landings reporting; (Issue 10) Pelagic longline 25 mt incidental BFT allocation; and, (Issue 11) Permit condition for recreational trips.

<u>Issue 1: Definitions of Pelagic and Bottom Longlines</u>

As described in Chapter 2, the alternatives considered to better differentiate between PLL and BLL gear include:

I1(a) Retain current definitions for PLL and BLL gear (No Action)

I1(b) Establish additional restrictions on longline gear in HMS time/area closures by specifying a maximum and minimum allowable number of commercial fishing floats to qualify as a BLL and PLL vessel, respectively

I1(c) Differentiate between PLL and BLL gear based upon the species composition of the catch onboard or landed – Preferred Alternative

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

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

Ecological Impacts

Alternative I1(a) would retain the current definitions for PLL and BLL gear (No Action). In the existing regulations, the longline definitions are based upon the presence of weights/floats capable of anchoring/supporting the mainline on/in the seafloor/water column. There is no threshold regarding how many weights or floats are allowed, or which species may be possessed. Problems have arisen with these definitions because some BLL vessels may possess and utilize floats on bottom longlines, and some PLL vessels may possess and utilize weights on pelagic longlines. Therefore, in some instances, it may be difficult to precisely determine compliance with HMS closed area and VMS regulations, which are specific to either HMS-permitted PLL or BLL vessels. This may compromise the effectiveness of HMS time/area closures. In the absence of full compliance with current closed area restrictions, adverse ecological impacts may occur including increased discards of undersized swordfish, bluefin tuna, dusky sharks, sandbar sharks, other HMS, other finfish, and protected species.

Alternative I1(b), a preferred alternative in the Draft HMS FMP, would establish additional restrictions on longline gear in HMS time/area closures. Specifically, under this alternative, to be considered a BLL vessel in a PLL closed area, the vessel could possess no more than 70 commercial fishing floats onboard or deployed, combined. To be considered a PLL vessel in a BLL closed area, the vessel would have to possess at least 71 commercial fishing

floats onboard or deployed, combined. Examples of commercial fishing floats include bullet floats, poly balls, high flyers, and lobster pot buoys. In the Draft HMS FMP, NMFS specifically requested public comment on this list to determine if it was accurate and/or complete. Also, NMFS requested public comment regarding whether or not to include a definition of "fishing floats" in the regulations, and on potential language for a “float” definition. Several commenters indicated that the number of floats is not an appropriate gauge to determine the type of fishing gear that is being deployed, and that the presence of “bullet floats,” anchors, or the type of mainline would be better indicators. Other commenters stated that a float requirement would be an unnecessary burden that could diminish the flexibility of vessel operators to participate in different fishing activities, depending upon the circumstances. Additionally, consultations with NMFS Law Enforcement indicated that the float requirement in alternative I1(b) would not be practical. Based on these comments, NMFS has chosen not to prefer alternative I1(b) in the Final HMS FMP. Although alternative I1(b) was preferred in conjunction with alternative I1(c) in the Draft HMS FMP, NMFS believes that the objective of this alternative can be effectively achieved by implementing alternative I1(c) alone, species composition of catch. Nevertheless, the establishment of quantifiable gear-based criteria to differentiate between PLL and BLL gear could still help to eliminate ambiguity between gear types, if necessary. NMFS will continue to assess the need for, and potential effectiveness of, gear-based criteria. If needed, such criteria could further improve the monitoring of, and compliance with, HMS closed areas. As a result, the ecological benefits associated with HMS closed areas would remain intact, including reductions in discards of undersized swordfish, bluefin tuna, dusky sharks, sandbar sharks, other HMS, and protected species. However, if the number of allowable floats in this alternative were not sufficient for the gear to operate as intended, it could possibly result in broken sets or lost fishing gear. The unintended consequence could potentially be an unquantifiable increase in bycatch and species entanglements. Also, establishing a threshold based solely on the allowable number of floats onboard or deployed could create an incentive for vessel operators to carry just enough floats to comply with one of the two definitions, but actually fish in an opposite manner (pelagic or demersal). This practice could compromise the effectiveness of the closed area restrictions.

Alternative I1(c), the preferred alternative, would establish a five-percent limit (by weight) on the allowable amount of pelagic “indicator” species that BLL vessels may possess or land from PLL closed areas, and establish a five-percent limit (by weight) on the allowable amount of “indicator” demersal species that PLL vessels may possess or land from BLL closed areas (as measured relative to the total weight of all “indicator” species). The “indicator” species are listed in Table 4.71**.** In the Draft HMS FMP, NMFS specifically requested public comment regarding the adequacy of the list of pelagic and demersal “indicator” species. On the basis of public comment, the list of demersal “indicator” species has been modified from the Draft HMS FMP by removing silky, great hammerhead, scalloped hammerhead, and smooth hammerhead sharks from the list, and by adding tilefish, blueline tilefish, and sand tilefish to the list. NMFS believes that these changes are appropriate because those shark species can be caught on both pelagic and bottom longlines, and because the tilefish species are representative of demersal fishing activity. The establishment of quantifiable species-based criteria to differentiate between PLL and BLL fishing gear in closed areas should help to eliminate ambiguities, because PLL gear would logically be expected to capture pelagic species and vice-versa. This alternative should improve the monitoring and effectiveness of, and compliance with, HMS closed areas.

With improved monitoring and compliance, the ecological benefits associated with HMS closed areas would remain intact, including reductions in discards of undersized swordfish, bluefin tuna, dusky sharks, sandbar sharks, other HMS, and protected species. However, establishing a threshold based on the species composition of the catch could potentially result in an increase in regulatory discards if vessel operators discard species because the threshold is exceeded, either intentionally or accidentally. Excessive discards could compromise the effectiveness of the closed area restrictions. NMFS does not expect that significant regulatory discards will occur as a result of this alternative. A five-percent threshold has been established to account for any unanticipated bycatch.

Table 4.72 and Table 4.73, respectively, indicate that this threshold (five percent) is slightly above the average weight of pelagic species that have been reported in the Coastal logbook in recent years (4.45 percent), and slightly above the average weight of demersal species that have been reported in recent years in the HMS logbook (4.52 percent). In 2004, however, on a fishery-wide basis, the five-percent threshold would have been exceeded. NMFS believes that, if longline vessels are fishing in an appropriate manner, either demersally in the PLL closed areas or pelagically in the BLL closed area, this threshold should adequately account for any unintentional bycatch in the closed areas. If necessary, the five-percent threshold and the list of indicator species could be modified in the future based upon a review of historic and current landings and the effectiveness of the regulation. Although alternative I1(c) was preferred in conjunction with alternative I1(b) in the Draft HMS FMP, the objective of providing a quantifiable method to differentiate between pelagic and bottom longline fishing activity can effectively be achieved by implementing alternative I1(c) alone, species composition of catch.

Alternative I1(d) would require time/depth recorders (TDRs), or data loggers, at pre-specified intervals on all HMS longlines. The TDRs must be operational, and able to accurately record the maximum and minimum fishing depths of HMS longline gear using an onboard TDR reader. Pelagic longline gear would be required to remain within the upper two-thirds of the water column while fishing, and bottom longline gear would be required to remain within the bottom third of the water column while fishing. This alternative, in combination with information indicating a vessel's fishing location and water depth information from charts or sounders, could indicate how deep the longline gear was fishing and whether it was fishing pelagically or demersally. This would improve the monitoring and effectiveness of, and compliance with, HMS closed areas. With improved monitoring and compliance, the ecological benefits associated with HMS closed areas would remain intact, including reductions in discards of undersized swordfish, bluefin tuna, dusky sharks, sandbar sharks, other HMS, and protected species. Conversely, depending upon the amount of time that it takes to remove TDRs from the mainline or gangions, and any other reduced efficiencies associated with using them, this alternative could cause an increase in the mortality of discarded fish.

Alternative I1(e) would implement longline time/area closures that would be effective for both HMS-permitted PLL and BLL vessels. As mentioned above, the existing time/area closures are specific to either HMS-permitted PLL or BLL vessels, but not both. This alternative would effectively eliminate any uncertainties in differentiating between the two gear types by prohibiting both in all of the closed areas. This would improve the monitoring and effectiveness of, and compliance with, time/area closures. With improved monitoring and compliance, the ecological benefits associated with HMS closed areas would remain intact, including reductions

in discards of undersized swordfish, bluefin tuna, dusky sharks, sandbar sharks, other HMS, and protected species. By implementing non-gear-specific closed areas, alternative I1(e) could also provide additional conservation benefits for many other species. Because HMS-permitted BLL vessels would be prohibited from fishing year-round in the Desoto Canyon and East Florida Coast closed areas, and seasonally in the Charleston Bump and Northeastern U.S. closed areas, additional conservation benefits for many species of sharks and other demersal finfish could occur. These are areas of significant BLL fishing activity. For the three-year period (2001 – 2003), 140 BLL sets were reported in these areas in the HMS logbook compared to 363 BLL sets in open areas. Similarly, because HMS-permitted PLL vessels would be prohibited from fishing seasonally in the Mid-Atlantic Shark closed area, pelagic species and some sharks that are caught as bycatch on PLL gear could potentially be conserved. This alternative could also provide additional conservation of protected species, including threatened and endangered sea turtles and marine mammals.

None of the alternatives considered above are likely to have any adverse impacts on protected species or essential fish habitat.

Social and Economic Impacts

Alternative I1(a) (No Action) would likely produce the fewest additional adverse social and economic impacts on commercial fishing vessels. However, the No Action alternative does have some associated negative socio-economic costs. Because it may be difficult to precisely differentiate between PLL and BLL gear, commercial fishing activities on vessels boarded at sea may be interrupted for longer periods of time while compliance with closed area regulations is determined. Valuable economic and administrative resources might be required on behalf of both industry and government to resolve these gear definition issues. Also, negative social impacts could occur under the No Action alternative for law-abiding vessels if the protective benefits of the closed areas are compromised because other commercial fishing vessels are deploying gear that is allegedly BLL gear but catching pelagic species in PLL closed areas, or deploying gear that is allegedly PLL gear but catching demersal species in BLL closed areas.

Alternative I1(b), a preferred alternative in the Draft Consolidated HMS FMP, would establish additional restrictions on longline gear in HMS time/area closures by requiring that BLL vessels in PLL closed areas possess no more than 70 commercial fishing floats, and that PLL vessels in BLL closed areas possess at least 71 commercial fishing floats. A threshold of 70 floats was chosen to differentiate between PLL and BLL gear based upon data obtained from the HMS logbook. In 2002 and 2003, a total of 233 sets were reported as using BLL gear. Of these, 23 BLL sets (10 percent) deployed 40 or more floats. Only 12 BLL sets (5 percent) reportedly deployed 180 or more floats. The reported median was 15 floats on BLL gear. For the same time period, a total of 19,441 sets were reported as using PLL gear. Of these, 17,496 sets (90 percent) deployed 87 or more floats, and 18,469 sets (95 percent) deployed 72 floats or more. Thus, at least 90 percent of all reported BLL sets in 2002 and 2003 possessed less than 70 floats, and approximately 95 percent of all reported PLL sets in 2002 and 2003 possessed more than 70 floats. In terms of vessels, five vessels reported using more than 70 floats on bottom longline gear for at least one set in either year. Most of these vessels reported homeports in North Carolina and northward. Eighty-seven vessels reported using less than 70 floats on pelagic

longline gear for at least one set in either year. Most of these vessels reported homeports in Florida, although some reported homeports in North Carolina, South Carolina, and Louisiana.

Overall, alternative I1(b) would not be expected to produce significant adverse social or economic effects. Based on the data presented above, this alternative would potentially impact less than five percent of all PLL sets, and less than ten percent of all BLL sets. The actual percent is likely to be smaller than this, because the alternative would only apply to the few vessels that are actually fishing with PLL gear in BLL closed areas, or fishing with BLL gear in PLL closed areas. Based on the homeports of the vessels that reported using BLL gear and more than 70 floats for at least one set, few of those vessels are based next to a PLL closed area. They are generally based next to a BLL closed area. Similarly, based on the homeports of the vessels that reported using PLL gear and fewer than 70 floats, few of those vessels are based next to a BLL closed area and are actually based next to several PLL closed areas. Thus, this alternative would not be expected have large impacts on fishermen fishing with BLL gear in PLL closed areas, or fishing with PLL gear in BLL closed areas. However, it could, appropriately, impact a small number of PLL vessels fishing near PLL closed areas, and a small number of BLL vessels fishing near BLL closed areas. To comply with this alternative, BLL vessel operators fishing in a PLL closed area could choose to reduce the overall length of their BLL gear or change the configuration of their gear. This could potentially increase the number of sets that would need to be deployed to maintain the same catch level, and could increase some associated variable costs including fuel, ice and food. Also, if the number of allowable floats were not sufficient for the gear to operate as intended, it could potentially result in broken sets or lost fishing gear. Positive social and economic benefits are anticipated for both industry and government with this alternative if it is successful at providing a quick method to reliably differentiate between PLL and BLL gear. This alternative would not be expected to compromise safety at sea, as it should not significantly alter current fishing practices.

As mentioned above, NMFS did receive public comment on alternative I1(b). Some commenters indicated that a float requirement would be an unnecessary burden that could diminish the flexibility of vessel operators to participate in different fishing activities, depending upon the circumstances. Based upon these comments, and on consultations with NMFS Law Enforcement indicating that this alternative was not practical, alternative I1(b) is no longer preferred. NMFS believes that the objective of this alternative can be effectively achieved by implementing alternative I1(c) alone, species composition of catch. By not preferring alternative I1(b), any potential adverse economic impacts associated with restricting the allowable number of floats, such as reduced operational flexibility, should be mitigated.

Alternative I1(c), the preferred alternative, would differentiate between PLL and BLL gear based upon the species composition of the catch onboard or landed. It would establish a five-percent limit (by weight) on the allowable amount of “indicator” pelagic species that BLL vessels may possess or land when fishing in PLL closed areas, and establish a five-percent limit (by weight) on the allowable amount of “indicator” demersal species that PLL vessels may possess or land when fishing in BLL closed areas (as measured relative to the total weight of all “indicator” species). The “indicator” species are listed in Table 4.71. As mentioned above, NMFS specifically sought and received comment on the lists of “indicator” species. The demersal “indicator” species list has been slightly modified by removing silky and hammerhead

sharks, and by adding tilefish, blueline tilefish, and sand tilefish. These modifications were made because the aforementioned shark species can be caught on both pelagic and bottom longlines, and because the tilefish species are indicative of demersal fishing activity. The "indicator" species were chosen because they constitute the primary target species in the pelagic and bottom longline fisheries. If necessary, the list of "indicator" species could be changed in the future based upon a review of historic and current landings and the effectiveness of the regulation. The percent of pelagic and demersal "indicator" species is measured relative to the total weight of all "indicator" species onboard or landed. The five-percent incidental allowance was established based upon historical landings of species, as reported from 2000 – 2004 in the Coastal logbook (Table 4.72) and the HMS logbook (Table 4.73).

Table 4.42 indicates that the percent of "indicator" pelagic species landed by vessels reporting in the Coastal logbook ranged from 3.33 percent in 2003 to 6.74 percent in 2004, with a five-year average of 4.45 percent. Table 4.73 shows that the percent of "indicator" demersal species landed by vessels reporting in the HMS logbook ranged from 1.17 percent in 2002 to 10.95 percent in 2004, with a five-year average of 4.52 percent. Although the five-percent threshold would have been exceeded in 2004 on a fishery-wide basis, NMFS believes that longline vessels fishing in HMS protected areas and using due diligence should be able to remain within the five-percent threshold that has been established to account for unintentional bycatch. If necessary, the five-percent threshold and the list of indicator species could be changed in the future based upon a review of historic and current landings, and the effectiveness of the regulation.

NMFS received comments indicating that alternative I1(c) could adversely impact longline vessels that fish, at least part of a trip, in HMS closed areas and catch both demersal and pelagic species on those trips. Similar to the comments received regarding alternative I1(b), there were concerns that, by establishing a species threshold when fishing in HMS closed areas, this alternative would restrict the flexibility of longline vessel operators to participate in different fishing activities depending upon the circumstances. Also, economic costs could result if vessel operators are unable to retain a portion of their catch that otherwise would have been retained on mixed fishing trips in the closed areas, or if they must necessarily choose to fish outside of the closed areas. NMFS received other comments indicating that there could be additional costs on vessels if they are boarded at sea by enforcement, and it was necessary to retrieve or observe fish in the hold in order to calculate the percentages of demersal and pelagic species possessed onboard. The time required to do this could create an economic burden in terms of opportunity costs associated with lost time and, possibly, reduced net revenues associated with re-icing the fish and reduced quality of the catch.

NMFS acknowledges that this alternative would likely require vessel operators to decide, prior to the start of a fishing trip, whether to target demersal or pelagic species if they are fishing, at least part of that trip, in an HMS closed area. However, alternative I1(c) should not significantly restrict operational flexibility or cause other significant adverse social or economic impacts. The HMS longline closed areas were implemented to provide important protection for a variety of HMS and other protected species. It is not unreasonable, or unduly burdensome, for longline vessels to adhere to the intent of the closed areas and to actively avoid pelagic or demersal species when legally fishing in those areas with BLL or PLL gear, respectively. The

five-percent "indicator" species threshold was specifically selected because it is higher than the five-year average percent of pelagic species caught when fishing for demersal species, based on Coastal logbook data, and higher than the five-year average percent of demersal species caught when fishing for pelagic species, based on HMS logbook data. This threshold should accommodate the majority of fishing trips, even those outside of closed areas. However, NMFS recognizes that the five-percent threshold would have been exceeded in 2004, based on this same data. If necessary, both the list of "indicator" species and the five-percent threshold could be changed in the future based upon a review of historic and current landings and the effectiveness of the regulation. The actual number of vessels impacted by this alternative is likely to be small, as it would only affect vessels that otherwise would exceed the threshold when fishing with PLL gear in BLL closed areas, or when fishing with BLL gear in PLL closed areas.

While NMFS did not receive any comments on the subject, the Agency is aware that several vessels have attempted to fish with PLL for sharks in the BLL closed area. Under this alternative, the practice would likely be eliminated because the species being caught are species found on the demersal "indicator" list. These are also the species that were intended to be protected by the closed area. To the extent that some of these vessels do not have the permits that allow them to land pelagic species such as swordfish or tunas, stopping this practice could have positive ecological benefits. However, stopping this practice may also have negative economic impacts on fishermen who were trying to find methods of adjusting their fishing practice to the BLL closed area. Alternative I1(c) would not prevent PLL fishermen with the appropriate permits from fishing for swordfish, tunas, and other pelagic species in the BLL closed area.

Additional costs could occur if a vessel was boarded at sea and it was necessary to retrieve or observe fish in the hold to calculate the percent of demersal and pelagic species. If difficulties arise in determining whether a vessel is fishing with PLL or BLL gear in a closed area, using the existing definitions in the regulations, the species composition of catch methodology described in this alternative provides a quantifiable method to verify fishing technique. The potential costs would be reduced if this alternative were enforced dockside, as offloaded fish would only need to be identified and weighed before being sold to the dealer. Positive social and economic benefits would be realized with this alternative if the species composition of the catch can quickly be determined with minimal disruption to commercial fishing and law enforcement activities. This alternative is not expected to compromise safety at sea, as it should not significantly alter current fishing practices.

Table 4.71 List of "Indicator" Species to Determine Composition of Catch.

PELAGIC SPECIES	DEMERSAL SPECIES
DOLPHINFISH	GROUPER, BLACK
SHARK, BLUE	GROUPER, GAG
SHARK, OCEANIC WHITETIP	GROUPER, MARBLED
SHARK, PORBEAGLE	GROUPER, MISTY
SHARK, SHORTFIN MAKO	GROUPER, RED
SHARK, THRESHER	GROUPER, SNOWY
SWORDFISH	GROUPER, WARSAW
TUNA, ALBACORE	GROUPER, YELLOWEDGE
TUNA, BLUEFIN	GROUPER, YELLOWFIN
TUNA, BIGEYE	HIND, RED
TUNA, SKIPJACK	HIND, ROCK
TUNA, YELLOWFIN	HIND, SPECKLED
WAHOO	SHARK, ATLANTIC SHARPNOSE
	SHARK, BLACKNOSE
	SHARK, BLACKTIP
	SHARK, BONNETHEAD
	SHARK, BULL
	SHARK, FINETOOTH
	SHARK, LEMON
	SHARK, NURSE
	SHARK, SANDBAR
	SHARK, SPINNER
	SHARK, TIGER
	SNAPPER, BLACKFIN
	SNAPPER, CUBERA
	SNAPPER, DOG
	SNAPPER, LANE
	SNAPPER, MANGROVE
	SNAPPER, MUTTON
	SNAPPER, QUEEN
	SNAPPER, RED
	SNAPPER, SCHOOLMASTER
	SNAPPER, SILK
	SNAPPER, VERMILION
	SNAPPER, YELLOWTAIL
	TILEFISH
	TILEFISH, BLUELINE
	TILEFISH, SAND

Table 4.72 Historical Per Trip Average Catch Composition of "Indicator" Species. Source: NMFS Coastal Logbook

	Pelagic (lb)	Demersal (lb)	Pelagic (%)	Demersal (%)
2000	507 lb	14,560 lb	3.36 %	96.64 %
2001	636 lb	13,347 lb	4.55 %	95.45 %
2002[1]	457 lb	13,177 lb	3.35 %	96.65 %
2003[1]	485 lb	14,092 lb	3.33 %	96.67 %
2004	1,354 lb	18,743 lb	6.74 %	93.26 %
Average	688 lb	14,784 lb	4.45 %	95.55 %

[1]Data for years 2002 and 2003 were inadvertently reversed in the Draft HMS FMP.

Table 4.73 Historical Per Trip Average Catch Composition of "Indicator" Species. Source: Pelagic Longline Logbook

	Pelagic (lb) [1]	Demersal (lb) [1]	Pelagic (%)	Demersal (%)
2000	5,803 lb	78 lb	98.67 %	1.33 %
2001	5,220 lb	99 lb	98.14 %	1.86 %
2002	5,926 lb	70 lb	98.83 %	1.17 %
2003	5,708 lb	88 lb	98.48 %	1.52 %
2004	9,767 lb	1,201 lb	89.05 %	10.95 %
Average	6,485 lb	307 lb	95.48 %	4.52 %

[1]Data from HMS logbook was converted from numbers of fish to lbs. using average weight of species.

Alternative I1(d) would require time/depth recorders (TDRs), or data depth loggers, at pre-specified intervals on all HMS longlines. PLL gear would be required to remain within the upper two-thirds of the water column while fishing, and BLL gear would be required to remain within the bottom third of the water column while fishing. This alternative would result in direct economic costs associated with the purchase of TDRs and data readers (communications hardware). Relatively few companies currently manufacture these devices for commercial use, and prices vary widely. Most current applications involve academic research projects, so prices would be expected to decrease if their use became more widespread as a result of implementing this alternative on the commercial fishery. Based upon telephone inquiries to two manufacturers conducted in the summer of 2005, the costs for one TDR and a reader range from approximately $680.00 – $1,300.00. Individual TDRs (without a reader) are available from one manufacturer for approximately $180.00. Therefore, assuming that a minimum of five TDRs and one reader per vessel would be required, the direct costs would range from $1400.00 ($180.00 X 5 + $500.00) to $6,500.00 ($1,300.00 X 5). These costs may be higher if vessel operators purchase extra TDRs to replace lost or damaged equipment. The lead-time for processing orders currently ranges from six to ten weeks. Aside from these direct costs, there could be some indirect costs associated with a loss in efficiency due to attaching TDRs to longlines, and downloading and recording the information. Conversely, positive social and economic benefits could be realized with this alternative if the TDR data could be quickly downloaded and interpreted by law enforcement with minimal disruption to normal commercial fishing and law enforcement

activities. This alternative would not be expected to compromise safety at sea, but there is a possibility that attaching and detaching TDRs could alter some current fishing practices.

Alternative I1(e) would implement HMS longline time/area closures that are effective for both pelagic and bottom longline HMS-permitted vessels. If selected, this alternative would prohibit HMS-permitted BLL vessels from fishing year-round in the DeSoto Canyon and East Florida Coast closed areas, seasonally in the Charleston Bump closed area from February 1 through April 30 each year, and seasonally in the Northeastern U.S. closed area from June 1 through June 30 each year. It would also prohibit HMS-permitted PLL vessels from fishing seasonally in the Mid-Atlantic shark closed area from January 1 through July 31 each year. Of all the alternatives analyzed for this issue, alternative I1(e) would likely produce the most significant adverse economic impacts, primarily upon HMS-permitted BLL vessels that would be prohibited from fishing year-round in the DeSoto Canyon and East Florida Coast closed areas, seasonally in the Charleston Bump closed area from February 1 through April 30 each year, and seasonally in the Northeastern U.S. closed area from June 1 through June 30 each year. For HMS-permitted BLL vessels, the DeSoto Canyon area would eliminate approximately 32,860 nm^2 miles of ocean; the East Florida Coast closed area would eliminate approximately 50,720 nm^2 of ocean; the Charleston Bump closed area would seasonally eliminate approximately 49,090 nm^2 of ocean; and, the Northeastern U.S. closed area would seasonally eliminate approximately 21,600 nm^2 of ocean. These are areas of intensive bottom longline fishing activity and, especially in the case of the East Florida Coast closed area, comprise major fishing areas for BLL vessels. For the three-year period (2001 – 2003), 140 BLL sets were reported in these PLL closed areas in the HMS logbook as compared to 363 BLL sets in the open areas. Also, some former BLL vessels may recently have switched to PLL fishing in BLL closed areas to mitigate adverse impacts. This alternative would prohibit both types of HMS longline fishing activity in the closed areas. This alternative would also impact PLL vessels, as an area off of Cape Hatteras that is frequently fished by PLL vessels would be closed from January through July under this alternative.

NMFS received contrasting comments regarding alternative I1(e). Comments in opposition to this alternative confirmed the conclusion presented in the Draft HMS FMP that this alternative would produce the most significant adverse economic impacts upon vessels, and that it was unnecessary because PLL and BLL gears can be effectively differentiated. Comments in support of this alternative stated that it would be the easiest to enforce, and was the only way to achieve a meaningful reduction in bycatch because billfish and other HMS are found throughout the water column. NMFS agrees that this alternative would be the easiest to enforce, but believes that preferred alternative I1(c), which implements limits on bycatch, can be effective at preserving the conservation benefits associated with the closed areas while simultaneously mitigating adverse economic impacts on longline vessels fishing in the areas.

Conclusion

Alternative I1(c), which would differentiate between gears based upon the species composition of the catch onboard or offloaded, is preferred because it is expected to accommodate the majority of commercial fishing operations, yet still provide a quantifiable method to differentiate between PLL and BLL vessels. The 5-percent species threshold to determine the composition of catch in alternative I1(c) is higher than the five-year average

percent of pelagic species caught when fishing for demersal species based on Coastal logbook data, and higher than the five-year average percent of demersal species caught when fishing for pelagic species, based on HMS logbook data. Moreover, the actual percent of affected vessels is likely to be small, as this alternative would apply only to the few vessels that are actually fishing with PLL gear in BLL closed areas, or fishing with BLL gear in PLL closed areas. Vessels that were fishing mixed trips outside the closed areas could still transit the closed area provided the signals from their VMS unit indicate that the vessel is transiting and not fishing. If necessary, both the list of "indicator" species and the five-percent threshold could be modified in the future, based upon a review of historic and current landings and the effectiveness of the regulation. This alternative is not expected to create significant adverse economic and social impacts. There may, however, be some minor adverse economic costs on vessels that fish for both pelagic and demersal species on the same trip in closed areas. Those situations (*i.e.*, "mixed" trips in the HMS longline closed areas) are expected to be rare occurrences, based upon HMS logbook information. Alternative I1(c) effectively addresses the crux of this issue, in that it should further discourage catches of pelagic species in PLL closed areas (and vice verse) without imposing additional gear restrictions which would be impractical to enforce and could reduce the flexibility of fishermen from pursuing different fishing activities, depending upon the circumstances. NMFS anticipates that HMS longline vessels will continue to be prudent, especially when fishing in the HMS closed areas by catching predominantly pelagic species in BLL closed areas, and demersal species in PLL closed areas.

Overall, preferred alternative I1(c) is expected to improve the monitoring of, and compliance with, HMS closed area regulations. As a result, the ecological benefits associated with HMS closed areas are expected to remain intact, including reductions in discards of undersized swordfish, bluefin tuna, dusky sharks, sandbar sharks, other HMS, other finfish, and protected species. Alternative I1(b) is no longer preferred based upon public comment regarding impacts to vessel's operational flexibility, difficulties with terminology, and impracticalities in enforcing the alternative. Alternative I1(d) would impose a much larger negative social and economic burden than the preferred alternative on HMS longline vessels, because of the requirement to purchase TDRs, and the need to provide precise documentation regarding fishing location and water depth in order to determine compliance. Alternative I1(e) would provide the largest ecological benefits, but would also impose the most significant adverse social and economic costs on HMS longline vessels.

Issue 2: Shark Identification

As described in Chapter 2, the alternatives considered to aid in shark identification include:

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

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

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

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

Ecological Impacts

Under alternative I2(a), current regulations would remain in place, which allow fishermen to remove all shark fins from carcass, as long as the total weight of the shark fins does not exceed five percent of the total weight of the dressed carcasses. Additionally, all fins must be offloaded at the first point of landing. These regulations were first put in place in the 1993 Atlantic Shark FMP (April 26, 1993, 58 FR 21931) and were later implemented nationally through the Shark Finning Prohibition Act (February 11, 2002, 67 FR 6194). The 1993 Shark Fishery Management Plan noted that prohibiting the finning of sharks (removing the fins and throwing the rest of the shark overboard) would reduce fishing mortality of sharks by reducing the incentive to target sharks, as fishermen would want to save freezer space for more valuable carcasses, such as swordfish and tuna. While this statement is generally correct, NMFS has found that by allowing all the fins to be removed from the carcass, the ability to identify sharks at the dock has been hampered. This could affect the accuracy of dealer reporting of sharks landed by species, and consequently have implications for stock assessments and quota monitoring. Additionally, NMFS has found that while many fishermen follow the regulations, some fishermen illegally keep fins from species that are different from those they land and, correspondingly, discard a number of unwanted shark carcasses and lower value fins overboard in order to maintain the five percent ratio. In other words, some fishermen mix and match fins and carcasses in order to maintain the highest profit while still complying with the five percent ratio. Thus, while the current regulations have ultimately reduced shark fishing mortality from the level it was at in 1993, it may not have reduced shark fishing mortality to the extent anticipated.

Under the preferred alternative I2(b), shark fishermen could still remove the more valuable fins from a shark while at sea (*e.g.*, the dorsal, caudal, and/or pectoral), but the smaller second dorsal and anal fins would need to remain attached to the shark while the vessel was at sea. Once landed, those fins could be removed either by the fisherman or the dealer. While shark "logs"- carcasses with fins removed- retaining only the second dorsal and anal fin could still be misidentified by the dealer, requiring these fins to remain on the shark until the first point of landing would likely improve dock-side identification of the shark "log." While this alternative would not help in identifying fins separated from the carcass, landings with many high-grade fins from species that normally produce lower grade fins may be more obvious, resulting in increased enforcement and DNA analyses of the fins and carcasses. NMFS received various comments supporting the preferred alternative, as well as comments confirming that retention of second dorsal and anal fins through landing could improve shark identification and species-specific landing data. NMFS also received comments indicating that this alternative would do little to improve shark identification. Additionally, under alternative A8 (see Section 2.1.1), NMFS would require shark dealers to attend identification workshops. Those workshops, in combination with this alternative, should help to improve the accuracy of dealer reports as well as quota monitoring and stock assessments.

Alternative I2(c) is similar to I2 (b), however, fishermen would be allowed to remove all the fins from lemon and nurse sharks. This alternative was considered due to the larger size of the second dorsal on these species, and the possible economic impacts resulting from requiring that these large fins remain on the shark. NMFS received comment that although these species have valuable fins, retaining them until landing was acceptable. Furthermore, in recent years,

lemon and nurse shark landings have accounted for one percent or less of the total large coastal shark commercial landings (see Section 3.4.5.2). If the identification of sharks is improved by requiring that some of the fins remain on the shark, then allowing all the fins to be removed from lemon and nurse sharks should not hinder quota monitoring. Enforcing this alternative, however, may prove to be more difficult. It is possible that under this alternative, fishermen may decide to remove the second dorsal and anal fin of sharks other than lemon or nurse sharks in order to receive as high an ex-vessel price as possible for the shark. This type of action would be in violation of this alternative, and could increase the reported landings of lemon and nurse sharks. Depending upon the species actually being landed, such an activity could have impacts on quota monitoring (*e.g.*, if small coastal sharks are being landed, they would be counted as a lemon or nurse shark both of which are large coastal sharks), would compromise data collection for use in stock assessments, and would not actively prevent illegal discards and mixing of shark fins.

Under alternative I2(d), all shark fins would be required to remain on the shark until the first port of landing. The fins could then be removed either by the fisherman or the dealer. The shark could still be headed, gutted, and bled. To ensure the sharks are stored in a manner that would maximize the value and quality of the sharks, the fins could be sliced as long as they are not removed completely from the shark (*i.e.*, they could remain attached to the shark via a small amount of uncut skin). Under this alternative, there would be less of a chance of misidentifying the shark or the fin, particularly if the person were trained to identify shark species (see Section 2.1.1). Thus, species-specific reporting should improve and, correspondingly, stock assessments should be more accurate. Additionally, because fishermen would no longer be able to bypass the regulations by keeping the fins of sharks that are not landed, fishing mortality of sharks overall could be reduced. This would improve the status of sharks, particularly large coastal sharks, and improve the chances of rebuilding sharks according to the rebuilding plan.

None of the alternatives considered above are likely to have any impacts on protected species or essential fish habitat.

Social and Economic Impacts

Shark fins are the most valuable part of the shark. While fishermen can also sell the meat, teeth, and skin, shark fins comprises the majority of the profit due to the large demand for shark fin soup from Asian countries. While the ex-vessel price of shark meat ranges from $0.25 per pound in 1996 for small coastal sharks to $1.11 per pound in 2001 for pelagic sharks, the ex-vessel price of shark fins range from $6.01 per pound in 1996 to $16.25 per pound in 2004 (see Table 3.65 in Section 3.5.1.2). Fin price depends on the length of the cartilage and the quality of the fin. Large, dry fins are worth more than small, wet fins. Fins are generally bought and sold in three "grades" or quality levels. Through anecdotal information, NMFS knows that the dorsal fin of a large sandbar shark or hammerhead shark can bring top price. According to a discussion on the Elasmo-L listserve, primary fins from a sandbar shark have a larger ex-vessel price than primary fins from a bull shark, while fins from a small shark, such as Atlantic sharpnose, bring in a much lower price.

Under alternative I2(a), there would be no short-term economic or social effects. Fishermen and communities would continue operating as they have since implementation of the regulations in 1993. To the extent that some fishermen are finning sharks illegally, there may be

fishing mortality that is not being accounted for in the quota monitoring or the stock assessment. In the long-term, this additional fishing mortality could extend the amount of time required to rebuild large coastal sharks and could increase the chances of pelagic or small coastal sharks becoming overfished. Illegal finning, coupled with errors in landing data could reduce the quota available for fishermen and, thus, reduce the overall potential revenues for the fishery.

Under alternative I2(b), fishermen could experience, in the short-term, some adverse economic costs associated with keeping the second dorsal and anal fins on the sharks. Due to their small size and fiber content, the second dorsal and anal fins of a shark are usually sold at the lowest quality grade and are often referred to as "chips." Thus, even under the current regulations, these fins are not going to result in a large percentage of the value of the shark. Under this alternative, these fins will remain frozen and will not begin to dry, unlike the other fins. At the dock, the owner/operator of the vessel will need to determine if the value of these small, wet fins offsets the cost of having crew remove them after the fish have been offloaded from the vessel. This decision will likely rely, in part, on the decision of the dealer regarding (a) whether or not to pay for the fins attached to the shark carcass and (b) whether or not to process the fins while completing the processing of the shark itself. Thus, it is possible that the fishermen will not experience any significant adverse economic costs from this alternative and may experience some benefits if the crew can spend less time processing and packing the sharks at sea and the dealers continue to give them full price for the smaller fins on the carcass. It is equally possible that the fishermen may lose a small portion of their revenue by failing to remove the fins and that the dealers gain by processing the fins after buying the carcass. The Agency received a comment opposing this alternative due to additional time and revenue losses that may result from removing the smaller/secondary fins after docking. While initial adjustments may have to be made to the offloading and processing procedures, in the long-term, improved quota monitoring and stock assessment data as a result of this alternative could result in a larger quota and therefore larger net revenues for both the fishermen and the dealer.

Under alternative I2(c), shark fishermen would be allowed to remove all the fins of lemon and nurse sharks only. This would allow the second dorsal and anal fins of these species, which are larger and likely worth more than those of other sharks, to begin to dry, thus allowing fishermen to maintain their current profit margins. However, because currently fishermen land so few lemon and nurse sharks (approximately one percent in total; all nurse sharks are currently released although they can be landed (Burgess and Morgan, 2005)), NMFS believes that any economic benefit gained would be marginal.

Alternative I2(d) would have the largest economic burden of any of the alternatives. In the short-term, this alternative could change the foundation of the U.S. Atlantic shark fin market. At this time and since the fishery began in the 1980s, most shark fins sold in the United States are landed separately from the shark. In 1993, shark fins were required to be removed from the vessel at the first port of landing. This prevented fishermen from drying shark fins onboard their vessel over time in order to increase the value of the fin. Under this alternative, shark fishermen would not be allowed to remove the fins from the shark until the sharks are landed. Costa Rica has implemented a similar regulation that allows fishermen to cut the fins mostly off the shark, as long as a small piece of skin keeps the fin attached to the shark until landing. According to a discussion on the Elasmo-L listserve, this practice has allowed fishermen to receive the expected

revenues for both the fin and the meat because the fin can be fully removed from the shark at the dock without thawing the shark. As with the preferred alternative I2(b), the vessel owner/operator would need to decide whether the benefit of selling the fins separate from the shark outweighs the cost of having the crew remove the fins during offloading. While the fin would likely still be of high quality once dry, it is unlikely that the ex-vessel price of fins packed in ice with the rest of the shark would be as high as fins that had begun drying. Additionally, if the shark cannot be packed in ice properly due to maintaining the fins on the shark, the quality of the meat, and therefore its value, could also decrease.

The overall social impact of any of these alternatives, with the possible exception of alternative I2(d), is likely to be minimal in the long-term. In all cases, shark fins would still be entering the market. For alternatives I2(b) and (c), the economic cost on the fishermen, even if they do not receive as high an ex-vessel price for the wet small fins as they do currently, should be minimal. Therefore, NMFS would not expect any social impacts. However, under alternative I2(d), it is possible that there could be numerous social impacts, particularly in the short-term, as the market adjusts itself to accepting all wet fins. This could be significant for the fishery and its related communities and support system that has had numerous reductions in quotas and profits since 1993.

Conclusion

NMFS prefers alternative I2(b), requiring the second dorsal and anal fins to remain on all sharks through the first port of landing. While this alternative could have some minor economic and social impacts, this alterative is expected to generate ecological benefits by enhancing and improving species identification and data collection, thereby leading to improved management and increased shark populations. Alternative I2(c) would have similar economic and social impacts but could confuse the issue of identification and might have adverse ecological impacts compared to either the No Action or the preferred alternative. Alternative I2(d) would have the largest ecological benefits but could also have fairly large adverse economic and social impacts.

Issue 3: HMS Retention Limits

Currently, compliance with many of the HMS retention limits is less effective than intended because the regulations are specific to "persons aboard a vessel" (*i.e.*, vessel owners and operators). As described in Chapter 2, NMFS is considering the following alternatives to address the purchase and sale of HMS by dealers in excess of the retention limits:

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

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

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

Ecological Impacts

Under alternative I3(a), the No Action alternative, there may be slight negative ecological impacts on vessel operators that may be illegally landing and selling HMS in excess of the commercial retention limits, thus circumventing the conservation benefits derived from those limits. Also under this alternative, dealers have not been prohibited from purchasing more than the commercial daily or trip-based HMS retention limits from one particular vessel. As the possession of HMS in excess of the commercial retention limit is already illegal under other sections of the regulation implementing the 1999 FMP, there is little data available to accurately assess the magnitude of this issue.

Under alternatives I3(b) and I3(c), the preferred alternatives, the addition of clear prohibitions regarding the purchase (by dealers) and sale (by vessels) of illegal landings in excess of the retention limits could provide an additional deterrent, and therefore have slightly more positive ecological benefits than the No Action alternative.

None of the alternatives considered above are likely to have any impacts on protected species or essential fish habitat.

Social and Economic Impacts

Under alternative I3(a), individual vessel owner/operators, and/or dealers, may be experiencing some positive economic benefits from the sale, or purchase, of HMS exceeding the current commercial retention limits. However, there may also be negative social and economic impacts associated with those activities attributed to violating the vessel trip limits and potential enforcement actions. There could also be negative social impacts associated with the perception of circumventing the intent of the current rules and regulations by law-abiding vessels, owner/operators, and dealers.

Under alternative I3(b), the overall net social and economic benefit would be slightly more positive than under the No Action alternative, because it would explicitly hold HMS dealers accountable for knowing and not purchasing any more fish from an individual vessel than the commercial retention limits specified for a particular species. Thus, this alternative may further deter illegal activities of this nature.

Under alternative I3(c), the net social and economic benefits would be very similar to alternative I3(b) because it would explicitly prohibit sales from an individual vessel in excess of commercial retention limits, thereby strengthening existing regulations regarding the possession, retention or landing of HMS. Both alternatives I3(b) and I3(c) would aid in the enforcement of HMS regulations.

Conclusion

NMFS prefers alternatives I3(b) and I3(c). The addition of clear prohibitions regarding the purchase and sale of illegal landings in excess of commercial retention limits may act as an additional deterrent to discourage this practice. Therefore, these alternatives will have slightly more positive ecological benefits than the No Action alternative. Although some fishery

participants may benefit economically from the illegal sale, or purchase, of HMS exceeding the current commercial retention limits, social benefits will be obtained as a result of strengthening the regulations on behalf of law-abiding vessel operators and dealers. NMFS believes that these social benefits will outweigh any short-term economic benefit gained as a result of illegally selling catches in excess of the commercial retention limits.

Issue 4: Definition of East Florida Coast Closed Area

As described in Chapter 2, the alternatives that are being considered to better define the East Florida Coast closed area are:

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

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

Ecological Impacts

Alternative I4(a) would retain the current coordinates for the East Florida Coast PLL closed area (No Action). As such, there would be no additional ecological impacts, either positive or negative. However, because a current coordinate of the closed area inadvertently does not extend seaward to the outer boundary of the U.S. EEZ, as originally described in the FSEIS prepared pursuant to the closure (NMFS, June 14, 2000), the No Action alternative is not defined as originally intended in the June 14, 2000, action. Therefore, the definition of the closed area is confusing.

Alternative I4(b) would amend the second coordinate of the East Florida Coast closed area by extending it seaward 1.02 km (0.55 nmi), so that it corresponds with the EEZ. Because the closed area would be enlarged, it could provide a greater reduction in the bycatch of undersized swordfish, sailfish, and other HMS than the No Action alternative. However, this reduction in bycatch and discards is not likely to be substantial, as the outer coordinate being considered in this alternative is only 1.02 km (0.55 nmi) seaward (eastward) of the current coordinate. Neither alternative is likely to have any impacts on protected species or essential fish habitat.

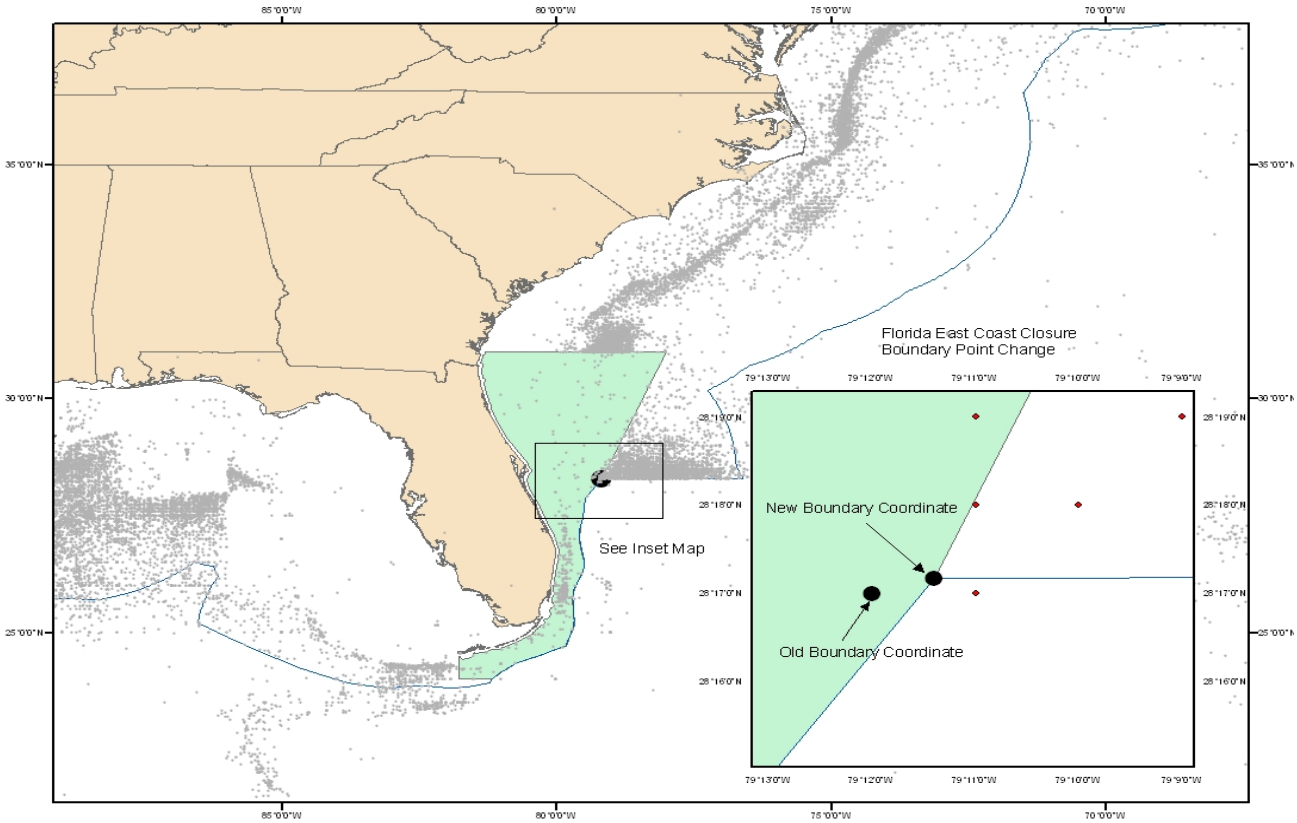


Figure 4.23 Map of the East Florida Coast closed area (solid shaded area) and the boundary of the U.S. EEZ (thin line wrapping around the coast). The inset is a close-up of the closed area depicting both the old and proposed (new) boundary coordinates. The small grey dots represent locations of longline sets from the year 2000 through the first half of 2004.

Social and Economic Impacts

Alternative I4(a) would retain the current coordinates for the East Florida Coast PLL closed area (No Action). As such, there would be no additional social or economic costs or benefits.

Alternative I4(b) would amend the second coordinate of the East Florida Coast closed area by extending it seaward 1.02 km (0.55 nmi) to 28° 17’ 10” N. Lat., 79° 11’ 24” W. Long. NMFS received a comment against this alternative. Because the PLL closed area would be enlarged, there would be less area available for PLL fishing activity. This alternative could, therefore, potentially reduce HMS catches and associated landings revenues. However, NMFS does not expect a reduction in HMS catches associated with alternative because the geographic size increase is very small and, according to the HMS logbook data, there have not been any recent catches or PLL sets in this area (Figure 4.23). This could indicate that fishing vessels have already been following the EEZ as a boundary for the East Florida Coast closed area, because the rest of the closed area corresponds with the EEZ. Nevertheless, fishing effort that would have occurred in this area would likely relocate to nearby open areas with similar catch rates. Therefore, overall fishing effort is not expected to significantly change under this alternative, and any potential reduction in catches or revenues would be minimal or nonexistent.

A potential benefit to this alternative is less confusion over the definition because the coordinates would correspond to the U.S. EEZ, as originally intended. This alternative is not expected to compromise safety at sea, as it is not likely to significantly alter current fishing practices.

Conclusion

NMFS prefers alternative I4(b). This alternative would amend the area of the East Florida Coast closed area by extending one of its coordinates 1.02 km (0.55 nmi) seaward so that it corresponds with the outer boundary of the EEZ. This alternative is not expected to create significant adverse economic costs or adverse social impacts. Any fishing effort that would have occurred in this area will likely relocate to nearby open areas with similar catch rates. Because the East Florida Coast closed area would be enlarged under this alternative, it could provide a greater reduction in the bycatch of undersized swordfish, sailfish, and other HMS as compared with the No Action alternative, but this reduction is expected to be very minimal.

Issue 5: Definition of Handline

As described in Chapter 2, the alternatives for defining handline are:

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

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

I5(c) Require that handlines remain attached to a vessel when fishing recreationally and allow unattached handlines when fishing commercially

Ecological Impacts

Alternative I5(a) would retain the current definition of "handline" at § 635.2 (No Action). This definition does not specify that handlines must remain attached to a vessel, and there is no limit on the amount of unattached handlines that could be deployed. There would be no additional ecological impacts, either positive or negative, associated with this alternative. However, it has been brought to the Agency's attention through public comment that some vessel operators, both commercial and recreational, may be deploying numerous handlines that are not attached to their vessel in areas that are closed to pelagic longlines and elsewhere. While these vessel operators may be technically compliant with current regulations, the No Action alternative may be inconsistent with the traditional concept that handline gear is relatively benign with minimal ecological impacts. Uncontrolled expansion of this gear sector, especially in areas that are closed to pelagic longlines to reduce bycatch, could potentially diminish NMFS' ability to accomplish this objective.

Under the current handline definition, most HMS commercial permit holders may legally deploy an unrestricted number of unattached handlines. As of February 1, 2006, the number of permit holders that could potentially participate in this activity include: Atlantic Tunas General (4,824 permittees); Shark Directed (240 permittees); Shark Incidental (312 permittees); Swordfish Directed (191 permittees); Swordfish Incidental (86 permittees); Swordfish Handgear (88 permittees); and Charter/Headboat (except when fishing for billfish where rod and reel is the

only authorized gear) (4,173 permittees). Also, except when fishing for billfish, all HMS Angling category permit holders (25,238 permittees) could deploy an unlimited number of unattached handlines. Because vessel owners may possess more than one permit, the actual number of affected entities is less than the sum of the permittees enumerated above. Nevertheless, a large proportion of HMS permit holders could potentially deploy unattached handlines. Based upon public comment, this practice does not appear to be widespread, but it may be growing among a small number of vessel operators, principally those targeting swordfish in the East Florida Coast closed area.

There are no data indicating exactly how many vessels are fishing with unattached handlines because the HMS logbook does not differentiate between "attached" and "unattached" handlines, and recreational data are limited. Table 4.74 indicates that the number of commercial fishing trips that reported using handline gear decreased quite significantly in 2003, but returned to more historical levels in 2004. Notably, however, those trips that were reported as using "handline-only" (*i.e.*, no other gears reported) showed a very large increase from 2003 to 2004. The primary target species in 2004 for commercial "handline-only" trips was swordfish, with lesser amounts of YFT and BET kept. This is probably due to greater swordfish abundance, but could also indicate more effective handline fishing techniques, including the use of unattached handlines. It is likely a combination of both of these factors. Although it is not possible to conclusively state that the commercial HMS handline fishery is becoming more efficient through the use of unattached handlines, the increased number of commercial "handline-only" trips in 2004, and the higher numbers of swordfish landed, suggests that this may be occurring. The No Action alternative could continue the trend of increased numbers of "handline-only" trips and swordfish handline landings. Historically the HMS commercial handline fishery has had relatively few discards, although there was an increase in both dead and live discards in 2004, which could be the result of an increased number of "handline-only" trips. It is possible that discards of undersized swordfish, billfish, tunas, sharks, and other species could increase if overall effort in the commercial and recreational handline fishery were to increase. Also, if more unattached handlines were deployed, there is a greater likelihood that more gear could get lost with unknown consequences on fish mortality. NMFS received a comment in reference to alternative I5(a), asking whether floating handlines were being used to catch undersized swordfish in the East Florida Coast closed area. As mentioned above, the HMS logbook does not differentiate between "attached" and "unattached" handlines, and recreational data are limited. Given these limitations, it is not possible to determine conclusively if floating handlines are being used to catch juvenile swordfish in the East Florida Coast closed area. However, given that the legal minimum size is below the size of maturity, the average size of swordfish caught across all fisheries is below the size of maturity, and because the area off the east coast of Florida is a known nursery ground for swordfish, it is likely that any fishing gear, including rod and reel or handlines, used to catch swordfish off the east coast of Florida catches juvenile swordfish. The data provided in Table 4.70 in the Authorized Fishing Gear section indicate that the "handline-only" fishery grew significantly in 2004, and provides information on catches and discards of swordfish.

Table 4.74 Numbers of Trips Reported as Using Handline Gear in the HMS Logbook and Numbers of Those Trips that were "Handline-Only." Source: HMS Logbook. Note that confidential data cannot be released and are marked by an *.

	2000	2001	2002	2003	2004
Number of trips using handline	115	83	81	19	73
Number of "handline-only" trips	*	0	*	*	64

* Confidential data

Alternative I5(b), a preferred alternative, would amend the definition of "handline" by requiring that handlines remain attached to all vessels. However, preferred alternative H5 would define unattached handlines as "buoy gear," and authorize their use only in the commercial swordfish handgear fishery with a more refined definition and additional restrictions. Therefore, in conjunction with preferred alternative H5, this alternative (I5(b)) would primarily impact recreational HMS fishery participants, and those commercial permittees that do not possess a swordfish handgear permit. By itself (*i.e.*, not in conjunction with alternative H5), this alternative could restrict or limit fishing effort, although there are no data indicating exactly how many vessel operators are fishing with unattached handlines, or how many handlines they are deploying. Depending upon the size of the vessel and the number of passengers onboard, the number of attached handlines that could be fished could range from one to, possibly, as many as fifty. In contrast, under the No Action alternative, a vessel could potentially fish with more than fifty unattached handlines and cover a much larger geographic area. Public comment suggests that, among active fishery participants, a requirement for handlines to remain attached to all vessels would reduce the number of handlines that could be fished or deployed. Operationally, it may also be less efficient to fish with several attached handlines as they may be more prone to entanglement. Because this alternative could restrict or limit fishing effort, it is projected to produce unquantifiable positive ecological impacts, including a reduction in the bycatch of undersized swordfish, other undersized species, protected species, and target species catches. However, catches of target species are not expected to significantly decrease, as they are largely governed by possession limits, quotas, and minimum size limits. Positive ecological benefits could also be realized by a reduction in the amount of gear that could get lost.

Alternative I5(c) would require that handlines remain attached to all vessels possessing an HMS Angling category permit, an HMS Charter/headboat permit when fishing on a for-hire trip, or an Atlantic Tunas General category permit when fishing in a registered HMS tournament. Under alternative I5(c), commercial permit holders that are currently authorized to fish with handlines would be allowed to fish with unattached handlines. The effect of this alternative could be to restrict or limit recreational fishing effort, although there are no data indicating exactly how many recreational vessels are fishing with unattached handlines, or how many unattached handlines these vessels are deploying. As of February 1, 2006, there were 25,238 HMS Angling category permit holders. If few recreational vessels are currently fishing with unattached handlines, then any ecological benefits associated with this alternative, including a reduction in discards or target species catch, would be minimal. Conversely, if fishing with unattached handlines is a common recreational practice, the ecological benefits associated with this alternative would be greater. Because this alternative could restrict or limit recreational fishing effort, it is projected to produce unquantifiable positive ecological impacts, including a reduction in the bycatch of undersized swordfish, other undersized species, and protected

species. Catches of target species are not expected to significantly decrease however, as they are largely governed by bag limits and minimum size limits. Positive ecological benefits could also be realized by a reduction in amount of gear that could get lost.

None of the alternatives considered above are likely to have any adverse impact on protected species or essential fish habitat.

Social and Economic Impacts

Alternative I5(a) would retain the current definition of "handline" at § 635.2 (No Action). This definition does not require that handlines remain attached to a vessel, and there is no upper limit on the number that may be deployed. There would be no additional social or economic benefits or costs associated with this alternative. Under the current definition, most HMS commercial permit holders may legally deploy unattached handlines, as described under the ecological impacts section above. Based upon public comment the practice does not appear to be widespread, but it may be growing among a small number of vessel operators primarily targeting swordfish in the East Florida Coast closed area. Under the No Action alternative, the ability to deploy numerous unattached handlines represents a positive social and/or economic opportunity for commercial and recreational fishery participants who choose to, or may want to, fish in this manner. Conversely, commercial and recreational fishery participants who do not participate in this activity may feel that the No Action alternative diminishes the quality of fishing by increasing the amount of deployed gear, particularly in areas that are closed to pelagic longlines.

As noted above, preferred alternative I5(b) (requiring attached handlines), if implemented in conjunction with preferred alternative H5 (authorize buoy gear in the swordfish handgear fishery), could impact all recreational HMS permit holders and those HMS commercial permittees that do not possess a swordfish handgear permit. By itself (*i.e.*, not in conjunction with alternative H5), alternative I5(b) could impact all HMS recreational permit holders and all commercial permit holders that are currently authorized to fish with handline gear. However, based upon public comment, this practice does not appear to be widespread, but may be growing among a small number of vessel operators. The effect of this alternative could be to restrict or limit such fishing effort. Depending upon the size of the vessel and the number of passengers onboard, under alternative I5(b), the approximate number of attached handlines that could be fished from a vessel could range from one to as many as fifty. In contrast, under the No Action alternative, a vessel could potentially fish with over fifty unattached handlines and cover a much larger geographic area. Operationally, it may also be less efficient to fish with attached handlines as they may be more prone to entanglement. Therefore, this alternative could result in an unquantifiable reduction in the number of handlines that could be fished. Because this alternative could restrict or limit fishing effort, it could potentially produce adverse social and economic costs, including an unquantifiable reduction in catches of target species for vessels that participate in this fishery. During the scoping process, some commenters indicated that a requirement to attach handlines to vessels would render the commercial handline fishery unprofitable. This could reduce opportunities for the United States to fully utilize its ICCAT swordfish quota, which has had consistent underharvests in recent years. Authorizing buoy gear in the swordfish handgear fishery under alternative H5 would mitigate this impact, however. Recreational catches of target species could be impacted, but are not expected to significantly decrease as the recreational sector is largely governed by bag limits, quotas, and minimum size

limits. If few recreational vessels currently fish with unattached handlines, then any social or economic impacts associated with this alternative would be minimal. Conversely, if fishing with unattached handlines is a common recreational practice, any social and economic burden associated with this alternative, including impacts on charter/headboat operators and gear suppliers, would be greater. Commercial and recreational fishery participants who do not participate in this activity, and do not intend to, may feel that the alternative I5(b) would improve the quality of fishing by reducing the amount of deployed gear. NMFS received a comment indicating that if a fishing line is attached to a vessel it is a handline, if it is not it is a longline. In general, by preferring alternative I5(b), NMFS concurs with this comment. Only a very narrow exception would be created by preferring Alternative H5, whereby commercial swordfish handgear permit holders would be permitted to deploy a limited amount of specially marked buoy gear. These measures will prevent the uncontrolled future expansion of the buoy gear sector, while simultaneously providing a reasonable opportunity for the U.S. to harvest its ICCAT swordfish quota.

Alternative I5(c) would require that handlines remain attached to all vessels that possess an HMS Angling category permit, an HMS Charter/headboat permit when fishing on a for-hire trip, or an Atlantic Tunas General category permit when fishing in a registered HMS tournament. Commercial HMS permit holders who are currently authorized to fish with handlines would continue to be allowed to fish with unattached handlines. The effect of this alternative could be to restrict or limit recreational fishing effort, although there are no data indicating exactly how many recreational vessels are fishing with unattached handlines, or how many they are deploying. Because this alternative could restrict or limit recreational fishing effort, it is projected to produce unquantifiable adverse social and economic impacts on affected recreational HMS fishing vessels, including a potential reduction in target species catches if operational efficiency is reduced. However, recreational catches of target species would not be expected to significantly decrease under this alternative, as the recreational sector is largely governed by bag limits, quotas, and minimum size limits. According to public comment, recreational swordfish catches would most likely be affected, as that is the primary target species. If few recreational vessels are currently fishing with unattached handlines, then any social or economic impacts associated with this alternative would be minimal. Conversely, if fishing with unattached handlines is a common recreational practice, any social and economic costs associated with this alternative would be greater for those vessel operators who participate in this activity. Similar to alternative I5(b), commercial and recreational fishery participants who do not participate in this activity, and do not intend to, may feel that the alternative I5(c) would improve the quality of fishing by reducing the amount of deployed gear.

Conclusion

NMFS prefers alternative I5(b). This alternative would require that handlines remain attached to all vessels. However, preferred alternative H5 would define unattached handlines as "buoy gear" and authorize their use only in the commercial swordfish handgear fishery with additional restrictions. Therefore, in conjunction with preferred alternative H5, alternative I5(b) would primarily impact recreational fishery participants and commercial permittees that do not possess a swordfish handgear permit. This alternative is not expected to create a significant adverse social or economic burden on fishery participants. Catches of target species could be impacted, but they are not expected to significantly decrease as catches are largely governed by

bag limits, trip limits, closed areas, gear restrictions, quotas, and minimum size limits. Relative to the No Action alternative, alternative I5(b) is expected to provide some minor positive ecological benefits by limiting the potential future expansion of the handline sector, and possibly reducing the amount of lost gear. If this were to occur, there may be an unquantifiable future reduction in the bycatch of undersized swordfish, other HMS species, protected species, and target catches. Alternative I5(c) would impose similar social, economic, and ecological impacts as the combination of preferred alternatives H5 and I5(b).

Issue 6: Possession of Billfish on Vessels Issued Commercial Permits

As described in Chapter 2, the alternatives considered to improve consistency in HMS regulations and to clarify the recreational nature of the billfish fishery are:

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

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

Ecological Impacts

Under alternative I6(a), HMS fishermen on a commercial vessel with pelagic longline gear onboard may not retain billfish, regardless of the gear used, but other commercial fishermen may retain billfish caught on rod and reel. Thus, General Category fishermen, who are commercial fishermen that use rod and reel to catch BFT, could keep Atlantic billfish. Similarly, fishermen using bottom longline gear, who happen to catch a billfish on rod and reel, could potentially keep the Atlantic billfish. These billfish could not be sold. Both white and blue marlin are overfished, and white marlin is a candidate for listing under ESA. Under an ICCAT recommendation, as noted by preferred alternative E6 in Section 2.2.3, the United States is limited to 250 recreational billfish landings per year. Additionally, the billfish fishery is considered to be a recreational fishery, and no fish may be sold. NMFS is not aware of any billfish that have been retained by commercial fishermen for personal or other use. However, allowing some HMS commercial fishermen to keep billfish but not other HMS commercial fishermen is internally inconsistent, and gives the impression that billfish are more than a recreational-only fishery. Depending upon how many fish are harvested by HMS commercial fishermen, this could have an adverse impact on the number of billfish that could be landed by recreational fishermen under the ICCAT-recommended 250-fish limit.

Under the preferred alternative, I6(b), only fishermen issued either an angling or charter/headboat permit could take or possess Atlantic billfish. Additionally, General category fishermen fishing in a registered tournament could take and possess Atlantic billfish. Other HMS permit holders, and General category fishermen outside of a registered tournament, could not take or possess a billfish. Fishermen who have both the recreational and commercial permits (*e.g.*, a commercial shark limited access permit and an HMS Charter/Headboat permit) could take or possess billfish if the other HMS onboard do not exceed the HMS recreational retention limits. This alternative is consistent with current regulations in regard to PLL gear. To the extent that this regulation may reduce Atlantic billfish mortality by requiring HMS commercial

permit holders to release any billfish caught, this alternative could have slight positive ecological benefits.

The HMS Charter/Headboat permit is both a recreational and commercial permit. Such permit holders are allowed to sell their tunas. However, such permit holders cannot sell their swordfish or sharks unless they also hold the appropriate commercial permit. When on a for-hire trip, HMS Charter/Headboat permit holders can still take and retain large coastal sharks under the recreational trip limit even when the fishing season is closed. NMFS did not limit the take of billfish to HMS Charter/Headboat permit holders on a for-hire trip because NMFS felt these permit holders were more likely to engage in recreational-type activities when on a non-for hire trip than typical HMS commercial permit holders. For instance, HMS Charter/Headboat permit holders often participate in tournaments for themselves, rather than for paying customers. As such, under the preferred alternative, HMS Charter/Headboat permit holders have the same benefits as an HMS Angling permit holder. Depending upon public comment and other actions, NMFS may reconsider this decision in the future.

Neither alternative would have any impact on fishermen who hold non-HMS commercial permits. Those permit holders would still need to hold the appropriate HMS permits in order to possess or take billfish. Additionally, neither alternative would be likely to have impacts on protected species or essential fish habitat.

Social and Economic Impacts

Neither alternative should have a significant economic or social burden. These alternatives could affect approximately 5,000 commercial permit holders and most of those are General Category fishermen who would be able to land billfish if they are fishing in a registered HMS tournament. Currently, Atlantic billfish cannot be bought or sold by any permit holder. Thus, limiting the number of billfish landed by commercial fishermen should not reduce profits and should not result in any impacts on communities. To some extent, because this alternative clarifies the recreational nature of the billfish fishery, the preferred alternative could have some positive economic and/or social impacts to the recreational fishing community if it results in enhanced fishing opportunities for recreational fishermen. There could, however, also be some very minor social impacts, as would be expected from any additional limitations on commercial fishermen. For example, commercial fishermen would not be able to retain any billfish for personal use unless they also hold either an HMS Angling or HMS Charter/Heatboat permit, and do not exceed any of the HMS recreational retention limits.

Conclusion

Alternative I6(b) is the preferred alternative because it may have minimal ecological benefits, would have no adverse economic impacts, and would clarify the regulations regarding the retention of billfish by HMS permit holders.

Issue 7: BFT Dealer Reporting

To provide additional flexibility for electronic BFT dealer reporting, it would be necessary to amend the HMS regulations to specify that BFT dealers may submit these reports over the Internet. NMFS is considering the following alternatives:

I7(a) Retain the current regulations regarding BFT dealer reporting (No Action)

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

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

Ecological Impacts

All of the alternatives for BFT dealer reporting are administrative in nature. Therefore, none of them have any significant ecological impacts. Some minor positive ecological impacts however, are anticipated with improved data collection under alternatives I7(b) and I7(c). If using the Internet improves the quality or timeliness of dealer reporting, this could improve quota monitoring, stock assessments, and compliance with ICCAT requirements. None of the alternatives are likely to have any impacts on protected species or essential fish habitat.

Social and Economic Impacts

Under alternative I7(a), the No Action alternative, dealers are required to submit the reports in the mail or via fax, the Agency personnel enter the data into a database. In some cases dealers are required to enter the same or similar data on several different forms, and the data are then re-entered by agency staff, imposing time costs on both industry and government.

Alternative I7(b), the preferred alternative, may reduce the amount of paperwork for the dealers by providing them with an option to submit required reports via the Internet once a data entry system is developed. This alternative may also reduce the dealer burden by reducing the number of times the same data is submitted; however, there may be some initial burden associated with learning the new software. The government's burden may also change from data entry to quality control and oversight of the provided data. This alternative would provide dealers with the flexibility to use electronic reporting, but would not require them to do so. As such, it is not possible to accurately quantify specific changes in paperwork burdens without knowing which dealers may choose to use this option.

Alternative I7(c) may further reduce burdens in the long-term by requiring most dealers, with some limited exceptions, to use electronic reporting. However, this alternative may impose initial economic costs to dealers who do not already have electronic access to the Internet, although some of the exceptions being considered may alleviate these costs (*i.e.* dealers of limited size and/or magnitude of reporting). Some social costs may be incurred by dealers who would have to learn and adapt to electronic reporting under alternative I7(c), although most dealers are expected to have already transitioned to similar electronic data systems as a part of modern business practice.

Conclusion

NMFS prefers alternative I7(b), and has received public comment supporting this alternative. The preferred alternative would provide an option for BFT dealers to submit certain reports electronically over the Internet once such a system is developed, but would not require it. Although unquantifiable, this alternative is expected to produce positive social and economic impacts for both industry and government, as a result of timesavings incurred when such a system is developed. None of the alternatives are expected to have any significant adverse ecological impacts, as reporting is primarily administrative in nature.

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

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

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

I8(c) Require submission of the trip "Cost-Earnings" reporting form for selected vessels 30 days after a trip and the "Annual Expenditures" report form by the date specified on the form – Preferred Alternative

Ecological Impacts

Under all of the alternatives, fishermen would continue to submit logbooks consistent with the current regulations. None of the alternatives would have any ecological impact, unless the fishermen submitted false reports. Therefore, none of the alternatives are likely to have any impacts on protected species or essential fish habitat.

Social and Economic Impacts

Under all of the alternatives, fishermen would continue to submit logbooks consistent with the current regulations. None of the alternatives would have any economic costs, unless the fishermen submitted false reports and were subject to penalties.

There could be some social impacts as a result of all the alternatives. Under the No Action alternative I8(a), numerous fishermen have been confused regarding the deadlines for submitting certain reports, which has caused delays in permit renewal. Under preferred alternative I8(b), the timeframe for submitting "no fishing" reports would be clarified in the regulations, resulting in fewer permit renewal delays. There could be an increased reporting burden for some fishermen who currently submit all of their "no fishing" reports only once a year, when renewing their permits. However, the Agency received comment supporting monthly submission of "no fishing" reports under alternative I8 (b). Preferred alternative I8(c) would specify that the trip "cost-earnings" reporting form for selected vessels would be due 30 days after a trip, and the "annual expenditures" report form would be due by the date specified on the form (presently January 31st). Under both of the preferred alternatives, failure to report or falsifying reports could result in penalties, fines, and/or permit sanctions including the loss of a permit.

Conclusion

Alternatives I8(b) and I8(c) are preferred because they would clarify HMS logbook reporting regulations and would have no ecological or economic impacts.

Issue 9: Non-Tournament Recreational Landings Reporting

As described in Chapter 2, the alternatives to remove regulatory inconsistencies and to clarify NMFS' intent that the vessel owner, rather than the angler, be responsible for reporting non-tournament recreational landings of Atlantic billfish and swordfish are:

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

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

Ecological Impacts

Alternative I9(a) (No Action) would retain the current regulatory language at § 635.5(c)(2), which specifies that anglers, rather than vessel owners, are required to report all non-tournament landings of Atlantic blue marlin, Atlantic white marlin, Atlantic sailfish, and North Atlantic swordfish by calling NMFS. There are no direct ecological impacts associated with this alternative, because HMS recreational reporting is primarily an enforcement and administrative function involving a toll-free call to NMFS when a billfish or swordfish is landed. Thus, there would be no change in fishing effort as a result of retaining the *status quo*. However, compliance with non-tournament recreational reporting requirements and data collection could be compromised under the No Action alternative, because individual anglers, especially on charter boats, may be less familiar with the regulations and less inclined to report. Furthermore, punitive permit sanctions issued on behalf of NMFS for a failure to report non-tournament landings are more difficult to impose because HMS fishing permits are issued to vessel owners, not to individual anglers. For this reason, the collection of non-tournament recreational HMS landings data may be less complete under the No Action alternative. This information is vital for HMS stock assessments, quota monitoring, and determining compliance with ICCAT recommendations.

Alternative I9(b) would amend the current regulatory language at § 635.5(c)(2), by specifying that vessel owners (or designee) must report all non-tournament landings of Atlantic blue marlin, Atlantic white marlin, Atlantic sailfish, and North Atlantic swordfish by calling NMFS. The vessel owner would be responsible for reporting, but the owner's designee could fulfill the requirement. For the same reasons discussed above, there would be no direct ecological impacts or change in fishing effort associated with this alternative. There would, however, be some positive ecological impacts associated with increased compliance and improved non-tournament recreational data collection by linking non-reporting to permit sanctions. Compliance and recreational HMS data collection could be further enhanced because permitted vessel owners, or their designee, are more likely to be familiar with the regulations governing their fishery than non-permitted anglers are. Improved non-tournament recreational

HMS reporting information is vital for stock assessments, quota monitoring, and determining compliance with ICCAT recommendations.

Neither alternative is likely to have any impacts on protected species or essential fish habitat.

Social and Economic Impacts

Under alternative I9(a), the current reporting process involves anglers placing a toll-free call to NMFS and a follow-up telephone call from NMFS to issue a confirmation number. As such, there are no significant social or economic costs associated with this alternative. However, there are some minor adverse social effects and compliance issues associated with the current regulations because they are inconsistent with regulations for BFT, which specify that vessel owners are required to report recreational landings regulated under the HMS Angling category. This inconsistency may cause confusion regarding reporting responsibilities for both vessel owners and anglers. Furthermore, since vessel owners are the permit holders, they are more likely to be familiar with the regulations governing their fishery than non-permitted anglers who may be onboard, possibly for just a day on a charter trip. Because permits are issued to vessel owners, not anglers, the recreational non-tournament reporting requirement should logically, and for compliance purposes, be the responsibility of vessel owners. Also, if several fish were landed on a vessel by different anglers, the current regulations require each angler to report their fish, as opposed to only the vessel owner reporting all of the fish. Finally, the current regulations are inconsistent with the original intent of the requirement. Previously, in response to a comment on the proposed rule implementing the original requirement (January 7, 2003, 68 FR 711), NMFS stated that, "Owners of HMS Angling permitted vessels and Charter/Headboat operators are responsible for reporting all non-tournament billfish/swordfish landings because not all CHB vessels are selected to submit logbooks as specified under 50 CFR 635(a)."

Alternative I9(b), the preferred alternative, would amend the current regulations at § 635.5(c)(2) by specifying that vessel owners (or their designees) must report all non-tournament landings of Atlantic blue marlin, Atlantic white marlin, Atlantic sailfish, and North Atlantic swordfish by calling NMFS at a toll-free number. Based upon public comment, this preferred alternative has been modified slightly from the Draft HMS FMP by specifying that a vessel owner's designee may also report landings, in lieu of the owner. The vessel owner would be responsible for reporting, but the owner's designee could fulfill the requirement. As of February 1, 2006, 25,238 HMS Angling category permits and 4,173 HMS CHB permits were issued**.** All of these permit holders could potentially be affected by this alternative if they land HMS. However, there would be no significant adverse social or economic costs or burden associated with this alternative, because non-tournament HMS recreational reporting simply involves placing a toll-free call to NMFS when a billfish or swordfish is landed and a follow-up call from NMFS. Requiring vessel owners (or their designees) to report would only minimally increase administrative costs. For the 2004 fishing year (the last complete year), 363 non-tournament recreational landings of HMS were reported, of which 302 came from Florida. Approximately 95 percent of these were from the vessel operator, based on an informal analysis of the call-in line, so this alternative is not expected to dramatically alter current reporting practices. NMFS received comment indicating that this alternative could potentially disadvantage, or impose an additional burden on, absentee vessel owners. In consideration of this comment, NMFS has

modified the preferred alternative to allow an owner's designee to report. The vessel owner would be responsible for reporting, but the owner's designee could fulfill the requirement. There could be some minor positive social impacts because recreational reporting responsibilities would be more consistent. Also, because permits are issued to vessel owners, linking non-reporting to permit sanctions would enhance enforcement and compliance. Compliance could be further enhanced because permitted vessel owners, or their designees, are much more likely to be familiar with the regulations governing their fishery than occasional anglers are. Enhanced compliance resulting from this alternative is expected to improve recreational non-tournament data collection, which would improve the analysis and development of recreational HMS management measures. It is possible that this alternative could also reduce the number of reporting calls to be made if, for example, several fish are landed on a vessel by several different anglers.

Conclusion

NMFS prefers alternative I9(b). This alternative would amend the current regulations at § 635.5(c)(2) by specifying that vessel owners (or their designees), rather than anglers, must report all non-tournament recreational landings of Atlantic billfish and North Atlantic swordfish. The vessel owner would be responsible for reporting, but the owner's designee could fulfill the requirement. This alternative is not expected to create significant adverse social or economic impacts. Compared to the No Action alternative, alternative I9(b) would achieve better consistency among HMS recreational reporting requirements, improve compliance with the non-tournament recreational HMS reporting requirements, and improve non-tournament recreational HMS data collection. This could enhance HMS stock assessments, quota monitoring, and the determination of compliance with ICCAT recommendations. Any negative social or economic impacts associated with the preferred alternative are expected to be minimal, primarily because vessel owners already submit the majority of non-tournament HMS landing reports, and because this alternative would allow the designee of a vessel owner to report.

<u>Issue 10: Pelagic Longline 25 mt NED Incidental BFT Allocation</u>

As described in Chapter 2, the alternatives being considered to clarify the amount of available incidental BFT quota for PLL fishing activity in the vicinity of the NED are:

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

I10(b) Modify the HMS regulations to state that "In addition, each year, 25 mt (ww) will be allocated for incidental catch by pelagic longline vessels fishing in the NED"

I10(c) Conduct additional discussions at ICCAT regarding quota rollovers and adjust quotas allocated to account for bycatch related to pelagic longline fisheries in the vicinity of the management area boundary accordingly (Preferred Alternative)

Ecological Impacts

Consistent with the 2002 ICCAT BFT quota recommendation, alternative I10(a) would continue to allocate a 25 mt (ww) set-aside quota of BFT to account for the incidental catch of BFT by longline fisheries directed on other species "in the vicinity of the management boundary

area" for the eastern and western BFT stocks (*i.e.*, the NED). Under this alternative, NMFS would allocate 25 mt (ww) on an annual basis and would apply carry-over provisions to this set-aside. Therefore, if the previous year's longline activity has not resulted in harvesting this set-aside in full, NMFS would carry forward the un-utilized quota and add it to the subsequent fishing year's 25 mt (ww) allocation. Conversely, if the previous year's longline activity has exceeded the incidental set-aside quota, NMFS would deduct the overharvest from the subsequent fishing year's 25 mt (ww) allocation. As the mortality of BFT caught and landed under this set-aside is accounted for in BFT stock assessments under the ICCAT-recommended 20-year rebuilding program, NMFS anticipates there would be no additional mortality that has not already been analyzed pursuant to the BFT stock from any of the alternatives. However, I10(a) may have some potentially adverse ecological impacts. Specifically, if the NED set-aside is not attained in multiple successive years, this set-aside quota could increase quite dramatically and, as the wording in the ICCAT recommendation specifically allocates this quota to the longline sector of the U.S. fleet, NMFS would not have the flexibility to transfer this quota to the Reserve or to another domestic user group to avoid a 'stockpiling' situation from occurring. An unconstrained build-up of the incidental NED set-aside quota may eventually undermine the intent of the set-aside itself by leading to additional effort being deployed in the NED, and could potentially provide incentives to direct effort on BFT. For example, this set-aside could increase to a level that makes it more attractive for pelagic longline vessels to target BFT, versus encountering them incidentally, which could possibly result in negative impacts to BFT stocks.

Alternative I10(b) would revise the regulatory text to read that "each year" 25 mt (ww) would be allocated for the incidental harvest of BFT in the NED, thus interpreting the ICCAT recommendation as if it was intended to establish a baseline allocation of 25 mt (ww) each year, and establish that the overall allotment of this set-aside quota could differ from the baseline 25 mt (ww) amount. Under this alternative, incidental BFT landings from the NED Statistical area would be accounted for by deducting landings from this specific set-aside quota and any under/overharvest of the set-aside quota would be carried forward into, or deducted from, the following year's baseline quota allocation of 25 mt (ww). This alternative would have similar potentially adverse ecological impacts as alternative I10(a) associated with applying carry-over provisions to this specific set-aside allocation. This alternative was originally preferred in the Draft HMS FMP, but after subsequent analysis of the recommendation and in response to comments seeking clarification, the Agency has determined the ICCAT recommendation provides the flexibility to avoid these potential negative consequences.

The preferred alternative I10(c) would conduct additional discussions at the annual ICCAT meeting regarding the long-term implications of allowing unused BFT quota from the previous year being added to the subsequent year's allocation that can be retained. Depending on the results of any additional discussions at ICCAT, the regulations and operational procedures that account for BFT bycatch related to directed longline fisheries in the vicinity of the management area boundary would be further amended. In the interim, NMFS would maintain the current regulatory text implementing this ICCAT recommendation, but would amend the current practice of allowing carryover provisions from applying to this set-aside allocation. Positive ecological impacts would be expected from this alternative, as it would support further discussion to take place at ICCAT regarding the long-term implications of carrying unharvested BFT quota forward, as well as limit this specific set-aside to 25 mt (ww). Not allowing set-aside

quota to be carried forward to the subsequent fishing year, in the interim, would maintain PLL fishing effort at current levels and would still allow for incidentally caught BFT in the NED to be accounted for. It is anticipated that there would be no additional impacts to other species, as this alternative would not be expected to alter existing fishing patterns or effort of PLL vessels.

None of the alternatives considered above are likely to have any impacts on protected species or essential fish habitat.

Social and Economic Impacts

Under alternative I10(a), the current regulatory text would remain in place and the current practice of applying carryover provisions to this set-aside would also be maintained. The NED set-aside quota would be allocated 25 mt (ww) annually. Therefore, any unharvested NED set-aside quota from the prior fishing year would be carried forward to the subsequent one. If incidental landings of BFT by PLL vessels operating in the NED exceed the 25 mt (ww) annual set-aside, the necessary quota adjustments would be accounted for in the subsequent year's set-aside allocation. This alternative may have some positive economic impacts, as the potential economic gain attributed to quota being carried forward from the preceding fishing year would remain be available. However, there may be some positive and negative social impacts associated with this alternative. The positive social impacts would be associated with the positive economic impacts discussed above, yet the negative social impacts would be attributed to this alternative not specifically clarifying the applicability of quota carry-over provisions to this set-aside quota and would potentially allow for implementing practices to not fully reflect the original intent of the recommendation.

Under alternative I10(b), the regulatory text would be adjusted to clarify the practice of applying carryover procedures to this set-aside and, therefore, unharvested quota from the NED set-aside would be rolled over into, or overharvests deducted from, the subsequent fishing year's baseline allocation. This alternative would provide similar positive economic impacts as described in alternative I10(a). However, excessive rollovers may also provide an incentive for PLL vessel operators to increase effort in this area, or to possibly target BFT in the NED, even though the intent of the recommendation and the regulations have been developed to avoid such a scenario. Slight positive social and economic benefits may result from this alternative as well for those PLL vessels and their homeports, or offloading ports, as a result of allowing quota from the previous year to be carried forward and landed in a subsequent year. Finally, under alternative I10(b), the NED set-aside and any rollover from this set-aside could not be transferred to other domestic quota categories as per the wording of the ICCAT recommendation. Thus, there may be a perceived negative social and economic impact among other fishery sectors if they were closed after achieving their allocated quota and were unable to access available quota from the NED set-aside via an inseason transfers.

The preferred alternative I10(c), would promote additional discussions at the annual ICCAT meeting regarding the long-term implications of allowing unused BFT quota from the previous year being added to the subsequent year's allocation that can be retained, and the how these discussions may affect this specific recommendation. This alternative would maintain the current regulatory text implementing this ICCAT recommendation, and amend the current practice of allowing carryover provisions from applying to this set-aside allocation. This

alternative would be expected to have some negative economic impacts as it would not allow for the potential economic gain attributed to quota being carried forward from the preceding fishing year. There would be both negative and positive social impacts associated with this alternative. The negative social impacts would be associated with PLL vessels and their homeports, or offloading ports, not being allowed to profit from unharvested quota carried over from the previous year. The positive social impacts would be associated with preventing excessive rollovers from occurring, thereby eliminating an incentive for PLL vessel operators to increase effort, or even possibly directing their effort, on BFT in this area. Accumulation of incidental quota, and possibly providing an incentive to target BFT with longline gear would not fully reflect the intent of the recommendation.

Conclusion

NMFS prefers alternative I10(c), which would support the United States conducting additional discussions at the annual ICCAT meeting regarding the long-term implications of allowing unused BFT quota from the previous year being added to the subsequent year's allocation that can be retained. Depending on the results of any additional discussions at ICCAT, the specific regulations and practices that account for BFT bycatch related to pelagic longline fisheries in the vicinity of the management area boundary may need to be further amended in the future. In the interim, NMFS would maintain the current regulatory text implementing the ICCAT recommendation indicating that 25 mt (ww) shall be allocated for incidental catch of BFT by pelagic longline vessels fishing in the NED, but would amend the current practice of allowing under/overharvest of this set-aside allocation to be rolled into, or deducted from, the subsequent fishing year's set-aside allocation. Therefore, regardless of the amount of the set-aside harvested or unused in a given year, the balance would return to 25 mt (ww) at the start of each fishing year. If landings were to exceed the 25 mt (ww) allotment, they would be accounted for via Longline category quota that applies to the entire Western Atlantic management area. This alternative is preferred because it would meet the objective of clarifying the applicability of carry-over provisions to this incidental set-aside quota, would still provide 25 mt (ww) to account for incidental BFT catch in the NED, would prevent the 'stockpiling' of incidental quota which may provide an incentive to target BFT in the NED, and would support the discussion of long-term implications of BFT quota roll-overs, in general, as the outcome from these discussions would directly affect the implementation of this specific ICCAT recommendation.

<u>Issue 11: Permit Condition for Recreational Trips</u>

As described in Chapter 2, the alternatives considered to reduce confusion regarding state and Federal recreational regulations include:

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

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

Ecological Impacts

Under the status quo**,** recreational anglers fishing for HMS must comply with state regulations when fishing in state waters, or comply with Federal regulations when fishing in Federal waters. This has caused some confusion on behalf of anglers when there are differences between state and Federal regulations (*e.g.*, Florida and Georgia). Additionally, some state regulations are consistent with Federal regulations for some HMS, but different for other HMS (*e.g.*, Alabama and South Carolina). In other instances, states do not have regulations for Atlantic HMS (*e.g.*, Connecticut and Rhode Island), so under the status quo Federal fishermen could fish without bag or size limits in these state's waters. The regulations for each state are outlined in Table 3.1 (Section 3.1).

These differences between state and Federal regulations also raise concerns regarding enforcement. If the state bag or size limit is higher than the Federal bag or size limit, maintaining the status quo could have negative ecological impacts because more fish, or smaller fish, could be landed than what is allowed for under Federal regulations, including those negotiated internationally. Additionally, if fishermen land HMS caught in Federal waters in a state with less restrictive regulations, they may be able to illegally land fish above the Federal bag or size limit due to ambiguities between state and Federal regulations. In some cases, enforcement officers may elect not to take action if it is unclear where the fish was caught (state or Federal waters) and which regulations apply.

In cases where the state regulations are more restrictive than Federal regulations, the *status quo*, and the preferred alternative, could have positive ecological benefits. In cases where the state regulations are less restrictive than Federal regulations, the status quo could have negative ecological benefits. For example, the State of Georgia has a number of regulations regarding shark bag and size limits that are different from the one shark per vessel per day and 54 inch minimum size for Federal waters. This inconsistency (and inconsistencies in other states) could hinder the rebuilding of large coastal sharks and could hinder enforcement efforts regarding shark regulations. However, the State of Georgia also bans the possession of billfish, except for catch-and-release. Thus, under the status quo, the rebuilding of billfish is aided.

Under the preferred alternative, anglers fishing for HMS with an HMS permit would need to abide by Federal regulations even if they were fishing in state waters, unless the state had more restrictive regulations. This alternative would have positive ecological benefits. For instance, under this alternative, in Georgia state waters, anglers fishing for sharks who have a Federal HMS permit would need to abide by Federal regulations and could be prosecuted if they are caught with the Georgia state limit onboard. This would enhance the rebuilding plan for large coastal sharks. Similarly, fishermen possessing a Federal HMS permit and fishing in Georgia state waters for billfish would need to catch-and-release any billfish. While this goes beyond the Federal regulations, it would enhance the rebuilding of Atlantic billfish. If a Federal permit holder caught a billfish in Federal waters, it would be necessary to document that it was caught in Federal waters if they intended to land that fish in a state with more restrictive regulations. Depending on the state regulations, it is possible that they would not be allowed to land the billfish. For states that do not have regulations for HMS, such as Connecticut, the preferred alternative would have positive ecological benefits by limiting fishermen with an HMS permit to the Federal regulations.

The preferred alternative would also have positive enforcement benefits because enforcement could decide to take action based on the more restrictive regulations. Which regulation applies would be decided on a case-by-case basis. However, it is likely that the regulations would be enforced individually rather than comprehensively as a suite. For instance, if a state has a larger bag limit and larger minimum size than the Federal regulations, the fishermen could be limited by both the Federal bag limit and the state minimum size.

Neither alternative would affect fishermen who do not hold a Federal HMS permit. Such fishermen are limited to fishing in state waters under state regulations and may not fish in Federal waters for HMS. Similarly, neither alternative restricts states from setting their own regulations. During the comment period, NMFS received comments from several states that felt that NMFS was exceeding their authority with the permit condition. NMFS believes that the Magnuson-Stevens Act does provide the authority to manage HMS species throughout their range (16 U.S.C. 1812 Section 102). NMFS could opt to pre-empt state's authority either through the Magnuson-Stevens Act or through ATCA. However, NMFS prefers to work with states and the Atlantic and Gulf States Marine Fisheries Commissions towards consistent regulations that meet both international and domestic goals because each state is different and the fishermen in each state prefer to fish for different HMS (*e.g.*, fishermen in the Gulf of Mexico may fish for Atlantic sharpnose sharks while fishermen in New Jersey would not) and use different gears. Additionally, the preferred alternative only applies to those fishermen who obtain a Federal permit and who, presumably, fish in Federal waters at least some of the time. The permit condition does not change state regulations. Thus, states still have the opportunity to establish their own regulations for fishermen who fish in their waters and not in Federal waters. Fishermen still have the opportunity not to obtain a Federal permit and to abide only by state regulations.

NMFS also received comments stating that the preferred alternative would mean that different regulations could apply to Federally permitted fisherman fishing in state waters next to a state-only permitted fisherman. NMFS does not believe that this should be an issue since the more restrictive regulation would apply. It may appear to be unfair to the Federally permitted fisherman if the Federal regulations for that species are more restrictive than the state regulations for that species. However, Federally permitted fishermen also have the opportunity to fish for HMS outside of state waters. If Federally permitted fishermen decide that the opportunity is not worth the additional restrictions, then they could decide not to obtain the permit. If the state regulations were more restrictive, then both fishermen would be limited by the state regulations.

Neither alternative is expected to have any impact on EFH or protected species.

Social and Economic Impacts

The social and economic burden associated with both the No Action and the preferred alternative would be minimal. In either case, recreational fishermen would be able to continue fishing and would continue to use the existing infrastructure (*e.g.*, hotels, supply shops) to do so. Additionally, states would be able to continue to implement their own regulations and regulate fishermen who fish in state waters only. Under the status quo, states would continue to regulate Federally permitted fishermen who are fishing for HMS in their waters at that time. Under the

preferred alternative, states would lose their ability to regulate Federally permitted fishermen, unless their state regulations are more restrictive. This may be problematic for states that require fishermen to have a Federal recreational permit, but have regulations that are different from Federal regulations. However, at this time, NMFS is not aware of any state that fits this situation.

Both the State of Georgia and the South Atlantic Fishery Management Council have requested that NMFS implement this type of regulation to facilitate enforcement of Georgia's billfish catch-and-release only regulation; however, they requested different language that would allow more restrictive state regulations to apply in adjacent Federal waters. However, in many cases, the regulations are established based on ICCAT recommendations (*e.g.*, the billfish size limits) and, under ATCA, the United States is bound to implement the ICCAT recommendation. Extending a more restrictive state regulation into Federal waters in those cases would be inconsistent with ATCA. Similarly, if the more restrictive regulation is not part of or consistent with the HMS FMP, the regulations may also be inconsistent with the Magnuson-Stevens Act.

To the extent that the preferred alternative clarifies regulations for Federally permitted vessels, there may be some social and economic benefits because fishermen would be at less risk in determining which regulation to follow, and when.

Conclusion

Alternative I11(b) is the preferred alternative. This alternative is expected to achieve increased consistency between state and Federal regulations for Federally permitted HMS recreational fishermen, and result in less confusion on behalf of fishermen and improved compliance. Compared with the No Action alternative, the preferred alternative would produce greater ecological benefits with few resulting adverse social and economic impacts.

4.4 Impacts on Essential Fish Habitat

The Magnuson-Stevens Act requires NMFS to evaluate the potential adverse effects of fishing activities on EFH. If NMFS determines that fishing gears are having an adverse affect on HMS EFH, or other species' EFH, then NMFS must include management measures that minimize adverse effects to the extent practicable. At this time, there is no evidence to suggest that any of the preferred alternatives or proposed management measures in this FMP is adversely affecting EFH to the extent that detrimental effects can be identified on the habitat or fisheries. As described in detail in Chapter 10, no HMS gear other than potentially bottom longline gear is considered to have an adverse affect on EFH. New information presented in the Gulf of Mexico and Caribbean Fishery Management Council EFH FEIS's (2004) suggest that bottom longline gear may have an adverse affect on coral reef habitat, which serves as EFH for certain reef fishes. As a result, NMFS has made a preliminary determination that bottom longline gear may have an adverse affect on EFH for other Federally-managed species. An assessment of whether HMS bottom longline gear used primarily to target LCS is fished in coral reef areas, and if so, the intensity, extent, and frequency of such impacts, including any measures to minimize potential impacts, will be addressed in a subsequent rulemaking.

The following measures considered in this FMP are not expected to adversely impact HMS EFH, or EFH from other Federal or non-Federally managed species, for the reasons described below.

4.4.1 Workshops

The preferred alternatives to implement workshops on safe release, disentanglement, and identification of protected resources are not expected to have any impacts on EFH. Furthermore, workshops on shark identification are also not expected to have any impacts on EFH. These workshops do not modify or expand the authorized gears permitted for harvest of HMS. In addition, these workshops will not result in an increase, or a redistribution of fishing effort. These workshops are being held to maintain compliance with the October 2003 and June 2004 Biological Opinions and to improve identification skills and shark dealer reporting.

4.4.2 Time/Area Closures

The preferred alternatives to establish complementary HMS regulations in the Madison-Swanson, Steamboat Lumps Marine Reserve, and criteria and a framework mechanism for implementation or modification of future time/area closures are not expected to have any negative impacts on EFH. Analysis of HMS observer and logbook data indicate that there has been minimal HMS fishing effort in the reserve in recent years, and closing the area to HMS gears should result in very little redistribution of fishing effort, and minimal or no associated impacts to EFH. From 1997 to 2003, only one pelagic longline set and two bottom longline sets were reported in the HMS logbook in these areas. Criteria for establishing new or modifying existing closures are designed to improve transparency in the decision-making process and allow fishermen more ability to plan for future changes. The criteria themselves would not be expected to have any impact on EFH.

4.4.3 Northern Atlantic Albacore Tuna

The preferred alternative to establish the foundation for development of an international rebuilding plan for Northern Atlantic albacore tuna is not expected to have any adverse effect on EFH as it does not modify or expand the authorized gears already permitted for harvest of albacore. Furthermore, this measure should not result in an increase or a redistribution of fishing effort. A rebuilding plan would not be implemented until after the next ICCAT stock assessment in 2007.

4.4.4 Finetooth Sharks

The preferred alternative to reduce fishing mortality of finetooth sharks is not expected to have any impacts on EFH as it does not modify or expand the authorized gears already permitted for harvest of finetooth sharks. Furthermore, this measure should not result in an increase or a redistribution of fishing effort. Eighty percent of finetooth shark landed in the commercial fishery are harvested with gillnet gear that does not touch the bottom. Recreational fisheries (*i.e.*, rod and reel gear) for finetooth sharks also do not have any deleterious effects on EFH for HMS or non-HMS fish species.

4.4.5 Atlantic Billfish Management Measures

The preferred alternatives for billfish management measures consider additional restrictions on recreational fishing gears, including tournaments, to reduce bycatch of blue and white marlin. The primary gear used in recreational billfish fishing is rod and reel, which is not considered to have a negative impact on EFH. As such, none of the preferred management measures are expected to have an adverse effect on EFH.

4.4.6 Bluefin Tuna Management Measures

Management measures that consider modification to bluefin tuna seasonal allocations of quota among user groups are not expected to adversely affect EFH to the extent that detrimental effects can be identified on the habitat or fisheries. The preferred alternatives would not alter fishing gears or practices and it is anticipated that this action would not have any adverse impacts on EFH.

4.4.7 Calendar Year/ Fishing Year

The preferred alternative to adjust the annual management year for HMS to a calendar year from the current fishing year is designed to provide consistency in timing of domestic and international management programs which would help to reduce complexity of U.S. reports to ICCAT, and is not expected to alter fishing practices or result in redistribution of fishing effort. Thus, this change is not expected to have any impact on EFH.

4.4.8 Authorized Fishing Gears

The preferred alternatives to authorize certain fishing gears are not expected to have negative impacts on EFH. With regard to impacts on EFH, the 1999 FMP and Amendment 1 to the Atlantic Billfish FMP state that Atlantic HMS occupies pelagic oceanic environments. The use of speargun fishing gear, buoy gear, and handheld cockpit gears are not expected to impact bottom structures or otherwise damage habitat. Under all of the above alternatives, NMFS does not anticipate any adverse impacts to EFH.

4.4.9 Regulatory Housekeeping

A number of regulatory housekeeping measures are being considered to clarify and improve the enforcement of HMS regulations. The preferred alternatives in Section 4.3.4 Regulatory Housekeeping) would have no direct impact on EFH. Most of the preferred alternatives are administrative in nature, including corrections, clarifications, and technical changes. Other preferred alternatives would strengthen or reinforce existing regulations. The remaining preferred alternatives that would implement new regulations are expected to have only minor ecological impacts.

4.5 Impacts on Protected Resources

NMFS does not believe that any of the preferred alternatives would trigger reinitiation of consultation under 50 C.F.R. 402.16. The preferred alternatives to implement workshops on the safe release, disentanglement, and identification of protected resources, and shark identification

are not expected to increase interactions with protected resources. In fact, the protected species workshops are being held to maintain compliance with October 2003 and June 2004 BiOps. These workshops are intended to help further reduce the mortality of sea turtles, smalltooth sawfish, and other protected resources captured incidentally in the HMS PLL, BLL, and gillnet fisheries. The purpose of HMS identification workshops is to train Federally permitted shark dealers to improve their species specific shark identification skills. Accurate species identification is important for compliance with HMS fishery regulations, including the avoidance of prohibited species and maintaining quota limits, and for accurate data collection. These workshops are not expected to alter existing fishing effort or practices, and therefore, should not result in increased interactions with protected resources. To the extent that interactions cannot be avoided, the safe handling and release workshops should result in increased survival rates of protected resources hooked or entangled by HMS fishing gears.

The primary goal of establishing complementary HMS regulations for the Madison-Swanson and Steamboat Lumps marine reserves is to provide consistency between the Gulf of Mexico Fishery Management Council and HMS regulations. Thus, prohibiting all HMS gears, other than trolling gear from May through October, in the existing reserve should not result in increased interactions with protected resources. Analysis of HMS observer and logbook data indicate that there has been minimal HMS fishing effort in the reserve in recent years, and closing the area to HMS gears should not have a major impact on redistribution of fishing effort, increased effort in other areas, or additional impacts on protected resources. Trolling gear is not anticipated to increase interactions with protected resources.

Regarding northern albacore tuna, the preferred alternative would not cause an increase in interactions with protected species. Any impact on protected species would be in the future and would depend upon any shift in fishing practices as a result of ICCAT's conservation and management measures developed under an international rebuilding plan. Because of low albacore tuna catch and landings in both of the current U.S. commercial and recreational fisheries, it is unlikely that any recommendations by ICCAT would result in a change in domestic fishing practices.

Regarding the finetooth shark preferred management measures, protected resources, such as marine mammals, sea turtles, and smalltooth sawfish, can be of concern in gillnet fisheries, which is the primary gear for finetooth sharks. However, the preferred management measure would not modify or increase existing fishing effort. Expanded observer coverage would improve the accuracy of extrapolated take estimates and increase knowledge of interactions between protected resources and gillnet fisheries that target both HMS and non-HMS. Adding finetooth sharks to the select species list for bycatch sampling would improve information collected on the interactions between HMS, protected resources, and the Shrimp Trawl Fishery in the Gulf of Mexico. Contacting the relevant Regional Fishery Management Councils, the Gulf and Atlantic States Marine Fisheries Commissions, and states regarding potential collaborative management measures affecting gillnet fishermen that possess multiple permits, or initiating management of species that are currently not regulated under any management scheme, may lead to increased understanding of protected resource interactions in gillnet fisheries. Any future rulemaking implementing additional measures to prevent overfishing of finetooth sharks would include analyses of the impacts on protected species.

Some of the preferred alternatives pertaining to Atlantic billfish, including mandatory use of circle hooks with natural baits in recreational billfish tournaments, may have a minor positive ecological impact on protected resources, such as Atlantic sea turtles, by potentially reducing interactions and possibly decreasing post-release mortality of any interactions that may occur. Further, implementation of the ICCAT recreationally caught marlin landing limit may have a minor positive impact on protected resources in the future. If in-season billfish management measures become necessary in the future, as a result of increased marlin landings, implementation of such management measures could lead to a decrease in recreational effort targeting Atlantic billfish, thereby potentially reducing the number of interactions between recreational fishermen and protected resources.

The preferred alternatives pertaining to BFT inseason management and annual specifications processes are procedural and administrative in nature and are expected to have negligible ecological impacts. The specific preferred alternatives that would adjust the General category allocation scheme to provide for a formal winter BFT fishery would not alter current impacts on threatened or endangered species, as they conform to current BFT quota recommendations and the gear used in the General category generally has a low interaction rate with protected species.

There may be slight positive impacts to protected species under the preferred alternative for changing the fishing year back to a calendar year when considered in combination with the preferred alternative for directed billfish regarding the 250-marlin landings. In combination, there is a small potential that if a management threshold was reached to reduce or halt marlin landings, it would occur earlier in the season than under the other alternatives considered for fishing year. This could slightly reduce fishing effort and any resultant bycatch. These potential positive impacts are expected to be small because the likelihood of a management action under the 250-marlin landings limit is projected to be low based on prior year's landings data, and the interaction rates of protected species with rod and reel are minimal.

The alternatives to authorize speargun, buoy gear, and secondary cockpit gears are not anticipated to result in increased interactions with protected resources. It is unlikely that a speargun fisherman would mistake a sea turtle or other protected species for a BAYS tuna. Thus, NMFS does not expect that gear type to increase protected species or marine mammal interactions. Further, buoy gear has been in use in HMS fisheries. In the case of buoy gear, this action would essentially rename an existing gear type (handline) for the commercial swordfish fishery and would limit the number of floatation devices that are allowed to be possessed or deployed by a vessel. Buoy gear, as it is currently used, is not likely to have many interactions with protected species. Limiting its use, as is preferred, would further reduce any interactions. Furthermore, as described in the regulatory housekeeping sections, NMFS is preferring to require handlines to be attached to the vessel. While this may not reduce interactions with protected species (interactions in the handline fishery currently are minimal), it would reduce any mortality because the fishermen would know immediately if an animal were caught on the gear.

Some of the preferred regulatory housekeeping actions, including a requirement that handlines remain attached to vessels, may have a minor positive ecological impact on protected

resources by potentially limiting interactions and reducing the amount of gear that could get lost. Other actions would strengthen, reinforce, or clarify existing regulations, including prohibitions on the sale or purchase of HMS in excess of retention limits, a minor modification of the East Florida Coast closed area, a prohibition on all commercial vessels (except HMS CHB permit holders or General Category permit holders during a registered HMS tournament) from possessing billfish, facilitation of electronic submittal of BFT dealer reports, clarification of reporting requirements, clarification of procedures for annual allocation of a 25 mt BFT incidental allowance for PLL vessels in the vicinity of the NED, and a requirement for HMS-permitted recreational vessels to abide by Federal regulations, regardless of where fishing, unless a state has more restrictive regulations. The remaining issues are either administrative or would not appreciably change fishing effort.

In addition to the impacts of the preferred alternatives in this document, NMFS continues to monitor impacts to protected species from the ongoing operation of HMS fisheries through various logbook and observer programs as described in Sections 3.4 and 3.8. For example, extrapolated annual take estimates of sea turtles and marine mammals for 2005 recently became available for the pelagic longline fishery in addition to data on observed interactions for the first quarter of 2006 (January through March). NMFS monitors observed interactions with marine mammals and sea turtles in the pelagic longline fishery on a quarterly basis and reviews the data in conjunction with extrapolated annual take estimates for appropriate action, if any, as necessary. Should additional management measures be deemed necessary to reduce bycatch or bycatch mortality of protected species in the pelagic longline or other HMS fisheries, NMFS would take appropriate action in a separate rulemaking.

4.6 Environmental Justice

Executive Order 12898 requires agencies to identify and address disproportionately high and adverse environmental effects of its regulations on the activities of minority and low-income populations. To determine whether environmental justice concerns exist, the demographics of the affected area should be examined to ascertain whether minority populations and low-income populations are present. If so, a determination must be made as to whether implementation of the alternatives may cause disproportionately high and adverse human health or environmental effects on these populations.

The communities of Dulac, Louisiana and Fort Pierce, Florida have significant populations of Native Americans and Black-Americans, respectively. The 2000 Census data indicates that Native Americans made up 39 percent of the Dulac population, specifically the Houma Indians, which is not Federally recognized tribe. About 30 percent of the Dulac population was living below poverty level in 2000. In 2000, Black-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 Vietnamese-American population in Louisiana, actively participating in the pelagic longline fishery, and commuting to fishing ports, but not living in “fishing communities” as defined by the Magnuson-Stevens Act and identified in Chapter 9 of this document. In reviewing the social impacts of the preferred alternatives of the Consolidated HMS FMP, none are expected to have a disproportionate impact on these minority and low-income populations. Greater information

about potential social impacts of each preferred alternative is briefly described below with detailed information provided in earlier 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 alternatives for Finetooth Sharks, Authorized Gear, Northern Albacore Tuna, and Regulatory Housekeeping are not anticipated to have any significant negative social or economic impacts on HMS-related communities and are not anticipated to have an impact on minority or low-income populations because they are largely administrative in nature or the impact a small diffuse group of people. The following alternatives could have negative social or economic impacts on various communities involved with HMS fisheries, but none of the preferred alternatives in this document are anticipated to have high or adverse human health or environmental effects on any of the HMS-related communities. In addition, most of the potential negative impacts can be mitigated or are not likely to occur.

The preferred alternatives for workshops (see Section 2.1.1) are not expected to negatively impact the HMS-related communities identified as having a significant minority and low-income population; Dulac, Louisiana and Fort Pierce, Florida. The preferred workshop alternatives would apply to longline and shark gillnet permit holders and the operators of these vessels, as well as shark dealer permit holders. There are a relatively low number of longline, gillnet, and HMS dealer permit holders residing in Dulac and Fort Pierce. NMFS does not maintain information about the residence of vessel operators if they do not possess an HMS permit, so it is difficult to evaluate the impact of the workshop alternatives on the vessel operators. The workshops would be held in areas where there is a high concentration of permit holders according to the addresses provided when applying for an HMS permit. NMFS intends to provide the workshop schedules in advance so that fishermen can attend the most convenient workshop. The workshop alternatives are not anticipated to have a negative socio-economic impact on any HMS-related community.

The preferred alternatives to establish complementary HMS regulations in the Madison-Swanson, Steamboat Lumps marine reserve, and to establish criteria for a regulatory framework adjustments to implement new or modify an existing time/area closures are not expected to have a disproportionate impact on minority or low-income populations. Analyses of HMS observer and logbook data indicate that there has been minimal HMS fishing effort in the Madison-Swanson and Steamboat Lumps marine reserve in recent years, and closing the area to HMS gears, other than trolling gear from May through October, should not have a major impact on fishing effort or gross revenues for the fishery. In particular, it is not expected to have a negative impact on minority or low-income populations. Establishing criteria to implement or modify future time/area closures is intended to provide greater transparency in the decision-making process for implementing new or modifying existing time/area closures. As such, the criteria are not expected to have any social or economic impacts.

The BFT tuna permit holders in Venice, Louisiana; Dulac, Louisiana; and Fort Pierce, Florida possess less than one percent of the commercial tuna, angling, CHB, and tuna dealer permits; therefore, the selected BFT alternatives are not anticipated to have a high or adverse environmental or social impact on these communities. The redistribution of the BFT General

category time period subquota allocation could result in a slight adverse economic and social impact on the northern BFT fisheries; however, NMFS does not anticipate that these effects will fall disproportionately on minority or low-income populations. Some of the negative impacts may be minimized if fishermen are willing and able to fish during the winter quota periods where the tuna are available.

Shifting all HMS species to a calendar year management cycle is not anticipated to have a disproportionate impact on minority or low-income populations. The calendar year preferred alternative would not change the management cycle for the shark fishery, but would shift the management cycle for tunas, billfish, and swordfish from a fishing year to a calendar year. No impact on the swordfish and tuna fisheries is expected to result from this alternative because the tuna fishery is managed on a finite scale, whereas the swordfish fishery has not harvested the entire annual quota for several years. The recreational billfish fishery is not anticipated to be impacted by a shift to a calendar year management cycle in the foreseeable future because the threshold for in-season management action is unlikely to be reached without substantial changes in angler effort or practices. There is the potential for some billfish tournaments to be negatively impacted by the calendar year management cycle when taken in combination with the preferred in-season management triggers and ICCAT billfish landing limits, if substantial changes in angler effort or practices do occur in the future. The impacts associated with these management measures are anticipated to be substantially mitigated by allowing for in-season adjustment of the minimum legal size which is expected to slow marlin landings and thereby allow the fishery to continue uninterrupted for the entire duration of the fishing year. Impacts could be further mitigated by, in some instances, changing tournament dates to occur earlier in the fishing year when the billfish landing limit has not been caught, shifting tournament formats to catch and release, if necessary, and by a shifting effort to other available billfish species, such as sailfish. In addition to mitigating any potential negative impacts, billfish tournaments are typically not held in low-income or minority communities.

Generally, the preferred alternatives are intended to improve compliance with ICCAT recommendations, data quality and collection, information dissemination, and NMFS' efficiency in enforcing and implementing specifications and management measures. See Chapter 2 for a more detailed description of the alternatives, Chapter 4 for additional discussion of the impacts related to the alternatives, and Chapter 9 for further description of communities involved in HMS fisheries.

4.7 Coastal Zone Management Act

The Coastal Zone Management Act (CZMA, 1972, reauthorized 1996) requires that Federal actions be consistent, to the extent practicable, with the enforceable policies of all state coastal zone management programs. NMFS has determined that the suite of preferred alternatives for all issues would be implemented in a manner consistent to the maximum extent practicable with the enforceable policies of the coastal states in the Atlantic, Gulf of Mexico, and Caribbean that have Federally approved coastal zone management programs. In August 2005, NMFS provided all states, Puerto Rico, and the U.S. Virgin Islands copies of the proposed rule and draft HMS FMP. Under 15 C.F.R. § 930.41, states have 60 days to respond after receipt of the consistency determination and supporting materials. States can request an extension of 15 days. If a response is not received within those time limits, NMFS can presume concurrence (15

C.F.R. § 930.41(a)). Eleven states replied, within the 60–day response period, that the proposed regulations were consistent, to the extent practicable, with the enforceable policies of their coastal zone management programs. The State of Georgia replied on March 1, 2006, that the proposed rule was not consistent with the enforceable policies of GA's coastal zone management program. NMFS notified the State of Georgia that because their response was after the 60-day response period, NMFS presumed concurrence after the end of the CZMA review period and would consider their comment as part of the public comments received on the proposed rule and draft HMS FMP. NMFS has presumed concurrence with the states that did not respond. NMFS will continue to work with the states to ensure consistency between state and Federal regulations.

4.8 Cumulative Impacts

Cumulative impact is the impact on the environment, which results from the incremental impact of the action when added to other past, present, and reasonably foreseeable future actions. Cumulative impacts can result from individually minor but collectively significant actions taking place over a period of time (40 CFR § 1508.7). A cumulative impact includes the total effect on a natural resource, ecosystem, or human community due to past, present, and future activities or actions of Federal, non–Federal, public, and private entities. Cumulative impacts may also include the effects of natural processes and events, depending on the specific resource in question. Cumulative impacts include the total of all impacts to a particular resource that have occurred, are occurring, and will likely occur as a result of any action or influence, including the direct and reasonably foreseeable indirect impacts of a Federal activity. The goal of this section is to describe the cumulative ecological, economic and social impacts of past, present and reasonably foreseeable future actions with regard to the management measures presented in this document. Table 4.75 describes the overall impacts anticipated from each of the alternatives considered.

4.8.1 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 HMS. 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 preferring to take similar actions in this document, and can reasonably expect to implement additional regulations in the future to address the management and conservation of Atlantic HMS. The need and objectives of this document are described in earlier sections, particularly Chapter 1, and are not repeated here.

In general, the preferred alternatives for workshops would implement a series of protected species and shark identification workshops to be held at various locations along the Atlantic and Gulf coasts. PLL, BLL, and gillnet vessel owners and operators, as well as Federally permitted shark dealers, would be required to recertify every three years prior to renewing their HMS permit. Recertification would allow the Agency to incorporate new information and technology into its training curriculum and allow fishery participants to stay apprised of the techniques for enhanced protected species safe handling and release as well as species identification over time. The preferred alternatives for time/area closures, finetooth sharks, and northern albacore tuna should help NMFS prevent overfishing and reduce bycatch. The preferred alternatives for billfish are intended to decrease recreational mortalities of Atlantic

billfish, given their current stock status, and limit landings, as appropriate, to ensure consistency with international obligations. The preferred alternatives for BFT are intended primarily to streamline and simplify the administrative process governing BFT annual and inseason management and ensure consistency with international obligations. The preferred alternative for fishing year management cycle is administrative in nature and should aid NMFS in meeting international reporting obligations and clarifying how they were met. The preferred alternatives for authorized fishing gear are designed to meet the changing needs of the fisheries. The regulatory housekeeping actions would facilitate and improve the HMS management regime. The public, law enforcement, port agents, and others often bring these types of management measures to the Agency's attention. As such, it is difficult to accurately predict reasonably foreseeable regulatory housekeeping measures that NMFS may consider in the future improving HMS administration, facilitating enforcement, or clarifying regulations.

In Chapter 1, NMFS describes some actions that could happen in the reasonable future including: changes to BFT size limits and tolerances; modifications to the current shark, swordfish, and tunas quotas; changes to the ICCAT recommended billfish landings limit; HMS permit reform; changes to time/area closures; modifications to EFH descriptions; and modifications to recordkeeping, monitoring, and reporting regulations (*e.g.*, VMS). Additional future actions could include annual specifications for all fisheries with quotas; establishing shark fishing season opening and closing dates; actions taken to improve coordination with Caribbean fisheries; and actions taken to reduce protected species interactions in HMS fisheries, particularly the pelagic longline fishery (*e.g.*, implementation of the PLTRP).

4.8.2 Cumulative Ecological Impacts

The cumulative long–term ecological impacts of the preferred alternatives for workshops (A2, A3, A5, A6, A9, and A16) are anticipated to be positive. Workshops for PLL, BLL, and gillnet vessel owners and operators could result in positive ecological impacts by reducing the mortality of protected resources. These workshops are essential for complying with BiOps and should reduce the post–hooking mortality of sea turtles and other protected resources. PLL, BLL, and gillnet vessel owners would be required to attend the Protected Species Workshops to link the requirement to the owner's ability to renew the vessels' permit, ensuring that workshops are well attended. Operators would be required to attend the workshops to ensure that at least one person on board the vessel during fishing activities is adept at the safe handling and release protocols, thereby increasing the likelihood of post–release survival. Mandatory HMS identification workshops, required for all Federally permitted shark dealers, would likely improve the accuracy of dealer reports and reduce the number of sharks listed as unclassified, which would likely improve stock assessments, quota monitoring, and stock rebuilding efforts.

In general, the cumulative impact of implementing a number of time/area closures since 1999, in addition to other measures to reduce bycatch and bycatch mortality, has been positive ecologically, but negative socially and economically, particularly for the pelagic longline industry. As described under the ecological impacts of the time/area closure no–action alternative to maintain existing closures, when comparing pre– and post–time/area closure data from the pelagic longline logbook, the existing time/area closures have resulted in a substantial reduction in the bycatch of all non–target HMS and protected species. In addition to time/area closures, other actions have been taken to reduce the bycatch of protected species in HMS

fisheries including requirements to post safe handling and release guidelines for incidentally captured sea turtles and marine mammals, new gear requirements to reduce sea turtle bycatch and bycatch mortality (*e.g.*, circle hooks and bait), requiring non–stainless steel corrodible hooks, line cutters, dipnets, and dehooking devices to mitigate impacts on incidentally caught sea turtles. Measures have also been taken to reduce interactions with endangered right whales during calving season by requiring 100 percent observer coverage for boats with gillnet gear. However, with all of the new regulations designed to reduce bycatch, there has also been a substantial decline in the landings of targeted HMS. A number of potential causes for the decline in landings were discussed in the preceding section on economic impacts of time/area closures. In general, additional restrictions have caused an overall decline in fishing effort (number of hooks set) across nearly every region except the Gulf of Mexico.

With regards to future closures, and especially closures in the Gulf of Mexico, NMFS may consider potential closures in the future to reduce bycatch and discards of target non–HMS and protected resources. In particular, NMFS is considering alternatives to reduce bycatch in the Gulf of Mexico, especially for BFT. For instance, more research is needed to further understand the complex BFT life history, particularly with regards to age structure and determining sustainable fishing pressure associated with different age classes. In addition, NMFS is considering developing incentives that would dissuade fishermen from keeping incidentally caught BFT, particularly spawning BFT in the Gulf of Mexico. This could involve an experimental fishery to research how changes in fishing practices may help reduce bycatch of non–target species as well as the tracking of discards (dead and alive) by all gear types or better understanding the oceanographic factors that influence their distribution of BFT in the Gulf of Mexico.

While time/area closures play an important part in resource management, a number of time/area closures have been implemented since 2000. NMFS is beginning to see the benefits of those closures; however, NMFS is still assessing the effect of additional management measures that have been implemented since 2000, such as circle hooks. Because circle hooks likely have a significantly different catch rate than J–hooks, further investigations are required to determine the potential impact of any new time/area closures. Thus, NMFS does not prefer to implement new closures as this time, except for Madison–Swanson and Steamboat Lumps, until the effect of current management measures (and potential unanticipated consequences of those management measures can be better understood). NMFS anticipates that 2005 PLL final data will become available in the summer of 2006. The Agency will continue to monitor and analyze the effect of circle hooks on catch rates and bycatch reduction as well as assess the cumulative affect of current time/area closures and circle hooks. In addition, NMFS is awaiting additional information regarding the status of the PLL fleet after the devastating hurricanes in the Gulf of Mexico during the fall of 2005. A majority of the PLL fleet was thought to be severely damaged or destroyed during the 2005 hurricane season. The amount of PLL fishing effort, especially within the Gulf of Mexico, will be assessed in the summer of 2006 when 2005 PLL final data becomes available. Until NMFS can better estimate the current fishing effort and potential recovery of the PLL fleet, it may be premature to implement any new time/area closures specific to that gear type at the present time. Finally, a number of stock assessments will be conducted during 2006 (LCS, blue marlin, white marlin, north and south swordfish, and eastern and western BFT). NMFS is waiting on the results of these stock assessments to determine domestic

measures with regard to management of these species, especially for LCS, north swordfish, white marlin, and western BFT.

Given that the preferred alternative to establish complementary HMS regulations in the Madison–Swanson, Steamboat Lumps Marine Reserve would impact a small area and a very small proportion of the total number of vessels permitted to fish for HMS that have actually fished in the area, NMFS considers the cumulative impact of adding this new closure to the existing closures to be minor. Furthermore, trolling would still be allowed from May through October for HMS and other species managed by the GOMFMC. The other preferred alternative to establish criteria for regulatory framework adjustments to implement new closures or modify existing time/area closures is not expected to have any ecological or economic impacts, even when considered in the context of other closures implemented in recent years. This is because the criteria are designed to enhance the transparency of the decision–making process with regard to new or modifications to existing time/area closures. If, in the future, NMFS decides to implement new closures or modify existing closures, NMFS would need to evaluate the ecological, economic, and cumulative impacts of the specific action being considered at that time.

For northern albacore tuna, past actions that NMFS has taken include maintaining compliance with U.S. TAC allocations and limiting vessel capacity, consistent with ICCAT recommendations, advocating international TAC levels less than current replacement yield at ICCAT meetings, and working to establish the foundation with ICCAT for developing an international rebuilding program. Due to the fact that the United States has not taken its entire adjusted quotas and that U.S. landings are minor compared to other ICCAT countries, cumulative actions to date have had little ecological impact. However, if ICCAT implements a rebuilding plan with target stock levels, a time table, and reference points, the long–term cumulative impacts should be positive as northern albacore tuna stocks rebuild. If NMFS took unilateral action, there could be adverse economic impact on U.S. fishermen without any noticeable ecological benefit for northern albacore tuna.

The cumulative long–term impacts of the selected measures for finetooth sharks are expected to be positive. In 2002, it was determined that finetooth sharks were experiencing overfishing, however, the biomass was still above the level at which it would be considered overfished. Since that time, NMFS has launched efforts to determine what Federal and state fisheries may be interacting with finetooth sharks by informal and formal consultations with other management bodies. NMFS has also started a pilot program to expand the DSGFOP coverage to include vessels fishing with gillnets who may be catching finetooth sharks incidentally or deploying a slightly different gillnet. The preferred measure would continue to gather information on other sources of finetooth shark fishing mortality via expanded observer coverage. These data can be employed to increase the catch series available for the upcoming SCS assessment and concurrently implement effective management measures targeting those fisheries responsible for the majority of finetooth shark fishing mortality. Contacting the relevant Regional Fishery Management Councils, the Atlantic and Gulf States Marine Fisheries Commissions, and states regarding finetooth shark landings and potential collaborative management measures affecting gillnet fishermen that possess multiple permits, or initiating management of species that are currently not regulated under any management scheme, may lead

to increased understanding of the ecological impacts of gillnet fisheries. The next SCS stock assessment is anticipated to begin in 2007, by which time NMFS will have a better understanding as to what measures would effectively reduce fishing mortality, if it is determined that overfishing continues to occur on finetooth sharks and/or they are deemed overfished.

Past management actions pertaining to Atlantic billfish, as described above and in Chapter 3 of this document, have had some positive ecological benefits for Atlantic billfish by limiting mortalities attributable to U.S. fishermen. However, given overall U.S. catches and landings of billfish relative to aggregate international catches, the impacts of these benefits on Atlantic–wide populations are likely limited. The preferred alternatives identified in this document are anticipated to provide additional positive ecological benefits for overfished Atlantic billfish populations by reducing mortalities associated with live releases in the U.S. recreational billfish fishery; however, for the same reasons noted above, their effect on the status of Atlantic–wide populations would likely be limited. Actions NMFS may consider in the future for both the recreational and commercial sectors include additional measures to reduce or mitigate billfish landings and mortalities, such as additional changes in legal minimum sizes, landings prohibitions, landing limits, possession limits, tagging and landing requirements, gear and/or bait restrictions, time/area closures, handling and release requirements, effort restrictions, seasonal closures, regional or seasonal allocations, or others as appropriate. These measures, if considered, would be designed to address specific needs of the fishery, and, as such, would be intended to have positive ecological impacts. Presently, there are no known third party actions that may affect target species, however, ICCAT is scheduled to meet and take action, if necessary, on Atlantic billfish in November 2006. Further, NMFS anticipates initiating and completing an ESA Listing Status review for Atlantic white marlin by the close of 2007. Pending the outcome of the ICCAT stock assessment and meeting as well as the ESA Listing review, additional management measures may be warranted.

Since 1999, management actions pertaining to Atlantic BFT have had minor positive ecological impacts by continuing to limit BFT mortality by U.S. fishermen in accordance with the strict quota limits set by ICCAT and established under the approved 20–year rebuilding plan. Currently, BFT are overfished. ICCAT is conducting a stock assessment in June 2006 that should provide additional information regarding the status of BFT and the current rebuilding plan. It is likely that later this year, ICCAT will finalize the stock assessment and recommend management actions for BFT. Depending on ICCAT recommendation(s) and the status of BFT, it is possible that NMFS could include additional issues within an ICCAT implementation rule. However, NMFS will need to prioritize issues to ensure that international obligations are met and the rebuilding plan is progressing. The preferred BFT alternatives are primarily administrative in nature and are anticipated to provide negligible or minor additional positive ecological benefits for overfished Atlantic BFT. Actions NMFS may consider in the future for both the recreational and commercial sectors include additional measures to rationalize BFT fishing effort, adjustment of size tolerance limits, discard reduction, landing limits, possession limits, tagging requirements, gear and/or bait restrictions, time/area closures, handling and release requirements, effort restrictions, seasonal closures, regional or seasonal allocations, or others as appropriate. Additionally, the time/area closure preferred alternative to implement criteria for the consideration of additional or modified closures for any gear type may be used to protect BFT, if needed. For example, NMFS could consider closing an area of the Gulf of Mexico and opening

it as an experimental fishery to test for ways of reducing bycatch of spawning bluefin tuna through such things as hook and bait combinations, environmental conditions, and/or temporal and spatial associations among different species. These measures, if considered, would be designed to address specific needs of the resource, and as such, would be intended to have positive ecological impacts.

When considering this action in the context of past actions, most of the impacts of the preferred alternative for fishing year, both positive and negative, would be fully mitigated. Since both the swordfish and BFT fisheries and quotas were initially managed on a calendar year and were switched to a fishing year within the last decade, any ecological impacts as a result of this preferred alternative should be mitigated by the impacts that occurred when they were switched to a fishing year (*e.g.*, the impacts of a compressed 6 month fishing year under this preferred alternative would be mitigated by the impacts of a fishing year that was stretched to cover 18 months during the previous action). For billfish, the cumulative ecological impacts attributed to the implementation of a calendar year management program in combination with a 250–marlin landings limit preferred alternative would be neutral to slightly positive. Marlin landings will be monitored and appropriate actions taken as necessary to maintain compliance with the ICCAT–recommended landings limit regardless of whether the fishery is managed on a fishing year or a calendar year. However, there is a small potential, that if a management threshold was reached to reduce or halt marlin landings, it would occur earlier in the season than under the other alternatives considered for fishing year, which could slightly reduce fishing effort and potentially have positive ecological impacts. The cumulative impacts of these two alternatives in combination are discussed in detail in Sections 4.2.3 and 4.3.2. Cumulative impacts of the calendar year preferred alternative in combination with the specifications processes for BFT and swordfish are also expected to be neutral because BFT fisheries are tightly monitored and controlled under quotas and current regulations afford protections for sensitive size classes and swordfish fisheries have not landed the full quota in recent years.

The revised list of authorized fisheries (LOF) and associated fishing gears became effective December 1, 1999 (64 FR 67511). The LOF is updated periodically and can be found at 50 CFR § 600.725. Amendment 1 to the 1999 FMP specified that only rod and reel and handline gears be allowed in the recreational shark fishery. In this document, the preferred alternatives for authorized fishing gear are not anticipated to dramatically increase effort and therefore would likely not result in significant increases in landings or landings rates of HMS or other finfish, protected, or threatened species with which HMS fishermen interact. NMFS does not expect the use of these gears to increase interactions with protected resources. As described in Section 4.3.3, other alternatives analyzed could have had potentially fewer or greater ecological impacts because authorizing different gears in different segments of the HMS fisheries could result in varying degrees of increases in target catches, as well as interactions with other HMS and other species. Authorizing speargun fishing gear would allow spearfishermen to target BAYS tunas; the number of spearfishermen in this fishery is not expected to be high. Due to stock status concerns, these fishermen would not be allowed to fish for other HMS at this time. The preferred alternative to authorize buoy gear would have positive ecological impacts because it would limit the amount of gear that is in the water and would only allow commercial swordfish fishermen to target swordfish. Current regulations do not limit the

gear or the fishermen. The preferred alternative to authorize secondary fishing gear is not expected to have minimal, if any, ecological impacts.

The suite of preferred alternatives in Section 4.3.4, entitled Regulatory Housekeeping, include alternatives I1(c), I2(b), I3(b), I3(c), I4(b), I5(b), I6(b), I7(b), I8(b), I8(c), I9(b), I10(c), and I11(b). All of these alternatives are projected to have minor positive conservation benefits for HMS, bycatch species, and protected resources consistent with the Magnuson–Stevens Act, ESA, and other applicable law. Several of these alternatives, including I7(b), I8(b), I8(c), and I9(b) are predominantly administrative in nature. As such, any positive ecological benefits derived from these preferred alternatives would be realized primarily through improvements in data collection. Many other alternatives, including I1(c), I2(b), I3(b), I3(c), I6(b), and I11(b) are intended to facilitate enforcement. Therefore, any positive ecological benefits derived from these preferred alternatives would be realized through improved compliance with HMS regulations. Alternative I4(b), which would modify the East Florida Coast closed area, would likely relocate effort; however, the cumulative impacts are expected to be negligible because the area affected is so small and catches and catch rates in adjacent areas are similar. Alternative I5(b), which would require that handlines remain attached to vessels, could reduce fishing effort, but that is not expected to be likely. Rather, alternative I5(b) would prevent the potential future expansion of effort. Alternative I10(c) is in regard to the ICCAT 25 mt NED BFT allocation. As such, it would support additional discussion at ICCAT regarding quota rollovers and would clarify how this set–aside would be allocated, and is expected to limit fishing effort to current levels. Actions that NMFS may consider in the future that would improve administration of the existing HMS management regime, facilitate enforcement, and/or clarify regulations would similarly be expected to produce minor positive ecological impacts.

Besides this rulemaking, NMFS is currently accepting comments on a proposed rule that would require vessel operators with HMS permits and BLL gear onboard to possess, maintain, and utilize additional equipment, protocols, and or guidelines for the safe handling, release, and disentanglement of sea turtles, smalltooth sawfish, and other non–target species (March 29, 2006, 71 FR 15680). These requirements are consistent, and are based upon, requirements for the PLL fishery that were implemented on July 6, 2004 (69 FR 40734), and effective on August 5, 2004. These requirements represent the most current, and best available information available for maximizing gear removal efficiency and reducing post–hooking mortality of sea turtles, smalltooth sawfish, or other non–target species. It is expected that the preferred workshop alternatives in the Final HMS FMP would enhance participants' ability to use the additional equipment and follow required protocols implemented in the proposed rule on handling and release equipment. Additionally, NMFS expects to conduct rulemaking in the near future as a result of the dusky shark assessment (May 25, 2006, 71 FR 30123) and the ongoing LCS stock assessment. Any action based on those stock assessments would be expected to have positive ecological benefits.

The cumulative ecological impacts on HMS stocks and fisheries due to potential actions under consideration by Regional Fishery Management Councils, Interstate Marine Fisheries Commissions, or other management bodies may be slightly positive. The Caribbean Fishery Management Council recently implemented area closures that could have minor positive benefits for Atlantic HMS. NMFS is currently proposing, in the same rule that proposes handling and

release equipment in the shark bottom longline fishery, an alternative to implement complementary closures (March 29, 2006, 71 FR 15680). The South Atlantic Fishery Management Council is considering management measures including time/area closures for bottom longline gear to protect grouper species that may have some impacts on HMS fisheries, particularly the shark fishery. Under this rule, charter/headboat fishermen would also need to comply with the dehooking requirements. The Gulf of Mexico Fishery Management Council recently proposed regulations that would implement similar dehooking requirements to those required in the HMS pelagic longline fishery and to those proposed for the HMS bottom longline fishery. HMS Advisory Panel members have raised concerns about the impacts of herring management on BFT stocks and the New England Fishery Management Council is considering a ban on midwater and pair trawling for herring in upcoming rulemaking to address concerns about impacts on BFT, cod, and whales. To the extent that herring trawl fisheries may be impacting BFT stocks, such a ban would likely have positive ecological impacts. Regarding shark management, the Atlantic States Marine Fisheries Commission is developing an interstate shark fishery management plan, which would likely have positive ecological impacts because many shark nursery areas are located in state waters.

For a discussion of non–fishing impacts to HMS EFH, see Section 10.5.

4.8.3 Cumulative Economic and Social Impacts

The cumulative long–term economic and social impacts of the preferred alternatives for workshops are not expected to be excessive as these workshops would be held in areas where be held in areas were they are high concentrations of HMS permit holders. The workshop training would be valuable to fishermen and could offset some unquantifiable portion of the estimated opportunity costs associated with attending the workshops and not fishing. Most trades and professions require practitioners to obtain licenses demonstrating competence; however, there is still an economic opportunity cost associated with any required activity that would not otherwise be taken voluntarily. To minimize those costs, the workshops would be held in areas where there is a high concentration of permit holders according to the addresses provided when applying for an HMS permit. NMFS intends to provide the workshop schedule in advance so that fishermen can attend the most convenient workshop, minimizing travel, lost fishing time, and time spent away from their place of business and family. The requirement to attend the workshops has been delayed until December 31, 2007, for shark dealers, and until the PLL, BLL, and gillnet vessel permit expires in 2007 for owners and operators. The delayed effectiveness allows individuals to plan ahead for the workshop and work around peak fishing times. Over the long–term, alternatives to in–person workshops (*i.e.*, internet–based, web–cast, DVD–based) may be considered to mitigate or reduce some of the anticipated social and economic impacts associated with the preferred alternatives for workshops.

As described above, the implementation of time/area closures has had cumulative economic and social impacts including putting fishermen out of business and causing some vessels to change fishing areas. The swordfish fishery, which is primarily a pelagic longline fishery, is no longer taking the full U.S. quota allocated by ICCAT. NMFS recently adjusted the 2005 North Atlantic fishing quota by adding 3,398.5 mt dw underharvests to the base quota of 2,937.6 mt dw. If the fishery were to catch the entire adjusted quota, it would be worth approximately $23.5 M. The large underharvests in this fishery could have an impact on

negotiations at the 2006 ICCAT meeting, depending on the status of swordfish. The current preferred alternatives in this action are not expected to have large economic or social impacts, and, to the extent that the criteria give NMFS the flexibility to do so, could, in the future, help relieve some of the economic stress by reopening or modifying existing closures.

The preferred alternatives for northern albacore tuna and finetooth sharks are not expected to have any significant economic or social impacts in the near future. The measures that may be needed when ICCAT implements a rebuilding plan for northern albacore tuna or when NMFS has collected additional data to target appropriate management measures to prevent overfishing of finetooth sharks could have economic or social impacts, and would be analyzed at that time.

For billfish, the cumulative economic and social impacts of actions taken since 1978 have been to eliminate domestic commercial fisheries for those species, resulting in negative economic and social impacts for the commercial sector. In eliminating commercial retention and sale of Atlantic billfish, the domestic pelagic longline fishery was forced to adapt to the loss of an increasing portion of their income in the late 1980s. However, it is likely that in doing so, previous billfish regulations have allowed for larger overall social and economic benefits to the nation given the substantial number of recreational fishermen who participate in Atlantic billfish fisheries. Thousands of recreational billfish trips are taken each year, each worth hundreds of dollars, as discussed in more detail in Section 3.5.2 and Chapter 4 of this document.

As discussed in Chapter 4 of this document, the preferred alternatives for billfish are anticipated to have generally minor adverse socio–economic impacts in the short–term as a result of a potential decrease in the availability of fish for landing, should the ICCAT recreational marlin landing limit be achieved, and as a result of the costs associated with purchasing new hooks. Adverse socio–economic impacts associated with the preferred alternatives are anticipated to be greatly constrained given high participation rates in catch and release fishing for Atlantic marlin, the fact that recent landings have rarely reached the ICCAT recommended 250–fish limit, and other factors discussed in Section 4.2.3. Localized impacts on communities where individual tournaments may cease operating as a result of potential in–season management action could be heightened; however, the aggregate impacts on the fishery as a whole are anticipated to be limited and may be slightly higher under a calendar year management cycle. Hooks represent a minor capital cost in relation to other expenditures related to recreational billfish fishing, including the purchase, outfitting, maintenance, and running of vessels. Healthy Atlantic billfish populations could lead to increased angler satisfaction, participation, and expenditures if the possibility of interacting with a billfish improves as a result of the measures identified in this rulemaking. As a result, the preferred alternatives pertaining to directed Atlantic billfish fishing could result in positive long–term cumulative socio–economic benefits if they assist in reversing declines in billfish populations.

Since the 1999 FMP, the majority of regulatory actions regarding BFT have been designed to improve BFT management and provide positive social and economic impacts to the fishery. For example, past adjustments to the target catch tolerance limits in both the harpoon and purse seine BFT fisheries and changes to the pelagic longline BFT incidental catch allowance provided marginal increases in social and economic impacts and responded to

changing conditions in the environment and market place. Annual management measures and inseason actions are analyzed and implemented to fully maximize the utilization of available quota and fishing opportunities for all fishery sectors.

As discussed in Chapter 4 of this document, the preferred alternatives are anticipated to continue to improve domestic BFT management by streamlining and simplifying the administrative processes governing BFT rulemaking and inseason actions. The preferred alternatives are expected to have positive socio–economic impacts in the short and long–term by responding to changed fishery conditions and needs within the BFT General category and increasing the ability of the Agency to affect timely annual rulemaking and respond to inseason management issues. In the future, it is expected that the Agency will continue to explore ways to improve domestic management including, for example, further streamlining and rationalization of the commercial permit program.

As described above, the change to a calendar year is mainly administrative and is not expected to have significant economic or social impacts. Any short–term confusion on the part of fishery participants due to the change to a calendar year would be offset by increased transparency in monitoring and compliance with international obligations. To the extent that switching back to a calendar year would offset any impacts from the original switch to a fishing year, this alternative could also provide some positive benefits.

The preferred alternatives for authorized fishing gear (H2, H5, and H7) could potentially increase the number of fishery participants. As discussed in Section 4.3.3, the preferred alternatives may have both positive and negative socio–economic impacts, with impacts varying by sector. This preferred action is expected to result in positive social and economic impacts for spearfishermen (ability to fish with a previously unauthorized gear type), commercial swordfish handgear fishermen (clarification on use of gear type), and all HMS fishermen choosing to utilize handheld cockpit gears (clarification on allowable use of secondary gears and reduced confusion on regulations). Some negative social and economic impacts may occur if competition for fishing grounds causes gear conflicts, however, public comments indicate that this is unlikely due to recent experiences where spearfishermen have fished in close proximity to rod and reel fishermen without incident. The preferred alternative not to modify the definition of green–stick gear but rather to clarify its current use could have some social and economic impacts. Clarifying the use of green–stick gear without preferring this alternative or modifying the regulations would have modest positive social benefits on those fishermen who are confused about the current regulatory regime. It may also result in minor positive economic benefits to those fishermen who now enter the fishery using this gear type in a manner allowed under current regulations but may not have done so previously as they were concerned it may have been illegal. These positive benefits may be offset by those fishermen who realize that they were using green–stick gear in the configurations that are not authorized under HMS regulations. HMS CHB and General category permit holders would be allowed to use various configurations of green–stick gear (see Section 2.3.3) although limited to two hooks per line under current handgear definitions. PLL vessels may use either configuration with unlimited hooks but need to comply with all other existing PLL regulatory requirements, including the use of circle hooks and avoiding closed areas.

The suite of preferred regulatory housekeeping alternatives in Section 4.3.4 is projected to have minimal social or economic impacts on HMS fishery participants. Several of the alternatives are predominantly administrative in nature. As such, any additional costs would be minor. Other alternatives to facilitate enforcement would impose no additional costs on vessels that are currently compliant with HMS regulations. Alternative I1(c), which would limit species composition of the catch, could potentially increase short–term social and economic impacts for those bottom or pelagic longline fishermen that fish in pelagic or bottom longline closed areas. However, NMFS expects that any cumulative impacts would be minor because the preferred alternatives accommodate the vast majority of commercial fishing operations, based on logbook data, and would only affect a small proportion of longline fishermen. Alternative I4(b), which would modify the East Florida Coast closed area, and alternatives I5(b), which would require that handlines remain attached to vessels, could reduce fishing effort, but that is not expected to be likely. Rather, fishery participants are expected to either move to nearby areas with similar catch rates (I4(b)), or to fish with attached handlines (I5(b)). AlternativeI10(c) clarifies how the NED BFT set–aside would be allocated, and is not expected to alter fishing effort. Actions of this nature that NMFS may consider in the future that would improve the administration of the existing HMS management regime, facilitate enforcement, or clarify regulations would similarly be expected to have minimal economic impacts.

As described previously, besides this rulemaking, NMFS is currently accepting comments on a proposed rule that would require vessel operators with HMS permits and BLL gear onboard to purchase and/or construct additional equipment for the safe handling, release, and disentanglement of sea turtles, smalltooth sawfish, and other non–target species. To the extent possible, the Agency has attempted to minimize initial costs to fishery participants by enabling them to construct equipment themselves. Furthermore, it is assumed that some participants are already in possession of the required equipment as vessels often fish with BLL and PLL gear; PLL participants are already required to possess the full suite of equipment. Attendance at workshops that are described above, and may be a requirement of the draft Consolidated HMS FMP, would result in some lost fishing and travel time, which would result in increased cumulative economic impacts. These economic and social impacts were fully analyzed in that document. While this action may result in minor negative socio–economic impacts, it is expected to ensure the long–term sustainability and continued economic viability of the BLL fishery by maintaining compliance with the October 2003 BiOp. NMFS also expects to issue proposed rules that would adjust the shark management measures based on recent or ongoing stock assessments. These upcoming rulemakings could have social economic impacts.

The cumulative social and economic impacts on HMS stocks and fisheries due to potential actions under consideration by Regional Fishery Management Councils, Interstate Marine Fisheries Commissions, or other management bodies may be slightly positive. The Caribbean Fishery Management Council recently implemented some area closures that could have minor positive benefits for Atlantic HMS. The HMS Management Division is currently proposing to implement complementary closures, and expects that any social or economic impacts would be minor due to the small size and amount of HMS fishing effort in the areas under consideration. The South Atlantic Fishery Management Council is considering management measures including time/area closures for bottom longline gear to protect grouper species that may have some impacts on HMS fisheries, particularly the shark fishery. Depending

on the size, these closures could have economic and/or social impacts on HMS fishermen. The Gulf of Mexico Fishery Management Council recently proposed regulations that would implement similar dehooking requirements to those required in the HMS pelagic longline fishery and to those proposed for the HMS bottom longline fishery. Because of the similarities, this proposed rule should not have any additional economic impact on HMS fishermen except for charter/headboat fishermen who also hold permits for fisheries managed by the Gulf of Mexico Fishery Management Council. HMS Advisory Panel members have raised concerns about the impacts of herring management on BFT stocks and the New England Fishery Management Council is considering a ban on midwater and pair trawling for herring in upcoming rulemaking to address concerns about impacts on BFT, cod, and whales. To the extent that herring trawl fisheries may be impacting BFT stocks, such a ban would likely have positive social and economic impacts for HMS fishermen, especially in New England areas where herring trawl fisheries operate. Regarding shark management, the Atlantic States Marine Fisheries Commission is also developing an interstate shark fishery management plan, which may have positive social and economic impacts if state measures aid in achieving OY for the shark fishery.

Table 4.75 Impacts of alternatives considered. The symbols +, –, and 0 refer to positive, negative, and zero impacts respectively. The expected impacts should be compared to other alternatives within that issue, not to the impacts between issues. See preceding section for details of impacts of each alternative.

Alternative Number	Alternative Description	Ecological Impacts	Social Impacts	Economic Impacts
Workshops				
Alternative A1	Voluntary protected species safe handling, release, and identification workshops for HMS longline fishermen (No Action)	–	0	0
Alternative A2	*Mandatory protected species safe handling, release, and identification workshops and certification for all HMS pelagic or bottom longline vessel owners – Preferred Alternative*	+	– / +	–
Alternative A3	*Mandatory protected species safe handling, release, and identification workshops and certification for vessel operators actively participating in HMS pelagic and bottom longline fisheries – Preferred Alternative*	+ +	– / +	– –

Alternative Number	Alternative Description	Ecological Impacts	Social Impacts	Economic Impacts
Alternative A4	Mandatory protected species safe handling, release, and identification workshops and certification for all HMS longline vessel owners, operators, and crew	+ + +	– / +	– – –
Alternative A5	*Mandatory protected species safe handling, release, and identification workshops and certification for shark gillnet vessel owners and operators – Preferred Alternative*	+ +	– / +	– –
Alternative A6	*Protected species safe handling, release, and identification certification renewal every 3-years – Preferred Alternative*	+ +	– / +	–
Alternative A7	No HMS identification workshops (No Action)	0	0	0
Alternative A8	Voluntary HMS identification workshops for dealers, all commercial vessel owners and operators, and recreational fishermen	+	0	0
Alternative A9	*Mandatory shark identification workshops for all shark dealers – Preferred Alternative*	+ +	– / +	–
Alternative A10	Mandatory HMS identification workshops for all swordfish, shark, and/or tuna dealers	+ + +	– / +	– –
Alternative A11	Mandatory HMS identification workshops for all commercial longline vessel owners	+ +	– / +	–
Alternative A12	Mandatory HMS identification workshops for all commercial longline vessel operators	+ +	– / +	–
Alternative A13	Mandatory HMS identification workshops for all commercial vessel owners (longline, CHB, General category, and handgear/harpoon)	+ +	– / +	– –

Alternative Number	Alternative Description	Ecological Impacts	Social Impacts	Economic Impacts
Alternative A14	Mandatory HMS identification workshops for all commercial vessel operators (longline, CHB, General category, and handgear/harpoon)	+ +	– / +	– –
Alternative A15	Mandatory HMS identification workshops for all HMS Angling permit holders	+ +	– / +	– – –
Alternative A16	*HMS identification certification renewal every 3–years – Preferred Alternative*	+ +	– / +	–
Time/Area Closures				
Alternative B1	Maintain existing closures; no new closures (No Action)	+	0	0
Alternative B2(a)	Prohibit the use of pelagic longline gear in HMS fisheries in the central portion of the Gulf of Mexico year–round	+/–	–	–
Alternative B2(b)	Prohibit the use of pelagic longline gear in HMS fisheries in an area of the Northeast during the month of June (1 month)	+/–	–	–
Alternative B2(c)	Prohibit the use of pelagic longline gear in HMS fisheries in the Gulf of Mexico from April through June (3 months)	+/–	–	–
Alternative B2(d)	Prohibit the use of pelagic longline gear in HMS fisheries in the Gulf of Mexico west of 86 degrees west longitude year–round	+/–	– –	– –

Alternative Number	Alternative Description	Ecological Impacts	Social Impacts	Economic Impacts
Alternative B2(e)	Prohibit the use of pelagic longline gear in HMS fisheries in an area of the Northeast to reduce sea turtle interactions	+/–	–	–
Alternative B3(a)	Modify the existing Charleston Bump time/area closure to allow the use of pelagic longline gear in all areas seaward of the axis of the Gulf Stream	0/–	+/–	+
Alternative B3(b)	Modify the existing Northeastern U.S. time/area closure to allow the use of pelagic longline gear in areas west of 72º 47' west longitude during the month of June	0	+/–	+
Alternative B4	*Implement complementary HMS management measures in Madison–Swanson and Steamboat Lumps Marine Reserves from November through April (6 months) – Preferred Alternative*	+	0	0/–
Alternative B5	*Establish criteria to consider when implementing new time/area closures or making modifications to existing time/area closures – Preferred Alternative*	0	0	0
Alternative B6	Prohibit the use of bottom longline gear in an area southwest of Key West to protect endangered smalltooth sawfish	+	0	–
Alternative B7	Prohibit the use of pelagic longline gear in HMS fisheries in all areas	++	– – –	– – –

Alternative Number	Alternative Description	Ecological Impacts	Social Impacts	Economic Impacts
Northern Albacore Tuna				
Alternative C1	Maintain compliance with the current ICCAT recommendation (No Action)	0	0	0
Alternative C2	Unilateral proportional reduction of United States northern albacore fishing mortality	+	–	– –
Alternative C3	*Establish the foundation with ICCAT for developing an international rebuilding program – Preferred Alternative*	0/+	0	0
Finetooth Sharks				
Alternative D1	Maintain current regulations for recreational and commercial fisheries (No Action)	–	0	0
Alternative D2	Implement commercial management measures to reduce fishing mortality of finetooth sharks	–/+	–	–
Alternative D3	Implement recreational management measures to reduce fishing mortality of finetooth sharks	–/+	–	–
Alternative D4	*Identify sources of finetooth shark fishing mortality to target appropriate management actions – Preferred Alternative*	0/+	0	0
Directed Billfish Fishery				
Alternative E1	Retain existing regulations regarding recreational billfish fishing, including permit requirements, minimum size limits, prohibited species, landing form, allowable gear, and reporting requirements (No Action)	+	0	0

Alternative Number	Alternative Description	Ecological Impacts	Social Impacts	Economic Impacts
Alternative E2	Effective January 1, 2007, limit all participants in Atlantic HMS recreational fisheries to using only non–offset circle hooks when using natural baits or natural bait/artificial lure combinations	++	–	–
Alternative E3	*Effective January 1, 2007, limit all HMS permitted vessels participating in Atlantic billfish tournaments to deploying only non–offset circle hooks when using natural baits or natural bait/artificial lure combinations – Preferred Alternative*	+	–	–
Alternative E4 (a)	Increase the minimum size limit for Atlantic white marlin to a specific size between 68 and 71'' LJFL	+	–	–
Alternative E4 (b)	Increase the minimum size limit for Atlantic blue marlin to a specific size between 103 and 106'' LJFL	+	–	–
Alternative E5	Implement a recreational bag limit of one Atlantic billfish per vessel per trip	+	–	–
Alternative E6	*Effective January 1, 2007, implement ICCAT Recommendations on Recreational Marlin Landings Limits – Preferred Alternative*	+	–	–
Alternative E7	Effective January 1, 2007 – December 31, 2011, allow only catch and release fishing for Atlantic white marlin	+	– –	– –
Alternative E8	Effective January 1, 2007 – December 31, 2011, allow only catch and release fishing for Atlantic blue marlin	++	– –	– –
Atlantic BFT				
BFT Subquota Management in the General and Angling Categories				

Alternative Number	Alternative Description	Ecological Impacts	Social Impacts	Economic Impacts
Alternative F1	Maintain the time–periods, subquota allocations, and geographic set asides for the General and Angling categories as established in the 1999 FMP (No Action)	0	+/–	+/–
Alternative F2	Establish General category time–periods, subquotas, and geographic set asides annually via framework actions	0	+/–	+/–
Alternative *F3*	*Amend the management procedures regarding General category time–periods, subquota, as well as geographic set–asides to allow for future adjustments to take place via a regulatory framework action – Preferred Alternative*	0	++	++
Alternative F3 (a)	Establish monthly General category time–periods and subquotas (June–Jan, 12.5% each)	0	+/–	+/–
Alternative F3 (b)	Revise General category time–periods and subquotas to allow for a formalized winter fishery (June–Aug, 54%; Sept, 26.5%; Oct–Nov, 9%; Dec, 5.2%; and Jan, 5.3%)	0	+/–	+/–
Alternative *F3 (c)*	*Revise General category time–periods and subquotas to allow for a formalized winter fishery (June–Aug, 50%; Sept, 26.5%; Oct–Nov, 13%; Dec, 5.2% and Jan, 5.3%)*	0	+/–	+/–

Alternative Number	Alternative Description	Ecological Impacts	Social Impacts	Economic Impacts
Alternative F3 (d)	Revise General category time–periods and subquotas to allow for a formalized winter fishery (June–Aug, 38.7%; Sept, 26.6%; Oct –Nov, 13%; Dec, 10.8%; and Jan, 10.9%)	0	+/–	+/–
Alternative *F4*	*Clarify the procedures for calculating the Angling category school size–class BFT subquota allocation and maintain the Angling category north/south dividing line – Preferred Alternative*	0	+	+
Annual BFT Quota Adjustments				
Alternative F5	Maintain full annual BFT specification process regardless of change in the U.S. BFT TAC and maintain under/overharvest procedures within individual domestic quota categories and individual vessels in the Purse seine category (No Action)	–	0/–	0/–
Alternative *F6*	*Revise the annual BFT specification process, to refer back to the analyses conducted in the DEIS of the consolidated HMS FMP and include seasonal management measures – Preferred Alternative*	0	+	+
Alternative F7	Eliminate unharvested quota carryover provisions and return unharvested quota to the resource, while maintaining status quo overharvest provisions	+/–	– – –	– – –

Alternative Number	Alternative Description	Ecological Impacts	Social Impacts	Economic Impacts
Alternative *F8*	*Establish an individual quota category carry–over limit of 100 percent of the baseline allocation (i.e., no more than the annual baseline allocation may be carried forward), except for the Reserve category, and authorize the transfer of quota exceeding the 100 percent limit to the Reserve or another domestic quota category, while maintaining status quo overharvest provisions – Preferred Alternative*	+	+/–	+/–
BFT Inseason Actions				
Alternative F9	Maintain inseason action procedures (No Action)	0	+/–	+/–
Alternative *F10*	*Revise and consolidate criteria considered prior to performing inseason and some annual BFT management actions – Preferred Alternative*	0	+/–	+/–
Alternative F11	Eliminate BFT inseason actions	– –	+/– –	+/– –
Timeframe for Annual Management of HMS Fisheries				
Alternative G1	Maintain the current fishing year for all HMS (No Action)	0	–	–
Alternative G2	*Shift the fishing year to January 1 – December 31 for all HMS – Preferred Alternative*	0	++	+/–
Alternative G3	Shift the fishing year to June 1–May 31 for all HMS	0	+	–
Authorized Fishing Gear				

Alternative Number	Alternative Description	Ecological Impacts	Social Impacts	Economic Impacts
Alternative H1	Maintain current authorized gears in Atlantic HMS fisheries (No Action)	0	–	0
Alternative H2	*Authorize speargun fishing gear as a permissible gear type in the recreational Atlantic BAYS tuna fishery – Preferred Alternative*	–	+	+
Alternative H3	Authorize speargun fishing gear as a permissible gear type in the commercial tuna handgear and recreational tuna fisheries	– –	++	+
Alternative H4	Authorize green–stick fishing gear for the commercial harvest of Atlantic BAYS tunas	–	+	+
Alternative H5	*Authorize buoy gear as a permissible gear type in the commercial swordfish handgear fishery; limit vessels employing buoy gear to possessing and deploying no more than 35 floatation devices, with each individual gear having no more than two hooks or gangions attached – Preferred Alternative*	+	+	+
Alternative H6	Authorize buoy gear as a permissible gear type in the commercial swordfish handgear fishery; limit vessels employing buoy gear to possessing and deploying no more than 50 floatation devices, with each individual gear having no more than 15 hooks or gangions attached	–	–	+

Alternative Number	Alternative Description	Ecological Impacts	Social Impacts	Economic Impacts
Alternative H7	*Clarify the allowance of hand–held cockpit gears used at boat side for subduing HMS captured on authorized gears – Preferred Alternative*	0	+	+
Regulatory Housekeeping				
Issue 1 – Definitions of Pelagic and Bottom Longlines				
Alternative I1(a)	Retain current definitions for PLL and BLL gear (No Action)	–	–	0
Alternative I1(b)	Establish additional restrictions on longline gear in HMS time/area closures by specifying a maximum and minimum allowable number of commercial fishing floats to qualify as a BLL and PLL vessel, respectively	+	0	0
Alternative I1(c)	*Differentiate between PLL and BLL gear based upon the species composition of the catch onboard or landed – Preferred Alternative*	+	0	0
Alternative I1(d)	Require time/depth recorders (TDRs) on all HMS longlines	+	–	–
Alternative I1(e)	Base HMS time/area closures on all longlines (PLL & BLL)	+ +	– –	– –
Issue 2 – Shark Identification				
Alternative I2(a)	Retain current regulations regarding shark landing requirements (No Action)	–	0	0
Alternative I2(b)	*Require that the 2nd dorsal fin and the anal fin remain on all sharks through landing – Preferred Alternative*	+	–	–
Alternative I2(c)	Require that the 2nd dorsal fin and the anal fin remain on all sharks through landing, except for lemon and nurse sharks	+	–	–

Alternative Number	Alternative Description	Ecological Impacts	Social Impacts	Economic Impacts
Alternative I2(d)	Require all fins remain on all sharks through landing	+ +	– –	– –
Issue 3 – HMS Retention Limits				
Alternative I3(a)	Retain current regulations regarding retention limits, with no new prohibitions (No Action)	–	0	0
Alternative I3(b)	*Add new prohibition at § 635.71(a)(48) making it illegal for any person to, "Purchase any HMS that was offloaded from an individual vessel in excess of the retention limits specified in §§ 635.23 and 635.24" – Preferred Alternative*	+	+	0/–
Alternative I3(c)	*Add new prohibition at § 635.71(a)(49) making it illegal for any person to, "Sell any HMS that was offloaded from an individual vessel in excess of the retention limits specified in §§ 635.23 and 635.24" – Preferred Alternative*	+	+	0/–
Issue 4 – Definition of East Florida Coast Closed Area				
Alternative I4(a)	Retain current coordinates for the East Florida Coast closed area (No Action)	–	0	0
Alternative I4(b)	*Amend the second coordinate of the East Florida Coast closed area to 28° 17' 10" N. lat., 79° 11' 24" W. long., so that it corresponds with the EEZ – Preferred Alternative*	+	–	–
Issue 5 – Definition of Handline				
Alternative I5(a)	Retain the current definition of "handline" at § 635.2 (No Action)	–	0	0

Alternative Number	Alternative Description	Ecological Impacts	Social Impacts	Economic Impacts
Alternative I5(b)	*Amend the definition of "handline" at § 635.2 by requiring that they be attached to, or in contact with, all vessels – Preferred Alternative*	+	–	–
Alternative I5(c)	Require that handlines remain attached to all vessels when fishing recreationally and allow unattached handlines when fishing commercially	+	–	–
Issue 6 – Possession of Billfish on Vessels Issued Commercial Permits				
Alternative I6(a)	Retain current regulations regarding the possession of Atlantic billfish (No Action)	–	0	0
Alternative I6(b)	*Prohibit vessels issued HMS commercial permits and operating outside of a tournament from possessing, retaining, or taking Atlantic billfish from the management unit – Preferred Alternative*	+	–	0
Issue 7 – BFT Dealer Reporting				
Alternative I7(a)	Retain the current regulations regarding BFT dealer reporting (No Action)	0/–	–	–
Alternative I7(b)	*Amend the HMS regulations to provide an option for Atlantic tunas dealers to submit required BFT reports using the Internet – Preferred Alternative*	+/0	+	+
Alternative I7(c)	Amend the HMS BFT dealer reporting regulations to require that Atlantic tunas dealers submit BFT reports electronically, with specific exceptions	+/0	+	+
Issue 8 – "No–Fishing" and Cost–Earnings" Reporting Forms				
Alternative I8(a)	Maintain the existing regulations regarding submission of logbooks (No Action)	0	–	0

Alternative Number	Alternative Description	Ecological Impacts	Social Impacts	Economic Impacts
Alternative I8(b)	*Require submission of "No Fishing" reporting forms for selected vessels if no fishing trips occurred during the preceding month, postmarked no later than seven days after the end of the month – Preferred Alternative*	0	+/–	0
Alternative I8(c)	*Require submission of the trip "cost-earnings" reporting form for selected vessels 30 days after a trip, and the "annual expenditures" report form by the date specified on the form – Preferred Alternative*	0	+/–	0
Issue 9 – Non–Tournament Recreational Landings Reporting				
Alternative I9(a)	Retain existing regulations at § 635.5(c)(2) requiring anglers to report non–tournament recreational landings of North Atlantic swordfish and Atlantic billfish (No Action)	–	–	0
Alternative I9(b)	*Require vessel owners (or their designees) to report non–tournament recreational landings of North Atlantic swordfish and Atlantic billfish – Preferred Alternative*	+	+	0
Issue 10 – Pelagic Longline 25 mt NED Incidental BFT Allocation				
Alternative I10(a)	Retain the current regulations specifically referring to 25 mt (ww) (No Action)	0	+	+
Alternative I10(b)	Modify the HMS regulations to state that "In addition, each year, 25 mt (ww) will be allocated for incidental catch by pelagic longlines" in the NED	0	+	+

Alternative Number	Alternative Description	Ecological Impacts	Social Impacts	Economic Impacts
Alternative I10(c)	*Conduct additional discussions at ICCAT regarding quota rollovers and adjust quotas allocated to account for bycatch related to pelagic longline fisheries in the vicinity of the management area boundary accordingly – Preferred Alternative*	+	–/+	–
Issue 11 – Permit Condition for Recreational Trips				
Alternative I11(a)	No permit condition for recreational trips (No Action)	–	–	0
Alternative I11(b)	*Require recreational vessels with a Federal permit to abide by Federal regulations, regardless of where they are fishing, unless a state has more restrictive regulations – Preferred Alternative*	+	+/–	0

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CHAPTER 5 TABLE OF CONTENTS

Chapter 5 Table of Contents **5-i**
5.0 Mitigation and Unavoidable Impacts **5-1**
5.1 Mitigation Measures 5-2
5.2 Unavoidable Adverse Impacts 5-7
5.3 Irreversible and Irretrievable Commitment of Resources 5-8

5.0 MITIGATION AND UNAVOIDABLE IMPACTS

None of the preferred alternatives in this final HMS FMP are likely to have significant adverse ecological impacts. The alternatives for workshops were designed to reduce mortality of sea turtles and other protected species. The alternatives for time/area closures were chosen to help protect spawning aggregations of gag grouper and to provide greater transparency to the affected public regarding the use of time/area closures to reduce bycatch.

The preferred alternative for northern albacore tuna would not have any ecological impact until ICCAT implements a rebuilding plan. To reduce mortality of northern albacore tuna, such a plan could include size limits, bag limits, or reductions in overall quotas. If such a plan were implemented, it could result in some regulatory discards because fishermen may continue to target other species and have to discard albacore bycatch. The current fishery averages about 25 percent below the existing allocation. Thus, the reduction in allocation as part of the rebuilding program would have to be greater than 25 percent per year on average before U.S. fishermen would begin to discard northern albacore.

The preferred alternative for finetooth sharks, which would implement a plan to identify sources of finetooth shark fishing mortality to target appropriate management actions, may not reduce fishing mortality on finetooth sharks in the short-term. Nevertheless, it is necessary to understand fully the extent and contribution that all fisheries may be contributing to finetooth shark fishing mortality. At that point, NMFS will consider initiating effective management measures to prevent overfishing. The majority of commercially landed finetooth sharks are harvested with gillnet gear by vessels that possess both HMS and non-HMS permits, or participate in fisheries that are not currently managed. Expanded observer coverage has shown that fisheries targeting non-HMS using sinknets and under the jurisdiction of other management entities are also responsible for finetooth landings. Management measures aimed solely at gillnet vessels targeting sharks might not be effective at preventing overfishing of finetooth sharks as these measures could be circumvented or may result in additional dead discards of finetooth sharks because these fishermen would continue to target non-HMS with gillnets and land finetooth sharks incidentally. A number of sources of finetooth shark mortality remain unclear. The Agency remains committed to obtaining more comprehensive information on finetooth shark landings from observers and other management entities. This information will be used to implement effective management measures that prevent overfishing for finetooth shark stocks, while minimizing dead discards and mitigating any associated economic and social impacts.

None of the preferred alternatives for reducing Atlantic billfish mortality from directed fishing are anticipated to have adverse ecological impacts. No significant changes in angler behavior are expected given the current high levels of participation in catch-and-release activities by Atlantic billfish fishermen. However, NMFS cannot predict angler behavior. Adverse ecological impacts to other species could occur if: 1) anglers shift their effort to other species, or 2) change their behavior significantly in reaction to the required use of circle hooks in billfish tournaments (on HMS permitted vessels when deploying natural bait or natural/artificial bait combinations) or potential in-season changes to minimum sizes or retention limits that could be enacted should the 250 marlin landing limit be approached or achieved. These shifts or changes could potentially result in increasing discards and retention of those species.

The preferred BFT management measures are not expected to have significant adverse ecological impacts. The General category time-period subquotas would not alter overall levels of mortality, but could likely shift where and when it occurs. Effort may increase in some areas and decrease in others, but overall effort should remain consistent because the amount of harvestable BFT quota is finite, and is not being changed. Interaction rates with protected species and other marine life may shift with localized effort shifts, but these interactions are difficult to quantify due to data limitations. The General category is only allowed to use handgear (rod and reel, handline, and harpoon) to harvest BFT and handgears typically have low interactions rates with protected resources in comparison to other gears, therefore any increases in interaction rates are expected to be minimal. Clarifying the procedures for calculating the Angling category school size-class BFT subquota allocation would result in a slight increase (0.02 percent or 2 mt) in the school BFT baseline quota allocation; however, any increase in effort or changes in fishing practices attributed to this slight quota increase are anticipated to be small. The slight increase in mortality is covered under ICCAT quota recommendations as well as the 20-year rebuilding plan established for BFT. The small orders of change associated with the preferred alternatives, quantified in either numbers of fish or in weight (mt), or time and/or location of harvest, compared to overall U.S. harvest levels, as recommended by ICCAT, equate to ecological impacts that are unlikely to be measurable in terms of variability in the data used to conduct stock assessments. Changes in inseason actions and specifying the season are administrative in nature and should not have any adverse ecological impacts.

Changing to a calendar-based fishing year is administrative in nature and should have no adverse ecological impacts. As described earlier, there is a small potential for negative economic and social impacts to billfish fisheries/tournaments at the end of a calendar year if the ICCAT 250-marlin limit threshold for catch-and-release fishing is reached.

The preferred alternatives for authorized fishing gear are not anticipated to dramatically increase effort, and therefore would likely not result in significant increases in landings or landings rates of HMS or other species with which HMS fishermen interact. The Agency does not expect the use of these gears to increase interactions with protected resources but will monitor the use of these gears, as appropriate.

The preferred alternatives in the regulatory housekeeping section, as a suite of management measures, are projected to have minor positive conservation benefits for HMS, bycatch species, and protected resources with minimal social or economic impacts on HMS fishery participants.

5.1 Mitigation Measures

Mitigation measures are measures that avoid, reduce, or minimize the effects of the preferred alternatives. According to the Council for Environmental Quality regulations at 40 CFR § 1508.20, mitigation measures may include the following types of actions: (a) avoiding the impact altogether by not taking a certain action or parts of an action; (b) minimizing impacts by limiting the degree or magnitude of the action and its implementation; (c) rectifying the impact by repairing, rehabilitating, or restoring the affected environment; (d) reducing or eliminating the impact over time by preservation and maintenance operations during the life of the action; and, (e) compensating for the impact by replacing or providing substitute resources or environments.

No mitigation measures were considered for the preferred alternatives of the time/area closures, northern albacore tuna, finetooth sharks, or authorized gear sections. NMFS would monitor the impacts of the preferred alternatives for these issues and would consider mitigation measures in the future as necessary.

The preferred workshop alternatives are likely to result in some negative economic impacts as a result of participants having to attend workshops, incurring travel costs and lost fishing time. To mitigate this potential impact, the Agency intends to host a number of workshops in regional fishing hubs and to provide a delay in effective date to give participants a chance to attend the workshop most convenient for them. Additionally, the Agency would strive to coordinate these workshops in order to reduce the time required to be away from fishing, work, and family responsibilities. The Agency is also allowing shark dealers to designate proxies for the mandatory HMS identification workshops. In the future, NMFS may consider ways to reduce travel time by expanding workshops to include Internet or video-based training opportunities.

As described in Chapter 4, the adverse socio-economic impacts of the preferred alternatives for Atlantic billfish would likely be minor, with possibly heightened local impacts in some instances. Consistent with public comment, to mitigate potential adverse impacts, NMFS is preferring to delay the effective date of new management measures. The delayed effective dates should allow anglers, tournament operators, tackle dealers, and hook manufacturers to adjust for new regulations prior to implementation. Anglers and charter headboat operators would have the opportunity to become comfortable and proficient in the use of new gears, as well as adjust fishing or business practices to prepare for the possibility of in-season changes to size limits and or retention limits, if triggered under the 250-marlin limit. Tournament operators would have time to adjust tournament rules and formats to accommodate new regulations in ways that could minimize confusion over gear requirements and mitigate potential decreases in participation. Shoreside businesses would also have time to reduce existing stockpiles of J-hooks. Further, allowing continued use of J-hooks outside of tournaments, and within tournaments on artificial lures, minimizes and substantially mitigates any potential minor adverse impacts from tournament circle hook requirements by allowing anglers to continue using existing quantities of J-hooks; tackle dealers to reduce existing inventories and adjust purchasing patterns, if necessary; and, hook manufacturers to adjust production, as appropriate. The preferred circle hook alternative may create short-term decreases in angler consumer surplus resulting from a perceived or real loss of fish as anglers adapt and become proficient with circle hooks. However, available studies on circle hooks show that catch rates on circle hooks are equal to or greater than for with J-hooks for some HMS. Therefore, as anglers become proficient in the use of circle hooks, the alternative may increase angler consumer surplus in the long-term. Further, this alternative should assist in rebuilding Atlantic billfish populations and could result in increased angler consumer surplus through elevated interactions. Also, while anglers will have initial capital expenditures to acquire circle hooks, they are generally somewhat less expense than J-hooks. Thus, the preferred alternative may result in negligible long-term economic benefits. It is also important to note that participation in billfish tournaments is voluntary on the part of HMS anglers. As such, any costs associated with circle hook requirements under the preferred alternative would be incurred by choice and could be avoided by choosing not to fish in billfish

tournaments. The alternative implementing the ICCAT landing limit was specifically crafted to minimize disruption and adverse impacts in the billfish fishery by allowing the Agency to slow landings (via an in-season minimum size increase) and thereby potentially preventing a more disruptive closure of the directed marlin fishery.

No specific mitigating measures were considered for any of the preferred alternatives for BFT management. While shifting the General category time-periods may result in less quota during some months, the regulations do not constrain fishermen to fishing in any one particular month. Provided they have the capability and the fishery remains open, fishermen may travel to where the fish are available regardless of the time of the year.

Changing to a calendar-based fishing year would require a transition period. Currently, NMFS prefers allowing for a seven-month transition where vessels participating in the tuna and swordfish fisheries could catch an entire year's worth of quota in seven months. The actual impacts of such a transition would be analyzed in a future rulemaking.

As described earlier in this document, many of the changes contained in the Regulatory Housekeeping section would have no effect either individually or cumulatively upon the human environment, and are consistent with the intent of previously analyzed and approved management actions. Therefore, alternatives have not been developed or analyzed for these measures. For the 11 more substantive measures, alternatives have been developed and analyzed. However, several of these would not implement new regulatory requirements. The preferred alternatives would either clarify or reinforce existing regulations, or facilitate modernized reporting procedures. For six issues, the preferred alternatives are expected to produce minor ecological benefits with few social or economic costs, and no mitigating measures are necessary. Similarly, the impacts associated with the preferred alternatives for the five, more substantive, issues in the Regulatory Housekeeping section are expected to be minor.

The preferred alternative to differentiate between pelagic and bottom longline gear in HMS closed areas, I1(c), would retain the existing definitions for these gears, but limit the amount of pelagic species that bottom longline vessels may possess or land when fishing in pelagic longline closed areas, and limit the amount of demersal species that pelagic longline vessels may possess or land when fishing in bottom longline closed areas. A five-percent threshold for the species composition of catch was chosen because it is consistent with the vast majority of commercial fishing operations, which have, on average, remained below the threshold. However, logbook data indicates that the threshold would have been exceeded on a fishery-wide basis in 2004. It is, therefore, possible that implementing a five-percent threshold to account for unavoidable bycatch in HMS closed areas could potentially lead to regulatory discards. NMFS is aware of this possibility and will continue to monitor the PLL and BLL fisheries to determine if the 2004 exceedance was anomalous, or part of a continuing trend. A preferred alternative in the Draft HMS FMP to restrict the number of floats is no longer preferred, based on public comment concerning difficulties with defining floats and concerns with enforceability of the measure. The list of demersal "indicator" species was modified from the proposed rule due to public comment by removing silky sharks and three species of hammerhead sharks, because these species could potentially be caught on both pelagic and bottom longlines. Also, three species of tilefish are added to the list of demersal "indicator" species, because these

species are indicative of bottom longline fishing activity, and based on public comment. If necessary, both the five-percent threshold and the list of "indicator" species could be further revised in the future to mitigate any adverse impacts, based upon a review of historic and current landings, and the effectiveness of the regulation. NMFS intends to continue to assess the need for, and potential effectiveness of, gear-based criteria to differentiate between PLL and BLL gear. If needed, such criteria could be developed in consultation with the fishing industry to further improve the monitoring of, and compliance with, HMS closed areas. NMFS anticipates that HMS longline vessels will continue to be prudent, especially when fishing in the HMS closed areas by catching predominantly pelagic species in BLL closed areas, and demersal species in PLL closed areas.

The preferred alternative, I2(b), that would require the second dorsal and anal fins to remain on all sharks through landing, is expected to produce ecological benefits and, in the long-term, aid in rebuilding large coastal sharks. Any adverse ecological impacts associated this alternative, in comparison to the alternative that would require all fins to remain on all sharks through landing, should be mitigated by other requirements in the final rule that would require shark dealers to attend species identification workshops. These workshops, in combination with the preferred alternative, should help to improve the accuracy of dealer reports as well as quota monitoring and stock assessments. Fishermen could experience, in the short-term, some adverse economic costs associated with the preferred alternative. While initial adjustments may have to be made to the offloading and processing procedures, in the long-term, improved quota monitoring and stock assessment data as a result of this alternative could result in an increased quota and, therefore, mitigate any short-term economic costs for both fishermen and dealers.

Prohibiting the sale and purchase of HMS in excess of retention limits (Issue 3 in the regulatory housekeeping section) should reinforce existing possession limits and prohibitions, thus further discouraging this illegal activity. Extending the East Florida Coast closed area to the EEZ (Issue 4 in the regulatory housekeeping section) is not expected to reduce fishing effort, as vessels would likely relocate to nearby areas with similar catch rates, but would better comply with the original intent of the closure.

Preferred alternative I5(b), which would require that all handlines remain attached to, or in contact with, all vessels is expected to produce minor positive ecological benefits by preventing future uncontrolled expansion of this gear sector. Positive ecological benefits could also be realized by a reduction in the amount of gear that could get lost at sea. However, because this alternative could restrict or limit fishing effort, it could potentially produce social and economic costs, including an unquantifiable reduction in catches of target species for vessels that participate in this fishery. This could reduce opportunities for the United States to fully utilize its ICCAT swordfish quota, which has had consistent underharvests in recent years. Authorizing buoy gear in the swordfish handgear fishery under alternative H5 should mitigate this impact.

A prohibition on the possession of billfish on HMS–permitted commercial vessels (Issue 6 in the regulatory housekeeping section) provides clarity and consistency with other HMS regulations, but is not expected to impose any economic costs as the sale of billfish is already prohibited.

The alternatives to facilitate reporting and improve administration would provide clarity and eliminate ambiguities in current regulations and practices (Issues 7, 8, and 9 in the regulatory housekeeping section). In the case of regulatory housekeeping Issue 7, NMFS would facilitate the electronic submittal of BFT dealer reports, while still maintaining current methodologies. Requiring the submission of negative reports (Issue 8 in the regulatory housekeeping section) would eliminate ambiguities by implementing a standard practice in most regions and a requirement that is already approved under the current PRA submission. Based upon public comment to provide additional flexibility for absentee vessel owners, NMFS has modified the preferred alternative in Issue 9 to allow vessel owners or their designee to report non-tournament recreational landings of swordfish and billfish.

Under preferred alternative I10(c), NMFS would conduct additional discussions during the annual ICCAT meeting regarding the long-term implications of allowing unused BFT quota from the previous year to be added to the subsequent year's allocation. This alternative is not expected to produce adverse ecological impacts. Depending upon the results of the ICCAT discussions, the regulations and operational procedures that account for BFT bycatch related to pelagic longline fisheries in the vicinity of the management area boundary may need to be further amended in the future. In the interim, NMFS would maintain the current regulatory text implementing the ICCAT recommendation, but would amend the practice of allowing under/overharvest of this set-aside allocation to be rolled into, or deducted from, the subsequent fishing year's set-aside allocation. Not allowing set-aside quota to be carried forward to the subsequent fishing year will maintain PLL fishing effort at current levels and still allow for incidentally caught BFT in the NED to be accounted for. However, this alternative may have some negative economic impacts, as it will not allow for the potential economic gain attributed to quota being carried forward from the preceding fishing year. This alternative is preferred because it meets the objective of clarifying the applicability of carry-over provisions to this incidental set-aside quota, still provides 25 mt (ww) to account for incidental BFT catch in the NED, prevents the 'stockpiling' of incidental quota which may provide an incentive to target BFT in the NED, and supports the discussion of long-term implications of BFT quota roll-overs. The outcome of these discussions will directly affect, and possibly mitigate, the implementation of this specific ICCAT recommendation.

Preferred alternative I11(b) would implement a permit condition requiring recreational vessels with a Federal permit to abide by Federal regulations, regardless of where they are fishing, unless a state has more restrictive regulations. This alternative is expected to achieve increased consistency between state and Federal regulations for Federally permitted HMS recreational fishermen, result in less confusion on behalf of fishermen, and improve enforcement and compliance. Compared with the no action alternative, the preferred alternative is expected to produce greater ecological benefits with few resulting social and economic s costs. This could mean, however, that different regulations will apply to Federally permitted fisherman fishing in state waters next to a state-only permitted fisherman. While it may appear to be unfair to the Federally permitted fisherman if the Federal regulations for that species are more restrictive than the state regulations for that species, Federally permitted fishermen also have the opportunity to fish for HMS outside of state waters. If Federally permitted fishermen decide that the opportunity is not worth the additional restrictions, they could decide not to obtain a Federal permit in order to mitigate any adverse impacts.

5.2 Unavoidable Adverse Impacts

In general, there are no unavoidable adverse impacts as a result of the preferred alternatives for the finetooth shark, northern albacore, BFT management, and fishing year issues. NMFS would continue to monitor the impact of the preferred alternatives of all issues and would propose additional management measures, as necessary, to avoid any unanticipated adverse impacts.

The preferred alternatives identified for workshops are necessary to meet the requirements of the October 2003 and June 2004 BiOps, thereby minimizing the impacts on protected resources, consistent with the Magnuson-Stevens Act, ESA, and MMPA. The preferred workshop alternatives are expected to have positive conservation benefits for sharks and protected resources with minimal social and economic impacts on longline and gillnet vessel owners and operators, as well as Federal shark dealer permit holders. The resulting economic or social costs of attending the workshops are unavoidable.

The preferred alternatives for time/area closures would not, at this time, implement any additional closures to reduce bycatch, including bycatch of Atlantic billfish, BFT, or sea turtles, except for establishing complementary measures for the Madison-Swanson and Steamboat Lumps Marine Reserves. Existing closures would remain unchanged. Part of the reason that NMFS is not adding new closures (other than the Madison-Swanson and Steamboat Lumps Marine Reserves) or modifying existing closures is because none of the alternatives considered would reduce bycatch of all of the species considered and many of the closures would result in only minimal impacts on one or more of those species while also having large social and economic impacts. In addition, all of the analyses on bycatch were based on J-hook data. NMFS currently has only analyzed six months of data with circle hooks (required in the pelagic longline fishery since July 2004). NMFS is also unsure of the current fishing effort as a result of Hurricanes Katrina and Rita in Fall 2005. NMFS expects that 2005 logbook data will be fully quality controlled and available for use in late Spring/Summer 2006. Once these data are available, NMFS should be better able to analyze circle hook data and the impacts of the hurricanes on the fleet. NMFS would continue to monitor bycatch and fishing effort and would consider these and other closures to reduce bycatch, to the extent practicable, as necessary.

As previously discussed, the preferred alternatives for billfish are not anticipated to have adverse ecological impacts on target species, non-target species, or protected resources, but some may have minor socio-economic impacts, which could be heightened at a local level in some instances. Furthermore, while the preferred alternatives are not anticipated to have adverse ecological impacts, NMFS cannot predict angler behavior. If implementation of the preferred alternatives results in substantial changes in angler effort or behavior, then there could be minor adverse ecological impacts for species with which billfish anglers interact by possibly increasing discards and/or retention of those species. In considering the alternatives, NMFS preferred alternatives that would minimize the adverse impacts while maximizing the positive impacts. Thus, any resulting economic or social impacts are unavoidable.

Under the preferred alternatives for authorized fishing gear, the potential exists for increased landings of BAYS tunas and swordfish. Alternatives H2 and H7, respectively, authorize the use of spearguns to target BAYS tunas recreationally and buoy gear to target

swordfish commercially. Any potential increase in landings would likely be minor. In the case of swordfish, U.S. fishermen are not fully harvesting the current ICCAT recommended quota.

As described above, in aggregate, the preferred alternatives in the regulatory housekeeping section are expected to have minor positive conservation benefits for HMS, bycatch species, and protected resources with minimal social or economic impacts on HMS fishery participants. This is because the preferred alternatives were specifically selected to mitigate any potential adverse impacts, yet still accomplish the objectives of this rulemaking. Any resulting economic or social impacts, beyond those described above, are unavoidable.

5.3 Irreversible and Irretrievable Commitment of Resources

The preferred alternatives identified for all the issues in this final HMS FMP are not expected to result in any irreversible and irretrievable commitment of resources.

CHAPTER 6 TABLE OF CONTENTS

Chapter 6 Table of Contents **6-i**
Chapter 6 List of Tables **6-ii**
6.0 Economic Evaluation **6-1**
6.1 Number of Fishing and Dealer Permit Holders **6-1**
6.1.1 HMS Commercial Fishing Permits 6-1
6.1.2 Dealer Permits 6-1
6.1.3 HMS Recreational Permits 6-1
6.2 Gross Revenues of Fishermen **6-2**
6.3 Variable Costs and Net Revenues **6-3**
6.4 Expected Economic Impacts of the Alternatives **6-4**
6.4.1 Bycatch Reduction 6-4
6.4.1.1 Workshops 6-4
6.4.1.2 Time/Area Closures 6-8
6.4.2 Rebuilding and Preventing Overfishing 6-11
6.4.2.1 Northern Albacore 6-11
6.4.2.2 Finetooth Sharks 6-11
6.4.2.3 Atlantic Billfish 6-13
6.4.3 Management Program Structure 6-16
6.4.3.1 Bluefin Tuna Quota Management 6-16
6.4.3.2 Timeframe for Annual Management of HMS Fisheries 6-21
6.4.3.3 Authorized Gears 6-21
6.4.3.4 Regulatory Housekeeping 6-22
Chapter 6 References **6-27**

CHAPTER 6 LIST OF TABLES

Table 6.1 Estimates of the total ex-vessel annual revenues of Atlantic HMS fisheries. Sources: NMFS 2005a; Cortes, 2005; and bluefin tuna dealer reports from the Northeast Regional Office. 6-2

6.0 ECONOMIC EVALUATION

This section assesses the economic impacts of the alternatives presented in this document. Additional economic and social considerations and information are discussed in Chapters 3, 4, 7, 8, and 9 of this document.

6.1 Number of Fishing and Dealer Permit Holders

In order to examine the baseline universe of entities potentially affected by the preferred alternatives, NMFS analyzed the number of permits that were issued as of February 2006 in conjunction with HMS fishing activities. This analysis of the permits issued is detailed further in Section 3.9 and summarized here.

6.1.1 HMS Commercial Fishing Permits

The program implemented in the 1999 Tunas, Swordfish, and Shark FMP set up six different limited access permit types: 1) directed swordfish, 2) incidental swordfish, 3) swordfish handgear, 4) directed shark, 5) incidental shark, and 6) tuna longline. These permits were designed so that the swordfish directed and incidental permits are valid only if the permit holder also holds both a tuna longline and a shark permit. Similarly, the tuna longline permit is valid only if the permit holder also holds both a limited access swordfish (directed or incidental, not handgear) and a shark permit. Swordfish handgear and shark permits are valid without another limited access permit. As of February 2006, there were 1,131 total HMS commercial fishing permits (191 directed swordfish, 86 incidental swordfish, 88 handgear, 240 directed shark, 312 incidental shark, and 214 tuna longline). However, there are only a total of 604 permit holders, since permit holders may have more than one type of permit. A detailed break down of the shark, swordfish, and tuna longline limited access permits by category and state is provided in Table 3.92. In addition to the 214 tuna longline permits, there are also 40 harpoon, seven trap, 4,824 general, and five purse seine Atlantic tuna permit holders as of February 2006. The HMS CHB permits, which are commercial permits for Atlantic tunas, are discussed below in the recreational permit section.

6.1.2 Dealer Permits

Dealer permits are required for any person that receives, purchases, trades for, or barters Atlantic tuna, swordfish, and sharks, from a fishing vessel of the United States or, in the case of tunas and swordfish, imports or exports regardless of ocean of origin. There were 285 Atlantic swordfish, 336 Atlantic shark, and 416 Atlantic tunas dealer permit holders as of February 2006. The geographic distribution of these dealer permit holders is detailed in Table 3.95.

6.1.3 HMS Recreational Permits

There are two types of permits issued with activities associated with HMS recreational fishing activity. The HMS Angling category permit is required for any angler that is fishing for Atlantic HMS; fish caught using this permit cannot be sold. As of February 2006, there were 25,238 HMS Angling category permit holders. The HMS CHB permit allows for the sale of Atlantic tunas and allows CHB vessels to catch and land sharks, swordfish, and billfish pursuant

to the recreational regulations (*i.e.*, no sale of fish). The CHB permit holder may also holds a swordfish handgear and/or shark limited access permit that allows for the sale of those species under the regulations for those permits. As of February 2006, there were 4,173 HMS CHB permit holders.

Since 1999, Federal regulations have required that each HMS tournament operator register their tournaments with the NMFS at least four weeks prior to the commencement of tournament fishing activities. In 2005, 256 HMS tournaments registered where as in 2004 just 215 tournaments registered. Tournament operations are variable from year to year. Section 3.9 provides more detailed information on HMS tournaments including a detailed geographic breakdown of registered HMS tournaments.

6.2 Gross Revenues of Fishermen

Table 6.1 summarizes the 2004 average annual revenues of the Atlantic HMS fisheries based on average ex-vessel prices and the weight reported landed as per the United States National Report (NMFS, 2005), information given to ICCAT (Cortes, 2005), and price and weight information reported to the NMFS Northeast Regional Office by Atlantic bluefin tuna dealers. Section 3.5 provides further detail regarding annual revenues, including historical numbers. The overall gross revenues generated from the HMS fishery totaled $43.9 million in 2004. The largest portion came from swordfish, generating $15.4 million in gross revenues (35 percent).

The highest average ex-vessel price per lb dw across all regions in the Atlantic HMS fishery was $7.86 for bluefin tuna. In addition, average ex-vessel price for shark fins, all grades combined, was approximately $16.25 per lb in 2004.

Table 6.1 Estimates of the total ex-vessel annual revenues of Atlantic HMS fisheries. Sources: NMFS 2005a; Cortes, 2005; and bluefin tuna dealer reports from the Northeast Regional Office.

Species	2004		
	Ex-Vessel Price ($/lb dw)	Weight (lb dw)	Revenue
Bigeye tuna	$4.10	551,503	$2,258,404
Bluefin tuna	$7.86	885,720	$6,961,760
Yellowfin tuna	$2.48	4,832,483	$11,972,477
Other tunas*	$0.74	287,127	$211,756
Swordfish**	$3.57	4,317,369	$15,391,422
Large coastal sharks	$0.86	3,206,377	$2,757,484
Pelagic sharks	$1.12	450,833	$504,933
Small coastal sharks	$0.50	677,305	$338,653
Shark fins (weight = 5% of all sharks landed)	$16.25	216,726	$3,521,793
Total HMS		**15,425,443**	**$43,918,682**

Note: Average ex-vessel prices may have some weighting errors, except for bluefin tuna which is based on a fleet-wide average.
* Other tunas include skipjack and albacore.
** Swordfish weight estimates do not include dead discards.

6.3 Variable Costs and Net Revenues

In 2003, NMFS initiated mandatory cost-earnings reporting for selected vessels to improve the economic data available for all HMS fisheries. In the past, most of the studies regarding pelagic longline variable costs and net revenues available to NMFS analyzed dated data from 1996 and 1997. An analysis of the 2004 cost-earnings data is incorporated below. Where noted, NMFS has converted 1996 and 1997 dollars to 2004 dollars using the consumer price index provided by the Bureau of Labor Statistics.

Larkin *et al.* (2000) examined 1996 logbooks and the 1996 voluntary economic forms and found that net returns to a vessel owner varied substantially depending on the vessel size and the fishing behavior (*i.e.,* sets per trip, fishing location, season, target species). They found that out of 3,255 pelagic longline trips reported in 1996, 642 pelagic longline trips provided the voluntary economic information. Larkin *et al.* (2000) suggest using median values (half of the fleet is less than this value and half is above) instead of mean values (the average of all vessels) given the high degree of skewness to the data. For example, the mean owner's share of a trip is $4,412, while the median is $2,242. Larkin *et al.* (2000) suggest that the median values identify the characteristics of the majority of the fleet better than the mean, which can be influenced by outliers (a few vessels that may not be similar to the rest of the fleet). The mean supply costs per trip for the vessels sampled was $5,959 and median was $3,666. This changed depending on area fished, with the median ranging from $1,928 in the area between North Carolina and the east coast of Florida (FEC to MAB) and $10,100 in the Caribbean. Vessels in the NED area (Maine to Virginia region in Larkin *et al.* (2000)) had a median supply cost per trip of $2,831 or $3,408 in 2004 dollars. For the entire fleet, Larkin *et al.* (2000) found that the average net revenues per vessel per trip was $7,354 ($8,854 in 2004 dollars). Vessels fishing in the Caribbean and Maine to Virginia areas had the largest average net returns to the vessel owner per trip at $12,188 and $6,672, respectively ($14,674 and $8,033, respectively, in 2004 dollars). Generally, Larkin *et al.* (2000) found that vessels between 46 and 64 feet in length that had between 10 and 21 sets per trip, fished in the second quarter, fished in the Caribbean, or had more than 75 percent of their gross revenues from swordfish had the highest net return to the owner (ranging from $3,187 to $13,097 per trip) while vessels less than 45 feet in length that had between one and three sets per trip, fished in the first quarter, fished between North Carolina and Miami, Florida, or had between 25 and 50 percent of their gross revenues from swordfish had the lowest net return to the owner (ranging from $642 to $1,885 per trip).

Porter *et al.* (2001) conducted a survey of 147 vessels along the Atlantic and Gulf of Mexico (110 surveys were completed) in 1998 regarding 1997 operations. Survey information was combined with trip tickets and logbook data. They found that on average, vessels received approximately $250,000 annual gross revenues, annual variable costs were approximately $190,000, and annual fixed costs were approximately $50,000. Thus, vessels were left with approximately $8,000 to cover depreciation on the vessel and the vessel owner lost approximately $3,500 per year. On a per trip level, gross revenues averaged $22,000 and trip expenses, including labor, were $16,000. Labor cost the owner the most (43 percent), followed by gear. Generally, trip returns were divided so the vessel owner received 43 percent and the captain and crew 57 percent. Porter *et al.* (2001) noted that 1997 was probably a financially poor year due to a reduction in swordfish quota and a subsequent closure of the fishery (this fishery

has not been closed since). Similar to Larkin *et al.* (2000), Porter *et al.* (2001) noted differences between region, vessel size, and target species. While all vessels had an average net return per trip of $5,556 ($6,539 in 2004 dollars), vessels that fished in the New England or Caribbean regions had much higher net returns per trip at $20,772 and $18,940, respectively ($24,448 and $22,291, respectively in 2004 dollars).

In general, both Larkin *et al*. (2000) and Porter *et al*. (2001) found that the average net return to a vessel is fairly low after all variable costs including labor were accounted for. This was true even of vessels fishing in the northeast region or Caribbean (*i.e.*, regions with relatively high gross revenues). This corresponds with the results of Ward and Hanson (1999) who found that fifty percent of the fleet earns $10,000 or less annually and that, each year, 20 percent of the fleet actually has a loss. Additionally, as suggested by Larkin *et al*. (2000) in their discussion of mean versus median values, Ward and Hanson (1999) found there were a number of vessels that earned much higher net revenues than the average vessel with 19 percent of the fleet earning $50,000 or more annually and seven percent earning more than $100,000 annually.

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. For reasons mentioned above, 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

6.4.1 Bycatch Reduction

6.4.1.1 Workshops

NMFS considered six alternatives (A1-A6) for workshops focusing on protected species release, disentanglement, and identification workshops for pelagic longline, bottom longline, and gillnet fishermen. In addition, ten alternatives (A7-A16) were considered for HMS species identification workshops.

The economic impacts of the various workshop alternatives primarily focuses on the opportunity costs associated with fishermen attending workshops. Opportunity cost is the cost of passing up the next best choice when making a decision. In this document, NMFS assumes that for fishermen who may have to attend workshops, the next best choice of using their time in terms of a business activity would likely be fishing or fishing related activities (*e.g.*, ensuring

vessel and equipment are in working order, completing logbook requirements, preparation for the next fishing trip, etc.). Other opportunities exist (*e.g.*, attending family events or other jobs); however, NMFS feels this assumption is reasonable given that fishing is often the most valuable activity engaged in by most fishermen. In order to estimate the value of their opportunity cost, NMFS assumed that fishermen would lose a day of fishing rather than a day of fishing related activities, and conducted an analysis of HMS logbook cost-earnings data to estimate daily earnings per day at sea for individual HMS fishery participants.

These estimates of opportunity cost per day at sea, along with additional estimates that follow, are likely to be high since they do not take into consideration the time the owners, operators (*i.e.*, captains), and crew spend on fishing related activities, such as preparing for a trip at the dock and the time it takes to offload and other activities that occur at the dock, that require labor time. Therefore, the estimates provided are likely to overestimate opportunity costs since crew share per day is estimated here by dividing a fisherman's share per trip by the number of days at sea, and not by the total number of days worked to earn their share since the Agency lacks this information. For example, if crew members earn $740 per trip and each trip is 9 days long at sea, the result would be an average of $82 per day in earnings. However, it is likely the crew actually worked for three days before the trip and one day after the trip preparing and offloading so their actual earnings per day worked would only be $62 per day.

Also, note that owners incur costs outside of costs directly associated with a trip, such as capital costs, that reduce their earnings/profit. The revenue share to owner per day at sea might not accurately reflect an owner's true opportunity cost and is likely to be overestimated. For example, insurance costs and capital equipment costs are not reflected in the estimated revenue share for owners, but if they were true earnings would be lower. This is even more evident when owners own multiple vessels. In addition, an owner's participation in a workshop may not disrupt their vessel's ability to go out fishing depending on the owner's roll in vessel operations.

Alternative A1 considers continuing voluntary workshops for longline fishermen. This alternative may result in some negative short-term economic impacts related to workshop travel costs and lost fishing time that may be incurred by fishery participants who choose to attend. Poor attendance at voluntary workshops due to competing demands for fishermen's time, however, may result in insufficient improvements in post-release mortality of threatened and endangered species. This may result in the fishery not achieving the post release mortality targets required under the June 2004 BiOp for the pelagic longline fishery, and thus, may result in future closures that would result in extensive long-term negative economic impacts to the pelagic longline fisheries.

Alternative A2, the preferred alternative, considers mandatory workshops and certification for all HMS pelagic and bottom longline *vessel owners*. This alternative will likely result in some short-term negative economic impacts, as a result of the cost of traveling to workshops and the opportunity cost of earnings foregone for the lost fishing and business time that may be incurred by participants that would be required to attend these mandatory workshops. It is estimated that 549 vessel owners permitted to fish for HMS with longline gear would participate in these workshops. Based on 2004 HMS logbook data, it is estimated that an owner's share of their vessel's revenue for bottom and pelagic longline vessel owners is

approximately $281 and $448 per day, respectively. The total opportunity cost for this alternative is thus estimated to be between $154,269 and $258,048 in the first year for all vessel owners combined. After the first year, the subsequent costs will depend on how any people enter the fishery. In addition, travel costs would be incurred that would be specific for each workshop location and distance traveled.

Alternative A3, a preferred alternative, considers mandatory workshops and certification for *vessel operators* actively participating in the HMS pelagic and bottom longline fisheries. This alternative would have similar economic impacts to alternative A2, except this alternative would impact operators, not vessel owners. It is estimated that 1,098 operators, assuming two operators per vessel, would participate in workshops under this alternative. Based on 2004 HMS logbook data, it is estimated that an operator's share for bottom and pelagic longline vessel operators is $345 and $149 per day at sea, respectively. The total opportunity cost for this alternative is thus estimated to be between $163,602 and $378,810 in the first year for all vessel operators combined. In addition, travel costs would be incurred.

Alternative A4 considers mandatory workshops and certification for all HMS longline vessel owners, operators, and crew. NMFS estimates that this alternative would result in 3,843 participants attending the workshops. Of this amount, 2,196 participants are estimated to be crewmembers. Based on 2004 HMS logbook data, it is estimated that a crewmember's share for bottom and pelagic longline vessel crewmembers is $90 and $109 per day at sea, respectively. Combining the total crewmember opportunity cost with the total owner and operator opportunity costs discussed above for alternatives A2 and A3, the total opportunity cost for this alternative is estimated to be between $515,511 and $876,222 in the first year. In addition, travel costs would be incurred that would be specific for each workshop location and distance traveled.

Alternative A5, a preferred alternative, considers mandatory workshops and certification for shark gillnet vessel owners and operators in the safe handling and release of protected resources, including sea turtles, smalltooth sawfish, and marine mammals. Individual opportunity costs are not available for gillnet vessel owners and operators due to confidentiality concerns, however the median opportunity cost for vessel owners and operators of all gear types combined, including gillnets, to participate in a one-day workshop would be $578 ($424 owner's share plus $154 captain's share). The costs incurred by the vessel owners and operators would be related to travel and the opportunity costs of time to attend the workshop.

Alternative A6 prefers a renewal timeline for workshop certifications. NMFS considered three different recertification timelines: every two years, three years, and five years. Recertification every two years would likely have the greatest economic impacts on participants and five years would result in the least negative economic impacts to the fishing community, because it would result in the most infrequent recertification schedule. Using the range opportunity costs estimated for preferred alternatives A2 and A3, the estimated net present value (using the Office of Management and Budget's recommend seven percent discount rate) of the opportunity costs associated with recertification ten years after initial certification would be between $1.4 and $2.1 million for recertification every two years, $1.0 and $1.5 million for recertification every three years, and $0.6 and $0.9 million for recertification every five years. A recertification frequency of three years appears to be an appropriate compromise of ecological

and economic impacts. This period would allow for sufficient retraining to maintain proficiency and update fishermen on new research and development related to the subject matter while not placing an excessive economic burden on the participants due to lost fishing time and travel resulting from attending a recertification workshop in person. The extent of the impacts would depend on the mechanism for recertification. In addition, the Agency is also considering alternative media for recertification in order to reduce costs. If an owner or operator is unable to attend a scheduled workshop, NMFS will consider granting one-on-one training at the expense of the permit holder. These one-on-one training sessions would accommodate the replacement of a captain whose employment was terminated on short notice or a change in ownership of a vessel, but, again, these sessions would be at the expense of the permit holder.

In addition to the workshops focusing on protected species release, disentanglement, and identification workshops for pelagic longline, bottom longline, and gillnet fishermen, NMFS considered several alternatives for HMS identification workshops. The No Action alternative (A7) is not anticipated to result in any change, either positive or negative, in economic impacts, primarily because current activities related to the dissemination of information to assist in identifying HMS would remain the same.

Voluntary workshops (A8) are not anticipated to result in any substantial economic changes, either positive or negative, primarily because attendance would be voluntary and at the discretion of the participants. Any associated travel costs may be considered a minimal economic impact, as it is not likely that participants would go to substantial expense and trouble for this type of voluntary training. In the long-term, misidentification could result in unquantifiable economic costs if sharks do not rebuild as a result of stock assessment data not being accurate.

Under alternatives A9 through A15, social and economic impacts on each individual would be similar in nature since each of the alternatives involve one day workshops that result in opportunity costs and travel costs. The main difference between alternatives is that the number of attendees and the associated overall total costs, taking all individuals into consideration, vary by alternative. Under alternative A9, the preferred alternative, mandatory workshops and certification for federally permitted shark dealers, it is estimated that there would be over 336 workshop participants. Under alternative A10, mandatory workshops for all shark, swordfish, and tuna dealers, it is estimated that there would be over 1,037 participants. Information regarding HMS dealer earnings is not available therefore the expected opportunity costs of alternatives A9 and A10 are unquantified at this time. Nevertheless, given the number of dealers involved, NMFS would expect alternative A9 to have less of an economic impact than alternative A10.

Under alternative A11, mandatory workshops and certification would include all commercial longline vessel owners, which currently total 549. Alternative A11 would result in opportunity costs equivalent to alternative A2 of between $154,269 and $245,952 for the first year. Under alternative A12, mandatory identification workshops would include all commercial longline vessel operators, which would include approximately 1,098 participants. Alternative A12 would result in opportunity costs equivalent to alternative A3 of between $154,269 and $378,810 for the first year. Under alternative A13, mandatory workshops and training

certification for all commercial vessel owners (longline, CHB, General category, and handgear/harpoon), which includes approximately 9,636 participants. Under alternative A14, mandatory workshops and certification would be required for all commercial vessel operators (approximately 10,374). Under alternative A15, mandatory workshops and certifications would be required for all HMS angling permit holders, total approximately 25,238. Thus, alternative A15 would have the greatest economic impact of the alternatives considered for species identification workshops.

On an individual basis, the only costs anticipated to be incurred by fishermen or dealers would be those related to travel and time to attend the workshops. The opportunity cost to all commercial vessel owners is estimated to be $424 per day in net revenue for all gear types based on HMS logbook cost earnings data for 2004. The opportunity cost to all commercial operators is estimated to be $154 per day for all gear types and $97 per day for crewmembers. Using these estimates of opportunity cost, alternative A13 would result in a total of approximate $4,085,664 in opportunity costs in the first year. The total opportunity cost for alternative A14 is estimated to be $1,597,596 in the first year. Daily opportunity cost estimates for dealers, anglers, and CHB owners and operators are not currently known. The administrative costs to NMFS for the workshops is high, but may be exceeded by the benefits associated with the possible impacts from increased education, as well as, the benefit of avoiding future management actions if BiOp takes are exceeded.

Under alternative A16, social and economic impacts would vary depending on the frequency of recertification workshop attendance required – every two, three, or five years. Furthermore, economic impacts would be dependent on the type of recertification selected by the agency. Hands-on, in-person recertification workshops would result in additional travel costs and lost fishing time. However, the Agency may consider alternative media for recertification, including: DVDs, printed materials, and/or web-based recertification. Negative economic impacts would be greater for shorter recertification frequencies due to more frequent travel costs and potential down time from fishing, although NMFS intends to schedule recertification workshops so as to minimize these factors, to the extent possible. In an effort to reduce economic impacts to shark dealers, the schedule for HMS Identification Workshops would be available in advance to allow dealers to select workshops close to them and most convenient to their schedule. If a dealer and/or proxy is unable to attend a scheduled workshop, NMFS will consider granting one-on-one training at the expense of the dealer. These one-on-one training sessions would accommodate the replacement of a proxy whose employment was terminated on short notice, but, again, these sessions would be at the expense of the permit holder. If dealer employee turnover is high and the renewals are scheduled every five-years, a dealer may pay for a greater number of one-on-one training sessions than with a three-year timetable.

6.4.1.2 Time/Area Closures

Alternative B1, the no action alternative to maintain existing closures has, and would likely continue to have, negative economic impacts on the pelagic longline industry. Existing closures may have contributed to the reported 15 percent decline in fishing effort, a 10 percent decline in the number of directed and incidental permits, and a decline from 199 to 130 active pelagic longline permits from 2000 to 2004. Chapter 4 details the economic impacts and analyzes conducted to estimate the impacts of the various time/area closure alternatives.

Alternative B2(a) would potentially impact a total of 61 vessels and potentially result in an 11 percent decline in fishing effort, and reductions in landings of target species ranging from a minimum of one percent for bigeye tuna to a maximum of 14.3 percent for yellowfin tuna. The combined total loss in gross revenues for alternative B2(a) without redistribution of effort would be approximately $2,299,018 annually. With redistribution of effort, alternative B2(a) is predicted to result in an increase in all targeted species landings and gross revenues except yellowfin tuna, which are predicted to decrease by one percent for a loss of approximately $138,204 annually. The combined total gain in gross revenues for alternative B2(a) with redistribution of effort would be approximately $1,242,832 annually. If, on the other hand, effort is displaced into open areas of the Gulf of Mexico only, gross revenues are predicted to decrease by $5,003,298 (6.8 percent of total 2003 HMS fisheries revenues), or $108,767 per vessel annually with no redistribution of effort. With redistribution of effort into the open areas of Gulf, there would be a predicted increase in gross revenues of $679,212. The predicted economic impacts to gross revenues for the fleet could range from a loss of approximately $5.0 million to a gain of approximately $1.2 million (6.8 to 1.6 percent of total 2003 HMS fisheries revenues).

Alternative B2(b) would potentially impact a total of 20 vessels. The combined total loss in gross revenues for the alternative B2(b) closure without redistribution of effort would be approximately $299,120 annually. Specifically, swordfish landings would potentially decrease by $231,252 annually. However, with redistribution of effort, the combined total loss in gross revenues for alternative B2(b) would be approximately $72,675 annually.

Alternative B2(c) would potentially impact a total of 75 vessels. The combined total loss in gross revenues for the alternative B2(c) closure without redistribution of effort would be approximately $3,136,229 annually. Specifically, yellowfin tuna gross revenues, the most lucrative species affected by alternative B2(c) and also the most lucrative HMS species, could decrease by $2,483,678 annually. However, with redistribution of effort, the combined gain in gross revenues for alternative B2(c) would be approximately $1,651,023.

Alternative B2(d) would potentially impact a total 78 vessels. The combined total loss in gross revenues for the alternative B2(d) closure without redistribution of effort would be approximately $10,683,133 annually. Yellowfin tuna gross revenues would be the most impacted, with estimated loss of $8,035,791 annually. However, with redistribution of effort, it is predicted that an overall increase in gross revenues of approximately $6,014,934 annually primarily due to potential increases in swordfish and bigeye tuna landings as effort redistributes.

Alternative B2(e), a 46,956 nm^2 closure in the Northeast, would potentially impact a total of 49 vessels. The combined total loss in gross revenues for alternative B2(e) without redistribution of effort would be approximately $3,234,660 annually. However, with redistribution of effort, gross revenue losses are predicted to total only $820,132 annually (1.1 percent of total 2003 HMS fisheries revenues).

Combining closures of B2(d) and B2(e) year-round would potentially impact a total of 127 vessels that fished in that area and without redistribution of effort would result in decrease in

landings valued at $12.9 million annually based on 2003 prices or $13.25 million based on 2004 prices. With redistribution of effort revenues could potentially increase by $7,802,425.

Modifications to two closed areas, alternatives B3(a) and B3(b), would potentially result in positive economic impacts. Re-opening areas of either closure would allow fishermen access to previously closed fishing grounds, resulting in increased landings of targeted species. However, this may create gear conflicts between recreational and commercial fishermen. Conversely, the modified area of B3(a) would be along the axis of the Gulf Stream, which would afford recreational fishermen closed portions inshore and allow pelagic longline vessels to fish in re-opened areas offshore.

Alternative B3(a), the Charleston Bump modification, would result in approximately a total increase in landings worth $234,460 annually with approximately $220,806 annually for swordfish alone. Alternative B3(b), the NEC modification, would potentially increase gross revenues by approximately $550 annually.

Alternative B4, the preferred alternative to implement complementary HMS management measures in Madison-Swanson and Steamboat Lumps Marine Reserve, could potentially impact commercial and recreational HMS fishery participants. However, the impact is likely to be low considering that between 1997 and 2003 only one pelagic longline set and two bottom longline sets were reported in the HMS logbook in these areas. Because the preferred closure areas are relatively small, any HMS fishing activity that otherwise would have occurred in these areas would likely relocate to nearby open areas with similar catch rates. The impact of this alternative on HMS recreational and charter/headboat fishing is unknown. However, because this alternative includes the seasonal surface trolling allowance during prime fishing season, it is not expected to substantially impact the HMS recreational and charter/headboat sector.

Alternative B5, which establishes criteria for regulatory framework adjustments for implementing new or making modifications to existing time/area closures, would have no direct economic impacts. However, the ultimate implementation of new, or modification of existing closures could have variable economic impacts depending on whether time/area closures are modified, removed or added. Future modifications to time/area closures will be analyzed for their social and economic effects on fishermen, recreational anglers, businesses, and communities.

Alternative B6, the closure off the southwest tip of Key West to bottom longline gear to protect smalltooth sawfish, would be expected to have minimal negative economic impacts. It is estimated that this alternative could affect 1.3 percent of commercial bottom longline sets based on the number of sets in this area between 1994 and 2003. This alternative would help reduce the number of interactions with smalltooth sawfish, and thereby help the bottom longline industry stay below their Incidental Take Statement (ITS) for smalltooth sawfish. Staying below the ITS will have positive economic and social impacts by keeping the entire bottom longline fishery open and operating, allowing economic activity to continue for the bottom longline fishermen and associated shore side businesses.

Alternative B7, prohibiting longlining in all areas, would potentially impact a total of 177 active vessels reporting landings in the Pelagic Longline Logbook. This alternative would have significant economic impacts on the longline vessel owners, operators and crew that would need to re-rig their vessels to continue fishing for HMS, find alternative fisheries, or discontinue fishing. It would also negatively impact dealers that purchase fish from pelagic longliner vessels and also other onshore business that support the industry. The closure of the pelagic longline fishery would result in, at a minimum, a loss of $25.8 million in gross revenues (35 percent of total 2003 HMS fisheries revenues). This estimate does not include the potential loss in revenues from sharks, tunas, and other finfish landings. This alternative would also likely have adverse impacts on shoreside support businesses and dealers.

6.4.2 Rebuilding and Preventing Overfishing

6.4.2.1 Northern Albacore

None of the alternatives considered to address northern albacore would result in impacts different from alternative C1, no action, as the United States is currently fishing below its ICCAT allocation for northern albacore. The impact of alternative C2, unilateral action for the U.S. fleet to reduce landings, would be a reduction in income, but this reduction would be small on the U.S. fishery since the level of landings for albacore is two orders of magnitude smaller than swordfish and shark landings. For the recreational fishery, alternative C2 would result in target species shifts to other opportunistic target species as well as catch-and-release of albacore. Economic impacts would be difficult to evaluate for the recreational fishery since there is such a high variation in the catch from year to year. Alternative C3, which would establish the foundation for developing an international rebuilding program, itself has no economic impact. As ICCAT has not yet adopted a rebuilding program for northern albacore tuna, an analysis of the social and economic impacts from any international rebuilding program resulting from alternative C3 cannot be conducted at this time. If the ICCAT Rebuilding Program involves a substantial reduction in allowable catch, there would likely be a short-term reduction in economic benefits to the longline fishery until the stock recovers. Since recreational fishermen target northern albacore tuna at certain times of the year and in certain areas, it is difficult to estimate the effect that a reduction in allowable landings of northern albacore would have on angler consumer surplus. It might be reduced, but to an unknown extent, since many recreational trips targeting northern albacore tuna often target other tuna species.

6.4.2.2 Finetooth Sharks

Alternative D1, the no action alternative, would not likely result in any adverse economic or social impacts since this alternative would not substantially modify or alter commercial or recreational fishing practices for finetooth or other species of shark. In the long-term, if finetooth sharks become overfished, there could be larger economic impacts.

Alternative D2, commercial management measures, considers the use of trip limits, modifying gillnet size, specifying maximum soak times, prohibiting the use of gillnet for targeting sharks, and reducing the quota for small coastal sharks (SCS). These commercial

management measures may impose negative economic impacts on a limited number of gillnet vessels that land sharks and potentially other operations.

Implementing a trip limit for finetooth sharks would increase the amount of travel to and from port resulting in lost fishing time and increased expenditures for fuel. The trip limit may also impact directed shark permit holders targeting other finfish species if they end up catching enough finetooth sharks during a trip to reach the limit, and thus reducing the number of sets that could be conducted per trip. However, the impact to directed shark permit holders targeting other finfish is likely to be to a lesser degree since it is assumed that finetooth sharks would comprise a smaller proportion of their landings. In addition, some fishermen targeting finfish species might discard some of the finetooth sharks that they catch to avoid having trips shortened as a result of reaching a trip limit.

Modifying gillnet mesh size requirements may impact a small number of gillnet vessels that direct on sharks, causing them to potentially replace existing gear in order to comply with any new requirements. Specifying maximum soak times for gillnet vessels targeting sharks may impose a negative economic effect as vessels would have to work longer hours and make more sets in order to maintain their current catch levels.

Alternatively, reducing the quota for SCS may have a negative impact depending on the amount of the reduction. The SCS quota reduction would have to be more than 25 percent to cause economic impacts on the shark gillnet fishery given historical landings.

Closing the directed the directed shark gillnet fishery would result in negative economic impacts for at least five vessels actively participating in the shark gillnet fishery, but minimal economic impacts on the shark fishery as a whole. Closing the shark gillnet fishery would likely cause economic dislocation of at least five individuals or small entities and possibly up to 15 vessels having reported landing finetooth sharks in Federal logbooks recently. These vessels would still be able to harvest sharks but only with other authorized gear types. The costs of refitting vessels to fish with other authorized gears could be substantial.

Alternative D3, considers management measures to reduce recreational fishing mortality of finetooth sharks including requiring circle hooks and increasing the existing size limit for finetooth sharks. The potential impacts that could result from requiring circle hooks are unknown. Requiring circle hooks when targeting SCS may result in negative impacts to the shark recreational anglers and related industries as a result of adjusting to this new gear, but those costs are not likely to be significant especially given the potentially lower cost of circle hooks (see discussion below regarding billfish and circle hooks). Increasing the existing size limit for finetooth may result in some negative economic impacts. However, the economic impact may be variable depending on the willingness of anglers to release finetooth sharks caught and/or substitute harvested fish with other similar species. In addition, finetooth sharks only comprise less than two percent of the overall SCS recreational harvest, so the economic impact to the recreational fishery is likely to be low. Tournaments would still be able to offer prize categories for finetooth sharks provided they are above the minimum size.

The preferred alternative (D4), identifying sources of finetooth shark fishing mortality to target appropriate management actions, would have minor economic impacts (*e.g.*, food costs for observer on board and potential safety compliance costs). The expansion of the shark gillnet observer program in 2005 to vessels targeting species other than sharks covered an additional 30 trips from eight vessels. The number of vessels fishing with gillnet gear for species other than shark, possessing a shark permit, and not currently subject to observer coverage is estimated at approximately ten vessels. These vessels would have to attain the proper safety certification decals from the United States Coast Guard and ensure that there are adequate accommodations on board for observers prior to taking an observer. Other efforts to expand data that is currently collected on shrimp trawl vessels would not result in any economic impacts as the percentage of observer coverage would not be expanded, only the selected species of bycatch that are sampled. In the long-term, gaining knowledge as a result this preferred alternative could minimize economic impacts while sustaining the population.

6.4.2.3 Atlantic Billfish

Eight alternatives are being considered for the management of the directed Atlantic billfish fishery. Alternative E1, the No Action alternative, would likely have no positive or negative short-term economic impacts. In the long-term, the No Action alternative could result in large adverse economic impacts if billfish are put on the endangered species list or if billfish populations do not recover and continue to decline.

Alternative E2, requiring the recreational fishery to use only non-offset circle hooks when using natural baits or natural bait/artificial lure combinations, would likely have limited adverse social and economic impacts. There are an estimated 7,915 billfish anglers in the U.S. Atlantic and 1,627 billfish anglers in Puerto Rico (Ditton and Stoll, 2003). The universe of vessels that could be impacted by circle hook requirements are the 25,238 Angling, 4,173 CHB, and 4,824 valid General category permits. A comparison of current J-hooks and circle hook prices indicates that anglers would, on average, pay 46 cents less for circle hooks compared to J-hooks if a shift in demand for circle hooks does not significantly affect prices. The delay in implementation of this alternative is anticipated to allow hook manufacturers, retailers, and anglers adequate time to utilize current inventories of J-hooks, thereby minimizing adverse economic impacts associated with alternative E2. This alternative may result in a temporary decrease in angler consumer surplus given anticipated or real loss of fish as fishermen adjust to and become more proficient with the use of circle hooks, but some studies of circle hook effectiveness indicate that there could be increased catches, and therefore angler consumer surplus associated with circle hooks. While unlikely, it is possible that there could be a decrease in tournament participation and demand for CHB trips, as well as trips taken by individuals based on real or perceived declines in catch. Overall, alternative E2 may provide long-term positive benefits with regard to increased angler consumer surplus and willingness to pay if circle hooks contribute to rebuilding efforts and result in increased encounter rates.

Alternative E3, a preferred alternative limiting all Atlantic billfish tournament HMS permitted vessel participants to using only non-offset circle hooks when using natural baits or natural bait/artificial lure combinations, is similar in economic impact to alternative E2, but reduced given the smaller universe of effected individuals. NMFS is not able to quantify the exact number of anglers or vessels participating in tournaments that may be impacted. However,

it is known that in 2003 and 2004, there were 244 and 215 registered HMS tournaments, respectively, and that the average number of vessels participating in a tournament was 47 for the period 1999-2004. It is possible, but unlikely, that this alternative will result in decreased tournament participation. The impacts to hook manufacturers, retailers, and anglers would likely be limited given that J-hooks would continue to be permitted outside of tournaments, and in tournaments with artificial lures. Angler recreational consumer surplus impacts would be similar to that of alternative E2, but would impact a smaller universe.

Alternatives E4(a) and E4(b) would increase the minimum size for blue and white marlins. It is uncertain if these measures would or would not affect angler participation rates. High current catch-and-release rates, tournaments that establish minimum sizes greater than the current limit, and past surveys indicate that minimum sizes have not affected billfish fishing activity. As reported in Table 4.3, very high percentage of blue marlin, white marlin, and sailfish were released in tournaments. Thus, NMFS expects that any resultant negative economic impacts of these alternatives would be minor.

Alternative E5, recreational bag limit of one Atlantic billfish per vessel per trip, would likely have minor impacts. Given that the recreational billfish fishery has low CPUE rates and the chances of landing more than white or blue marlin on a single trip is low, it is reasonable to assume that anglers would maintain current levels of participation based on the opportunity of catching and possibly landing one trophy-sized fish. It is possible that there will be an unquantified decrease in demand for CHB trips if not all individual anglers on a given trip would have the opportunity to land a billfish. Furthermore, tournament participation would not be expected to decrease in a substantial manner as tournament rules often prohibit participants from entering more than one marlin per day.

Alternative E6, which would implement the ICCAT recommendation for a recreational marlin landings limits, is anticipated to result in minimal to moderate adverse economic impacts depending on catch rates, angler response, and which of the available management actions become necessary. Historical data suggest that it is unlikely that the United States will achieve the 250 marlin landing limit.

Three scenarios were analyzed regarding whether certain thresholds for in-season management action are achieved to estimate the potential impacts of this alternative. If the threshold for inseason management action is not achieved, then alternative E6 would not be expected to result in impacts to the recreational marlin fishery. If the threshold for an inseason minimum size increase is achieved, NMFS believes it is unlikely that there would be a substantial decrease in demand for charter/headboat trips, trips by individual anglers, or participation in billfish tournaments given the catch-and-release ethic of billfish anglers. On the other hand, if the threshold for implementing catch-and-release only fishing is achieved, there could be some economic impacts. In a worst case scenario, marlin anglers may reduce their demand for charter fishing trips by between 0.4 and 24.2 percent of the available trips remaining during a given season, and the average cost of a CHB trip was $1,053 in 2004. Private vessel owners who fish for marlin may also reduce participation by between 0.4 and 24.2 percent; however, the economic impact for this is unquantifiable at this time.

In addition, NMFS estimates that between 0.8 and 10.1 percent of tournaments may cease to operate in a worse case scenario during a catch-and-release only time period based on RBS data on billfish tournament release rates. If the threshold were reached in May under a fishing year schedule, 16 tournaments, between 6.5 and 7.5 percent of registered tournaments, could be impacted and between zero and four tournaments (less than two percent of registered tournaments) may cease to operate. However, even these low numbers may be an overestimate given the recent evidence that anglers may be willing to pay more for catch-and-release tournaments. A reduction in one to four tournaments could result in an estimated adverse direct economic impact of $1,375,439 to $5,501,756 and result in some small decrease in consumer surplus for anglers participating in those tournaments. Impacts on shoreside businesses would likely be minor, but could be increased or decreased depending on angler response and when in the season a shift to catch-and-release only fishing might occur. Alternative E6 could have smaller long-term adverse economic impacts than alternative E1, if landing rates increase in the future, since E6 allows NMFS more flexibility on when and if action should be taken to remain consistent with international standards.

Alternative E7, which would allow only catch-and-release fishing for Atlantic white marlin for a five-year period, could potentially lead to negative economic impacts, although the magnitude is difficult to assess. The short-term social impacts of not being able to land trophy or record category fish is difficult to assess, however NMFS anticipates that this alternative could lead to a decrease in angler willingness-to-pay and angler consumer surplus. The long-term impacts of alternative E7 may result in an increase in net benefits as stocks rebuild and recreational encounters with white marlin become more frequent. The Agency estimates that alternative E7 could result in between $49,491 and $1,320,462 in lost revenues to CHB vessels annually. The loss of revenues of this magnitude would likely result in minor to moderate negative social and economic impacts to the CHB sector; however, considering the catch-and-release ethic of billfish anglers (31 white marlin reported landed in 2004), NMFS anticipates that negative impacts under this alternative would be less severe than those calculated above. Under alternative E7, negative social and economic impacts could occur if General category vessels that normally participate in HMS tournaments cease participating in tournaments. Any negative impacts would likely be reduced if these vessels already practice catch-and-release fishing for white marlin and participate in catch-and-release tournaments. In 2004, there were 129 registered tournaments that awarded points or prizes for white marlin (see Chapter 3). Assuming that one to four tournaments cease operations, the Agency estimates that alternative E7 could result in negative economic impacts ranging from $1,375,439 to $5,501,756. However, considering the catch-and-release ethic of billfish anglers, NMFS anticipates that negative impacts under this alternative would be of a lesser magnitude than those calculated above. The delayed effective date is anticipated to allow tournament operators sufficient time to alter tournament rules to provide for a catch-and-release format and allow anglers to adjust to new requirements. Angler willingness-to-pay and consumer surplus would likely remain high, given the currently high release rate of white marlin, which is reinforced by the low number of verified landings that occurred in recent years. However, it is possible that angler consumer surplus may decrease given the inability to land white marlin. Further, under alternative E7, anglers would still have the ability to land other billfish, including trophy-sized sailfish and blue marlin.

Alternative E8, which would allow only catch and release fishing for Atlantic blue marlin, is similar to E7 and could potentially lead to negative economic impacts, although the magnitude is difficult to assess. Alternative E8 is likely to have a greater economic impact than the white marlin catch and release only alternative since more blue marlin are landed than white marlin and since there are more blue marlin tournaments than white marlin tournaments. Angling category fishermen may reduce the number of trips targeting blue martin under this alternative. Estimating that between 461 and 2,862 trips may be canceled given the inability to retain blue marlin, this alternative could result in between $485,433 and $3,013,686 in lost revenues to CHB vessels annually. The loss of revenues of this magnitude would likely result in moderate negative social and economic impacts to the CHB sector. However, considering the catch-and-release ethic of billfish anglers, NMFS anticipates that negative impacts under this alternative would be of a lesser magnitude than those calculated above. Negative economic impacts could occur if General category vessels that normally participate in HMS tournaments cease operations. In 2004, there were 142 registered tournaments that awarded points or prizes for blue marlin captures (see Chapter 3). NMFS estimates that 10 to 14 tournaments could cease operations, and therefore alternative E8 could result in negative economic impacts ranging from $13,754,390 to $19,256,146. The loss of revenues of this magnitude would likely result in sizable local economic impacts for tournaments, tournament participants, and associated businesses. Angler consumer surplus would likely remain high, given the currently high release rate of blue marlin, which is reinforced by the low number of verified landings that occurred in recent year. However, it is possible that angler willingness-to-pay, and thus angler consumer surplus, may decrease given the inability to land blue marlin. Further, under alternative E8 anglers would still have the ability to land other billfish, including trophy-sized sailfish and white marlin. To mitigate negative socio-economic impacts, alternative E8 would delay implementation of catch-and-release-only fishing requirements to allow the fishery time to adjust to new measures.

6.4.3 Management Program Structure

6.4.3.1 Bluefin Tuna Quota Management

Alternative F1, the no action alternative, may have both positive and adverse economic impacts. The positive impacts are associated with the General category time-periods and associated subquota allocation percentages remaining consistent with those of prior years, as well as maintaining the General category New York set-aside allocation for those participants operating in that designated area. The adverse impacts associated with this alternative result from the Agency's inability to adapt BFT management measures to account for variations inherent to the fishery from one year to the next. This alternative would also have some adverse economic impacts on fishermen, dealers, and the support industries located in the south Atlantic region, due to the fact that BFT quota tends to be harvested prior to BFT arriving later in the season (Nov. - Jan.) off the southern Atlantic cost and current allocations do not provide for a formal winter fishery.

Alternative F2, the establishment of General category time-periods, subquotas, and geographic set-asides annually via regulatory framework adjustments, would provide NMFS with more flexibility to establish management measures more expeditiously. However, constituents would not be provided long-term certainty in the General category quota allocation

scheme around which they could devise a business plan. There may also be positive social and economic impacts attributed to increases experienced in a domestic quota category, time-period subquotas, or geographic set-aside quota in a given year; however, the likelihood of experienced negative social or economic impacts due to a decrease in any of these areas is equally the same.

Alternative F3, the preferred alternative, would blend aspects of alternatives F1 and F2 together to optimize the positive economic impacts associated with this alternative by enhancing NMFS' flexibility to adapt to the fisheries inherent variability by authorizing adjustments to the General category time-periods, associated subquotas, and geographic set-asides via a regulatory framework adjustment. This alternative would have positive economic impacts on the General category as a whole by providing reasonable fishing opportunities to General category BFT fishery participants throughout the range or the time of year that BFT are readily available to them.

There are four subalternatives associated with alternative F3. F3(a) would distribute the coastwide General category quota equally among the eight months that currently make up the General category BFT season (June-January), by allocating in 12.5 percent shares to each month. This subalternative would have both positive and negative social and economic impacts as it would provide some stability to the constituency by establishing a known amount of quota that would be available at the first of each month. However, if catch rates tend to be high, these quotas could be harvested rapidly and could lead to derby style fisheries on the first of each month, which is contrary to NMFS' intent. While this subalternative would formalize the recent General category winter BFT fishery, it would do little to recognize historical General category BFT allocations. Therefore, this subalternative would result in positive social and economic impacts for those General category participants located in the south Atlantic region attributed to a 40 percent increase in available quota, compared to the no action alternative, during the time frame of October through January. This increase in quota would equate to approximately four million dollars in additional gross revenue for the later part of the General category season. However, those General category participants in the New England area or those participants which pursue BFT in the summer months may experience some adverse social and economic impacts due to the shift in quota to the later portion of the season. For instance under this alternative, the status quo June through August time-period subquota allocation would be reduced by approximately 22.5 percent and the September time-period allocation would be reduced by approximately 17.5 percent. These reductions in allocation would result in decreased gross revenues of approximately $2.5 and $2 million , respectively. This subalternative would also reduce the need for specific geographic set-asides because quota allocation would be made on a monthly basis and would be evenly distributed. This subalternative would assist in distributing the General category BFT catch, temporally and geographically, which is beneficial for the collection of CPUE data and could assist in avoiding large scale landings in a constrained time frame, thus reducing market gluts.

Subalternative F3(b) would implement General category time-periods, and associated subquota allocation percentages similar to those contained in the 1999 FMP, but would separate the October through January time-period into three distinct time-periods of October through November, December, and January, and establish a formal General category winter BFT fishery on which fishermen, dealers, and supporting industries could depend and plan. The General

category time-period subquota allocation percentages would be adjusted slightly to incorporate the allocations in the winter months, but would still recognize the historical General category allocations during the summer and fall months.

This subalternative would have positive social and economic impacts to those General category participants located in the south Atlantic region attributed to a 9.5 percent increase in available quota, compared to the no action alternative, during the time from of October through January. This increase in quota would equate to approximately $1.1 million in additional gross revenue for the later part of the General category season. However, those General category participants in the New England area or to those participants which pursue BFT in the summer months may experience some adverse social and economic impacts due to the shift in quota to the later portion of the season. For instance under this alternative, the status quo June through August time-period subquota allocation would be reduced by approximately 6 percent and the September time-period allocation would be reduced by approximately 3.5 percent. These reductions in allocation would result in a decrease of early season gross revenues of approximately $0.7 and $0.4 million, respectively. These negative impacts may be mitigated by individuals traveling to where the BFT are located at any time of the season. However, NMFS has little specific information at this time regarding the costs that would be incurred due to this travel.

Subalternative F3(c), the preferred alternative, would implement the same time-periods as mentioned in Subalternative F3(b), but would implement slightly different subquota allocation percentages for the June through August and October through November time-periods. This subalternative was designed to redistribute the quota from the early time-periods to provide a winter General category BFT fishery to during the months of December and January. This subalternative would reduce the allocation to the June through August time-period to a higher degree, than subalternative F3(b) and increase the suballocation to the October through November time period, thus shifting more of the potentially adverse social and economic impacts to the earliest portion of the season.

This subalternative would enhance equity among regional General category participants, given that access to fish available at different times of the year in different locations is likely to occur. Because this alternative would allocate General category quota based on a balance between historical General category BFT allocations, recent BFT landing trends, and the NCDMF Petition for Rulemaking, there would be no significant social or economic impacts to the fishery as a whole. However, this subalternative would have similar positive and adverse social and economic impacts as outlined in Subalternative F3(b). The adverse social and economic impacts would be slightly shifted to the earliest portion of the fishery, where the General category subquota allocations have traditionally been the highest. This subalternative would have positive social and economic impacts to those General category participants fishing in the later portion of the season due to a 13.5 percent increase in available quota, compared to the no action alternative, during the time from of October through January. This increase in quota would equate to approximately 1.5 million dollars in additional gross revenue for the later part of the General category season. However, those General category participants who pursue BFT in the summer months may experience some adverse social and economic impacts due to the shift in quota to the later portion of the season. For instance under this alternative, the status

quo June through August time-period subquota allocation would be reduced by approximately 10 percent and the September time-period allocation would be reduced by approximately 3.5 percent. These reductions in allocation would result in a decrease of gross revenues of approximately $1.2 and $0.3 million, respectively for each of these time periods.

Reallocating more quota from the June through August time-period to the later time-periods would slightly mitigate some of these adverse social and economic impacts because the amount of quota being reallocated would equate to a smaller percentage of the June through August subquota relative to the other time-period subquotas. This subalternative is preferred due to the balance it strikes between providing all General category BFT fishery participants an equitable opportunity to harvest a portion of the coastwide General category quota, while still recognizing the historical participation in this fishery. Any adverse social or economic impacts associated with this alternative would be minimized and may even be mitigated as fishermen are allowed to travel to the geographical location of where the BFT are located at any give time. However, NMFS has little specific information at this time regarding the costs that would be incurred due to this travel.

Subalternative F3(d) would implement the same time-periods as described in Subalternatives F3(b) and F3(c), but would allocate the General category time-period subquota in accordance with the NCDMF's Petition for Rulemaking (*i.e.*, 150 mt total for the months of December and January or approximately 21.7 percent of the coastwide General category quota). This alternative would have a greater positive social and economic impact to General category participants in the south Atlantic region, region due to a 24.7 percent increase in available quota, compared to the no action alternative, during the time from of October through January. This increase in quota would equate to approximately $2.6 million in additional gross revenue for the later part of the General category season. However, those General category participants in the New England area or to those participants which pursue BFT in the summer months may experience greater adverse social and economic impacts due to the shift in quota to the later portion of the season. For instance under this alternative, the status quo June through August time-period subquota allocation would be reduced by approximately 21.3 percent and the September time-period allocation would be reduced by approximately 3.4 percent. These reductions in allocation would result in decrease gross revenues of approximately $2.5 and $0.3 million, respectively. These negative impacts may be mitigated by individuals traveling to where the BFT are located at any time of the season. However, NMFS has little specific information at this time regarding the costs that would be incurred due to this travel.

Alternative F4 would clarify the procedures NMFS uses in calculating the ICCAT recommendations regarding the eight percent tolerance for BFT under 115 cm. This alternative would have slightly more positive economic impacts as it would slightly increase the school size-class BFT quota by approximately two mt (0.02 percent) of the status quota allocation.

Alternative F5 would maintain the status quo process currently used in allocating the ICCAT-recommended U.S. BFT TAC domestically, the accounting for annual under/overharvest, and establishing General category effort controls. This alternative is not expected to have any substantial economic impacts.

Alternative F6 would have slightly more positive economic impacts, in comparison to F5, as each baseline domestic quota category allocation, quantified in metric tons, would be codified in the regulatory text implementing the consolidated HMS FMP. This alternative would have positive economic impacts to the domestic BFT fishery as a whole by allowing BFT fishery participants, either commercial or recreational in nature, to make better informed decisions on how to best establish a business plan for the upcoming season.

Alternative F7, which would not allow carry forward of unharvested quota from one fishing year to the next, would likely have the most adverse economic impact of all the annual BFT management measure alternatives. This alternative could lead to derby style fishing where vessels may operate in less than optimal conditions to harvest the quota before the season is closed. This alternative could also result in a domestic quota category not receiving a quota transfer from another domestic quota category with large amounts of underharvest to assist in covering an overharvest situation, which could result in that category having quota deducted from the following year. This could result in reduced fishing opportunities, income, and angler consumer surplus for the commercial and/or recreational fleet, as well as the businesses that support those BFT fisheries.

Alternative F8, which would limit the amount of unharvested BFT quota in each category that could be carried forward, would have both slightly positive and negative economic impacts on the BFT participants. This would limit the maximum amount of revenue each domestic quota category could generate to no more than double the value of the baseline allocation. These potential negative economic impacts would be mitigated, overall, by reallocation of tonnage that exceeds the cap to the Reserve or to another domestic quota category.

Alternative F9 maintains inseason action procedures. When catch rates are low, a liberalized retention limit of two or three BFT may have positive economic impacts on a vessel that is able to harvest multiple fish especially if ex-vessel prices are high during a low catch rate period. However, if catch rates were to increase dramatically over a short period while retention limits were set at the upper end of the allowable range, large numbers of BFT could be landed in a short time period, thus flooding the market and depressing ex-vessel prices.

Alternative F10 would have slightly more positive economic impacts, as the criteria NMFS must consider when making inseason action determinations would be consolidated and consistent, regardless of what type of inseason action is being considered. This consolidation will likely minimize confusion regarding how NMFS came to a decision, and thereby provide additional transparency to the management process.

Alternative F11, which would eliminate BFT inseason actions, would constrain NMFS' ability to adjust management actions that help spread the maximum utilization of BFT quota over the longest period of time to provide reasonable fishing opportunities. The positive economic aspect of this alternative would be that quota allocations and daily retention limits would remain stable throughout the entire season, which would aid in planning fishing activities.

6.4.3.2 Timeframe for Annual Management of HMS Fisheries

Three alternatives were considered for changing the annual management timeframes for HMS fisheries. Alternative G1, maintaining the current fishing year for all HMS species, would not result in any anticipated disruptions to any of the HMS markets.

Alternative G2, which would manage all HMS species on a calendar year cycle, would not have any economic impacts on the shark fishery, since this is the status quo for that fishery. For the bluefin tuna fisheries, the economic impacts of alternative G2 are expected to be minimal given the current measures used to distribute quota throughout the year. The economic impacts to the Atlantic billfish fisheries could vary slightly depending upon whether thresholds for taking restrictive action are achieved and the management measures subsequently implemented. Minor to moderate impacts as a result of the ICCAT billfish landings limit (E6) could be shifted to the tail end of the calendar year, beginning in late summer, under this alternative. This temporal shift in impacts would result in some geographic shift to include New England and Mid-Atlantic regions. If the threshold for implementing catch-and-release-only fishing is achieved to comply with the ICCAT limit, it is estimated that an average of 39 tournaments awarding prizes for marlin occurring from August to December could be impacted, and up to four tournament cancellations could occur resulting in an annual economic impact of $5,501,756.

Alternative G3, which would establish a June 1 – May 31 fishing year management cycle for all HMS species, could result in some short-term negative economic impacts as shark wholesale and retail markets adjust to the potential disruption in catch rates resulting from the shift to a fishing year and new trimesters.

6.4.3.3 Authorized Gears

Seven alternatives have been considered to address issues with authorized gear. Alternative H1, the No Action alternative, would not be expected to have any additional economic impacts because fishermen are already operating under these measures.

Alternative H2, which would authorize speargun fishing gear as a permissible gear-type in the recreational Atlantic BAYS tuna fishery, could have positive economic impacts for spearfishermen. Not allowing BFT to be taken with speargun fishing gear avoids the possibility of further exacerbating quota limited situations in the school size fishery and might avoid gear conflicts with other members of the BFT recreational fleet. It could also increase sales of speargun fishing gear. The charter/headboat sector may also experience positive economic impacts as spearfishermen may increase their use of for-hire vessels.

Alternative H3, which would authorize speargun fishing in both the commercial BAYS tuna handgear and recreational fisheries, would have similar economic impacts to alternative H2 except that there would be potential economic benefits for CHB and General category fishermen from the sale of commercially speared tunas. However, it is not anticipated that many commercial tuna fishermen would utilize this gear type.

Alternative H4 would authorize green-stick gear for the commercial harvest of Atlantic BAYS tunas. This alternative would likely have positive economic impacts for those fishermen who wish to employ green-stick gear to target Atlantic BAYS tunas commercially. The vessels

that would be authorized to use green-stick gear under this alternative would include all permitted Atlantic Tunas Longline, General, and HMS CHB (on non for-hire trips) category vessels, approximately 214, 4,824, and 4,173 vessels, respectively. The higher landing rates and higher quality of meat landed using green-stick gear could provide positive economic impacts to commercial fishermen, as well as benefit fish houses, gear supply houses, and other associated business. The economic benefits of this alternative, however, would likely be small since some vessels are already utilizing this gear type. There could be negative economic impacts from the prohibition on the possession or retention of BFT when possessing commercial configurations of green-stick since this practice may already be occurring. Any increases in green-stock gear sales could produce positive economic benefits to onshore gear suppliers and other onshore businesses.

Alternative H5 would allow the commercial swordfish handgear fishery to continue utilizing unattached handlines, redefined as "buoy gear," and would likely continue affording positive economic benefits to current fishery participants. If any vessels are currently fishing with buoy gear utilizes more than 35 flotation devices, this alternative could limit effort, and there could be some unquantified adverse economic impacts. This alternative would also require that fishermen using this gear type affix gear monitoring equipment to each buoy to aid in recovery. NMFS anticipates that most swordfish handgear fishermen using unattached handlines likely already possess and utilize some or all of this gear monitoring equipment. If not, minimum compliance costs for the least expensive equipment (*e.g.*, reflective tape and spotlight) could be incurred. Given the change in definition of handlines in alternative I5(b) requiring them to be attached to a vessel, alternative H5 represents a positive economic opportunity for commercial swordfish handgear and directed swordfish limited access permit holders. However, this alternative could result in perceived negative social impacts by recreational fishermen by continuing to allow commercial swordfishing in areas closed to HMS pelagic longline gear.

Alternative H6 is similar to H5, except under alternative H6, each buoy would be allowed to have no more than 15 hooks or gangions attached. This alternative could provide additional positive economic impacts stemming from the ability to increase the number of hooks attached to each buoy gear. Additionally, this alternative would allow vessels in the swordfish handgear fishery to possess and deploy up to 50 flotation devices.

Alternative H7, which would clarify the allowance of hand-held cockpit gears used at boat side for subduing HMS, would likely have positive economic impacts by reducing confusion over the allowance of these gears and increased retention rates for those fishermen who target large HMS and wish to use these secondary gears. The use of these hand-held cockpit gears can be dangerous and lead to costs if injuries occur, but they would help subdue fish and are already being used.

6.4.3.4 Regulatory Housekeeping

Eleven regulatory housekeeping issues were addressed with several alternatives for each issue. NMFS considered five different alternatives for the first issue, clarifying the definitions of pelagic and bottom longlines. Alternative I1(a), the No Action alternative, would likely produce the fewest additional adverse economic impacts on fishing vessels, though it could result in compliance issues and longer periods of interruption during compliance inspections at sea.

Alternative I1(b), would establish additional restrictions on longline gear in HMS time/area closures by requiring that BLL vessels in closed areas possess no more than 70 commercial fishing floats, and that PLL vessels in BLL closed areas possess at least 71 commercial fishing floats, would not be expected to produce adverse economic impacts. This alternative would potentially impact less than 5 percent of all PLL sets and less than 10 percent of all BLL sets. BLL fishermen would not need to buy more floats to comply with this alternative. However, PLL fishermen who regularly use short lines may need to buy more floats to ensure that they have more than 71 floats. This alternative would also likely improve inspections at sea.

Alternative I1(c), the preferred alternative, would differentiate between PLL and BLL gear based upon the species composition of the catch onboard or landed. A five percent incidental allowance of "indicator" species is higher than the average across five years, and therefore this alternative would not be expected to produce adverse economic impacts. This alternative, however, could adversely impact those longline vessels that regularly target both demersal and pelagic species on the same trip and that fish in closed areas. The time required to conduct an enforcement inspection at sea under this alternative could create an adverse economic impact in terms of lost opportunity cost, and possibly reduce net revenues associated with re-icing the fish and reduced quality of the catch, but it could also have a positive economic impact if these inspections are quicker than under the No Action alternative.

Alternative I1(d), which would require time/depth recorders on all HMS longlines, would result in direct economic costs associated with the purchase of these devices. It is estimated that equipment costs per vessel could be approximately $1,400 to $6,500, and there could be costs associated with a loss of efficiency due to attaching the devices to longlines, and downloading and recording the information. Some positive economic benefits could be realized if this alternative would minimize the disruption of enforcement inspections.

Alternative I1(e) would implement HMS longline time/area closures for both pelagic and bottom longline HMS permitted vessels. This alternative is expected to produce the most significant negative economic impacts, primarily on HMS-permitted BLL vessels that would be prohibited from fishing year-round in the DeSoto Canyon and Florida East Coast closed areas, in the Charleston Bump closed area from February 1 through April 30 each year, and in the Northeastern U.S. closed area from June 1 through June 30 each year.

NMFS considered four alternatives for enhancing shark identification. Alternative I2(a), which retains the current regulations, is not expected to result in economic impacts in the short-term. In the long-term, data issues resulting from poor shark identification could result in less than optimal fishery management.

Under alternative I2(b), fishermen could experience, in the short-term, some adverse economic impacts associated with keeping the second dorsal and anal fins on the shark. In the long-term, the improved quota monitoring and stock assessment data as a result of this alternative could result in a larger quota, and therefore larger net revenues for both fishermen and dealers. Alternative I2(c) is similar, but would allow fishermen to remove all the fins of lemon

and nurse sharks while at sea. Since so few lemon and nurse sharks are landed, NMFS believes that any economic benefits gained would be marginal.

Alternative I2(d), which would require all fins to remain on all sharks through landing, would have the largest economic impact of any of the shark identification alternatives. It is unlikely that the ex-vessel price of the fins that were packed in ice with the rest of the shark would be as high as the fins that had begun to dry if they were removed. Additionally, if the shark cannot be packed in ice properly due to maintaining the fin on the shark, the quality of the meat, and therefore its value, could also decrease.

NMFS considered three alternatives for addressing compliance with HMS retention limits. Under alternative I3(a), the No Action alternative, individual vessel owner/operators, and/or dealers may experience some positive economic benefits from the sale or purchase of HMS exceeding the commercial retention limits; however, there would be economic impacts from noncompliance with retention limits. Under I3(b) and I3(c) it would be illegal to purchase or sell any HMS from an individual vessel in excess of the retention limits, and therefore there could be slightly less revenue by vessels exceeding the retention limits. However, there would be slightly positive economic impacts with enhanced compliance with the retention limits, but there may be increased dealer administrative/information costs with insuring that they are not purchasing more than the commercial retention limits from a particular vessel.

NMFS considered two alternatives for defining the Florida East Coast closed area. The No Action alternative I4(a) would not result in any additional economic impacts. Alternative I4(b) would extend the closed area and could potentially reduce HMS catches and associated landings revenues by a small amount. This is not expected to be significant given the limited number of vessels that fished in that area in recent years.

NMFS considered five alternatives for revising the definition of handline. Alternative I5(a), which would retain the current definition, would not add any additional economic impacts. Alternative I5(b), which would amend the definition of "handline" by requiring that they remain attached to all vessels, would potentially impact a large portion of HMS permit holders and result in negative economic impacts by potentially reducing operational efficiency. However, this practice does not appear to be widespread and is likely limited to recreational swordfish activity. Alternative I5(c), which would require handlines remain attached to all vessel when fishing recreationally, could impact recreational fishing activity but there is currently no data indicating how many recreational vessels are fishing this way.

Alternative I6(a) and I6(b) focus on clarifying the recreational nature of the billfish fishery. Neither the No Action alternative (I6(a)) nor the alternative to prohibit the possession of taking of billfish by commercial permit holders (I6(b)) would be expected to have any adverse economic impacts since Atlantic billfish cannot be bought or sold by commercial vessels. There could be some positive economic impacts to the recreational fishing community if alternative I6(b) results in enhanced fishing opportunities for recreational fishermen.

NMFS considered three alternatives for BFT dealer reporting. Alternative I7(a), the No Action alternative, would not change the current economic impacts of reporting, but it could

continue to impose time costs associated with the entry of similar data on several different forms for reporting. Alternative I7(b) would allow the option to do one-stop data entry on the Internet, and thus provide flexibility that could reduce economic impacts associated with reporting. Alternative I7(c) would require most dealers to use electronic reporting, which might benefit some, but could also impose additional Internet access costs and training costs in learning the new system.

Alternatives to address no fishing and cost-earnings reporting forms (I8(a-c)) clarify the current practices in submitting these forms and are not likely to increase economic costs associated with these activities. However, the clarification of the timeframes involved for submitting reports may result in fewer permit renewal delays.

Maintaining the current non-tournament recreational landings reporting requirements for North Atlantic swordfish and Atlantic billfish under alternative I9(a) would not result in any significant economic impacts. Alternative I9(b), which would require vessel owners to report non-tournament recreational landing, would not cause any significant adverse economic impacts since 95 percent of past reports were reported by vessel owners. Linking non-reporting to permit sanctions would enhance enforcement and compliance that is expected to improve recreational data collection. In addition, the overall number of calls needed to report landings might be reduced if operators report landings for several anglers' landings.

Under the No Action alternative I10(a), status quo regulatory text would remain unchanged and the applicability of quota carry-over provisions to this set-aside quota would not be clarified. Under this alternative, unharvested quota from the set-aside would be rolled-over to subsequent fishing years, and thus would provide a potential positive economic impact. There may be a perceived negative economic impact among other fishery sectors if they were to close after achieving their allocated quota and were unable to access available quota, via in-season transfers, from the NED set-aside. Alternative I10(b) would amend the regulatory text to clarify that carry-over provisions apply to this specific set-aside and therefore would also allow unharvested quota from the set-aside to be rolled-over to subsequent fishing years, and thus provide a potential positive economic impact. Again, there may be a perceived negative economic impact among other fishery sectors if they are closed after achieving their allocated quota and are unable to access available quota, via in-season transfers, from the NED set-aside. Alternative I10(c) would conduct additional discussions at ICCAT regarding the long-term implications of allowing unused BFT quota from the previous year being added to the subsequent year's allocation. Depending on the results these discussions the regulations and operation procedures may need to be further amended in the future. In the interim, NMFS would maintain the current regulatory text, but would amend the practice of allowing under/overharvest of this set-aside allocation to be rolled into, or deducted from, the subsequent fishing year's set-aside allocation. Therefore, regardless of the amount of the set-aside harvested or unused in a given year, the balance would return to 25 mt (ww) at the start of each fishing year. This alternative would be expected to have some negative economic impacts as it would not allow for the potential economic gain attributed to quota being carried forward from the preceding fishing year.

Alternatives I11(a-b) examine whether or not recreational vessels with Federal permits should be required to abide by Federal regulations regardless of where they are fishing, unless a state has more restrictive regulations. If Federal regulations always apply unless state regulations are more restrictive, as in alternative I11(b), there could be some decreases in recreational satisfaction as a result of potentially increasing regulatory requirements to the Federal standards.

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CHAPTER 7 TABLE OF CONTENTS

Chapter 7 Table of Contents **7-i**
Chapter 7 List of Tables **7-i**
7.0 Regulatory Impact Review **7-1**
7.1 Description of the Management Objectives 7-1
7.2 Description of the Fishery 7-1
7.3 Statement of the Problem 7-1
7.4 Description of Each Alternative 7-1
7.5 Economic Analysis of Expected Effects of Each Alternative Relative to the Baseline 7-1
7.6 Conclusion 7-3

CHAPTER 7 LIST OF TABLES

Table 7.1 Summary of the Net Economic Benefits and Costs of Alternatives 7-4

7.0 REGULATORY IMPACT REVIEW

The Regulatory Impact Review (RIR) is conducted to comply with Executive Order 12866 (E.O. 12866) and provides analyses of the economic benefits and costs of each alternative to the nation and the fishery as a whole. Certain elements required in an RIR are also required as part of an environmental impact statement (EIS). Thus, this section should be considered only part of the RIR, the rest of the RIR can be found throughout this document.

7.1 Description of the Management Objectives

Please see Chapter 1 for a description of the management objectives associated with these management actions.

7.2 Description of the Fishery

Please see Chapter 3 for a description of the fisheries that could be affected by these management actions.

7.3 Statement of the Problem

Please see Chapter 1 for a description of the problem and need for these management actions.

7.4 Description of Each Alternative

Please see Chapter 2 for a summary of each alternative and Chapter 4 for a complete description of each alternative and its expected ecological, social, and economic impacts. Chapters 6 and 8 provide additional information related to the economic impacts of the alternatives.

7.5 Economic Analysis of Expected Effects of Each Alternative Relative to the Baseline

In the preceding chapters, NMFS has analyzed the impacts of the alternatives for nine major issues. Table 7.1 indicates the possible net economic benefits and costs of each alternative for the nine major issues. It is likely that the implementation of the preferred alternatives could incur moderate economic costs. However, the benefits of these actions, in particular preventing closures of the fishery due to exceedance of authorized take of protected species and BiOp requirements, improving data for shark stock assessments, rebuilding HMS, maintaining compliance with ICCAT, increasing the flexibility of BFT management, adding more authorized fishing gears, and addressing a wide variety of regulatory issues, will likely outweigh the costs.

Several alternatives were considered for workshops for protected species handling and release and species identification. The preferred alternatives that would require owners and operators of vessels that use longline and gillnet gear to attend workshops and renew their certifications every three years addresses the BiOp recommendations while avoiding excessive costs associated with certifying crew (A4) or shorter renewal cycles. In addition, the preferred alternative for species identification workshops, alternative A9, would target training to shark

dealers who are likely to face the greatest challenges in proper species identification since they are inspecting landed carcasses, rather than whole specimens. In combination with alternative I2(b), requiring that the second dorsal fin and anal fin remain on all sharks through landking, there could be significant improvements in proper shark species identification and therefore reporting.

The examination of additional time/area closures revealed that is difficult to target closures to prevent impacts on a particular species without impacting other species that are overfished, experiencing overfishing, threatened or endangered. Redistribution of effort, as a result of a closure alternative targeting a particular species interaction, often resulted in the potential for significant impacts on other species that are overfished, experiencing overfishing, threatened or endangered. The potential redistribution of effort with the analyzed time/area closure alternatives often revealed that the economic impact of time/area closures is very dependent on the extent of effort redistribution. Criteria for regulatory framework adjustments for closures, one of the preferred alternatives for this issue, would have minimal economic impacts and would likely lead to enhanced future fishery management planning. In addition, the implementation of complementary HMS management measures in the Madison-Swanson and Steamboats Lumps Marine Reserves (B4), the other preferred alternative for this issue, would result in minimal economic costs on commercial revenues and recreational activities.

The analysis of the northern albacore tuna alternatives reveals that economic costs could occur by unilateral restrictions on effort, however, the ecological and economic benefits from implementing management measures now are likely to be negligible without coordinated international management of this highly migratory species. Pursuing an international rebuilding plan at ICCAT would likely have the best economic return for the potential costs involved in managing northern albacore.

In a similar vein, the management of finetooth sharks within just the HMS fishery would not produce enough ecological benefits to warrant the potential high costs on a small number of HMS permit holders. The preferred alternative would lead to identification of mortality of finetooth sharks in other fisheries that should reveal lower marginal cost opportunities to reduce finetooth shark mortality and thus maximize net benefits.

Incremental management measures, such as those under alternative E3 which limits all HMS permitted vessels participating in Atlantic HMS tournaments to using only non-offset circle hooks when using natural baits or natural bait/artificial lure combinations, would achieve many of their ecological benefits with the minimum amount of economic impacts. Requiring HMS permitted tournament participants to adopt circle hooks would likely encourage other recreational billfish fishery participants to also adopt circle hooks and result in a low regulatory cost and high ecological benefit outcome. Alternative E6 also would utilize an incremental approach to achieve compliance with ICCAT catch/landing limits while having the low impact on billfish tournaments and billfish recreational anglers.

The alternatives considered for bluefin tuna management focus on enhancing regulatory flexibility to address a constantly changing and dynamic resource. NMFS expects that maintaining flexibility and consistency should allow businesses to plan and should maximize the

net benefits for this fishery. The preferred alternatives would allow for future adjustments to take place via regulatory framework actions (F3), formalize a winter fishery for BFT (F3(c)), clarify procedures for calculating school size-class BFT subquota allocations, streamline the annual BFT specification and associated seasonal management measures process (F6), and establish a quota carryover process that would allow for the reallocation of tonnage that exceeds the cap to the Reserve or to another domestic quota category that could result in economic benefits by increasing total allowable catch for those quota categories (F8).

Several regulatory issues have been addressed. The potential shift from a "fishing year" to a calendar year to manage the HMS fishery would impact several of the regulatory alternatives being considered. The largest impact of this potential shift would likely be on billfish fishery participants, however, the benefits of a consistent and easily understood management timeframe would likely have net benefits to the businesses associated with the fishery in the long term. Impacts would only occur if thresholds for implementation of in-season management action are achieved. Otherwise, no impacts would likely occur.

Authorizing recreational Atlantic BAYS spearfishing would also likely enhance the HMS recreational fishery by introducing a new dedicated user group into the Atlantic BAYS recreational fishing community. The benefits of this alternative to the recreational speargun fishing community and CHB sector would likely exceed any associated costs. In general, providing the flexibility to use various technologies allows opportunities to find greater efficiencies. This would likely also be the case with the buoy gear and hand-held cockpit gear alternatives. The buoy gear preferred alternative (H5) and the allowance of hand-held cockpit gears (H7) will continue to afford positive economic benefits to current fishing participants.

Other regulatory issues being considered address a variety of definitional issues and clarifications that are not likely to have much of an overall impact on net benefits and costs. The details of those regulatory adjustments are included in the table below.

7.6 Conclusion

Under E.O. 12866, a regulation is a "significant regulatory action" if it is likely to: (1) have an annual effect on the economy of $100 million or more or adversely affect in a material way the economy, a sector of the economy, productivity, competition, jobs, the environment, public health or safety, or state, local, or tribal governments or communities; (2) create a serious inconsistency or otherwise interfere with an action taken or planned by another agency; 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. The preferred alternatives described in this document do not meet the above criteria. Therefore, under E.O. 12866, the preferred alternatives described in this document have been determined to be not significant for the purposes of E.O. 12866. A summary of the expected net economic benefits and costs of each alternative, which are based on supporting text in Chapters 4 and 6, can be found in Table 7.1.

Table 7.1 Summary of the Net Economic Benefits and Costs of Alternatives.

Alternative	Net Economic Benefits	Net Economic Costs
Workshops		
A1 Voluntary protected species safe handling, release, and identification workshops for HMS longline fishermen (No Action)	Minimal	Short-term cost of traveling for fishermen who attend voluntary workshops. In the long-term, if targets are not met, could result in closures and significant economic impacts to pelagic and bottom longline fisheries. Cost for 12 workshops estimated $42,000 plus materials per year for the Agency.
A2 *Mandatory protected species safe handling, release, and identification workshops and certification for all HMS pelagic or bottom longline vessel owners –* *Preferred Alternative*	Long-term benefit from preventing the fishery from being closed and, if fishery is perceived as being environmentally responsible, from increasing ex-vessel prices.	Travel costs for approximately 549 owners and an estimated $154,269 - $258,048 in annual opportunity costs. Costs associated with recertification (See A6). Cost for 12 workshops estimated $42,000 plus materials per year for the Agency.
A3 *Mandatory protected species safe handling, release, and identification workshops and certification for vessel operators actively participating in HMS pelagic and bottom longline fisheries – Preferred Alternative*	Long-term benefit from preventing the fishery from being closed and, if fishery is perceived as being environmentally responsible, from increasing ex-vessel prices.	Travel costs for approximately 1,098 captains and an estimated $163,602 - $378,810 in annual opportunity costs. Costs associated with recertification (See A6). Cost for 23 workshops estimated $80,500 plus materials per year for the Agency.
A4 Mandatory protected species safe handling, release, and identification workshops and certification for all HMS longline vessel owners, operators, and crew	Long-term benefit from preventing the fishery from being closed and, if fishery is perceived as being environmentally responsible, from increasing ex-vessel prices.	Travel costs for 3,843 participants and an estimated $515,511 - $876,222 in annual opportunity costs. Costs associated with recertification (See A6). Cost for 81 workshops estimated $283,500 plus materials per year for the Agency.
A5 *Mandatory protected species safe handling, release, and identification workshops and certification for shark gillnet vessel owners and operators – Preferred Alternative*	Long-term benefit from preventing the fishery from being closed and, if fishery is perceived as being environmentally responsible, from increasing ex-vessel prices.	Travel and the opportunity cost for approximately 20 participants. Costs associated with recertification (See A6). Cost for 3 workshops estimated $10,500 plus materials per year for the Agency.

Alternative	Net Economic Benefits	Net Economic Costs
A6 *Protected species safe handling, release, and identification certification renewal every 3-years – Preferred Alternative*	Long-term benefit from preventing the fishery from being closed and, if fishery is perceived as being environmentally responsible, from increasing ex-vessel prices.	Costs associated with renewing certification. Minimum cost for workshops estimated $42,000 plus materials per year for the Agency.
A7 No HMS identification workshops (No Action)	No travel costs. If enough fishermen attend, then the LCS fishery could rebuild faster and quotas might be increased.	Inaccuracies in data could result in longer rebuilding timeframes and lower quotas for the fishery.
A8 Voluntary HMS identification workshops for dealers, all commercial vessel owners and operators, and recreational fishermen	Minimal. If enough fishermen attend, then the LCS fishery could rebuild faster and quotas might be increased.	Cost of travel for fishermen who attend voluntary workshops. Cost for workshops estimated $25,200 plus materials per year for the Agency.
A9 *Mandatory shark identification workshops for all shark dealers – Preferred Alternative*	Long-term the LCS fishery could rebuild as a result of improved information. The LCS quota could then be increased and result in higher benefits.	Travel and the opportunity cost for approximately 336 participants. Costs associated with recertification (See A16). Cost for 3 workshops estimated $25,200 per year for the Agency.
A10 Mandatory HMS identification workshops for all swordfish, shark, and/or tuna dealers	Long-term the HMS fisheries could rebuild as a result of improved information. Those HMS fisheries that are quota limited could then have quotas increased, resulting in higher benefits.	Travel and the opportunity cost for approximately 649 participants. Costs associated with recertification (See A16). Cost for 24 workshops estimated $50,400 per year for the Agency.
A11 Mandatory HMS identification workshops for all commercial longline vessel owners	Long-term the HMS fisheries could rebuild as a result of improved information. Those HMS fisheries that are quota limited could then have quotas increased, resulting in higher benefits.	Travel costs for approximately 549 owners and an estimated $154,269 - $245,952 in annual opportunity costs. Costs associated with recertification (See A16). Cost for 19 workshops estimated $39,900 per year for the Agency.
A12 Mandatory HMS identification workshops for all commercial longline vessel operators	Long-term the HMS fisheries could rebuild as a result of improved information. Those HMS fisheries that are quota limited could then have quotas increased, resulting in higher benefits	Travel costs for approximately 1,098 operators and an estimated $163,602 - $378,810 in annual opportunity costs. Cost associated with recertification (See A16). Cost for 37 workshops estimated $77,700 per year for the Agency.
A13 Mandatory HMS identification workshops for all commercial vessel owners (longline, CHB, General category, and handgear/harpoon)	Long-term the HMS fisheries could rebuild as a result of improved information. Those HMS fisheries that are quota limited could then have quotas increased, resulting in higher benefits	Travel costs for approximately 9,636 vessel owners and an estimated $4,085,664 in annual opportunity costs. Costs associated with recertification (See A16). Cost for 322 workshops estimated $676,200 per year for the Agency.

Alternative	Net Economic Benefits	Net Economic Costs
A14 Mandatory HMS identification workshops for all commercial vessel operators (longline, CHB, General category, and handgear/harpoon)	Long-term the HMS fisheries could rebuild as a result of improved information. Those HMS fisheries that are quota limited could then have quotas increased, resulting in higher benefits	Travel costs for approximately 10,374 vessel operators and an estimated $1,597,596 in annual opportunity costs. Cost associated with recertification (See A16). Costs for 346 workshops estimated $726,600 per year for the Agency.
A15 Mandatory HMS identification workshops for all HMS Angling permit holders	Long-term the HMS fisheries could rebuild as a result of improved information. Those HMS fisheries that are quota limited could then have quotas increased, resulting in higher benefits	Travel and the opportunity costs for approximately 25,238 participants. Costs associated with recertification (See A16). Cost for workshops estimated $1,768,200 per year for the Agency.
A16 *HMS identification certification renewal every 3-years – Preferred Alternative*	Long-term the LCS fishery could rebuild as a result of improved information. The LCS quota could then be increased and result in higher benefits.	Cost associated with renewing certification. Minimum estimated cost for workshops estimated $25,200 per year for the Agency.
Time/Area Closures		
B1 Maintain existing closures; no new closures (No Action)	Current closures have reduced bycatch and should be aiding in rebuilding. In long-term, stock may rebuild leading to greater quotas.	Continued negative impacts on pelagic longline industry from existing closed areas, including loss of participants and supply infrastructure base.
B2(a) Prohibit the use of pelagic longline gear in HMS fisheries in the central portion of the Gulf of Mexico from May through November (7 months)r	There could be benefits to protected species, and thus increase total existence value of these species. Additional reduction in bycatch of HMS and other fisheries should aid in rebuilding of stocks in general. If fishery is perceived as being environmentally responsible then additional benefits could be realized.	Estimated decrease in annual revenues potentially range from (-) $5.1 million to (+)$1.2 million.
B2(b) Prohibit the use of pelagic longline gear in HMS fisheries in an area of the Northeast during the month of June (1 month)	There could be benefits to protected species, and thus increase total existence value of these species. Additional reduction in bycatch of HMS and other fisheries should aid in rebuilding. If fishery is perceived as being environmentally responsible then additional benefits could be realized.	Estimated decrease in annual revenues potentially range from (-) $307,077 to (-) $74,608.
B2(c) Prohibit the use of pelagic longline gear in HMS fisheries in the Gulf of Mexico from April through June (3 months)	There could be benefits to protected species, and thus increase total existence value of these species. Additional reduction in bycatch of HMS and other fisheries should aid in rebuilding. If fishery is perceived as being environmentally responsible then additional benefits could be realized.	Estimated decrease in annual revenues potentially range from (-) $3.2million to (+) $1.6 million.

Alternative	Net Economic Benefits	Net Economic Costs
B2(d) Prohibit the use of pelagic longline gear in HMS fisheries in the Gulf of Mexico west of 86 degrees west longitude year-round	There could be benefits to protected species, and thus increase total existence value of these species. Additional reduction in bycatch of HMS and other fisheries should aid in rebuilding. If fishery is perceived as being environmentally responsible then additional benefits could be realized.	Estimated decrease in annual revenues potentially range from (-) $10.9 million to (+) $6.2 million.
B2(e) Prohibit the use of pelagic longline gear in HMS fisheries in an area of the Northeast to reduce sea turtle interactions	There could be benefits to protected species, and thus increase total existence value of these species. Additional reduction in bycatch of HMS and other fisheries should aid in rebuilding. If fishery is perceived as being environmentally responsible then additional benefits could be realized.	Estimated decrease in annual revenues potentially range from (-) $3.3 million to (-) $841,948.
B3(a) Modify the existing Northeastern U.S. time/area closure to allow the use of pelagic longline gear in areas west of 72º 47' west longitude during the month of June	Estimated increase in annual revenues of $241,025.	Perceptions of gear conflict may result in loss of recreational fishery income in infrastructure base.
B3(b) Modify the Northeastern U.S. closure	Estimated increase in annual revenues of $565.	Perceptions of gear conflict may result in loss of recreational fishery income in infrastructure base.
B4 *Implement complementary HMS management measures in Madison-Swanson and Steamboat Lumps Marine Reserves year-round – Preferred Alternative*	There could be benefits to protected species, and thus increase total existence value of these species. May result in increased revenue for gag grouper fishery.	Minimal impact on commercial revenues and recreational activity.
B5 *Establish criteria to consider when implementing new time/area closures or making modifications to existing time/area closures – Preferred Alternative*	Variable	Variable
B6 Prohibit the use of bottom longline gear in an area southwest of Key West to protect endangered smalltooth sawfish	Staying below smalltooth sawfish ITS may keep fishery open. If fishery is perceived as being environmentally responsible then additional benefits could be realized.	Minimal impacts on bottom longline fleet.

Alternative	Net Economic Benefits	Net Economic Costs
B7 Prohibit the use of pelagic longline gear in HMS fisheries in all areas	There could be benefits to protected species, and thus increase total existence value of these species.	Minimum loss of revenue of $26.5 million in revenue annually. May shift fishing effort to other countries that are not as environmentally conscious regarding protected species, and thus increase ecological impacts.
Northern Albacore Tuna		
C1 Maintain compliance with the current ICCAT recommendation (No Action)	None	None
C2 Unilateral proportional reduction of United States northern albacore fishing mortality	If the fishery is rebuilt, there could be an increase in ecological benefits and long-term increase in commercial and recreational benefits.	Possible reduction in income from northern albacore tuna depending on restrictions needed per rebuilding plan.
C3 *Establish the foundation with ICCAT for developing an international rebuilding program – Preferred Alternative*	If the fishery is rebuilt, there could be an increase in ecological benefits and long-term increase in commercial and recreational benefits.	None
Finetooth Sharks		
D1 Maintain current regulations for recreational and commercial fisheries (No Action)	In short-term, business arrangements would remain the same. In long-term, none.	In the long-term, there could be a decrease in finetooth shark population and result in a decrease in commercial revenues from finetooth shark harvest.
D2 Implement commercial management measures to reduce fishing mortality of finetooth sharks	None	Negative impacts on limited number of gillnet vessels. Could also increase discards and increase ecological impacts.
D3 Implement recreational management measures to reduce fishing mortality of finetooth sharks	None	Potential negative economic impacts to shark recreational fishery and related industries.
D4 *Identify sources of finetooth shark fishing mortality to target appropriate management actions – Preferred Alternative*	Long-term, the alternative would have positive ecological impacts by addressing finetooth mortality in HMS and other fisheries and positive economic impacts if the fishery is sustained.	If action as result of information collection does not happen in time to prevent the stock from becoming overfished, then the alternative could reduce quotas and cause more restrictive management measures to be implemented.
Atlantic Billfish		

Alternative	Net Economic Benefits	Net Economic Costs
E1 Retain existing regulations regarding recreational billfish fishing, including permit requirements, minimum size limits, prohibited species, landing form, allowable gear, and reporting requirements (No Action)	None	Continued overfishing could potentially lead to ESA listing and the closure of the recreational fishery.
E2 Effective January 1, 2007, limit all participants in Atlantic HMS recreational fisheries to using only non-offset circle hooks when using natural baits or natural bait/artificial lure combinations	Long-term benefits to angler consumer surplus from rebuilding efforts. Circle hooks cost less so there is some minor benefit associated with this alternative.	Temporary decrease in angler consumer surplus from adjustment to using circle hooks.
E3 *Effective January 1, 2007, limit all HMS permitted vessels participating in Atlantic billfish tournaments to deploying only non-offset circle hooks* *when using natural baits or natural bait/artificial lure combinations – Preferred Alternative*	Long-term benefits to angler consumer surplus from rebuilding efforts. Circle hooks cost less so there is some minor benefit associated with this alternative.	Temporary decrease in angler consumer surplus from adjustment to using circle hooks. Unlikely potential decrease in tournament participation.
E4(a) Increase the minimum size limit for Atlantic white marlin to a specific size between 68 and 71'' LJFL	Long-term potential benefits as Atlantic white marlin stocks rebuild and recreational encounters with white marlin increase.	Uncertain impact on angler participation rates.
E4(b) Increase the minimum size limit for Atlantic blue marlin to a specific size between 103 and 106'' LJFL	Long-term potential benefits as Atlantic blue marlin stocks rebuild and recreational encounters with blue marlin increase.	Uncertain impact on angler participation rates.
E5 Implement a recreational bag limit of one Atlantic billfish per vessel per trip	Long-term potential benefits as stocks rebuild and recreational encounters with marlin increase.	Minor reductions in billfish angler consumer surplus.

Alternative	Net Economic Benefits	Net Economic Costs
E6 *Effective January 1, 2007, implement ICCAT Recommendations on Recreational Marlin Landings Limits – Preferred Alternative*	Long-term potential benefits as stocks rebuild and recreational encounters with marlin increase.	None to moderate adverse impacts to anglers depending on whether thresholds for action are met. Potential reduction in CHB trips by 0.4 to 24.2 percent (from the point in the management cycle when catch and release only fishing may have to be implemented). Potential loss of $1.3 to $5.5 million worth of tournament activity annually under a worst case scenario. Potential impacts on shoreside businesses.
E7 Effective January 1, 2007, - December 31, 2011, allow only catch and release fishing for Atlantic white marlin	Long-term potential benefits as stocks rebuild and recreational encounters with marlin increase.	Potential decrease in angler consumer surplus. Potential decrease in CHB revenue of $49,491 to $1.3 million annually. Potential negative economic impact to tournaments from $1.4 to $5.5 million annually.
E8 Effective January 1, 2007, - December 31, 2011, allow only catch and release fishing for Atlantic blue marlin	Long-term potential benefits as stocks rebuild and recreational encounters with marlin increase.	Potential decrease in CHB revenue of $0.5 to $3.0 million annually. Potential negative economic impacts to tournaments from $13.8 to $19.3 million annually. Angler consumer surplus may decrease.
Bluefin Tuna Quota Management		
F1 Maintain the time-periods, subquota allocations, and geographic set asides for the General and Angling categories as established in the 1999 FMP (No Action)	None	Economic impacts to fishermen, dealers, and support industries associated with timeliness of required FMP amendment.
F2 Establish General category time-periods, subquotas, and geographic set asides annually via framework actions	Framework actions would result in overall positive economic impacts to the General category by allow fishing in locations and times when BFT are most available.	Uncertainty regarding General category quota allocation, from one year to the next, could increase difficulty of business planning. Potential short-term decreases in quota available.

Alternative	Net Economic Benefits	Net Economic Costs
F3 *Amend the management procedures regarding General category time-periods, subquota, as well as geographic set-asides to allow for future adjustments to take place via a regulatory framework action – Preferred Alternative*	Framework actions would result in overall positive economic impacts to the General category by allowing fishing in locations and times when BFT are most available. Minor benefits to the South Atlantic region.	Minor impacts to New England General category due to reallocation of time period sub-quotas from the no action alternative.
F3(a) Establish monthly General category time-periods and subquotas (June-Jan, 12.5% each)	By formalizing the winter fishery, there would be positive economic impacts for General category participants in the South Atlantic region.	Minor impacts to New England General category. If catch rates tend to be high, these quotas could be harvested rapidly and could lead to derby style fisheries on the first of each month.
F3(b) Revise General category time-periods and subquotas to allow for a formalized winter fishery (June-Aug, 54%; Sept, 26.5%; Oct-Nov, 9%; Dec, 5.2%; and Jan, 5.3%)	By formalizing the winter fishery, there would be positive economic impacts for General category participants in the South Atlantic region.	Minor impacts to New England General category. Minor impacts to those who would pursue BFT in the summer months as other time-period subquotas would be reduced.
F3(c) *Revise General category time-periods and subquotas to allow for a formalized winter fishery (June-Aug, 50%; Sept, 26.5%; Oct-Nov, 13%; Dec, 5.2% and Jan, 5.3%) – Preferred Alternative*	By formalizing the winter fishery, there would be positive economic impacts for General category participants in the South Atlantic region.	Minor impacts to New England General category. Minor impacts to those who would pursue BFT in the summer months as other time-period subquotas would be reduced.
F3(d) Revise General category time-periods and subquotas to allow for a formalized winter fishery (June-Aug, 38.7%; Sept, 26.6%; Oct - Nov, 13%; Dec, 10.8%; and Jan, 10.9%)	Greater positive economic impacts to General category participants in the South Atlantic region	Would have increased negative economic impacts to those General category participants in northern areas.
F4 *Clarify the procedures for calculating the Angling category school size-class BFT subquota allocation and maintain the Angling category north/south dividing line – Preferred Alternative*	Minimal positive impacts by slightly increasing school size-class quota (2 mt).	Minimal

Alternative	Net Economic Benefits	Net Economic Costs
F5 Maintain the annual BFT specification process and the under/overharvest procedures within individual domestic quota categories and individual vessels in the Purse seine category (No Action)	None	None
F6 *Revise the annual BFT specification process to refer back to the supporting analytical documents of the consolidated HMS FMP and include seasonal management measures in annual framework actions – Preferred Alternative*	Minor positive economic impacts by allowing for better planning.	None
F7 Eliminate unharvested quota carryover provisions and return unharvested quota to the resource, while maintaining status quo overharvest provisions	None	Could result in derby-style fishing where vessels may operate in less than optimal conditions to harvest the quota before the season is closed. Could reduced fishing opportunities, income, and angler consumer surplus for the commercial and/or recreational fleet, as well as the businesses that support those BFT fisheries.
F8 *Establish an individual quota category carry-over limit of 100 percent of the baseline allocation (i.e., no more than the annual baseline allocation may be carried forward), except for the Reserve category, and authorize the transfer of quota exceeding the 100 percent limit to the Reserve or another domestic quota category, while maintaining status quo overharvest provisions – Preferred Alternative*	Reallocation of tonnage that exceeds the cap to the Reserve or to another domestic quota category could result in economic benefits by increasing total allowable catch for those quota categories.	Slight negative impacts as a result of limiting maximum amount of harvest available from carry forward for a category.
F9 Maintain inseason action procedures (No Action)	None	None

Alternative	Net Economic Benefits	Net Economic Costs
F10 *Revise and consolidate criteria considered prior to performing inseason and some annual BFT management actions – Preferred Alternative*	Consistent criteria for inseason actions could lead to positive economic benefits.	None
F11 Eliminate BFT inseason actions	Quota allocations and daily retention limits would remain stable and help facilitate planning.	Prevents maximum utilization of BFT quota over longest time period.
Timeframe for Annual Management of HMS Fisheries		
G1 Maintain the current fishing year for all HMS (No Action)	Minimal	Minimal
G2 *Shift the fishing year to January 1 – December 31 for all HMS – Preferred Alternative*	Would establish consistent timing between U.S. domestic and international management programs. Would improve international reporting and negotiations, and thus potentially improving international management of fisheries.	In conjunction with preferred Alt E6, could result in impacts to billfish tournaments (see E6 above), but this is unlikely.
G3 Shift the fishing year to June 1-May 31 for all HMS	None	Short-term negative economic impacts to shark wholesale and retail markets.
Authorized Gears		
H1 Maintain current authorized gears in Atlantic HMS fisheries (No Action)	Minimal, if any	Minimal, if any
H2 *Authorize speargun fishing gear as a permissible gear type in the recreational Atlantic BAYS tuna fishery - Preferred Alternative*	Positive economic impacts to recreational speargun fishermen and CHB sector.	Competition for fishing grounds may result in negative economic impacts for rod and reel fishermen.
H3 Authorize speargun fishing gear as a permissible gear type in the commercial tuna handgear and recreational tuna fisheries	Positive economic impacts to recreational speargun fishermen and CHB sector. Potential economic benefits for CHB and General category fishermen from the sale of commercially speared tunas.	Competition for fishing grounds and speargun fishing take under the BFT Angling and General categories may result in negative economic impacts for rod and reel fishermen.
H4 Authorize green-stick fishing gear for the commercial harvest of Atlantic BAYS tunas	Potentially higher landing rates and higher quality of meat landed using green-stick gear could provide positive economic impacts to commercial fishermen, as well as benefit fish houses, gear supply houses, and other associated business.	None

Alternative	Net Economic Benefits	Net Economic Costs
H5 *Authorize buoy gear as a permissible gear type in the commercial swordfish handgear fishery; limit vessels employing buoy gear to possessing and deploying no more than 35 floatation devices, with each individual gear having no more than two hooks or gangions attached - Preferred Alternative*	Positive economic benefits continued to be afforded to current fishery participants.	Negative economic impacts to vessels employing more than 35 free-floating buoyed handlines.
H6 Authorize buoy gear as a permissible gear type in the commercial swordfish handgear fishery; limit vessels employing buoy gear to possessing and deploying no more than 50 floatation devices, with each individual gear having no more than 15 hooks or gangions attached	Additional positive economic impacts from the ability to increase the number of hooks attached to each buoy gear.	None
H7 *Clarify the allowance of hand-held cockpit gears used at boat side for subduing HMS captured on authorized gears - Preferred Alternative*	Positive economic impacts by reducing confusion over the allowance of these gears.	None
Regulatory Housekeeping		
I1(a) Retain current definitions for PLL and BLL gear (No Action)	None	Could continue compliance issues and longer periods of interruption during compliance inspections at sea.
I1(b) Establish additional restrictions on longline gear in HMS time/area closures by specifying a maximum and minimum allowable number of commercial fishing floats to qualify as a BLL and PLL vessel, respectively	Could reduce periods of interruption during compliance inspections at sea.	More restrictive gear definitions could potentially impact approximately 5 percent of all PLL and 10 percent of BLL sets.

Alternative	Net Economic Benefits	Net Economic Costs
I1(c) *Differentiate between PLL and BLL gear based upon the species composition of the catch onboard or landed – Preferred Alternative*	Provides quantifiable method to determine fishing technique without requiring additional gear restrictions.	Could adversely impact longline vessels that regularly target both demersal and pelagic species on the same trip. Potentially longer enforcement inspections.
I1(d) Require time/depth recorders (TDRs) on all HMS longlines	Could minimize disruption of enforcement inspections.	Could costs vessels $1,400 to $6,500 in equipment costs, efficiency losses having the devices on the line, and labor costs associated with recording the information.
I1(e) Base HMS time/area closures on all longlines (PLL & BLL)	None	Primarily would impact BLL vessels by making some PLL time/area closures also apply to all longline vessels resulting in more significant economic impacts than other alternatives considered for this issue.
I2(a) Retain current regulations regarding shark landing requirements (No Action)	None	None
I2(b) *Require that the 2nd dorsal fin and the anal fin remain on all sharks through landing – Preferred Alternative*	Increased accuracy in identification could improve stock assessments and lead to faster rebuilding of shark stocks and therefore the fishery.	Potential small reduction in income from retaining second dorsal and anal fins on sharks.
I2(c) Require that the 2nd dorsal fin and the anal fin remain on all sharks through landing, except for lemon and nurse sharks	Increased accuracy in identification could improve stock assessments and lead to faster rebuilding.	Potential small reduction in revenues from retaining second dorsal and anal fins on sharks, except lemon and nurse shark fins can be removed.
I2(d) Require all fins remain on all sharks through landing	Increased accuracy in identification could improve stock assessments and lead to faster rebuilding of shark stocks and therefore the shark fishery.	Reduction in revenues from sale of removed shark fins. Value of shark meat could decrease if retaining fins causes packing problems.
I3(a) Retain current regulations regarding retention limits, with no new prohibitions (No Action)	None	Non-complying vessels may be landing and selling HMS in excess of the commercial retention limits, thus circumventing the conservation benefits derived from those limits.

Alternative	Net Economic Benefits	Net Economic Costs
I3(b) *Add new prohibition at § 635.71(a)(48) making it illegal for any person to, "Purchase any HMS that was offloaded from an individual vessel in excess of the retention limits specified in §§ 635.23 and 635.24" – Preferred Alternative*	Increased compliance could lead to faster rebuilding of HMS stocks.	Increase dealer administrative/information costs with insuring that they are not purchasing more than the commercial daily retention limits from a particular vessel.
I3(c) *Add new prohibition at § 635.71(a)(49) making it illegal for any person to, "Sell any HMS that was offloaded from an individual vessel in excess of the retention limits specified in §§ 635.23 and 635.24" – Preferred Alternative*	Increased compliance could lead to faster rebuilding of HMS stocks.	None
I4(a) Retain current coordinates for the East Florida Coast closed area (No Action)	None	None
I4(b) *Amend the second coordinate of the East Florida Coast closed area to 28° 17' 10" N. lat., 79° 11' 24" W. long., so that it corresponds with the EEZ – Preferred Alternative*	None	Minor impact on landings revenue.
I5(a) Retain the current definition of "handline" at § 635.2 (No Action)	None	None
I5(b) *Amend the definition of "handline" at § 635.2 by requiring that they be attached to, or in contact with, all vessels – Preferred Alternative*	Decreased opportunity to lose gear may lead to ecological benefits.	Could impact large portion of HMS permit holders. Potentially reduce operational efficiency.

Alternative	Net Economic Benefits	Net Economic Costs
I5(c) Require that handlines remain attached to all vessels when fishing recreationally and allow unattached handlines when fishing commercially	None	Could impact recreational anglers by reducing operational efficiency.
I6(a) Retain current regulations regarding the possession of Atlantic billfish (No Action)	None	None
I6(b) *Prohibit vessels issued HMS commercial permits and operating outside of a tournament from possessing, retaining, or taking Atlantic billfish from the management unit – Preferred Alternative*	Minor potential enhancement of billfish recreational fishing.	None
I7(a) Retain the current regulations regarding BFT dealer reporting (No Action)	None	Could continue extra time costs of entering similar data on multiple forms.
I7(b) *Amend the HMS regulations to provide an option for Atlantic tunas dealers to submit required BFT reports using the Internet – Preferred Alternative*	Could increase data entry efficiency.	None
I7(c) Amend the HMS BFT dealer reporting regulations to require that Atlantic tunas dealers submit BFT reports electronically, with specific exceptions	Could increase data entry efficiency.	Could result in additional Internet access costs and training costs for some dealers.
I8(a) Maintain the existing regulations regarding submission of logbooks (No Action)	None	None

Alternative	Net Economic Benefits	Net Economic Costs
I8(b) *Require submission of "No Fishing" reporting forms for selected vessels if no fishing trips occurred during the preceding month, postmarked no later than seven days after the end of the month – Preferred Alternative*	Potentially decreases permit renewal delays and their associated costs.	None
I8(c) *Require submission of the trip "Cost-Earnings" reporting form for selected vessels 30 days after a trip and the annual "Cost-Earning" report form by January 31 of each year – Preferred Alternative*	Potentially decreases permit renewal delays and their associated costs.	None
I9(a) Retain existing regulations at § 635.5(c)(2) requiring anglers to report non-tournament recreational landings of North Atlantic swordfish and Atlantic billfish (No Action)	None	Would continue inconsistency with some other HMS recreational reporting requirements. Anglers on CHB vessels may be unaware of reporting requirements.
I9(b) *Require vessel owners(or their designees) to report non-tournament recreational landings of North Atlantic swordfish and Atlantic billfish – Preferred Alternative*	Minor – could reduce number of overall calls for reporting.	Minor - almost all owners (or designees) currently report.
I10(a) Retain the current regulations specifically referring to 25 mt (ww) (No Action)	Potential increased revenue from unharvested quota from NED set-aside rolling from one year to the next.	May create an incentive for PLL vessel operators to increase effort, or even possibly directing their effort, on BFT in this area. Potential impacts to other fishery sectors if they are closed after reaching their quota and cannot access available quota from the NED set-aside.
I10(b) Modify the HMS regulations to state that "In addition, each year, 25 mt (ww) will be allocated for incidental catch by pelagic longlines" in the NED	Potential increased revenue from unharvested quota from NED set-aside rolling from one year to the next.	May create an incentive for PLL vessel operators to increase effort, or even possibly directing their effort, on BFT in this area. Potential impacts to other fishery sectors if they are closed after reaching their quota and cannot access available quota from the NED set-aside.

Alternative	Net Economic Benefits	Net Economic Costs
I10(c) *Conduct additional discussions at ICCAT regarding quota rollovers and adjust quotas allocated to account for bycatch related to pelagic longline fisheries in the vicinity of the management area boundary accordingly - Preferred Alternative*	Would eliminate additional incentives for PLL vessel operators to increase effort, or even possibly directing their effort, on BFT in this area.	Would not allow revenue from unharvested quota from NED set-aside rolling from one year to the next. Potential impacts to other fishery sectors if they are closed after reaching their quota and cannot access available quota from the NED set-aside.
I11(a) No permit condition for recreational trips (No Action)	None	None
I11(b) *Require recreational vessels with a Federal permit to abide by Federal regulations, regardless of where they are fishing, unless a state has more restrictive regulations - Preferred Alternative*	Reduced confusion may lead to greater fishery participant satisfaction.	Potential minor decrease in recreational fishing satisfaction.

CHAPTER 8 TABLE OF CONTENTS

Chapter 8 Table of Contents **8-i**

8.0 Final Regulatory Flexibility Analysis **8-1**

8.1 Statement of the Need for and Objectives of this Final Rule 8-1

8.2 A Summary of the Significant Issues Raised By the Public Comments in Response to the Initial Regulatory Flexibility Analysis, a Summary of the Assessment of the Agency of Such Issues, and a Statement of Any Changes Made in the Rule as a Result of Such Comments 8-1

8.2.1 Workshops 8-1

8.2.2 Time/Area Closures 8-3

8.2.3 Finetooth Sharks 8-4

8.2.4 Atlantic Billfish 8-4

8.2.5 Atlantic Bluefin Tuna Domestic Management Measures 8-6

8.2.6 Timeframe for Annual Management of HMS Fisheries 8-6

8.2.7 Authorized Fishing Gear 8-6

8.2.8 Regulatory Housekeeping 8-7

8.3 Description and Estimate of the Number of Small Entities to Which the Proposed Rule Will Apply 8-9

8.3.1 Workshops 8-9

8.3.2 Time/Area Closures 8-9

8.3.3 Northern Albacore Tuna 8-10

8.3.4 Finetooth Sharks 8-10

8.3.5 Atlantic Billfish 8-10

8.3.6 Atlantic Bluefin Tuna Domestic Management Measures 8-10

8.3.7 Timeframe for Annual Management of HMS Fisheries 8-10

8.3.8 Authorized Fishing Gear 8-10

8.3.9 Regulatory Housekeeping 8-11

8.4 Description of the Projected Reporting, Record-Keeping, and Other Compliance Requirements of the Proposed Rule, Including an Estimate of the Classes of Small Entities Which Will Be Subject to the Requirements of the Report or Record 8-11

8.5 Description of the Steps the Agency Has Taken to Minimize the Significant Economic Impact on Small Entities Consistent with the Stated Objectives of Applicable Statutes, Including a Statement of the Factual, Policy, and Legal Reasons for Selecting the Alternative Adopted in the Final Rule and the Reason That Each One of the Other Significant Alternatives to the Rule Considered by the Agency Which Affect Small Entities Was Rejected 8-12

8.5.1 Bycatch Reduction 8-13

8.5.1.1 Workshops 8-13

8.5.1.2 Time/Area Closures 8-15

8.5.2 Rebuilding and Preventing Overfishing 8-16

8.5.2.1 Northern Albacore Tuna 8-16

8.5.2.2 Finetooth Sharks 8-16

8.5.2.3 Atlantic Billfish 8-16

8.5.3 Management Program Structure 8-18
8.5.3.1 Bluefin Tuna Quota Management 8-18
8.5.3.2 Timeframe for Annual Management of HMS Fisheries 8-19
8.5.3.3 Authorized Fishing Gears 8-19
8.5.3.4 Regulatory Housekeeping 8-20

8.0 FINAL REGULATORY FLEXIBILITY ANALYSIS

The Final Regulatory Flexibility Analysis (FRFA) is conducted to comply with the Regulatory Flexibility Act (5 USC 601 et. seq.) and provides a description of the economic impacts of the various alternatives on small entities. Certain elements required in an FRFA are also required as part of an environmental impact statement (EIS). Therefore, the FRFA incorporates the economic impacts identified in the EIS. The Initial Regulatory Flexibility Analysis was done in the draft EIS and is also contained in the proposed rule.

8.1 Statement of the Need for and Objectives of this Final Rule

Please see Chapter 1 for a description of the need for action.

8.2 A Summary of the Significant Issues Raised By the Public Comments in Response to the Initial Regulatory Flexibility Analysis, a Summary of the Assessment of the Agency of Such Issues, and a Statement of Any Changes Made in the Rule as a Result of Such Comments

NMFS received many comments on the proposed rule and the draft HMS FMP during the public comment period. A summary of these comments and the Agency's responses are included in Appendix D of this document and will be included in the final rule. NMFS did not receive any comments specific to the Initial Regulatory Flexibility Analysis (IRFA), but did receive a limited number of comments related to economic issues and concerns. These comments are responded to with the other comments in Appendix D. The specific economic concerns are also summarized here.

8.2.1 Workshops

The Agency received public comment both in support of and opposed to the protected species workshops. Some commenters were concerned about potential lost revenue on longline trips if bycatch were to be handled correctly, and recommended not limiting these workshops to longline fishermen. Some comments supported extending the workshop requirements to include all HMS fishermen, as well as expanding the release techniques to include additional species. NMFS received many comments suggesting that various combinations of owners, operators, and crew members be required to participate in the workshops. Commenters noted that if the crew members are not required to attend, then the operators should be responsible for training the crew. A few comments supported grandfathering in the industry certified individuals, so that they do not need to attend the first round of mandatory workshops (they would still need to be recertified). Additionally, the Agency received comment on the recertification timeframes, and provided recommendations for scheduling and selecting venues to mitigate any negative impacts to participants.

Public comment both supported and opposed alternative A2, stating that mandatory owner attendance may discourage them from hiring inexperienced operators who may not know how to properly handle sea turtles and other protected resources, handling protected resources wastes time on money making trips, and owners may not be operators.

The Agency received public comment in favor of owners/operators being required to train all crew members onboard. NMFS encourages all workshop participants to disseminate this information to all crew members involved with haul-back or fishing activities, however, is not requiring owners to train crew members at this time.

Alternative A3 was supported by public comment. Commenters suggested that vessel operators should be certified and that they should, in turn, train each individual crew member working aboard their vessel to ensure that the crew is informed and that proper procedures are followed. Operators are encouraged to transfer the knowledge and skills obtained from successfully completing the workshops to the crew members, potentially increasing the proper release, disentanglement, and identification of protected resources. While this alternative would not require crew members to attend the workshops, it is likely that knowledge transfer from operator and owners to crew would be able to disseminate this information in a cost effective manner. In addition, the Agency received several comments opposing the requirement to have crew certified because of their transient nature and the fact that some crew members are not U.S. citizens and may not be available to attend workshops.

The Agency received public comment supporting alternative A5. However, some commenters were concerned about requiring both owners and operators of vessels to be certified. The Agency realizes that many vessel owners may not operate or be present on the vessels during fishing trips; therefore, certifying vessel owners ensures that they are aware of the certification requirements and protocols. The owners are, then, accountable for preventing their vessel from engaging in fishing activities without a certified operator on board.

NMFS received several comments in support of alternative time periods for renewal of certification; however, the Agency prefers to maintain the original preferred alternative of recertification every three years. Recertification every three years would balance the ecological benefits of maintaining familiarity with the protocols and species identification, and the economic impacts of workshop attendance due to travel costs and lost fishing opportunities.

The Agency received comment regarding the need for proxies for dealers attending workshops under alternative A9, the flexibility required in certifying newly hired proxies, and the need for multiple proxies. Alternative A9 was modified to address these comments and allow for dealer proxies. Because not all shark dealer permit holders may be onsite where vessels unload their catches, a local proxy could attend the workshop to obtain the proper training in species-specific shark identification, while allowing the permit holder to meet the certification requirements. Furthermore, since the actual permit holders may not be involved in fish house activities, the workshops would be more effective at decreasing the reported unknown sharks if a proxy whom is directly involved with fish house activities attends and obtains the training in lieu of the permit holder. If a dealer opts to send a proxy, then the dealer would be required to designate a proxy from each place of business covered by the dealer's permit. A proxy would be a person who is employed by a place of business, covered by a dealer's permit, a primary participant in identification, weighing, or first receipt of fish as they are offloaded from a vessel, and involved in filling out dealer reports. According to public comment, NMFS should anticipate turnover in dealer proxies. To address this, the Agency is allowing one-on-one

training sessions that would accommodate the replacement of a proxy whose employment was terminated on short notice. These sessions would be at the expense of the permit holder.

Public comment on the HMS Identification Workshops were supportive of mandatory workshops for Federally permitted shark dealers, but also suggested that these workshops be available to others, such as the recreational and commercial fishery, law enforcement, port agents, and state shark dealers. While these workshops would be mandatory for Federally permitted shark dealers, NMFS would try to accommodate other interested individuals when it is feasible. At well-attended workshops, those persons for whom the workshops are mandatory would be given priority in terms of hands-on instruction.

8.2.2 Time/Area Closures

NMFS also received comments on the time/area closure alternatives. A number of commenters expressed concern over the effort redistribution model used to analyze these alternatives. These commenters felt that pelagic longline vessels were not mobile enough to redistribute effort uniformly and that vessels in a certain area would move to adjacent areas (*e.g.*, vessels homeported in the Gulf of Mexico would stay in the Gulf of Mexico and would not move into the mid-Atlantic bight). NMFS received comments that different approaches to effort redistribution should be considered, particularly for closures of bluefin tuna in spawning areas in the Gulf of Mexico. As a result, NMFS considered redistribution of effort based on an analysis of the mobility of the PLL fleet and known effort displacement currently taking place out of the Gulf of Mexico (see Appendix A). Based on this revised approach, NMFS has determined that the closures in the Gulf of Mexico could still result in an increase in bycatch for some of the species being considered. As a result, NMFS has decided not to move forward with any new time/area closures other than complementary closures for Madison-Swanson and Steamboat Lumps.

During the comment period, NMFS heard from commenters and the peer reviewers that the Agency should design a “decision matrix” that could help to guide the choices that NMFS would have to make between different closures and different species. NMFS interpreted this request to mean that NMFS should decide whether, for example, it is more important to protect spawning BFT during particular times and areas than leatherback sea turtles. If NMFS decided that were the case, then an area would be closed to protect spawning BFT even though it could potentially increase takes of leatherback sea turtles. Related to this idea of a decision matrix, some commenters noted that NMFS should set bycatch reduction goals. For example, NMFS would need to reduce BFT discards by some set percent; under this concept, NMFS would need to find ways to reduce BFT discards by the appropriate percent, possibly to the detriment of other species. Once that percent reduction was made, NMFS would no longer need to reduce BFT discards. Similarly, if NMFS implements measures that reduce BFT discards by more than the decided amount, NMFS could potentially relax some of the measures to bring the reduction down to the pre-decided level. Finally, NMFS received comments from commercial interests indicating that the bycatch reduction goals of the existing closures have already been met and, therefore, the Agency should reopen at least portions of the current closures.

8.2.3 Finetooth Sharks

NMFS received a range of public comments regarding finetooth shark alternatives indicating support and opposition to Alternatives D2-D4, and additional comments, including, but not limited to: comments on gillnet fisheries in general, the use of VMS, the results of the 2002 SCS stock assessment, reporting of HMS by dealers, identification of finetooth sharks, and the accuracy of data attained from MRFSS. All of these comments were considered prior to selection of the preferred course of action for preventing overfishing of finetooth sharks. Additional measures, possibly those analyzed in this document, and/or others, may be necessary to prevent overfishing of finetooth sharks in the future.

8.2.4 Atlantic Billfish

NMFS also received many comments regarding Atlantic billfish alternatives. Commenters strongly suggested that given the feeding habits of blue marlin, mandating circle hooks on artificial lures would significantly reduce the viability of trolling for blue marlin. Based on public comment from scoping and the draft HMS FMP, as well as an examination of post-release mortality data of blue marlin caught on J-hooks, NMFS is allowing anglers on HMS permitted vessels in billfish tournaments to continue to use J-hooks with artificial lures.

NMFS received substantial public comment opposing and supporting circle hook requirements proposed under draft alternatives E2 and E3. A prevalent theme contained in comments opposing mandatory circle hook use, in all or portions of the HMS and billfish recreational fisheries, was that the recreational sector has a minor impact on Atlantic billfish populations relative to the commercial pelagic longline fleet. However, given the relatively small size of the U.S. domestic pelagic longline fleet and the considerable size of the recreational fishing fleet, NMFS determined that it was appropriate to examine this issue from the domestic perspective.

A second important theme in comments opposing mandatory circle hook use under alternatives E2 and E3 was the need for NMFS to promulgate more detailed specifications for circle hooks. NMFS is unable to provide an index of detailed hook specifications for each size circle hook that could be used in the recreational billfish fishery. NMFS is continuing to work on various formulaic definitions of circle hooks that may lead to a more refined hook definition in the future. However, NMFS finds that it is appropriate to require the use of circle hooks in portions of the recreational billfish fishery at this time in an effort to reduce post-release mortalities in the recreational billfish fishery.

NMFS received public comment expressing concern that HMS circle hook requirements may apply to all tournament participants, even non-HMS fishermen participating in large tournaments that may have award categories for species other than HMS. NMFS has refined the phrasing of the alternative to more accurately reflect the intent of this alternative.

NMFS also received comment that tournament operators would need advance notice of impending circle hook regulations to allow for production of rules, advertising, and informing tournament participant of potential circle hook requirements. NMFS surveyed a number of tournament operators in the Atlantic, Gulf of Mexico and Caribbean to better understand various

aspects of tournament operations, and determined that a delayed date of effectiveness of no less than six months would be necessary to minimize adverse impacts to tournament operators and participants. NMFS is preferring an effective date of January 1, 2007 for Atlantic billfish tournament circle hook requirements. This additional six month delay in effectiveness will provide billfish tournament anglers additional time to familiarize themselves and become proficient in the use of circle hooks, while allowing tournament operators to adjust tournament rules, formats, and materials production, as appropriate, thereby minimizing any potential adverse socio-economic impacts.

NMFS received comment recommending that the Agency automatically carry forward any underharvest to the following management period. As noted above, this alternative allows for underharvests to be carried forward. However, given the uncertainty surrounding landings of Atlantic marlin in the Commonwealth of Puerto Rico and the U.S. Caribbean, the United States has made a commitment to ICCAT not to carry forward underharvest until such time as this uncertainty is resolved.

Given that the known level of U.S. recreational marlin landings have been within the 250 fish limit for three of the four reported years, and that the 2002 overharvest was offset by the 2001 underharvest, the ecological benefits of this alternative are likely limited. NMFS received comment on the limited ecological impact that could be categorized into two opposing views and which suggested two different courses of action as a result of the anticipated limited ecological impact. Some commenters suggested that the limited ecological impact was not worth any potential adverse economic impact, even a very limited one, while other commenters suggested that the United States must implement the 250 marlin limit to live up to U.S. international obligations and as part of a strategy to implement appropriate measures to help limit billfish mortality. Implementation of this preferred alternative is anticipated to allow the United States to continue to successfully pursue international marlin conservation measures by fully implementing U.S. international obligations and potentially provide a minor ecological impact with, at most, minor adverse economic impacts.

NMFS received strong public comment opposed to the Atlantic white marlin catch and release alternative. Based on public comment that indicated more significant concerns over potential adverse economic impacts to the fishery if catch and release only fishing for Atlantic white marlin were required, as well as a number of other factors, including but not limited to, the impending receipt of a new stock assessment for Atlantic white marlin and upcoming international negotiations on Atlantic marlin, NMFS has chosen not to prohibit landings of Atlantic white marlin. Additionally, the Agency received substantial comment in support of this measure. The commenters supporting the landings prohibition stated concerns over white marlin stock status, the ESA listing review, and an interest in maintaining leadership at the international level. The implementation of circle hook requirements (alternative E3) is an important first step in reducing mortality in the directed billfish fishery. NMFS will consider catch and release only fishing options for Atlantic white marlin as well as other billfish conservation measures in future rulemakings, as necessary and appropriate.

8.2.5 Atlantic Bluefin Tuna Domestic Management Measures

NMFS received public comment in the past regarding the timing of annual BFT specification publication and that administrative or other delays in publishing the annual BFT specifications can have adverse social and economic impacts due to constituents inability to make informed business decisions. Under the preferred alternative the annual BFT quota specifications established baseline domestic quota category allocations, as well as adjusted those allocations based on the previous years under- and/or overharvest. Any delay in publishing the annual BFT quota specifications would have prolonged the establishment of a baseline quota in any of the domestic categories.

NMFS received a number of comments opposing the removal of the Angling category North/South dividing line and one comment supporting its removal. In response to those comments, NMFS modified preferred alternative F4 to include maintaining the north/south dividing line.

Fishermen have commented that knowing the exact schedule of BFT RFDs prior to the season facilitates planning and scheduling of trips and the preferred alternative F6 should help facilitate the development of timely schedules.

8.2.6 Timeframe for Annual Management of HMS Fisheries

The timeframe for annual management of HMS fisheries preferred alternative G2 was modified because the comment period was extended. The actual compressed fishing year would occur in 2007 rather than 2006 as described in the draft Consolidated HMS FMP. During the public comment period, several commenters expressed concern about the effect of a calendar year management cycle on the availability of quota rollover from the previous calendar year during the January portion of the south Atlantic fishery. Under changes to the BFT management program included in this Consolidated HMS FMP, the January subperiod would be provided with a quota of 5.3 percent of the annual ICCAT allocation.

8.2.7 Authorized Fishing Gear

In regard to authorized gears, there was strong public comment support for the preferred alternative H2 authorizing speargun fishing as a permissible gear type for recreational Atlantic BAYS tuna. NMFS has received written requests, comment at public hearings, and has heard presentations at AP meetings requesting that NMFS authorize the use of speargun fishing gear in the Atlantic tuna fishery. NMFS has received comment that recreational spearfishermen place a high value on spearfishing for tunas and are currently traveling outside of the United States for the opportunity to participate in tunas speargun fisheries.

During the public comment period, numerous comments were received expressing confusion over the current regulatory regime regarding green-stick gear, unease over the potential impacts and intent of the preferred alternative in the draft Consolidated HMS FMP, and concern over potential negative impacts of the green-stick gear. Therefore, the agency does no longer prefer H4, the green-stick authorization alternative.

In regard to buoy gear, the Agency received public comment requesting that commercial vessels be limited to deploying fewer than 35 individual buoy gears. Additionally, commercial fishermen familiar with this gear type requested that they be allowed to attach multiple floatation devices to buoy gears to aid in monitoring and retrieval, as well as allow them to use “bite indicator” floats that will alert them to gears with fish attached. In response to public comment, NMFS modified the preferred alternative to allow fishermen to use more than one floatation device per gear and configure the gear differently depending on vessel and crew capabilities, or weather and sea conditions. This increased flexibility may result in positive social impacts and increased safety at sea.

The Agency has also received public comment in support of the clarification of the allowance of cockpit gears associated with alternative H7.

8.2.8 Regulatory Housekeeping

The public also provided comment on the proposed regulatory housekeeping alternatives. NMFS requested public comment regarding whether or not to include a definition of "fishing floats" in the regulations, and on potential language for a “float” definition. Based on these comments, NMFS has chosen not to prefer alternative I1(b) in this document. Several commenters indicated that the number of floats is not an appropriate gauge to determine the type of fishing gear that is being deployed, and that the presence of “bullet floats,” anchors, or the type of mainline would be better indicators. Other commenters stated a float requirement would be an unnecessary burden that could diminish the flexibility of vessel operators to participate in different fishing activities, depending upon the circumstances. Finally, consultations with NMFS Office of Law Enforcement indicated that the float requirement in alternative I1(b) would not be practical. For these reasons, alternative I1(b) is no longer preferred. Although alternative I1(b) was preferred in conjunction with alternative I1(c) in the draft HMS FMP, NMFS believes that the objective of this alternative can be effectively achieved by implementing alternative I1(c) alone, species composition of catch.

On the basis of public comment, the list of demersal “indicator” species associated with alternative I1(c) has been modified from the Draft HMS FMP by removing silky, great hammerhead, scalloped hammerhead, and smooth hammerhead sharks from the list, and by adding tilefish, blueline tilefish, and sand tilefish to the list. NMFS believes that these changes are appropriate because those shark species can be caught on both pelagic and bottom longlines, and because the tilefish species are representative of demersal fishing activity.

NMFS received comments indicating that alternative I1(c) could adversely impact longline vessels that fish, at least part of a trip, in HMS closed areas and that catch both demersal and pelagic species on those trips. Similar to the comments received regarding alternative I1(b), there were concerns that, by establishing a species threshold when fishing in HMS closed areas, this alternative would restrict the flexibility of longline vessel operators to participate in different fishing activities depending upon the circumstances. Also, adverse economic impacts could result if vessel operators are unable to retain a portion of their catch that otherwise would have been retained on mixed fishing trips in the closed areas, or if they must necessarily choose to fish outside of the closed areas. NMFS received other comments indicating that there could be additional costs on vessels if they are boarded at sea by enforcement, and it was necessary to

retrieve or observe fish in the hold in order to calculate the percentages of demersal and pelagic species possessed onboard. The Agency, however, still finds that this preferred alternative is important in maintaining existing time/area closures.

In regards to alternative I2(b) regarding that the second dorsal fin and anal fin remain on all sharks through landing, NMFS received various comments supporting the preferred alternative, as well as comments confirming that retention of second dorsal and anal fins through landing could improve shark identification and species-specific landing data. However, NMFS also received comments indicating that this alternative would do little to improve shark identification. NMFS received comment that although these species have valuable fins, retaining them until landing was acceptable. The Agency received a comment opposing this alternative due to additional time and revenue losses that may result from removing the smaller/secondary fins after docking. While initial adjustments may have to be made to the offloading and processing procedures, in the long-term, improved quota monitoring and stock assessment data as a result of this alternative could result in a larger quota and therefore larger net revenues for both the fishermen and the dealer.

Public comment suggests that, among active fishery participants, a requirement for handlines to remain attached to all vessels would reduce the number of handlines that could be fished or deployed. Operationally, it may also be less efficient to fish with several attached handlines as they may be more prone to entanglement. Because this alternative could restrict or limit fishing effort, it is projected to produce unquantifiable positive ecological impacts, including a reduction in the bycatch of undersized swordfish, other undersized species, protected species, and target species catches. Based upon public comment the practice does not appear to be widespread, but it may be growing among a small number of vessel operators primarily targeting swordfish in the East Florida Coast closed area. According to public comment, recreational swordfish catches would most likely be affected, as that is the primary target species. If few recreational vessels are currently fishing with unattached handlines, then any social or economic impacts associated with this alternative would be minimal.

NMFS prefers alternative I7(b) regarding allowing the option for electronic reporting for BFT dealer reports, and has received public comment supporting this alternative. The preferred alternative would provide an option for BFT dealers to submit certain reports electronically over the Internet once such a system is developed, but would not require it.

Based upon public comment regarding requiring vessel owners to report non-tournament recreational landing of North Atlantic swordfish and Atlantic billfish under preferred alternative I9(b), this alternative has been modified slightly from the draft HMS FMP by specifying that a vessel owner's designee may also report landings, in lieu of the owner. NMFS received comment indicating that this alternative could potentially disadvantage absentee vessel owners. In consideration of this comment, NMFS has modified the preferred alternative to allow an owner's designee to report.

During the comment period, NMFS received comments from several states who felt that NMFS was exceeding their authority with the permit condition. NMFS believes that the Magnuson-Stevens Act does provide the authority to manage HMS species throughout their

range (16 U.S.C. 1812 Section 102). NMFS could opt to pre-empt state's authority either through the Magnuson-Stevens Act or through ATCA. However, NMFS prefers to work with states and the Atlantic and Gulf States Marine Fisheries Commissions towards consistent regulations that meet both international and domestic goals because each state is different and the fishermen in each state prefer to fish for different HMS (*e.g.*, fishermen in the Gulf of Mexico may fish for Atlantic sharpnose sharks while fishermen in New Jersey would not) and use different gears.

Finally, NMFS received several comments in general regarding the information presented regarding the HMS recreational sector. Section 3.5.2 provides detailed information regarding the data available and past research concerning the HMS recreational fisheries. Economic data on recreational data is difficult to collect and challenging to interpret. Nevertheless, efforts have been undertake to improve, update, and expand upon the economic information regarding the HMS recreational fisheries.

8.3 Description and Estimate of the Number of Small Entities to Which the Proposed Rule Will Apply

NMFS considers all permit holders to be small entities as reflected in the Small Business Administration's (SBA) size standards for fishing entities. All permit holders are considered to be small entities because they either had gross receipts less than $3.5 million for fish-harvesting, gross receipts less than $6.0 million for charter/party boats, or 100 or fewer employees for wholesale dealers. These are the SBA size standards for defining a small versus large business entity in this industry. A description of the fisheries affected, the categories and number of permit holders, and registered tournaments can be found in Chapter 3.

8.3.1 Workshops

The alternatives considered for requiring attendance at workshops on protected species release, disentanglement, and identification for pelagic longline, bottom longline, and gillnet owners and operators (A2, A3, and A5) are estimated to apply to 549 vessels permitted to fish for HMS with longline gear and 20 shark gillnet vessels. The preferred alternatives for shark identification workshops (A9) would impact approximately 336 Federally permitted shark dealers.

8.3.2 Time/Area Closures

The preferred time/area closure alternative (B4) to implement complementary HMS time/area closures in the Madison-Swanson and Steamboat Lumps Marine Reserve would apply to 549 pelagic and bottom longline permitted vessels, but would likely impact few pelagic or bottom longline vessels based on past observer and logbook data indicating only one pelagic longline and two bottom longline sets reported in those areas. This preferred alternative would also apply to 4,173 permitted HMS charter/headboat businesses and 25,238 HMS angling permit holders. However, the impacts to charter/headboat businesses and recreational fishermen are not expected to be substantial since this alternative includes a seasonal surface trolling allowance. In addition, many of these businesses have already been impacted by the previously implemented Madison-Swanson and Steamboat Lumps Marine Reserves established by the GOMFMC, and

therefore are not likely to face further economic impacts as a result of the preferred complimentary HMS closure in the same area.

8.3.3 Northern Albacore Tuna

The preferred alternative considered for northern albacore management (C3), which would establish the foundation for developing an international rebuilding program through ICCAT, would apply to all tuna categories, a total of 34,501 permit holders. However, the preferred alternative does not have any direct impacts on small entities in the short term because it does not require any changes to direct management measures at this time.

8.3.4 Finetooth Sharks

The preferred alternative for finetooth sharks, a strategy for preventing overfishing (D4), also would not have any direct impacts on small entities but could affect 20 commercial vessels and potentially some of the 25,238 HMS angling permit holders. The non-preferred commercial management alternative, however, would apply to the estimated 20 shark gillnet vessels that are permitted and could apply to all commercial shark permit holders depending on what the management measures would be. The non-preferred recreational management alternative would apply to the 25,238 HMS angling permit holders; however, a small percentage of these recreational anglers target small coastal sharks or finetooth sharks.

8.3.5 Atlantic Billfish

The preferred Atlantic billfish Alternatives E3 and E6 would apply to 25,238 Angling, 4,173 CHB, and up to 4,824 valid General (those participating in tournaments) category permits. In addition, there are currently 256 registered HMS tournaments that would be impacted by the Atlantic billfish alternatives.

8.3.6 Atlantic Bluefin Tuna Domestic Management Measures

The alternatives being considered for bluefin tuna management for time-periods and subquota allocations would primarily apply to the 4,824 General category tuna permit holders. However, other bluefin tuna alternatives to streamline management processes would apply to all tuna categories, a total of 34,501 permit holders (Section 3.9.4).

8.3.7 Timeframe for Annual Management of HMS Fisheries

The alternatives that consider changing the timeframe for annual management of HMS fisheries from a fishing year to a calendar year would essentially apply to all 36,925 HMS permit and tournament registrants, including dealer permits. Under the preferred alternative (G2), only the shark fishery would not be impacted by the shift in annual management timeframe because it is already managed on a calendar year basis at this time.

8.3.8 Authorized Fishing Gear

Several alternatives allowing or defining authorized gears would apply to small entities. The authorization of recreational speargun fishing for Atlantic tunas (H2) would apply to an

unknown number of speargun users. This preferred alternative may also positively impact the 4,173 CHB permit holders by potentially increasing charter revenues. The non-preferred alternative to allow speargun in both recreational and commercial tuna fisheries (H3) would also apply directly to the 4,824 General category and 4,173 CHB permit holders. Alternative H5, which address the utilization of unattached handlines, would apply to 279 permit holders (88 swordfish handgear and 191 swordfish directed). The preferred alternative clarifying the authorized use of secondary cockpit gears (H7) would apply to all HMS permit holders.

8.3.9 Regulatory Housekeeping

Finally, a variety of regulatory housekeeping preferred alternatives would apply to small entities. Specifically, the preferred change to the definitions of pelagic and bottom longline (alternative I1(c)) would apply to the 576 permitted pelagic and bottom longline vessels. The preferred alternative requiring smaller second dorsal and anal fins would need to remain attached to the shark (alternative I2(b)) would apply to the 240 directed shark and 312 incident shark permit holders. The preferred HMS retention limit requirements (I3) would apply to the 621 permitted shark and swordfish dealers and the 416 permitted Atlantic tuna dealers. The change in the definition of the East Florida Coast Closed Area (I4) is unlikely to directly impact any small entities but could affect any commercial permit holders fishing in that area. The preferred alternative prohibiting the retention of Atlantic billfish by vessels issued commercial permits and operating on a non-for-hire trip or outside of a tournament (I6(b)) would apply to General category, bottom longline, and shark gillnet vessels utilizing rod and real gear, but it is unlikely that many would be impacted by this proposed regulation. The preferred alternative to amend the HMS regulations to provide an option for Atlantic tunas dealers to submit required BFT reports using the Internet (I7(b)) would apply to the 416 Atlantic tuna permit dealer holders. The preferred alternative requiring vessel owners or proxies to report non-tournament recreational landings of North Atlantic swordfish and Atlantic billfish (I9(b)) would apply to 4,173 CHB permit holders and 25,238 Angling permit holders, but it is not expected that this proposal would impact many entities. Finally, the preferred alternative requiring recreational vessels with a Federal permit to abide by Federal regulations (I11(b)), regardless of where they are fishing, would potentially apply to 25,238 Angling, 4,173 CHB, and up to 4,824 valid General (those participating in tournaments) category permits.

Other sectors of the HMS fisheries such as dealers, processors, bait houses, and gear manufacturers, some of which are considered small entities, might be indirectly affected by the preferred alternatives, particularly time/area closures, Atlantic billfish, and authorized gear alternatives. However, the rule does not apply directly to them, unless otherwise noted above. Rather, it applies only to permit holders and fishermen. As such, economic impacts on these other sectors are discussed in Chapters 4, 6, and 7.

8.4 Description of the Projected Reporting, Record-Keeping, and Other Compliance Requirements of the Proposed Rule, Including an Estimate of the Classes of Small Entities Which Will Be Subject to the Requirements of the Report or Record

None of the preferred alternatives in this document would result in additional reporting, record-keeping, and compliance requirements that would require new Paperwork Reduction Act filings. However, some of the preferred alternatives could modify existing reporting and record-

keeping requirements. These include workshops, coordination efforts directed at gathering additional information about finetooth shark mortality, and bluefin tuna dealer reporting. The preferred alternatives for workshops (A2, A3, A5, A6, A9, and A16) would require record-keeping by NMFS to record attendance at workshops and the certification status of pelagic and bottom longline vessel owners and operators, as well as shark gillnet owners and operators and shark dealers and proxies. This Agency record keeping would not have an impact on small entities although small entities will need to keep their own certificates and may decide to keep copies of certificates for their own records. Attending workshops would also be a change in compliance.

In addition, the finetooth shark preferred alternative (D4) may expand the coverage of the current HMS observer programs. In addition, this preferred alternative would result in efforts to expand data that are currently collected by NMFS observers on shrimp trawl vessels to include finetooth shark and other HMS species of interest. Fishermen themselves would not need to change reporting.

Finally, under regulatory housekeeping, the preferred alternative to allow bluefin tuna dealers the option to report electronically (I7(b)) once a system is developed and is made available would modify current reporting requirement, but would not result in additional reporting or burden. In fact, this option may reduce the potential need to report the same data on multiple reports for those some small entities that chose this option.

In addition to the reporting and record-keeping requirements of the preferred alternatives, there are also compliance requirements associated with the preferred alternatives. These compliance requirement include limiting billfish tournament participants to using only non-offset circle hooks when using natural baits or natural bait/artificial lure combinations (E3), requiring the retention of shark second dorsal and anal fins (I2(b)), and establishing the minimum and maximum number of floats for bottom longline and pelagic longline gear definitions (I1(b)).

The other preferred alternatives, which are outlined in Chapter 2, would change quota allocations, timeframes, authorized gear types, definitions, and other management measures, but would not likely change reporting or compliance in the fishery.

8.5 Description of the Steps the Agency Has Taken to Minimize the Significant Economic Impact on Small Entities Consistent with the Stated Objectives of Applicable Statutes, Including a Statement of the Factual, Policy, and Legal Reasons for Selecting the Alternative Adopted in the Final Rule and the Reason That Each One of the Other Significant Alternatives to the Rule Considered by the Agency Which Affect Small Entities Was Rejected

One of the requirements of an FRFA is to describe any alternatives to the proposed rule that accomplish the stated objectives and that minimize any significant economic impacts. These impacts are discussed below and in Chapters 4 and 6 of this document. Additionally, the Regulatory Flexibility Act (5 U.S.C. § 603 (c) (1)-(4)) lists four general categories of "significant" alternatives that would assist an agency in the development of significant alternatives. These categories of alternatives are:

1. Establishment of differing compliance or reporting requirements or timetables that take into account the resources available to small entities;
2. Clarification, consolidation, or simplification of compliance and reporting requirements under the rule for such small entities;
3. Use of performance rather than design standards; and,
4. Exemptions from coverage of the rule for small entities.

As noted earlier, NMFS considers all permit holders to be small entities. In order to meet the objectives of this final HMS FMP and the statutes (*i.e.*, Magnuson-Stevens Act, ATCA, ESA) as well as address the management concerns at hand, NMFS cannot exempt small entities or change the reporting requirements for small entities. Among other things, this final HMS FMP would set quotas for the fishing season, retention limits for the recreational fishery, and gear restrictions, all of which would not be as effective with differing compliance and reporting requirements. Thus, there are no alternatives discussed which fall under the first and fourth categories described above. Alternatives under the second and third categories are discussed below with the alternatives that were considered but not preferred.

As described below, NMFS considered a number of alternatives that could minimize the economic impact on small entities, particularly those pertaining to workshops, time/area closures, northern albacore tuna, finetooth sharks, Atlantic billfish, bluefin tuna quota management, timeframe for annual management, authorized fishing gears, and regulatory housekeeping measures.

8.5.1 Bycatch Reduction

8.5.1.1 Workshops

The preferred alternatives for protected species safe handling, release, and identification workshops require mandatory workshops and certification on a three year renewal timeline (A6) for all HMS pelagic and bottom longline vessel owners (A2) and operators (A3) and shark gillnet vessel owners and operators (A5). These measures were designed to minimize the economic impacts on fishermen, while simultaneously complying with 2003 BiOp and the post-release mortality targets for protected resources established in the June 2004 BiOp. Alternative A2 is estimated to have an economic impact to each bottom and pelagic longline vessel owner of up to $281 and $448 in potentially lost revenue share based on 2004 logbook data, as well as unquantified travel costs to attend a workshop. The aggregate economic impact is estimated to be between $154,269 and $258,048 in the first year. Longline vessel operators would also be impacted by the preferred alternative, but it might not impact the economic well-being of the small business for which they work. In addition, the estimated twenty shark gillnet owners that would be participating in required workshops would each have an economic impact of up to $424 in lost revenue share based on 2004 logbook data, as well as unquantified travel costs to attend a workshop.

Specifically, under these alternatives, NMFS would strive to host a number of workshops in regional fishing hubs in order to minimize travel and lost fishing time. Besides the costs of

travel and lost time, there would be no additional costs for workshop participants. NMFS would attempt to hold workshops during periods when the fishery is typically inactive, effectively minimizing lost fishing time. To minimize the overall economic cost of these workshops, the preferred alternatives would limit required participation in these workshops to owners and operators. Owners and operators could pass information and appropriate direction to their crew concerning release, disentanglement, and identification of protected resources. NMFS would also select a recertification period that would allow for sufficient retraining to maintain proficiency and update fishermen on new research and development related to the subject matter while not placing an excessive economic burden on the participants due to lost fishing time and travel resulting from attending a recertification workshop in person. In addition, to lower the costs of recertification, NMFS is considering the use of alternative sources of media including CD-ROM, DVDs, or web-based media that would not result in travel costs or lost fishing time, as well as allowing private certified trainers to provide training at tailored times and locations to minimize any costs.

Other alternatives considered were voluntary workshops for longline fishermen (A1) and mandatory workshops that would include crewmembers in addition to owners and operators (A4). Several alternatives would have less onerous economic impacts to small businesses relative to the preferred alternatives. These include: the No Action alternative (A1) and mandatory workshops for only owners or only operators. These alternatives would not satisfy the RPA under the June 2004 BiOp issued pursuant to Section 7 of the ESA.

The preferred alternative for identification workshops, which would require mandatory workshops for all Federally permitted shark dealers (A9), is preferred because species-specific identification of offloaded shark carcasses is much more difficult than other HMS as evidenced by the large proportion of "unclassified" sharks listed on shark dealer logbooks. The Agency would attempt to minimize economic impacts to shark dealers by holding workshops at fishing ports to minimize travel costs and during non-peak fishing times to minimize perturbations to business activity, to the extent possible. As a result of public comment, dealers would also have the option to specify proxies to attend workshops in order to increase flexibility and minimize costs. Similar measures as those being considered for disentanglement and identification recertification are being considered for the identification workshops for shark dealers in order to minimize the economic impacts caused by this measure.

Other alternatives in addition to the No Action alternative were voluntary HMS identification workshops (A8), mandatory identification workshops for swordfish and tuna dealers (A10), mandatory identification workshops for all commercial longline vessel owners (A11) and operators (A12), mandatory identification workshops for all commercial vessel (longline, CHB, General category, and handgear/harpoon) owners (A13) and operators (A14), and mandatory identification workshops for all HMS Angling permit holders (A15). The economic impacts of these alternatives are detailed in Chapter 6. The No Action (A7) and voluntary HMS identification workshop alternative (A8) would have less onerous economic impacts relative to the preferred alternative. However, these alternatives would not address the persistent problems with species-specific shark identification in dealer reports nor satisfy the requirements and goals of this final HMS FMP or aid in rebuilding the shark fishery.

In addition to the type of workshops, NMFS considered two additional renewal timetables of two and five years. A renewal timetable of five years would have a less adverse impact than the preferred timetable of three years. However, recertification every five years for bycatch release and disentanglement workshops would allow a more extensive period of time to lapse between certification workshops than necessary to maintain proficiency and provide updates on research and development of handling and dehooking protocols. In a similar fashion, recertification every five years for HMS identification workshops would also allow a more extensive period of time to lapse between certification workshops than necessary to maintain proficiency in species identification.

8.5.1.2 Time/Area Closures

The preferred alternatives for time/area closures, which would implement complementary measures in Madison-Swanson and Steamboat Lumps closures (B4) and establish criteria to be considered when implementing new time/area closures or making modifications to existing time/area closures (B5), were designed to minimize economic impacts incurred by fishermen, while simultaneously reducing the bycatch of non-target HMS and protected species, such as sea turtles, in Atlantic HMS fisheries. Alternative B4 would establish complementary HMS regulations in the Madison-Swanson and Steamboat Lumps closures with minimal economic impacts. Creating these complementary HMS regulations would consolidate and simplify requirements for fishermen, and therefore simplify compliance. This alternative would also implement compatible regulations that would provide for a seasonal allowance (May – October) for surface trolling to partially alleviate any negative economic impacts associated with the closures or the HMS recreational and charter/headboat sector.

Other alternatives considered in addition to the No Action alternative were a closure of 11,191 nm^2 in the central Gulf of Mexico to pelagic longline gear (B2(a)), a closure of 2,251 nm^2 in the Northeast to pelagic longline gear (B2(b)), a closure of 101,670 nm^2 in bluefin tuna spawning areas in the Gulf of Mexico (B2(c)), a closure west of 86º W Longitude in the Gulf of Mexico to pelagic longline gear (B2(d)), a closure of 46956 nm^2 in the Northeast to pelagic longline gear (B2(e)), a prohibition on the use of bottom longline gear in an area off the Florida Keys to protect endangered smalltooth sawfish (B6), and a prohibition on the use of pelagic longline gear in HMS fisheries in all areas (B7). These closures alternatives were not preferred due to large economic impacts with conflicting ecological benefits between species. The details of the economic impacts associated with these other alternatives are detailed in Section 4.1.2 and Chapter 6. In addition to the closure alternatives, modifications to existing closures were also considered for the Charleston Bump closure (B3(a)) and the Northeastern U.S. closure (B3(b) which provided some economic relief but did not meet ecological needs.

Alternative B5 would establish criteria that would guide future decision-making regarding implementation or modification of time/area closures. This would provide enhanced transparency, predictability, and understanding of HMS management decisions. The time/area closure criteria would not have immediate impacts. Any ecological, social, or economic impacts of a specific closure or modified closure would be analyzed in the future when that specific action is proposed.

8.5.2 Rebuilding and Preventing Overfishing

8.5.2.1 Northern Albacore Tuna

The preferred alternative for northern albacore management, which would establish the foundation for developing an international rebuilding program (C3), was designed to address rebuilding of the northern albacore tuna fishery while simultaneously minimizing economic impacts incurred by fishermen. This alternative would have minimal economic impacts, because it would not implement any additional restrictions at this time. Even under an international plan, the United States is a small participant in this fishery and only has a small allocation that it does not even fully harvest at this time.

Other alternatives considered were No Action (C1) and taking unilateral proportional reductions in northern albacore tuna harvest (C2). Taking unilateral action to address northern albacore tuna on the part of the United States would likely not be effective in rebuilding the stock because the United States is a small participant in this fishery, and would have larger economic impacts than the preferred alternative.

The No Action alternative would have the same economic impacts as the preferred alternative because NMFS has been promoting an international rebuilding plan at ICCAT. In a prior rulemaking, NMFS addressed the same northern albacore tuna alternatives but did not incorporate them into the HMS FMP. The No Action alternative is rejected, because it would not include the rebuilding strategy in the FMP.

8.5.2.2 Finetooth Sharks

The preferred alternative for finetooth shark management (D4) was designed to address overfishing while minimizing economic impacts incurred by fishermen and potential negative ecological impacts. This alternative would be expected to have minimal to no economic impacts, because no new restrictions are being proposed at this time. Long-term, the alternative would have positive ecological impacts by addressing finetooth mortality in HMS and other fisheries and positive economic impacts if the fishery is sustained.

Other alternatives considered were No Action (D1), commercial management measures (D2), and recreational management measures (D3). Only the No Action alternative would have less economic impact relative to the preferred alternative. However, this alternative was not preferred because it would not facilitate efforts to address overfishing of finetooth sharks.

8.5.2.3 Atlantic Billfish

The preferred alternatives for Atlantic billfish management, which include requiring the use of non-offset circle hooks when using natural baits in tournaments (E3) and implementing the ICCAT marlin landings limits (E6), were designed to minimize economic impacts incurred by recreational fishing sector, while simultaneously enhancing the management of the directed Atlantic billfish fishery. Specifically, alternative E3 would likely have a minimal economic impact, since it would not affect all billfish recreational anglers, only tournament participants.

Therefore, the impacts on hook manufactures, retailers, and anglers would likely be limited given that J-hooks would continue to be permitted outside of tournaments and within tournaments with artificial lures. In addition, delayed implementation to 2007 would help lower any potential economic impacts due to supply and demand changes. Impacts on tournaments would also likely be minimal, given the increase in the number of tournaments that provide special award categories or additional points for billfish captured and released on circle hooks. Alternative E3 would also likely have high compliance rates given the self-policing that is likely to occur among tournament participants competing for prizes, as well as the increasing use of tournament observers.

Alternative E6 is the preferred alternative because management measures can be implemented in response to the needs of a given fishing year to ensure maximum utilization of the ICCAT landing limit. The alternative considers three levels of management measures based upon marlin landing thresholds to minimize the economic impact. When it is not expected that marlin landings will approach the threshold for action, then no in-season actions would occur and there would not be any economic impacts. If the threshold for action were achieved, minimum size requirements for Atlantic marlins would increase to a level sufficient to curtail landings. Finally, if the ICCAT landing limits were achieved in any one year, the fishery would shift to a catch and release only fishery for the remainder of that year. This last scenario would be unlikely given historical landings and minimum size requirements that would occur at the action threshold. Under the preferred calendar year management alternative (G2), alternative E6 also would help reduce any disproportionate economic impacts to CHB operators, tournaments, and anglers who fish for marlin late in the fishing year or in late season tournaments by providing anglers the greatest opportunity to land marlin over the entire length of the fishing year. Alternative E6 is estimated to potentially result in $1.3 to $2.7 million in economic impacts as compared to the $13.4 to $20.0 million in impacts for catch-and-release only for Atlantic blue and white marlin (Alternatives E7 and E8 combined) resulting in an estimated one to two tournament cancellations and unquantified impacts on CHB businesses.

Other alternatives considered were No Action (E1), limiting all participants in the Atlantic HMS recreational fishery to using only non-offset circle hooks when using natural baits or natural bait/artificial lure combinations in all HMS fisheries (E2), increasing the minimum size limit for Atlantic white and/or blue marlin (E4), implementing recreational bag limits of one Atlantic billfish per vessel per trip (E5), allowing only catch and release fishing for Atlantic white marlin (E7), and allowing only catch-and-release fishing for Atlantic blue marlin (E8). Only the No Action alternative would have less onerous economic impacts relative to the preferred alternative. However, the No Action alternative would not satisfy the requirements and goals of implementing the ICCAT recommendations under ATCA, rebuilding the Atlantic blue and white marlin fishery under the Magnuson-Stevens Act, or the objectives of the HMS FMP.

8.5.3 Management Program Structure

8.5.3.1 Bluefin Tuna Quota Management

The preferred alternatives for bluefin tuna quota management include revised General category time-periods and subquotas to allow for a formalized winter fishery (F3(c)), clarified procedures for calculating the Angling category school size-class subquota allocation (F4), modification of the bluefin tuna specification process and streamlining annual under/overharvest procedures (F6), an individual quota category carryover limit and authorization of the transfer of quota exceeding limit (F8), and revised and consolidated criteria that would be considered prior to performing a BFT inseason action (F10). These preferred alternatives were designed to minimize economic impacts incurred by fishermen, while simultaneously enhancing and clarifying bluefin tuna quota management and inseason actions.

Alternative F3(c) would strike a balance between providing consistent quota allocations and having the flexibility to amend them in a timely fashion. This alternative would slightly reduce General category quota from early time periods, thereby allowing for a formal winter General category bluefin tuna fishery to take place during the months of December and January, and therefore would increase regional access. By shifting the allocated quota from the June through August time-period, which has an overall higher allocation, to a later time-period any adverse impacts would be mitigated by the increased revenue generated in the later time-period. In addition, the fishermen from the Northeast are not precluded from fishing in southern areas during winter bluefin tuna season.

Alternative F4 would clarify the procedures NMFS uses in calculating the ICCAT recommendation regarding the eight percent tolerance for BFT under 115 cm. It would also maintain the north/south dividing line that separates the Angling category. This alternative is not likely to have an economic impact.

Alternative F6 would simplify quota allocations by eliminating the need to allocate each domestic quota categories' baseline allocation each year, as the allocation percentages and the actual quota equivalents (measured in metric tons) would be codified in the regulations implementing the consolidated HMS FMP at least until ICCAT alters its BFT TAC recommendation. This alternative would have positive economic impacts to the domestic BFT fishery as a whole by allowing BFT fishery participants, either commercial or recreational in nature, to make better informed decisions on how to best establish a business plan for the upcoming season.

Alternative F8 would have some economic impacts as a result of limiting the amount of underharvest of the bluefin tuna quota that could be rolled over from one year to the next within a category. However, this alternative was designed to mitigate any impacts by allowing NMFS to redistribute quota exceeding the proposed 100 percent rollover cap to the Reserve or to other domestic quota categories, provided the redistributions are consistent with ICCAT recommendations and the redistribution criteria.

Alternative F10 would result in slightly more positive economic impacts as the criteria NMFS must consider when making an inseason action determination would be consolidated and consistent regardless of what type of inseason action is being considered. This would minimize confusion and provide additional transparency to the management process.

Other alternatives considered in addition to the No Action (F1, F5, and F9) alternatives were establishing General category time-periods, subquotas, and geographic set asides annually via framework actions (F2); establishing monthly General category time-periods and subquotas (F3(a)); revising the General category time-periods and subquotas to allow for a formalized winter fishery with different time-period allocations (F3(b) and (d)); eliminating the underharvest quota carryover provisions (F7), and eliminating the BFT inseason actions (F10). These additional alternatives would not likely reduce overall impacts to the fishery as a whole further relative to the preferred alternatives.

8.5.3.2 Timeframe for Annual Management of HMS Fisheries

The preferred alternative for the timeframe for annual management of HMS fisheries, which would shift the time frame to a calendar year (January 1 to December 31 (G2)), was designed to minimize economic impacts on HMS fisheries and simplify HMS fishery management and reporting to ICCAT. This alternative would not impact the shark fishery, since that fishery is already operating under a calendar year. The shift in the other HMS fisheries' timeframe for annual management would establish consistent timing between U.S. domestic and international management programs, reducing the complexity of U.S. reports to ICCAT and creating more transparent analyses in the U.S. National Report. Setting an annual quota and other fishery specifications on a multi-year basis for bluefin tuna could mitigate any potential negative impacts associated with reduced business planning periods that may result from a calendar year timeframe. The flexibility established in alternative E6 for billfish could partially mitigate any negative regional economic impacts to marlin tournaments, charters, and other related recreational fishing businesses. To facilitate the transition to a calendar year management timeframe for bluefin tuna and swordfish, the 2007 fishing year would be abbreviated from June 1, 2007 through December 31, 2007, which could provide slightly higher quotas during that time period and slight positive impacts for fishermen. The specifics of this abbreviated season would be implemented under a separate action.

Other alternatives considered were to maintain the current fishing year (G1) and to shift the fishing year to June 1 - May 31 for all HMS species (G3). These alternatives are not likely to result in economic impacts substantially different than the preferred alternative; however, they would not meet the objectives of this action.

8.5.3.3 Authorized Fishing Gears

The preferred alternatives for authorized gears, which would authorize speargun fishing in the recreational Atlantic tuna fishery (H2), authorize buoy gear for the commercial swordfish fishery (H5), and clarify the allowance of hand-held cockpit gear (H7), were designed to reduce the economic impacts to fishermen, in the case of H5, and enhance the economic opportunities in recreational and commercial fishing. Specifically, alternative H2 would enhance economic

opportunities in the tuna recreational fishery by including a new authorized class of recreational fishing, speargun fishing.

The swordfish handgear fishery may currently utilize individual handlines attached to free-floating buoys, however, preferred alternative I5(b) would require that handlines used in HMS fisheries be attached to a vessel. Alternative H5 would change the definition of individual free-floating buoyed lines, that are currently considered to be handlines, to "buoy gear," allowing the commercial swordfish handgear fishery to continue utilizing this gear type. Alternative H5 would explicitly authorized this gear type but limit vessels to possessing and deploying no more than 35 individual buoys with each having no more than two hooks or gangions attached. The economic impact of this alternative would likely be minimal, since the upper limit on the number of buoys is based on information obtained about the fishery though public comment, and based on what NMFS has identified as the manageable upper limit for the commercial sector.

Finally, alternative H7 would also likely reduce confusion over the allowable use of secondary cockpit gears to subdue HMS captured on authorized gears. The use of these secondary gears might result in positive economic benefits from anticipated increases in retention rates.

Other alternatives considered in addition to No Action were to authorize speargun in both the commercial tuna handgear and recreational tuna fisheries (H3), authorizing green-stick fishing gear (H4), and authorizing buoy gear in the commercial swordfish handgear fishery with 50 buoys with 14 hooks each (H6). None of the non-preferred alternatives would have less economic impacts than the preferred alternatives.

8.5.3.4 Regulatory Housekeeping

The preferred alternatives for regulatory housekeeping items were designed to minimize economic impacts, while also clarifying regulatory definitions and requirements, facilitating species identification, and enhancing regulatory compliance.

The preferred alternative I1(c), which would differentiate between BLL and PLL gear by using the species composition of catch landed, would more clearly define the difference between BLL and PLL gear using a combination of gear configuration and performance standards based on the composition of catch landed. This would clarify the difference between these two gear types and enhance compliance with time/area closures that place restrictions on these two gear types. There could be some, but likely limited, economic impacts to vessels that may currently fish in gear restricted time/areas closures that do not conform to the proposed BLL and PLL gear specifications and performance standards. This performance based standard could adversely impact those longline vessels that regularly target both demersal and pelagic species on the same trip. Other alternatives considered in addition to the No Action alternative were to specify maximum and minimum number of floats for BLL and PLL gear (I1(b)) require time/depth recorders on all HMS longlines (I1(d)) and base closures on all longline vessels (I1(e)). Only the No Action alternative could have less onerous economic impacts relative to the preferred alternatives. However, the No Action alternative would not address the Agency's concerns with differentiating between bottom and pelagic longline gear.

The preferred alternative for shark identification, which would require that the second dorsal fin and anal fin remain attached on all sharks (I2(b)), addresses issues associated with shark species identification, but would be flexible enough to still allow fishermen to remove the most valuable fins in order to minimize the economic impacts of this alternative. Fishermen could experience, in the short-term, some adverse economic impacts associated with lower revenues associated with keeping the second dorsal and anal fins on sharks. Other alternatives considered in addition to the No Action alternative (I2(a)) were to require the dorsal and anal fin on all sharks except lemon and nurse sharks (I2(c)) and to require all fins on all sharks be retained (I2(d)). Some alternatives could have fewer economic impacts relative to the preferred alternative. These include the No Action alternative and the alternative requiring the dorsal and anal fin on all sharks except lemon and nurse sharks (I2(c)). These alternatives, however, would not satisfy enforcement and species identification needs.

The preferred alternatives I3(b) and I3(c), which would prohibit the purchase or sale of HMS from vessels in excess of retention limits, would enhance compliance with current regulations by consolidating the requirement for both vessels and dealers. These alternatives would have minimal economic impact on dealers and vessels following the current retention limits. The only additional alternative considered was No Action, which would have less economic impact than the preferred alternatives but would not satisfy the enforcement or monitoring objectives.

The preferred alternative I4(b), which would amend the Florida East Coast closed area, would clarify the regulations regarding this closed area and make them consistent with the boundary of the EEZ. The only additional alternative considered was No Action. Neither alternative is expected to have any economic impact since fishing activity is likely to be limited in this small area.

The preferred alternative I5(b), which would amend the definition of handline gear to require that they be attached to a vessel, would clarify the definition of handline. The economic impact of this new definition would be minimal since unattached handline gear would be defined as “buoy gear” under alternative H5. Other alternatives considered were No Action (I5(a)) and to require handlines be attached to recreational vessels only (I5(c)). These two alternatives could have less economic impacts relative to the preferred alternative, but they would not meet the ecological objectives of this document.

The preferred alternative I6(b), which would prohibit commercial vessels from retaining billfish, would not have any economic impacts because current regulations do not allow these vessels to sell the billfish that are landed. This alternative would clarify and consolidate the requirements for commercial vessels to make them consistent with the regulations prohibiting vessel with pelagic longline gear from retaining billfish. The only other alternative considered was No Action, which could have less social impacts than the preferred alternative but it would not satisfy ecological needs of rebuilding billfish stocks.

The preferred alternative I7(b), which would allow Atlantic tuna dealers to submit reports using the Internet, would simplify reporting and potentially reduce costs. The other alternatives

considered were No Action and providing BFT dealers the option to report online (with specific exceptions). They would not result in less economic burden than the preferred alternative.

The preferred alternatives I8(b) and I8(c), which would require the submission of no fishing and cost-earnings reporting forms, would clarify current regulations and potentially enhance compliance. The other alternative considered was No Action; that alternative would not meet the NMFS' objectives to collect quality data to manage the fishery. Neither alternative is expected to have any economic impacts.

The preferred alternative I9(b), which would require vessel owners to report non-tournament recreational landings, would clarify and simplify the reporting process by codifying the current prevalent practice of recreational landings being reported by vessel owners versus individual anglers. The other alternative considered, No Action (I9(a), might result in less economic burden to small businesses but would not satisfy the goal of improving reporting or other objectives of the FMP.

The preferred alternative I10(c) would conduct additional discussions at ICCAT regarding the long-term implications of allowing unused BFT quota from the previous year being added to the subsequent year's allocation. Depending on the results these discussions the regulations and operation procedures may need to be further amended in the future. In the interim, NMFS would maintain the current regulatory text, but would amend the practice of allowing under/overharvest of this set-aside allocation to be rolled into, or deducted from, the subsequent fishing year's set-aside allocation. Other alternatives considered include No Action and amending the regulatory text to clarify that rollover provisions would apply to this set-aside quota. There could be potential economic impacts associated with all of these alternatives, for instance the potential economic gain attributed to quota being carried forward from the preceding fishing year would remain be available under alternative I10(a) and I10(b), however alternative I10(c) would prevent excessive rollovers from occurring, thereby eliminating an incentive for PLL vessel operators to increase effort, or even possibly directing their effort, on BFT in this area. Accumulation of incidental quota, and possibly providing an incentive to target BFT with longline gear would not fully reflect the intent of the recommendation.

Finally, the preferred alternative I11(b), which would require recreational vessels with a Federal permit to abide by Federal regulations regardless of where they are fishing, would standardize compliance with HMS regulations for vessels possessing a federal HMS permit. This would likely simplify compliance with regulations, except in cases where a state has more restrictive regulations. The other alternative considered was No Action, which could have marginally less economic impact than the preferred alternative, but it would not result in simplified compliance with regulations, and therefore would not meet the objectives of the FMP.

CHAPTER 9 TABLE OF CONTENTS

Chapter 9 Table of Contents **9-i**
Chapter 9 List of Tables **9-iii**
Chapter 9 List of Figures **9-v**
9.0 Community Profiles **9-1**
9.1 Introduction 9-1
9.2 Methodology 9-3
9.2.1 Previous community profiles and assessments 9-3
9.2.2 Information Used in this Assessment 9-3
9.2.2.1 Community Impacts from Hurricanes Katrina and Rita 9-5
9.3 United States Demographic Profile 9-6
9.4 State and Community Profiles 9-7
9.4.1 Maine 9-7
9.4.2 New Hampshire 9-8
9.4.3 Massachusetts 9-9
9.4.3.1 Gloucester, Massachusetts 9-11
9.4.3.2 New Bedford, Massachusetts 9-13
9.4.4 Rhode Island 9-17
9.4.5 Connecticut 9-18
9.4.6 New York 9-20
9.4.7 New Jersey 9-21
9.4.7.1 Barnegat Light, New Jersey 9-22
9.4.7.2 Brielle, New Jersey 9-25
9.4.8 Delaware 9-28
9.4.9 Maryland 9-29
9.4.10 Virginia 9-30
9.4.11 North Carolina 9-31
9.4.11.1 Hatteras 9-33
9.4.11.2 Wanchese, North Carolina 9-36
9.4.12 South Carolina 9-39
9.4.13 Georgia 9-40
9.4.14 Florida 9-41
9.4.14.1 Pompano Beach, Florida 9-43
9.4.14.2 Fort Pierce, Florida 9-45
9.4.14.3 Madeira Beach, Florida 9-46
9.4.14.4 Panama City, Florida 9-49
9.4.14.5 Islamorada, Florida 9-51
9.4.15 Alabama 9-53
9.4.16 Mississippi 9-55
9.4.17 Louisiana 9-56
9.4.17.1 Venice, Louisiana 9-57
9.4.17.2 Dulac, Louisiana 9-61
9.4.18 Texas 9-64
9.4.19 Puerto Rico 9-65
9.4.19.1 Arecibo, Puerto Rico 9-66

9.5 Future Assessments 9-68
Chapter 9 References 9-76

CHAPTER 9 LIST OF TABLES

Table 9.1 Demographic Profile of the United States. Source: U.S. Census, 1990 and 2000. 9-6
Table 9.2 Maine Demographic Profile. Source: U.S. Census, 1990 and 2000. 9-8
Table 9.3 New Hampshire Demographic Profile. Source: U.S. Census, 1990 and 2000 9-9
Table 9.4 Massachusetts Demographic Profile. Source: U.S. Census, 1990 and 2000 9-10
Table 9.5 Demographic Profile of Gloucester, Massachusetts. Source: U.S. Census, 1990 and 2000. 9-12
Table 9.6 Demographic Profile of New Bedford, Massachusetts. Source: U.S. Census, 1990 and 2000. 9-14
Table 9.7 Rhode Island Demographic Profile. Source: U.S. Census, 1990 and 2000 9-18
Table 9.8 Connecticut Demographic Profile. Source: U.S. Census, 1990 and 2000 9-19
Table 9.9 New York Demographic Profile. Source: U.S. Census, 1990 and 2000 9-20
Table 9.10 New Jersey Demographic Profile. Source: U.S. Census, 1990 and 2000 9-22
Table 9.11 Demographic Profile of Barnegat Light. Source: U.S. Census, 1990 & 2000. . 9-23
Table 9.12 Demographic Profile of Brielle, New Jersey. Source: U.S. Census, 1990 and 2000 9-26
Table 9.13 Delaware Demographic Profile. Source: U.S. Census, 1990 and 2000 9-28
Table 9.14 Maryland Demographic Profile. Source: U.S. Census, 1990 and 2000 9-29
Table 9.15 Virginia Demographic Profile. Source: U.S. Census, 1990 and 2000 9-31
Table 9.16 Demographic Profile of North Carolina. Source: U.S. Census, 1990 and 2000 9-32
Table 9.17 Demographic Profile of Hatteras, North Carolina Source: U.S. Census, 1990 and 2000 9-34
Table 9.18 Demographic Profile of Wanchese, North Carolina. Source: U.S. Census 1990 and 2000 9-37
Table 9.19 South Carolina Demographic Profile. Source: U.S. Census, 1990 and 2000 9-39
Table 9.20 Georgia Demographic Profile. Source: U.S. Census, 1990 and 2000 9-40
Table 9.21 Florida Demographic Profile. Source: U.S. Census, 1990 and 2000 9-42
Table 9.22 Demographic Profile of Pompano Beach, Florida. Source: U.S. Census 1990 and 2000 9-44
Table 9.23 Demographics of Fort Pierce, Florida. Source: U.S. Census 1990 and 2000. ... 9-45
Table 9.24 Demographic Profile for Madeira Beach, Florida. Source: U.S. Census 1990 and 2000 9-47
Table 9.25 Demographic Profile for Panama City, Florida. Source: U.S. Census 1990 and 2000 9-50
Table 9.26 Demographic Profile for Islamorada, Florida. Source: U.S. Census, 1990 and 2000 9-53
Table 9.27 Alabama Demographic Profile. Source: U.S. Census, 1990 and 2000. 9-54
Table 9.28 Mississippi Demographic Profile. Source: U.S. Census, 1990 and 2000. 9-55
Table 9.29 Louisiana Demographic Profile. Source: U.S. Census, 1990 and 2000. 9-56

Table 9.30 Demographic Profile of Venice, Louisiana. Source: U.S. Census, 1990 and 2000. 9-60
Table 9.31 Demographic Profile of Dulac, LA. Source: U.S. Census, 1990 and 2000. 9-63
Table 9.32 Texas Demographic Profile. Source: U.S. Census, 1990 and 2000. 9-65
Table 9.33 Puerto Rico Demographic Profile. Source: U.S. Bureau of the Census, 1990 and 2000. 9-65
Table 9.34 Number and Percentage of HMS Angling Permits by State and Country in 2005. 9-69
Table 9.35 Number and Percentage of HMS Charter/Headboat Permits by State and Country in 2005. 9-71
Table 9.36 Number and Percentage of Commercial Tuna Permits by State and Country in 2005. 9-72
Table 9.37 Number and Percentage of HMS Dealers by State and Country as of February 2006 (sharks and swordfish) and for calendar year 2005 (tunas). 9-73
Table 9.38 Number and Percentage of Directed and Incidental Shark Permit Holders by State as of February 2006. 9-74
Table 9.39 Number and Percentage of Swordfish Permit Holders by State as of February 2006. 9-75

CHAPTER 9 LIST OF FIGURES

Figure 9.1 Location of HMS Angling Permit Holders in 2005 and the percentage of Angling permit holders for the top five states..... 9-69

Figure 9.2 Location of HMS Angling Permit Holders in 2005 by region..... 9-70

Figure 9.3 Location of the HMS Charter/Headboat Permit Holders in 2005 and the percentage of HMS Charter/Headboat permit holders for the top five states.... 9-71

Figure 9.4 Location of the Commercial Tuna Permit Holders in 2005 (all gear categories - harpoon, longline, purse seine, and trap) and the percentage of commercial tuna permit holders for the top five states..... 9-72

Figure 9.5 Location of all HMS Dealer Permit Holders as of February 2006 for shark and swordfish permits and for fishery year 2005 for tunas and the percentage of total HMS dealer permit holders for the top five states. 9-73

Figure 9.6 Location of the Shark Directed and Incidental Permit Holders as of February 2006 and percentage of shark permit holders for the top five states. 9-74

Figure 9.7 Location of the Swordfish Permit Holders as of February 2006 and the percentage of swordfish permit holders for the top five states. 9-75

9.0 COMMUNITY PROFILES

This Chapter identifies and describes the HMS fishing communities as required under the Magnuson-Stevens Act and other laws. This Chapter consolidates all of the communities profiled in previous HMS FMPs or FMP amendments and updates the community information where possible. The communities profiled in this chapter were originally selected due to the proportion of HMS landings in the town, the relationship between the geographic communities and the fishing fleets, the existence of other community studies, and input from the HMS and Billfish Advisory Panels. Though additional communities could be impacted by changes to the current HMS regulations, the communities profiled in this section were previously identified as ones that are most likely to experience the most significant impacts. After reviewing the HMS permit databases, additional HMS-related community profiles should be developed in the future. Recommendations for these new profiles are included at the end of this chapter (Section 9.1).

9.1 Introduction

The Magnuson-Stevens Act requires, among other things, that all FMPs include a fishery impact statement intended to assess, specify, and describe the likely effects of the measures on fishermen and fishing communities (§303(a)(9)).

The National Environmental Policy Act (NEPA) also requires federal agencies to consider the interactions of natural and human environments by using a "systematic, interdisciplinary approach which will ensure the integrated use of the natural and social sciences...in planning and decision-making" (§102(2)(A)). Moreover, agencies need to address the aesthetic, historic, cultural, economic, social, or health effects, which may be direct, indirect, or cumulative. Consideration of social impacts is a growing concern as fisheries experience increased participation and/or declines in stocks. The consequences of management actions need to be examined to better ascertain and, if necessary and possible, mitigate regulatory impacts on affected constituents.

Social impacts are generally the consequences to human populations resulting from some type of public or private action. Those consequences may include alterations to the ways in which people live, work or play, relate to one another, and organize to meet their needs. In addition, cultural impacts, which may involve changes in values and beliefs that affect people's way of identifying themselves within their occupation, communities, and society in general are included under this interpretation. Social impact analyses help determine the consequences of policy action in advance by comparing the status quo with the projected impacts. Community profiles are an initial step in the social impact assessment process. Although public hearings and scoping meetings provide input from those concerned with a particular action, they do not constitute a full overview of the fishery.

The Magnuson-Stevens Act outlines a set of National Standards (NS) that apply to all fishery management plans and the implementation of regulations. Specifically, NS 8 notes that:

> "Conservation and management measures shall, consistent with the conservation requirements of this Act (including the prevention of overfishing and rebuilding of

overfished stocks), take into account the importance of fishery resources to fishing communities in order to: (1) provide for the sustained participation of such communities; and, (2) to the extent practicable, minimize adverse economic impacts on such communities." (§301(a)(8)). See also 50 CFR §600.345 for National Standard 8 Guidelines.

"Sustained participation" is defined to mean continued access to the fishery within the constraints of the condition of the resource (50 CFR §600.345(b)(4)). It should be clearly noted that NS 8 "does not constitute a basis for allocation of resources to a specific fishing community nor for providing preferential treatment based on residence in a fishing community" (50 CFR §600.345(b)(2). The Magnuson-Stevens Act further defines a "fishing community" as:

> " ... a community that is substantially dependent upon or substantially engaged in the harvest or processing of fishery resources to meet social and economic needs, and includes fishing vessel owners, operators, crew, and fish processors that are based in such communities." (§3(16))

The National Standard guidelines expand upon the definition of a fishing community, and state that, "A fishing community is a social or economic group whose members reside in a specific location and share a common dependency on commercial, recreational, or subsistence fishing or on directly related fisheries-dependent services and industries (for example, boatyards, ice suppliers, tackle shops)" (50 CFR §600.345(b)(2)). So while there is a diffuse Vietnamese-American population in Louisiana actively participating in the pelagic longline fishery and commuting to fishing ports as mentioned in Section 4.6, this group of individuals is not considered a fishing community, according to the National Standard guidelines.

NMFS (2001) guidelines for social impact assessments specify that the following elements are utilized in the development of FMPs and FMP amendments:

1. The size and demographic characteristics of the fishery-related work force residing in the area; these determine demographic, income, and employment effects in relation to the work force as a whole, by community and region.

2. The cultural issues of attitudes, beliefs, and values of fishermen, fishery-related workers, other stakeholders, and their communities.

3. The effects of proposed actions on social structure and organization; that is, on the ability to provide necessary social support and services to families and communities.

4. The non-economic social aspects of the proposed action or policy; these include life-style issues, health and safety issues, and the non-consumptive and recreational use of living marine resources and their habitats.

5. The historical dependence on and participation in the fishery by fishermen and communities, reflected in the structure of fishing practices, income distribution and rights.

9.2 Methodology

9.2.1 Previous community profiles and assessments

NMFS contracted with Dr. Doug Wilson, from the Ecopolicy Center for Agriculture, Environmental and Resource Issues at Rutgers, the State University of New Jersey, to help develop the community profiles and social impact assessments for the 1999 HMS FMP and Amendment 1 to the FMP for Atlantic Billfish. Dr. Wilson and his colleagues completed their fieldwork in July 1998. This study covered four species groups (tunas, swordfish, sharks and billfishes) that have important commercial and recreational fisheries extending along the Atlantic and Gulf coasts from Maine to Texas and in the Caribbean. The study investigated the social and cultural characteristics of fishing communities in five states and one U.S. territory: Massachusetts, New Jersey, North Carolina, Florida, Louisiana, and Puerto Rico. These areas were selected because they each had important fishing communities that could be affected by the 1999 HMS FMP and Atlantic Billfish Amendment, and because they are fairly evenly spread along the Atlantic and Gulf coasts and the Caribbean. The study compiled basic sociological information from at least two coastal communities for each state or territory. These locations were visited for further analysis. In the 1998 study, towns were selected based on HMS landings data, the relationship between the geographic communities and the fishing fleets, and the existence of other community studies. The information in this document incorporates by reference the Wilson *et al.*, (1998) study of the HMS fishery and the work of McCay and Cieri (2000) for the Mid-Atlantic Fishery Management Council, "The Fishing Ports of the Mid-Atlantic."

Additionally, this Chapter uses the information gathered under the contract with the Virginia Institute of Marine Science (VIMS) at the College of William and Mary to re-evaluate several of the baseline HMS communities (Kirkley, 2005). The VIMS study gathered a profile of basic sociological information for the principal states involved with the Atlantic shark fishery. From the 255 communities identified as involved in the 2001 commercial fishery, Amendment 1 to the 1999 HMS FMP focused on specific towns based on shark landings data, the size of the shark fishing fleet, the relationship between the geographic communities and the fishing fleets, and the existence of other community studies. While the recreational fishery is an important component in the overall shark fishery, the VIMS study did not profile the shark recreational fishery because participation and landings were not documented in a manner that permits community identification. The Wilson *et al*., study 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. To the extent that it is available, the information on the HMS-related recreational fisheries has been incorporated into the community profiles.

9.2.2 Information Used in this Assessment

To ensure continuity with the 1999 HMS FMP and previous amendments, if a community was selected and described as being involved with an HMS fishery, the same community was included in this assessment. The HMS permit data support the need to include the previously profiled communities as communities that continue to be active in HMS fisheries. The communities selected for detailed study are Gloucester and New Bedford, Massachusetts; Barnegat Light and Brielle, New Jersey; Wanchese, and Hatteras Township, North Carolina;

Pompano Beach, Fort Pierce, Madeira Beach, Panama City Beach, and Islamorada, Florida; Boothville/Venice and Dulac, Louisiana; and Arecibo, Puerto Rico. These communities are not intended to be an exhaustive list of every HMS-related community in the United States; rather the objective is to give a broad perspective of representative areas. The demographic profile tables in this chapter were modified from previous documents to include the same baseline information for each community profiled. As a result, most of the tables include more information than portrayed in previous HMS FMPs and amendments. The demographic tables use both 1990 and 2000 Bureau of the Census data for comparative purposes. A profile for the U.S. Virgin Islands could not be created because the 1990 Census data were not available, and only some of the demographic information was available for 2000. Additionally, a descriptive profile for the Virgin Islands has not been developed for any previous HMS-related actions. The descriptive community profiles in this chapter include information provided by Wilson, *et al.* (1998) and Kirkley (2005) with some new information provided by Impact Assessment, Inc (2004) on the Gulf of Mexico communities. Unlike the Wilson, *et al.* (1998) study used in the 1999 HMS FMP, it was not possible to undertake field research for this assessment. In this chapter, the community descriptions are organized by state.

This assessment also reviewed the available information on location of HMS permit holders to provide information about residence and to identify additional HMS-related fishing communities that may be profiled in the future. Six GIS maps were generated to identify the communities where angler, charter/headboat, HMS dealers (tunas, shark, and swordfish combined), commercial tuna (all gear categories combined), directed and incidental shark, and swordfish (directed, incidental, and handgear combined) permit holders reside with four regional maps for the angler permits due to the volume of permit holders. In past community profile and social impact analyses, it was difficult to identify where HMS recreational fishermen were located because no data were available for the number of recreational fishermen and their landings by community. As a result, the previous assessments report on charter fishing operations, fishing tournaments, and related activities to identify the scope of recreational fishing for each of the communities described. The permit holder information should assist in identifying future recreational industry community profiles, such as Ocean City and Berlin, Maryland.

While geographic location is an important component of a fishing community, the transient nature of HMS may cause the permitted fishermen to shift location in an attempt to follow the fish. Because of this characteristic, management measures for HMS often have the most identifiable impacts on fishing fleets that use specific gear types. The geographic concentrations of HMS fisheries may also fluctuate from year to year, as the behavior of these migratory fish is variable. The relationship between these fleets, gear types, and geographic fishing communities is not always a direct one; however, they are important variables for understanding social and cultural impacts. As a result, the inclusion of typical community profiles in HMS management decisions is somewhat difficult, as geographic factors and use of a specific gear type have to be considered.

Several other chapters in this FMP include information that addresses the requirements described Section 9.1 and that is an integral part of this social impact assessment and fishery impact statement. Please refer to the Description of the Fisheries in Chapter 3, the Economic

Evaluation in Chapter 6, the Regulatory Impact Review (RIR) in Chapter 7, and the Final Regulatory Flexibility Analysis (FRFA) in Chapter 8. Furthermore, each of the management alternatives in Chapter 4 includes an assessment of the potential social and economic impacts associated with the proposed alternatives. The preferred alternatives are selected to minimize economic impacts and provide for the sustained participation of fishing communities, while taking the necessary actions to rebuild overfished fisheries as required by the Magnuson-Stevens Act.

9.2.2.1 Community Impacts from Hurricanes Katrina and Rita

The impacts of both Hurricane Katrina (late August 2005) and Hurricane Rita (September 2005) have yet to be fully realized, but have had a devastating effect on many Gulf of Mexico communities. NMFS has conducted assessments of the commercial and recreational fishing sectors, as well as the coastal communities and the supporting marine infrastructure (NMFS, 2005b). Much of this information is still preliminary and has not been thoroughly documented to date.

Storm surge and/or broken levies destroyed many of the Gulf communities, such as Venice, Louisiana and areas south of Belle Chasse (Ingles, pers. com.). Many individuals involved with HMS fisheries, and their families, have lost their homes and have been displaced or are living in temporary structures with no electricity or running water and only minimal monetary assistance from Federal Emergency Management Agency (pers. com. with affected fisheries participants). In some instances, vessels have become the primary residence because their homes were destroyed. Rebuilding has been challenging because many people did not have insurance prior to the hurricanes. Those with insurance found that it covered only wind and not water damage. And others with basic coverage found that it was not enough to cover the boat, business, and home. As a result, the hurricanes have accelerated gentrification in many of the communities (Ingles, pers. com.).

In addition to their homes, the storms had a devastating impact on fishing vessels in the Gulf region. These impacts include, vessels sunk, displaced, piled up, or completely destroyed (Ingles, pers. com.). Even though some vessel did survive the hurricanes, there was a major impact to the supporting infrastructure that the commercial industries rely upon (*e.g.*, seafood dealers, processors, suppliers) and anglers require to go fishing (*e.g.*, bait shops, marinas, etc.) (NMFS, 2005b). Where vessels escaped relatively unscathed by the hurricanes, but lost the supporting infrastructure to continue landing in their usual ports, fishermen chose to land their catch in Gulf ports located further west where the damage was not as great (Ingles, pers. com.).

The pelagic longline fishery was significantly impacted by the hurricanes since about 60 percent of the Eastern pelagic longline vessels were in the Gulf region when the hurricanes arrived (National Fishermen, 2006). The number of sets made in 2005 declined compared to 2004 with a majority of that decline attributable to the Gulf of Mexico area (National Fishermen, 2006). About 22 percent of the active PLL fleet showed no activity during third quarter of 2005, likely due to the impact of Hurricane Katrina; and about 14 percent of the active fleet showed no activity in the fourth quarter, possibly a result of Hurricane Rita. More than half the longline vessels operating out of Louisiana were fishing again by March 2006 with the remainder of the vessels severely damaged or being used for housing, rather than fishing (National Fishermen,

2006). Even those vessels that can still operate may not be in an area where the infrastructure is sufficient to support a commercial fishery and may not be able to relocate due to the rising price of fuel (Ingles, pers. com.).

While the impacts of Hurricanes Katrina and Rita were devastating to many Gulf communities, at least half of the inactive permit holders in the second half of 2005 had renewed their permits as of March 2006 (Preliminary Logbook Data, 2005). Though this does not necessarily indicate that these vessels are actively fishing, it at least indicates that the permit holders are hopeful about using the permits again.

9.3 United States Demographic Profile

In 1990, the United States had a total population of 248.7 million (Table 9.1). The population increased to 281.4 million in 2000. Throughout the previous decade, the population was roughly half female and half male. Individuals between 20 and 44 years of age comprised the largest proportion of the population in both 1990 and 2000. The dominant race was white. Ninety-two million total households, in 1990, grew to 105.5 million households in 2000. The average household and family size remained about the same between the two decades. The number of high school graduates, ages 25 and older, increased between 1990 and 2000 by about five percent (Table 9.1). Between 1990 and 2000, the total number of business establishments in the United States increased from 6.2 to 7.1 million. While unemployment decreased by half in 2000, the individuals below the poverty line decreased by less than one percent. In 1990, employment in farming, fishing, forestry, and mining industries accounted for 3.3 percent collectively; whereas in 2000, collective employment in these industries accounted for less than two percent.

Table 9.1 Demographic Profile of the United States. Source: U.S. Census, 1990 and 2000.

Demographics	1990	2000
Total Population	248,709,873	281,421,906
Sex		
Male	48.7%	49.1%
Female	51.3%	50.9%
Age		
< 20	25.6%	28.6%
20 - 44	43.2%	36.9%
45 - 64	18.6%	22.0%
> 65	12.6%	12.4%
Race		
White	80.3%	75.1%
Black or African American	12.1%	12.3%
American Indian and Alaska Native	0.8%	0.9%
Asian	2.8%	3.6%
Native Hawaiian and Other Pacific Islander	0.1%	0.1%
Other	3.9%	5.5%
Household		
Total	**91,947,410**	**105,480,101**
Family households	70.2%	68%
Nonfamily households	29.8%	32%
Average household size	3	2.59
Average family size	3.16	3.14
Housing Occupancy		
Total housing units	102,263,678	115,904,641
Vacant housing units	10.1%	9.0%
Housing Tenure		
Owner-occupied housing units	64.2%	66.2%
Renter-occupied housing units	35.8%	33.8%

UNITED STATES	1990
Population:	281,421,906
Education:	
High school graduates (25 years or older)	75.2%
Economic Characteristics	
Labor force (16 years and over)	65.3%
Unemployed	6.3%
Median Household Income	$ 30,056
Individuals below the poverty line*	13.1%
Employment in some industry sectors:	
Managerial/professional	26.4%
Technical, Administrative, & Sales	31.7%
Construction, Production, Maintenance, & Transportation	26.2%
Farming, fishing, forestry, & mining	2.5%
Industry	
Farming, fishing, forestry & mining	3.3%
Construction	6.2%
Manufacturing	17.7%
Wholesale trade	4.4%
Retail	16.8%
Education, health & social services	23.3%
Arts, recreation, lodging & food services	1.4%

9.4 State and Community Profiles

9.4.1 Maine

Between 1990 and 2000, the population in the state of Maine increased by about 4.6 percent (Table 9.2). The number of high school graduates, ages 25 years and older, has increased over the past decade. The unemployment rate decreased, while the percentage of individuals below the poverty line remained the same. Employment in the farming, fishing, forestry, and mining industries remained about the same with education, health, and social services industries providing the greatest source of employment for the state's residents.

As of February 2006, Maine had nine commercial vessels with shark and swordfish fishing permits (Table 9.38 and Table 9.39) and 517 commercial tuna permit holders (Figure 9.4 and Table 9.36). Maine also has 26 licensed dealers for tunas, sharks, and swordfish; ten of the dealers reside in Portland (Table 9.37 and Figure 9.5). In fact, Maine has the third greatest number of commercial tuna permit holders with 10.2 percent of the total (Table 9.36).

Despite having only four shark permits issued to Maine residents in 2006, there were several communities involved with the commercial shark fishery in 2003, such as Cape Elizabeth, Harpswell, and Portland (Cumberland County); Southwest Harbor and Winter Harbor (Hancock County); Owls Head and Rockland (Knox County); and Kittery, Milbridge, and Old Orchard Beach (York County) (NMFS 1999a). Many of the vessels homeported in Maine participate in the shark fisheries in southern waters and make landings in Florida and other states; therefore, landings are not always indicative of a community's involvement in a fishery. The incidental nature of shark catches off Maine for the commercial fishery is also true for the recreational fishery. Sharks are often taken incidentally during tuna fishing trips. There is, however, a small group of anglers who fish with light tackle for blue shark, mako, and porbeagle in the Gulf of Maine. To date, no HMS-related community profiles have been developed for the State of Maine, as there are no significant concentrations of HMS-related fisheries in any particular community.

In 2004, an estimated 287,000 sportfishermen made 760,000 fishing trips in marine waters off Maine (NMFS, 2005a). Of these anglers, about 54 percent were from out of state. About one percent of the HMS angling permit holders live in the state of Maine (Table 9.34 and Figure 9.1). The American Sportfishing Association (ASA) estimated that all saltwater recreational fishing in Maine in 2001 generated some $67.8 million in direct and indirect retail sales. Employment in marine recreational fishing services was estimated to be 1,287 jobs (ASA, 2002). An indication of recreational interest in shark fishing is that charterboats advertise for shark fishing trips from York Harbor, Sheepscot, Casco Bay, Saco Bay, Bath, Damariscotta, and Old Orchard Beach. Sixty-one charter/headboats in Maine held HMS permits as of February 2006 (Table 9.35). These Maine charter operations are seasonal, typically from Memorial Day to Labor Day, and some of the operators advertise that they move to Florida, or the Caribbean, to run charters during the Florida season from November to May.

Table 9.2 Maine Demographic Profile. Source: U.S. Census, 1990 and 2000.

Maine	1990	2000
Population:	**1,227,928**	**1,274,923**
Education:		
High school graduates (25 years or older)	78.8%	85.4%
Employment:		
Labor force (16 years and over)	65.6%	65.3%
Unemployment Rate	6.6%	4.8%
Median Household Income	$27,854	$37,240
Individuals below the poverty line*	10.8%	10.9%
Employment in some industry sectors:		
Farming, fishing, forestry & mining	2.8%	2.6%
Construction	7.3%	6.9%
Manufacturing	19.7%	14.2%
Wholesale trade	3.6%	3.4%
Retail	18.4%	13.5%
Education, health & social services	24.8%	23.2%
Arts, recreation, lodging & food services	0.9%	7.1%

*U.S. Census uses data from 1989 and 1999 to estimate these values.

9.4.2 New Hampshire

New Hampshire's population increased by about 10.3 percent between 1990 and 2000 (Table 9.3). The number of high school graduates, ages 25 years and older, increased slightly. The unemployment rate decreased, while the percentage of individuals below the poverty line remained the same. Employment in the farming, fishing, forestry, and mining industries declined by six percent with education, health, and social services industries continued to provide the greatest source of employment for the state's residents.

New Hampshire's commercial shark fishery is very small and largely incidental to the take of other species. The local shark fishery involves three vessels (Table 9.38). Only one swordfish permit holder resides in New Hampshire (Table 9.39). There are 26 HMS dealers in the state of New Hampshire (Table 9.37). New Hampshire has the sixth greatest number of commercial tuna permit holders (Table 9.36). Slightly greater than one percent of the angling permit holders reside in New Hampshire (Table 9.34). Because of the relatively small size of the HMS fisheries, community profiles were not developed for New Hampshire ports.

The recreational fishery for sharks in New Hampshire waters is largely incidental, on a very small scale, and similar to that of Maine. Occasionally caught close to shore, most makos are taken in water reaching depths over 20 fathoms. New Hampshire is home to 324 HMS angling permit holders in 2005 (Table 9.34). There are 55 charterboat operators in Portsmouth, Rye, Seabrook, Hampton, as well as a few other towns, held HMS permits in 2005 (Table 9.35). Many of these charterboats advertise shark fishing trips offshore from June through September, with the best fishing in June and July. Target species for these trips are mako, blue, thresher and porbeagle sharks.

In 2003, 164,000 anglers made 361,000 fishing trips to the marine waters off New Hampshire (NMFS, 2003). Of these saltwater anglers, 43 percent were visitors from out-of-state. It is estimated that these saltwater anglers generated some $59.3 million in direct and indirect retail sales related to their fishing in New Hampshire in 2001 (ASA, 2002). The marine recreational fishing services sector provided some 1,103 jobs in the state in 2001.

Table 9.3 New Hampshire Demographic Profile. Source: U.S. Census, 1990 and 2000

New Hampshire	1990	2000
Population:	**1,109,252**	**1,235,786**
Education:		
High school graduates (25 years or older)	82.2%	87.4%
Employment:		
Labor force (16 years and over)	71.9%	70.5%
Unemployment Rate	6.2%	3.8%
Median Household Income	$36,329	$49,467
Individuals below the poverty line*	6.4%	6.5%
Employment in some industry sectors:		
Farming, fishing, forestry & mining	1.5%	0.9%
Construction	7.1%	6.8%
Manufacturing	22.5%	18.1%
Wholesale trade	4.0%	3.6%
Retail	17.6%	13.7%
Education, health & social services	22.6%	20.0%
Arts, recreation, lodging & food services	1.2%	6.9%

*U.S. Census uses data from 1989 and 1999 to estimate these values.

9.4.3 Massachusetts

Commercial fisheries in Massachusetts are diverse, and range from small-scale inshore small-boat fisheries for lobster and clams, to offshore scallops, groundfish dragging, and longline fishing for HMS species. In 2003, New Bedford, Massachusetts ranked eighth in the United States for the weight of fish landed, and first for value with ex-vessel sales, bringing in 176.2 million dollars (NMFS, 2004). In the same year, Gloucester ranked twelfth in weight of fish landed and thirteenth in ex-vessel value. Due to the number of HMS permit holders and the relative importance of commercial and recreational fisheries to the Commonwealth, community profiles for both New Bedford and Gloucester were originally developed for the 1999 HMS FMP and have been included below.

The population in the Commonwealth of Massachusetts increased from 6 million people to 6.3 million people over the past decade (Table 9.4). The majority of individuals 25 years and older have a high school diploma and/or a graduate level degree. The percentage of employed individuals and individuals below the poverty line has remained about the same in the past decade, but there has been a slight decline in the unemployment rate, almost two percent. Employment in the farming, fishing, forestry, and mining industries has declined over the last decade. The arts, recreation, lodging, and food services industries are the only industries that expanded.

Massachusetts holds the greatest number of commercial tuna permits with 1,601 vessels permitted in 2005 (Table 9.36). In addition, Gloucester has the greatest concentration of commercial tuna permit holders with 106 vessels permitted (Figure 9.4). Massachusetts is ranked fourth in the greatest number of swordfish permit holders with just over nine percent of the total swordfish permit holders residing in Massachusetts (Table 9.39). In addition to swordfish, there are 17 directed and incidental shark permit holders (Table 9.38). Boston has the greatest concentration of HMS permitted dealers with New Bedford and New York City in second and third for the greatest number of HMS dealers (Table 9.37 and Figure 9.5).

Table 9.4 Massachusetts Demographic Profile. Source: U.S. Census, 1990 and 2000

Massachusetts	1990	2000
Population:	**6,016,425**	**6,349,097**
Education:		
High school graduates (25 years or older)	80.0%	84.8%
Employment:		
Labor force (16 years and over)	67.8%	66.2%
Unemployment Rate	6.7%	4.6%
Median Household Income	$36,952	$50,502
Individuals below the poverty line*	8.9%	9.3%
Employment in some industry sectors:		
Farming, fishing, forestry & mining	1.2%	0.4%
Construction	5.5%	5.5%
Manufacturing	18.1%	12.8%
Wholesale trade	4.1%	3.3%
Retail	16.2%	11.0%
Education, health & social services	28.0%	23.7%
Arts, recreation, lodging & food services	1.1%	6.8%

*U.S. Census uses data from 1989 and 1999 to estimate these values.

In 2003, marine recreational fishing in Massachusetts attracted an estimated 1,017,000 anglers making 4,569,000 fishing trips in both state and Federal waters (NMFS, 2004b). Approximately, 344,000 (34 percent) of the anglers were from out of state. Direct and indirect retail sales generated by marine recreational fishermen in Massachusetts in 2001 were estimated to be $320.7 million (ASA, 2002). The marine recreational fishing industry generated 5,423 jobs in the Commonwealth in 2001. Shark fishing, largely catch-and-release using light tackle, takes place in offshore waters (NMFS, 2003). Recreational vessels often travel 50 - 100 miles out to their fishing grounds and most shark trips are 10 - 12 hours in duration, with some extending to an overnight trip, or even two- or three-day trips. Massachusetts residents held 557 charter/headboat permits in 2005. Sharks are usually taken incidental to bluefin tuna fishing, but a number of charterboat operators advertise shark fishing trips. The target shark species South and East of Cape Cod are mako, blue and porbeagle sharks and these species, as well as thresher, dusky, and tiger sharks are found throughout the Gulf of Maine.

HMS fishing tournaments are promoted, and participated in, by some charterboat operators (NMFS 2003). Examples of these tournaments include Boston Big Game and Monster Shark Tournaments (Oak Bluffs); Nantucket Angler's Club (Nantucket); Fisherman Outfitter's

Cutty Hunk Shootout (Cutty Hunk); and Giant Bluefin Tournament (Hyannis). Charterboat operations advertising shark fishing trips are based in Newburyport, Rockport, Gloucester, Boston, Quincy, Chatham, Harwich Port, South Yarmouth, Hyannis, Mashpee, East Falmouth, Oak Bluffs, Edgartown, Vineyard Haven, Menemsha, Mattapoisett, Fairhaven, New Bedford, and Westport Point.

9.4.3.1 Gloucester, Massachusetts

In 1990, the population of Gloucester was 28,716. There was a minimal population increase of approximately 1,500 individuals between 1990 and 2000 (Table 9.5). Forty percent of the population was between the ages 20 – 44 years old in 2000. The median age of the Gloucester population has gotten older by five years, rising to 40 years old in 2000. There is a slightly larger percentage of females in the Gloucester population, 48 percent males to 52 percent females. In 2000, the number of households is two and half times greater than in 1990, but the total number of housing units increased only slightly, from 13,125 to 13,958.

A greater percentage of the 16 years and older population was an active part of the labor force during 2000 (Table 9.5). While the percentage of unemployed declined, the percentage of individuals below the poverty line increased in the last decade. The greatest source of employment in 1990 was the technical and administrative industries. In 2000, 36 percent of the population was employed in the managerial and professional industries. The number of businesses engaged in the forestry, fishing, hunting, mining, and agriculture industries declined over the last decade from 3.9 percent to 2.5 percent. The greatest percentage of businesses was engaged in education, health, and social service.

Gloucester residents hold the largest number of commercial tuna permits with 106 permits issued in 2005 (Table 9.36 and Figure 9.4). The Atlantic bluefin tuna purse seine fishery lasts for a short period of time each year and is limited by regulation to five vessels. One purse seine vessel operates out of Gloucester. The economic health of the purse seine fishery is heavily dependent on bluefin tuna prices and, concomitantly, on the value of the Japanese yen. Finding crew is not a problem; many of the current crew members have had their berths for years. The owner and many of the crew of purse seine vessels, even some who do not reside in the community, are well-integrated through kinship ties into the fishing community. They see themselves as responsible for creating the bluefin tuna fishery and the fleet enjoys the respect of the extended fishing communities in Gloucester (Wilson *et al*., 1998).

There are also a large number of HMS dealers in the Gloucester area, licensed to purchase and sell tuna, sharks, and swordfish (Table 9.37 and Figure 9.5). Bluefin tuna dealers in Gloucester work with a large number of vessels of various types, including purse seine vessels. Most bluefin tuna are sold on consignment, and some dealers give a minimum guarantee on fish they take. Personal networks are very important and the competition can be intense. During the bluefin tuna season, some transient dealers come to Gloucester. The largest dealer buys from the purse seine vessels because it is one of the few dealers that is able to finance the transaction. This business has only one full-time employee and up to seven seasonal employees, who may be fishermen seeking alternative employment. The dealer to whom the purse seine vessels sell their bluefin tuna heavily depends on those vessels to maintain its current profit margins. However, this dealer reports that the structure of its business is such that there

would be no lost jobs even if the purse seine landings were significantly reduced, since BFT reallocated to another gear category would likely be handled by the same dealer (Wilson *et al*., 1998).

Table 9.5 Demographic Profile of Gloucester, Massachusetts. Source: U.S. Census, 1990 and 2000.

Demographics	1990	2000
Total Population	28,716	30,273
Sex		
Male	48.2%	47.9%
Female	51.8%	52.1%
Age		
Median Age	**35.5**	**40.2**
< 20	25.2%	23.9%
20 - 44	39.3%	34.4%
45 - 64	20.2%	26.1%
> 65	15.4%	15.6%
Race		
White	99.4%	97.0%
Black or African American	0.2%	0.6%
American Indian & Alaska Native	0.1%	0.1%
Asian	0.2%	0.7%
Other	0.1%	0.5%
Household		
Total	**11,550**	**29,913**
Family households	66.1%	62.7%
Nonfamily households	33.9%	37.3%
Average household size	2.49	2.38
Average family size	3.11	3.00
Housing Occupancy		
Total housing units	13,125	13,958
Vacant housing units	11.8%	9.8%
Housing Tenure		
Owner-occupied housing units	57.8%	59.7%
Renter-occupied housing units	42.2%	40.3%

Gloucester, Massachusetts	1990	2000
Population:	28,716	30,273
Education:		
High school graduates (25 years or older)	75.6%	85.7%
Economic Characteristics		
Labor force (16 years and over)	62.6%	66.1%
Unemployed	4.5%	3.2%
Median Household Income	$ 32,690	$ 47,722
Individuals below the poverty line	7.5%	8.8%
Employment in some industry sectors:		
Managerial/professional	26.8%	36.1%
Technical/administrative	28.0%	25.4%
Construction, Production, Maintenance, & Transportation	2.8%	21.4%
Farming, fishing, forestry, & mining	13.0%	2.0%
Industry		
Forestry, fishing, hunting, mining, and agriculture	3.9%	2.5%
Construction	5.5%	7.1%
Manufacturing	22.1%	16.7%
Wholesale trade	4.7%	3.6%
Retail trade	16.2%	10.8%
Education, health & social services	14.1%	20.2%
Arts, recreation, lodging & food services	1.4%	9.2%

Commercial rod and reel tuna fishing (with General category permits) as well as recreational rod and reel tuna fishing (with Angling category permits) drive a large shoreside economy, including the sale and repair of tackle, vessels, and engines, and the sale of supplies such as bait and ice. The rod and reel fishery also supports general tourist services such as restaurants and hotels. This community is competing with many other possible tourist destinations for tuna fishermen, increasing their dependence on the bluefin tuna as a prominent attraction. Vulnerabilities stem from the seasonal nature of tuna fishing in Gloucester and the general dependence of tuna fishing on the health of the economy. According to those interviewed, seasonality makes business planning, as well as finding and retaining trained employees, more difficult (Wilson, *et al*., 1998).

The bluefin tuna rod and reel fishery attracts wealthier fishermen than the fisheries for many other species. The bluefin tuna fishing experience is not always a family activity, but it is often the attraction that brings an adult, and hence the rest of the family, to the community. It attracts experienced and amateur fishermen alike, as well as adventure seekers who are often outdoors enthusiasts in other arenas. Gloucester used to have an annual bluefin tuna tournament organized by the largest of the recreational marinas. However, limited availability of fish has canceled the tournament in past years (Wilson *et al*., 1998). Most fishing tourists who come to Gloucester are from the northeastern United States. These “weekend warrior” bluefin tuna

fishermen have an important impact on the community's economy, particularly weekend fuel sales (Wilson, *et al*., 1998).

The Gloucester charter fleet follows a standard policy that, when a bluefin tuna is landed, the fish belongs to the vessel and the charter for the day is free, since the vessel operator may sell the fish to the dealer (Wilson *et al*., 1998). Serious customers want to target bluefin tuna, even though there is a low probability that they will catch them. Very often when the General category is open, charter captains will take an extra mate and fish for bluefin tuna without paying passengers. They feel that having no amateurs on board enhances their chances of actually landing a fish.

Of the three retail tackle shops in Gloucester, only one specializes in offshore fishing. Eighty-five percent of its business is related to both commercial and recreational bluefin tuna fishing. Bluefin tuna and shark fishing gear is very expensive; reels cost $800 to $1,000 and are useful for shark and bluefin tuna only. Fishermen in Gloucester often choose high quality gear and show little concern about price (Wilson *et al*., 1998).

In the HMS rod and reel fishery of Gloucester, sharks are usually not the primary target species, but they are encountered incidentally to tunas. Most sharks caught in Gloucester recreational fisheries are released (Wilson *et al*., 1998). Researchers noted tension and distance between the recreational and commercial fishing communities, as recreational fishermen tend to believe that commercial fishing is to blame for the decline in local shark populations.

9.4.3.2 New Bedford, Massachusetts

New Bedford is a long and narrow city along the coast of southern Massachusetts, facing the city of Fairhaven across the water. New Bedford faces problems associated with its urban setting, such as low education levels and high unemployment. The working waterfront and its industry have become increasingly important economically as the manufacturing base of the city has declined. With multiplier effects, the city's economy may benefit from the fishing industry by $500 million (Wilson *et al*., 1998). Thousands of people are employed in supporting services such as processing, manufacturers of equipment, transport companies, supply houses, oil companies, welders, pipe fitters, stores, settlement houses, *etc*. Once the "whaling capital of the world," New Bedford still possesses one of the largest fishing fleets in the eastern United States (NOAA, 1996). New Bedford ranked seventh in the United States for the weight of fish landed in 2004, and first for value with ex-vessel sales bringing in 206.5 million dollars (NMFS, 2005a).

New Bedford has learned a great deal about how to survive crises in fisheries. Many of the members of this fishing community are descended from Portuguese fishing families and kinship networks are an extremely important influence on employment patterns in the fishing industry (NMFS, 1999a). The Portuguese families are very close and many trace their families back to fishermen in Portugal. The Fishermen's Family Assistance Center opened in 1994 with help from the Federal government in response to the collapse in the groundfish fishery. Thirty-two vessels in New Bedford were removed through the buyback program. With help from the Center, ex-fishermen are finding jobs, particularly in the marine trade, computer, and trucking industries. The marine trade jobs tend to be in New York, New Jersey, and Massachusetts.

Other industries in New Bedford have been supportive of the fishermen through the crisis and extended family networks have helped minimize social impacts (Wilson, *et al*., 1998).

Between 1990 and 2000, New Bedford experienced a decrease in its population of over 6,000 individuals — 99,922 in 1990 to 93,768 in 2000 (Table 9.6). The median age of the population increased slightly, from 33 to 36 years old. The 2000 age distribution remains relatively similar to the age distribution in 1990 with the greatest percentage of individuals in the 20 to 44 years age group. The percentage of females in the population is larger than the percentage of males in both 1990 and 2000 by 6 percent. The number of total households increased by 42 percent in the last decade, which could be attributed to an increase in the number of non-family households.

The number of high school graduates increased by almost 8 percent in the 1990s (Table 9.6). The size of the 16 years and older labor force increased, and the percentage of unemployed declined, but the percentage of individuals below the poverty line increased by almost 4 percent. A large percentage of New Bedford residents are employed in the construction, production, maintenance, and transportation industries. This was a significant increase over the last decade in this sector, where the greatest percentage of employment was in the technical, administrative, and sales industries throughout the 1990s. The percentage of businesses engaged in the forestry, fishing, hunting, and agriculture industries declined by almost a third throughout the 1990s. In 2000, the major industries were manufacturing and education, health, and social services.

Table 9.6 Demographic Profile of New Bedford, Massachusetts. Source: U.S. Census, 1990 and 2000.

Demographics	1990	2000
Total Population	99,922	93,768
Sex		
Male	46.7%	47.1%
Female	53.3%	52.9%
Age		
Median Age	**32.6**	**35.9**
< 20	29.1%	27.4%
20-44	35.4%	35.6%
45- 64	18.0%	20.1%
> 65	17.4%	16.7%
Race		
White	87.8%	78.9%
Black or African American	3.8%	4.4%
American Indian and Alaska Native	0.4%	0.6%
Asian and Pacific Islander	0.3%	0.7%
Other	7.6%	9.5%
Household		
Total	**38,646**	**91,782**
Family households	69.0%	63.1%
Nonfamily households	31.0%	39.9%
Average household size	2.59	2.40
Average family size	3.15	3.01
Housing Occupancy		
Total housing units	41,760	41,511
Vacant housing units	7.1%	8.0%
Housing Tenure		
Owner-occupied housing units	43.8%	43.8%
Renter-occupied housing units	56.2%	56.2%

New Bedford, Massachusetts	1990	2000
Population:	99,922	93,678
Education:		
High school graduates (25 years or older)	49.7%	57.6%
Economic Characteristics		
Labor force (16 years and over)	52.1%	57.7%
Unemployed	7.2%	5.0%
Median Household Income	$ 22,647	$ 27,569
Individuals below the poverty line	16.8%	20.2%
Employment in some industry sectors:		
Managerial/professional	17.0%	20.8%
Technical, Administrative, & Sales	27.2%	23.6%
Construction, Production, Maintenance, & Transportation	2.6%	34.9%
Farming, fishing, forestry, & mining	11.9%	1.0%
Industry		
Forestry, fishing, hunting, mining, and agriculture	3.16%	1.1%
Construction	6.1%	7.1%
Manufacturing	27.8%	20.7%
Wholesale trade	4.3%	4.4%
Retail trade	17.0%	12.1%
Education, health & social services	15.4%	20.9%
Arts, recreation, lodging & food services	0.7%	7.4%

New Bedford also has a large number of residents with a commercial tuna permit (Table 9.36 and Figure 9.4). All pelagic longline vessels that land HMS in New Bedford are large "distant water" vessels. The fleet consists of large vessels that follow swordfish throughout their migrations. These vessels make long trips, are relatively expensive to operate, and are highly specialized to distant water fishing (*i.e*., they have large holds and additional fuel capacity). Respondents to the Wilson *et al*. study report that these large distant water vessels have developed a minimal history in other U.S. fisheries, though it is fairly easy for both the vessels and captains to find work in foreign longline fisheries. Many of these vessels already moved from the Atlantic Ocean to the Pacific Ocean, and others are currently for sale (Wilson *et al*., 1998). In summer months, the remaining large distant water vessels fish on the Grand Banks and land swordfish in New England and Canadian ports. During winter months, their product is initially landed in San Juan, Puerto Rico and transhipped to New Bedford and other destinations. San Juan, Puerto Rico is the only international airport in the Caribbean with the necessary lift capacity to tranship their product. Long storage time at sea means that this fleet produces relatively lower quality swordfish, so they compete directly with cheaper imports for the low-end markets. Participants report concern over expenses and the decreased price of swordfish.

Because of these problems and the pressures brought about by increased regulation and several decreasing fish stocks, the distant water fleet has responded by staying out at sea for longer periods (Wilson *et al*., 1998). This has affected family life; wives of fishermen do not want to raise children essentially alone. While some members of this fleet, their suppliers, and their customers live in the New Bedford area, the distant water fleet is not attached to a geographical community in the same sense as other fleets. Participants in this fleet tend to be fairly isolated within the communities where they live, even when those communities are strongly integrated fishing communities like New Bedford. The wives of captains and crew who participate in the distant water fishery generally do not know each other well. New Bedford has a fishermen's wives association but it is mainly for older Portuguese women whose husbands are scallopers and draggers "who do only 14-day trips" (Wilson *et al*., 1998). New Bedford respondents not associated with the distant water fleet report that they see it as socially distant from the rest of the community. This isolation from other fishing people, and the length of the trips, has placed a strain on the family life of participants.

The distant water fleet has used its longer reach to recruit crew members from overseas, particularly the West Indies, thus avoiding crew supply problems typical of other sectors of the longline fleet. The range of these vessels over many different waters makes them particularly dependent on the skill and experience of their captains. New Bedford does not offer these captains alternative employment outside of the fishing industry at comparable income levels (Wilson, *et al*., 1998).

A dealer in the New Bedford area who purchases from the distant water fleet does $15 million to $20 million worth of business each year, including imports. About half of the dealer's purchases are domestic. Overall, his business consists of 60 percent swordfish, 15 percent tunas (yellowfin, bigeye, bluefin), ten percent lobster, and 15 percent other (sharks, bait, *etc.*). The dealer employs 40 to 65 people depending on supply conditions (Wilson *et al*., 1998). There are also a large number of HMS dealers in Gloucester licensed to purchase and sell tunas, sharks, and swordfish (Figure 9.5).

When fishing is disrupted through closures, the dealers experience large labor fluctuations. Even the increased reliance on imports has not completely solved this problem. When they make an effort to buy from U.S. vessels in distant waters, special arrangements and timing are required to get the fish to market and maintain vessels. The fishermen have to unload close to an international airport with lift capacity, which in the Caribbean means San Juan. The dealers have to hire people to unload any vessel landings in San Juan, and send supervisors so that the fish is kept cold, weighed properly and counted correctly. Then they need to arrange for cargo departure and negotiate freight weight. These activities can be easily disrupted by short notice of seasonal closures and other regulatory decisions.

Of the five vessels that hold permits to fish in the bluefin tuna purse seine fishery, four are associated with New Bedford. One of these vessels is owned by a resident while the three other vessels are owned by non-residents. All four land their catch in New Bedford and have crew members who live in the city. The owners and many of the crew of the purse seine vessels, even some who do not reside in the community, are well integrated through kinship ties into the fishing community. They are generally thought of as being responsible for creating the bluefin tuna fishery, and the fleet enjoys the respect of extended fishing communities in New Bedford (Wilson *et al*., 1998). Three of these vessels do nothing else but fish for bluefin tuna and are tied up at the dock for the rest of the year. The fourth vessel holds a scallop permit as well. Many of the current crew members have had their berths for years. In 1998, these vessels employed 26 crew members combined, 24 percent less than they did at the height of this fishery in the 1980s. Many of these crew members are family and almost all have been with these vessels for a long time. The average age is considerably older than that of most fishing crews. When the vessels are tied up, the crew members collect unemployment and do odd jobs. A greater percentage of the crew members' wives worked outside the home in the 1990s compared to the 1980s (Wilson *et al*., 1998).

The purse seine fleet's economic health is heavily dependent on bluefin tuna prices and, concomitantly, on the value of the Japanese yen. The New Bedford dealer who buys bluefin tuna from the purse seine fleet has been in business since the early 1960s. This dealer currently depends on the purse seiners to maintain profit margins. However, he reports that the structure of his businesses is such that there would be no lost jobs even if the purse seine landings were to be significantly reduced, since any bluefin tuna reallocated to other commercial categories would likely be handled by the same dealer. The business employs 200 people and would not lay off workers if the bluefin tuna quota were cut. While bluefin tuna currently makes up only 1.25 percent of their gross dollars, it accounts for 25 percent or more of their net profit.

The recreational tuna fishing industry in New Bedford is a highly diverse one, with an increasing emphasis on providing an enjoyable fishing experience for all ages. Fishery participants feel that bluefin tuna fishing is an adventure, and the prize is an important aspect of the experience. It attracts experienced and amateur fishermen alike, as well as adventure seekers who are often outdoors enthusiasts in other arenas. Most charterboats in the New Bedford area are owner-operated. Respondents report that it can be hard to find suitable crew members because the business is seasonal and they are unwilling to hire unemployed commercial fishermen (Wilson *et al*., 1998).

Recreational fishing in these communities drives a much larger economy, including the marine trades (tackle, vessels, engines, *etc.*), suppliers of bait and ice, and general tourist services such as restaurants and hotels. These communities are competing with many other possible tourist destinations, increasing their dependence on large, well-known fish that act as prominent attractions. Economic vulnerabilities stem from the seasonal nature of recreational fishing in these communities and recreational fishing's general dependence on the health of the economy. The seasonality of this fishery makes business planning, as well as training and keeping employees, more difficult. Respondents emphasized that these communities depend on potential customers' expectation that they will have a reasonable chance to land a fish (Wilson *et al*., 1998).

Shark tournaments are also an important component in promoting business in the New Bedford area, attracting numerous repeat customers. They bring in curious people because sharks are considered a dangerous and exciting fish. Recreational shark fishing in New Bedford is mainly catch-and-release (Wilson *et al*., 1998). However, respondents argue that New Bedford is not the appropriate area for catch-and-release tournaments, because the length of the trip (100 miles) makes taking observers impractical. Although shark fishing is comparatively less important to recreational fishermen in this community, some customers are attracted by the particular challenge of shark fishing. Recreational fishermen throughout the area tend to believe that commercial fishing is to blame for the decline in shark populations.

9.4.4 Rhode Island

Rhode Island's population increased from just over one million people in 1990 to 1.1 million people in 2000 (Table 9.7). The percentage of individuals 25 years and older with a high school diploma and/or some graduate level degree has increased by three percent. The percentage of employed individuals and the unemployment rate declined slightly, but the number of individuals below the poverty line increased from 9.6 percent to almost 12 percent. Employment in the farming, fishing, forestry, and mining industries has declined with the education, health, and social services industries providing the greatest employment opportunities in 2000. Due to the relatively low involvement in the HMS fisheries in the past, there are no community profiles describing the relationship of HMS fisheries to any Rhode Island communities.

Over four and half percent of the commercial tuna permit holders reside in Rhode Island (Table 9.36) with a concentration of permit holders residing in Wakefield (Figure 9.1). Nine shark permit holders and 27 swordfish permit holders are located in the state of Rhode Island (Table 9.38 and Table 9.39). Communities involved with the commercial fisheries are Warwick, Little Compton, Newport, Tiverton, Block Island, Narragansett, Peace Dale, Point Judith, South Kingstown, Wakefield and West Kingstown. Rhode Island also has 45 HMS dealers, operating in Newport, Point Judith, Middletown, Wakefield, Narragansett, Peace Dale, South Kingstown, and Block Island (Table 9.37 and Figure 9.5). In the future, NMFS may want to consider developing a HMS-related community profile for Wakefield, Rhode Island due to the number of residents involved in the commercial tuna and swordfish fisheries according to the information from the HMS permit databases.

Table 9.7 Rhode Island Demographic Profile. Source: U.S. Census, 1990 and 2000

Rhode Island	1990	2000
Population:	**1,003,464**	**1,048,319**
Education:		
High school graduates (25 years or older)	72.0%	78.0%
Employment:		
Labor force (16 years and over)	66.1%	64.6%
Unemployment Rate	6.6%	5.6%
Median Household Income	$32,181	$42,090
Individuals below the poverty line*	9.6%	11.9%
Employment in some industry sectors:		
Farming, fishing, forestry & mining	1.3%	0.5%
Construction	5.7%	5.4%
Manufacturing	22.7%	16.4%
Wholesale trade	3.7%	3.4%
Retail	17.5%	12.1%
Education, health & social services	25.0%	23.0%
Arts, recreation, lodging & food services	1.2%	8.6%

*U.S. Census uses data from 1989 and 1999 to estimate these values.

In 2004, some 351,000 anglers took 1,444,000 saltwater fishing trips for all species of fish in the state of Rhode Island (NMFS, 2005a). Of these marine anglers, about 65 percent were from out-of-state. In 2005, 831 Rhode Island residents held an HMS angling permit (Table 9.34). Retail sales generated by marine anglers in Rhode Island in 2001 are estimated to total $86.2 million and 1,382 jobs were generated in the marine recreational fishing industry (ASA, 2002). Recreational shark fishing from Rhode Island is seasonal between late June and October, with a peak in late August (NMFS 2003). A variety of shark species are available with the most common being mako sharks between 60 - 100 pounds. After mako, thresher, blue, dusky and sandbar sharks are the most common species caught by anglers. Light tackle is the gear preferred for shark fishing by the charter operators and most private boat fishermen, and catch-and-release is normal in the fishery.

In Rhode Island, the number of charter/headboat permit holders increased from 94 in 2003 to 143 in 2005 (Table 9.35). Charter operators offering shark fishing trips are based in Block Island, Point Judith, Little Compton, Warwick, West Greenwich, Newport, and Westerly. Charter trips for sharks are usually to the deep waters South of Rhode Island and the eastern tip of Long Island, last at least 10 hours and, in August, are often overnight trips. On the ten-hour trips with five anglers onboard, the average fee was on the order of $800 in 2003 (NMFS, 2003). This fee is comparable to those charged in the other New England states. Fees for participation in a five-day fishing tournament are on the order of $4,500 for a fully rigged and provisioned boat with skipper and mate (the angler is responsible for the payment of the tournament fees, which can be in excess of $5,000 per angler).

9.4.5 Connecticut

Connecticut's population has increased by 3.5 percent between 1990 and 2000 (Table 9.8). The percentage of individuals 25 years and older with a high school diploma and/or a

graduate level degree has increased by about five percent. The percentage of employed individuals has declined, and correspondingly, the unemployment rate and individuals below the poverty line have increased over the past decade. Employment in the farming, fishing, forestry, and mining has declined with the education, health, and social services industries providing the greatest employment opportunities in 2000.

In general, Connecticut's involvement in the commercial fishery has been minimal. There are 170 commercial tuna permit holders living in the state (Table 9.36) with two permit holders for the shark and swordfish permits (Table 9.38 and Table 9.39). Only two HMS permitted dealers are located in Connecticut (Table 9.37). The communities involved in the commercial shark fishery are New London and Old Lyme. Due to the relatively minimal involvement with HMS fisheries, there are no community profiles for the state of Connecticut.

In 2003, some 369,000 anglers took 1,579,000 saltwater fishing trips for all species of fish (NMFS, 2004b). Of these marine anglers, about 18 percent were from out-of-state. In 2005, 1,080 Connecticut residents held an HMS angling permit (Table 9.34). Recreational shark fishing is conducted throughout Long Island Sound, but primarily from the eastern ports in the state from which offshore waters can be easily reached. The number of charter/headboats permit holders in Connecticut has increased from 62 in 2003 to 110 in 2005 (Table 9.35). Charterboats advertising shark fishing trips operate from Milford, New London, Norwalk, Old Lyme, Saybrook, Stonington and Westport. The recreational fishery is principally a catch-and-release fishery using light tackle.

Table 9.8 Connecticut Demographic Profile. Source: U.S. Census, 1990 and 2000

Connecticut	1990	2000
Population:	**3,287,116**	**3,405,565**
Education:		
High school graduates (25 years or older)	79.2%	84.0%
Employment:		
Labor force (16 years and over)	69.0%	66.6%
Unemployment Rate	5.4%	5.3%
Median Household Income	$41,721	$53,935
Individuals below the poverty line*	6.8%	7.9%
Employment in some industry sectors:		
Farming, fishing, forestry & mining	1.3%	0.4%
Construction	5.9%	6.0%
Manufacturing	20.5%	14.8%
Wholesale trade	4.2%	3.2%
Retail	15.4%	11.2%
Education, health & social services	24.8%	22.0%
Arts, recreation, lodging & food services	1.1%	6.7%

*U.S. Census uses data from 1989 and 1999 to estimate these values.

9.4.6 New York

The state of New York's population increased by nearly one million people in the decade between 1990 and 2000 (Table 9.9). The percentage of individuals 25 years and older with a high school diploma and/or some graduate level degree has increased by about five percent. The percentage of employed individuals has declined slightly, while both the unemployment rate and individuals below the poverty line have increased over the past decade. Employment in the farming, fishing, forestry, and mining industries has declined with the education, health, and social services industries providing the greatest employment opportunities in 2000.

Twenty-one individuals holding an HMS shark permit and 29 individuals holding a swordfish permit reside in New York (Table 9.38 and Table 9.39). In addition to the shark and swordfish permit holders, there are also 327 commercial tuna permit holders in New York (Table 9.36). New York has the third greatest number of HMS dealer permit holders (86 total) with a large concentration of dealers located in New York City and the surrounding areas (Table 9.37 and Figure 9.5). The communities participating in the shark commercial and recreational fisheries include Freeport, Lawrence, Ammagansett, Brightwaters, East Hampton, East Quogue, Greenport, Hampton Bays, Islip, Montauk, Oakdale, Brooklyn, Riverhead, Seaford, Port Jefferson, Babylon, Hauppauge, Staten Island, Southold, and Wantagh. While no HMS community profiles have been developed for New York, a profile should be developed for Montauk due to the residents' significant participation in the commercial tuna, charter/headboat and the number of shark permit holders.

Table 9.9 New York Demographic Profile. Source: U.S. Census, 1990 and 2000

New York	1990	2000
Population:	**17,990,455**	**18,976,457**
Education:		
High school graduates (25 years or older)	74.8%	79.1%
Employment:		
Labor force (16 years and over)	63.6%	61.1%
Unemployment Rate	6.9%	7.1%
Median Household Income	$40,927	$43,393
Individuals below the poverty line*	13.0%	14.6%
Employment in some industry sectors:		
Farming, fishing, forestry & mining	1.3%	0.6%
Construction	5.2%	5.2%
Manufacturing	14.7%	10.0%
Wholesale trade	4.2%	3.4%
Retail	14.9%	10.5%
Education, health & social services	27.9%	24.3%
Arts, recreation, lodging & food services	1.5%	7.3%

*U.S. Census uses data from 1989 and 1999 to estimate these values.

In 2004, some 677,000 anglers took 4,743,000 saltwater fishing trips for all species of fish in both state and Federal waters (NMFS, 2005a). The majority of these anglers are residents of New York State, with about 11 percent were from out-of-state. In 2005, New York had the

fourth greatest number of HMS angling permit holders with 2,391 permitted vessels (Table 9.34) and a large concentration of these anglers residing in New York City (Figure 9.2). The Amecian Sportfishing Association (ASA) estimated that, in 2001, saltwater angling generated some $389.3 million in New York State in retail sales and some 5,122 jobs in the marine recreational fishing industry (ASA, 2003). Shark fishing by anglers appears to be largely catch-and-release, using light tackle, and tends to be incidental to tuna and billfish fishing offshore. In New York State, there are 379 charter/headboats were permitted for HMS fishing in 2005 (Table 9.35). A number of charterboat operators advertise shark fishing as part of their offerings. A large percentage of the 41 charterboats operating out of Montauk advertise shark fishing either as an occasional exciting catch or offering shark fishing trips offshore. Montauk is positioned well for offshore trips as it lies only 20 – 40 miles from the edge of deep water and Gulf Stream eddies. Connecticut and Rhode Island boats on the other hand have to travel at least 60-100 miles to reach the prime fishing waters for tunas and sharks.

9.4.7 New Jersey

Between the 1990 Census and the 2000 Census, New Jersey's population increased from 7.7 million people to 8.4 million people, respectively (Table 9.10). The percentage of individuals 25 years and older with a high school diploma and/or some graduate level degree has increased by about five percent. The percentage of employed individuals has declined slightly, while the unemployment rate remained about the same and individuals below the poverty line increased over the past decade. As with many of the other states, employment in the farming, fishing, forestry, and mining industries has declined, whereas the education, health, and social services industries provided the greatest employment opportunities in 2000.

While both Barnegat Light and Brielle have already been profiled for HMS fisheries, NMFS may want to also consider an HMS profile for Cape May due to the number of HMS angling, charter/headboat, shark and swordfish permits located in the community.

In 2005, there were 357 commercial tuna permit holders in the state of New Jersey (Table 9.36). New Jersey has the second greatest number of shark permit holders living within the state, second to Florida (Table 9.38) with significant concentrations of shark permit holders living in Barnegat Light and Cape May (Figure 9.6). New Jersey is also home to 50 swordfish permit holders (Table 9.39) with many of these permit holders in Barnegat Light and Cape May (Figure 9.7). Fifty-six HMS dealers are also located in New Jersey (Table 9.37).

Marine recreational fishing attracted 1,120,000 participants to New Jersey in 2004 (NMFS, 2005a). These anglers, collectively, made 6,580,000 saltwater fishing trips during the year. Of these anglers, 33 percent were from out-of-state, and about two percent from non-coastal counties in New Jersey. In 2005, New Jersey has the greatest number of HMS angling permit holders at 3,439 (Table 9.34) with large concentrations of these anglers residing in Point Pleasant Beach, Brick, Toms River, Forked River, and Tuckerton (Figure 9.2). The ASA estimated that saltwater angling-related retail sales in New Jersey were some $448.7 million in 2001. The marine recreational fishing industry provided some 7,762 jobs in New Jersey in 2001 (ASA, 2002).

Table 9.10 New Jersey Demographic Profile. Source: U.S. Census, 1990 and 2000

New Jersey	1990	2000
Population:	**7,730,188**	**8,414,350**
Education:		
High school graduates (25 years or older)	76.9%	82.1%
Employment:		
Labor force (16 years and over)	67.4%	64.1%
Unemployment Rate	5.7%	5.8%
Median Household Income	$40,927	$55,146
Individuals below the poverty line*	7.6%	8.5%
Employment in some industry sectors:		
Farming, fishing, forestry & mining	1.2%	0.3%
Construction	6.0%	5.6%
Manufacturing	16.9%	12.0%
Wholesale trade	5.4%	4.4%
Retail	15.2%	11.3%
Education, health & social services	23.4%	19.8%
Arts, recreation, lodging & food services	1.7%	6.9%

*U.S. Census uses data from 1989 and 1999 to estimate these values.

The recreational fishery for sharks is primarily incidental to fishing for tuna and billfish. New Jersey is also second to Florida in the number of HMS charter/headboats permit holders with 578 permitted vessels in 2005 (Table 9.53). Many of the angling communities are also home to the charter/headboat permit holders, but also Cape May, and Ocean City (Figure 9.3). Of these party and charterboats, some advertise shark trips using light tackle during the summer and early fall (July-October) (NMFS, 2003). These trips go offshore between 25 and 60 miles to the heads of the canyons, and thus are full-day or overnight trips.

9.4.7.1 Barnegat Light, New Jersey

Barnegat Light is one of eleven municipalities on Long Beach Island, a large "barrier beach" island that helps form the seaward boundary of Barnegat Bay. This small town measures less than one square mile and is located on the northern end of the barrier island. The town is named after its famous lighthouse that guided ships for generations along the New Jersey coast. This lighthouse was replaced in 1855 with the second-tallest lighthouse in the United States operating until 1927 (NMFS, 2003). The building continues as both a community landmark and a navigation mark. The name Barnegat originates from "Barende-gat," a Dutch name meaning "inlet of breakers" (NMFS, 1999a). Prior to 1820, fishing operations and maritime trade were conducted in the small settlements on the mainland inside the chain of islands and sand bars fringing the New Jersey Coast (NMFS, 2003). Barnegat Inlet was one of the important channels to the open ocean, with a sheltered anchorage immediately inside the inlet, and ample resource for a fishing community. A lighthouse was built in 1824 to mark the entrance to the inlet. In 1995, the infamous inlet's fierce currents were tamed by a $45 million Army Corps of Engineers project that constructed a South jetty along with a three-quarter-mile beach and a fishing pier (NMFS, 1999a).

Barnegat Light has grown and changed in the decade between the 1990 and 2000 Censuses. The changes are reflected in two demographic dimensions. The first is a shift to higher education and higher qualification occupations and the second is a continued shift to an older, retired population. The change in age structure also signifies a change in the workforce and the source of household earnings. In 2000, there were 371 households with an average size of 2.05 persons per household (Table 9.11). Of these households, 233 (62.8 percent) received income in the form of earnings, while 202 households (54.4 percent) received income from Social Security (NMFS, 2003). One hundred and thirty households received retirement income (35.0 percent). For households receiving income from earnings, the average income was $63,373 in 1999[1]. The average Barnegat Light household with retirement income received $22,168 (plus appropriate Social Security payments). In comparison with New Jersey as a whole, employment earnings were less than the state average, while retirement income was above the state average. However, the median household income in Barnegat Light ($52,361) in 1990 was some $2,800 lower than the statewide median household income.

Table 9.11 Demographic Profile of Barnegat Light. Source: U.S. Census, 1990 and 2000.

Demographics	1990	2000
Total Population	681	764
Sex		
Male	52.0%	50.9%
Female	48.0%	49.1%
Age		
Median Age	**50.9**	**54.9**
< 20	12.8%	15.4%
20-44	29.8%	20.9%
45-64	27.0%	29.4%
> 65	30.4%	34.3%
Race		
White	99.6%	98.3%
Black or African American	0.4%	0.5%
American Indian and Alaska Native	0.0%	0.0%
Asian and Pacific Islander	0.0%	0.6%
Other	0.0%	0.4%
Household		
Total	**342**	**371**
Family households	62.0%	62.0%
Nonfamily households	38.0%	38.0%
Average household size	1.99	2.05
Average family size	2.42	2.60
Housing Occupancy		
Total housing units	1,167	1,207
Vacant housing units	71.0%	69.3%
Housing Tenure		
Owner-occupied housing units	82.6%	87.9%
Renter-occupied housing units	17.4%	12.1%

Barnegat Light, New Jersey	1990	2000
Population:	681	764
Education:		
High school graduates (25 years or older)	84.9%	92.1%
Economic Characteristics		
Labor force (16 years and over)	52.6%	46.9%
Unemployed	0.5%	1.2%
Median Household Income	$ 37,955	$ 52,361
Individuals below the poverty line	7.2%	4.7%
Employment in some industry sectors:		
Managerial/professional	32.4%	40.8%
Technical, Administrative, & Sales	31.4%	23.3%
Construction, Production, Maintenance, & Transportation	10.4%	16.4%
Farming, fishing, forestry, & mining	13.9%	6.5%
Industry		
Forestry, fishing, hunting, mining, and agriculture	12.6%	8.2%
Construction	12.6%	10.3%
Manufacturing	7.4%	4.8%
Wholesale trade	1.3%	1.7%
Retail trade	21.0%	9.2%
Education, health & social services	7.4%	16.8%
Arts, recreation, lodging & food services	2.9%	11.0%

Barnegat Light is a vacation and retirement destination. Of the 1,207 housing units available in 2000, 64.3 percent (781 units) were vacation homes, and 371 homes were occupied year-round (NMFS, 2003). Some 69.3 percent of the homes were unoccupied at the time of the 2000 census. About one-quarter of the resident population had lived in Barnegat Light for less than five years in 2000, and most of the new residents moved to the town from other parts of New Jersey. Of the population of Barnegat Light in 2000, 55 percent (430 persons) had been

[1] Income and earnings data reported in the decennial Censuses is for the previous year, *i.e.* the income reported in the 1990 Census is for 1989, for the 2000 Census it is for 1999.

born in New Jersey, while 41 percent were born elsewhere in the United States. There is a "community stickiness" factor among persons resident in Barnegat Light, since 70 percent had lived there prior to 1995, but there is also evidence of change that could affect life-style and the culture of the community. One of the elements of "community stickiness" is that many of the "new" residents are retirees who have converted their former vacation homes to year-round residences.

In 1881, the Barnegat City Improvement Company was formed and developed the present-day town as a resort and recreation area, with the town owning all the beaches and dunes (NMFS, 2003). The mix of tourism and fishing has continued to the present. Fishing operations are now linked to their markets by road and there is a tight mesh between the winter and summer economies. Local shops and services are sustained by the fishing activities in the winter months, and it is estimated that the direct employment in fisheries and fishing services was on the order of 52 percent of the 300 persons civilian workforce in 2000. This number does not agree with the Census Bureau's data of fisheries employment of 6.5 percent, probably due to failure of respondents to complete census forms or undercounting because fishermen were at sea.

There are four full service marinas in Barnegat Light in addition to 44 municipal boat slips and a municipal ramp (NMFS, 2003). The marinas and slips are on the bayside of Long Beach Island and extend southwards some 18 blocks from the inlet. Commercial fishing docks and fishhouses also line Bayview Avenue, but are clustered towards the southern end of the street. Five bait and tackle shops, three of which also provide boat rentals, provide services to local and visiting fishermen. The charter fleet working from Barnegat Light is estimated to be 20 boats, including eight vessels with HMS permits. About half this fleet is active year-round in Barnegat Light, while the other vessels at least fish elsewhere in the winter months. Some of the boat fish for tuna off North Carolina in the winter and spring, while others fish from November through April from ports in Florida.

One dock is completely occupied by privately-owned, commercial vessels, including seven scallopers, ten longliners that fish for tunas, swordfish, and tilefish, and about nine inshore net vessels. Three offloading stations are part of this dock. Five or six locally hired full-time employees, the vessel captain, and the crew perform the offloading. Additional dock hands are hired locally for the busy season. The owners of the dock sell some of the catch to fresh fish markets in Boston, Philadelphia, Maryland, and New York with the remaining being sold to local restaurants, retailers, wholesalers or at their own fish market, which is open from April to October (McCay, 1993).

Some of the fisheries organizations in Barnegat Light include Blue Water Fishermen's Association; Forked River Tuna Club; Jersey Devils Fishing Club; Beach Haven Marlin and Tuna Club; Long Beach Island Fishing Club; and United National Fishermen's Association.

The Barnegat Light port is known for its pelagic longline fishery. Today, the fleet targets yellowfin and bigeye tunas for most of the year and swordfish for part of the year. Pelagic and large coastal sharks are important incidental catches and some species like mako, porbeagle, and sandbar sharks are usually kept and sold. There are a large number of residents that hold a commercial permit for sharks (22 permits; Table 9.38) and swordfish (18 permits; Table 9.39).

During the winter, a few vessels continue to bottom longline for tilefish in the deep waters of the outer continental shelf and canyons. Some captains from this port have begun to fish off the coasts of other countries. Pelagic longline crews are increasingly from other regions, such as Nova Scotia and some of the southern states. Some of the pelagic longline fishermen from Barnegat Light have become distant-water operators, going to the Grand Banks off Newfoundland, the waters off Greenland, as well as the Caribbean, Brazil, and other distant fishing grounds. The owner of one major fleet (six longline vessels) has left Barnegat Light to fish for HMS in the Pacific Ocean (Wilson *et al*., 1998).

Other captains of pelagic longline vessels strongly prefer to work closer to home or to take shorter trips. The options of those who resist going to other ports are far more restricted. Distant water fishing is very disruptive to families and the community. Some local vessels are now converting from pelagic longline fishing to monkfishing, although many who have tried to convert to other fisheries have failed to meet deadlines for limited entry. Another concern of local residents is that the demise of commercial fisheries is likely to transform the use of the waterfront, bringing in condominium development where marinas are now located, an outcome that many long-term residents find undesirable.

9.4.7.2 Brielle, New Jersey

Brielle is located in the southernmost region of Monmouth County, and borders the Manasquan River of central New Jersey. For the purposes of this document, the community will include Brielle/Point Pleasant. This is an area where recreational fishermen are as traditional as commercial fishermen, and recreational fishermen have been distressed about the management of tunas and sharks.

Brielle experienced a modest population increase between 1990 and 2000 from 4,406 to 4,893 individuals (Table 9.12). The percent of males and females remained virtually unchanged between 1990 and 2000 with 48 percent of the population comprised of males and 52 percent females. The age distribution of the Brielle population remained virtually the same for the past decade. The age distribution is fairly even between the under 20 years old, 20 – 44, and 45 – 64 years old. The over 65 year olds are the smallest age group with about 19 or 18 percent. Whites accounted for approximately 93 percent of the population in both 1990 and 2000. The percent of other races, however, declined between 1990 and 2000. The largest industry in 1990 was retail trade, which dropped significantly by 2000 (7.3 percent). In 2000, the largest industries in Brielle were education, health, and social services. In both 1990 and 2000, the greatest source of employment was managerial and professional related jobs. Employment in the farming, fishing, forestry, and mining declined from 6.8 percent in 1990 to 0.7 percent in 2000.

The Brielle/Point Pleasant port is one of the most important of the inlet ports along the barrier beach complex that makes up the New Jersey coast. It has been a center of both recreational and commercial fishing since the early 1800s. It is estimated that up to 100 working charterboats used this port historically. Today, Brielle has ten charter/headboats, and there are 17 charter/headboats in Point Pleasant. The majority of vessels that fish offshore are private vessels. It is reported that although these vessels actively fish for tunas and are thus required to have an Atlantic tunas permit, many of these vessels do not hold the necessary permit.

New Jersey, and in particular Brielle, recreational fishermen (private and charter/headboats) have historically targeted school bluefin tuna (measuring 27 inches to less than 47 inches). There is documentation back to the 1890s regarding the recreational fishery for bluefin tuna. According to respondents in the Wilson *et al.*, study, New Jersey vessels landed nearly 20,000 bluefin tuna in one month of 1939. The 1998 annual coastwide Angling category quota was 269 mt, or about 19,000 fish.

Table 9.12 Demographic Profile of Brielle, New Jersey. Source: U.S. Census, 1990 and 2000.

Demographics	1990	2000
Total Population	4,406	4,893
Sex		
Male	48.2%	47.4%
Female	51.8%	52.6%
Age		
Median Age	**42.7**	**42.9**
< 20	23.2%	25.2%
20 - 44	28.6%	27.9%
45 - 64	29.1%	29.1%
> 65	19.2%	17.8%
Race		
White	93.8%	93.1%
Black or African American	5.4%	3.5%
American Indian and Alaska Native	0.8%	0.1%
Asian and Pacific Islander	0.0%	0.7%
Other	0.0%	2.7%
Household		
Total	**1,735**	**1,938**
Family households	74.6%	73.0%
Nonfamily households	25.4%	27.0%
Average household size	2.54	2.52
Average family size	3.00	3.00
Housing Occupancy		
Total housing units	1,986	2,123
Vacant housing units	12.6%	8.7%
Housing Tenure		
Owner-occupied housing units	82.3%	83.4%
Renter-occupied housing units	17.7%	16.6%

Brielle, New Jersey	1990	2000
Population:	4,406	4,893
Education:		
High school graduates (25 years or older)	91.3%	94.8%
Economic Characteristics		
Labor force (16 years and over)	58.6%	59.4%
Unemployed	4.4%	2.1%
Median Household Income	$ 53,485	$ 68,368
Individuals below the poverty line	2.3%	3.9%
Employment in some industry sectors:		
Managerial/professional	44.7%	56.0%
Technical, Administrative, & Sales	31.5%	21.8%
Construction, Production, Maintenance, & Transportation	0.9%	11.3%
Farming, fishing, forestry, & mining	6.8%	0.7%
Industry		
Forestry, fishing, hunting, mining, and agriculture	1.6%	0.7%
Construction	5.9%	7.4%
Manufacturing	11.7%	8.4%
Wholesale trade	6.7%	2.5%
Retail trade	21.4%	7.3%
Education, health & social services	18.7%	23.1%
Arts, recreation, lodging & food services	2.1%	7.8%

Here, as elsewhere in New York and New Jersey, HMS fisheries often take place in the "canyons" and around eddies and at the edge of the continental shelf. In the past, bluefin tuna could be caught on day trips in coastal waters, rather than the canyons, and they were the major source of profit for the charter/headboat fleet here (and elsewhere in New Jersey and the larger Mid-Atlantic). Today, the canyon fisheries for tunas are thought of as additional opportunities for most charter/headboat captains, who regularly take clients fishing for bluefish, fluke, or other tunas.

At one time, the full-time canyon fishermen included hundreds of inshore bluefin tuna vessels, and "six-pack" boats (smaller vessels certified to carry no more than six passengers; also known as uninspected vessels). Respondents to the 1998 Wilson *et al*. study indicated that they must steam 80 miles offshore to reach the canyons, and are therefore limited by weather. A similar trend is found in Cape May, New Jersey, where anglers fish in the Baltimore Canyon. The Hudson Canyon offshore fishery started 15 to 20 years ago, and the Brielle/Point Pleasant fleet rely heavily on the canyon for the fall fishery. This fishery has diminished, and the smaller, less powerful vessels are gone. Recent improvements in the U.S. economy have once again

fueled investment in expensive offshore fishing vessels, and this is a major contribution to New Jersey's economy. For example, the majority of the private vessels purchased in the Cape May area are built in New Jersey. There are eight tackle shops in the Brielle/Point Pleasant area.

Charter/headboat captains indicate that in 1998, they were generally unable to book tuna trips, because passengers do not like to take trips when the bluefin tuna retention limit is low or when retention is prohibited. One of the charterboat owners said that in 1991, the four busiest captains averaged 30 to 35 tuna trips each, but that the average number of trips dropped to approximately 12 in 1996 (Wilson *et al*., 1998). The argument for more liberal retention limits includes the idea that it is necessary to keep people interested in the gambling aspect of the fishery. Although people may not actually land more fish, customers are attracted by the possibility. Charterboat captains emphasize that reasonable recreational retention limits are important to their clients, who wish to bring fish home to eat and share with others.

Due to landings restrictions on bluefin tuna, bluefish generally replaced the tunas as the important inshore/offshore fishery in northern New Jersey. The Brielle/Point Pleasant charter/headboat fishermen, like most other people involved in the sport fisheries, would like to see the economic value of their fisheries documented. In this light, a recent study done in Virginia found that 30 percent of the fisheries income in the state came from the offshore recreational fisheries. Respondents emphasized that the figure is likely to be much larger for New Jersey (Wilson *et al*., 1998).

Adding to the general problems of the bluefin tuna fishery in New Jersey is the effect of the "North-South line." This line (38° 47' N), roughly at Delaware Bay, is used to separate the Angling category fishery into a northern and a southern area. Recreational bluefin tuna fishermen from Brielle fish in the northern area whereas fishermen from Cape May and other southern ports have historically fished in the southern area. However, because it is unlawful to possess bluefin tuna in excess of the daily retention limit in the respective area, those who fish in the southern zone and return to a New Jersey port with their catch must abide by northern area regulations. The Draft Consolidated HMS FMP contained a preferred alternative to remove the Angling category's North/South line (see Section 2.3.1). Removal of the North-South line would mean consistent regulations in the EEZ off of New Jersey; making it easier for New Jersey anglers to comply with the daily retention limits and allowing them to land in any New Jersey port. Due to public comment on the alternative, the Consolidated HMS FMP would maintain the North/South line as a management tool and would provide an equitable opportunity to harvest the recreational BFT allocation.

Sharks are comparatively less important to recreational fishermen in Brielle than bluefin tuna. Sharks play an important role in the fishing industry, and, while other fish may be available, some customers are attracted by sharks in particular. Makos are the sharks with the greatest economic importance to the recreational fishery in New Jersey. Mako tournaments are popular and several impose catch restrictions on participants. They have recently canceled some traditional shark tournaments out of concern for the stock, and two recent shark tournaments in New Jersey did not catch a single mako above the tournament's minimum size. Researchers reported that the shark fishery in Brielle is being strongly affected by a decrease in its historical tuna fishery and is therefore more vulnerable to negative impacts.

9.4.8 Delaware

Between 1990 and 2000, Delaware's population increased by 15 percent (Table 9.13). The percentage of individuals 25 years and older with a high school diploma and/or a graduate level degree has increased by about five percent. The percentage of employed individuals has declined slightly, while both the unemployment rate and individuals below the poverty line increased over the past decade. As with many of the other states, employment in the farming, fishing, forestry, and mining industries has declined, whereas the education, health, and social services industries provided the greatest employment opportunities in 2000.

Table 9.13 Delaware Demographic Profile. Source: U.S. Census, 1990 and 2000

Delaware	1990	2000
Population:	**666,168**	**783,600**
Education:		
High school graduates (25 years or older)	77.50%	82.60%
Employment:		
Labor force (16 years and over)	68.3%	65.7%
Unemployment Rate	4.0%	5.2%
Median Household Income	$34,875	$47,381
Individuals below the poverty line*	8.7%	9.2%
Employment in some industry sectors:		
Farming, fishing, forestry & mining	2.3%	1.1%
Construction	8.0%	7.4%
Manufacturing	18.8%	13.2%
Wholesale trade	3.5%	2.6%
Retail	2.1%	11.6%
Education, health & social services	23.0%	19.4%
Arts, recreation, lodging & food services	10.4%	7.7%

*U.S. Census uses data from 1989 and 1999 to estimate these values.

Thirty-nine commercial tuna permit holders lived in Delaware during 2005 (Table 9.36). There are three HMS dealers for tuna located in Delaware, one in Rehoboth, another in Harrington, and the last in Middletown (Table 9.37 and Figure 9.5). There was one shark and one swordfish permit holder in the state of Delaware during 2005 (Table 9.38 and Table 9.39).

The recreational fishery in Delaware Bay and offshore is popular because of the diversity of species and habitats available to anglers. In 2004, Delaware's recreational fisheries attracted 354,000 saltwater anglers of whom 68 percent were from out-of-state. In total, the anglers made 1,163,000 fishing trips in 2004 (NMFS, 2005a). In 2005, Delaware was home to 741 HMS angling permit holders (Table 9.34) with a significant concentration of anglers in Millsboro, Delaware. The retail sales generated by the Delaware anglers were estimated to be $48.9 million in 2001 and the marine recreational fishing service sector provided some 724 jobs in Delaware (ASA, 2002). One hundred and three charter/headboats with HMS permits were operating from Delaware communities in 2005. Communities where these HMS-permitted charter/headboats are registered include Bethany Beach, Cedar Creek, Dagsboro, Dewey Beach, Dover, Fenwick Island, Georgetown, Indian River, Lewes, Long Neck, Middletown, Milford, Millsboro, Ocean

View, Rehoboth Beach, and Wilmington (NMFS, 2003). To date, no HMS community profiles have been developed for any Delaware communities due to the relatively low level of involvement with HMS fisheries.

9.4.9 Maryland

Maryland's population increased from 4.8 million people in 1990 to 5.3 million people in 2000 (Table 9.14). The percentage of individuals 25 years and older with a high school diploma and/or some graduate level degree has increased by about five percent. The percentage of employed individuals, ages 16 and older, has declined slightly, while both unemployment rate and individuals below the poverty line remain approximately the same over the past decade. As with many of the other states, employment in the farming, fishing, forestry, and mining industries has declined, whereas the education, health, and social services industries provided the greatest employment opportunities in 2000.

In Maryland, there are 57 commercial tuna permit holders (Table 9.36). In addition, ten shark permit holders and seven swordfish permit holders reside in Maryland (Table 9.38 and Table 9.39). To support these HMS fisheries, there are sixteen dealers permitted for tuna, sharks and swordfish (Table 9.37).

Table 9.14 Maryland Demographic Profile. Source: U.S. Census, 1990 and 2000

Maryland	1990	2000
Population:	**4,781,468**	**5,296,486**
Education:		
High school graduates (25 years or older)	78.4%	83.8%
Employment:		
Labor force (16 years and over)	70.6%	67.8%
Umemployment Rate	4.3%	4.7%
Median Household Income	$39,386	$52,868
Individuals below the poverty line*	8.3%	8.5%
Employment in some industry sectors:		
Farming, fishing, forestry & mining	1.7%	0.6%
Construction	7.9%	6.9%
Wholesale trade	3.8%	2.8%
Retail	15.0%	10.5%
Manufacturing	10.3%	7.7%
Education, health & social services	25.8%	20.6%
Arts, recreation, lodging & food services	1.2%	6.8%

*U.S. Census uses data from 1989 and 1999 to estimate these values.

In 2004, some 485,000 Maryland residents were marine recreational fishermen (NMFS, 2005a). Another 336,000 out-of-state marine anglers also fished in Maryland. Between them these two groups made some 2.7 million fishing trips for saltwater species (NMFS, 2005a). In 2005, Maryland was home to 1,563 HMS angling permit holders (Table 9.34). The ASA estimated that saltwater anglers generated $335.9 million in retail sales, and the marine recreational fishing industry provided some 6,981 jobs in Maryland in 2001 (ASA, 2002).

The recreational fishery for sharks is largely offshore, although sharks are found in the lower reaches of the Chesapeake Bay. The offshore fishery takes place at least 15 miles out to sea and charterboats often run 60 to 70 miles offshore to areas of deep water. In Maryland, the number of HMS charter/headboat permit holders increased from 155 in 2003 to 196 in 2005 (Table 9.35). Most of these vessels are registered in Ocean City, which is known as the "White Marlin Capital of the World". This hotspot for recreational fishing industry is home to the Annual White Marlin Open, which brings approximately $1 million as the top prize for the tournament. Other communities involved with the HMS charter/headboat industry include Annapolis, Baltimore, Cambridge, Chesapeake City, Chester, Conowingo, Edgewater, Glen Burnie, Ocean Pines, Pasadena, Pocomoke, Salisbury, Severna, St. Michaels, Stevensville, Tilghman, White Hall, and White Haven.

9.4.10 Virginia

Virginia's population increased from 6.2 million people in 1990 to 7.1 million people in 2000 (Table 9.15). The percentage of individuals 25 years and older with a high school diploma and/or some graduate level degree has increased by six percent. The percentage of employed individuals, ages 16 and older, has declined slightly, while both the unemployment rate and individuals below the poverty line remained approximately the same over the past decade. Employment in the farming, fishing, forestry, and mining industries has declined, whereas the education, health, and social services industries provided the greatest employment opportunities in 2000.

Virginia ranked second for the quantity of commercial fishery landings at its Reedville port and third for the value of the commercial landings in the Hampton Roads area in 2004 (NMFS, 2005a). Virginia has 106 commercial tuna permit holders (Table 9.36). The Virginia commercial HMS fisheries have 27 licensed dealers, with two or more dealers operating in Chincoteague, Hampton, Newport News, Norfolk, and Virginia Beach (Table 9.37 and Figure 9.5). Six shark and five swordfish permit holders live in the Commonwealth of Virginia (Table 9.38 and Table 9.9). The commercial landings of tuna, sharks, and swordfish are not as significant as the total commercial landings coming into the state; therefore, HMS fisheries are not significantly tied to any particular Virginia community and no HMS-specific community profiles have been developed for Virginia.

In 2003, the Virginia recreational saltwater fishery attracted 996,000 anglers, of whom just over 42 percent were from out-of-state (NMFS, 2005a). Collectively, these anglers made 3.6 million recreational fishing trips in 2004. In 2005, Virginia was home to 1,351 HMS angling permit holders (Table 9.34) with a large concentration of angling permit holders living in Virginia Beach and Chesapeake (Figure 9.1). It is estimated that these saltwater anglers generated some $246.8 million in retail sales in Virginia in 2001 and their activity provided 4,251 jobs in the marine recreational fishing industry (ASA, 2002). Principal species sought were striped bass, flounder, bluefish, weakfish (sea trout) and drum. Offshore fishing was principally for mackerels, tuna, dolphin fish, and billfish.

The Virginia recreational fishery for sharks is similar to that of Delaware and Maryland. There is a very small directed shark fishery in the private boat sector, but most sharks are taken incidentally to the catch of other species. There are 153 charter/headboats in Virginia with HMS

permits (Table 9.35). The communities with the greatest number of charterboats with HMS permits were Virginia Beach, Norfolk, Chincoteague, Wachapreague, and Portsmouth. The principal shark fishing season for recreational anglers is June through October.

Table 9.15 Virginia Demographic Profile. Source: U.S. Census, 1990 and 2000

Virginia	1990	2000
Population:	**6,187,358**	**7,078,515**
Education:		
High school graduates (25 years or older)	75.2%	81.5%
Employment:		
Labor force (16 years and over)	68.9%	66.8%
Unemployment Rate	4.5%	4.2%
Median Household Income	$33,328	$46,677
Individuals below the poverty line*	10.2%	9.6%
Employment in some industry sectors:		
Farming, fishing, forestry & mining	2.6%	1.3%
Construction	7.8%	7.3%
Wholesale trade	3.4%	2.7%
Retail	16.1%	11.4%
Manufacturing	15.1%	11.3%
Education, health & social services	23.2%	18.3%
Arts, recreation, lodging & food services	1.1%	7.2%

*U.S. Census uses data from 1989 and 1999 to estimate these values.

9.4.11 North Carolina

The population in North Carolina increased by nearly 18 percent between 1990 and 2000 (Table 9.16). The percentage of individuals 25 years and older with a high school diploma and/or some graduate level degree has increased by eight percent. The percentage of employed individuals, ages 16 and older, has remained roughly the same, while the unemployment rate increased and the individuals below the poverty line declined slightly over the past decade. As with many of the other states, employment in the farming, fishing, forestry, and mining industries has declined, whereas the manufacturing industry provided the greatest employment opportunities in 2000.

North Carolina's commercial fishery has a distinctive split between the North and South with Cape Hatteras as the dividing point as a result of the local oceanographic conditions. The Gulf Stream, as it skirts the Cape Hatteras shoals, is twenty miles offshore. This is the closest it approaches land after leaving the Cape Canaveral area. The cold Labrador Current influences the waters North of Cape Hatteras. The area off Dare and Hyde Counties, North Carolina is where these two water bodies mix and provides very rich fishing grounds. South and West of Cape Hatteras, the coast curves away to the West forming the relatively shallow Carolina Bight. Vessels operating in this area have further to travel from shore to the Gulf Stream and do not have the same diversity and richness found in the fisheries immediately to the North of Cape Hatteras.

North Carolina has the fifth largest number of HMS angling permit holders with 1,863 permits issued to its residents (Table 9.34). In 2004, NMFS estimated that 2,055,000 anglers fished in North Carolina's marine waters making a total of 7,025,000 million recreational fishing trips (NMFS, 2005a). Of these fishermen, 1,152,000 anglers (56 percent) were from out-of-state and 14 percent were from non-coastal counties in North Carolina. Marine recreational fishing is thus an important element in the life and economies of coastal counties. In 1996, expenditures by saltwater anglers in North Carolina were approximately $673 million, accounting for nearly eight percent of the total U.S. expenditures by saltwater anglers. Saltwater fishing in North Carolina incurred expenditures of nearly $1.3 billion (about five percent of the U.S. total), generated wages and salaries of approximately $357 million and created over 19,000 jobs (ASA, 1997 cited by Wilson, 1998). In 2001, ASA estimated that saltwater recreational fisheries generated about $388 million in retail sales and the marine recreational fishing industry provided 8,551 jobs (ASA, 2002).

Table 9.16 Demographic Profile of North Carolina. Source: U.S. Census, 1990 and 2000

North Carolina	1990	2000
Population:	**6,628,637**	**8,049,313**
Education:		
High school graduates (25 years or older)	70.0%	78.1%
Employment:		
Labor force (16 years and over)	67.6%	65.7%
Unemployment Rate	4.8%	5.3%
Median Household Income	$26,647	$39,184
Individuals below the poverty line*	13.0%	12.3%
Employment in some industry sectors:		
Farming, fishing, forestry & mining	2.9%	1.6%
Construction	7.0%	8.2%
Wholesale trade	4.2%	3.4%
Retail	16.1%	11.5%
Manufacturing	26.7%	19.7%
Education, health & social services	20.3%	19.2%
Arts, recreation, lodging & food services	1.0%	6.9%

*U.S. Census uses data from 1989 and 1999 to estimate these values.

The marine recreational fisheries in North Carolina fall into three groups by species, gear and access. First, the recreational fishery in the Sounds and behind the barrier islands is typically a small, open boat fishery for flounder, croaker and drum, spot and sea trout. Striped bass (rockfish) forms an important fishery in Albemarle Sound and around the northern inlets. Second, the inshore and ocean beach fisheries target the same species but also include striped bass, bluefish, and king and spanish mackerel. These inshore fisheries require larger boats and heavier gear, but the boats operate within sight of land. Third, the offshore recreational fisheries target billfish, tunas (bluefin, yellowfin and blackfin), mackerels, dolphin fish (mahi mahi), wahoo, and, in the southwestern area, shark. In the area North of Hatteras and around Cape Lookout, recreational fishermen view sharks as a nuisance in their pursuit of other fish, particularly tuna, marlin, and swordfish. Typically, the boats are 22 feet long or longer, have electronic navigation systems, and are powered by an inboard engine. Generally, heavy tackle is

used, and fighting chairs are usually installed for the billfish and giant tuna fishing. The offshore boats normally fish 15 to 60 miles offshore. North Carolina marine recreational fisheries are seasonal, but fishing is year-round as fish species move through the area.

In 2005, North Carolina had the fourth largest fleet of charter/headboats holding HMS permits with 441 vessels (Table 9.35). A significant percentage of these boats operated from communities North of Cape Hatteras. Some of these charterboats were highly specialized, for seeking only billfish for example. The vessels specializing in tunas usually began the year fishing off Dare or Hyde counties, and then moved North to operate off New Jersey and then later off Cape Cod. Vessels specializing in billfish fisheries, would fish off North Carolina in the summer months and then head to the Caribbean for the winter season. Other charterboats, and some headboats, would fish in North Carolina waters from April through November, and then travel south to Florida to fish from December through March. From the advertising materials distributed by charter operations it would appear that from 12 to 15 percent of the fleet changed their operating base during the fishing year.

An unusual feature of the North Carolina charter/headboat fleet is the number of boats built locally. This appears to be particularly true for vessels over 35 feet in length and fishing offshore. Similarly, information about captains and crew of the charter fleet emphasized their local connections, and often relatives of different generations fished together. While this information has not been gathered systematically, it appears that community linkages between North Carolina captains and crews are stronger than those in many of the other states.

North Carolina has historically been an important commercial shark fishing state with 35 to 60 percent of all South Atlantic region landings coming from North Carolina in recent years. The time/area closure implemented in January 2005, to protect essential fish habitat for sandbar and dusky sharks has forced commercial shark fishermen to seek out other fisheries or other gears to target sharks and other species. Many fishermen claim that the closure has hurt their business. After North Carolina's petition to NMFS reopen Federal waters or adjust the Mid-Atlantic shark closure was denied, the State of North Carolina decided to reopen state waters to the commercial shark fishery in 2006.

In addition to recreational and for-hire industries, North Carolina residents hold the second largest number of commercial tuna permits with 659 permitted vessels (Table 9.36). Thirty-eight North Carolina residents hold shark permits and 20 residents hold swordfish permits (Table 9.38 and Table 9.39). In addition to these commercial permit holders, there are 58 dealers authorized to purchase and sell tunas, sharks, and swordfish. North Carolina is fourth in HMS dealers behind Florida, Massachusetts, and New York (Table 9.37).

9.4.11.1 Hatteras

Hatteras Township is located in the "Outer Banks" of North Carolina, and includes the villages of Avon, Buxton, Frisco and Hatteras. Hatteras Village is a rural community at the southern end of Hatteras Island on North Carolina's Outer Banks. Hatteras Island is a dynamic barrier island, bordered by the Atlantic on the East and Pamlico Sound on the West. In the 18th century, Hatteras established itself as a seaport community, where activities included whaling

and exporting/importing. Since World War II, the economy of the Hatteras community has depended on charter and commercial fishing (Wilson *et al*., 1998).

According to the 1990 and 2000 Census data, the population decreased from 2,675 in 1990 to 2,596 in 2000 (Table 9.17). The population decline can be attributed to mortality and out-migration exceeding births and in-migration. The number of males and females were approximately equal in 1990 and 2000. The age structure of the population has changed; the population has aged markedly, with consequences for educational attainment and other demographic indicators. In 1990, 37 percent of the population was 45 years or older, while in 2000 some 57 percent of the year-round residents were aged 45 years or older. The racial composition of the township has not changed significantly between the 1990 and 2000 censuses with the majority of the township Caucasian and European ancestry predominant. The number of households has increased from 1,078 in 1990 to 1,171 in 2000, while the average size of households has dropped from 2.46 persons to 2.20 persons/household. These trends are consistent with an aging and declining population as "empty-nesters" and retirement couples and widows/widowers make up a higher proportion of households. The farming, fishing, forestry, and mining industries employed about 34 percent of the Hatteras population, a significant increase from 1990, and the greatest sources of employment (Table 9.17). One of the most prominent fishing organizations is the Hatteras-Ocracoke Auxiliary of the North Carolina Fishermen's Association (Wilson *et al*, 1998).

Table 9.17 Demographic Profile of Hatteras, North Carolina Source: U.S. Census, 1990 and 2000

Demographics	1990	2000
Total Population	2,675	2,596
Sex		
Male	51.6%	49.2%
Female	48.4%	50.8%
Age		
Median Age	**35.1**	**42.1**
< 17	23.9%	20.4%
18 - 44	39.6%	33.7%
45 - 64	25.4%	39.6%
> 65	11.1%	17.2%
Race		
White	98.8%	97.1%
Black or African American	0.4%	0.0%
American Indian and Alaska Native	0.8%	0.0%
Asian and Pacific Islander	0.0%	0.0%
Other	0.0%	2.3%
Household		
Total	**1,078**	**1,171**
Family households	69.7%	78.1%
Nonfamily households	30.3%	21.4%
Average household size	2.46	2.20
Average family size	2.97	2.73
Housing Occupancy		
Total housing units	1,919	2,156
Vacant housing units	43.4%	45.7%
Housing Tenure		
Owner-occupied housing units	72.3%	79.1%
Renter-occupied housing units	27.7%	20.9%

Hatteras Township, North Carolina	1990	2000
Population:	2,675	2,596
Education:		
High school graduates (25 years or older)	74.4%	68.1%
Employment:		
Labor force (16 years and over)	67.3%	83.1%
Unemployed	2.80%	4.6%
Median Household Income	$ 24,667	$ 39,881
Individuals below the poverty line	6.4%	4.7%
Employment in some industry sectors:		
Managerial/professional	28.4%	23.2%
Technical, Administrative, & Sales	29.9%	23.3%
Construction, Production, Maintenance, & Transportation	16.6%	10.8%
Farming, fishing, forestry, & mining	6.7%	33.8%
Industry		
Forestry, fishing, hunting, mining, and agriculture	6.4%	10.4%
Construction	16.2%	15.5%
Manufacturing	3.4%	2.4%
Wholesale trade	2.7%	4.0%
Retail trade	26.1%	14.9%
Education, health & social services	11.3%	14.0%
Arts, recreation, lodging & food services	1.2%	13.4%

Fishing from Hatteras is a year-round activity, subject to weather conditions. The cycle of the offshore fishery begins in December, when giant bluefin tuna are passing through the area through March. This catch-and-release fishery is followed by the availability of yellowfin tuna, dolphin, and wahoo from March through December. In the summer months, a catch-and-release

fishery for blue and white marlin, swordfish and sailfish takes place between May and September. If ocean conditions are poor, fishermen are able to fish in the sheltered waters behind the barrier islands and in Pamlico Sound for striped bass, drum, sea trout and redfish.

Commercial fishing is a major occupation on Hatteras Island, where there are approximately 500 to 600 part-time and full-time commercial and charterboat fishermen (Wilson *et al*., 1998). The 2000 Census indicates that 34 percent of the population is employed in the farming, fishing, forestry, and mining industry (Table 9.17). Since fishermen are customarily self-employed either as owner-operators of vessels or as crew/independent contractors receiving a share of the catch or tips as payment for their services, Wilson's estimate of 500-600 part-time and full-time commercial and charterboat fishermen is considered to be accurate for 2003 (NMFS, 2003).

Tourism and recreational fishing are also major industries in Hatteras in terms of seasonal employment. There are three economic "seasons" in Hatteras (NMFS, 1999a). In the spring, weekend and holiday travelers cause an increase in revenue; several vessels from the commercial fleet become active in charter fishing beginning in April. During the second season, June through August, family vacations provide tourist income. The third season is the fall, when fishing, surfing and windsurfing are the dominant activities.

There are five seafood wholesalers, one retail market, and three marinas (Wilson *et al*., 1998). The three marinas in Hatteras provide dockage for as many as 56 offshore charter/headboats, some 15 inshore boats that can fish along the coast, and six charterboats that fish only in the Sounds. In addition, there are approximately 210 berths for private boats. Some commercial boats use the marinas during the late fall and winter months, but otherwise dock at fish houses and the fishermen's private docks.

The three marinas each have a charterboat fleet of independent owner/operators, and each maintains a booking and information system for its fleet. The charterboats operate with a captain and mate or crewman, and often have a second relief captain available for peak seasons when the boat will be making trips every day. The captain takes his profits (pay) from the revenues earned by the boat, and the mate customarily receives a tip of 15 - 20 percent of the charter fee from the client. In many cases, the boat will retain the sale rights to fish caught by clients and if the right is exercised, the ex-vessel price is apportioned between boat, captain, and mate (crew). At the height of the summer season, the recreational fisheries and fishing services (marinas, bait and tackle, *etc*) in Hatteras provide employment for approximately 205 persons.

The recreational rod and reel fishery for pelagic fish flourishes in Hatteras. A bluefin tuna fishery during winter months is intense but somewhat unpredictable. Early in the spring, fishermen target offshore yellowfin tuna, dolphin, and wahoo, followed by marlin and sailfish fishing in the summer. Other species caught seasonally include king mackerel and striped bass. Fly-fishing has become more popular, although it still comprises a small number of offshore trips from Hatteras. Captains say it is very hard to find a year-round mate because college students work summers only and most skilled fishermen want their own vessels (Wilson *et al*., 1998).

About half of fishing parties are all male and the other half are families, some of which participate in other tourist activities while the others fish. "Make-up charters", where marinas organize the parties, are becoming increasingly common (Wilson *et al*., 1998). One captain estimated that his marina did 140 make-up charters in the past year. The majority of the charter customers want to fish offshore. Customers are often willing to accept retention limits imposed by the captain, although the possibility of landing at least one fish is important to many anglers. Changes in fishing conditions including weather conditions and the availability of fish affect charter bookings almost instantly, and there is not much customer loyalty to Hatteras. Clients cancel trips when they hear a species has moved out of the area. Because Hatteras attracts top sport fishermen from around the world, the issues of minimum sizes and trophy fish take on special significance. Many fishermen are interested in setting records by catching smaller bluefin tuna on fly rods.

In 2005, there were 25 HMS charter/headboat permit holders from Hatteras, North Carolina, but many of the charterboats operating in Hatteras are from other areas. They come for the winter bluefin tuna fishery but stay year-round. Researchers report tension between the local charterboats and the transient charterboats because of increased competition for both fish and customers. There is also tension with private recreational fishermen who follow the charter/headboats to see where they fish (Wilson *et al*., 1998).

The status of the relatively new winter bluefin tuna fishery is hot topic for HMS fishermen in Hatteras is the status of the relatively new winter fishery for bluefin tuna. In their study of the 1997 bluefin tuna fishing season, Ditton *et al*. (1998) found that bluefin tuna anglers spent $3.6 million dollars in Hatteras in two and one-half months in the 1997 winter season. They estimate that this meant a $7.6 million impact on the output of the Hatteras area economy and supported 170 jobs. Dare County unemployment estimates indicate that the bluefin tuna fishery may have reduced unemployment by eight percent during the first quarter of 1997. Unemployment in Dare County in March 1998, a year when the bluefin tuna did not show up in numbers anywhere near the 1997 level, was 29 percent higher than in March 1997.

Respondents view and respond to the winter fishery very differently, even disagreeing on the year it started. Because of the unpredictability of the appearance of bluefin tuna and the duration of their stay, there is uncertainty among local businesses about whether or not to invest further and stay open during winter months. Those who now have winter jobs, and those who hire them, have a different perspective. Businesses are generally pleased to retain year-round employees rather than hiring and training seasonally. Finding a place to live on Hatteras Island is already difficult for low wage workers. Many people, especially fishermen, did not think the winter fishery would last (Ditton *et al*., 1998).

9.4.11.2 Wanchese, North Carolina

Wanchese is located on the southern part of Roanoke Island, in the northern Outer Banks. The village continues to revolve around fishing and fish processing. Wanchese's first seafood dealership was opened in 1936 by a family that still operates two seafood businesses in the community. The Wanchese Seafood Industrial Park was constructed in 1980 by the state. It has 30 acres of leasable land, a 15-acre deep-water harbor, and 1,500 feet of commercial-style concrete docks, and seven seafood-related businesses (CNCSS, 1993). The industrial park is

also the scene of the annual blessing of the fleet, which is organized by the Oregon Inlet Users Association. Although commercial fishing has historically been a major industry, there has been an increasing emphasis on recreational angling and tourism.

Between 1990 and 2000, the population increased from 1,374 to 1,527 individuals (Table 9.18). The population is roughly divided between males and females. The population of Wanchese is about 98 percent Caucasian, and mostly of European ancestry. The largest age group is the 18 - 44 year old individuals and continues to remain about the same over the past two decades. The most dramatic shafts in the population distribution have been the decline in the percent of individuals under 20 and increase in the 45 - 64 year old group. In 1990, there were 503 households in Wanchese, with an average of 2.73 persons per household. The number of households had grown to 614 in 2000, with an average of 2.49 persons per household.

Table 9.18 Demographic Profile of Wanchese, North Carolina. Source: U.S. Census 1990 and 2000

Demographics	1990	2000
Total Population	1,374	1,527
Sex		
Male	51.2%	50.7%
Female	48.8%	49.3%
Age		
Median Age	**27.7**	**37.2**
< 20	36.8%	25.9%
20 - 44	35.7%	37.9%
45 - 64	20.2%	24.1%
> 65	7.2%	12.0%
Race		
White	98.5%	98.1%
Black or African American	0.0%	30.0%
American Indian and Alaska Native	1.5%	0.6%
Asian and Pacific Islander	0.0%	0.1%
Other	0.0%	0.5%
Household		
Total	**503**	**614**
Family households	76.1%	70.5%
Nonfamily households	23.9%	29.5%
Average household size	2.73	2.49
Average family size	3.25	2.96
Housing Occupancy		
Total housing units	574	690
Vacant housing units	10.8%	11.0%
Housing Tenure		
Owner-occupied housing units	72.1%	89.0%
Renter-occupied housing units	27.9%	11.0%

Wanchese, North Carolina	1990	2000
Population:	1,374	1,527
Education:		
High school graduates (25 years or older)	67.3%	76.5%
Employment:		
Labor force (16 years and over)	70.7%	66.6%
Unemployed	7.8%	1.8%
Median Household Income	$ 25,977	$ 39,250
Individuals below the poverty line	9.3%	8.1%
Employment in some industry sectors:		
Managerial/professional	17.0%	24.3%
Technical, Administrative, & Sales	24.6%	21.9%
Construction, Production, Maintenance, & Transportation	18.8%	36.0%
Farming, fishing, forestry, & mining	12.6%	9.5%
Industry		
Forestry, fishing, hunting, mining, and agriculture	19.7%	8.2%
Construction	5.0%	9.9%
Manufacturing	9.5%	13.1%
Wholesale trade	6.6%	6.9%
Retail trade	19.1%	11.7%
Education, health & social services	8.5%	22.0%
Arts, recreation, lodging & food services	2.9%	7.2%

In 1990, the largest industries in Wanchese were forestry, fishing, hunting, mining, and agriculture with retail trade as a close second (Table 9.18). The 2000 Census data show a significant decline in the forestry, fishing, hunting, mining, and agriculture industry and a marked increase in the education, health and social services industries. The decline in the farming, fishing, forestry, and mining industry is also noticeable in the employment estimates. Some of these declines can be attributed to difficulties in hiring and managing crew for pelagic longline vessels, especially for the larger vessels that need people to stay on for longer trips (Wilson *et al*., 1998). There is a lot of turnover in fishing crews, particularly when vessels shift to other fisheries and revenue drops. Many of the larger vessels have already left, and experienced fishermen are finding work overseas and other captains and vessel owners are searching for alternatives to commercial fishing. Some have switched to carpentry and building

and others have gone into the charter fishing business. Finding alternative permanent work may prove difficult for many fishermen who are highly skilled in their profession but have less formal education than the average worker (Wilson *et al*., 1998).

Fishing related associations include the Oregon Inlet Users Association and the North Carolina Fisheries Association. The former is involved with supporting the plans for jetties at Oregon Inlet and are responsible for organizing both the Wanchese Seafood Festival and the Blessing of the Fleet. The latter is a trade organization of seafood dealers and commercial fishermen from the state; two members of the 18-member Board of Directors are from Wanchese (CNCSS, 1993).

Recent growth in tourism and recreational fishing has sparked competition for a restricted resource. However, commercial and recreational fishermen still see themselves as being part of the same fishing-based community and many come from the same families. Members of the non-fishing public are generally supportive of the fishing industry. Unlike the surrounding communities, and in distinct contrast to Hatteras Township, Wanchese has very little seasonal variation in employment resulting from tourism; what seasonal fluctuations do exist are caused by the availability of the fisheries resources and are countered by the flexibility and opportunistic nature of the Wanchese fishermen (CNCSS, 1993).

Wanchese is not a community linked to tourism in the way that most other Outer Banks and Dare County communities are. Of the housing stock, only eleven percent was rental properties in 2000 (Table 9.18). The marinas and boatyards in Wanchese cater to transient boats and the charterboat fleets, but recreational fishing from Wanchese is more likely to be done by local fishermen in the Albemarle, Currituck, or Pamlico Sounds, rather than by tourists fishing offshore in private or charterboats. The reason for this is the distance to Oregon Inlet, and the presence of the Oregon Inlet Fishing Center with extensive recreational boat docks, facilities for charterboats, and launching ramps with large parking areas close to the inlet.

A large number of commercially important marine fish are landed in Wanchese, including inshore and offshore species. Many fishermen emphasized that they have to be versatile due to quick changes in water temperature and therefore in availability of species in the area (Wilson *et al*., 1998). The species that longline fishermen target off the mid-Atlantic coast include swordfish, sharks, and tunas (primarily, yellowfin and bigeye). Although targeting bluefin tuna with longline gear is prohibited, there is an incidental catch allowance of bluefin tuna as part of other fishing operations. Fishermen aboard large longline vessels fish for swordfish, tunas, and dolphin. Because of the weather, tunas and swordfish are accessible to the medium-sized vessels that gillnet for other species and longline in the summer. Respondents explained that they also gillnet for dogfish, bluefish, and Spanish mackerel (in spring and fall), and trout and croaker (in winter). They also bottom fish for bass and grouper. There are a number of vessels that gillnet in some seasons and then switch over to charterboat fishing in the summer. Other fishing activities in Wanchese include trawling trips for squid in the summer, and fishing for weakfish, croaker, and flounder in the winter. Market considerations are crucial in deciding which species should be targeted by longline vessels (Wilson *et al*., 1998).

Researchers found pressure on this sector of the longline fishery to be substantial. Hiring and managing crew for pelagic longline vessels is increasingly difficult, especially for the larger vessels that need people to stay on for longer trips. There is a lot of turnover in fishing crews, particularly when vessels shift to other fisheries and revenue drops. Many of the larger vessels have already left, and experienced fishermen are finding work overseas and other captains and vessel owners are searching for alternatives to commercial fishing. Some have switched to carpentry and building and others have gone into the charter fishing business. Finding alternative permanent work may prove difficult for many fishermen who are highly skilled in their profession but have less formal education than the average worker (Wilson *et al*., 1998).

9.4.12 South Carolina

The population in South Carolina has increased by 13.1 percent between 1990 and 2000 (Table 9.19). The number of individuals with a high school diploma or greater has increased from 68.3 percent in 1990 to 76.3 percent in 2000. The unemployment rate has remained about the same and the number of individuals below the poverty line declined by just over one percent. Employment in the farming, fishing, forestry, and mining industries has declined slightly with the only significant increase in employment taking place in the arts, recreation, lodging, and food services industries, from 1.1 percent in 1990 to 8.3 percent in 2000.

Table 9.19 South Carolina Demographic Profile. Source: U.S. Census, 1990 and 2000

South Carolina	1990	2000
Population:	**3,486,703**	**4,012,012**
Education:		
High school graduates (25 years or older)	68.3%	76.3%
Employment:		
Labor force (16 years and over)	66.0%	63.4%
Unemployment Rate	5.6%	5.9%
Median Household Income	$26,256	$37,082
Individuals below the poverty line*	15.4%	14.1%
Employment in some industry sectors:		
Farming, fishing, forestry & mining	2.3%	1.1%
Construction	7.9%	8.3%
Wholesale trade	3.6%	3.3%
Retail	16.6%	11.9%
Manufacturing	25.7%	19.4%
Education, health & social services	19.9%	18.6%
Arts, recreation, lodging & food services	1.1%	8.3%

*U.S. Census uses data from 1989 and 1999 to estimate these values.

South Carolina has 89 commercial tuna permit holders, holding 1.7 percent of the total commercial tuna permits (Table 9.36). Additionally, there are 32 dealers for tunas, shark, and swordfish in the state of South Carolina. With 25 shark permits (directed and incidental), South Carolina holds the fifth greatest number of shark permits. Due to the relatively small number of HMS permit holders and landings in South Carolina, no community profiles have been developed at this time.

In 2005, South Carolina was home to 736 HMS Angling permit holders (Table 9.34). About 662,000 marine anglers fished in South Carolina's waters making 2.2 million recreational fishing trips in 2004 (NMFS, 2005a). Of these recreational fishermen, 335,000 (51 percent) were from out-of-state and 101,000 (15 percent) were from non-coastal counties within South Carolina. Estimated retail sales generated by the saltwater fishery in South Carolina in 2001 were some $264 million and the marine recreational fishing industry created 5,498 jobs (ASA, 2002). Anecdotal information suggests that the shark fishery is incidental to other fisheries, and is primarily catch-and-release.

In 2005, South Carolina had a fleet of 130 charter/headboats with HMS permits, many of which fish the Gulf Stream for tuna and billfish, dolphin and wahoo, and take shark as incidental catch (Table 9.35). There is a directed fishery by charter/headboats for sharks in South Carolina. Shark fishing trips, including night fishing, are offered by a number of charter operators. Sharks are taken, in the directed fishery, from near-shore waters, inlets, and from around breakwaters and jetties. Shark fishing is said to be particularly good from May to December, but sharks are available year-round. Principal species targeted are blacktip, hammerhead, lemon, and tiger shark. The International Game Fish Association (IGFA) world-record tiger shark was caught off Cherry Grove Beach, SC, near Myrtle Beach. Charterboat operators advertising shark fishing as special trips or part of general near-shore fishing are found in the communities of Myrtle Beach, North Myrtle Beach, Hilton Head, Georgetown, Pawley's Island, Murrell Inlet, Edisto Beach, Isle of Palms, Seabrook Island, Charleston, Mount Pleasant, Beaufort, and Little River.

9.4.13 Georgia

The population in Georgia has increased quite a bit in the last decade, from 6.5 million people in 1990 to 8.2 million people in 2000 (Table 9.20). The labor force (ages 16 and older) and unemployment has remained the same over the past decade, but there was a slight decline in the percentage of individuals below the poverty line. Employment in the farming, fishing, forestry, and mining industries has declined slightly since 1990; there has been only a slight employment increase in the art, recreation, lodging, and food services industries, from one percent to seven percent.

Table 9.20 Georgia Demographic Profile. Source: U.S. Census, 1990 and 2000

Georgia	1990	2000
Population:	**6,478,216**	**8,186,453**
Education:		
High school graduates (25 years or older)	70.9%	78.6%
Employment:		
Labor force (16 years and over)	66.1%	66.1%
Unemployment Rate	5.5%	5.5%
Median Household Income	$29,021	$42,433
Individuals below the poverty line*	14.7%	13.0%
Employment in some industry sectors:		
Farming, fishing, forestry & mining	2.7%	1.4%
Construction	6.9%	7.9%

Georgia	1990	2000
Wholesale trade	5.1%	3.9%
Retail	16.5%	12.0%
Manufacturing	18.9%	14.8%
Education, health & social services	20.4%	17.6%
Arts, recreation, lodging & food services	1.0%	7.1%

*U.S. Census uses data from 1989 and 1999 to estimate these values.

Commercial shark fishing in Georgia has traditionally been only a very small segment of the commercial fisheries in the state. There are only four vessels that hold shark permits in Georgia (Table 9.38). Both Darien and Townsend, in McIntosh County, have been involved with the commercial shark fishery. There are three dealers permitted to sell HMS such as tunas, sharks, and swordfish (Table 9.37). Twenty-six vessels are permitted to participate in the commercial tuna fisheries (Table 9.36). The number of HMS charter/headboat permits operating in Georgia increased from 27 in 2003 to 40 in 2005 (Table 9.35). Some of the active charter/headboat communities are Columbus, Brunswick, Marietta, Savannah, Atlanta, Alpharetta, and St. Simons Island.

In 2005, Georgia residents held 205 HMS angling permits (Table 9.34). In 2004, marine recreational fishing in Georgia attracted 276,000 anglers, of whom 20 percent (54,000) were from out-of-state and 43 percent from non-coastal counties (NMFS, 2005a). Collectively, these anglers made 929,000 recreational fishing trips in 2004. Saltwater angling is estimated to have generated some $57.8 million in retail sales in Georgia in 2001 and about 10,649 jobs in the marine recreational fishing service sector (ASA, 2002). Principal recreational fisheries are for tarpon and snook inshore, and billfish and tunas offshore. Sharks are taken incidental to these fisheries but there are targeted shark fisheries inshore on spinner, sandbar, and lemon sharks.

9.4.14 Florida

Florida's population increased by more than 3 million people between 1990 and 2000 (Table 9.21). The percentage of individuals 25 years and older with a high school diploma and/or a graduate level degree has increased by almost five percent in the last decade. The percentage of employed individuals has declined slight, whereas the unemployment rate and percentage of individuals below the poverty line remained about the same through the nineties. As with many of the other states, employment in the farming, fishing, forestry, and mining industries has declined, whereas the education, health, and social services industries provided the greatest employment opportunities in 2000. Employment in the arts, recreation, lodging, and food services industries has been on the rise in the last decade.

Florida's fishing industry is one of the largest and most diverse in the region. Florida residents hold more than half of the commercial shark permits with 283 permit holders residing in the state (Table 9.38). Some of the large concentrations of permit holders are in Fort Pierce, St. Petersburg, Key West, and Panama City, Florida (Figure 9.6). Florida is also home to the greatest number of swordfish permit holders with 117 permitted vessels (Table 9.39). The large numbers of swordfish permit holders are found in Fort Pierce, Pompano Beach, St. Petersburg, and Panama City. Florida residents hold about five percent of the commercial tuna permits, and are generally spread out along the entire coast of Florida (Table 9.36 and Figure 9.4). Florida

residents also have the greatest number of HMS dealer permits with 137 dealers permitted to purchase and sell tunas, sharks, and swordfish (Table 9.37). A large number of these dealers can be found in Miami, Fort Lauderdale, Key West, and St. Petersburg.

Florida has the largest marine recreational fisheries in the United States. In 2004, approximately 6,534,000 saltwater anglers fished in the waters off Florida and made 27,204,000 fishing trips during that year (NMFS, 2005a). Of these fishermen, 3,291,000 (50 percent) were from out-of-state. More specifically to recreational HMS fisheries, Florida has the greatest number of HMS angling permits in the United States, with 3,439 permitted individuals (Table 9.34). A large concentration of HMS anglers reside in Jupiter, West Palm Beach, Pompano Beach, Fort Lauderdale, and Miami, Florida (Figure 9.2). The retail sales generated by saltwater anglers in Florida in 2001 were estimated to be $2,987.2 million and the marine recreational fishing industry provided 59,418 jobs (ASA, 2002). Sharks are an incidental catch for many fishermen, but some private boat fishermen have a directed fishery for sharks, including lemon, hammerhead, sandbar, blacktip and tiger sharks.

As with the recreational anglers, Florida is also the number one state for HMS charter/headboat permit holders with 632 permitted vessels (Table 9.35). Many of these charter/headboat operators are from Key West, Islamorada, Miami, and Destin, Florida (Figure 9.3). It should be noted that these 634 charterboats/headboats permit holders refer to Florida residents and do not account for the transient vessels traveling to Florida for the winter and spring fishing seasons.

Table 9.21 Florida Demographic Profile. Source: U.S. Census, 1990 and 2000

Florida	1990	2000
Population:	**12,937,926**	**15,982,378**
Education:		
High school graduates (25 years or older)	74.0%	79.9%
Employment:		
Labor force (16 years and over)	60.4%	58.6%
Unemployment Rate	5.8%	5.6%
Median Household Income	$27,483	$38,819
Individuals below the poverty line*	12.7%	12.5%
Employment in some industry sectors:		
Farming, fishing, forestry & mining	3.1%	1.3%
Construction	7.8%	8.0%
Wholesale trade	4.6%	3.9%
Retail	19.6%	13.5%
Manufacturing	10.5%	7.3%
Education, health & social services	21.4%	18.1%
Arts, recreation, lodging & food services	2.3%	10.5%

*U.S. Census uses data from 1989 and 1999 to estimate these values.

9.4.14.1 Pompano Beach, Florida

Pompano Beach is a small city directly adjacent to Fort Lauderdale. The Fort Lauderdale area is known as the "Yachting Capital of the World" and the "Venice of America" because of the vast canal system, which extends throughout Broward County and creates 165 miles of waterfront in the region. Recreational fishing is a very important activity in Pompano Beach, mainly targeting billfish. In contrast to many Florida communities, local people in addition to tourists support a substantial amount of the recreational fishing industry. Many small fishing tournaments attract about 75 percent local people and 25 percent tourists. Pompano Beach is also a globally important manufacturing center for commercial longlining equipment with its own small commercial longline fleet (Wilson *et al.*, 1998). As a community, Pompano Beach owes its current infrastructure and social and economic lifestyle to the arrival of the railroad in 1896 to a small coastal settlement. The proximity of good fishing and other natural resources encouraged the town and region's development as tourism and retirement center. The local chamber of commerce sponsors three marine festivals every year.

Between 1990 and 2000, the population increased from 72,411 to 78,191 individuals (Table 9.22). The male to female ratio in the Pompano population changed only slightly in the past decade with a slight decrease in the number of females (48:52 to 49:51). The percent of the total population by each age group remained relatively constant between 1990 and 2000. Since the 1990 Census, the ethnic and racial population of Pompano Beach has shifted to increase the number of "other" ethnicities in the population. In 1990, the population was 70 percent Caucasian and 29 percent Black-American. Twenty percent of the population was of Hispanic ancestry. In 2000, the population consisted of 67 percent Caucasians, 25 percent Black-Americans, and eight percent of people of other ethnicities. The proportion of the population with Hispanic ancestry had dropped to ten percent.

The number of households increased from 31,891 in 1990 to 35,197 in 2000 (Table 9.22). The average household size in Pompano Beach decreased from 2.2 persons/household in 1990 to 2.1 persons/household in 2000. Of the households in 2000, some 69 percent were in receipt of earned income. Some 36 percent of the households received Social Security payments, while 16 percent of households were in receipt of retirement income from pensions (NMFS, 1999a). This suggests that some 30 percent of households were retired and living on fixed incomes. The per capita income for Pompano Beach in 1989 was $17,382, and greater than the state average by $2,684 per annum. In 2000, per capita income in Pompano Beach was $23,938, and greater than the state average income by $2,381. The technical, administrative, and sales industries provide the greatest source of employment, with managerial and professional positions a close second. Employment in the farming, fishing, forestry and mining industries declined from almost 12 percent in 1990 to less than one percent in 2000.

Pompano Beach has a proud longlining heritage and there are several successful businesses that are still involved to some degree with the fleet (Wilson *et al*., 1998). This gives the current small vessel fleet and other longline business some networks of support. At the same time, Pompano Beach is now increasingly a recreational fishing community. In fact, Pompano Beach has the second largest concentration of HMS angling permit holders with 303 residents participating in the HMS recreational fishery (Figure 9.2). Virginia Beach has 316 permit holders. There is a great deal of tension between the recreational fishermen and the longliners.

At the present time, researchers found that the longline fleet is not receiving community support beyond that supplied from within their own industry. Both sides acknowledge a problem with overfished stocks, but each often blames the other side.

Pompano Beach has a small pelagic longline fleet, remnant of a much larger fleet, which mainly targets tunas and swordfish. A large number of swordfish permit holders reside in Pompano Beach (Figure 9.7). There is also some shark fishing farther North along the coast. There are eleven HMS longline permit holders residing in Pompano Beach, Florida. The most intensive local fishing takes place December through April. The longline fleet conducts business with three Pompano Beach dealers permitted for shark and swordfish and one Dania shark and swordfish permitted dealer. The development of the Pompano Beach area for yachting and recreational fishing has made dockage and access to the water more expensive (NMFS, 1999b).

Wilson *et al.* (1998) noted that commercial respondents reported increased difficulty in getting quality crew. The smaller vessels take two crew plus the captain. Owner-operators often try to have at least one consistent crew member, and then find anyone they can for particular trips. The end result of all of these factors has been a substantial reduction of the Pompano Beach longline fleet. Pompano Beach's remaining pelagic and bottom longline fleet is considered, by both its owners and suppliers, to be in major trouble (Wilson *et al*., 1998). Skilled captains were seeking employment in the Bahamas, as well as with the growing longline fleets in South Africa and South America, while the longline supply business has shifted its emphasis to supplying foreign fleets. In the urban economy of Pompano Beach, non-fishing alternatives for fishermen do exist. However, the work force is fairly well-educated, so finding employment could be competitive (Table 9.22). Commercial fishing employment alternatives for vessels and crew are minimal because of limited entry programs in other fisheries.

Table 9.22 Demographic Profile of Pompano Beach, Florida. Source: U.S. Census 1990 and 2000.

Demographics	1990	2000
Total Population	72,411	78,191
Sex		
Male	48.2%	49.3%
Female	51.8%	50.9%
Age		
Median Age	**39.8**	**42.2**
< 20	19.8%	19.7%
20 - 44	35.0%	34.5%
45 - 64	19.9%	22.5%
> 65	25.3%	23.4%
Race		
White	70.1%	67.8%
Black or African American	28.6%	25.4%
American Indian and Alaska Native	0.1%	0.2%
Asian and Pacific Islander	0.3%	0.8%
Other	0.9%	2.0%
Household		
Total	**31,981**	**35,197**
Family households	57.9%	52.4%
Nonfamily households	42.1%	47.6%
Average household size	2.26	2.13
Average family size	2.90	2.85
Housing Occupancy		
Total housing units	42,179	44,496
Vacant housing units	24.7%	20.9%

Pompano Beach, Florida	1990	2000
Population:	72,411	78,191
Education:		
High school graduates (25 years or older)	73.7%	77.2%
Employment:		
Labor force (16 years and over)	52.1%	53.8%
Unemployed	3.5%	3.6%
Median Household Income	$ 29,683	$ 36,073
Individuals Below the Poverty Line	16.0%	17.0%
Employment in some industry sectors:		
Managerial/professional	24.8%	28.6%
Technical, Administrative, & Sales	31.8%	30.0%
Construction, Production, Maintenance, & Transportation	3.2%	11.4%
Farming, fishing, forestry, & mining	11.6%	0.5%
Industry Code Description		
Forestry, fishing, hunting, mining, and agriculture	3.1%	0.5%
Construction	10.4%	9.8%
Manufacturing	8.5%	7.1%
Wholesale trade	5.4%	4.7%
Retail trade	18.6%	13.6%
Education, health & social services	13.2%	14.9%
Arts, recreation, lodging & food services	2.3%	11.0%

9.4.14.2 Fort Pierce, Florida

Fort Pierce is located in St. Lucie County, a rapidly developing area in South Florida. St. Lucie County is known as a center for citrus growing, particularly grapefruit. Fort Pierce is on the site of an Army fort built in 1838, and remained an isolated outpost until the railroad reached the town in 1900. Fort Pierce was incorporated in 1901, and soon developed as a center for industry and agribusiness. At the junction of the Florida Turnpike and Interstate 95, Fort Pierce is a thriving intermodal transportation center, distribution point, and tourist stopover point.

Fort Pierce is a community in transition. The community grew rapidly between 1960 and 1990, from a population of 24,857 to 36,830 (Table 9.23). Between 1990 and 2000, the population grew by only two percent, increasing by about 800 people. Changing from a predominantly white community in 1950, the white portion of the population declined to less than half the total in 2000. The black or African American population made up just over 40 percent of the Fort Pierce population. No other ethnic or racial groups dominate the remaining 11 percent of the population. About 30 percent of the population is under 20 years old, whereas another 33 percent is between 20 and 44. The median age in 2000 was 35.4 years old.

Table 9.23 Demographics of Fort Pierce, Florida. Source: U.S. Census 1990 and 2000.

Demographics	1990	2000
Total Population	36,830	37,516
Sex		
Male	47.1%	49.3%
Female	52.9%	50.7%
Age		
Median Age	**34.2**	**35.4**
< 20	30.4%	30.3%
20 - 44	30.8%	32.7%
45 - 64	18.8%	19.6%
> 65	20.0%	17.5%
Race		
White	53.8%	49.5%
Black or African American	42.5%	40.9%
American Indian and Alaska Native	0.2%	0.3%
Asian and Pacific Islander	0.4%	0.9%
Other	3.1%	5.4%
Household		
Total	**14,283**	**14,407**
Family households	64.4%	61.2%
Nonfamily households	35.6%	38.8%
Average household size	2.58	2.56
Average family size	3.21	3.19
Housing Occupancy		
Total housing units	17,250	17,170
Vacant housing units	17.8%	16.6%
Housing Tenure		
Owner-occupied housing units	53.3%	53.2%
Renter-occupied housing units	46.7%	46.8%

Fort Pierce, Florida	1990	2000
Population:	36,830	37,516
Education:		
High school graduates (25 years or older)	56.9%	59.7%
Employment:		
Labor force (16 years and over)	48.2%	55.1%
Unemployed	6.8%	4.9%
Median Household Income	$ 18,913	$ 25,121
Individuals Below the Poverty Line	29.2%	30.9%
Employment in some industry sectors:		
Managerial/professional	16.8%	19.9%
Technical, Administrative, & Sales	28.0%	20.5%
Construction, Production, Maintenance, & Transportation	9.7%	9.0%
Farming, fishing, forestry, & mining	10.4%	31.3%
Industry		
Forestry, fishing, hunting, mining, and agriculture	9.8%	7.8%
Construction	8.2%	12.6%
Manufacturing	7.1%	8.0%
Wholesale trade	4.1%	4.8%
Retail trade	21.0%	12.5%
Education, health & social services	17.1%	16.9%
Arts, recreation, lodging & food services	1.1%	10.8%

There were 14,407 households in Fort Pierce, with an average household size of 2.56 persons, in 2000. The population is relatively mobile, since only 46 percent lived in the same house in 2000 as they did in 1995. It is also a relatively poor community, with median household income of $25,121 in 2000, and 31 percent of the population living below poverty level. Per capita income in Fort Pierce in 2000 was $14,345, compared to the statewide average per capita income of $21,557, and $9,593 less than the per capita income in Pompano Beach.

These earnings data reflect the unskilled and seasonal nature of jobs in agribusiness, packing plants and transportation businesses in and around Fort Pierce.

Locals refer to Fort Pierce as the "gateway to the Bahamas" because of the number of sport fishing and other vessels which use Fort Pierce as their departure point for the Bahamas and its associated Gulf Stream fisheries for HMS and other species of fish, including shark. In 2003, Fort Pierce hosted 15 fishing tournaments and related marine activities. The city's marina, in conjunction with other marinas and docks along the Indian River, Indian River Lagoon, and Intracoastal Waterway, provides sufficient dockage for recreational boaters and fishermen and for a commercial fishing fleet, principally longliners, but also the shark gillnetters. Fifteen shark and nine swordfish permit holders reside in Fort Pierce (Figure 9.6 and Figure 9.7).

The commercial fishing fleet in Fort Pierce has grown in the past decade due to lost dock space for commercial fleets in nearby ports. With the exception of the gillnet fleet unique to Fort Pierce, the commercial fishery is similar to the commercial fishery of Pompano Beach and is principally conducted during the fall and winter seasons. Smaller vessels switch gears and target species throughout the year, while larger vessels move with the fish stocks and retain the same gear configurations. Dealers and fish processors have also consolidated buying and packing operations in Fort Pierce because of the high cost of doing business in the tourism-related coastal communities North and South of Fort Pierce.

9.4.14.3 Madeira Beach, Florida

Madeira Beach is part of the Tampa Bay urban complex, one of several beach suburbs of St. Petersburg. The area is the home of the West-central Florida shark bottom longline fleet. Madeira Beach is also home to a thriving recreational HMS fishery. In terms of revenue, tourism is the number one industry in Pinellas County. Annually, four million visitors contribute about two billion dollars to the economy. The tourism industry also employs almost 60,000 of the residents either directly or indirectly, adding up to $720 million in wages (St. Petersburg-Clearwater Visitors Bureau brochure, 1998). The state of the economy since September 2001 has dampened the tourism industry, and Pinellas County Chamber of Commerce reported that the 2002 visitor and expenditure statistics were similar to those of 1998 (PCCC Report, March, 2003).

Madeira Beach's economy has changed with the changing tourism industry. A sign of the times is the renovation of much of the waterfront along St. John's Pass from a working waterfront of docks, fish houses and chandleries to a boardwalk lined with restaurants and boutiques. Many of the slips remaining are assigned to recreational vessel docking and storage. The once-dominant fishing industry is now a shadowy presence in much of Madeira Beach.

The population in Madeira Beach increased by about six percent over the last decade (Table 9.24). In 2000, 97 percent of the population was Caucasian. During the decade, the number of people in the population claiming German ancestry rose from 11 percent to 19.7 percent in 2000, although 92 percent of the population of Madeira Beach was born in the United States. The Madeira Beach population aged during the decade. The median age increased from 34.2 in 1990 to 47.6 in 2000. The number of households in Madeira Beach increased from 2,230 in 1990 to 2,523 in 2000, but the average number of persons in a household declined from 1.88

persons in 1990 to 1.78 in 2000. In 2000, almost 28 percent of the housing units in Madeira were seasonal or recreational units vacant at the time of the Census.

Per capita income in Madeira Beach in 1989 was $17,301; in 1999, per capita income had risen to $30,097, some $8,000 more than the state average per capita income and $15,752 more than the average per capita income in Fort Pierce. Individuals living at or below poverty level comprised 9.8 percent of the Madeira Beach population. Some 72 percent of Madeira Beach's households received earnings from wages or salaries. Twenty-three percent of the households were in receipt of retirement funds or pensions, while 31 percent of the households received income from Social Security. The jobs in farming, fishing, forestry, and mining industries declined over the last decade from just over ten percent to less than one percent (Table 9.24). The industry itself also declined, whereas the arts, recreation, lodging and food services related industries increased from 2.5 percent to over 21 percent.

The offshore fishing industry in Madeira Beach started as a bandit (reel fixed to transom) fishery before it shifted to bottom longlining. Grouper is the traditional fishery for the community. In the 1960s, there were two dealers supported by charterboats selling fish and a small commercial fleet targeting kingfish and grouper. Many species that are now sold in Madeira Beach, such as amberjack, were considered junk fish in earlier years. As demand for seafood began to grow, higher prices accompanied by investment programs led to substantial investment in commercial fishing within this community.

Table 9.24 Demographic Profile for Madeira Beach, Florida. Source: U.S. Census 1990 and 2000.

Demographics	1990	2000
Total Population	4,225	4,500
Sex		
Male	50.9%	52.0%
Female	49.1%	48.0%
Age		
Median Age	**34.2**	**47.6**
< 20	11.2%	9.5%
20 - 44	35.3%	32.5%
45 - 64	28.0%	36.0%
> 65	25.6%	21.9%
Race		
White	99.8%	97.4%
Black or African American	0.0%	0.0%
American Indian and Alaska Native	0.0%	0.8%
Asian and Pacific Islander	0.2%	0.0%
Other	0.0%	1.8%
Household		
Total	**2,230**	**2,523**
Family households	50.5%	59.8%
Nonfamily households	49.5%	40.2%
Average household size	1.89	1.78
Average family size	2.49	2.39
Housing Occupancy		
Total housing units	3,788	3,971
Vacant housing units	41.1%	36.5%

Madiera Beach, Florida	1990	2000
Population:	4,225	4,500
Education:		
High school graduates (25 years or older)	83.8%	87.3%
Employment:		
Labor force (16 years and over)	56.9%	61.5%
Unemployed	1.6%	2.7%
Median Household Income	$ 24,748	$ 36,671
Individuals Below the Poverty Line	8.4%	9.8%
Employment in some industry sectors:		
Managerial/professional	35.3%	30.4%
Technical, Administrative, & Sales	31.2%	28.9%
Construction, Production, Maintenance, & Transportation	1.4%	17.8%
Farming, fishing, forestry, & mining	10.3%	0.7%
Industry		
Forestry, fishing, hunting, mining, and agriculture	1.4%	0.0%
Construction	8.8%	7.0%
Manufacturing	7.5%	11.3%
Wholesale trade	4.5%	4.1%
Retail trade	30.7%	11.4%
Education, health & social services	11.4%	7.9%
Arts, recreation, lodging & food services	2.5%	21.6%

Longline vessels began to target swordfish in the 1970s, using cloth and nylon line before monofilament longlining was commonly used. Local availability of swordfish declined quickly and a group of vessels went North to look for fish. On their way back they set longline gear in deep water and caught a significant amount of shark, tilefish and yellowedge grouper; this was

how the bottom longline fishery in Madeira Beach began (Wilson *et al*., 1998). Marginal swordfish vessels began to experiment with various techniques such as straight hooks, auto-baiters and circle hooks. The Madeira Beach fleet is currently 95 percent bottom longline vessels. There are three seafood dealers in this community, two of which were permitted to sell HMS species in 2005. One dealer estimated that before restrictions on shark fishing his business used to be 45 percent grouper, 45 percent shark, and ten percent swordfish and tuna; now it is 75 percent grouper, ten percent shark and 15 percent swordfish and tuna (Wilson *et al.*, 1998). With the imposition of the live-bait ban in 2000, the swordfish and tuna landings have decreased appreciably.

Sharks and grouper are both caught with bottom longline gear. For this reason, the majority of longline fishermen hold permits for multiple fisheries. Due to the various regulations for all of the fisheries, the maximum number of trips fishermen can make is about 15 trips a year, as a bottom longline trip lasts some seven to fourteen days. Grouper fishermen are subject to limited access, a minimum size, area restrictions, seasonal closures, and a quota.

Overall, the Madeira Beach bottom longliners are becoming fewer and more isolated from the rest of the fishing community (Wilson *et al*., 1998). Respondents say that antagonism and competition among dealers has gotten worse in recent years as vessels drop out of fishing, often being sold outside of the country. Many of these crews are living trip to trip and often need credit for engine repair, ice, fuel and even household and personal items. Both the fishermen and an engine supplier reported that the commercial fleet is spending more on maintaining existing gear and vessels rather than buying new equipment. Traditional patterns of dealers building relationships by extending services and credit to vessels are giving way to price-based competition to gain access to vessels (NMFS, 1999a).

Fishermen in this community have experienced restrictions on gear, harvest, and capacity in many of its important fisheries. Wilson *et al.* found that alternative employment outside of the fishery is available through expanding opportunities in the tourism and recreational fishing industries. However, this relatively ready supply of alternative employment threatened the stability of the labor pool for the fishing industry. Some reported that the best captains are leaving the country or moving on to other jobs. Like many other fishing communities, the longline fleet in Madeira Beach is experiencing market competition from imports of their target species (Wilson *et al*., 1998; NMFS, 1999a).

When the shark bottom longline fishery began in Florida, it was easy to catch sharks, but the catch from the bottom longline fishery has become marginal due to restrictions and increased steam time to fishing grounds (Wilson *et al*., 1998). Members of the fishing and supply industries reported price fluctuations in the shark fishery, which they attributed to the difficulty in maintaining steady supplies under derby-style quota management. The fins bring the most money and are exported to Asian nations. Shark trips have to be kept as short as possible to maintain good quality meat. Respondents suggest that regulations, particularly the 4,000-pound shark commercial retention limit, have turned the fishery into a small vessel fishery. Some fishermen keep both grouper and shark gear on board (NMFS, 1999a).

Approximately 50 to 60 charter/headboats participated in the recreational fisheries of Madeira Beach during the 1990s, and more than 48,000 pleasure vessels were registered in Pinellas County (Florida Bureau of Vessel Titling and Registration, 1996 and 1997). Researchers found tension and distance between the recreational and commercial fishing communities to be high, and recreational fishermen tend to maintain that commercial fishing is to blame for the declining shark populations (Wilson *et al*., 1998). Shark fishing is comparatively less important to recreational fishing in Madeira Beach than other HMS, although researchers reported that the local recreational shark fisheries are very healthy (NMFS, 1999a).

The renewal and renovation of the town's waterfront, particularly on John's Pass, removed many of the berths and infrastructure, which supported both the charterboat fleet and the commercial fishing fleet. In 2005, there was one charter/headboat with HMS permits holders living in Madeira Beach. Additionally, the Madeira Beach shark tournaments, which were mostly sponsored by a vessel or engine manufacturer, are no longer held due to loss of this infrastructure. Stores sell very little shark tackle, but some maintain the industry is beginning to come back. The miles-long remainder of the old Sunshine Skyway bridge is now used as a pier for recreational shark fishing. It is estimated that recreational shark fishing in this community is 90 percent catch-and-release (NMFS, 1999a).

9.4.14.4 Panama City, Florida

Panama City is located on the Gulf of Mexico in the Florida Panhandle. Panama City is one of the Florida's top fishing centers offering surf fishing, pier fishing, and charter/headboat fishing, according to the Panama City Tour Guide (NMFS, 2003). According to the Florida Bureau of Vessel Titling and Registration, the county has a total of 16,865 registered vessels with 15,359 pleasure and 1,433 commercial vessels. Headboats are an important part of Panama City's tourism. People enjoy bringing children along since these trips are shorter than charterboat trips. Panama City is a summer resort, with little tourist activity in the winter, as well as an important commercial fishing port.

During the winter, recreational fishermen target bottom fish and bluefish. In March, the season begins for Spanish mackerel, cobia, snapper, bonito, little tunny, amberjack, snapper, red porgies, rudder fish, blue runner, bluefish, and redfish. By summer, they also fish for king mackerel, dolphin fish, wahoo, little tunny, and barracuda. White marlin, blue marlin, and sailfish are caught recreationally in late summer. Some charterboats will go shark fishing at night for extra income. In September, the fishery is very mixed, and in October, king mackerel and bonito are popular. Tourists are mainly interested in bottom fishing. Motivations have changed; people used to be interested in catching a lot of fish and taking it home to eat or sell, but now people are satisfied to catch anything (Wilson *et al*., 1998; NMFS, 1999a).

Between 1990 and 2000, Panama City experienced a modest increase in its population from 34,378 in 1990 to 36,417 in 2000 (Table 9.25). Since 1990, there has been an increase in the male population with a corresponding decrease in the female portion of the total population; males: 47 to 49 percent and females: 53 to 51 percent. The Panama City population did get older in the past decade the median age increased from 34 years old to about 37 years old. Correspondingly, the greatest portion of the population in both decades was in the 20 – 44 years old age bracket.

Panama City had 14,033 households in 1990, and the number of households grew to 14,819 in 2000 (Table 9.25). The average household size decreased from 2.37 persons in 1990 to 2.30 persons in 2000, indicating that there might be an increase in "empty nesters" and retiree households. The percentage of individuals below the poverty line decreased slightly over the past decade from almost twenty to seventeen percent. In 1989, the per capita income in Panama City was $12,169 and was significantly lower than the state average per capita income of $14,698. This situation persisted in 1999, when the Panama City per capita income had increased to $17,830, but continued to be less than the Florida average of $21,557 per capita.

Like Fort Pierce, Panama City is a transportation hub and has an agricultural and industrial base in addition to its fisheries. Panama City's commerce rests on a supply of unskilled labor able to service agribusiness, transportation services, and the tourism industry. Panama City has two city marinas in addition to private commercial operations. The Panama City marina is located downtown on the Intracoastal Waterway and provides 240 berths for recreational, commercial and charter/headboat vessels. The second municipal marina, St. Andrews, lies on St. Andrews Bay, closer to the Gulf of Mexico, and provides docking and other facilities for much of the commercial fishing fleet. This fleet is chiefly composed of shrimp boats. Seven charter/headboats are based in the city marinas. There are thirty Panama City residents with an HMS charter/headboat permit (Figure 9.3). While the largest local employers are hospitals and resort hotels, two shipyards between them employed 650 persons in 2003 (Panama City/Bay County Chamber of Commerce, 2003).

Table 9.25 Demographic Profile for Panama City, Florida. Source: U.S. Census 1990 and 2000.

Demographics	1990	2000
Total Population	34,378	36,417
Sex		
Male	46.7%	48.6%
Female	53.3%	51.4%
Age		
Median Age	**33.9**	**37.2**
< 20	28.6%	25.6%
20 - 44	34.9%	36.8%
45 - 64	19.6%	21.7%
> 65	16.9%	16.0%
Race		
White	76.1%	73.6%
Black or African American	21.0%	21.5%
American Indian and Alaska Native	0.7%	0.6%
Asian and Pacific Islander	1.6%	1.6%
Other	0.6%	0.8%
Household		
Total	**14,033**	**14,819**
Family households	69.2%	61.0%
Nonfamily households	30.8%	39.0%
Average household size	2.37	2.30
Average family size	2.90	2.92
Housing Occupancy		
Total housing units	15,928	16,548
Vacant housing units	11.8%	10.4%
Housing Tenure		
Owner-occupied housing units	58.3%	57.8%
Renter-occupied housing units	41.7%	42.2%

Panama City Beach, Florida	1990	2000
Population:	34,378	36,417
Education:		
High school graduates (25 years or older)	70.3%	79.2%
Employment:		
Labor force (16 years and over)	54.0%	53.9%
Unemployed	4.6%	3.1%
Median Household Income	$ 21,881	$ 31,572
Individuals Below the Poverty Line	19.6%	17.2%
Employment in some industry sectors:		
Managerial/professional	25.9%	32.2%
Technical, Administrative, & Sales	32.2%	27.7%
Construction, Production, Maintenance, & Transportation	1.5%	19.0%
Farming, fishing, forestry, & mining	10.2%	0.4%
Industry		
Forestry, fishing, hunting, mining, and agriculture	1.6%	0.5%
Construction	7.0%	6.7%
Manufacturing	7.7%	7.0%
Wholesale Trade	3.3%	0.1%
Retail Trade	21.4%	13.8%
Education, health & social services	19.4%	22.2%
Arts, recreation, lodging & food services	1.5%	14.2%

In the early 1980s, yellowfin tuna was the main commercial fishery for Panama City from April through December while bluefin tuna were targeted in the winter. Some of the longline vessels shifted from yellowfin tuna fishing to bottom longline fishing for grouper and

sharks in 1998, since the latter required fewer crew members (Wilson *et al*., 1998). Some of these vessels targeted dolphin fish in the summer, and swordfish more rarely. In 1998, two of these vessels were owner operated, two were owned by a dealer, three were each owned by a single person who hired a captain, and two others were jointly owned and had hired captains (Wilson *et al*., 1998). In 2005, ten longline vessels held an HMS permit; 20 shark permits and 12 swordfish permits were issued to residents of Panama City.

Some pelagic longline fishermen also participated in the reef fish and bottom longline fishery. There were 16 to 19 grouper vessels operating out of Panama City in 1998. One fish trader interviewed by the researchers in 1998 reported that his current business was 87 percent yellowfin tuna and eight percent snapper, with the remainder being a mix of swordfish, bluefin tuna, dolphin, wahoo, sandbar shark, and escolar. He bought from about ten vessels in 1998, but had bought from 30 vessels a few years ago (Wilson *et al.*, 1998). The prohibition on the use of live bait in 2000 reduced the tuna and swordfish catches of the commercial fleet and increased use of bottom longline for grouper and shark.

While Panama City was developing tourist and recreational fishing industries, the commercial fishermen were becoming fewer and more isolated from the rest of the community. The competition among dealers was perceived as becoming more aggressive in 1997 - 1998. Traditional patterns of dealers building relationships by extending services and credit to vessels in the shrimp and longline fisheries were giving way to price-based competition to gain access to vessels. Fishermen in this community had experienced restrictions on gear, harvest, and capacity in many important fisheries. Researchers found in 1998 that alternative employment outside of the fishery was available in the developing tourism and recreational fishing industries. However, researchers concluded that this relatively ready supply of alternative employment threatened the stability of the labor pool for the fishing industry (Wilson *et al*., 1998).

9.4.14.5 Islamorada, Florida

Located in the Florida Keys, Islamorada calls itself the Sportfishing Capital of the World because of its proximity to the Florida Bay, the Everglades, bonefish flats, coral reefs and the Gulf Stream. Islamorada is famous for light tackle technique and many different rods have been developed in this community. It is now increasingly a recreational fishing community, with many charterboats that troll for yellowtail snapper, grouper, blackfin tuna, dolphin, wahoo and billfish in inshore waters. Recreational activities in the Keys consist of trophy fishing, catch-and-release, spearfishing, and fishing for food. In the past decade or so, there has been a growing interest in the guided fishing industry that promotes catch-and-release (NMFS, 1999a). According to the Florida Bureau of Vessel Titling and Registration, Monroe County has a total of 23,079 registered vessels, with 18,731 pleasure and 4,260 commercial vessels as of 1996. In 1998, there were eleven marinas in Islamorada (Wilson *et al*., 1998).

Tournaments are an important marketing device for tourism in this town. The majority of vessels in Islamorada tournaments are Florida vessels, but there are some out-of-state participants. The Tourist Development Council of the Florida Keys has a large marketing budget and gives grants and sponsorship to tournaments. One tackle shop employed 57 people in 1998 and planned to open a fishing school next year that would employ six teachers and teach 24 people at a time for three to four days. Other water-related tourist businesses include powerboat

rentals, boat tours, cruises, kayak, wave runner and sailboat rentals, snorkel and dive shops, boat dockage, lifts and repair shops, and fishing supply shops.

The largest resort in Islamorada began as a fishing marina and sportfishing is a big part of their marketing. The resort has two sets of vessels offshore and "back country," the local term for the Florida Bay area. There are 19 "six-pack boats" which are charterboats and one headboat. In the winter, charter/headboats target sailfish, blackfin tuna, and bonito. Recreational fishermen in this community generally feel that retention limits, minimum sizes, voluntary catch-and-release, and other management measures are effective. Florida's ban on inshore net fishing is also considered a success. Sea trout, bonefish, pompano, and Spanish mackerel are plentiful as a result of the net ban.

According to the Monroe County Cooperative Extension Service, fishing is better as a result of regulations. However, some charter/headboat captains are pessimistic about the future. They feel that the overall fishing is not good, and they have lost customers because there are not as many fish to target (Wilson *et al*., 1998). There is a general concern in Islamorada that it would be devastating to the community if the fish stocks were depleted. There are a lot of concerns with habitat such as the loss of grass beds, destruction of mangrove shoreline, water quality, algae blooms, and coral reefs dying from ozone depletion and too much sunlight. Some people are concerned with runoff from the lower part of the peninsula including phosphates and exhaust. There is also a concern over an increasing number of fishermen in the area (Wilson *et al*., 1998).

Islamorada has been subject to considerable expansion. In 1990, the population was 1,220 individuals and in 2000, it was 6,846 - 429.5 percent increase over a ten-year period (Table 9.26). The population was roughly half male and half female in both census years. The pattern of age distribution, however, changed between 1990 and 2000. The population in Islamorada is older than Fort Pierce, Pompano, and Panama City. The median age increased from just over 42 years to just over 46 years old over the past decade. The dominant age group shifted from 20 – 44 years old to 45 – 64 years old. Islamorada has a very well educated population with almost 92 percent having at least graduated high school.

The labor force has declined over the past decade indicating that the population is aging (Table 9.26). While the median household income and the percentage of individuals above the poverty line increased, the employment rate also increased slightly. In both 1990 and 2000, the greatest source of employment is in the technical, administrative, and sales industry sectors. Employment in farming, fishing, forestry, and mining decreased by one half. Correspondingly, the forestry, fishing, mining, and agriculture industry decreased by one half. The largest industry in Islamorada was retail trade in 2000.

Due to limited range and safety concerns about venturing farther offshore, Islamorada has a small vessel longline fleet that fishes year-round in nearby waters. While these vessels are experiencing increased difficulty with finding crew, this is significantly less of a problem for them than for larger pelagic longline vessels. Researchers found that the commercial fishing community has an increasingly smaller niche relative to recreational fisheries. They cited limited entry in the snapper, king mackerel, and crab fisheries; a ban on net use in inshore waters

in Florida; and incidental catch limits for bluefin tuna as limiting factors for the commercial fisheries. Florida Keys National Marine Sanctuary has also proposed a "no take" zone policy, which will put many commercial fishermen out of business (NMFS, 1999a).

Skilled captains were seeking employment in the Bahamas, as well as the growing longline fleets in South Africa and South America, while the longline supply business has shifted its emphasis to supplying foreign fleets. In Islamorada, a growing recreational fishing industry provides alternative employment opportunities for commercial fishermen familiar with charter/headboats and as fishing guides. In fact, there is a significant concentration of charter/headboat permits issued to Islamorada residents, 27 permitted vessels in 2005. However, the Islamorada work force is fairly well educated, so finding alternative employment could be competitive.

Table 9.26 Demographic Profile for Islamorada, Florida. Source: U.S. Census, 1990 and 2000.

Demographics	1990	2000
Total Population	1,293	6,846
Sex		
Male	54.2%	53.0%
Female	45.8%	47.0%
Age		
Median Age	**42.3**	**46.2**
< 20	13.3%	17.0%
20 - 44	40.8%	30.6%
45 - 64	26.7%	35.6%
> 65	19.2%	16.9%
Race		
White	95.3%	96.8%
Black or African American	0.9%	0.5%
American Indian and Alaska Native	0.0%	0.2%
Asian and Pacific Islander	0.0%	0.7%
Other	3.9%	0.8%
Household		
Total	**672**	**3,174**
Family households	51.6%	58.4%
Nonfamily households	48.4%	41.6%
Average household size	1.92	2.10
Average family size	2.54	2.63
Housing Occupancy		
Total housing units	966	5,461
Vacant housing units	32.4%	41.9%
Housing Tenure		
Owner-occupied housing units	65.9%	71.1%
Renter-occupied housing units	34.1%	28.9%

Islamorada, Florida	1990	2000
Population:	1,293	6,846
Education:		
High school graduates (25 years or older)	77.8%	91.7%
Employment:		
Labor force (16 years and over)	73.2%	62.9%
Unemployed	0.9%	2.3%
Median Household Income	$ 26,266	$ 41,522
Individuals Below the Poverty Line	9.1%	6.9%
Employment in some industry sectors:		
Managerial/professional	25.9%	28.0%
Technical, Administrative, & Sales	30.7%	30.0%
Construction, Production, Maintenance, & Transportation	7.8%	17.9%
Farming, fishing, forestry & mining	7.9%	3.9%
Industry		
Forestry, fishing, hunting, mining, and agriculture	6.8%	3.7%
Construction	3.8%	6.6%
Manufacturing	4.6%	1.9%
Wholesale trade	2.9%	1.2%
Retail trade	39.4%	20.2%
Education, health & social services	6.1%	12.7%
Arts, recreation, lodging & food services	3.2%	21.1%

9.4.15 Alabama

The population in Alabama has increased by about 400,000 people between 1990 and 2000 (Table 9.27). The percentage of individuals 25 years and older with a high school diploma and/or some graduate level degree has increased by about eight percent. The percentage of employed individuals, unemployment rate, and percentage of individuals below the poverty line have declined slightly in the last decade. As with many of the other states, employment in the farming, fishing, forestry, and mining industries has declined, whereas the education, health, and social services industries provided the greatest employment opportunities in 2000. Also, the arts,

recreation, lodging, and food services, and manufacturing industries have been the greatest source of employment Alabama residents over the past decade.

In 2005, Alabama residents held 20 commercial tuna permits (Table 9.36). There are seven commercial shark permits allocated to Alabama residents and three swordfish permit (Table 9.38 and Table 9.39). The communities involved in the shark fishery are Andalusia, Bayou la Batre, Elba, Elberta, Gulf Shores, and Lillian. There are five licensed HMS dealers working in coastal Alabama (Table 9.37). Alabama residents hold about one percent or less of the commercial tuna, shark, and swordfish permits; therefore, no community profiles have been developed to date.

The marine recreational fishery off Alabama attracted 806,000 anglers in 2004, who made 2.0 million fishing trips (NMFS, 2004b). Of these recreational fishermen, 398,000 (49 percent) are from out-of-state and another 183,000 anglers (22.7 percent) are from non-coastal counties within Alabama. In 2005, there were 320 Alabama residents who held an angling permit to fish recreationally for HMS (Table 9.34). A large number of these anglers are in Mobile, Alabama. The estimated retail sales generated by saltwater anglers in Alabama in 2001 were valued at $235.9 million. Some 5,477 jobs were attributed to the marine recreational fishing industry in 2001 (ASA, 2002). Thus recreational fishing off Alabama also benefits the local tourist industry as it does in Florida. Shark fishing is largely incidental to recreational fishing for other fish species.

Table 9.27 Alabama Demographic Profile. Source: U.S. Census, 1990 and 2000.

Alabama	1990	2000
Population:	**4,040,587**	**4,447,100**
Education:		
High school graduates (25 years or older)	66.9%	75.3%
Employment:		
Labor force (16 years and over)	61.1%	59.7%
Unemployment Rate	6.9%	6.2%
Median Household Income	$23,597	$34,135
Individuals below the poverty line*	18.3%	16.1%
Employment in some industry sectors:		
Farming, fishing, forestry & mining	3.03%	1.90%
Construction	7.1%	7.6%
Wholesale trade	4.1%	3.6%
Retail	16.2%	12.2%
Manufacturing	22.9%	18.2%
Education, health & social services	21.6%	19.3%
Arts, recreation, lodging & food services	0.9%	6.4%

*U.S. Census uses data from 1989 and 1999 to estimate these values.

There are 78 vessels with an HMS charter/headboat permit in Alabama (Table 9.35). A significant number of these vessels are located in Orange Beach (34.5 percent). Some other communities with several charter/head boat permit owners are Birmingham, Mobile, Gulf Shores

and Dauphin Island. There is a small, directed shark fishery advertised by some of the charter/headboats, but most take shark incidentally to other fish species throughout the year.

9.4.16 Mississippi

Between 1990 and 2000, Mississippi's population increased from 2.6 million people to 2.8 million people (Table 9.28). The percentage of individuals 25 years and older with a high school diploma and/or some graduate level degree has increased significantly by almost 24 percent. The percentage of employed individuals has remained the same over the past decade, while the unemployment rate declined slightly and percentage of individuals below the poverty line declined by almost five percent. As with many of the other states, employment in the farming, fishing, forestry, and mining industries has declined, whereas the education, health, and social services industries provided the greatest employment opportunities in 2000. Also, the arts, recreation, lodging, and food services industries have been growing source of employment in Mississippi over the past decade.

Eight Mississippi residents held a commercial tuna permit in 2005 (Table 9.36). As for other HMS-related permits, there are eight residents that held a shark permit and two that held a swordfish permit (Table 9.38 and Table 9.39). Communities involved in the commercial shark fishery are Moss Point, Biloxi, and Pascagoula. Only one HMS permitted dealer resided in Mississippi during 2005 (Table 9.37).

Mississippi's saltwater recreational fisheries attracted approximately 278,000 anglers in 2004 (NMFS, 2005a). Fifty-four thousand (19 percent) of these anglers were from out-of-state, and 29,000 (10 percent) were from non-coastal counties within Mississippi. In 2005, there were 194 Mississippi residents with an HMS angling permit (Table 9.34). The ASA estimated that marine recreational fishing generated $50.5 million in retail sales in Mississippi in 2001 and some 1,003 jobs (ASA, 2002). There are 36 charter/headboats with HMS permits home-ported in Mississippi (Table 9.35). Communities involved in the charter and headboat fishery include Biloxi, Gautier, Gulfport, Long Beach, Pascagoula, Pass Christian, and Picayune. Biloxi and Gulfport are each homeport to about one-third of the charter and head boat fleet with HMS permits.

Table 9.28 Mississippi Demographic Profile. Source: U.S. Census, 1990 and 2000.

Mississippi	1990	2000
Population:	**2,573,216**	**2,844,658**
Education:		
High school graduates (25 years or older)	64.3%	87.9%
Employment:		
Labor force (16 years and over)	59.7%	59.4%
Unemployment Rate	8.4%	7.4%
Median Household Income	$20,136	$31,330
Individuals below the poverty line*	25.2%	19.9%
Employment in some industry sectors:		
Farming, fishing, forestry & mining	4.6%	3.4%
Construction	6.4%	7.6%

Mississippi	1990	2000
Wholesale trade	3.8%	3.4%
Retail	16.1%	11.8%
Manufacturing	23.4%	18.3%
Education, health & social services	22.5%	20.1%
Arts, recreation, lodging & food services	0.7%	8.3%

*U.S. Census uses data from 1989 and 1999 to estimate these values.

Marine recreational fishing in Mississippi has three modes: shoal water fishing along salt-water marshes, behind barrier islands, and in the sounds; near-shore fishing in relatively shallow water out to some 15 miles from shore, including trips to artificial reefs and oil platforms; and offshore fishing in deeper water with HMS species as a target. Sharks are, however, taken in all three modes and it is reported that some are retained for personal use by anglers.

9.4.17 Louisiana

The population of Louisiana has not changed by much in the past decade, 4.2 million people in 1990 and 4.5 million people in 2000 (Table 9.29). The percentage of individuals 25 years and older with a high school diploma and/or some graduate level degree has increased by almost seven percent. The percentage of employed individuals has remained the same over the past decade, while the unemployment rate and percentage of individuals below the poverty line have declined. As with many of the other states, employment in the farming, fishing, forestry, and mining industries has declined, whereas the education, health, and social services industries provided the greatest employment opportunities in 2000. Also, the arts, recreation, lodging, and food services industries have been growing source of employment over the past decade.

Louisiana was second only to Alaska in the quantity of its commercial fisheries in the United States in 2003 and fifth in value (NMFS, 2004b). Several of Louisiana's communities were in the top ten major U.S. ports for the greatest quantity of commercial fishery landings: Empire-Venice, Intracoastal, and Cameron. Two communities were ranked in the top ten for the value of the commercial fishery landings: Empire-Venice and Dulac-Chauvin, Louisiana. The menhaden fishery is based in Venice, while shrimping is the principal fishery in Dulac. Both of these fisheries have declined during the past two decades, from the peak year of Louisiana commercial landings in 1984 when 1,931,027,000 pounds of fish were landed in the state.

Table 9.29 Louisiana Demographic Profile. Source: U.S. Census, 1990 and 2000.

Louisiana	1990	2000
Population:	**4,219,973**	**4,468,976**
Education:		
High school graduates (25 years or older)	68.0%	74.8%
Employment:		
Labor force (16 years and over)	59.3%	59.4%
Unemployment Rate	9.6%	7.3%
Median Household Income	$21,949	$32,566
Individuals below the poverty line*	23.6%	19.6%
Employment in some industry sectors:		

Louisiana	1990	2000
Farming, fishing, forestry & mining	5.7%	4.2%*
Construction	6.8%	7.9%
Wholesale trade	4.5%	3.5%
Retail	17.5%	11.9%
Manufacturing	12.5%	10.1%
Education, health & social services	25.3%	21.7%
Arts, recreation, lodging & food services	1.1%	9.1%

*U.S. Census uses data from 1989 and 1999 to estimate these values.

Eighty-six Louisiana residents held a commercial tuna permit in 2005 (Table 9.36). Louisiana was home to the third largest number of shark permit holders with 47 permitted vessels (Table 9.38). Sixteen of those permit holders live in New Orleans, Louisiana (Figure 9.4). The largest concentrations of shark vessels were home ported in New Orleans, Houma, Dulac, and Gretna. There are also 43 swordfish permit holders in Louisiana (Table 9.39). To support these HMS fisheries, there are 25 dealers licensed to purchase and sell tunas, sharks, and/or swordfish in Louisiana.

The recreational saltwater fisheries off Louisiana attracted some 1,102,000 anglers in 2004, collectively making 4,810,000 fishing trips (NMFS, 2005a). Of these anglers, 19 percent (207,000) were from out-of-state, while 13 percent were from non-coastal counties within Louisiana. There were 602 HMS angling permit holders residing in Louisiana during 2005 (Table 9.34). The ASA estimated that salterwater angling generated some $409.6 million in Louisiana in 2001, and 7,786 jobs in marine recreational fisheries (ASA, 2002). The center of fishing activity is off the Mississippi delta, and ports like Boothville-Venice, Port Fourchon and Grand Isle with good road access to the metropolitan areas of Baton Rouge and New Orleans, benefit from their access to good bottom-fishing areas and to “blue-water” areas offshore. Sharks are taken in both the bottom-fishery and in the blue-water fishery.

In 2005, there are 90 charter/headboats with HMS permits operating from Louisiana communities. The majority of websites sampled show that sharks is a component of most trips offered by these vessels. Communities involved in the charter and head boat fishery for sharks include Venice, New Orleans, Chauvin/Dulac, Houma, Baton Rouge, Golden Meadow, Belle Chase, Metaire, Grande Isle, Cut-Off, Chalmette, Lake Charles, and Monroe.

As described in Section 9.2.2.1, the impacts from Hurricanes Katrina and Rita have been devastating to Louisiana and many Gulf Coast communities. NMFS is involved in several studies to determine the full economic and social impacts of these hurricanes.

9.4.17.1 Venice, Louisiana

Venice is another Louisiana community with historical ties to the commercial fishing industry. Venice has a strong focus on commercial fisheries, and cites the large volume of local shrimp landings and numerous residents involved in the fishing industry as evidence. Many residents fish commercially, at least on a part-time basis (Impact Assessment, 2004). In the past 20 years, however, oil and recreational fishing have become increasingly important for the economy of Venice. Wilson *et al*. (1998) note, however, few if any, Venice residents

commercially harvest highly migratory species. Boothville-Venice is a "census designated place" and the Bureau of the Census statistics includes both small communities. Similarly, NMFS links Empire and Venice as a single port. Thus, both the port and community are referred to as Venice in this document.

The population of Venice has declined from 2,743 in 1990 to 2,220 in 2000 (Table 9.30). There is a slightly greater percentage of males compared to females in the population. The median age increased from about 26 to 32 between 1990 and 2000. The number of individuals under 20 declined by almost seven percent, while those 45 and older increased by almost seven percent in the last decade. Whites account for a majority of the resident population, but blacks or African Americans accounted for about 29 percent of the total population in both 1990 and 2000. Despite apparent overall out-migration, numerous families of Vietnamese and Cambodian ancestry have moved to the area over the last decade (Impact Assessment, 2004). While many initially went into the fishing industry, more recently, there has been an apparent shift among many new arrivals toward citrus farming.

In 1990, there were 836 households with an average size of 3.23 people. The number of households decreased to 746 in 2000 and the average household size had dropped to 2.96 people. The number of people employed in farming, fishing, forestry, and mining decreased over the last decade from 16.9 percent to 11 percent. The forestry, fishing, hunting, mining, and agriculture industries continued to make up twenty-two percent area's businesses. Retail trade is the second largest industry in the area.

In 1990, thirty-six percent of the population of Venice lived below the poverty level, but this figure dropped to 18 percent in 2000 (Table 9.30). In 1990, the median household income was $16,250. Eighteen percent of the households in Venice in 1990 received Social Security, averaging $5,433 per year, and 11 percent of the households received public assistance income, averaging $3,301 per year (NMFS, 1999a). In 2000, the per capita income of Venice residents was $13,123, while the per capita income for the state of Louisiana had increased to $16,912.

Venice is located about 30 miles south of the parish seat Point à la Hache, which is flanked by eroding wetlands and levees that border the Mississippi River. The unemployment rate is low compared to that of Dulac, perhaps because Venice has been the epicenter of oil industry activity in Louisiana. The main job opportunities in Venice are oil, seafood harvest and processing and, increasingly, recreational fishing (Wilson *et al*, 1998). Fishing infrastructure in Venice is extensive. There are several seafood dealers and docks; sale and repair facilities for commercial and recreational boats, bait shops, ice houses, boat launches, and several small marinas and marine suppliers (Impact Assessment, 2004). One of the marinas, the Cypress Cove Marina and Lodge, is a large facility offering boat storage, charter services, guided waterfowl hunting with air boat transportation, hotel, restaurant, and various support services essential for recreational fishing and hunting (Impact Assessment, 2004). The majority of business is sport-recreational. Venice extends into the Gulf of Mexico close to billfish areas that are frequented by recreational fishermen. Recreational fishing increased steadily there during the 1990s (Wilson *et al*., 1998).

Marina owners suggest that commercial fishing activity has declined over the last several years, and that Venice residents seem to be more focused on recreational fishing and oil field support. A local retail seafood dealer suggests that Louisiana's unpredictable weather and foreign shrimp imports are detrimentally affecting the local commercial fleet. Other informants suggest that the commercial fishing fleet is struggling in many ways, but that the involvement of the larger community in alternative industries, such as offshore oil field support and citrus, is keeping the local economy fairly dynamic (Impact Assessment, 2004).

Animosity regarding competition for fish extends to the political arena, as commercial and recreational fishermen oppose each other on regulatory issues. Commercial fishery participants claim that law enforcement agents harass them, while recreational fishery participants claim that regulations are not enforced in Venice because there are simply not enough agents to cover the area. Among local commercial fishermen, there is a sense that recreational fishermen have helped create a regulatory environment that is pushing commercial fishermen out of business (Wilson *et al*., 1998).

Most of the commercial vessels landing in Venice are home-ported in New Orleans or other Mississippi River towns further upriver from the Gulf of Mexico. Even Louisiana natives who fish for shark with nets in state waters live in neighboring towns, not in Venice. Shrimp is the largest commercial catch bought and sold in Venice, although this fishery has become less profitable since the late 1980s (Wilson *et al*., 1998). The longline fleet is not well integrated into the Louisiana community of Venice. The longline fishermen are mostly "commuters" from towns and cities further inland, such as New Orleans, and most of them are from a different ethnic background, including many Vietnamese-Americans. Due to the language barrier, many of these fishermen do not participate in public fisheries meetings (NMFS, 1999a).

In 1998, several dealers in Venice drew 40 percent of their business from the longline fleets. Another dealer drew only about 20 percent from longline vessels. A large wholesaler dealt only in longline catches and purchased fish from local dealers. In 1997, 60 percent of this business was tuna, 30 percent shark and ten percent swordfish. The competition between dealers in 1998 was perceived as becoming more aggressive (Wilson *et al*., 1998). Traditional patterns of dealers building relationships by extending services and credit to vessels are giving way to price-based competition to gain access to vessels.

Table 9.30 Demographic Profile of Venice, Louisiana. Source: U.S. Census, 1990 and 2000.

Demographics	1990	2000
Total Population	2,699	2,220
Sex		
Male	51.4%	51.0%
Female	48.6%	49.0%
Age		
Median Age	**26.3**	**31.7**
< 20	42.0%	35.2%
20 - 44	35.1%	35.2%
45 - 64	18.3%	22.0%
> 65	4.6%	7.6%
Race		
White	63.9%	61.9%
Black or African American	31.3%	28.7%
American Indian and Alaska Native	3.3%	3.4%
Asian and Pacific Islander	1.4%	4.0%
Other	0.0%	0.3%
Household		
Total	**836**	**746**
Family households	84.7%	78.3%
Nonfamily households	15.3%	21.7%
Average household size	3.23	2.96
Average family size	3.58	3.38
Housing Occupancy		
Total housing units	960	933
Vacant housing units	14.0%	20.0%
Housing Tenure		
Owner-occupied housing units	87.5%	87.1%
Renter-occupied housing units	12.5%	12.9%

Boothville & Venice, Louisiana	1990	2000
Population:	2,699	2,220
Education:		
High school graduates (25 years or older)	43.5%	48.4%
Employment:		
Labor force (16 years and over)	48.1%	53.0%
Unemployed	3.3%	2.0%
Median Household Income	$ 16,250	$ 33,813
Individuals Below the Poverty Line	36.2%	17.3%
Employment in some industry sectors:		
Managerial/professional	13.8%	18.1%
Technical, Administrative, & Sales	20.7%	19.5%
Construction, Production, Maintenance, & Transportation	12.1%	40.8%
Farming, fishing, forestry, & mining	16.9%	11.0%
Industry		
Forestry, fishing, hunting, mining, and agriculture	22.5%	22.7%
Construction	10.8%	8.1%
Manufacturing	7.1%	4.8%
Wholesale Trade	9.4%	0.0%
Retail Trade	16.0%	13.1%
Education, health & social services	5.6%	14.4%
Arts, recreation, lodging & food services	0.0%	10.4%

While pelagic longline fishermen with large vessels work year-round, pelagic longlining in the area tends to intensify in May and ease up during the wintertime. There are four docks in Venice where longline vessels unload. Docks in Venice employ between five and 15 workers on a seasonal basis for unloading vessels and packing seafood, as well as five to eight people year-round. The docks purchase tuna year round, shrimp from May through December, bottom fish such as drum, catfish, and sheepshead, from January through May, mullet (for the roe) from October through December (NMFS, 1999a).

Researchers in 1998 found that alternative employment outside of the fishery was available. For instance, the oil industry hired unskilled labor from this area in recent years, and employed three percent of the civilian labor force in 2000. The agricultural sector also provides employment opportunities during the off-season for fishing, as reported by one Vietnamese-American captain. However, researchers found that this relatively ready supply of alternative employment threatened the stability of the labor pool for the fishing industry. The Vietnamese-American community has avoided such personnel problems to some extent by relying on tight kinship networks in both fishing and fish buying, although they did report some difficulty in finding captains. The Vietnamese-American community was the only one studied which reported recent investment in new longline vessels. Concerns cited by the fishermen in Venice included the safety of small vessels during winter openings, and the prospect of small vessels having to pay for observers and VMS (Wilson *et al*., 1998).

Other commercial fisheries in the area that could provide alternative employment include pompano in October, mullet from October to January, shrimp from May to December, and oysters from January to May (Wilson *et al*., 1998). Wilson *et al.* concluded that the overall

effect of increased restrictions on this fleet would be increased pressure on grouper and yellowfin tuna, increased difficulty in finding and retaining employees, and an acceleration in the rate at which the fleet's vessels and experienced fishermen are moving overseas, especially to Mexico.

Recreational fishermen fish from Venice year-round, but are affected by inclement weather during the winter. The larger vessels can fish for yellowfin tuna year round, in addition to inshore species like redfish, snapper and speckled trout. Bluefin tuna are found too far away (100 miles offshore) and recreational fishermen are prohibited from directing effort on bluefin tuna anyway. They fish for billfish, particularly blue marlin, from May through November. Blacktip shark was once a popular catch, but recreational fishermen say they are now too small to be an enjoyable catch. There is some animosity between recreational and commercial fishermen, which seems to arise from competition for particular species. Charterboats regularly specify sharks as a species available to their clients.

There are only two marinas in Venice that cater to recreational fishermen, although a third parish-run marina offers vessel slips to both recreational and commercial fishermen. One opened in the mid-1980s and offers boat slips, launches, a hoist, a couple of condominiums, baitshop, fuel, and ice. The marina employs 13 people during peak summer months. Most of the marina's business comes from private vessels from New Orleans and border states. Less than one percent of this business consists of charterboats. The other marina opened only a few years ago, offering 120 pre-paid boat slips, a 64-room two-story hotel, condominiums, a dry dock storage facility, fuel, and ice. This second marina employs 12 to 15 people in its newly opened hotel and another 15 to 25 in the marina. Eight charterboats operate from the marina, and there is room for ten more.

Researchers in 1998 reported that the catch-and-release ethic for billfish was strong among recreational fishermen in Venice, but local billfishing tournaments require that trophy fish be brought to the dock and weighed. Sportfishermen prefer to catch and retain tunas, dolphin fish, and wahoo for consumption, although they voiced support for tag and release programs (NMFS, 1999a).

9.4.17.2 Dulac, Louisiana

Dulac is located in the center of Terrebonne Parish, about 15 miles South of Houma, Louisiana. Houma lies at the intersection of the Houma Navigational Canal and the Intercoastal Waterway and serves as the parish seat and a locale of employment opportunities in offshore equipment building for Dulac residents (Wilson *et al*., 1998). With easy access to Timbalier Bay and the Gulf of Mexico via the Houma Navigational Canal, many Dulac residents are deeply involved in commercial fishing, and many recreational fishers from Houma and distant Lafayette maintain camps in this area (Impact Assessment, 2004). Terrebonne Parish government is a consolidated government so most data are gathered on a parish-wide basis. According to the Terrebonne Parish Planning Department in 1998, the parish did not spend much time tracking the importance of the commercial fishing industry, but anecdotal evidence suggests that it is a long-standing and significant part of the community economy (Wilson et al., 1998). Landings of tunas, swordfish, and sharks indicate that Dulac is among the most important fishing ports in the state. However, many of the fishermen who target HMS are a commuter population; they land fish in Dulac or purchase fish in Dulac, but they live elsewhere. Three dealers purchase fish

from longline vessels; two are owned and operated by first-generation Vietnamese immigrants, and the other is run by a New Orleans native whose father operates a large tuna wholesale company in Venice.

In 1990, the population was 3,273 individuals; it declined to 2,458 in 2000 (Table 9.31). Dulac reported the same number of males as females both 1990 and 2000. Individuals under 20 years old make up the greatest proportion of the population in both 1990 and 2000 with individuals between 20 and 44 comprising the second largest age group. Whites comprise the largest proportion of race — 49 and 54 percent in 1990 and 2000, respectively. American Indian and Native Alaskans accounted for 48 and 39 percent of the total population in 1990 and 2000, respectively. As noted in Wilson *et al*. (1998), however, this latter category is made up mostly of the Houma Indians, which is a tribe not recognized by the U.S. government. Less than two percent of the population was Asian/Pacific Islander, despite the fact that most of the longline captains who sustain the Dulac commercial industry for tunas, swordfish, and sharks were Vietnamese.

In 1990, Dulac had 922 households with an average size of 3.55 persons per household (Table 9.31). By 2000, the number of households had decreased to 768 and the average size of each household had dropped to 3.20 persons. At the time of the 1990 Census, nearly half of the individuals in Dulac were living below the poverty level, with a median household income of $12,653. In 2000, median household income in Dulac had increased to $22,900, but more than 30 percent of individuals continued to live below poverty level. Per capita income in Dulac in 1990 was $4,946; for the State of Louisiana, average per capita income was $10,635. By 2000, per capita income in Dulac had risen to $8,785, while for the state as a whole, per capita income had risen to $16,912. In 1990, the largest proportion of the Dulac population was employed in the technical, administrative, and sales industries. Whereas in 2000, the largest proportion of the population was employed in construction, production, maintenance, and transportation. Sixteen percent of the population was employed in the farming, fishing, forestry, and mining industries in 2000. Forestry, fishing, hunting, mining, and agriculture were the largest industries in Dulac in both 1990 and 2000.

The combination of a high concentration of minorities in the Dulac population and the high percentage of individuals living below the poverty line highlights the need to consider Executive Order 12898 or Environmental Justice. Under this Executive Order, agencies determine if there will be disproportionately high and adverse environmental effects of its regulations on the activities of minority and low-income populations. As mentioned in Chapter 4, some of the preferred alternatives may have some negative social and/or economic impacts in general, but most of these could be mitigated and none of the preferred alternatives are likely to have disproportionate impacts on minority and low-income sectors of the Dulac population.

Table 9.31 Demographic Profile of Dulac, Louisiana. Source: U.S. Census, 1990 and 2000.

Demographics	1990	2000
Total Population	3,273	2,458
Sex		
Male	49.3%	50.0%
Female	50.7%	50.0%
Age		
Median Age	**25.5**	**31.8**
≤ 20	41.8%	35.2%
20 – 44	35.2%	32.2%
45 – 64	17.0%	22.8%
≥ 65	6.0%	9.8%
Race		
White	49.4%	54.0%
Black or African American	2.3%	2.5%
American Indian and Alaska Native	48.1%	39.4%
Asian and Pacific Islander	0.0%	0.5%
Other	0.3%	0.5%
Household		
Total Households	**922**	**768**
Family households	85.8%	79.3%
Nonfamily households	14.2%	20.7%
Average household size	3.55	3.20
Average family size	3.93	3.55
Housing Occupancy		
Total housing units	1,182	1,063
Vacant housing units	33.0%	27.8%
Housing Tenure		
Owner-occupied housing units	80.1%	79.3%
Renter-occupied housing units	19.9%	20.7%

Dulac, Louisana	1990	2000
Population:	3,273	2,458
Education:		
High school graduates (25 years or older)	27.1%	39.1%
Employment:		
Labor force (16 years and over)	37.8%	44.9%
Unemployed	8.0%	3.0%
Median Household Income	$ 12,653	$ 22,900
Individuals Below the Poverty Line	49.3%	30.9%
Employment in some industry sectors:		
Managerial/professional	5.7%	12.4%
Technical, Administrative, & Sales	18.1%	17.7%
Construction, Production, Maintenance, & Transportation	17.2%	41.4%
Farming, fishing, forestry, & mining	12.3%	15.9%
Industry		
Forestry, fishing, hunting, mining, and agriculture	23.6%	25.9%
Construction	3.7%	3.1%
Manufacturing	14.0%	10.0%
Wholesale Trade	8.5%	5.7%
Retail Trade	17.7%	10.3%
Education, health & social services	9.7%	8.5%
Arts, recreation, lodging & food services	0.0%	10.7%

Pelagic longline fishermen in Dulac target yellowfin tuna all year. Dulac longline vessels do not target swordfish, and incidentally-caught sharks are often discarded (Wilson *et al*., 1998). The competition between dealers was perceived as becoming more aggressive in 1998. Traditional patterns of dealers building relationships by extending services and credit to vessels were giving way to price-based competition to gain access to vessels. Researchers reported, in 1998, that one dock in Dulac employed three to four people, but laid them all off in 1998. That dealer purchased tuna (50 percent), shark (30 percent), swordfish (20 percent), and dolphin, wahoo, and amber jack (20 percent combined). Another dealer employed six or seven people in 1998, all of whom lived in Dulac. Of this dealer's purchases, 60 percent were tuna, 20 percent were swordfish and 20 percent were divided among other pelagic species like shark, wahoo, amber jack. A third dealer employed six Mexican workers, supplemented by local residents on a seasonal basis (Wilson *et al.*, 1998). The pelagic longline fleet has seen reductions in its catches with the prohibition of the use of live-bait in 2000 causing a reduction in the community's employment rate. In 2005, HMS permit data show only one dealer in Dulac with several HMS dealer permits.

Researchers in 1998 found that alternative employment outside of the fishery was available. For instance, while unemployment in Louisiana fishing communities has been high in the past, the oil industry hired unskilled labor from this area in recent years. In 1990, 33 residents of Dulac worked in the oil fields and a similar number were employed by the oil industry in 2000. The agricultural sector also provides employment opportunities, as reported by one Vietnamese-American captain, particularly during the off-season for fishing. However, this supply of alternative employment threatened the stability of the labor pool for the fishing industry (Wilson *et al*., 1998). This was true for both captain and crew positions, particularly

among the non-Vietnamese-American population. The Vietnamese-American community avoided such personnel problems to some extent by relying on tight kinship networks in both fishing and fish buying. The Vietnamese-Americans, however, did report some difficulty in finding captains. The Vietnamese-American community was the only one studied which reported recent investment in new longline vessels. In Louisiana, the Vietnamese-American may be impacted more intensely by changes in the regulations given the extent of their investment in this fishery (NMFS, 1999a).

Dulac was also a homeport for a limited inshore shark bottom longline fishery in Federal waters in 1998. Blacktip shark was the main catch in this fishery. These fishermen did not fish much during the winter because of the safety concerns associated with small vessels (Wilson *et al*., 1998). Typically, sharks are caught between five and 20 miles from shore. Almost all vessels that sell in Dulac are owner-operated. Owners are usually their own captains or they hire a close relative to captain their vessel. Good first mates try to acquire their own vessels. At least five bottom longline vessels were built in 1997 and have been added to the fleet in Dulac. Some participants in the bottom longline fishery for sharks also participated in the reef fish fishery. The local fishermen, fishing for shark in state waters, use a gillnet and fish under a special state license because longlining for sharks in state waters is banned.

9.4.18 Texas

The population of Texas has increased by nearly 4 million people over the past decade, reaching 20.1 million in 2000 (Table 9.32). The percentage of individuals 25 years and older with a high school diploma and/or a graduate level degree has increased slightly. The percentage of employed individuals, the unemployment rate, and percentage of individuals below the poverty line, have all declined over the past decade. As with many of the other states, employment in the farming, fishing, forestry, and mining industries has declined, whereas the education, health, and social services industries provided the greatest employment opportunities in 2000.

In the state of Texas, 26 residents possessed a commercial tuna permit (Table 9.36). In addition to the commercial tuna permit holders, thirteen individuals held a shark permit and seven individuals held a swordfish permit (Table 9.38 and Table 9.39). The commercial shark fishery generally tends to be a small portion of the commercial fisheries of Texas. There are licensed HMS dealers for tuna, shark, and swordfish operating in 14 different locations in coastal Texas (Table 9.37).

In 2005, there were 586 Texas residents that held an HMS angling permit (Table 9.34). The ASA estimated that saltwater angling generated some $622.2 million in retail sales in Texas in 2001 and that there were 13,322 jobs in Texas associated with the marine recreational fishing industry (ASA, 2002). The number of charter/headboat permit holders from Texas has increased from 129 in 2003 to 168 in 2005 (Table 9.35) with a significant concentration of the 2005 permit holders in Port Aransas (Figure 9.3). Most of these take shark as an incidental catch to other near-shore and offshore fish. In addition to Port Aransas, Freeport, Galveston, Houston, Port Isabel, and Port O'Connor, as well as several other communities, are home to HMS angling permit holders.

Table 9.32 Texas Demographic Profile. Source: U.S. Census, 1990 and 2000.

Texas	1990	2000
Population:	**16,986,510**	**20,851,820**
Education:		
High school graduates (25 years or older)	72.1%	75.7%
Employment:		
Labor force (16 years and over)	66.0%	63.6%
Unemployment Rate	7.1%	6.1%
Median Household Income	$27,016	$39,927
Individuals below the poverty line*	18.1%	15.4%
Employment in some industry sectors:		
Farming, fishing, forestry & mining	4.9%	2.7%
Construction	6.7%	8.1%
Wholesale trade	4.9%	3.9%
Retail	17.4%	12.0%
Manufacturing	14.4%	11.8%
Education, health & social services	22.5%	19.3%
Arts, recreation, lodging & food services	1.2%	7.3%

*U.S. Census uses data from 1989 and 1999 to estimate these values.

9.4.19 Puerto Rico

The population in Puerto Rico increased by nearly 300,000 people in the last decade (Table 9.33). The percentage of individuals 25 years and older with a high school diploma and/or a graduate level degree has increased by over ten percent in the last decade. The percentage of employed individuals, unemployment rate, and percentage of individuals below the poverty line all declined through the nineties. Education, health, and social services provide the greatest sources of employment. The farming, fishing, forestry, and mining employed less than two percent of the population in 2000.

While Puerto Rico was home to 100 commercial tuna permit holders in 2005, there were no permit holders for sharks or swordfish (Table 9.36). A large number of the commercial tuna permit holders are in Aguadilla (44 percent) and another large group is located in Rincon (13 percent). There are six HMS dealer permit holders in Puerto Rico; four for tunas in Aguadilla; one for tunas in Aquada; and one for sharks and swordfish in San Juan (Table 9.37).

Table 9.33 Puerto Rico Demographic Profile. Source: U.S. Bureau of the Census, 1990 and 2000.

Puerto Rico	1990	2000
Population:	**3,522,037**	**3,808,610**
Education:		
High school graduates (25 years or older)	49.7%	60.0%
Employment:		
Labor force (16 years and over)	47.3%	40.7%
Unemployment Rate	20.4%	19.2%
Median Household Income		$ 14,412
Individuals below the poverty line*	58.9%	48.2%

Puerto Rico	1990	2000
Employment in some industry sectors:		
Farming, fishing, forestry & mining		1.7%
Construction		
Wholesale trade		4.4%
Retail		11.7%
Manufacturing		13.5%
Education, health & social services		19.3%
Arts, recreation, lodging & food services		6.5%

*U.S. Census uses data from 1989 and 1999 to estimate these values.

The recreational saltwater fisheries in Puerto Rico attracted 167,000 anglers in 2004, collectively making 1,055,000 fishing trips (NMFS, 2005a). Of these anglers, 16 percent of the anglers were not from Puerto Rico. In 2005, 899 HMS angling permit holders were residing in Puerto Rico (Table 9.34). The following communities have the largest concentrations of HMS anglers: San Juan, Guaynabo, Arecibo, Mayaguez, Vega Baja, Ponce, Carolina, as well as several other communities with smaller concentrations of permit holders. Twenty-seven vessels from Puerto Rico held an HMS charter/headboat permit in 2005, specifically several were located in San Juan and Rincon (Table 9.35). Due to the number of HMS permits issued to individuals located in San Juan, a community profile should be developed in the future.

Generally, the fishing industry of Puerto Rico is made up of private clubs for the upper and middle class and small, and poor artisanal fishing communities. There are approximately 2,500 licensed artisanal fishermen who are required to report their landings to the Office of Natural Resources' Fisheries Laboratory. However, interviews and informal conversation with artisanal fishermen suggest that the reported and actual landings differ widely (Wilson *et al.*, 1998). At the local level, there are artisanal fishermen's associations (villages) and recreational fishermen's membership clubs.

The fishing industry is not a prominent economic activity in Puerto Rico and variations in fishing incomes have little impact on the island's economy. Most of the recreational fishing activity centers around the capital city of San Juan. Artisanal fishing communities are found throughout the island. These communities are extremely poor and will likely be the communities most affected by changes in regulations. The extremely deep inshore waters off these areas make billfish and other highly migratory species accessible to the artisanal fishery.

9.4.19.1 Arecibo, Puerto Rico

The Arecibo population in 1990 was 93,385 people; approximately 99 percent of those people were born in Puerto Rico or in the United States (NMFS, 1999b). The majority of the population is classified as Hispanic or Latino. Naturalized citizens and non-citizens each make up less than one percent of the population of Arecibo, but their ethnicity is unknown. According to interviews with local government officials, the vast majority of immigrants in Arecibo are from the Dominican Republic; however, there is no way to confirm that information due to waves of illegal immigration. In 2000, the U.S. Census reported the Arecibo population grew by less than seven percent (101,131 people).

The number of households in Arecibo grew by almost ten thousand throughout the last decade, from 24,333 to 34,245 households. In 1990, the median household income is $7,520. By 2000, the median household income increased by $5,000 to $12,520. In the early nineties, thirty-two percent of the households are receiving some kind of public assistance; the average public assistance income is $1,939. The number of individuals below the poverty line did decrease over the past decade, from 73 percent to almost 51 percent. The unemployment rate also declined from 23 percent to eight percent in 2000. Of the population age 16 and older, 43.9 percent are in the civilian labor force in 1990, whereas this number declined to 38 percent in 2000. In 1990, the highest employing industries for men and women were manufacturing and services. In 2000, the construction, production, maintenance, and transportation industries supplied the greatest number of employment opportunities.

Recreational fishing is the predominant mode of participation in the HMS fisheries in Arecibo, Puerto Rico. Fifty-one Arecibo residents hold an HMS angling permit, but none of 28 charter/headboat permit holders in Puerto Rico are from Arecibo. Two Arecibo residents hold a commercial tuna permit. Despite the lack of commercial shark and swordfish permit holders in Puerto Rico, there is one HMS permitted dealer for sharks and swordfish in San Juan, one for tunas in Aquada, and four for tunas in Aquadilla.

The Arecibo Yacht Club is a private club created by and for the local recreational fishermen. The members of the club formed the Association of Sport Fishing of Arecibo and its facilities. Members of the Arecibo Yacht Club organize marlin and inshore fishing tournaments. According to local government officials, the municipality does not get any economic benefit from those tournaments because all the profits go directly to the Club, which is a private business. The tournament does not affect the economy of the region even indirectly by promoting related business because the participants are mainly the same local fishermen. The marlin tournament is held in May. However, according to the commodore of the club, the tournaments are not always lucrative, even for the club (Wilson *et al*., 1998). The club has approximately 253 members, and among them, 82 are boat owners. The size of the vessels fluctuates between 18 and 50 feet. The larger boats, measuring 33 feet or more, have a crew consisting of a captain and a mate. The crew is in charge of the maintenance of the boats while in the marina and directing the fishing journeys. The facilities of the club and marina were constructed with private funds and are a very exclusive place for the middle-upper class of Arecibo. Although, the commodore reports that in the club's facilities there is an area available for the boats of the artisanal fishermen.

Among the members are part-time artisanal fishermen, but most of them are recreational fishermen. However, usually they come out on the weekends and use the money they obtain from the catch to pay for the trip expenses. The artisanal fishermen catch mostly red snapper and grouper by bottom fishing. This kind of fishing is done with a line that goes to the bottom of the sea, mostly in rocky areas. The rest of the fishermen mainly target dolphin and tuna. To catch these species, they use a hand line, or a single cord with one hook. From May through October, marlin, white needle, and blue needle are typically found seven to ten miles from the shore.

9.5 Future Assessments

In the future, the HMS permit databases, landings information, and HMS APs should be consulted to determine the most appropriate community profiles for HMS-related fisheries. The 2005 HMS permit data indicate that several new community profiles should be developed and some of the previously profiled communities may not have as significant an investment in the fishery as the community may have in the past (Figure 9.1 – Figure 9.7). Wakefield, Rhode Island should be considered due to the number of commercial tuna and swordfish permit holders in the area. Montauk, New York has a large concentration of charter/headboat, commercial tuna, and HMS dealers in the community. A large number of Cape May residents hold an HMS angling, charter/headboat, shark and/or swordfish permits. Ocean City and Berlin, Maryland have a high concentration of HMS Angling and Charter/headboat permit holders in residence. The commercial fishery is less significant compared to other towns with higher concentrations. In addition to the information from the HMS permit databases, NMFS received a large number of public comments describing the importance of the White Marlin Open Tournament to the Ocean City area economy. Morehead City, North Carolina is home to a number of HMS angling, charter/headboat, and commercial tuna permit holders. Each of these towns is actively involved with more than one sector of HMS fisheries, and therefore changes to HMS regulations may have could have an impact on each of these communities. While the number of permit holders in Puerto Rico and the Virgin Islands are not as numerous as the permit holders on the U.S. mainland, HMS fisheries are active in these two area and several communities benefit from those activities. This chapter does not include a general profile for the Virgin Islands because 1990 and 2000 Census data was incomplete. Future HMS actions should consider developing general profile for the Virgin Islands and a community profile for Christiansted, St. Croix, as well as San Juan, Guaynabo, Aguadilla, Mayaguez, and/or Vega Baja Puerto Rico due to the number of HMS permit holders in these areas. While NMFS may have community profiles describing these areas, to best determine the impact of changes to HMS-related regulations, an HMS-specific community profile should be developed for these towns.

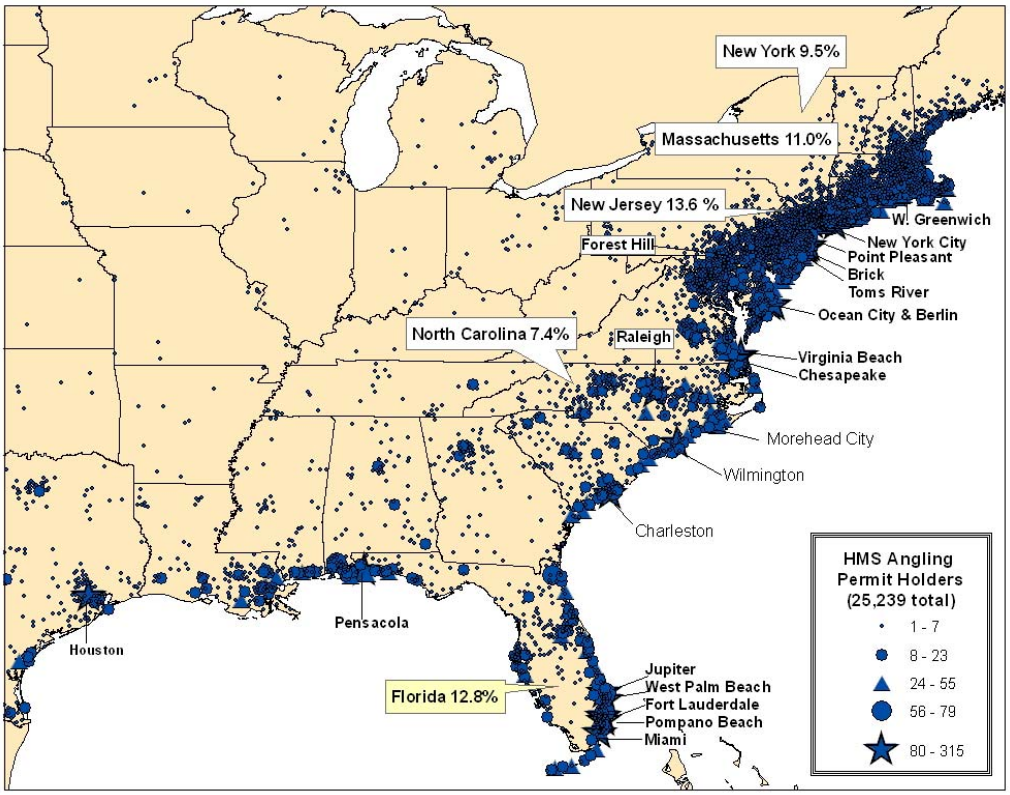

Figure 9.1 Location of HMS Angling Permit Holders in 2005 and the percentage of Angling permit holders for the top five states.

Table 9.34 Number and Percentage of HMS Angling Permits by State and Country in 2005.

Angling Permits		
State	**Total**	**%**
New Jersey	3,439	13.6%
Florida	3,238	12.8%
Massachusetts	2,769	11.0%
New York	2,391	9.5%
North Carolina	1,863	7.4%
Maryland	1,563	6.2%
Pennsylvania	1,520	6.0%
Virginia	1,351	5.4%
Connecticut	1,080	4.3%
Puerto Rico	899	3.6%
Rhode Island	831	3.3%
Delaware	741	2.9%
South Carolina	736	2.9%
Louisiana	602	2.4%
Texas	586	2.3%
New Hampshire	324	1.3%
Alabama	320	1.3%
Maine	251	1.0%
Georgia	205	0.8%
Mississippi	194	0.8%
Tennessee	52	0.2%
Virgin Islands	31	0.1%
Vermont	31	0.1%
Ohio	24	0.1%
Michigan	22	0.1%
Illinois	17	0.1%
Missouri	17	0.1%
California	14	0.1%
West Virginia	14	0.1%
Washington, DC	13	0.1%
Arkansas	12	0.0%
Wisconsin	9	0.0%
Kentucky	8	0.0%
Minnesota	8	0.0%
Indiana	7	0.0%
Nevada	6	0.0%
Oklahoma	6	0.0%
Alaska	5	0.0%
Colorado	5	0.0%
Iowa	5	0.0%
Kansas	4	0.0%
New Mexico	4	0.0%
Arizona	3	0.0%
Marshall Islands	2	0.0%
North Dakota	2	0.0%
Nebraska	2	0.0%
Palau	2	0.0%
Washington	2	0.0%
Wyoming	2	0.0%
British Virgin Islands	1	0.0%
Canada	1	0.0%
Micronesia	1	0.0%
Hawaii	1	0.0%
Montana	1	0.0%
Oregon	1	0.0%
South Dakota	1	0.0%
Grand Total	**25,239**	**100%**

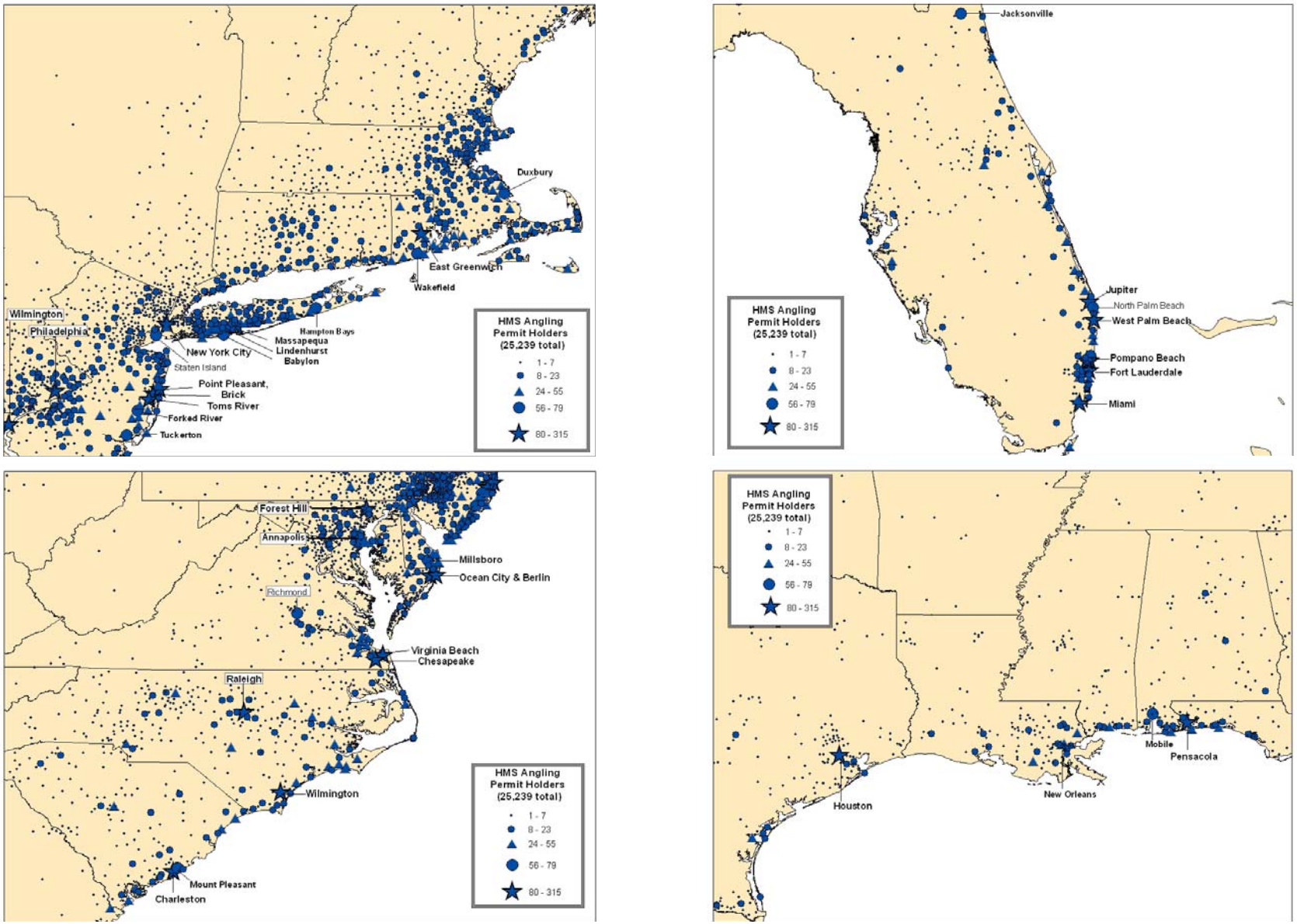

Figure 9.2 Location of HMS Angling Permit Holders in 2005 by region.

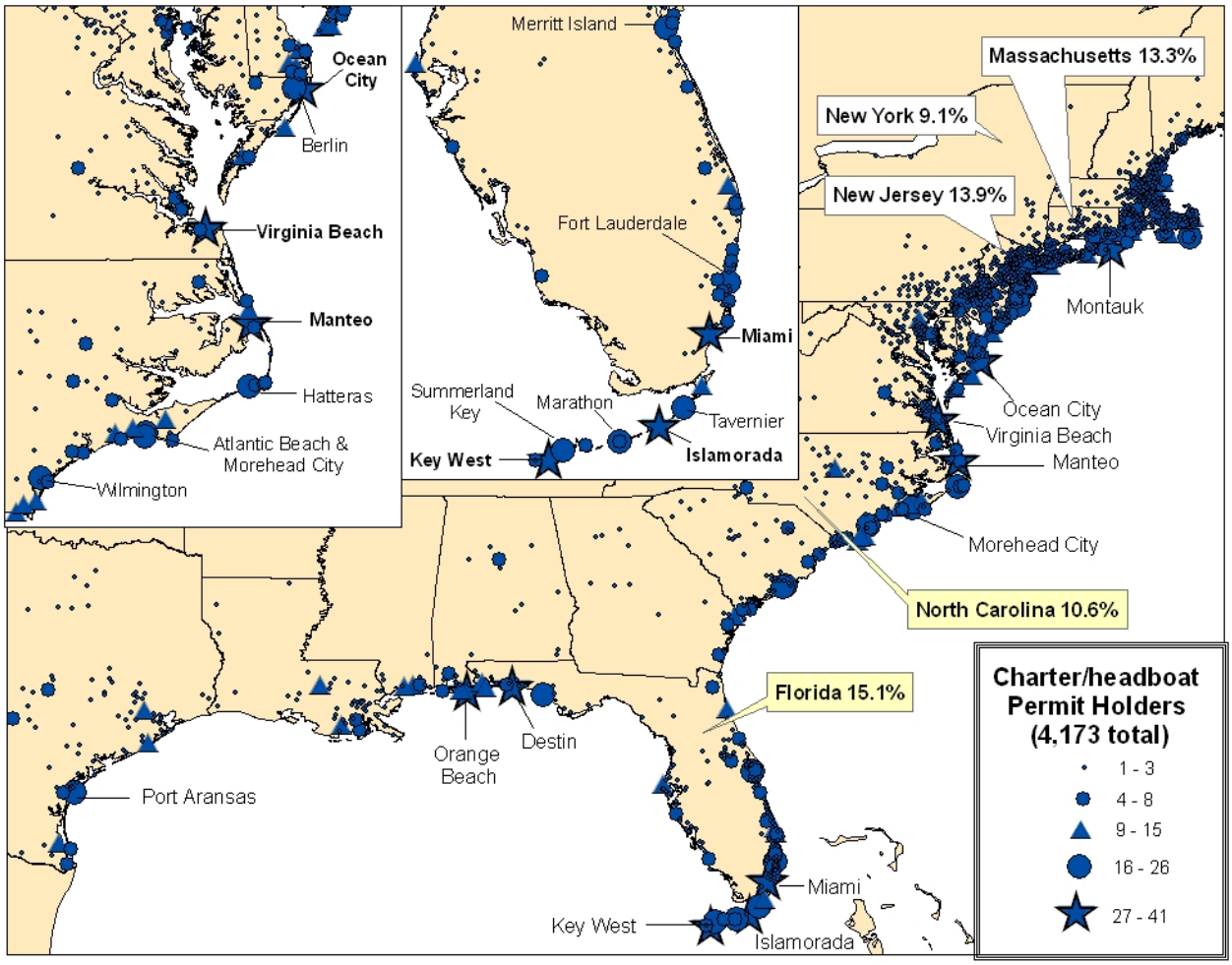

Figure 9.3 Location of the HMS Charter/Headboat Permit Holders in 2005 and the percentage of HMS Charter/Headboat permit holders for the top five states.

Table 9.35 Number and Percentage of HMS Charter/Headboat Permits by State and Country in 2005.

Charter/Headboat Permits		
State	**Total**	**%**
Florida	632	15.1%
New Jersey	578	13.9%
Massachusetts	557	13.3%
North Carolina	441	10.6%
New York	379	9.1%
Maryland	196	4.7%
Texas	168	4.0%
Virginia	153	3.7%
Pennsylvania	143	3.4%
Rhode Island	143	3.4%
South Carolina	130	3.1%
Connecticut	110	2.6%
Delaware	103	2.5%
Louisiana	90	2.2%
Alabama	78	1.9%
Maine	61	1.5%
New Hampshire	55	1.3%
Georgia	40	1.0%
Mississippi	36	0.9%
Puerto Rico	27	0.6%
Virgin Islands	20	0.5%
California	1	0.0%
Tennessee	6	0.1%
Michigan	4	0.1%
Ohio	3	0.1%
Illinois	2	0.0%
Kentucky	2	0.0%
Oklahoma	2	0.0%
Vermont	2	0.0%
West Virginia	2	0.0%
Alaska	1	0.0%
Hawaii	1	0.0%
Indiana	1	0.0%
Marshall Islands	1	0.0%
Minnesota	1	0.0%
Missouri	1	0.0%
Nebraska	1	0.0%
Nevada	1	0.0%
Palau	1	0.0%
Grand Total	**4,173**	**100%**

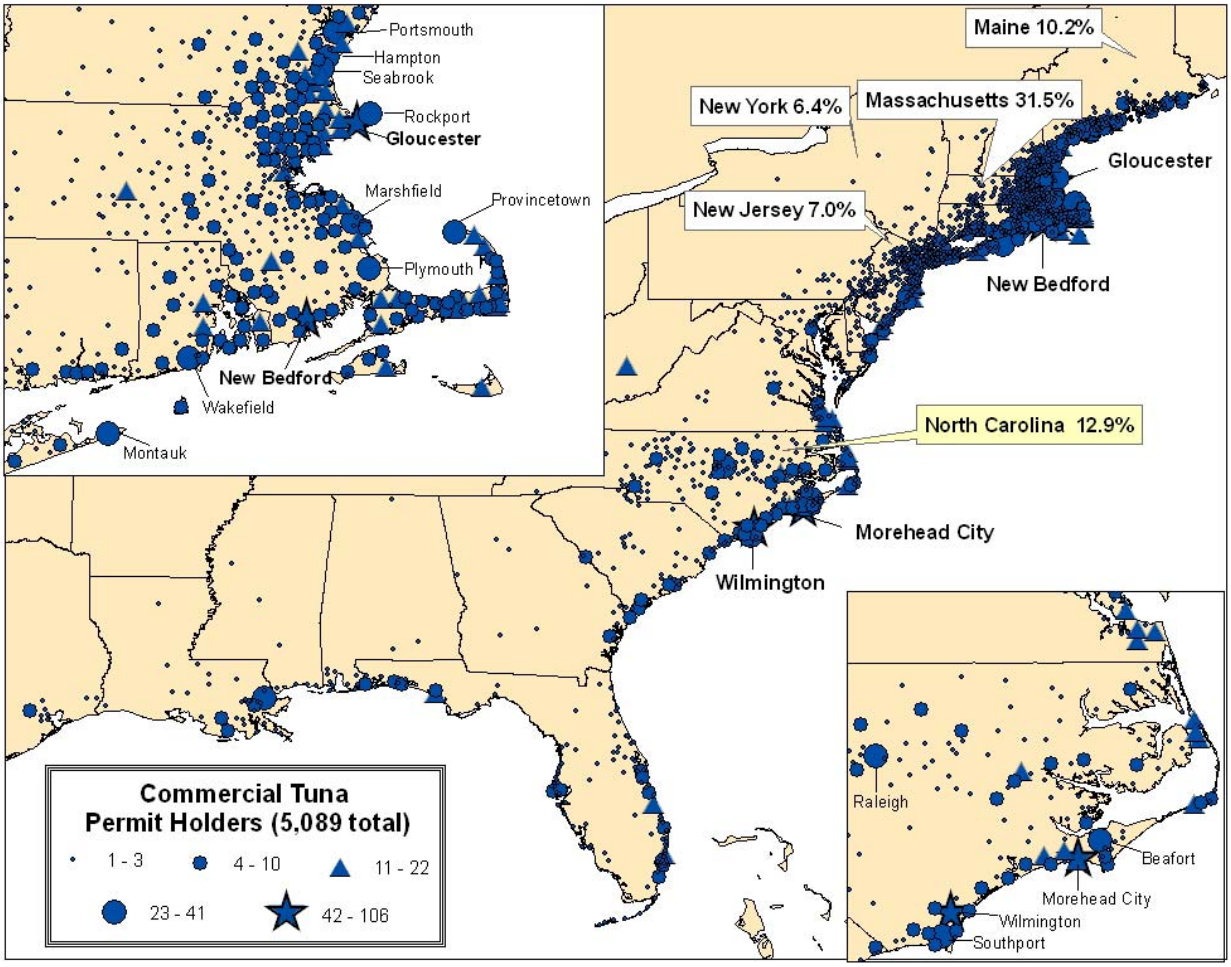

Figure 9.4 **Location of the Commercial Tuna Permit Holders in 2005 (all gear categories - harpoon, longline, purse seine, and trap) and the percentage of commercial tuna permit holders for the top five states.**

Table 9.36 **Number and Percentage of Commercial Tuna Permits by State and Country in 2005.**

Commercial Tuna Permits		
State	**Total**	**%**
Massachusetts	1,601	31.5%
North Carolina	659	12.9%
Maine	517	10.2%
New Jersey	357	7.0%
New York	327	6.4%
New Hampshire	278	5.5%
Florida	250	4.9%
Rhode Island	232	4.6%
Connecticut	170	3.3%
Puerto Rico	106	2.1%
Virginia	106	2.1%
South Carolina	89	1.7%
Louisiana	86	1.7%
Pennsylvania	59	1.2%
Maryland	57	1.1%
Virgin Islands	46	0.9%
Delaware	39	0.8%
Georgia	26	0.5%
Texas	26	0.5%
Alabama	20	0.4%
Vermont	11	0.2%
Mississippi	8	0.2%
Colorado	2	0.0%
Washington, DC	2	0.0%
Hawaii	2	0.0%
Michigan	2	0.0%
Alaska	1	0.0%
Arizona	1	0.0%
California	1	0.0%
Idaho	1	0.0%
Indiana	1	0.0%
Minnesota	1	0.0%
Montana	1	0.0%
Oklahoma	1	0.0%
Tennessee	1	0.0%
Washington	1	0.0%
West Virginia	1	0.0%
Grand Total	**5,089**	**100%**

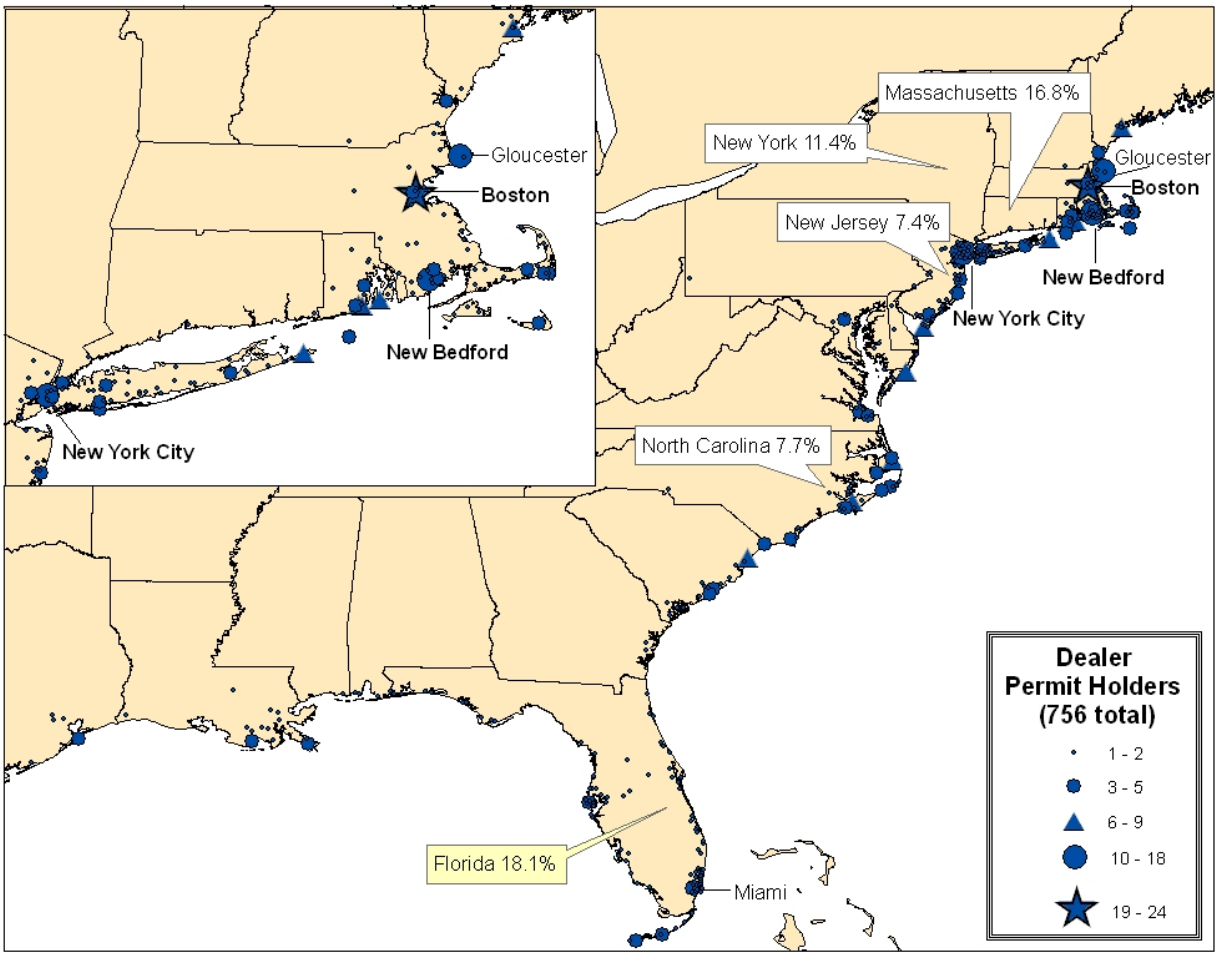

Figure 9.5 **Location of all HMS Dealer Permit Holders as of February 2006 for shark and swordfish permits and for fishery year 2005 for tunas and the percentage of total HMS dealer permit holders for the top five states.**

Table 9.37 **Number and Percentage of HMS Dealers by State and Country as of February 2006 (sharks and swordfish) and for calendar year 2005 (tunas).**

HMS Dealer Permits		
State	**Total**	**%**
Florida	137	18.1%
Massachusetts	127	16.8%
New York	86	11.4%
North Carolina	58	7.7%
New Jersey	56	7.4%
Rhode Island	45	6.0%
California	42	5.6%
South Carolina	32	4.2%
Virginia	27	3.6%
Maine	26	3.4%
Louisiana	25	3.3%
Maryland	16	2.1%
Texas	14	1.9%
Hawaii	9	1.2%
Washington	9	1.2%
Canada	8	1.1%
Puerto Rico	7	0.9%
Alabama	5	0.7%
New Hampshire	5	0.7%
Pennsylvania	5	0.7%
Virgin Islands	5	0.7%
Delaware	3	0.4%
Georgia	3	0.4%
Connecticut	2	0.3%
Chile	1	0.1%
Illinois	1	0.1%
Missouri	1	0.1%
Mississippi	1	0.1%
Grand Total	**756**	**100%**

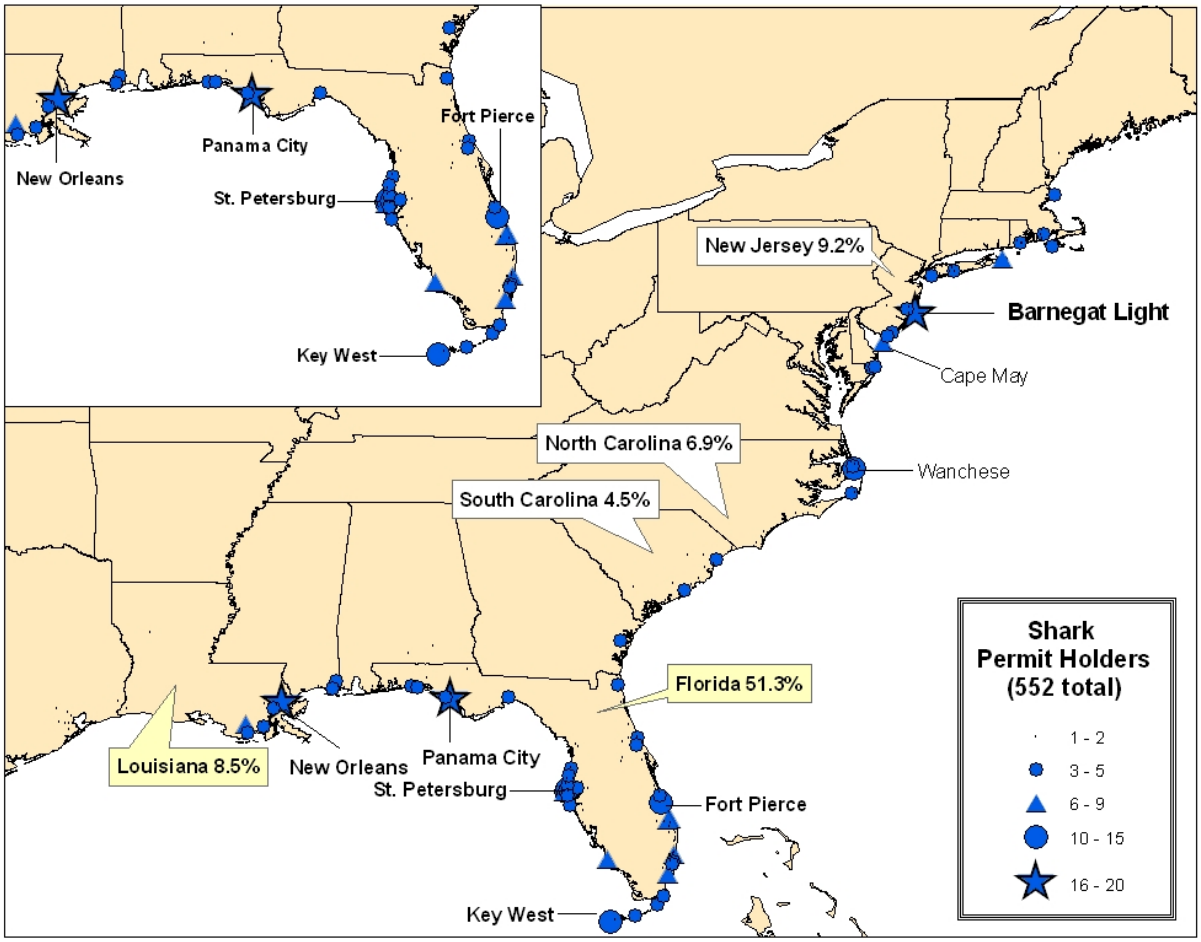

Figure 9.6 **Location of the Shark Directed and Incidental Permit Holders as of February 2006 and percentage of shark permit holders for the top five states.**

Table 9.38 **Number and Percentage of Directed and Incidental Shark Permit Holders by State as of February 2006.**

Shark Permits		
State	**Total**	**%**
Florida	283	51.3%
New Jersey	51	9.2%
Louisiana	47	8.5%
North Carolina	38	6.9%
South Carolina	25	4.5%
New York	21	3.8%
Massachusetts	17	3.1%
Texas	13	2.4%
Maryland	10	1.8%
Rhode Island	9	1.6%
Mississippi	8	1.4%
Alabama	7	1.3%
Virginia	6	1.1%
Maine	5	0.9%
Georgia	3	0.5%
New Hampshire	3	0.5%
California	2	0.4%
Connecticut	2	0.4%
Delaware	1	0.2%
Virgin Islands	1	0.2%
Grand Total	**552**	**100%**

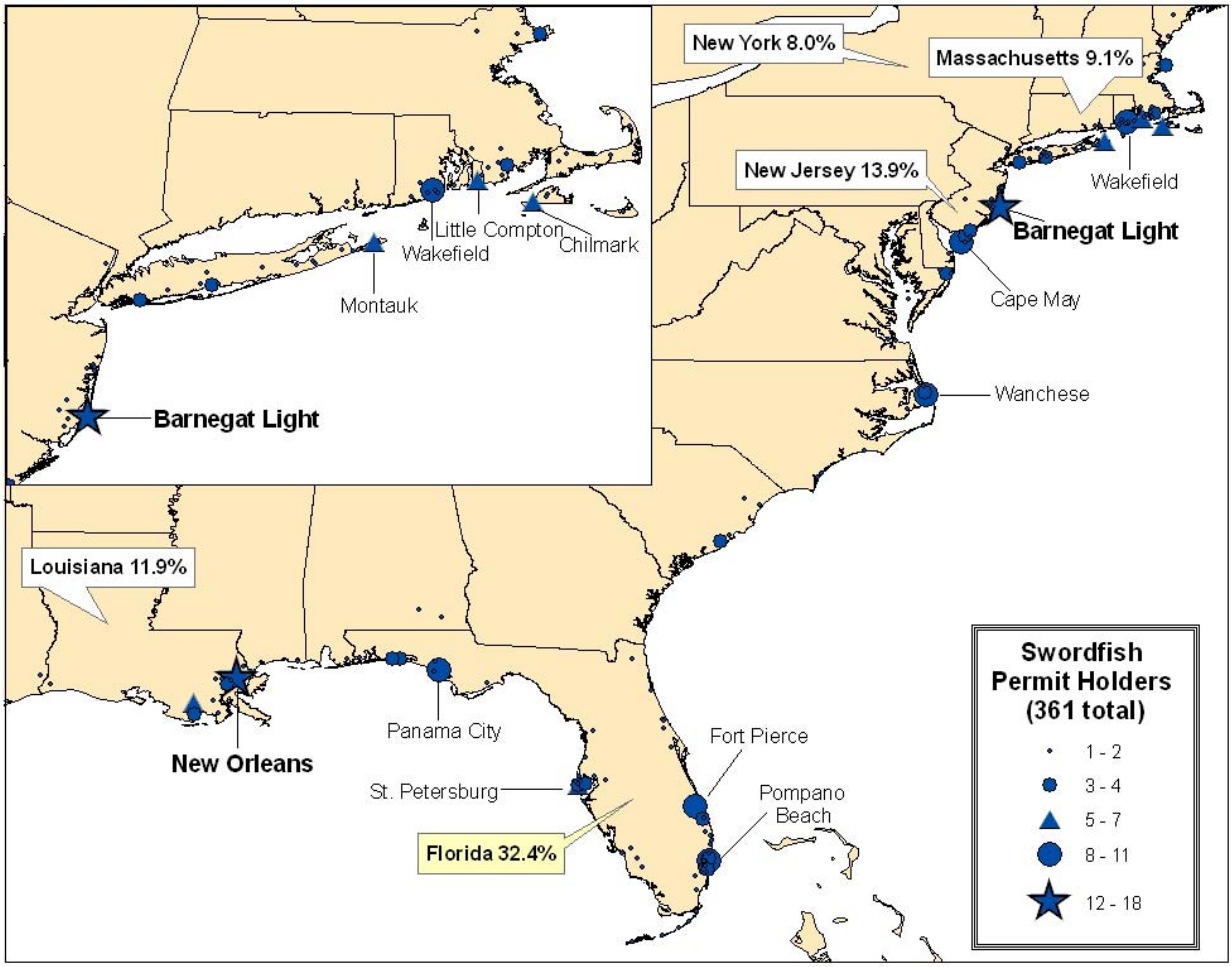

Figure 9.7 **Location of the Swordfish Permit Holders as of February 2006 and the percentage of swordfish permit holders for the top five states.**

Table 9.39 **Number and Percentage of Swordfish Permit Holders by State as of February 2006.**

Swordfish Permits		
State	**Total**	**%**
Florida	117	32.4%
New Jersey	50	13.9%
Louisiana	43	11.9%
Massachusetts	33	9.1%
New York	29	8.0%
Rhode Island	27	7.5%
North Carolina	20	5.5%
Maryland	7	1.9%
South Carolina	7	1.9%
Texas	7	1.9%
Virginia	5	1.4%
Maine	4	1.1%
Alabama	3	0.8%
California	2	0.6%
Connecticut	2	0.6%
Mississippi	2	0.6%
Delaware	1	0.3%
New Hampshire	1	0.3%
Virgin Islands	1	0.3%
Grand Total	**361**	**100%**

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CHAPTER 10 TABLE OF CONTENTS

Chapter 10 Table of Contents **10-i**
Chapter 10 List of Tables **10-ii**
10.0 Essential Fish Habitat **10-1**
10.1 Introduction 10-1
10.2 EFH Five-Year Review Process 10-2
10.2.1 Descriptions of Datasets Used in the Review 10-3
10.2.2 Methods Used to Map and Analyze EFH Data 10-6
10.3 Summary of Review and Findings 10-8
10.3.1 Tunas 10-9
10.3.2 Swordfish 10-13
10.3.3 Billfish 10-14
10.3.4 Sharks 10-16
10.4 Threats to Essential Fish Habitat 10-19
10.4.1 Regulatory Requirements and Fishing Activities That May Affect EFH 10-19
10.4.2 Potential Impacts of HMS Fishing Activities on HMS and non-HMS EFH 10-20
10.4.2.1 HMS EFH Overview 10-20
10.4.2.2 Impact of HMS Federally regulated gear on HMS and non-HMS EFH 10-22
10.4.3 Potential Impacts of non-HMS Fishing Activities on HMS EFH 10-25
10.4.4 Federally Managed Fishing Activities 10-27
10.4.5 Non-Federally Managed Fishing Activities 10-29
10.4.6 Description of Fishing Gears 10-31
10.4.7 Summary 10-45
10.5 Non-fishing Impacts to EFH 10-45
10.5.1.1 Land-based Activities That May Impact HMS EFH 10-47
10.5.1.2 Coastal and Offshore Activities That May Impact HMS EFH 10-48
10.5.2 Cumulative Impacts 10-51
Chapter 10 References **10-54**

CHAPTER 10 LIST OF TABLES

Table 10.1. Impact assessment of HMS fishing gear on HMS and non-HMS EFH. '-' indicates that the gear type is not used in these habitat types. Habitat impacts are as follows: negligible = 0, low = +, medium = ++, high = +++, unknown=?, and a blank indicates not evaluated. Source: Symbols before the slash are from the Caribbean FEIS, 2004 (Table 3.15a). The symbols after the slash are taken from Barnette, 2001. 10-25

Table 10.2. A comprehensive list of all gear types used in HMS fisheries. 10-28

Table 10.3. Fishing gear types regulated in Federal waters of the Northeast region and their effects on HMS EFH. Habitat impact is as follows: minimal/negligible = 0. Source: Stevenson *et al*., 2004. 10-28

Table 10.4. Fishing gear types regulated in Federal waters in the Southeast region and their effects on HMS EFH. Habitat impact is as follows: minimal/negligible = 0. Source: Hamilton, 2000; Barnette, 2001; GOMFMC FEIS 2004. 10-29

Table 10.5. Non-FMP Fishing Gear in the Northeast region and their effects on HMS EFH. Habitat impact is as follows: minimal/negligible = 0. Source: Stevenson *et al*., 2004. 10-30

Table 10.6. Non-FMP Fishing Gear in Southeast region: Effects of other fishing gear on HMS EFH. Habitat impact is as follows: minimal/negligible = 0. Source: Hamilton, 2000; Barnette, 2001; GOMFMC, 2004. 10-31

10.0 ESSENTIAL FISH HABITAT

10.1 Introduction

In 1996 Congress reauthorized the Magnuson Stevens Fishery Conservation and Management Act (Magnuson-Stevens Act), which required NMFS to describe and identify essential fish habitat (EFH) for the fishery based on the guidelines established by the Secretary under section 305(b)(1)(A), minimize to the extent practicable adverse effects on such habitat caused by fishing, and identify other actions to encourage the conservation and enhancement of EFH. In doing so, Congress recognized the importance of habitat in maintaining viable and sustainable fisheries. EFH is defined as those habitats necessary to the species for spawning, breeding, feeding, or growth to maturity. The EFH guidance published on January 17, 2002 (67 FR 2343) stated that EFH must be identified and described for each life stage and for all species in the fishery management unit (FMU), as well as the physical, biological, and chemical characteristics of EFH, and, if known, how these characteristics influence the use of EFH by each species and life stage. FMPs and FMP amendments must provide written descriptions of EFH and must also provide maps of the geographic locations of EFH or the geographic boundaries within which EFH for each species and life stage is found (50 CFR 600.815(a)(1)(i)).

The Magnuson-Stevens Act states that NMFS should periodically review and revise or amend the EFH provisions as warranted based on available information (50 CFR 600.815(a)(10). The EFH guidance further states that NMFS should review all EFH information at least once every five years. EFH, including habitat areas of particular concern (HAPCs), for HMS were identified in the 1999 HMS FMP. This amendment constitutes Phase 1 of the comprehensive five-year review of EFH for all HMS. The purpose of the EFH review is to gather any new information and determine whether modifications to existing EFH descriptions and delineation's are warranted. While NMFS has presented new information relative to HMS EFH in the annual Stock Assessment and Fishery Evaluation (SAFE) reports, this is the first comprehensive review of all new information related to EFH that has been completed since 1999.

NMFS does not intend to modify any of the existing EFH descriptions or boundaries in this FMP or to minimize impacts from fishing gear. Rather, NMFS is presenting new EFH information and data collected since 1999, including gear evaluations, and requesting public comment on any additional data or information that may need to be included in the five-year review. Based on an assessment of the data collected thus far, NMFS has made a preliminary determination that modification to existing EFH for some species and/or life stages may be warranted. At this time, even though NMFS is conducting the gear evaluations, NMFS is not minimizing any impacts due to fishing gears. Any modifications to existing EFH descriptions and boundaries and potential measures to minimize fishing impacts would be addressed in a subsequent FMP action. In order to consolidate EFH descriptions and maps previously provided in separate documents, all of the EFH descriptions and maps from the 1999 FMP, Amendment 1 to the FMP, and Amendment 1 to the Billfish FMP are provided in this FMP. Maps in this FMP include data acquired through the review process and will provide an opportunity for public comment on the need for any additional information to be considered. These maps can be found in Appendix B.

To further the conservation and enhancement of EFH, the EFH guidelines encourage FMPs to identify HAPCs. HAPCs are areas within EFH that meet one or more of the following criteria: they are ecologically important, particularly vulnerable to degradation, undergoing stress from development, or they are a rare habitat type. HAPCs can be used to focus conservation efforts on specific habitat types that are particularly important to the managed species. Currently, only three HAPCs for sandbar sharks have been identified, including: three separate areas off North Carolina; Chesapeake Bay, MD; and Great Bay, NJ (NMFS, 1999). Although no new HAPCs have been identified since the 1999 FMP, and none are proposed in the current Amendment, NMFS may consider alternatives for HAPCs in a subsequent FMP action, based upon information provided by experts in the field or from other information gathered during this review. Once additional information is compiled and analyzed for the five-year EFH review, additional HAPC alternatives may be proposed.

Additionally, FMPs are required to identify fishing and non-fishing activities and to minimize any adverse effects on EFH. Each FMP must include an evaluation of the potential adverse impacts of fishing on EFH designated under the FMP, including effects of each fishing activity regulated under the FMP; also the effects of other Federal FMPs and non-Federally managed fishing activities (*i.e.*, state fisheries) on HMS EFH. FMPs must describe each fishing activity and review and discuss all available relevant information such as the intensity, extent, and frequency of any adverse effects on EFH; the type of habitat within EFH that may be adversely affected; and the habitat functions that may be disturbed (§ 600.815(a)(2)). If adverse effects of fishing activities are identified, the Magnuson-Stevens Act requires that these effects on EFH are minimized to the extent practicable (MSA § 303(a)(7)).

NMFS completed the original analysis of fishing and non-fishing impacts in the 1999 FMP, and is now presenting information gathered to complete the five-year review, including all fishing and non-fishing impacts. Considerable new information is available regarding gear impacts that have been incorporated into this review. For example, new information presented in the Gulf of Mexico and Caribbean Fishery Management Council EFH FEIS' (2004) suggest that bottom longline gear may have an adverse affect on coral reef habitat which serves as EFH for certain reef fishes, and both Councils have taken action to minimize fishing impacts on those areas. Bottom longline gear in HMS fisheries is primarily used in sandy and/or muddy habitats where it is expected to have minimal to low impacts. An assessment of whether HMS bottom longline gear is fished in coral reef areas, and if so, the intensity, extent, and frequency of such impacts, including any measures to minimize potential impacts will be considered in a subsequent rulemaking. At that time, NMFS may consider similar alternatives to prohibit HMS gears in those areas identified by the Councils, or other areas identified by NMFS. Other gear types that contact the bottom, such as tuna traps or anchored gillnets, are either so few in number, as in the case of the tuna traps, or are also used in sand or mud habitats, as is the case of the anchored gillnets, that impacts from these HMS gear types are expected to be minimal, and will be addressed in a subsequent rulemaking.

10.2 EFH Five-Year Review Process

The original identification and description of EFH for HMS was completed for tunas, swordfish, and sharks in the 1999 FMP, and for billfish in the 1999 Amendment 1 to the Billfish FMP. Amendment 1 to the 1999 FMP included a review and update of EFH for five shark

species. EFH for these species was updated based on either a change in management status (*e.g.* from overfished to not overfished or vice versa) or based on new information that had become available. Species for which management status had changed included the blacktip shark (*Carcharhinus limbatus*) (no longer overfished), sandbar shark (*C. plumbeus*) (overfishing is occurring), and finetooth shark (*C. isodon*) (overfishing is occurring). Species for which new information had become available included the dusky shark (*C. obscurus*) and nurse shark(*Ginglymostoma cirratum*). As described above, these updated descriptions and maps are included in this Amendment.

As part of the five-year review process, a search of all new literature and information on HMS EFH was undertaken to assess habitat use and ecological roles of HMS EFH in the FMU. Published and unpublished scientific reports, fishery independent and fishery dependent datasets, and expert and anecdotal information detailing the habitats used by the managed species were evaluated and synthesized for inclusion in the five-year review process in this FMP Amendment (See Section 10.3). Ongoing research on the biology, ecology, and early life history of Atlantic HMS, and research and publications relating to HMS EFH, are described in greater detail below.

10.2.1 Descriptions of Datasets Used in the Review

A number of different data sets from state, Federal, and non-governmental organizations were compiled during the review process. For the most part, these are updated versions of the same data sources that were used for the original 1999 EFH identifications. One new data set, from the Cooperative Atlantic States Shark Pupping and Nursery (COASTSPAN) program, was initiated in 1998 by the Northeast Fisheries Science Centers (NEFSC) Apex Predator Program (APP). Although several of the data sets described below appear to be focused on a particular species, there may be an overlap in the species that are documented, particularly in the tagging programs. For example, the Cooperative Shark Tagging Program (CSTP), described below, includes data on 114 adult white marlin tagged between 1964 and 2002, and 318 juvenile white marlin tagged between 1967 and 2003, even though the primary focus is on Atlantic sharks.

The CSTP, managed by the NEFSC APP, provides one of the most comprehensive, long-term data sets available on Atlantic sharks and, to a lesser degree, swordfish, tunas, and billfish. The CSTP data set has a continuous time series of observations dating back to 1962. Between 1962 and 2004, more than 171,000 sharks of 52 species have been tagged and more than 10,000 sharks of 33 species have been recaptured. Information is collected by distributing tags to scientists and commercial and recreational fishermen who record information on the species, capture or tagging location, date, gear, and size of the tagged fish prior to its release.

The NEFSC APP has also been conducting surveys since 1986 which represented the first systematic survey of sharks covering most of the U.S. Atlantic coast from Southern New England to mid-Florida in depths of 5 to 200 m. Pre-determined stations were positioned roughly 30 nautical miles (nmi) apart, with additional (tagging only) stations in regions of high shark abundance. The cruise was designed to obtain baseline information on the abundance and distribution of large pelagic fishes, primarily sharks, using standard pelagic longline gear. By 1989, the objectives of the survey were shifted from pelagic fish to large coastal sharks and this survey covered the waters from Tampa, FL, to southern New England. The gear was weighted and the bottom longline survey was initiated. Survey procedures and gear were standardized

between the NEFSC and Southeast Fisheries Science Center SEFSC in 1995 to make the surveys comparable and to mimic the gear used in the commercial large coastal shark fishery. Changes to the NEFSC survey were: 1) gear changed from New England pelagic (rope mainline, rope and wire gangions) to Florida bottom (monofilament mainline and gangions), 2) soak time increased from 1 to 3 hrs, 3) bait changed from mackerel to spiny dogfish, 4) stations limited to depths between 5 and 40 fms, and 5) longline fished entirely on the bottom, eliminating the pelagic sets of the previous surveys, 6) 300 hooks fished rather than 100.

The Cooperative Tagging Center (CTC) operated by the SEFSC was established in 1992 in response to expansion of tag release and recapture activities, data requests from other tagging agencies, and domestic and international tagging research needs. The CTC runs the Cooperative Tagging System (CTS), and other projects aimed at tagging research and cooperative work with endangered species emphasizing highly migratory species such as tunas and billfishes. The CTC collects catch, effort, tagging, and bio-profile data on tunas and billfish to monitor trends in abundance.

The Commercial Shark Fishery Observer Program (CSFOP), also referred to as the Shark Observer Program (SOP), administered by the Florida Museum of Natural History, University of Florida, has been collecting information on the directed shark bottom longline fishery since 1994. A voluntary program for many years, it became mandatory in 2002. Trained observers collect fishery-dependent information on the location of each longline set, species composition, number of each species caught, disposition of the catch, and information on individual sharks such as length and sex. The coverage for this data set extends from the Atlantic east coast to the Gulf of Mexico. Data from this program are essential to monitoring the fishery and providing distributional information for many different shark species.

The Pelagic Observer Program (POP), administered by SEFSC in Miami, has been monitoring the commercial pelagic longline fishery since 1992. The program places trained observers aboard commercial fishing vessels, monitoring the U.S. pelagic longline fleet in the Atlantic and Gulf of Mexico. Observers collect information on location, number of fish caught per set, species identification, sex, length, and weight for swordfish, sharks, tunas, and billfish. The POP targets approximately 8 percent of the vessels based on the fishing effort of the fleet, and supplies data on all species included in the 1999 FMP.

The COASTSPAN program, also administered by the NEFSC APP, has been collecting information on shark nursery areas for several Atlantic east coast states since 1998. The purpose of these surveys is to assess the geographical and seasonal extent of shark nursery habitat, determine which shark species use these areas and gauge the relative importance of these coastal habitats. NOAA scientists and state and university researchers monitoring shark populations in Delaware, North Carolina, South Carolina, Georgia, and Florida collect the information. In 2002, a synthesis document of research including several other states bordering the Atlantic east coast and Gulf of Mexico was completed, resulting in additional information on shark EFH. The information included in this data set was derived through a variety of collecting methods including longline, gillnet and trawl surveys, and standardized to include information on location, species, length, and data source.

The Southeast Fishery Longline Shark Survey, administered by the SEFSC, Pascagoula Laboratory, has been conducting biological surveys to assess the relative abundance and distribution of coastal sharks since 1995. Biological data is collected from all captures and associated environmental data is recorded from each longline location. Most of the sharks captured are tagged and released. The longline surveys provide a useful fisheries independent database for sharks.

The Mote Center for Shark Research (CSR), operated out of the Mote Marine Laboratory (MML), includes data on sharks and any tuna and billfish bycatch. MML is an independent, nonprofit marine research institution with a nearly 50-year history of shark research, including: collecting angler tag data to provide basic biological information on shark migrations, age and growth studies, natural mortality studies, and investigations on behavior and habitats.

The Southern Atlantic SEAMAP Shallow Water Trawl Survey, administered by the South Carolina Department of Natural Resources is a state sponsored public tagging program. Over the past twenty-seven years, close to12,000 anglers have participated in the program. Over 100,000 fish have been tagged with an overall recovery rate of around 13 percent. Species tagged include sharks, tunas, and billfish. For example, a blue marlin tagged through SEAMAP became the first documented Atlantic blue marlin to cross the equator. This marlin was tagged off Georgetown, South Carolina and was recaptured several months later 750 miles off the coast of Brazil. It had traveled approximately 4,300 nautical miles from its original tagging location.

The Virginia Institute of Marine Science (VIMS) longline survey began in 1973 and is still continued today. This project allows VIMS scientists to assess the abundance of local shark stocks and to monitor changes in this abundance over time. The survey is a depth-stratified field survey of the Chesapeake Bay and Virginia coastal waters.

The Billfish Foundation (TBF) is a non-profit organization that has been collecting data on billfish tagging for a number of years, and providing the data to the NMFS SEFSC. The Billfish Foundation developed the widely used hydroscopic nylon tag head, which has been employed in offshore and inshore fisheries tagging efforts. In addition, TBF has contributed to the development and use of satellite tagging technology for marlin.

In addition to these data sets, data were obtained from individual researchers involved in shark, tuna, swordfish, and billfish research. For example, in 2002 a synthesis document of shark nursery research conducted along the U.S. Atlantic and Gulf of Mexico coasts was initiated, resulting in additional information on shark EFH. The data collected by the various researchers were synthesized into a single standardized data set to provide a comprehensive view of shark nursery and pupping areas in state waters. The information included in this data set was derived through a variety of collecting methods including longline, gillnet and trawl surveys, and standardized to include information on location, species, length, and data source.

The Pelagic Longline Logbook (PLL), a comprehensive fisheries dependent logbook reporting system, was also compiled during the review, but could not be included in the maps due to the lack of size information. The PLL data include, among other things, targeted species caught, bycatch, effort, and gear. However, since EFH descriptions are based on different

lifestages of HMS, information on sizes is required for EFH mapping and analysis. Thus, NMFS was only able to use the PLL data to confirm the presence of HMS in areas that appeared to be outside of the normal distribution range of points from other data sets.

10.2.2 Methods Used to Map and Analyze EFH Data

The overall approach used to analyze data and identify EFH is described in the EFH regulations (§ 600.815(a)(1)) and was followed during the initial identification of HMS EFH in 1999, as well as during this five-year review. The regulations recommend using an approach of categorizing data according to different levels. The regulations require that, at a minimum, distribution data (level 1 information) be used to identify EFH. This level 1 information is based on presence/absence data of the species or life stages in specific habitats used. Where possible, data sets and information on habitat-related densities of species (level 2), growth, reproduction and survival within habitats (level 3), and production rates by habitat (level 4), should be used to identify EFH. Distribution data (level 1) are the most common data available for HMS. As described in further detail below, the interpretation and application of these data are subject to certain limitations.

As part of the review process NMFS scientists who have expertise working with HMS were consulted to determine whether the data included in the updated maps for this amendment were appropriate, whether appropriate size ranges for species' individual life stages applied to the mapped data points, and whether modifications to existing EFH areas may need to be considered in the future. For mapping purposes, there were no changes to the size ranges for the three life stages of tunas, swordfish, or billfish from the 1999 FMP. However, the naming conventions for the life stages were modified slightly to provide clarity and help distinguish between them. Size ranges for each of the species' life stages are indicated on the bottom of each of the maps. Due to a lack of published literature on length-at-age data for several HMS, NMFS changed the 1999 categories for size classes of tunas, swordfish, and billfishes from juvenile/subadults to juveniles only. NMFS is aware of the inherent difficulties in accurately determining the size, sex, and in certain cases, species for classification purposes (described in more detail in section 10.3).

After reviewing published scientific reports and consulting with experts in the field, NMFS believes that several of the size ranges for various life stages of sharks may need to be changed from those described in the 1999 FMP. Identifications and descriptions of shark life stages by size are provided in Appendix B. The data points on the maps provided in this Amendment represent these new size ranges. The data points reflect a "neonate" life stage (where available) and do not contain an "early juvenile" life stage, as was the case in the 1999 FMP. The 1999 definition was modified to include primarily neonates and young-of-the-year sharks in the neonate category in order to better define and identify the life stage that occupies nursery habitat. The change in classification of "late juveniles/subadults," to "juveniles" was done to ensure that all immature sharks from young juveniles to older or late juveniles were included in the juvenile category. Finally, the "adult" size class still consists of mature sharks based on the size at first maturity for females of the species. Similar modifications to other HMS species' size ranges may be undertaken in the future.

After careful screening to ensure standardization and quality of the data, all of the data points for each species were compiled in a Geographic Information Systems (GIS) program for mapping. By combining all of the data sets, the number of observations for an individual life stage for a single species ranged from several hundred to over 18,000. Each observation included at a minimum the species, size, life stage, latitude and longitude coordinates, date of collection, sex, and data source.

Identifying areas with the highest concentration of observations was determined by superimposing individual observations on a regional grid covering coastal waters in the U.S. Exclusive Economic Zone (EEZ). The grid was constructed of ten-minute squares that are all equal to 0.0279 square degrees or 100 square degree minutes[1], or approximately 100 nm^2. The grid and individual data points were spatially joined and each square was given a summary of the numeric attributes and a count field of the points that fell inside it. Depending upon the species, the number of observations per 100 nm^2 ranged from zero to several thousand. The squares containing observations were color-coded depending upon the number of observations per square, and scaled to reflect the frequency of occurrence.

A grid was used rather than individual data points so that reviewers could determine the relative concentration of fish in a given area, something that is difficult to determine with overlapping data points. However, the grid and associated scale are not meant to represent abundance or density estimates (level 2 data). In addition, the grid will be helpful in future efforts to revise existing boundaries by providing a scale that can be used as a guide for the inclusion or exclusion of given areas. For example, in Amendment 1 to the FMP, criteria (presented here for reference only) for including or excluding a given number of observations per square were established for each species based on the status of the stock, and used as a guide to identify appropriate EFH areas. For a rebuilt species like blacktip shark, a criteria of greater than 10 observations per 100 nm^2 was used to help identify and map areas as EFH. For an overfished species such as finetooth shark, a more precautionary criteria of > 1 observation per 100 nm^2 was used to help identify and map EFH areas. Thus, the grid might be used in a future rulemaking to analyze potential alternatives based on including or excluding a specific number of observations per 100 nmi^2 area.

[1]A minute of latitude equals a nautical mile, but the distance represented by a minute of longitude varies according to distance from the equator. Thus, ten minute "squares" are larger in size near the equator and get progressively smaller in size as you approach the poles.

Due to natural variability in abundance for different species and lifestages, which is reflected by the variation in the number of observations per 100 nm^2, the relative concentrations were tailored to each species. NMFS adopted this approach because it made the data easier to view and analyze, but there may also be a benefit to a uniform scale for certain species and lifestages.

10.3 Summary of Review and Findings

As part of the review process, NMFS provided draft maps of the 1999 EFH boundaries overlayed both new and existing data for each HMS to technical reviewers for their feedback and comment. Several reviewers raised concerns regarding identification of EFH for a number of reasons described in further detail below. The comments ranged from questions regarding size classifications for various species' life stages to potential errors in species identification. NMFS is providing a summary of these comments and observations so that the public and others reviewing the current distributions and maps will have a better understanding of the issues involved in interpreting the data, and ultimately modifying EFH.

One of the overarching comments was the challenge of identifying EFH for tunas, swordfish, billfish, and sharks, and the limitations of relying too heavily on distribution data alone. By nature, these species are highly migratory and occupy a wide range of habitats including estuarine, coastal, and offshore pelagic environments. HMS are typically associated with oceanographic features such as fronts, current boundaries, temperature discontinuities, or water masses with particular physical characteristics, which may be ephemeral, difficult to map, and difficult to correlate with specific periods in which they are occupied by HMS. Other features such as shelf edges and sea mounts are more easily identified and may be sites of higher abundance for some HMS on a seasonal basis. In the past, areas with readily identifiable geographic or bathymetric features that coincided with, or overlapped with areas of HMS aggregations, were used to delineate the boundary, or a portion of the EFH boundary. Where expert opinion was available and data points were scarce, areas were identified as EFH based on the best interpretation of life history accounts.

Distribution data alone may not provide sufficient information on whether the habitat should be considered essential even if correlations can be drawn between the presence of HMS in a given area and a particular habitat. For many HMS, additional information from surveys, or observations of feeding or spawning activity may be used to further confirm the importance of the habitat. Information about the life history of a particular species, such as the timing of the reproductive cycle, may also be used to correlate the presence of HMS in an area. However, as described in greater detail below, these types of correlations are difficult to confirm, are not well documented in the scientific literature, and should be viewed with caution. Due to difficulties in identifying EFH, a precautionary approach of selecting large areas has been used in the past.

EFH information for most of the data sets described above is based on distribution information (level 1) derived from systematic presence/absence sampling and relative abundance (CPUE) data. Level 2 density information (*i.e.*, number of sharks/m^3) is generally not available due to the types of gear used to collect HMS. For example, data from the McCandless *et al.* (2002) report on shark nursery areas in coastal waters were gathered using a wide variety of sampling techniques including gillnet, longline, and trawl surveys. Of the 15 separate research

studies conducted from Massachusetts to Texas that contributed to the McCandless *et al.* (2002) report, only one provided trawl data that might have been used to generate habitat related densities. Additional equipment would have been needed to collect information on water volume sampled in order to estimate densities. The other sampling techniques (gillnet and longline) provide presence/absence or relative abundance through CPUE data (*e.g.* number of sharks/gillnet hour, or number of sharks/100 hooks), but not density data. Additionally, due to the differences in fishing effort, a cross comparison of CPUE among the different studies was not possible. Due to the types of gear used to sample other HMS (longline, rod and reel, handline, harpoon), similar difficulties are encountered for nearly all HMS. However, the information may nonetheless prove to be useful in providing a broad overview of the regional distributions, habitat requirements, and nursery areas for a wide variety of species.

Despite the lack of density information, other valuable information may be derived from studies such as these, including data on growth rates from recaptured tags and habitat utilization information through sampling, telemetry, and tagging efforts. By determining the life stage of a species at capture, through size measurements, additional information may be derived about habitat utilization. Information on where and when HMS are located in a given area, how long they may have been in the area, when migrations occur, and whether they return to the same area in subsequent years may be determined. In combination, all of these data help to determine habitat value and provide a more complete overview of habitat utilization than simple distribution data might suggest.

To the extent possible, these and other types of information from studies of life history dynamics of HMS, reports, and expert opinion are utilized to identify EFH. The sources that were used to identify EFH areas are referenced in the text. When environmental information was available, it was included in the EFH descriptions. The information included temperature, dissolved oxygen, salinity ranges, depths, seasons, and geographic locations. The textual accounts for each species serve as the legal description of EFH, and where environmental characterizations are known they have been included. Maps are provided as supplemental material to facilitate the description and identification of EFH.

Additionally, NMFS conducted a review of new publications related to HMS EFH and has provided a summary of ongoing EFH research efforts. For each of the HMS groups, the major issues involved with identifying and describing EFH are discussed in greater detail below. One of the major considerations for any future adjustments to existing EFH boundaries will be whether the existing areas can be refined. Currently, HMS EFH encompasses the entire U.S. EEZ from the U.S. Atlantic and Gulf coast to the border of Mexico. One of the objectives of the proposed modifications in the future would be to reduce the scope of HMS EFH while still providing the maximum amount of habitat protection. This may require additional research on HMS habitat use which could be related to landings and logbook data to establish definitive relationships between fish presence and what is deemed essential fish habitat.

10.3.1 Tunas

In recent years, archival tags and popup satellite tags (PSATs) have been used to successfully monitor ocean-wide movements of giant bluefin tuna as well as other HMS (Block *et al*., 2001, 2005, Lutcavage *et al*., 1999). This technology has greatly expanded the

understanding of migratory patterns, reproductive behavior, and habitat use for bluefin tuna as well as other HMS such as blue and white marlin (NMFS, 2004). However, despite these advances, there are considerable gaps in the understanding of habitat requirements as they relate to identifying EFH for tunas. Accurate identification of certain species of tunas can be difficult unless one has sufficient knowledge to check for appropriate distinguishing characteristics. This is particularly true for planktonic larval stages of all tuna species and adult stages of bigeye and blackfin tuna. For example, bigeye tuna may easily be mistaken for blackfin or juvenile yellowfin tuna, and can only be positively distinguished from one another by examining the liver and gill rakers. Reviewers raised concerns regarding presence of a high number of bigeye tuna in the Gulf of Mexico, which are much more rare than blackfin tuna, and which may have been misidentified. The distribution maps for bigeye tuna indicate a significant number of observations in the Gulf of Mexico that may need to be reviewed and reanalyzed for accuracy prior to any modifications being made to existing boundaries (J. Lamkin, pers. comm.).

The Tag A Giant (TAG) program is a collaborative effort among scientists from Stanford University, the Monterey Bay Aquarium, and NMFS which continues to place electronic tags internally and externally on Atlantic bluefin tuna in the North Atlantic to continuously record data. Tag A Giant deployed 201 archival and 37 pop-up satellite archival tags (PSATs) over the past two years, during which time 21 archival tags were recovered, more than a third of which were recaptured east of the 45 degree management line. The program has collected over 13,000 geopositions obtained from 330 bluefin tuna. It is now possible to examine data in relation to year class, season, and spawning grounds visited. Bluefin tuna tagged in the western Atlantic have migrated to both the Mediterranean and Gulf of Mexico spawning grounds. Most migration to spawning grounds in the Gulf of Mexico occurred in the spring months where spawning fish appear to prefer mesoscale cyclonic eddies in the western Gulf. Results indicate that spawning occurs in the Gulf of Mexico primarily during the months of April to June (Block *et al*., 2005).

The results attained from the TAG program detail the movements and behaviors of Atlantic bluefin tuna. These data answer questions about habitat preferences, spawning and feeding grounds, spawning site fidelity, the level of mixing between eastern and western stocks, and how movements are influenced by age class and season. Linking biological data with environmental data can assist in understanding relationships between the bluefin's physical environment and its behavior, movements, abundance and distribution, leading to predictive models enabling researchers to estimate the abundance and distribution of bluefin based on oceanographic features, season, and year class. This information is being collected primarily for ICCATs consideration in updating management strategies and quotas that reflect the bluefin tunas life history in the Atlantic Ocean.

Data collected to date consistently show that spawning occurs primarily after the bluefin reach 10 years of age. Bluefin tuna that are 8.5 years and younger tend to remain near New England in the summer and fall whereas older fish move offshore, many traveling to the east of the 45 degree management zone to the Mid-Atlantic Bight and Flemish Cap. Seasonal patterns are also apparent. Bluefin tuna remained in the coastal and offshore waters of North Carolina and the South Atlantic Bight throughout the winter months, predominately over the shallow continental shelf. In the spring, most fish move north depending on age class, where they remain

for the summer before returning to the south in the fall. The movements among regions appear to be dependent on temperature.

In 2002 and 2003, the TAG program expanded tagging efforts to New England, off the coast of Nantucket to spread efforts over a broader area. In 2003, efforts were expanded to the eastern Atlantic off the coast of Ireland where the program has obtained the first data on a new group of fish that have not yet been studied with this technology. Deploying tags off Ireland will also increase the likelihood of documenting the behaviors of fish spawning in the Mediterranean for comparison to those spawning in the Gulf of Mexico. The improved understanding of bluefin movements and behaviors has important applications for management and can serve as the basis for necessary changes in current management strategies.

Beginning in 1997, studies led by the New England Aquarium have implanted pop-up and pop-up archival satellite tags (PSATs) on western Atlantic bluefin tuna. Recent studies involved the implantation of PSATs into 68 Atlantic bluefin tuna in the southern Gulf of Maine and off the coast of North Carolina between July 2002 and January 2003 (Wilson *et al*., In Press). Most of the fish tagged in the southern Gulf of Maine in late summer/early fall remained in that area until late October, consistent with previous studies. Of the 33, 14 remained in northern shelf waters (between Maryland and Nova Scotia), 14 moved south to waters off the coasts of Virginia and North Carolina, and five were in offshore waters of the northwestern Atlantic Ocean. In the spring, six of the 11 fish either stayed in northern waters or moved to that area from Virginia and North Carolina waters, and the other five fish moved offshore into the Mid-Atlantic Ocean. Similar seasonal movement patterns have been shown by individuals tagged in coastal waters off North Carolina. During the winter months, these fish remained either on the Carolina shelf or in offshore waters of the northwestern Atlantic Ocean and moved offshore along the path of the Gulf Stream in spring. By summer, many were in northern shelf waters.

Swimming depth was significantly correlated with location, season, size class, time of day, and moon phase. The greatest depth recorded was 672 m (2,218 ft), and fish experienced temperatures ranging from 3.4° to 28.7°C (38° to 83.7° F). The data show that Atlantic bluefin tuna spend the majority of their time in the top 20 m (66 ft) of the water column, descending occasionally to depths in excess of 500 m (1,650 ft). The vertical behavior of bluefin tuna differed among locations, with shallower swimming depths occurring when the fish were in inshore waters.

A recent study of the diet and trophic position of bluefin tuna in coastal Massachusetts and the Gulf of Maine used stable isotope analyses to investigate feeding habits of bluefin tuna. The results suggest that bluefin tuna feed on a variety of schooling fish, including silver hake, Atlantic mackerel, and Atlantic herring (Estrada *et al*., 2005). Juvenile bluefin tuna appear to have isotopic nitrogen signatures similar to those of suspension feeders, suggesting that nektonic crustaceans or zooplankton may contribute significantly to the diet of juvenile bluefin tuna (Estrada *et al*., 2005).

Combined, all of the studies and data are providing a higher resolution of potential spawning, feeding, and other important habitat areas for bluefin tuna. Given that there is a

considerable and growing body of science on bluefin tuna, it may be one of the species for which NMFS may consider modifying the boundaries in the future. For example, although bluefin tuna spawning habitat has been described as encompassing nearly all of the Gulf of Mexico by Block *et al.* (2005), adult bluefin tuna EFH is limited to a smaller portion of the western Gulf of Mexico, and the adult EFH areas may not necessarily correspond to areas considered most likely as bluefin tuna spawning habitat (Block *et. al*., 2005). NMFS may need to reconsider these boundaries to account for new information being developed through PSAT technology and other means. Similarly, some of the highest individual counts of adult bluefin tuna (per 100 nm^2) have been observed off of North Carolina, yet these areas are not currently included as adult bluefin tuna EFH. Furthermore, the SEFSC is currently conducting a comprehensive review of larval distributions from 1984 to the present from ichthyoplankton collections in the northern Gulf of Mexico. Once larval movement due to local currents is accounted for these data may prove useful in the review of potential modification of EFH boundaries for other tunas as well.

In addition, the distribution and abundance of other tuna species (*i.e.*, albacore, bigeye, skipjack, and yellowfin tunas) have been attained through fishery data combined with other information, such as remote sensing data. Many of these species have similar bioecological responses (*i.e.*, many species are specialized in high energy foraging strategies of sustained fast swimming, searching over large areas (Sharp and Dizon, 1978; Au 1986)) and therefore, have similar physiological responses to oceanographic conditions (Ramos *et al.*, 1996). Skipjack and albacore are highly migratory tunas with active thermic exchanges with the environment (Sharp and Dizon, 1978). Consequently, their distribution is influenced by changes in marine features at different spatial and temporal scales (Ramos *et al.*, 1996). For instance, both species are visual predators and are unable to efficiently capture small pelagic prey in colder turbid upwelled waters (Ramos *et al.*, 1996). Therefore, over small spatial and temporal scales, the most suitable areas based on the physiology and feeding strategies for these two species are the boundary between warm and cold water where food and other abiotic features are physiologically optimal (Ramos *et al.*, 1996). Over longer temporal and spatial scales, such as migration pathways, sea surface temperatures generated by the Intertropical Zone of Convergence play an important role (Ramos *et al.*, 1996). In addition, concentration of food and water quality (*i.e.*, higher temperature, high concentration of oxygen and low level of turbidity) lead to the concentration of skipjack and albacore in their respective fishing grounds (the northeast Atlantic for albacore and Senegal waters 10° North to the Canarian area 28° North for skipjack; Ramos *et al.*, 1996).

Yellowfin tuna is a cosmopolitan species mainly distributed in the tropical and subtropical oceanic water of the three oceans. In the Atlantic Ocean, tagging and catch-at-size data analyses have shown that yellowfin tuna move at different scales in the whole tropical Atlantic Ocean (Maury *et al.*, 2001). Environmental conditions are probably the main causes driving migration phenomena and massive population movements (Mendelssohn and Roy, 1986; Lehodey *et al.*, 1997). Recent work by Maury *et al.* (2001) showed that on a large spatiotemporal scale (the whole ocean), low salinity was a good predictor of yellowfin habitat. Juveniles were mainly distributed in low-salinity waters (< 35 parts per thousand) whereas adults extend their range to water of 36 parts per thousand. This can be due to two reasons; for young tuna (<3 yrs old), salinity could be a marker of favorable feeding areas, such as low salinity levels in the Gulf of Guinea where freshwater runoff contains high levels of nutrients. Secondly, the metabolic cost of osmotic regulation could prevent young yellowfin tuna from reaching high

salinity levels (Maury *et al.*, 2001). After breeding in the Gulf of Guinea, adults, however, disperse in an east-west fashion related to salinity and warmwater seasonal oscillations (Maury *et al.*, 2001). On a mesoscale (1000 km), north-south seasonal movements are clearly related to warmwater seasonal oscillations. Such seasonal migrations should be due to surface water temperatures where adults preferentially stay in zones of water temperature between 26 to 29° C and where deeper waters are warmer than 15° C. Juveniles stay in surface waters where the sea surface temperature is 27° C or higher (Maury *et al.*, 2001). Finally, at the local level (100 km), yellowfin tuna seem to be influenced by both local hydrological and biological features, such as tuna prey distribution and the spatial stability of water masses. For instance, the presence of floating objects, and the existence of small-scale hydrological events like local fronts or convergences can all be responsible for yellowfin concentrations (Bakun 1996).

Lastly, bigeye tuna are large epi-and mesopelagic fish that are found in surface waters ranging in temperatures from 13 to 29°C (Collette and Nauen, 1983). However major concentrations coincide with the temperature range of the permanent thermocline, between 17 and 22°C. Therefore, temperature and thermocline depth appear to be important environmental factors governing the vertical and horizontal distribution of bigeye tuna (Alvarado Bremer *et al.*, 1998). Such oceanographic features can have important implications for fisheries management; for instance, water temperature can prevent movement of fish between ocean basins, influencing stock structure (Alvarado Bremer *et al.*, 1998). On the basis of fisheries data, geographic distribution, tagging results, and the location of spawning and nursery areas, a single population is assumed to inhabit the Atlantic Ocean (ICCAT, 1997). For management purposes, both the Indian Ocean and Pacific populations are considered to be single units. Recent molecular work has indicated that the Atlantic and Indo-Pacific populations are two regions and genetically distinct (Alvarado Bremer *et al.*, 1998), confirming a single spawning stock of bigeye in the Atlantic and a single spawning stock in the Indo-Pacific. In the Atlantic Ocean, juvenile bigeye tuna have been observed only in the Gulf of Guinea (ICCAT, 1997). Tagging studies indicate trans-Atlantic movements of bigeye from the Gulf of Guinea to the central Atlantic north of Brazil, and northerly migration from the Gulf of Guinea to the eastern Atlantic (ICCAT, 1997).

As with most other HMS, salinity and temperature appear to be primary factors influencing the distribution of tunas and may ultimately determine EFH. The challenge remains in identifying specific EFH areas based solely on environmental parameters; in most cases, distribution data may still provide the best indication of habitat preference of these different species. For additional EFH information on these tuna species, see Appendix B.

10.3.2 Swordfish

Based on a review of the swordfish maps and current distribution points, reviewers commented that additional research may be needed to validate the current size ranges for juvenile and adult swordfish. In addition, further analysis may be needed to determine whether certain areas have been used consistently over time. Analyzing spawning areas that are consistently used over a number of years may provide a better understanding of swordfish EFH. Several discrepancies in distribution points and EFH areas delineated in 1999 were noted, including a high concentration of observed occurrences of juvenile swordfish in an area north of Long Island Sound that was not defined as EFH in 1999. NMFS may consider modifying swordfish EFH boundaries in the future, particularly in the Long Island Sound area, and

conversely, areas currently delineated as EFH that have few if any observed occurrences in the data sets being analyzed.

Pinpointing definitive EFH for spawning swordfish is difficult because research indicates that presence of larvae may not always be a sign that spawning occurred in the vicinity of the collection. Adult swordfish, and HMS in general, may move significant distances during spawning, and eggs and larvae may be transported substantial distances by currents as well. Govoni *et. al*. (2000) determined that since a swordfish egg's incubation period is 3 days at 24°C, with an additional three or four days for posthatch growth, along with an average velocity of the Gulf Stream of 1.5 m/s (Olson *et al*., 1994), larvae of four to five mm SL in the Atlantic could have been transported from as far away as 900 km. A similar trajectory was projected for small larvae of bluefin tuna (McGowan and Richards, 1989).

10.3.3 Billfish

Similar to other HMS, billfish EFH is not easily identified due to a lack of association with readily identifiable features such as benthic habitat or other underwater structures. Billfish tend to aggregate in areas with dynamic features such as temperature gradients, ocean fronts or currents resulting from interactions between a number of factors. Many of these water column features are dynamic, making detailed delineation of billfish spawning, nursery, and feeding habitats difficult. Adding to the difficulty of designating billfish EFH is that most of the literature on billfish larvae and juveniles mention them as incidental catches in studies that were directed at other species or that were concerned with characterizing ichthyofaunal or plankton communities as a whole (NMFS, 2004).

Comments received during the Draft FMP indicate that *Sargassum* may be an important component of billfish habitat, particularly during early life stages, and that NMFS should investigate this further. If NMFS determines that EFH for some or all HMS needs to be modified, then that would be addressed in a subsequent rulemaking, at which point *Sargassum* could also be considered as potential EFH. With regard to harvest, the final South Atlantic Fishery Management Council FMP for Pelagic *Sargassum* Habitat in the South Atlantic Region was approved in 2003 and implemented strict restrictions on commercial harvest of *Sargassum*. The approved plan includes strong limitations on future commercial harvest. Restrictions include prohibition of harvest south of the NC/SC state boundary, a total allowable catch (TAC) of 5,000 pounds wet weight per year, limiting harvest to November through June to protect turtles, requiring observers onboard any vessel harvesting *Sargassum*, prohibiting harvest within 100 miles of shore, and gear specifications.

One of the key issues associated with delineating billfish EFH is the difficulty of accurately identifying billfish larvae. However, new molecular techniques are being developed that show promise (Luthy *et al.*, 2005). Without accurate identification of larvae, it is difficult to draw conclusions on spawning areas, habitat associations, and requirements. Billfish larvae may be swept miles from actual spawning grounds before they are sampled. Thus, even though peak spawning periods for blue and white marlin are known to occur from May to June, there are significant issues related to positive identification of larvae that must be overcome to verify spawning locations. Research off Punta Cana, Dominican Republic, is one of the few instances on record where spawning by blue and white marlin was confirmed through simultaneous

collections of both larvae and tracking of spawning adults using pop-up satellite tags (Prince *et al*., 2005).

Collaborative studies conducted by NMFS and University of Miami scientists using PSATs while simultaneously conducting adult and larval sampling off the Dominican Republic in the spring of 2003 have revealed important information concerning white and blue marlin spawning locations as well as horizontal and vertical movements. Co-occurrence of larval blue marlin and white marlin in samples suggest that the two species share a spawning location in the vicinity of Punta Cana, Dominican Republic. Adult white and blue marlin caught in the area appear to have similar vertical and horizontal movement patterns in terms of time at depth, time at temperature, average horizontal displacement per day, net horizontal displacement, and directional dispersion (compass heading).

Displacements of seven white marlins tagged with PSATs ranged from 31.7 to 267.7 nm (58.7 to 495.8 km), while displacement of one blue marlin was 219.3 nm (406.2 km). In general, all marlin spent a high proportion of the monitoring time in the upper 25 m (82 ft) and at temperatures at or above 28°C (82°F). Minimum and maximum depth and temperatures monitored show that on most days marlin visited depths of 100 m (330 ft) or more, but generally stayed at these depths less that 10 percent of the time. Minimum temperatures ranged from 16.8° to 20.6°C (62.2° to 69°F), while maximum temperatures ranged from 28.2° to 30.0°C (82.7° to 86°F). Additional research in other areas of the Gulf of Mexico and U.S. Atlantic coast would help improve understanding and delineation of billfish EFH (Prince *et al*., 2005).

The characterization of adult movements and larval distribution in a potentially important spawning area is paramount for establishing improved management and rebuilding strategies for depressed Atlantic billfish stocks. However, more information on the distribution of reproduction and nursery areas and on adult movement patterns is needed to help managers make more informed decisions regarding conservation of the resource.

Scientists at VIMS have been involved with electronic tagging of blue and white marlin since 1999, some of which has been conducted in conjunction with the NOAA SEFSC. More recently, VIMS has deployed over 60 PSAT on white marlin during the past three years from both recreational sport boats and a commercial pelagic longline vessel to determine post-release survival (Prince *et. al*., 2005). In addition to this work, VIMS is also in the process of updating information regarding habitat preferences and vertical movements of white marlin using environmental data obtained from the PSAT work as well as other environmental data. Most of the work at VIMS, however, remains focused on the interactions of billfish with the various fisheries.

There are a few considerations and limitations of these data that reviewers should keep in mind as they look at EFH determinations (E. Prince pers. comm.). Inaccurate EFH maps for billfish can be created because of boat side misidentification of billfish, sexual dimorphism, and criteria used in defining groups can result in both under and overestimates and ultimately impact the accuracy of the maps. The CTS is the main source of data for most of the billfish EFH maps and it obtains size information of tagged, released, and recovered fish from constituents based mostly on boatside estimates of fish size. This approach introduces a significant amount of error.

In addition, most size estimates are made when the fish is underwater and the reflective index biases these estimates upwards by as much as 30 percent (E. Prince, pers. comm.).

Billfish are sexually dimorphic (size difference between sexes), with this being most severe for blue marlin. The maps provided in this amendment do not include a consideration of sexually dimorphic differences in size and thus the characterization of juvenile size limits on the maps may be quite different for male and female marlin. The tagging data only infrequently have recoveries that include gender, so separating the maps into males and females would not likely be practical, even though it would probably be more accurate (E. Prince, pers. comm.). Furthermore, the accuracy of the maps for defining juvenile marlin based on size could vary depending on the criteria used in this definition.

Data from the CTS, which account for a significant portion of the overall data points for billfish, were historically recorded only to the nearest degree, and did not include minutes or seconds. As a result, reviewers will notice that certain data points that reflect a high number of observations are lined up along major lines of latitude or longitude, both in the Gulf of Mexico and the Atlantic coast. This may be an artifact resulting from the way in which tagging locations were recorded rather than the true points of highest observed occurrence. Depending on reviewer comments received on this aspect of the data, NMFS may consider removing these data points during future considerations of EFH boundaries. Therefore, as a result of technical reviewer comments, several changes to EFH boundaries may be considered in the future. These include, but are not limited to, potential modifications of EFH boundaries for blue and white marlin for the reasons stated above (E. Prince, pers. comm.).

10.3.4 Sharks

Significant progress has been made in recent years in identifying habitat requirements and EFH for sharks. The proximity of nursery and pupping grounds to coastal areas has provided research opportunities that do not exist for other HMS that spawn much farther from shore. Sampling has increased in a number of different locations under the auspices of several different programs (Cooperative Atlantic States Shark Pupping and Nursery Survey (COASTSPAN), Cooperative Gulf of Mexico States Shark Pupping and Nursery Survey (GULFSPAN), and others). Considerable research has been devoted to determining the size ranges of the different shark life stages (neonate, juvenile, and adult). The size ranges for each species' lifestage used in this review as well as size ranges used in the 1999 FMP are presented in Table B.1, Appendix B. The table reflects new information and updates to the 1999 FMP size ranges. Based on these size ranges, the distribution data have been mapped for each species and life stage.

The 1999 FMP highlighted the importance of coastal nursery and pupping areas in maintaining viable shark populations. It also identified continued delineation of shark nurseries as a research priority. As a result, several studies and cooperative research projects aimed at improving NMFS' understanding of EFH and shark reproductive habitat requirements have been undertaken since the 1999 HMS FMP.

In 2002, the COASTPAN project initiated a synthesis document of information on shark nursery grounds along the U.S. Atlantic east coast and the Gulf of Mexico. Researchers from

universities and state and Federal agencies in twelve different states from Massachusetts to Texas contributed information to the preliminary report (McCandless *et al*., 2002; McCandless et. al., 2005). This information was included in updates to EFH for several shark species in Amendment 1 to the FMP, and is being incorporated into the data for the current review. Results for the 2003 sampling year were compiled and synthesized, and the final report is currently under review. Participants in the 2003 COASTSPAN survey included the North Carolina Division of Marine Fisheries, the South Carolina Department of Natural Resources, Coastal Carolina University, the University of Georgia's Marine Extension Service and the University of Florida's Program for Shark Research. Researchers from the National Marine Fisheries Service's Apex Predators Program and the University of Rhode Island conducted the survey in Delaware Bay. A total of 3,698 sharks were sampled in the 2003 COASTSPAN survey. Juvenile sharks sampled, tagged and released during the survey were the Atlantic sharpnose, blacknose, blacktip, bonnethead, bull, dusky, finetooth, nurse, sandbar, sand tiger, scalloped hammerhead, silky, spinner, and tiger sharks, and also the smooth and spiny dogfish. Environmental parameters for each sampling location were also measured to indicate habitat preferences. There were a number of tag recaptures returned by fishery biologists and commercial and recreational fisherman in 2003 from sharks that were tagged by COASTSPAN cooperators in previous years.

A final synthesis document entitled "Shark Nursery Grounds of the Gulf of Mexico and the East Coast Waters of the United States" is currently under review for publication by the American Fisheries Society (AFS). It is a compilation of 20 individual papers documenting shark distributions in coastal habitats similar to the project described above, but expanded to include several new studies. This document provides valuable information for the possible modification or inclusion of additional shark EFH.

In 2003, NMFS initiated the GULFSPAN Survey to expand upon the Atlantic COASTSPAN Survey. States involved in the program during 2004, the second year of the program, include Florida, Mississippi, Alabama, and Louisiana. Sharks sampled, tagged, and released during the surveys included the Atlantic sharpnose, blacknose, blacktip, bonnethead, bull, finetooth, great hammerhead, sandbar, scalloped hammerhead, and spinner sharks. In addition, environmental parameters were measured qualitatively. The most abundant sharks included the Atlantic sharpnose, blacktip, and bull sharks. Results of this study are under review in the AFS synthesis document as well.

In Florida waters, most species captured were juveniles and young-of-the-year. Among sharks for all areas combined, the Atlantic sharpnose shark, a member of the small coastal shark (SCS) management group, was the most abundant shark captured, while the blacktip shark was the most abundant species captured in the LCS management group. The bonnethead shark was the second most abundant species captured in the SCS group and overall was the third most encountered species. The remaining species commonly captured in decreasing order of abundance were the finetooth, spinner, scalloped hammerhead, blacknose, and sandbar sharks. Other species infrequently caught were bull shark, great hammerhead shark, and the Florida smoothhound.

In Mississippi and Alabama waters, 75 percent of the sharks captured were immature. The blacktip shark was the most abundant species caught, followed by the Atlantic sharpnose,

finetooth, and bull sharks. In Louisiana in the 2004 sampling season, most species captured were juveniles. The blacktip shark was the most abundant species caught, followed by the bull shark. A single adult specimen of the finetooth shark in addition to young-of-the-year Atlantic sharpnose shark was also collected in 2004.

New information on habitat preferences is also emerging from this study. Juvenile bonnethead sharks appear to prefer habitat dominated by seagrass (in northwest Florida) or mangroves (Louisiana), although these areas have not yet been identified as EFH. In areas where neither of these habitat types is available, juvenile bonnetheads are in very low numbers or absent (*i.e.* Mississippi Sound). Adult bonnethead sharks, however, are found in diverse habitats ranging from areas with a mud or sand bottom to areas dominated by seagrass. Evidence indicates bull sharks are found among the most diverse environmental conditions with salinities ranging from 15 ppt (in Louisiana and Mississippi) to 33 ppt (in northwest Florida), and over all habitat types. Within the Gulf of Mexico, most juvenile sandbar sharks are still predominately caught in the northwest portion while blacktip, finetooth, and Atlantic sharpnose sharks are found throughout all areas. Although bull sharks can be found over a variety of habitats, the areas of highest abundance are those adjacent to freshwater inflow.

Obtaining information regarding trophic relationships and feeding habits of sharks, also critical to understanding essential fish habitat, is another goal of the GULFSPAN program. A quantitative examination of feeding ecology from different areas can assist in understanding how juvenile sharks use nursery habitats, and which habitats are more valuable as nursery areas than others.

Mote Marine Laboratory's CSR program is focusing on identifying and understanding shark nursery areas of the U.S. Gulf of Mexico and southeast Atlantic coasts. Through tagging studies, this program aims to characterize these nursery areas, obtain estimates of juvenile shark relative abundance, distribution, and growth rates, and reveal the movement patterns of these sharks. As of fall 2004, the CSR has collected data on 20,732 sharks of 16 species that utilize these coastal waters as pupping and nursery areas. More than half of the captured sharks (12,241) comprise neonate, young-of-the-year (YOY) or older juvenile sharks. The studies found that most pupping activity in the region occurs in the late spring and early summer, and the neonate and YOY animals inhabit the primary nurseries throughout the summer and into the fall. Typically, declining water temperatures in the fall are associated with the southward movement of sharks from these natal waters to warmer and in some cases offshore, winter nurseries. Tag returns of Year-1 sharks have demonstrated travel distances to winter nursery areas of at least 500 km (311 mi). Tag return data have further demonstrated annual cycles of philopatric behavior whereby juveniles of both large and small coastal species migrate back to their natal nurseries in spring and summer (Hueter and Tyminski, in review).

In the 1999 HMS FMP, the smallest size class of sharks was described as "neonates and early juveniles." This definition has been modified to include primarily neonates and only small young-of-the-year sharks in order to better define and identify nursery areas. The total length cutoff for this size class is determined as the maximum embryo size in term females plus 10 percent. This criteria was used because it helps to eliminate some of the small one-year-old sharks that fall within the young-of the-year size range, making it easier to identify primary

nursery areas (where pupping occurs and young-of-the-year are present). This criteria can also be more easily applied to other species given the lack of published data on growth rates for many species, especially during the first year. This modification should also better represent the habitat shift between primary nursery areas and secondary nursery areas (occupied by age 1+ sharks), although many species do overlap habitat use between these two size classes.

The middle size class designated in the 1999 HMS FMP, "late juveniles and subadults," has been renamed "juveniles". This size class includes all immature sharks from young juveniles to older or late juveniles. Some overlap between the "neonate and early juveniles" and the "adult" EFH areas may occur, depending on the species, due to the return to primary nursery areas by many juveniles, age 1+, and the developing conformity to adult migration patterns by late juveniles. As in the 1999 HMS FMP, the largest size class, "adults," still consists of mature sharks based on the size at first maturity for females of the species. Changes to the size range of the adult size class for some species have been made based on new information on the size at first maturity for females of those particular species.

As a result of technical reviewer comments, several changes to EFH boundaries may be considered in the future. These include, but are not limited to, potential modification of EFH boundaries for basking, hammerhead, white, bull, Caribbean reef, lemon, spinner, tiger, Atlantic sharpnose, blacknose, longfin mako, shortfin mako, oceanic whitetip, and thresher sharks (J. Castro and J. Carlson, pers. comm.). In summary, based on the preliminary examination of new information acquired since the original EFH identifications in 1999, and on comments from technical reviewers, modifications to some of the existing EFH descriptions and boundaries may be warranted. Any proposed modifications to existing boundaries, as well as consideration of any new HAPC areas, would be addressed in a subsequent document.

10.4 Threats to Essential Fish Habitat

10.4.1 Regulatory Requirements and Fishing Activities That May Affect EFH

Regulatory Requirement

The EFH regulations and the Magnuson-Stevens Act require the Regional Fishery Management Councils and NMFS, on behalf of the Secretary of Commerce, to minimize adverse effects on EFH from fishing activities to the extent practicable. Although NMFS is not taking any action to minimize fishing impacts in this FMP, NMFS may propose actions to minimize adverse effects from fishing in a subsequent rulemaking. Adverse effects from fishing may include physical, chemical, or biological alterations of the substrate, and loss of or injury to benthic organisms, prey species and their habitat, and other components of the ecosystem. Based on an assessment of the potential adverse effects of all fishing equipment types used within an area identified as EFH, NMFS must act if there is evidence that a fishing practice is having an a more than minimal and not temporary adverse effect on EFH.

The Magnuson-Stevens Act states that each FMP must contain an evaluation of the potential adverse effects of fishing on EFH designated under the FMP, including effects of each

fishing activity regulated under the FMP or other Federal FMPs. This evaluation should consider the effects of each fishing activity on each type of habitat found within EFH. FMPs must describe each fishing activity, review and discuss all available relevant information (such as information regarding the intensity, extent, and frequency of any adverse effect on EFH; the type of habitat within EFH that may be affected adversely; and the habitat functions that may be disturbed), and provide conclusions regarding whether and how each fishing activity adversely affect EFH. The evaluation should also consider the cumulative effects of multiple fishing activities on EFH. The evaluation should list any past management actions that minimize potential adverse effects on EFH and describe the benefits of those actions to EFH. The evaluation should give special attention to adverse effects on habitat areas of particular concern and should identify for possible designation as habitat areas of particular concern any EFH that is particularly vulnerable to fishing activities. Additionally, the evaluation should consider the establishment of research closure areas or other measures to evaluate the impacts of fishing activities on EFH. In

This section includes an assessment of fishing gears and practices that are used in the Highly Migratory Species (HMS) fisheries to describe impacts to EFH and conservation recommendations or mitigation measures, as necessary.

10.4.2 Potential Impacts of HMS Fishing Activities on HMS and non-HMS EFH

Adverse effects from fishing may include physical, chemical, or biological alterations of the substrate, and loss or injury to benthic organisms, prey species and their habitat, and other components of the ecosystem. However, the degree to which fishing will impact EFH also depends on the substrate that makes up the EFH; certain substrates, such as complex coral reef habitat, will be more susceptible to damage due to fishing gears than will mud and/sand substrates or even the water column because of the extended time for habitat recovery. Below is a brief overview of HMS EFH followed by an assessment of HMS fishing gear impacts on both HMS EFH and non-HMS EFH.

10.4.2.1 HMS EFH Overview

From the broadest perspective, fish habitat is the geographic area where the species occurs at any time during its life. Habitat can be described in terms of location, physical, chemical and biological characteristics, and time. Ecologically, habitat includes structure or substrate that focuses distribution (*e.g.*, coral reefs, topographic highs, areas of upwelling, frontal boundaries, particular sediment types, or submerged aquatic vegetation) and other characteristics that are less distinct but are still crucial to the species' continued use of the habitat (*e.g.*, turbidity zones, salinity, temperature or oxygen gradients) (NMFS, 1999a).

Species use habitat for spawning, breeding, migration, feeding and growth, and for shelter from predation to increase survival. Spatially, habitat use may shift over time due to changes in life history stage, abundance of the species, competition from other species, and environmental variability in time and space. Species distributions and habitat use can be altered by habitat change and degradation resulting from human activities and impacts, or other factors. The type of habitat available, its attributes, and its function are important to species productivity, diversity and survival (NMFS, 1999a).

The role of habitat in supporting the productivity of organisms has been well documented in the ecological literature, and the linkage between habitat availability and fishery productivity has been examined for several fishery species. Because habitat is an essential element for sustaining the production of a species, the goals of FMPs must include maintaining suitable habitat for the considered species (NMFS, 1999a). However, the quantitative relationships between fishery production and habitat are very complex, and no reliable models currently exist. Accordingly, the degree to which habitat alterations have affected fishery production is unknown. In one of the few studies that have been able to investigate habitat fishery productivity dynamics, Turner and Boesch (1987) examined the relationship between the extent of wetland habitats in the Gulf of Mexico and the yield of fishery species dependent on coastal bays and estuaries. They found reduced fishery stock production following wetland losses, and stock gains following increases in the areal extent of wetlands. While most of the studies examined shrimp or menhaden productivity, other fisheries show varying degrees of dependence on particular habitats and likely follow similar trends. Accordingly, a significant threat facing fishery production is the loss of habitat due to natural and/or anthropogenic causes (NMFS, 1999a).

HMS utilizes diverse habitats that have been identified as essential to various life stages. Some billfish use both offshore and inshore habitats (*e.g.*, sailfish spawning in coastal habitats off southeastern Florida) (NMFS, 1999b). Many of the shark species use bays, estuaries and shallow coastal areas as crucial pupping and nursery areas (NMFS, 1999a). In most cases the neonates (newborn) and juveniles occupy different habitats than the adults. For example, neonate blacktip sharks are found in very shallow waters, juvenile blacktip sharks inhabit a variety of coastal habitats, and adults are found in both coastal and oceanic waters (Castro, 1993). There is little published information correlating life stages and migratory movements, and there are few descriptions correlating shark habitat use to physical habitat characteristics (but see McCandless *et al*., 2002). Parameters that could describe shark habitat are temperature, salinity, depth, dissolved oxygen, light levels, substrate, and food availability, although there are probably other important factors or requirements that remain unknown. Unlike certain reef or benthic fishes, it is difficult to draw definitive links between presence of a given species of HMS and characteristics of marine substrate (*i.e.*, sand, SAV, cobble) or types or marine ecosystems (*i.e.* mangroves, seagrass beds, and coral reefs). For example, Amendment 1 to the HMS FMP updated the EFH for juvenile (37-221 cm TL) nurse sharks as:

> *Shallow waters from the shoreline to the 25 m isobath off the east coast of Florida from south of Cumberland Island, GA (30.5 N) to the Dry Tortugas; also shallow waters from Charlotte Harbor, FL (26 N) to the north end of Tampa Bay, FL (28 N); also off Puerto Rico, shallow coastal waters out to the 25 m isobath from 66.5 W to the southwest tip of the island.*

In only a few cases for HMS are there particular bottom types that can be attributed to influencing the choice of habitats, *e.g.*, the bonnethead shark juvenile stages are associated with seagrass (Section 10.3.4). More typically, pelagic species (or life stages), such as the pelagic sharks, tuna and swordfish, are most often associated with areas of convergence or oceanographic fronts such those found over submarine canyons, the edge of the continental shelf,

or the boundary currents (edge) of the Gulf Stream. Some species aggregate at frontal boundaries in the ocean, with floating objects (such as *Sargassum* for swordfish and billfish), or at bottom features such as the continental shelf break, submarine canyons, and even shipwrecks (NMFS, 1999b).

Occasionally, the aggregations form where a front or boundary lies above one of these bottom features. These aggregations are most likely associated with prime feeding grounds and, as such, these areas are identified as EFH. Although there is no substrate or hard structure in the traditional sense, these water column habitats can be characterized by their physical, chemical and biological parameters (NMFS, 1999a). The water column can be defined by a horizontal and vertical component. Horizontally, salinity gradients strongly influence the distribution of biota. Horizontal gradients of nutrients, decreasing seaward, affect primarily the distribution of phytoplankton and, secondarily, the organisms that depend on this primary productivity. Vertically, the water column may be stratified by salinity, oxygen content, and nutrients (SAFMC, 1998). The water column is especially important to larval transport. While the water column is relatively difficult to precisely define in terms of habitat characteristics, it is no less important since it is the medium of transport for nutrients and migrating organisms between estuarine, inshore, and offshore waters (SAFMC, 1998).

10.4.2.2 Impact of HMS Federally regulated gear on HMS and non-HMS EFH

Generally, HMS is associated with hydrographic structures of the water column, e.g., convergence zones or boundary areas between different currents. Because of the magnitude of water column structures and the processes that create them, there is little effect expected from the HMS fishing activities undertaken to pursue these animals. There are, however, some impacts that can be manifest on the biological or chemical characteristics of some of these sites, e.g., excess dead discards causing increased biological oxygen demand (BOD) (NMFS, 1999a). For fisheries in which gear does contact the substrate, there is certainly the potential for disturbance of the habitat. An analysis of the effects and the impacts they may have on the associated fisheries is complicated by the fact that scientists are not certain of the particular characteristics that draw the fish to these habitats (NMFS, 1999a).

Impacts of HMS fishing gears and practices were analyzed by examining published literature and anecdotal evidence of potential impacts or comparable impacts from other fisheries. An assessment was made based on this literature review of the gears and practices employed in HMS fisheries to determine whether these fishing activities cause adverse impacts on HMS EFH and non-HMS EFH (Table 10.1). The degree of impact from fishing activities depends in large part on the susceptibility of particular habitats to damage. EFH varies in its vulnerability to disturbance, as well as its rate of recovery. A variety of gears are used to target HMS species. Fishing gears that are only associated with the water column are expected to have no impact on the benthic environment and minimal to no impact to the pelagic environment (Table 10.1). However, fishing gears that interact with the benthic environment can have an impact, depending on the composition of the benthos. For example, due to its simple composition, sediments (*i.e.*, sand, mud) are impacted to a lesser degree than a complex coral reef under similar treatments. Coral reefs are composed of numerous structures forming species, with many that grow vertically into the water column (*e.g.*, sponges, stony corals, gorgonians) and create a greater surface area than sediments (Barnette, 2001). The vertical profile and

increased surface area of coral reefs allow gear to easily become snagged or entangled, thus providing more opportunities for habitat to be impacted from fishing as compared to sediments (Barnette, 2001). While NMFS and the Councils have jurisdiction only in Federal waters of the exclusive economic zone under the Magnuson-Stevens Act, estuarine and nearshore waters are critical to various life stages of many organisms; numerous managed species utilize estuaries and bays for reproduction or during juvenile development (Barnette, 2001).

Since most HMS are pelagic species that are predominantly found in the mid- to upper water column of the neritic environments, most HMS gears are fished in the water column, as opposed to bottom tending gears such as trawls and dredges that are used to target bottom-dwelling or benthic species. The exception is bottom longline gear, which could potentially have adverse effects on HMS and non-HMS EFH (Table 10.1). Bottom longlines principally target large coastal sharks in the EEZ between Texas and Maine. Typically they are placed in sandy and muddy bottom habitats where expected impacts would be minimal to low (Barnette, 2001). The 1999 NMFS EFH Workshop categorized the impact of bottom longline gear on mud, sand, and hard-bottom as low (Barnett, 2001). Bottom longline may have some negative impact if gear is set in more complex habitats, such as hardbottom or coral reefs in the Caribbean or areas with gorgonians, or soft corals and sponges in the Gulf of Mexico (Barnette, 2001, NREFHSC, 2002; Morgan and Chuenpagdee, 2003). Bottom longline set with cable groundline or heavy monofilament with weights can damage hard or soft corals and potentially become entangled in coral reefs upon retrieval, resulting in coral breakage due to line entanglement. However, the extent to which bottom longline gear is fished in areas with coral reef habitat has not been determined. This gear type is similar to that employed in fisheries targeting reef fish in the Gulf of Mexico and South Atlantic regions.

One of the only studies available regarding the impact of bottom longline gears is from submersible observations of halibut longline gear off the southeast coast of Alaska (NPFMC, 1992). For example, halibut longline gear generally consists of 5/16- inch nylon or polyester rope as groundline with 3-4 foot long twine gangions (branch lines) spaced at 3-18 feet. To the degree that Caribbean, Gulf of Mexico, and Atlantic longlines differ in construction from the Alaska longlines, potential damage will also differ. Unlike Alaskan fisheries, Atlantic longlines can use cable or heavy monofilament with weights for groundline. In addition, the Alaskan marine ecosystem is much different from that in the Caribbean, Gulf of Mexico, and Atlantic Ocean in that it does not have tropical coral reefs. However, the Alaskan marine ecosystem does have sponges and other vertical relief, which makes it somewhat analogous to the Gulf of Mexico conditions, and therefore, may give some insight to the type of damage bottom longlines can cause. For instance, the shearing action of the longlines under tension would have similar results on sensitive vertical structure (Barnette, 2001). However, in instances where target species are attracted to the habitat due to hydrographic characteristics (*i.e.*, up-welling, convergences, etc.), the scale of impact from careless placement of bottom longlines is probably not of sufficient magnitude to affect the characteristics of the habitat. Bottom longline gear may have a detrimental effect on non-HMS EFH if it is placed in coral reefs, hard bottom or SAV habitats. However, bottom longline gear in HMS fisheries is primarily used in sandy and/or muddy habitats where it is expected to have minimal to low impacts.

Other HMS gears that contact the bottom are tuna traps and anchored gillnets. However, these are either so few in number that their expected impact is low (*i.e.*, there were only two tuna trap permit holders in 2004), or they are usually set in sand or mud areas where there is minimal to low impact on the benthic substrate, as is the case with anchored gillnets. In some cases, rod and reel or handlines (*i.e.*, "vertical gear") are used in areas with coral reefs and/or hardbottom, and impacts from these gears may include entanglement and minor degradation of benthic species from line abrasion and the use of weights (sinkers). Schleyer and Tomalin (2000) noted that discarded or lost fishing line appeared to entangle readily on branching and digitate corals and was accompanied by progressive algal growth. This subsequent fouling eventually overgrows and kills the coral, becoming an amorphous lump once accreted by coralline algae (Schleyer and Tomalin, 2000). Lines entangled among fragile coral may break delicate gorgonians and similar species. Due to the widespread use of weights over coral reef or hardbottom habitat and the concentration of effort over these habitat areas from recreational and commercial fishermen, the cumulative effect may lead to significant impacts resulting from the use of these gear types (Barnette, 2001).

Since most of HMS gears are fished in the water column, the impacts on EFH are generally considered negligible, minimal, or low. In other words, HMS gears do not affect the physical characteristics that define HMS EFH such as salinity, temperature, dissolved oxygen, and depth. Similarly, most HMS gears are not expected to impact other fisheries' EFH, with the possible exception of bottom longline, depending on where it is fished. Each of the HMS gears, the means by which they are fished, and their potential impacts on HMS and other species' EFH are described in the following section. However, no new management measures, and therefore no regulations, are proposed in this document. Rather, this document serves as an evaluation of fishing impacts on EFH and could help identify areas appropriate for HAPC and/or time/area closures in the future. NMFS is, however, currently exploring potential alternatives that could minimize the impacts of bottom longline, especially in areas of with hardbottom, hard and soft coral structure and sponges. For instance, bottom longlines used in the Caribbean reef fish fishery are typically 700 feet long. Potentially shorter longlines will likely do less habitat damage than longer longlines (Barnette, 2001). In addition, avoiding or reducing bottom longline effort on corals, gorgonians, or sponge habitat will minimize risk of habitat damage to these areas. The two following conservation recommendations are meant as precautionary measures, and should be used whenever possible in the event that impacts to coral reef or other hard bottom EFH habitat may be occurring but unverified: (1) fishers should take appropriate measures to identify bottom obstructions and avoid setting gear in areas where it may become entangled; and (2) if gear is lost, diligent efforts should be undertaken to recover the lost gear.

The Gulf of Mexico and Caribbean Fishery Management Councils (GOMFMC and CFMC, respectively) are evaluating the impacts of several gear types, including bottom longline, on EFH areas identified under their respective reef fish and coral reef fisheries (GOMFMC, 2004; CFMC, 2005). Specifically, both Councils are evaluating measures to minimize the impacts of bottom longline gear on coral reef habitat identified as EFH for several of their managed species in areas adjacent to the Dry Tortugas Marine Reserve in Florida and the Gramantic Banks off of Puerto Rico. However, NMFS would first need to assess the extent of HMS fishing effort, if any, in these areas. And, if those measures are finalized, NMFS will

consider further rulemaking, as necessary, for the Atlantic shark fisheries, because there may be overlap in fishery participants (NMFS, 2003).

In summary, according to the best scientific information available to NMFS, NMFS concludes that most HMS gears are having minimal to no impact on HMS EFH or to other species' EFH.

Table 10.1. Impact assessment of HMS fishing gear on HMS and non-HMS EFH. '-' indicates that the gear type is not used in these habitat types. Habitat impacts are as follows: negligible = 0, low = +, medium = ++, high = +++, unknown=?, and a blank indicates not evaluated. Source: Symbols before the slash are from the Caribbean FEIS, 2004 (Table 3.15a). The symbols after the slash are taken from Barnette, 2001.

		Interactions Between HMS Fishing Gears and HMS and Non-HMS EFH *Habitat Type*					
		Estuarine/Inshore					**Offshore**
HMS Gear Type	Contacts Bottom	SAV	Coral Reef	Hard Bottom	Sand/Shell	Soft Bottom	HMS EFH Water column
Bandit Gear				/+			0
Bottom Longline	X	0/	+/	+/+	0/+	0/+	0
Handline		0/	+/	+/+	0/	0/	0
Harpoon							0
Gillnet, Anchored	X	+/+	++/	+/+	+/+	0/+	0
Gillnet /Strikenet							0
Pelagic Longline		0/0	0/0	0/0	0/0	0/0	0
Purse Seine, Tuna		0/?	0/	0/	0/+	0/+	0
Rod and Reel		0/	+/	+/+	0/	0/	0
Tuna Trap/Fish Weir	X	++/++	-	-	0/?	0/?	0

10.4.3 Potential Impacts of non-HMS Fishing Activities on HMS EFH

At this time, only limited information exists to relate fishing activities to habitat damage (Rester, 2000; Hamilton, 2000; Barnette, 2001; Johnson, 2002; NRC, 2002; Stevenson *et al.*, 2004), and the degree to which habitat damage affect fishery production to date is unknown (NMFS, 1999b). Therefore only a speculative, qualitative evaluation of the degree of impairment of the function of the habitat from fishing impacts can be made. This section provides an overview of potential impacts of non-HMS fishing gears on HMS EFH.

Nearly all HMS EFH is similarly defined according to the geographic boundaries of a given area as opposed to specific benthic habitat types that might be affected by fishing gears. However, for some species of sharks (blacktip, spinner, blacknose and finetooth) certain substrates, such as mud bottom and seagrasses in a specific area of Apalachicola and Apalachee Bay, have been identified as EFH (see Appendix B). For these specific coastal and estuarine habitats, there may be an impact on benthic habitats from bottom tending gears in state waters. Trawl fisheries that scrape the substrate, disturb boulders and their associated epiphytes or epifauna, re-suspend sediments, flatten burrows and disrupt seagrass beds have the potential to alter the habitat characteristics that are important for survival of early life stages of many

targeted and non-targeted species. According to the GOMFMC (2004), bottom tending gears in this area consist of shrimp trawls and stone crab pots. The fishing impact index for these gears in this area was assessed as being low (based on habitat type and fishing effort from 2000-2001) (Figures 3.5.24 and 3.5.27b; GOMFMC, 2004). Thus, the adverse effects of these gears on these species' EFH are expected to be minimal. No other benthic habitat types have been identified as EFH for neonate or juvenile sharks (*i.e*., neonate and juvenile shark EFH has been designated based on depth, and/or isobath; Appendix B). Therefore, until such habitat types are identified and the degree of overlap and the extent to which habitat is altered by various bottom tending gears is known, NMFS cannot assess the impact of such gears on neonate and juvenile shark EFH.

The degree of impact and long-term habitat modification depends on the severity and frequency of the impacts as well as the amount of recovery time between impacts (Auster and Langton, 1999; Barnette, 2001). The extent to which particular parameters are altered by trawl gear is somewhat dependent on the configuration of the gear and the manner in which the gear is fished. Additional efforts are required to study HMS EFH areas that are fished for non-HMS species and identify fishing gears that impact these habitats in a "more than minimal and not temporary in nature" (50 CFR 600.815(a)(2)(ii)). In this regard, coordination efforts should be undertaken with the respective Councils to identify potential common areas. Research into the spatial distribution of these activities, the frequency of disturbance, and the short and long-term changes induced in the habitat are of primary importance. A better understanding of specific habitat types for HMS (the highest, most refined level of information available with which to identify EFH, and which is currently not available for HMS), and the habitat characteristics that influence the abundance of managed species within those habitats, is also needed in order to better understand the effects of fishing activities on habitat suitability for sharks (NMFS, 2003). The potential impacts of different gears with different habitats types are given in more detail in Barnette (2001), the Caribbean FEIS (2004), and Stevenson *et al*., (2004). Nonetheless, until specific habitat types are associated with HMS EFH, the degree to which these impacts will affect HMS EFH is currently unknown.

Besides altering the physical characteristics of EFH, other fisheries may remove prey species that make up the necessary biological components of HMS EFH. Many of these impacts have been addressed in other fishery management plans (*e.g.*, SAFMC, 1998; GMFMC, 1998) that focus on restricting the removal of attached species such as corals or kelp that provide essential structure in their respective habitats; however, for pelagic species other biological components must be considered.

As described in the EFH guidelines, loss of prey species may be an adverse effect on EFH and managed species because the presence of prey makes waters and substrate function as feeding habitat. Therefore, actions that reduce the availability of a major prey species, either through direct harm or capture, or through adverse impacts to the prey species' habitat that are known to cause a reduction in the population of the prey species, may be considered adverse effects on EFH if such actions reduce the quality of EFH. For example, bluefin tuna are opportunistic feeders that prey on a variety of schooling fish, including Atlantic herring in the Gulf of Maine. NMFS would need to determine the extent to which herring or other prey species contribute to bluefin tuna EFH, and whether the removal of a portion of herring would constitute

a negative effect on bluefin tuna EFH. These types of analyses would be part of a follow up rulemaking in which changes to EFH boundaries may be proposed, potential impacts on EFH would need to be analyzed, and if necessary, measures to minimize adverse effects would be proposed. NMFS will continue to examine the importance of forage species on bluefin tuna and other HMS species EFH.

Besides direct harvest, prey species such as herring may be susceptible and sensitive to noise and schools are known to disperse when approached by vessels or when disturbed by mid-water nets or purse seines (NMFS, 2005). This disturbance could be interpreted as a potential impact on the pelagic habitat of juvenile or adult herring. The effect, however, is known to be temporary: schools of herring that are dispersed by vessels or mid-water trawls re-form quickly after passage of the boat or the net, within a matter of minutes (NMFS, 2005 are references therein). This may adversely affect the pelagic habitat for juvenile and adult herring, but the effects are minimal and temporary in nature and do not need to be minimized.

Some tuna and swordfish life stages have been found to be associated, or to co-occur, with floating mats of the brown algae, *Sargassum* spp. The mats are pelagic and are moved extensively by winds and currents. They are frequently found in convergence zones, windrows, or at current boundaries - areas that are EFH for many of the HMS life stages. Whether the floating mats serve as shelter, act as a source for aggregating prey (because of the abundance of prey species associated with them), serve as a means of camouflage, or serve some other biological function is not entirely clear. It is a biological component that may focus, particularly on the small scale, the distribution of certain life stages of tuna and swordfish, and it may need to be examined as EFH.

In summary, there are few anticipated impacts from other (*i.e.*, non-HMS) Federally regulated and non-Federally regulated gears on HMS EFH. Since most HMS EFH is defined as the water column or attributes of the water column (*i.e.*, temperature gradients, frontal boundaries, etc.), there are anticipated to be minimal or no cumulative impacts from non-HMS fishing gears. The only exceptions are nearshore and estuarine shark pupping grounds in the specific area described above and the effect of bottom tending gears in this area. Since benthic habitats have not been identified as EFH for neonate and juvenile sharks (with the exception of blacktip, spinner, finetooth and blacknose sharks in Apalachee Bay; see above), NMFS cannot currently assess the impact of these gears. If specific benthic habitat types (*i.e.*, SAV, mud, coral reefs, etc.) were to be identified as EFH for other sharks species, and the degree of overlap and impact of various bottom tending gears is known in these areas, NMFS would assess whether those types of gear have negative impacts on HMS EFH and determine if these impacts are more than minimal and not temporary in nature.

10.4.4 Federally Managed Fishing Activities

The following tables describe the comprehensive set of gears managed by HMS and by the different Fishery Management Councils in each of the regions. A brief description of all gears is given below in Section 10.4.6.

Table 10.2. A comprehensive list of all gear types used in HMS fisheries.

	HMS Fishery			
HMS Gear Type	**Shark**	**Tuna**	**Swordfish**	**Billfish**
Bandit Gear	X	X	X	
Harpoon		X	X	
Gillnet, Drift/Strikenet	X			
Longline, Bottom	X			
Longline, Pelagic	X	X	X	
Purse Seine, Tuna		X		
Trap		X		
Vertical Gear				
Handline	X	X	X	
Rod and Reel	X	X	X	X

The Federally managed gears for the Northeast region and their potential effects on HMS EFH are outlined in

Table 10.3. The Northeast region is comprised of the New England, Mid-Atlantic and South Atlantic Fishery Management Councils.

Table 10.3. Fishing gear types regulated in Federal waters of the Northeast region and their effects on HMS EFH. Habitat impact is as follows: minimal/negligible = 0. Source: Stevenson *et al*., 2004.

Northeast Region		***Effects of Fishing Gear on HMS EFH***
Gear Type	**Contacts Bottom***	**Water Column**
Bag Nets		0
Dredge, Clam	X	0
Dredge, Sea Scallop	X	0
Gill Nets, Drift		0
Gill Nets, Runaround		0
Gill Nets, Sink/Anchor	X	0
Gill Nets, Stake	X	0
Hand Harvest		0
Haul Seines, Long (Danish)	X	0
Longline (Bottom)	X	0
Longline (Pelagic)		0
Otter Trawl Bottom, Fish	X	0
Otter Trawl Bottom, Sea Scallop	X	0
Otter Trawl Bottom, Shrimp	X	0
Otter Trawl Midwater		0
Pots and Traps, Red Crab	X	0
Pots and Traps, Fish	X	0
Pots and Traps, Lobster Offshore	X	0
Purse Seine, Herring		0
Purse Seine, Tuna		0
Scottish Seine	X	0
Traps, Floating Fish		0

Northeast Region		*Effects of Fishing Gear on HMS EFH*
Gear Type	**Contacts Bottom***	**Water Column**
Trawl, Beam	X	0
Trawl Midwater, Paired		0
Troll Lines		0
Trot Lines		0
Vertical Gear		
Handline		0
Reel, Electric or Hydraulic		0
Rod and Reel		0

*At this time, there are no benthic habitats identified as HMS EFH that may be affected by bottom tending gears. In addition, there is insufficient evidence to indicate an impact of bottom tending gear on HMS EFH that is defined as the "water column."

The Federally managed gears for the Southeast region and their potential effects on HMS EFH are outlined in

Table **10.4**. The Southeast region is comprised of the Gulf of Mexico and the Caribbean Fishery Management Councils.

Table 10.4. Fishing gear types regulated in Federal waters in the Southeast region and their effects on HMS EFH. Habitat impact is as follows: minimal/negligible = 0. Source: Hamilton, 2000; Barnette, 2001; GOMFMC FEIS 2004.

Southeast Region		*Effects of Fishing Gear on HMS EFH*
Gear Type	**Contacts Bottom***	**Water Column**
Allowable Chemical	X	0
Bandit Gear		0
Dip Net		0
Gill/Trammel Nets		0
Hand Harvest		0
Longline (Bottom)	X	0
Slurp Gun		0
Snare		0
Spears/Powerheads		0
Trap, Lobster	X	0
Trap/Pots, Fish	X	0
[1]Trawl, Frame	X	0
[1]Trawl, Otter	X	0
Vertical Gear		0
Hook and Line		0
Rod and Reel		0

*At this time, there are no benthic habitats identified as HMS EFH that may be affected by bottom tending gears. In addition, there is insufficient evidence to indicate an impact of bottom tending gear on HMS EFH that is defined as the "water column."
[1]Not currently used in the Caribbean; however, potential exists for future use.

10.4.5 Non-Federally Managed Fishing Activities

The following tables describe the comprehensive set of gears that are not managed under fishery management plans.

Table 10.5 and Table 10.6 outline allowable gears that are used in state waters of the Northeast and Southeast regions. A brief description of all gears is given below in Section 10.4.6.

The non-Federally managed gears for the Northeast region and their potential effects on HMS EFH are outlined in. The Atlantic States Marine Fisheries Commission manages non-Federal fisheries in the New England, Mid-Atlantic and South Atlantic regions.

Table 10.5. Non-FMP Fishing Gear in the Northeast region and their effects on HMS EFH. Habitat impact is as follows: minimal/negligible = 0. Source: Stevenson *et al.*, 2004.

***Northeast RegionNon-FMP* (state waters)**		***Effects of Fishing Gear on HMS EFH***
Gear Type	**Contacts Bottom***	**Water Column**
Cast Nets		0
Clam Kicking	X	0
Diving		0
Dredge, Conch	X	0
Dredge, Crab	X	0
Dredge, Mussel	X	0
Dredge, Oyster,	X	0
Dredge, Bay Scallop	X	0
Dredge, Sea Urchin	X	0
Fyke and Hoop Nets, Fish	X	0
Hand Hoes	X	0
Pots and Traps, Conch	X	0
Pots and Traps, Blue and Blue Peeler Crab	X	0
Pots and Traps, Eel	X	0
Pots and Traps, Lobster Inshore	X	0
Pounds Nets, Crab	X	0
Pound Nets, Fish	X	0
Purse Seines, Menhaden		0
Rakes	X	0
Scrapes	X	0
Seines, Haul-Beach	X	0
Seines, Haul-Long	X	0
Seines, Haul-Long (Danish)	X	0
Seines, Stop	X	0
Spears		0
Tongs and Grabs, Oyster	X	0
Tongs Patent, Clam	X	0
Tongs Patent, Oyster	X	0
Trawl, Otter-Crab	X	0
Weirs	X	0

*At this time, there are no benthic habitats identified as HMS EFH that may be affected by bottom tending gears. In addition, there is insufficient evidence to indicate an impact of bottom tending gear on HMS EFH that is defined as the "water column."

The non-Federally managed gears for the Southeast region and their potential effects on HMS EFH are outlined in Table 10.6. The Gulf States Marine Fisheries Commission manages non-federal fisheries in the Gulf of Mexico and the Caribbean regions.

Table 10.6. Non-FMP Fishing Gear in Southeast region: Effects of other fishing gear on HMS EFH. Habitat impact is as follows: minimal/negligible = 0. Source: Hamilton, 2000; Barnette, 2001; GOMFMC, 2004.

***Southeast Region Non-FMP* (state waters)**		***Effects of Fishing Gear on HMS EFH***
Gear Type	**Contacts Bottom***	**Water Column**
Barrier Net	X	0
Cast Net		0
Crab Scrapes	X	0
Dredge-Oyster	X	0
Drop Net		0
Lampara Net		0
Longline (Pelagic)	X	0
Purse Seine		0
Rakes and Tongs	X	0
Seine, Beach	X	0
Traps/Pots- Crab	X	0
Trawl, Skimmer	X	0
Vertical Gear		
Handline		0

*Currently the only benthic habitat types identified as EFH for neonate sharks are in Apalachee Bay off the Florida Panhandle. In this area, neonate blacktip, spinner, finetooth and blacknose sharks have been associated with mud or seagrass areas. The GOMFMC (2004) has determined that bottom tending gears (shrimp trawls and crab pots) have a low impact on these habitat types in this area. In addition, there is insufficient evidence to indicate an impact of bottom tending gear on HMS EFH that is defined as the "water column."

10.4.6 Description of Fishing Gears

Fishing gears that are dragged over the seabed or through the water column are called mobile gear (*e.g.*, trawls, dredges, and purse seines), whereas gear that remains stationary are called static gear (nets, traps, and longlines). Unless otherwise noted, gear descriptions were taken from Stevenson *et al*., (2004).

Bottom Tending, Mobile Gear

Trawls

Trawls are classified by their function, bag construction, or method of maintaining the mouth opening. Function may be defined by the part of the water column where the trawl operates (*e.g.*, bottom), by the species that it targets, or the composition of the bottom (smooth versus rough and soft versus hard) (Hayes, 1983). There is a wide range of otter trawl types used in the Northeast and Southeast as a result of the diversity of fisheries prosecuted and bottom types encountered in the region. For instance, trawls target flatfish, crabs scallops, lobsters, and shrimp in the Northeast (Stevenson *et al.*, 2004), and shrimp, calico scallops, flounder and butterfish in both state and Federal waters of the Gulf of Mexico (GFMC FDEIS 2004).

Otter Trawls - Bottom trawls are towed at a variety of speeds, but average about 5.5 km/hr (3 knots or nmi/hr). There are three components of the otter trawl that come in contact with the sea bottom: the doors, the ground cables and bridles, which attach the doors to the wings of the net, and the sweep (or foot-rope) which runs along the bottom of the net mouth.

The traditional otter board door is a flat, rectangular wood structure with steel fittings and a steel “shoe” along the bottom that prevents the bottom of the door from damage and wear as it drags over the bottom. Other types include the V-type (steel), polyvalent (steel), oval (wood), and slotted spherical otter board (steel) (Sainsbury, 1996). It is the spreading action of the doors resulting from the angle at which they are mounted that creates the hydrodynamic forces needed to push them apart. Steel cables are used to attach the doors to the wings of the net. The ground cables run along the bottom from each door to two cables (the “bridle”) that diverge to attach to the top and bottom of the net wing. The bottom portion of the bridle also contacts the bottom.

On smooth bottoms, the sweep may be a steel cable weighted with chain, or may be merely rope wrapped with wire. On rougher bottoms, rubber discs (“cookies”) or rollers are attached to the sweep to assist the trawl's passage over the bottom (Sainsbury, 1996). There are two main types of sweep used in smooth bottom in New England (Mirarchi, 1998). In the traditional chain sweep, loops of chain are suspended from a steel cable, with only 2-3 links of the chain touching bottom. Streetsweeper gear is much heavier in the water due to the use of steel cores in the brush components. Roller sweeps and rockhoppers are used on irregular bottom (Carr and Milliken, 1998). Vertical rubber rollers rotate freely and are as large as 14.5 cm (36 inches) in diameter. In New England, the rollers have been largely replaced with "rockhopper" gear that uses larger fixed rollers and are designed to “hop” over rocks as large as 1 meter in diameter. Small rubber “spacer” discs are placed in between the larger rubber discs in both types of sweep.

In the Northeast, flatfish are primarily targeted with a mid-range mesh flat net that has more ground rigging and is designed to get the fish up off the bottom. A high rise or fly net with larger mesh is used to catch demersal fish that rise higher off the bottom than flatfish (NREFHSC, 2002). Crabs, scallops, and lobsters are also harvested in large mesh bottom trawls. Small mesh bottom trawls are used to capture northern and southern shrimp, whiting, butterfish and squid and usually employ a light chain sweep. Small-mesh trawls are designed, rigged, and

used differently than large-mesh fish trawls and are used to catch northern shrimp in the Gulf of Maine. In the Southeast, bottom trawl fisheries target demersal species throughout the U.S. Atlantic Ocean (Barnette, 2001, National Academy of Sciences, 2002). These activities are managed under Federal fishery management plans.

Beam Trawls - The beam trawl is much like an otter trawl except the net is spread horizontally by a steel beam that runs the horizontal width of the net rather than with otter boards. The net is spread vertically by heavy steel trawl heads that generally have skid-type devices with a heavy shoe attached (Sainsbury, 1996). It is believed that beam trawls are not currently used in the Northeast United States (NREFHSC, 2002). A few beam trawls were used in the 1970s to catch monkfish, but the fishery was unsuccessful. In the mid 1990's, a number of boats off New Bedford, MA used what were referred to as beam trawls, but the gear more closely resembled a scallop dredge rather than the traditional, European beam trawls. There are a few boats that are currently recorded as using beam trawls in the NMFS fishery landings database, but it is believed these were most likely mis-characterized and are actually otter trawls being deployed from the side of the vessels (NREFHSC, 2002). In the Southeast, beam trawls are used for monkfish, shrimp, and other demersal species. These trawls are also used for scientific sampling as the fixed mouth opening allows for consistent benthic sampling. In Florida, roller frame trawls are used to harvest bait shrimp primarily in state waters (National Academy of Sciences, 2002). These activities are managed under Federal fishery management plans.

Dredges

Most dredges are used for clams, oysters and scallops and are primarily used in the Northeastern region.

Hydraulic Clam Dredge - Hydraulic clam dredges have been used in the surfclam (*Spisula solidissima*) fishery and in the ocean quahog (*Arctica islandica*) fishery. These dredges are highly sophisticated and are designed to: 1) be extremely efficient (80 to 95% capture rate); 2) produce a very low bycatch of other species; and 3) retain very few undersized clams (NREFHSC, 2002). The typical dredge is 3.7 m (12 feet) wide and about 6.7 m (22 feet) long and uses pressurized water jets to wash clams out of the seafloor. Towing speed at the start of the tow is about 4.5 km/hr (2.5 knots or nmi/hr) and declines as the dredge accumulates clams. The water jets penetrate the sediment in front of the dredge to a depth of about 20 - 25 cm (8 - 10 inches), depending on the type of sediment and the water pressure. The water pressure that is required to fluidize the sediment varies from 50 pounds per square inch (psi) in coarse sand to 110 psi in finer sediments. The objective is to use as little water as possible since too much pressure will blow sediment into the clams and reduce product quality. The "knife" (or "cutting bar") on the leading bottom edge of the dredge opening is 14 cm (5.5 inches) deep for surfclams and 8.9 cm (3.5 inches) for ocean quahogs. This activity is managed under a Federal fishery management plan.

Dredges are not fished in clay, mud, pebbles, rocks, coral, large gravel greater than one half inch, or seagrass beds (NREFHSC, 2002). In the soft-clam (*Mya arenaria*) fishery, the dredge manifold and blade are located just forward of an escalator, or conveyor belt, that carries the clams to the deck of the vessel. These vessels are restricted to water depths less than one-

half the length of the escalator and are typically operated from 15 m (49 ft) vessels in water depths of 2-6 m (6.6 - 20 ft) (DeAlteris, 1998). The escalator dredge is not managed under Federal fishery management plans.

Quahog Dredge - Ocean quahogs are also harvested in eastern Maine coastal waters using a non-hydraulic dredge that is essentially a large metal cage on skis with 15 cm (6 inch) long teeth projecting at an angle off the leading bottom edge. Maine state regulations limit the length of the cutter bar to 91 cm (36 inches). The teeth rake the bottom and lift the quahogs into the cage. This fishery takes place in small areas of sand and sandy mud found among bedrock outcroppings in depths of 9 to > 76 m (30 - 250 ft) in state and Federal coastal waters. These dredges are used on smaller boats, about 9 - 12 m long (30 to 40 ft) and are pulled through the seabed using the boat's engine (NREFHSC, 2002). This fishery is managed under the MAFMC Surf Clam and Ocean Quahog FMP (MAFMC).

Sea Scallop Dredges - The New Bedford (or "chain sweep") dredge is the primary gear used in the Northeast U.S. sea scallop (*Placopecten magellanicus*) fishery and is very different than scallop dredges utilized in Europe and the Pacific because it is a toothless dredge. The forward edge of the New Bedford dredge includes the cutting bar, which rides above the surface of the substrate, creating turbulence that stirs up the substrate and kicks objects (including scallops) up from the surface of the substrate into the bag. Shoes on the cutting bar are in contact with and ride along the substrate surface (NREFHSC, 2002). A sweep chain is attached to each shoe and to the bottom of the ring bag (Smolowitz, 1998). The bag is made up of metal rings with chafing gear on the bottom and twine mesh on the top, and drags on the substrate when fished. Tickler chains run from side to side between the frame and the ring bag and, in hard bottom, a series of rock chains run from front to back to prevent large rocks from getting into the bag (Smolowitz, 1998). New Bedford dredges are typically 4.3 m (14 feet) wide; two of them are towed by a single vessel at speeds of 4 to 5 knots. Chain sweep dredges used along the Maine coast are smaller. In the Northeast region, scallop dredges are used in high and low energy sand environments, and high energy gravel environments. This activity is managed under a Federal fishery management plan.

Other Non-Hydraulic Dredges

Oyster or Crab Dredge/Scrape/Mussel Dredge - The oyster dredge is a toothed dredge consisting of a steel frame 0.5-2.0 m (1.6 -6.6 ft) in width, a tow chain or wire attached to the frame, and a bag to collect the catch. The bag is constructed of rings and chain-links on the bottom to reduce the abrasive effects of the seabed, and twine or webbing on top. The dredge is towed slowly (<1 m/sec) in circles, from vessels 7 to 30 m (23 - 98 ft) in length (DeAlteris, 1998). Crabs are harvested with dredges similar to oyster dredges. Stern-rig dredge boats (approximately 15 m (49 ft) in length) tow two dredges in tandem from a single chain warp. The dredges are equipped with 10 cm (4 inch) long teeth that rake the crabs out of the bottom. (DeAlteris, 1998). The toothed dredge is also used for harvesting mussels (Hayes, 1983). These dredging activities are not managed under Federal fishery management plans.

Bay Scallop Dredge - Bay scallops usually reside on the bottom. The bay scallop dredge may be 1 to 1.5 m (3.3 - 4.9 ft) wide and about twice as long. The simplest bay scallop dredge can be just a mesh bag attached to a metal frame that is pulled along the bottom. For bay

scallops that are located on sand and pebble bottom, a small set of raking teeth are set on a steel frame, and skids are used to align the teeth and the bag (Sainsbury, 1996). This dredging activity is not managed under Federal fishery management plans.

Sea Urchin Dredge - Similar to a simple bay scallop dredge, the sea urchin dredge is designed to avoid damaging the catch. It has an up-turned sled-like shape at the front that includes several leaf springs tied together with a steel bar. A tow bail is welded to one of the springs and a chain mat is rigged behind the mouth box frame. The frame is fitted with skids or wheels. The springs act as runners, enabling the sled to move over rocks without hanging up. The chain mat scrapes up the urchins. The bag is fitted with a codend for ease of emptying. This gear is generally only used in waters up to 100 m (330 ft) deep (Sainsbury, 1996). This dredging activity is not managed under Federal fishery management plans.

Clam "Kicking" - Clam kicking is a mechanical form of hard clam harvest practiced in North Carolina, which involves the modification of boat engines so that the propeller is directed downwards instead of backwards (Guthrie and Lewis, 1982). In shallow water the propeller wash is powerful enough to suspend bottom sediments and clams into a plume in the water column, which allows them to be collected in a trawl net towed behind the boat (Stephan *et al.*, 2000). This activity is not managed under a Federal fishery management plan.

Seines

Haul Seines - Haul seining is a general term describing operations where a net is set out between the surface and seabed to encircle fish. It may be undertaken from the shore (beach seining), or away from shore in the shallows of rivers, estuaries or lakes (Sainsbury, 1996). Seines typically contact the sea bottom along the lead line. Additionally the net itself may scrape along the bottom as it is dragged to shore or the recovery vessel. This activity is not managed under a Federal fishery management plan.

Beach Haul Seines - The beach seine resembles a wall of netting of sufficient depth to fish from the sea surface to the seabed, with mesh small enough that the fish do not become gilled. A floatline runs along the top to provide floatation and a leadline with a large number of weights attached ensures that the net maintains good contact with the bottom. Tow lines are fitted to both ends. The use of a beach seine generally starts with the net on the beach. One end is pulled away from the beach, usually with a small skiff or dory, and is taken out and around and finally back in to shore. Each end of the net is then pulled in towards the beach, concentrating the fish in the middle of the net. This is eventually brought onshore as well and the fish are removed. This gear is generally used in relatively shallow inshore areas (Sainsbury, 1996). This activity is not managed under a Federal fishery management plan.

Long Haul Seines - The long haul seine is set and hauled in shallow estuarine and coastal areas from a boat typically 15 m (49 ft) long. The net is a single wall of small mesh webbing less than 5 cm (2 inches), and is usually greater than 400 m (1440 ft) in length and about 3 m (9.8 ft) in depth. The end of the net is attached to a pole driven into the bottom, and the net is set in a circle so as to surround fish feeding on the tidal flat. After closing the circle, the net is hauled into the boat, reducing the size of the circle, and concentrating the fish. Finally, the live

fish are brailed or dip-netted out of the net. (DeAlteris, 1998). This activity is not managed under Federal fishery management plans

Stop Seines - These are seines that are used in coastal embayments to close off the opening to a small cove or bight. This method is used in Maine to harvest schools of juvenile herring (Everhart and Youngs, 1981). This activity is not managed under a Federal fishery management plan.

Danish and Scottish Seines - The Danish seine is a bag net with long wings, that includes long warps set out on the seabed, enclosing a defined area. As the warps are retrieved, the enclosed area (a triangle) reduces in size. The warps dragging along the bottom herd the fish into a smaller area, and eventually into the net mouth. The gear is deployed by setting out one warp, the net, then the other warp. On retrieval of the gear, the vessel is anchored. This technique of fishing is aimed at specific schools of fish located on smooth bottom. In contrast to Danish seining, if the vessel tows ahead while retrieving the gear, then this is referred to as Scottish seining or fly-dragging. This method of fishing is considered more appropriate for working small areas of smooth bottom, surrounded by rough bottom. This activity is managed under a Federal fishery management plan.

Bottom Tending, Static Gear

Pots

Pots are portable, rigid devices that fish and shellfish enter through small openings, with or without enticement by bait (Everhart and Youngs, 1981; Hubert, 1983). They are used to capture lobsters, crabs, black sea bass, eels and other bottom dwelling species seeking food or shelter (Everhart and Youngs, 1981; Hubert, 1983). Traps and pots are weighted to rest on the bottom, marked with buoys at the surface, and are sometimes attached to numerous other trap and one long line called a trot line. Pot fishing can be divided into two general classifications: (1) inshore potting in estuaries, lagoons, inlets and bays in depths up to about 75 m (250 ft) and; (2) Offshore potting using larger and heavier vessels and gear in depths up to 730 m (2400 ft) or more (Sainsbury, 1996).

In the Southeast region, pots are used for a number of fish and invertebrates. In certain areas of the Gulf of Mexico and Caribbean, due to their use to harvest species associated with coral and hardbottom habitat, traps and pots have been identified to impact and degrade habitat (Barnette, 2001).

Lobster Pots - Lobster pots are typically rectangular and are divided into two sections, the chamber and the parlor. The chamber has an entrance on both sides of the pot and is usually baited. Lobsters then move to the parlor via a tunnel (Everhart and Youngs, 1981). Escape vents are installed in both areas of the pot to minimize the retention of sub-legal sized lobsters (DeAlteris, 1998). Lobster pots are fished as either 1) a single pot per buoy (although two pots per buoy are used in Cape Cod Bay, and three pots per buoy in Maine waters), or 2) a “trawl” or line with up to 100 pots. According to NREFHSC (2002) important features of lobster pots and their use are the following:

- About 95% of lobster pots are made of plastic - coated wire.
- Floating mainlines may be up to 7.6 m (25 ft) off bottom.
- Sinklines are sometimes used where marine mammals are a concern – neutrally buoyant lines may soon be required in Cape Cod Bay.
- Soak time depends on season and location - usually 1-3 days in inshore waters in warm weather, to weeks in colder waters.
- Offshore pots are larger (more than 1 m (4 ft) long) and heavier (~ 100 lb or 45 kg), with an average of ~ 40 pots/trawl and 44 trawls/vessel. They have a floating mainline and are usually deployed for a week at a time.
- There has been a three-fold increase in lobster pots fished since the 1960's, with more than four million pots now in use.
- Although the offshore component of the fishery is regulated under Federal rules, American lobster is not managed under a Federal fishery management plan.

Fish Pots - Fish pots are similar in design to lobster pots. They are usually fished singly or in trot lines of up to 25 pots, in shallower waters than the offshore lobster pots or red crab pots. Pots may be set and retrieved 3-4 times/day when fishing for scup (NREFHSC, 2002). Wire-mesh fish traps are one of the principal fishing gears used in coral reef areas in the Caribbean (Appledorn *et al*., 2000). This activity is managed under a Federal fishery management plan.

Hagfish pots (40 plastic gallon barrels) are fished in deep waters, on mud bottoms. Cylindrical pots are typically used for capturing eels in Chesapeake Bay, however, half-round and rectangular pots are also used and all are fished in a manner similar to that of lobster pots (Everhart and Youngs, 1981). Hagfish and eel activities are not managed under a Federal fishery management plan.

Crab Pots - Crabs are often fished with pots consisting of a wire mesh. A horizontal wire partition divides the pot into an upper and lower chamber. The lower chamber is entered from all four sides through small wire tunnels. The partition bulges upward in a fold about 20 cm (8 inches) high for about one third of its width. In the top of the fold are two small openings that give access to the upper chamber (Everhart and Youngs, 1981).

Crab pots are always fished as singles and are hauled by hand from small boats, or with a pot hauler on larger vessels. Crab pots are generally fished after an overnight soak, except early and late in the season (DeAlteris, 1998). These pots are also effective for eels (Everhart and Youngs, 1981). This activity is not managed under a Federal fishery management plan.

Deepsea red crab pots are typically wood and wire traps 1.2 m by 0.75 m (48 by 30 inches) with top entry. Pots are baited and soak for about 22 hours before being hauled. Currently, vessels are using an average of 560 pots in trawls of 75- 180 pots per trawl along the continental slope at depths from 400 to 800 m (1300 - 2600 ft). These vessels are typically 25 -

41 m (90 - 150 ft) in length. Currently there are about 6 vessels engaged in this fishery (NEFMC, 2002). This activity is managed under a Federal fishery management plan.

Traps

A trap is generally a large-scale device that uses the seabed and sea surface as boundaries for the vertical dimension. The gear is installed at a fixed location for a season, and is passive, as the animals voluntarily enter the gear. Traps are made of a leader or fence, that interrupts the coast parallel migratory pattern of the target prey, a heart or parlor that leads fish via a funnel into the bay or trap section that serves to hold the catch for harvest by the fishermen. The non-return device is the funnel linking the heart and bay sections (DeAlteris, 1998).

Fish Pound Nets - Pound nets are constructed of netting staked into the seabed by driven piles (Sainsbury, 1996). Pound nets have three sections: the leader, the heart, and the pound. The leader (there may be more than one) may be as long as 400 m (1300 ft) and is used to direct fish into the heart(s). One or more hearts are used to further funnel fish into the pound and prevent escapement. The pound may be 15 m (49 ft) square and holds the fish until the net is emptied. These nets are generally fished in waters less than 50 m (160 ft) deep. Pound nets are also used to catch crabs. This activity is not managed under a Federal fishery management plan.

Fyke and Hoop Nets - Constructed of wood or metal hoops covered with netting, hoop nets are 2.5 to 5 m (8.2 - 16 ft) long, "Y-shaped" nets, with wings at the entrance and one or more internal funnels to direct fish inside, where they become trapped. Occasionally, a long leader is used to direct fish to the entrance. Fish are removed by lifting the rear end out of the water and loosening a rope securing the closed end. These nets are generally fished to about 50 m (160 ft) deep (Sainsbury, 1996). A common fyke net is a long bag mounted on one or several hoops which keep the net from collapsing as well as provide an attachment for the base of the net funnels to prevent the fish from escaping. This gear is used in shallow water and extensively in river fisheries (Everhart and Youngs, 1981). This activity is not managed under a Federal fishery management plan.

Bag Nets – Bag nets are large nets that are kept vertically open by a frame, usually constructed of wood, and are held horizontally stretched by the water current. Bag nets are fished usually in deep water and are held in position by floats and anchors. This activity is not managed under a Federal fishery management plan.

Shallow Floating Traps - In New England, much of the shoreline and shallow subtidal environment is rocky and stakes cannot be driven into the bottom. Therefore, the webbing of these traps is supported by floats at the sea surface, and held in place with large anchors. These traps are locally referred to as "floating traps." The catch, design elements, and scale of these floating traps is similar to pound nets (DeAlteris, 1998). The floating trap is designed to fish from top to bottom, and is built especially to suit its location. The trap is held in position by a series of anchors and buoys. The net is usually somewhat "T-shaped," with the long portion of the net (the leader net) designed to funnel fish into a box of net at the top of the "T." The leader net is often made fast to a ringbolt ashore (Sainsbury, 1996). This activity is not managed under a Federal fishery management plan.

Weirs - A weir is a simple maze that intercepts species that migrate along the shoreline. Brush weirs are used in the Maine sardine/herring fishery. These are built of wooden stakes and saplings driven into the bottom in shallow waters. The young herring encounter the lead, which they follow to deeper water, finally passing into an enclosure of brush or netting. The concentrated fish are then removed with a small seine (Everhart and Youngs, 1981). This activity is not managed under a Federal fishery management plan. However, there are a few Federal permits for incidental catch of bluefin tuna using weirs in the Northeast. This activity is managed under a Federal fishery management plan.

Sink Gill Nets and Bottom Longlines

Sink/Anchor Gill Nets - Individual gill nets are typically 91 m (300 ft) long, and are usually fished as a series of 5-15 nets attached end-to-end. Gill nets have three components: leadline, webline and floatline. Fishermen are now experimenting with two leadlines. Leadlines used in New England are ~65 lb (30 kg)/net, but in the Middle Atlantic leadlines may be heavier. Weblines are monofilament, with the mesh size depending on the target species. Nets are anchored at each end, using materials such as pieces of railroad track, sash weights, or Danforth anchors, depending on currents. Anchors and leadlines have the most contact with the bottom. Some nets may be tended several times/day, (*e.g.*, when fishing for bluefish in the Middle Atlantic). For New England groundfish, frequency of tending ranges from daily to biweekly (NREFHSC, 2002).

Trammel Net - A trammel net is made up of two or more panels suspended from a float line and attached to a single lead line. The outer panel(s) are of a larger mesh size than the inner panel. Fish swim through the outer panel and hit the inner panel, which carries it through the other outer panel, creating a bag and trapping the fish. Smaller and larger fish become wedged, gilled, or tangled (Barnette, 2001). Trammel nets are primarily used in state waters, though they are an authorized gear in the Caribbean for both the spiny lobster and shallow water reef fish fisheries.

Strikenets - Vessels fishing in a strikenet fashion used nets 364.8 meters long, 30.4 meters deep, and with mesh size 22.9 cm. Strikenetting consists of using an additional smaller, second vessel to actively set the net around a school of sharks. These nets are sometimes referred to runaround drift gillnets. Nets used for sharks in the southeast region are typically 456 to 2,280 meters long and 6.1 to 15.2 meters deep, with stretched mesh from 12.7 to 22.9 cm. This fishery is currently prohibited in the state waters off South Carolina, Georgia, and Florida, Texas and Louisiana thereby forcing some of these vessels to operate in deeper waters under Federal jurisdiction, where gillnets are less effective. The entire process (set to haulback) takes approximately 9 hours (Carlson and Baremore, 2002). These activities are managed under Federal fishery management plans.

Stake Gill Nets - Generally a small boat is used inshore so that a gill net is set across a tidal flow and is lifted at slack tide to remove fish. Wooden or metal stakes run from the surface of the water into the sediment and are placed every few meters along the net to hold it in place. When the net is lifted, the stakes remain in place. These nets are generally fished from the surface to about 50 meters deep (Sainsbury, 1996). These activities are not managed under Federal fishery management plans.

Runaround Drift Gillnet – see "Strikenets".

Bottom Longlines - Longlining for bottom species on continental shelf areas and offshore banks is undertaken for a wide range of species including cod, haddock, dogfish, skates, and various flatfishes (Sainsbury, 1996). A 9.5 m (31 ft) vessel can fish up to 2,500 hooks a day with a crew of one and double that with two crew members. Mechanized longlining systems fishing off larger vessels up to 60 m (195 ft) can fish up to 40,000 hooks per day (Sainsbury, 1996).

In the Northeast, up to six individual longlines are strung together, for a total length of about 460 m (1500 ft), and are deployed with 20-24 lb (9 - 11 kg) anchors. The mainline is parachute cord or sometimes stainless steel wire. Gangions (lines from mainline to hooks) are 38 cm (15 inches) long and 1-2 m (3-6 ft) apart. The mainline, hooks, and gangions all come in contact with the bottom. Circle hooks are potentially less damaging to habitat features than other hook shapes. These longlines are usually set for only a few hours at a time (NREFHSC, 2002). Longlines used for tilefish are deployed in deep water, may be up to 40 km (25 miles) long, are stainless steel or galvanized wire, and are set in a zig-zag fashion (NREFHSC, 2002).

The Southeast bottom longline fishery targets both large coastal sharks (LCS) and small coastal sharks (SCS) of sharks as well as reef fish. Bottom longline is the primary commercial gear employed in the LCS and SCS fisheries in all regions. Gear characteristics vary by region, but in general, an approximately ten-mile long bottom longline, containing about 600 hooks, is fished overnight. Skates, sharks, or various finfishes are used as bait. The gear typically consists of a heavy monofilament mainline with lighter weight monofilament gangions. Some fishermen may occasionally use a flexible 1/16 inch wire rope as gangion material or as a short leader above the hook. This activity is managed under a Federal fishery management plan.

Trot Lines – see "Pots" section

Pelagic Gear

Mid-Water Otter Trawl - The mid-water trawl is used to capture pelagic species that school between the surface and the seabed throughout the water column. The mouth of the net can range from 110 m to 170 m (360 - 560 ft) wide and requires the use of large vessels (Sainsbury, 1996). Successful mid-water trawling requires the effective use of various electronic aids to find the fish and maneuver the vessel while catching them (Sainsbury, 1996). This activity is managed under a Federal fishery management plan. This gear is not expected to have contact with or impacts upon bottom habitats.

Paired Mid-Water Otter Trawl - Pair-trawling is used by smaller vessels, which herd small pelagics such as herring and mackerel into the net (Sainsbury, 1996). Large pelagic species are also harvested with a huge pelagic pair trawl towed at high speed near the surface. The nets have meshes exceeding 10 m (33 ft) in length in the jibs and first belly sections, and reduce to cod-end mesh sizes of 20 cm (8 inches) (DeAlteris, 1998). This activity is managed under a Federal fishery management plan. This gear is not expected to have contact with or impacts upon bottom habitats.

Purse Seines - Purse seines are very efficient for taking pelagic schooling species. The purse seine is a continuous deep ribbon of web with corks on one side and leads on the other. Rings are fastened at intervals to the lead line and a purse line runs completely around the net through the rings (Everhart and Youngs, 1981). One end of the net is fastened to the vessel and the other end to a skiff. The vessel then encircles a school of fish with the net, the net pursed and hauled back to the vessel. Purse seines vary in size according to the vessel size, the size of the mesh, the species sought and the depth to be fished. Tuna seines are nearly one kilometer (0.6 miles) long and fish from 55 - 640 m (180 - 2100 ft) (Everhart and Youngs, 1981). Due to the large depth of the net for tuna purse seines, they have been shown to contact and interact with the sea bottom when fishing in some shallow water locations such as Massachusetts Bay and vicinity (NMFS, 2001). Purse seines are also utilized to harvest menhaden in the Gulf and South Atlantic. Purse seines in the Gulf menhaden fishery frequently interact with the bottom, resulting in sediment re-suspension (Barnette, 2001). Currently there are only five vessels permitted to fish for tunas with purse seine gear. This activity is managed under a Federal fishery management plan.

Lampara Net - The lampara net has a large central bunt, or bagging portion, and short wings. The buoyed float line is longer than the weighted lead line so that as the lines are hauled, the wings of the net come together at the bottom first, trapping the fish. As the net is brought in, the school of fish is worked into the bunt and captured. In the Florida Keys, a modified lampara net is used to harvest baitfish near the top of the water column. The wing is used to skim the water surface as the net is drawn in and fish are herded into the pursing section to be harvested with a dip net. This activity is not managed under a Federal fishery management plan. This gear is not expected to have contact with or impacts upon bottom habitats.

Drift Gill Nets - Gillnets operate principally by wedging and gilling fish, and secondarily by entangling (DeAlteris, 1998). The nets are a single wall of webbing, with float and lead lines. Drift gillnets are designed so as to float from the sea surface and extend downward into the water column and are used to catch pelagic fish. In this case the buoyancy of the floatline exceeds the weight of the leadline. Drift gillnets may be anchored at one end or set-out to drift, usually with the fishing vessel attached at one end (DeAlteris, 1998). This activity is managed under a Federal fishery management plan. This gear is not expected to have contact with or impacts upon bottom habitats.

Pelagic Longline Gear - The pelagic or subsurface longline is a technique directed mostly towards tunas, swordfish, sailfish, dolphin (dorado), and sharks. The gear is typically set at depths from the surface to around 330 m (1100 ft). The gear can also be set with a main line hanging in arcs below the buoy droplines to fish a band of depths (Sainsbury, 1996). The gear is set across an area of known fish concentration or movement, and may be fished by day or night depending upon the species being sought (Sainsbury, 1996). The length of the mainline can vary up to108 km (67 miles) depending on the size of the vessel. If the mainline is set at a fixed depth, then the leader or gangion lengths vary from 2-40 m (6.6 - 130 ft), so as to ensure the hooks are distributed over a range of depths (DeAlteris, 1998). If a line-shooter is used to set the mainline in a catenary shape with regard to depth, then the gangions are usually a single minimal length, but are still distributed by depth (DeAlteris, 1998). Each gangion typically contains a baited hook and chemical night-stick to attract the fish. Traditional or circle hooks may be used.

Swordfish vessels typically fish 20 to 30 hooks per 1.6 km (one mile) of mainline between 5 and 54 km (3 - 34 miles) in length (Sainsbury, 1996). This activity is managed under a Federal fishery management plan. This gear is not expected to have contact with or impacts upon bottom habitats.

Troll Lines - Trolling involves the use of a baited hook or lure maintained at a desired speed and depth in the water (Sainsbury, 1996). Usually, two to four or more lines are spread to varying widths by the use of outrigger poles connected to the deck by hinged plates. Line retrieval is often accomplished by means of a mechanized spool. Each line is weighted to reach the desired depth and may have any number of leaders attached, each with a hook and bait or appropriate lure. This gear is generally fished from the surface to about 20 meters (Sainsbury, 1996). This activity is managed under a Federal fishery management plan. This gear is not expected to have contact with or impacts upon bottom habitats.

Other Gear

Rakes - A bull rake is manually operated to harvest hard clams and consists of a long shaft with a rake and basket attached. The length of the shaft can be variable but usually does not exceed three times the water depth. The length and spacing of the teeth as well as the openings of the basket are regulated to protect juvenile clams from harvest (DeAlteris, 1998). Rakes are typically fished off the side of a small boat. This activity is not managed under a Federal fishery management plan.

Tongs - Tongs are a more efficient device than rakes for harvesting shellfish. Shaft-tongs are a scissor-like device with a rake and basket at the end of each shaft. The fisherman stands on the edge of the boat and progressively opens and closes the baskets on the bottom gathering the shellfish into a mound. The tongs are closed a final time, brought to the surface, and the catch emptied on the culling board for sorting. The length of the shaft must be adjusted for water depth. Oysters are traditionally harvested with shaft tongs in water depths up to 6 m (21 ft), with shaft tongs 8 m (29 ft) in length (DeAlteris, 1998).

Patent tongs are used to harvest clams and oysters and are opened and closed with a drop latch or with a hydraulic ram and require a mechanized vessel with a mast or boom and a winch (DeAlteris, 1998). Patent tongs are regulated by weight, length of teeth, and bar spacing in the basket. This activity is not managed under a Federal fishery management plan.

<u>Line Fishing/Handgear/Vertical Gear</u>

Handlines/Hook and Line - The simplest form of hook and line fishing is the hand line. It consists of a line, sinker, leader and at least one hook. The line is usually stored on a small spool and rack and can vary in length. The line varies in material from a natural fiber to synthetic nylon. The sinkers vary from stones to cast lead. The hooks are single to multiple arrangements in umbrella rigs. An attraction device must be incorporated into the hook, usually a natural bait and artificial lure (DeAlteris, 1998). Although not typically associated with bottom impacts, this gear can be fished in such as manner so as to hit bottom and bounce or be carried by currents until retrieved. This activity is managed under a Federal fishery management plan.

Electric or Hydraulic Reel - Mechanized line hauling systems have been developed to allow more lines to be worked by smaller crews and use electrical or hydraulic power to work the lines on the spools or jigging machines (Sainsbury, 1996). These reels, often termed bandits, are mounted on the vessel bulwarks and have a spool around which the mainline is wound (Sainsbury, 1996). Each line may have a number of branches and baited hooks, and the line is taken from the spool over a block at the end of a flexible arm. This gear is used to target several species of groundfish, especially cod and pollock, and it has the advantage of being effective in areas where other gears cannot be used. Jigging machine lines are generally fished in waters up to 600 m (2000 ft) deep (Sainsbury, 1996). This gear may also have the ability to contact the bottom depending upon the method selected to fish. This activity is managed under a Federal fishery management plan.

Bandit Gear – see "Electric or Hydraulic Reel."

Rod and Reel – Rod and reel consists of a handheld fishing rod with a manually or electronically operated reel attached. This gear may have the ability to contact the bottom. This activity is managed under a Federal fishery management plan.

Hand Hoes - Intertidal flats are frequently harvested for clams and baitworms using hand-held hoes. These are short handled rake-like devices, which are often modified gardening tools (Creaser *et al.*, 1983). Baitworm hoes have 5 to 7 tines, 21 to 22 cm (8.3 - 8.7 ft) in length for bloodworms and 34 to 39 cm (13 – 15 inches) for sandworms. Clam hoes in Maine typically have 4 to 5 tines, 15 cm (6 inches) long (Wallace, 1997). This activity is not managed under a Federal fishery management plan.

Diving - By either free diving or using SCUBA, divers collect crustaceans, mollusks and some reef fish in shallow water. Most often a support vessel is used to transport the diver(s) to the fishing site and carry the landings to port. In deeper waters, helmet diving systems are used and the diver is tethered to the vessel with air pumped from the surface. This method is most often used by sea urchin divers and some lobster divers. Divers normally use small rakes or hoes to scrape creatures off rocks or dig them out of the seabed. Generally, the catch is placed in bags, which are either towed to the surface by the boat or floated to the surface using an air source and a lift bag. Divers rarely work deeper than about 20 m (66 ft) (Sainsbury, 1996). This activity is not managed under a Federal fishery management plan.

Spears/Powerheads - Spears were initially hand-held, then thrown, then placed in launching devices including cross-bows, spear guns for divers, etc. Spears with long shafts (gigs) are used by fishermen in small boats at night in the Carolina Sounds for flounder, through the ice for eels in New England bays, and by divers for fish in coastal waters (DeAlteris, 1998). In the Southeast, reef fish such as grouper and snapper, as well as pelagic species such as dolphin and mackerel, are targeted by divers (Barnette, 2001). Commercial divers sometimes employ a shotgun shell known as powerhead at the shaft tip. This method is commonly used to harvest large species such as amberjack (Barnette, 2001). This activity is not managed under a Federal fishery management plan.

Harpoon – A harpoon consists of a pointed dart or iron attached to the end of a line several hundred feet in length, the other end of which is attached to a flotation device. Harpoon gear is attached to a pole that is propelled only by hand and not by mechanical means. This activity is managed under a Federal fishery management plan.

Slurp Guns - Slurp guns are self-contained, handheld devices that capture tropical fish by pulling in seawater that contains target fish. These are typically used on hard bottom substrates and over coral reefs in state and Federal waters. This activity is not managed under a Federal fishery management plan.

Allowable Chemical - Collectors of live tropical reef fish commonly employ anesthetics such as quinaldine (Barnette, 2001). Quinaldine (2-methy quinoline, C10H9N) is the cheapest and most available of several substituted quinolines (Goldstein, 1973). This activity is not managed under a Federal fishery management plan.

Barrier Net - Barrier nets are used in conjunction with small tropical nets or slurpguns to collect tropical aquarium species. The net is deployed to surround a coral head or outcropping and may or may not have a pocket or bag that fish are "herded" into for capture. Barrier nets may be utilized by tropical fish collectors in both state and Federal waters (Barnette, 2001). This activity is not managed under a Federal fishery management plan.

Snare - Recreational divers pursuing spiny lobster often use a long, thin pole that has a loop of coated wire on the end called a snare. The loop is placed around a lobster that may be residing in a tight overhang or other inaccessible location, and then tightened by a pull toggle at the base of the pole in order to capture and extract the lobster (Barnette, 2001). This activity is managed under a Federal fishery management plan.

Dip net/Bully Net - Widely utilized to catch baitfish, crabs, or lobster, varieties of dip nets consist of a long pole with a bag of netting of varying mesh size that are lowered into the water. Dip nets may also be employed to capture tropical reef fish, though these utilize a short handle and very fine mesh. Additionally, landing nets or hand bully nets used to capture lobster can be considered a form of dip net. Varieties of dip nets may be used both in state and Federal waters (Barnette, 2001). This activity is managed under a Federal fishery management plan.

Cast Net - Used to capture baitfish and shrimp, cast nets are circular nets with a weighted skirt that is thrown over a schooling target. Cast nets are primarily used in shallow areas such as estuaries, though they may be used to catch baitfish offshore in Federal waters (Barnette, 2001). This activity is managed under a Federal fishery management plan.

Drop Net - Drop nets are closed-bottom square or circular nets having a square or circular frame attached to the open top of the net. A series of lines run from points on the frame to a single hand line. This allows the net to be lowered into the water to sit flat on the bottom. Bait can be attached to the bottom of the net or dropped onto the water's surface above the net to attract the target species. When the desired species is on or above the net, it is hauled up quickly, presumably capturing the organism. The drop net is also known by the name "lift net", which seems more appropriate. These nets are generally fished in calmer waters with relatively flat

sand or mud bottoms in estuarine settings, and are used mostly to catch crabs (GULF FEIS, 2004). This activity is not managed under a Federal fishery management plan.

10.4.7 Summary

In summary, NMFS concludes that most HMS gears are having minimal to no impact on HMS EFH or to other species' EFH. Bottom longline gear is one of the only gear types that could have a detrimental effect on the benthic environment, especially if placed in coral reef, hard bottom or SAV habitats. However, bottom longline gear in HMS fisheries is primarily used in sandy and/or muddy habitats where it is expected to have minimal to low impacts. NMFS is aware of actions being taken by the Gulf and Caribbean Fishery Management Councils to minimize fishing impacts in specific habitat areas described earlier. To provide consistency between the Council regulations and HMS regulations, NMFS may consider similar alternatives to prohibit HMS gears in those areas in a subsequent rulemaking. In addition, NMFS will continue to collect the necessary data to determine if these potential adverse effects from bottom longline could be more than minimal and not temporary on non-HMS EFH in a future document.

In general, NMFS has not detected adverse effects from non-HMS fishing gears on HMS EFH. As outlined in Section 10.4.2.1, most HMS EFH is defined as the water column or attributes of the water column (*i.e.*, temperature gradients, frontal boundaries, etc.). Therefore, there are little anticipated cumulative impacts that rise above the threshold of more than minimal and not temporary from non-HMS fishing gears. The only exceptions are nearshore and estuarine shark pupping grounds where bottom tending gears (*i.e.*, trawls and dredges) that dramatically altered the benthic environment and overlap with the EFH of these species may have some negative impact on their EFH. However, habitat types associated with these species' EFH, the degree of overlap between the various bottom tending gears and these species' EFH, the extent to which the habitat is altered by these gears, and the impact these gears have on the EFH are all currently unknown. As data becomes available to NMFS, NMFS will make the determination of whether or not these gears have adverse effects on HMS EFH and if those effects are more than minimal and not temporary in nature.

10.5 Non-fishing Impacts to EFH

The EFH regulations require that FMPs identify non-fishing related activities that may adversely affect EFH of managed species, either quantitatively or qualitatively, or both. In addition, the regulations require that Federal agencies consult with NMFS on all actions, or proposed actions that are permitted, funded, or undertaken by the agency, and that may adversely affect EFH. NMFS must then recommend conservation measures to conserve and enhance EFH by avoiding, minimizing, mitigating, or otherwise offsetting the adverse effects to EFH.

Broad categories of activities that may adversely affect HMS EFH include, but are not limited to: (1) actions that physically alter structural components or substrate, *e.g.*, dredging, filling, excavations, water diversions, impoundments and other hydrologic modifications; (2) actions that result in changes in habitat quality, *e.g.*, point source discharges; (3) activities that contribute to non-point source pollution and increased sedimentation; (4) introduction of potentially hazardous materials; or (5) activities that diminish or disrupt the functions of EFH. If these actions are persistent or intense enough, they can result in major changes in habitat quantity

as well as quality, conversion of habitats, or in complete abandonment of habitats by some species.

HMS EFH has been identified in estuarine, coastal, and offshore waters. Estuaries and coastal embayments have been identified as particularly important shark nursery areas, while offshore waters contain important spawning and feeding areas for HMS. All of these waters are at one time or another used by humans for a variety of purposes that often result in degradation of these and adjacent habitats, posing threats, either directly or indirectly, to the biota they support. These effects, either alone in combination with (cumulative) effects from other activities within the ecosystem, may contribute to the decline of some species or degradation of the habitat. In some cases such effects may be demonstrated, but they are often difficult to quantify.

Pollutants (*e.g.*, heavy metals, oil and grease, excess nutrients, improperly treated human and animal wastes, pesticides, herbicides and other chemicals) can be introduced into the aquatic environment through a number of routes, including point sources, non-point sources, and atmospheric deposition. These contaminants have been demonstrated to affect finfish and invertebrates by altering the growth, visual acuity, swimming speed, equilibrium, feeding rate, response time to stimuli, predation rate, spawning seasons, migration routes, and resistance to disease and parasites. In addition to the introduction of contaminants that cause direct effects on animal physiology, point and non-point source discharges also affect essential habitat characteristics such as temperature, pH, dissolved oxygen, salinity, and other parameters that affect habitat suitability for individuals, populations, and communities. The synergistic effects of multiple discharge components such as heavy metals and various chemical compounds are not well understood but are increasingly the focus of research efforts. More subtle effects of contaminants, such as endocrine disruption in aquatic organisms and reduced ability to reproduce or compete for food, are also being identified and investigated (Hanson *et al*., 2003).

Non-point source runoff, which is often difficult to detect, may have a more significant impact on coastal water quality, resulting in tighter controls on point source discharges. Activities that tend to increase the input of contaminants to aquatic environments through non-point sources include coastal development, urbanization, certain agriculture and silviculture practices, marina and port development, commercial and recreational boating, and hydromodification. Related activities, such as the use of septic systems and improper disposal or treatment of wastes, can also contribute biological contaminants. Many of these activities can result in large quantities of pesticides, nutrients, and bacteria or pathogens in coastal waters. Excess nutrification is one of the greatest sources of coastal water contamination. Nutrient enrichment can lead to noxious algal blooms, fish kills, and oxygen depletion (as hypoxic or anoxic events). Researchers have found reduced or stressed fisheries populations to be common in areas where hypoxia occurs (Hanson *et al*., 2003).

As required under the EFH regulations, the following discussion identifies non-fishing activities that have the potential to adversely affect HMS EFH. In many cases these activities are regulated under particular statutory authorities. As long as they are regulated within those guidelines, their potential to adversely affect EFH may be reduced, although not necessarily eliminated. Many of the standards that are used to regulate these activities are based on human

health needs and do not consider long-term impacts on fish and fish habitats. Additionally, if the activity fails to meet, or is operated outside of, its permitted standards, it may adversely affect EFH. The EFH regulations require NMFS and the Councils to identify actions with the potential to adversely affect EFH, including its biological, chemical and physical characteristics. The EFH regulations also recommend the examination of cumulative impacts to EFH, as it is possible that multiple permitted actions, while each is operating within its respective regulatory bounds, may, when combined with others, cause adverse impacts to EFH. The following sections encompass a broad range of activities so as to ensure that their potential to adversely affect HMS EFH has been identified.

The review of habitat use undertaken for HMS identified both benthic and water column habitats in coastal, estuarine and offshore areas as EFH, although in many cases the particular habitat characteristics that influence species habitat use are not clearly understood or identified. Many of these factors appear to be related to water quality (*e.g.*, temperature, salinity, dissolved oxygen). Therefore, water quality degradation has been a primary focus in this section. When analyzing the impacts that water quality changes can have on HMS EFH, it is important to examine all habitats. EFH for HMS includes offshore areas, but even these distant habitats are affected by actions that originate in coastal habitats (both terrestrial and aquatic) and adjacent estuaries. Many of the HMS aggregate over submarine canyons or along river plumes; these physiographic features can serve as conduits for currents moving from inshore out across the continental shelf and slope, while carrying and redistributing contaminants from the nearshore realm to offshore habitats. Until the precise zones of influence from various river and coastal discharges can be delineated, a precautionary approach should be taken in order to protect the integrity of HMS EFH and the sustainability of the HMS fisheries.

10.5.1.1 Land-based Activities That May Impact HMS EFH

Coastal Development

Coastal development activities include urban, suburban, commercial, and industrial construction, along with development of corresponding infrastructure. These activities may result in erosion and sedimentation, dredging and filling (see following sub-section), point and non-point source discharges of nutrients, chemicals, and cooling water into streams, rivers, estuaries and ocean waters. Industrial point source discharges result in the contamination of water and degradation of water quality by introducing organics and heavy metals or altering other characteristics such as pH and dissolved oxygen. Improperly treated sewage treatment effluent has been shown to produce changes in water quality as a result of chlorination and increased contaminant loading, including solids, phosphorus, nitrogen and other organics, and human pathogens and parasites. Non-point source pollution - that which results from land runoff, atmospheric deposition, drainage, groundwater seepage, or hydrologic modification - results in the deposition of pathogens, nutrients, sediments, heavy metals, oxygen demanding substances, road salts, hydrocarbons and other toxics.

Coastal development can also lead to the destruction of coastal wetlands, resulting in the elimination of protective buffer zones that serve to filter sediments, nutrients, and contaminants - such as heavy metals and pesticides - that are transported to the coastal zone in ground and surface waters. In addition, hydrological modifications associated with coastal development

alter freshwater inflow to coastal waters, resulting in changes in salinity, temperature, and nutrient regimes, and thereby contributing to further degradation of estuarine and nearshore marine habitats. The variety of pollutants and the severity of their effects from coastal development activities depend upon a number of factors, such as the nature of the construction, physical characteristics of the site involved, and proximity of the pollutant source to the coastline. However, all of these factors ultimately serve to degrade estuarine and coastal water quality to some degree in terms of dissolved oxygen levels, salinity concentrations, and contaminants. The result can be losses of important flora and fauna.

Agriculture (and Silviculture)

Cropland, livestock rangeland, and commercial nursery grounds can be connected to coastal waters and inland tributaries. Agricultural and silvicultural practices can affect estuarine, coastal and marine water quality through nutrient enrichment and chemical contamination from animal wastes, fertilizers, pesticides and other chemicals via non-point source runoff or via drainage systems that serve as conduits for contaminant discharge into natural waterways. Pesticides can adversely affect EFH through direct toxicological impact on the health or performance of exposed fish, an indirect impairment of the productivity of aquatic ecosystems, and a loss of aquatic vegetation that provides physical shelter for fish. In addition, uncontrolled or improper irrigation practices can contribute to non-point source pollution, and may exacerbate contaminant flushing into coastal waters. Major impacts also include nutrient over-enrichment with subsequent deoxygenation of surface waters; algal blooms, which can also produce hypoxic or anoxic conditions and stimulation of toxic dinoflagellate growth. Excessively enriched waters often will not support fish, and may also not support food web assemblages and other ecological assemblages needed to sustain desirable species and populations. Agricultural activities also increase soil erosion and associated sediment transport in adjacent water bodies, resulting in high turbidity. Many of these same concerns may apply to silviculture as well.

10.5.1.2 Coastal and Offshore Activities That May Impact HMS EFH

Dredging and Disposal of Dredge Material

Dredging operations occur in estuaries, nearshore areas, and offshore in order to maintain certain areas for activities such as shipping, boating, construction of infrastructure (*e.g.*, offshore oil and gas pipelines), and marine mining. Disposal of the dredged material takes place in designated open water disposal areas, often near the dredge site. These operations result in negative impacts on the marine environment. Of particular concern regarding HMS EFH is the temporary degradation of water quality due to the resuspension of bottom materials, resulting in water column turbidity, potential contamination due to the release of toxic substances (metals and organics), and reduced oxygen levels due to the release of oxygen-consuming substances (*e.g.*, nutrients, sulfides). Even with the use of approved practices and disposal sites, ocean disposal of dredged materials is expected to cause environmental harm since contaminants will continue to be released, and localized turbidity plumes and reduced oxygen zones may persist.

Aquaculture and Mariculture

Aquaculture is an expanding industry in the United States, with most facilities located in farmland, tidal, intertidal and coastal areas. Aquaculture related impacts that adversely affect the chemical and biological nature of coastal ecosystems include the discharge of excessive waste products and the release of exotic organisms and toxic substances. Problems resulting from the introduction of food and fecal wastes may be similar to those resulting from certain agricultural activities. However, greater nutrient input and localized eutrophic conditions are currently the most probable environmental effects of aquaculture activities. Extremely low oxygen levels and fish kills, of both natural stocks and cultured fish, have been known to occur in impounded wetlands where tidal and wind circulation are severely limited and the enclosed waters are subject to solar heating. In addition, there are impacts related to the dredging and filling of wetlands and other coastal habitats, as well as other modifications of wetlands and waters through the introduction of pens, nets, and other containment and production devices.

Navigation

Navigation-related threats to estuarine, coastal, and offshore environments that have the potential to affect HMS EFH include navigation support activities such as excavation and maintenance of channels (including disposal of excavated sediments) which result in the elevation of turbidity and resuspension of contaminants; construction and operation of ports, mooring and cargo facilities; construction of ship repair facilities; and construction of channel stabilization structures such as jetties and revetments. In offshore locations the disposal of dredged material is the most significant navigation related threat, resulting in localized burial of benthic communities and degradation of water quality. In addition, threats to both nearshore and offshore waters are posed by vessel operation activities such as the discharge and spillage of oil, other hazardous materials, trash and cargo, all of which may result in localized water quality degradation and direct effects on HMS, especially eggs, larvae and neonates that may be present. Wakes from vessel operation may also exacerbate shoreline erosion, effecting habitat modification and potential degradation.

Marinas and Recreational Boating

Marinas and recreational boating are increasingly popular uses of coastal areas. As marinas are located at the water's edge, there is often no buffering of associated pollutants released into the water column. Impacts caused by marinas include lowered dissolved oxygen, increased temperatures, bioaccumulation of pollutants by organisms, toxic contamination of water and sediments, resuspension of sediments and toxics during construction, eutrophication, change in circulation patterns, shoaling, and shoreline erosion. Pollutants that result from marina activities include nutrients, metals including copper released from antifouling paints, petroleum hydrocarbons, pathogens, and polychlorinated biphenyls. Also, chemicals commonly used to treat timber used for piers and bulkheads (*e.g.*, creosote, copper, chromium, and arsenic salts) are introduced into the water. Other potential impacts associated with recreational boating are the result of improper sewage disposal, fuel and oil spillage, cleaning operations, and disposal of fish waste. Propellers from boats can also cause direct damage to multiple life stages of organisms, including eggs, larvae/neonates, juveniles and adults; destratification; elevated temperatures, and increased turbidity and contaminants by resuspending bottom materials.

Marine Sand and Minerals Mining

Mining for sand (*e.g.*, for beach nourishment projects), gravel, and shell stock in estuarine and coastal waters can result in water column effects by changing circulation patterns, increasing turbidity, and decreasing oxygen concentrations at deeply excavated sites where flushing is minimal. Ocean extraction of mineral nodules is a possibility for some non-renewable minerals now facing depletion on land. Such operations are proposed for the continental shelf and the deep ocean proper. Deep borrow pits created by mining may become seasonally or permanently anaerobic. Marine mining also elevates suspended materials at mining sites, creating turbidity plumes that may move several kilometers from these sites. Resuspension of sediments can affect water clarity over wide areas, and could also potentially affect pelagic eggs and larvae. In addition, resuspended sediments may contain contaminants such as heavy metals, pesticides, herbicides, and other toxins.

Offshore Oil and Gas Operations

Offshore oil and gas operations (exploration, development, production, transportation and decommissioning) pose a significant level of potential threat to marine, coastal and estuarine ecosystems. Exploration and recovery operations may cause substantial localized bottom disturbance. However, more pertinent to HMS is the threat of contaminating operational wastes associated with offshore exploration and development, the major operational wastes being drilling muds and cuttings and formation waters. In addition, there are hydrocarbon products, well completion and work-over fluids, spill clean-up chemicals, deck drainage, sanitary and domestic wastes, ballast water, and the large volume of unrefined and refined products that must be moved within offshore and coastal waters.

Potential major contaminants used in oil and gas operations may be highly saline; have low pH; contain suspended solids, heavy metals, crude oil compounds, and organic acids; or may generate high biological and chemical oxygen demands. Also, accidental discharges of oil - crude, diesel and other oil products - and chemicals can occur at any stage of exploration, development, or production, the great majority of these being associated with product transportation activities. Blowouts and associated oil spills can occur at any operational phase when improperly balanced well pressures result in sudden, uncontrolled releases of petroleum hydrocarbons. To remove fixed platforms, explosives are frequently used. All of these activities result in harmful effects on marine water quality as well as the biota in the vicinity.

In the Gulf of Mexico, Outer Continental Shelf (OCS) oil and gas operations are extending to deeper and deeper waters, throughout which HMS are known to range. Locations such as the De Soto Canyon area in the northern Gulf and the Blake Plateau north of the Bahamas repeatedly appear in the analysis of HMS EFH as highly productive areas important to many of these species. Oil and gas production in these areas should be discouraged because of the potential impact on HMS EFH in these areas.

Considerable documentation exist that highlights the benefits of offshore production platforms as artificial reefs that attract numerous species of fishes, including HMS. It is likely that the attraction of these species to the platforms increases the potential for exposure to contaminants they may release into the aquatic environment.

Liquid Natural Gas Development

Liquefied natural gas, or LNG, is natural gas in its liquid form. By cooling natural gas to minus 259° F (-161° C), it becomes a clear, colorless, odorless liquid. LNG is neither corrosive nor toxic. Natural gas is primarily methane, with low concentrations of other hydrocarbons, water, carbon dioxide, nitrogen, oxygen and some sulfur compounds. During the process known as liquefaction, natural gas is cooled below its boiling point, removing most of these compounds. The remaining natural gas is primarily methane with only small amounts of other hydrocarbons. LNG weighs less than half the weight of water so it will float if spilled on water.

Ships unload LNG at specially designed terminals where the LNG is pumped from the ship to insulated storage tanks at the terminal. LNG is also converted back to gas at the terminal, which is connected to natural gas pipelines that transport the gas to where it is needed. Specially designed trucks may also be used to deliver LNG to other storage facilities in different locations. There has been an increase in the number of LNG terminals authorized for use in the Atlantic Ocean including the Gulf of Mexico (Federal Energy Regulatory Commission, 2005). Many of the offshore proposals in the Gulf of Mexico propose the use of an open-loop, or once through, regasification technology that may utilize 100 – 200 million gallons of seawater per day. These facilities can subject early life stages of marine species to entrainment, impingement, thermal shock, and water chemistry changes. Mortality caused by open-loop LNG facilities could affect the health of some marine fisheries, including bluefin tuna.

Ocean Dumping

The disposal of dredged sediments and hazardous and/or toxic materials (*e.g.*, industrial wastes) containing concentrations of heavy metals, pesticides, petroleum products, radioactive wastes, pathogens, etc., in the ocean degrades water quality and benthic habitats. These effects may be evident not only within the immediate vicinity of the dumping activity, but also at farther locations, as well, due to current transport and the potential influence of other hydrographic features. The disposal of uncontaminated dredged material, including adverse effects on EFH and appropriate conservation measures are addressed in Section 6.6.2.4 of this chapter. Disposal of hazardous and toxic materials by U.S. flag vessels and vessels operating in the U.S. territorial sea and contiguous zone is currently prohibited under the Marine Protection Research and Sanctuaries Act (MPRSA), although under certain circumstances the Environmental Protection Agency may issue emergency permits for dumping industrial wastes into the ocean. Major dumping threats to the marine environment are therefore limited mostly to illegal dumping and accidental disposal of material in unauthorized locations. However, given the amount of debris that is deposited along the Nation's beaches every year, including hazardous materials such as medical wastes, it is evident that effects from such dumping may be substantial.

10.5.2 Cumulative Impacts

The EFH regulations suggest that cumulative impacts should be analyzed for adverse effects to EFH. Cumulative impacts on the environment are those that result from the incremental impact of actions added to other past, present and reasonably foreseeable future actions. Such cumulative impacts generally occur in inshore and estuarine areas, and can result from individually minor, but collectively significant, actions taking place over a period of time.

These impacts include water quality degradation due to nutrient enrichment, other organic and inorganic contaminants associated with coastal development, activities related to marine transportation, and loss of coastal habitats, including wetlands and sea grasses. The rate and magnitude of these human-induced changes on EFH, whether cumulative, synergistic, or individually large, is influenced by natural parameters such as temperature, wind, currents, rainfall, salinity, etc. Consequently, the level of threat posed by a particular activity or group of activities may vary considerably from location to location. These multiple effects can, however, result in adverse impacts on HMS EFH.

Wetland loss is a cumulative impact that results from activities related to coastal development: residential and industrial construction, dredging and dredge spoil placement, port development, marinas and recreational boating, sewage treatment and disposal, industrial wastewater and solid waste disposal, ocean disposal, marine mining, and aquaculture. In the late 1970s and early 1980s the country was losing wetlands at an estimated rate of 300,000 acres per year. The Clean Water Act and state wetland protection programs have helped to decrease wetland losses to 117,000 acres per year, between 1985 and 1995. Estimates of wetlands loss vary according to the different agencies. The USDA estimates attributes 57 percent wetland loss to development, 20 percent to agriculture, 13 percent to deepwater habitat, and ten percent to forest land, rangeland, and other uses. Of the wetlands lost to uplands between 1985 and 1995, the U.S. Fish and Wildlife Service estimates that 79 percent of wetlands were lost to upland agriculture. Urban development, and "other" types of land use activities were responsible for six percent and 15 percent, respectively.

Nutrient enrichment has become a major cumulative problem for many coastal waters. Nutrient loading results from the individual activities of coastal development, non-point source pollution, marinas and recreational boating, sewage treatment and disposal, industrial wastewater and solid waste disposal, ocean disposal, agriculture, and aquaculture. Excess nutrients from land based activities accumulate in the soil, pollute the atmosphere, pollute ground water, or move into streams and coastal waters. Nutrient inputs are known to have a direct effect on water quality. For example, in extreme conditions excess nutrients can stimulate excessive algal blooms or dinoflagellate growth that can lead to increased turbidity, decreased dissolved oxygen, and changes in community structure, a condition known as eutrophication. Examples of such dinoflagellates or algae include *Gymnodinium breve*, the dinoflagellate that causes neurotoxic shellfish poisoning, dinoflagellates of the genus *Alexandrium*, which causes paralytic shellfish poisoning, *Aureococcus anophagefferens*, the algae which causes "brown tides", and diatoms of the genus *Pseudo-nitzschia* which cause amnesic shellfish poisoning. *Pfiesteria piscicida* is a recently-described toxic dinoflagellate that has been documented in the water column in coastal areas of Delaware, Maryland, and North Carolina. Another *Pfiesteria*-like organism has been documented in St. John's River, FL. This organism has been associated with fish kills in some areas.

In addition to the direct cumulative effects incurred by development activities, inshore and coastal habitats are also jeopardized by persistent increases in certain chemical discharges. The combination of incremental losses of wetland habitat, changes in hydrology, and nutrient and chemical inputs produced over time, can be extremely harmful to marine and estuarine biota, resulting in diseases and declines in the abundance and quality of the affected resources.

Future investigations will seek to analyze cumulative impacts within specific geographic locations (certain estuarine, coastal and offshore habitats) in order to evaluate the cumulative impacts on HMS EFH. Information and techniques that are developed for this process will be used to supplement future revisions of these EFH provisions as the information becomes available.

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CHAPTERS 11-13 TABLE OF CONTENTS

Chapters 11-13 Table of Contents 11-i

11.0 Other Considerations 11-1

11.1 National Standards 11-1

11.2 Ongoing Management and the Procedure for Adjusting Management Measures .. 11-11

11.3 Consideration of Magnuson-Stevens Act Section 304(g) Measures..... 11-12

12.0 List of Preparers 12-1

13.0 List of Agencies, Organizations, and Persons Consulted and to Whom Copies of the EIS Will Be Sent..... 13-1

11.0 OTHER CONSIDERATIONS

11.1 National Standards

The analyses in this document are consistent with the National Standards (NSs) and their guidelines set forth in the 50 CFR part 600 regulations. The following descriptions are a summary of how the preferred alternatives are consistent. More information can be found in Chapters 1, 2, 3, 4, 6, 7, 8, and 9.

NS 1 requires NMFS to prevent overfishing while achieving, on a continuing basis, the Optimum Yield (OY) from each fishery for the U.S. fishing industry. As summarized in Chapter 3, over the past years, NMFS has undertaken numerous management actions, including the 1999 FMP, Amendment 1 to the 1999 FMP, and Amendment 1 to the Billfish FMP, to address overfishing and to rebuild HMS stocks. The preferred alternatives in this HMS FMP are consistent with ongoing management efforts to rebuild, manage, and conserve target species and with the NS 1 guidelines.

- The preferred measures in this action for workshops should support those ongoing management efforts consistent with NS 1. While the preferred workshop alternatives do not directly impact fishing effort, the HMS identification workshops for shark dealers may improve the estimates of fishing mortality rates and MSY for sharks, and thus, enhance management efforts aimed at preventing overfishing and achieving OY.
- The preferred Madison-Swanson and Steamboat Lumps closures should support efforts aimed at achieving OY for gag grouper and may have some minor positive ancillary benefits for HMS. The preferred alternative to establish criteria for time/area closures would clarify the process NMFS uses to consider the status of the species before establishing or modifying time/area closures.
- The preferred alternative for northern albacore tuna would establish the foundation to implement domestically an international rebuilding plan that the United States would, during international negotiations, seek to develop in a manner that is consistent with the Magnuson-Stevens Act.
- The preferred alternative for finetooth sharks would identify sources of fishing mortality in order to implement appropriate management measures. Historically there have been approximately five vessels “targeting” sharks with drift gillnets or strikenets and observer data indicate that their landings comprise only a small portion of the total finetooth shark landings. Observer coverage was recently expanded to other gillnet vessels that catch sharks but target other species. These data indicate that these vessels use variations of gillnet and are also responsible for finetooth shark landings. As part of the plan to prevent overfishing, NMFS intends to collect more detailed information on finetooth shark landings and then address this issue through directed management measures and/or collaborative management with Regional Fishery Management Councils, state, or other management entities. These data will

be used for future stock assessments and to develop effective management measures to prevent overfishing of finetooth sharks.

- The preferred alternatives for the directed Atlantic billfish fishery support international management efforts aimed at preventing overfishing and rebuilding billfish stocks by addressing the contribution of U.S. anglers to Atlantic-wide landings and mortalities and implementing international recommendations.
- The preferred BFT alternatives would not increase overall fishing effort or the overall U.S. quota allocation from ICCAT and are consistent with ICCAT's western Atlantic BFT rebuilding program. The adjustment of the fishing year is largely administrative and would not likely impact fishing effort, catch, or age/size at harvest.
- The authorized fishing gear and regulatory housekeeping preferred alternatives would not increase fishing effort on target species beyond domestic and/or ICCAT-adopted quotas.

NS 2 requires that conservation and management measures be based on the best scientific information available. The preferred alternatives in this HMS FMP are consistent with this NS.

- One of the goals for the workshop alternatives is to improve the quality of the scientific information used in population assessments and in estimating bycatch and bycatch mortality. Pelagic and bottom longline and gillnet owners and operators would be trained to correctly identify protected species, thereby improving the quality of logbook data. HMS permitted shark dealers would be trained to identify sharks, either in whole or log form, thereby improving the accuracy of dealer reports.
- The time/area closure alternatives are based on up-to-date logbook and observer data and were analyzed using models, which are based on generally accepted principles in fisheries science, to analyze the range of potential impacts. Additionally, the preferred alternative to establish criteria for time/area closures should help ensure that the most up-to-date information and science is taken into account when new closures are being considered.
- The preferred alternative for northern albacore tuna is based on the most recent stock assessment results and the most up-to-date landings data submitted to ICCAT.
- The preferred alternative for finetooth sharks is based on the 2002 SCS stock assessment, which constitutes the best available scientific information. As described in Section 3.2.5.3, there was a lack of bycatch data and inconsistent catch series data when this assessment was conducted. The preferred alternative seeks to gain additional finetooth shark landings data through expanded observer coverage, contacting states to obtain landings data and including finetooth sharks as a select species for bycatch reporting in the Gulf of Mexico Shrimp Trawl Fishery Observer Program.
- The analyses and preferred measures for Atlantic billfish are based on the best available scientific information, including the latest information available on the post-release mortality of Atlantic white marlin and other species.

- For BFT, the preferred alternatives consider the most recent biological information to determine the availability of BFT both geographically and temporally. The alternatives also consider current and historical harvest rates and fishing patterns to establish the General category time periods and subquota allocations. The BFT quota allocation recommended by ICCAT is based on the most recent stock assessment (2002). BFT management measures, along with management measures for other ICCAT species, may be reconsidered after the upcoming 2006 BFT stock assessment.
- The preferred alternative regarding the fishing year may slightly enhance the availability and utility of scientific information for international stock assessments and management reviews since the data would be reported in a way that would be consistent with most other international information.
- The potential impacts of preferred authorized fishing gear alternatives and regulatory housekeeping alternatives were analyzed using the best scientific information available including logbook data.

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 HMS FMP are consistent with this NS.

- Many of the preferred alternatives – including the workshop, time/area closure, fishing year, authorized gear, and regulatory housekeeping alternatives – do not influence the HMS management units or the geographic scope of the fishery.
- The preferred alternative for finetooth sharks would ensure that finetooth sharks continue to be managed within the SCS complex throughout their range, which includes the south Atlantic, Gulf of Mexico, and Caribbean. NMFS intends to seek collaborative efforts with states and Regional Fishery Management Councils in these regions to address comprehensively finetooth shark fishing mortality throughout the species' range.
- The preferred alternatives for northern albacore tuna and the directed billfish fishery apply uniformly to albacore tuna and billfish stocks within those portions of their ranges over which the United States has jurisdiction, thereby facilitating management as a unit. In addition, the United States continues to participate at ICCAT to further conservation and management of HMS species through international rebuilding efforts.
- The preferred alternatives to change the time-period allocations for the BFT General category ensure that the fishery is managed throughout the geographic scope of that fishery.

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 HMS FMP are consistent with this NS.

- The workshop alternatives are consistent because they would apply to any individual that owns or operates an HMS permitted vessel that uses longline or gillnet gear and any Federally permitted shark dealers.
- With regard to time/area closures, while fishermen who live near a closure could be affected more by the closure than fishermen in other states, as explained in the NS 8 discussion below, the Madison-Swanson and Steamboat Lumps closures are not expected to have substantial economic impacts on HMS fishermen and would be closed to all HMS fishermen other than those surface trolling from May to October, regardless of what state they are from or how far they need to travel. The preferred alternative to establish closure criteria would not have direct impacts on fishermen; potential impacts of specific closures would be evaluated as those closures are considered in the future.
- Under the preferred alternative for finetooth sharks, the current overall quota of 454 mt dw for SCS and the regional and/or trimester quota distributions applies to residents of all states and would not be modified.
- The preferred alternatives for Atlantic billfish and northern albacore tuna do not discriminate between residents of different states or allocate or assign fishing privileges. Any reductions in the fishing mortality rates for these species are necessary throughout their ranges.
- The preferred BFT management measure to revise the General category time-period subquotas consistent with recent trends in BFT availability along the coast would ensure more opportunity for fishermen in all of the states to have access to the resource when it is available in their area. Even if this action were to be considered an allocation, it is fair and equitable because the fishery is a coast-wide fishery and the action would promote access to the resource throughout the BFT range. In addition, it is consistent with the BFT rebuilding program and ongoing conservation and management efforts. The other preferred BFT alternatives (*e.g.*, establishing inseason criteria) would implement overall improvements in the BFT management process with no differing impacts on residents of different states.
- The adjustment of the fishing year in conjunction with implementation of the ICCAT marlin landings limit could have minor indirect impacts that may be slightly greater in certain regions of the nation. However, none of the fishing year alternatives would directly allocate or assign fishing privileges among various U.S. fishermen, and all are intended to enhance conservation and management of the HMS fisheries.
- None of the authorized fishing gear and regulatory housekeeping preferred alternatives discriminate between residents of different states or allocate or assign fishing privileges.

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 HMS FMP are consistent with this NS.

- The preferred workshop alternatives would not directly impact the efficiency in the utilization of the fishery resources. To the extent that the workshops teach fishermen how to remove protected resources from fishing gear in an efficient manner that maximizes survival and improve species identification, the workshops could have some benefits.
- The preferred Madison-Swanson and Steamboat Lumps closures are not expected to have significant economic impacts, and no direct impacts are expected from the closure criteria. Neither this alternative nor the criteria alternative is expected to change efficiency in the utilization of fishery resources.
- The preferred alternatives for northern albacore tuna and finetooth sharks would have no impacts on efficiency in the short-term as they would not implement new regulatory requirements on the fisheries at this time.
- The preferred billfish alternatives consider efficiency, where practicable, by tailoring the circle hook and bait requirements, as opposed to applying them across the whole fishery, and by proposing a mechanism for implementing inseason regulatory adjustments.
- The preferred BFT inseason action alternative would consolidate criteria used for inseason and annual adjustments, and thus, could increase consistency in the inseason criteria and transparency in the management process. Having the flexibility to modify the regulations in response to variation in the fishery and the resource could also promote efficiency. One of the preferred BFT alternatives would ensure that excessive amounts of quota do not accumulate in any particular domestic quota category by allowing NMFS to limit the amount of underharvest that can be carried forward, if warranted. Excess quota would be rolled over to the Reserve or to other domestic quota categories. Thus, the alternative provides reasonable fishing opportunities, while ensuring efficient use of the resource.
- The preferred fishing year alternative should improve efficiency and transparency of managing HMS fisheries.
- The authorized fishing gear preferred alternatives consider efficiency, where practicable, and would allow fishermen some flexibility in rigging gears for speargun and buoy gear as well as flexibility in their choices of cockpit gear. This flexibility should allow different segments of the HMS fisheries to choose or rig gears in ways that maximize their efficiency in a particular area.
- The preferred alternatives for regulatory housekeeping are not expected to impact the efficiency of using the fishery resources. Requiring that the dorsal and anal fins remain on the shark could alter the efficiency of the fishery slightly, but should improve the data and conservation of the fishery and resource. In addition, the option

of submitting dealer reports over the internet, once such a system is available, could provide a more efficient and flexible method of reporting.

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 for this HMS FMP are consistent with this NS.

- The workshop alternatives provide that the workshop requirements could be adjusted through a regulatory framework adjustment. Such adjustments would account for any unexpected changes in the HMS fisheries attributable to fishing practices, gear, effort, or the improved knowledge of safe-handling and release methods.
- The preferred alternative for time/area closure criteria specifically takes into account variations in fisheries and fishery resources by providing criteria to be applied in modifying or adding new closures either through the framework or FMP amendment process. The Madison-Swanson and Steamboat Lumps closures take variations in fisheries into account by allowing surface trolling during prime fishing months.
- The preferred alternatives for finetooth sharks and northern albacore tuna would not affect any previous measures implemented to protect against social, economic, or ecological uncertainties that may arise in HMS fisheries.
- The preferred alternatives for the directed Atlantic billfish fishery provide needed flexibility in allowable hooks and baits, as well as in both the mechanism for implementing inseason regulatory adjustments, and the measures considered for inseason adjustment.
- The preferred BFT management measures acknowledge the variation in the BFT fishery, resource, and catches, and improve NMFS' ability to account for these variations and make changes to the management actions to ensure a reasonable fishing opportunity throughout the management unit. The preferred management measures also provide the industry with consistent baseline annual quotas from year to year until ICCAT modifies the recommended U.S. BFT TAC. The preferred BFT management measures continue to provide a reserve to compensate for uncertainty in estimating domestic harvest, stock conditions, or environmental factors. Furthermore, one of the preferred alternatives allows for the transfer of unharvested quota to cover the overharvest of another gear category, compensating for the uncertainties in these fisheries. The preferred inseason action criteria for BFT would continue to allow NMFS to account for variability in the fishery or resource and provide for greater consistency in the factors considered for all inseason actions.
- Changes in the management cycle timeframe would not impact existing regulations that have been implemented to protect against social, economic, or ecological uncertainties, consistent with ICCAT recommendations.
- The preferred authorized fishing gear alternatives would allow for variability in the fishery and resource by allowing fishermen some flexibility in rigging gears for speargun and buoy gear as well as flexibility in their choices of cockpit gears. This flexibility would allow segments of the HMS fisheries to choose or rig gears

according to the current limits and season. Some of the regulatory housekeeping alternatives allow for more flexibility and variation. For example, clarifying the definitions for pelagic and bottom longline fishing gear should alleviate some confusion regarding bottom longline fishing in pelagic longline closed areas. Most of the preferred alternatives for regulatory housekeeping do not address variations or contingencies in the fishery.

NS 7 states that conservation and management measures shall, where practicable, minimize costs and avoid unnecessary duplication. The preferred alternatives in this HMS FMP duplicate other regulations.

- The costs associated with the preferred workshop alternatives include possible lost fishing time or other opportunity costs and travel to the workshops. These costs would be mitigated by holding workshops when fishing activity is anticipated to be slow and in locations in the vicinity of the longline and gillnet communities as well as in the vicinity of shark dealers. Nevertheless, time spent at these workshops will provide valuable skills that may offset some of the costs associated with attending the workshops. Linking the workshop certification to the permit renewal would facilitate enforcement of the requirements. The workshop alternatives are not anticipated to shift costs to another sector, such as a local government or the private sector. NMFS considered the burden of training owners, operators, and crew of vessels using longline and gillnet gear in the analysis of alternatives. However, the bycatch mortality reduction benefit of training the larger universe of owners, operators, and crew does not appear to outweigh the costs (*e.g.*, administrative burden, lost fishing, and time away from other responsibilities) of requiring everyone to attend. Thus, NMFS is preferring to require just the owners and operators of those vessels, not the crew, to attend the workshops. However, members of the larger universe other than owners and operators would be allowed to attend workshops on a voluntary basis. The same analyses were true for the HMS identification workshops. Training all of the HMS dealers, anglers, and commercial vessel owners and operators versus just the shark dealers would not improve the shark data collection enough to justify the costs.
- The preferred alternatives for time/area closures are expected to have minimal costs. Few HMS commercial longline fishermen reported fishing in the complementary Madison-Swanson and Steamboat Lumps closures and surface trolling would be allowed during prime recreational fishing months. NMFS does not expect any costs to be associated with the criteria for time/area closures.
- The preferred alternatives for the directed Atlantic billfish fishery may result in minor, short-term compliance costs, due to the initial purchase of circle hooks. However, in the long-term, there may be *de minimus* economic benefits to recreational fishermen because circle hooks typically cost less than J hooks. Additionally, allowing the continued use of J-hooks outside of tournaments and with artificial baits in tournaments minimizes costs by allowing fishermen to utilize their existing stockpile of J-hooks. Delaying the effective date also provides recreational

fishermen a chance to utilize existing stockpiles of J-hooks, and allows fishermen to replace J-hooks which they would have used with natural baits in tournaments with lower cost circle hooks over time.

- The preferred BFT alternatives take into consideration recent trends in BFT availability and attempt to provide greater fishing opportunities for all fishermen in this coast-wide fishery. Further, the preferred alternatives are also aimed at improving the efficient utilization of the available quota by improving NMFS' ability to make inseason adjustments and allowing NMFS to be responsive to the annual and seasonal variability in the fishery. While there may be some costs associated with revising the General category time-period and subquota allocations (*e.g.*, less quota would be available for fishermen in northern states), as discussed further under NS 8, any economic impacts are expected to be minor.
- The preferred alternative for adjusting the fishing year appears to minimize costs while maximizing benefits.
- The preferred alternatives for northern albacore tuna, finetooth sharks, authorized gears, and most of regulatory housekeeping do not impose any costs on the fishermen. A few of the regulatory housekeeping alternatives would impose minimal costs on fishermen. The requirement to leave the anal and second dorsal fin on the shark could have some minor impact on the cost of fishing but these impacts would be less than the impact of requiring all fins to remain on the shark.

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 for this HMS FMP are consistent with this NS.

- The preferred alternatives for workshops are not anticipated to have a negative impact on the sustained participation of any HMS fishing communities. Workshops would be held near these communities and at times when the fishing activities are slow in order to minimize, to the extent practicable, any negative economic or social impacts.
- The preferred time/area closure alternatives of establishing criteria and implementing complementary closures would not have significant, adverse economic impacts or impacts on fishing communities. Few commercial sets have been reported set in the Madison-Swanson and Steamboat Lumps closures in recent years and surface trolling are allowed during prime recreational fishing months.
- The preferred alternatives for finetooth sharks and northern albacore tuna are not expected to result in any adverse social or economic impacts to fishing communities because no new regulations are being implemented as a result of this action.
- While some communities may experience heightened localized impacts if angler behavior substantially changes, the preferred alternatives for the directed billfish fishery are anticipated to minimize any economic impacts on the fishery as a whole as well as sustain participation in the directed Atlantic billfish fishery.

- The Atlantic BFT management measures are designed to ensure a reasonable fishing opportunity is provided throughout the BFT range. There may be some negative economic impacts for fishermen participating in the early portion of the season because this action would reduce the current General category time-period and subquota allocations for the early season (*e.g.*, when BFT are available for fishermen off northern states) in order to provide for a winter fishery for fishermen off southern states. However, any such impacts are expected to be minor, and NMFS, in developing BFT alternatives, took into consideration traditional fishing patterns in New England as well as recent trends in BFT availability. The other preferred alternatives would adjust BFT management procedures and are not expected to have any adverse economic or social impacts.
- Changing the fishing year for HMS fisheries to make them consistent with the calendar year is not expected to have a negative impact on the sustained participation of any HMS fishing communities. However, due to the combination of the 250-fish limit on billfish and this preferred alternative, some communities may notice short-term impacts and may need to adjust to either earlier tournaments, if possible, or catch-and-release only tournament. Communities that rely on more than billfish tournaments are unlikely to notice any impacts.
- Authorizing additional fishing gears and the preferred regulatory housekeeping alternatives are not anticipated to have a negative impact on the sustained participation of any HMS fishing community.

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 NS 9 guidelines provide that, when determining whether actions minimize bycatch and bycatch mortality to the extent practicable, several factors should be considered, consistent with other national standards and maximization of net benefits to the Nation. NMFS has taken those factors into consideration throughout the HMS FMP.

- The protected species workshops for pelagic longline, bottom longline, and gillnet fishermen are aimed at reducing the bycatch mortality of sea turtles, smalltooth sawfish, and other non-target species. These workshops would train the owners and operators of vessels using longline and gillnet gear in the safe release and disentanglement protocols, enabling the owners and operators to return these species to the sea alive, thus minimizing bycatch mortality to the extent practicable.
- NMFS conducted extensive analyses of a wide range of alternatives to see if further time/area closures or modifications of existing time/area closures would provide ecological benefits to all bycatch species. However, the analyses indicated that additional or modified closures would not provide benefits for all bycatch species; closures or combinations of closures may benefit certain species with adverse impacts on others. Additionally, the analyses are based on J-hook data (these hooks are no longer allowed in the pelagic longline fishery) and NMFS is currently evaluating the effect of circle hooks on all bycatch species. At this time, NMFS is preferring the Madison-Swanson and Steamboat Lumps closures to complement existing measures

in the Gulf of Mexico, and a closure criteria alternative that would provide greater transparency in the evaluation of new or modified closures. Complementary closures are expected to minimize bycatch on gag grouper and other reef-dwelling species.

- The preferred alternative for northern albacore tuna is not expected to change bycatch rates of any species because NMFS is not taking any regulatory actions in this FMP for this issue.
- The preferred alternative for finetooth sharks would not result in any significant modifications to fishing gear, effort, or practices currently employed for finetooth sharks in the short term because NMFS is not taking any regulatory actions in this FMP for this issue. Furthermore, the alternative would identify other fisheries that may be contributing to bycatch of finetooth sharks, in which case the agency may recommend measures or seek collaborative efforts to reduce this bycatch.
- The preferred alternatives for the directed billfish fishery are not expected to increase bycatch of Atlantic billfish, as Atlantic billfish released by anglers under the catch-and-release program established for Atlantic billfish are not considered bycatch. The preferred alternatives may substantially reduce the post-release mortality of Atlantic billfish in the directed billfish fishery, consistent with the intent of NS 9. To the extent that using circle hooks in tournaments reduces the bycatch of other species, the preferred alternatives may minimize the bycatch of other fish or marine life.
- The preferred alternatives for BFT, for modifying the fishing year, and for authorizing additional gears are not expected to modify the interaction with bycatch, or to change the bycatch mortality associated with the Atlantic HMS fisheries because overall effort across the fishery is not expected to change as a result of the actions in this Consolidated HMS FMP. Due to the nature of the gear, NMFS expects little to no bycatch in the recreational speargun fishery. Additionally, available handline data indicate that buoy gear would likely have low bycatch and limited dead discards.
- None of the preferred alternatives for regulatory housekeeping are expected to increase or decrease bycatch rates substantially. The species composition requirement in the definition between pelagic and bottom longline could increase bycatch slightly if fishermen catch greater than five percent of a particular species that is not on the list for the gear they are using. NMFS expects this scenario is unlikely given reported landings and has modified the list of indicator species based on public comment.

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 this HMS FMP are consistent with this NS.

- No impact to safety of life at sea is anticipated to result from the workshop preferred alternatives. While the preferred workshop alternatives do not require fishing vessels to carry additional gear, the owner and operator would be trained in the proper handling of the gear used for the safe-handling and disentanglement procedures for

protected resources. The safe-handling and release gear is light enough that it should not have any impact on the stability of the vessel.

- The preferred alternatives for time/area closures, northern albacore tuna, finetooth sharks, the directed billfish fishery, the fishing year modifications, and the regulatory housekeeping items are not expected to have any effects on safety of human life at sea. None of those preferred alternatives would require fishermen to travel greater distances, fish in bad weather, or otherwise fish in an unsafe manner.
- The preferred management measures for Atlantic BFT are not anticipated to have an impact on safety of life. The BFT General category is managed by time-period subquotas in order to ensure that BFT is available according to traditional and historical fishing patterns and to allow for a winter fishery in the South Atlantic. The preferred alternatives provide an opportunity to fish throughout the BFT range when the tuna are present and available and do not require fishing vessels to carry additional gear. The preferred management alternative was designed to avoid "derby" style fishing and reflects the historical fishing patterns for the New England region and provides an opportunity for the South Atlantic tuna fishermen to participate in the fishery when the tuna have migrated into the area.
- None of the authorized gear alternatives are expected to have an impact on safety of life at sea, partly because fishermen are already using these gears in HMS or other fisheries. However, these gears, such as speargun and secondary cockpit gears, can be dangerous and may create additional hazards to fishermen because they have sharp points and trailing lines that could entangle fishermen. Alternative H2 (authorize recreational harvest of BAYS tunas with speargun gear) may result in fishermen traveling greater distances to find productive fishing grounds, if the speargun and rod and reel sectors compete for fishing areas. While AP members have expressed concern for the safety of individuals using speargun gear, given the safety equipment the fishermen use and their ability to use this gear safely in other fisheries around the world, NMFS does not expect the authorization of this gear to create problems with safety. Alternative H7 clarifies the allowable use of secondary cockpit gears. This alternative would also promote safety at sea by allowing fishermen to use implements specifically designed to gain control of, and subdue, large fish that were captured with authorized primary gears when they are brought alongside the vessel.

11.2 Ongoing Management and the Procedure for Adjusting Management Measures

The 1999 FMP, Amendment 1 to the 1999 FMP, and Amendment 1 to the Billfish FMP outlined the process for amending or modifying regulations via regulatory framework adjustment or FMP amendment. The actions that can be done via framework adjustment are also listed in 50 CFR part 635.34, and currently the list includes:

- actions to implement ICCAT recommendations, as appropriate;
- domestic quotas;
- Atlantic tunas Purse Seine category cap on BFT quota;

- commercial retention limits;
- recreational retention limits;
- maximum sustainable yield or optimum yield levels based on the latest stock assessment or updates in the SAFE report;
- species size limits;
- permitting and reporting requirements;
- monitoring and tracking programs (*e.g.*, landing tag);
- composition of the species groups;
- fishing year or season;
- time/area restrictions;
- target catch requirements;
- gear prohibitions, modifications, or use restrictions;
- effort restrictions;
- essential fish habitat;
- any shark species management group based on additions to or removals from the prohibited species list;
- classification system within shark species groups;
- shark management regions and the regional quotas; and,
- quota allocations between shark fishing seasons.

Additions to the list as a result of this Final Consolidated HMS FMP would include:

- changes to the Atlantic blue and white marlin annual landings limit;
- additions, changes, or modifications to time/area closures; and
- workshop requirements.

11.3 Consideration of Magnuson-Stevens Act Section 304(g) Measures

Section 304(g) of the Magnuson-Stevens Act sets forth requirements specific to the preparation and implementation of an FMP or FMP amendment for HMS. See 16 U.S.C. 1854(g) for full text. 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 each of the preferred management measures and how they meet these requirements are described in more detail in Chapters 2 and 4 of this document.

1. Consult with and consider the views of affected Councils, Commissioners, and advisory groups.

NMFS provided the five Atlantic Fishery Management Councils, the Gulf and Atlantic States Marine Fisheries Commissions, and members of the HMS and Billfish Advisory Panels copies of the Issues and Options Paper (released in April 2004), the Predraft of the Consolidated HMS FMP (released in February 2005), and the draft Consolidated HMS FMP (released in August 2005). Additionally, NMFS presented the Issues and Options paper to three of the Regional Fishery Management Councils, the Atlantic States Marine Fisheries Commission, and the HMS and Billfish Advisory Panels; presented the Predraft to all five of the Atlantic Regional Fishery Management Councils, both the Atlantic and Gulf States Marine Fisheries Commissions, and the Advisory Panels; and, presented the draft Consolidated HMS FMP to all five Atlantic Regional Fishery Management Councils, the Atlantic and Gulf States Marine Fisheries Commissions, and the Advisory Panels. NMFS also engaged in active dialog with some of the Regional Fishery Management Councils during the public comment period on the draft Consolidated HMS FMP. Written comments and comments received during the presentations were considered at all stages when preparing this Final Consolidated HMS FMP. NMFS will send the Final Consolidated HMS FMP/FEIS 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 and Billfish Advisory Panels.

2. Establish an advisory panel for each FMP.

NMFS established the HMS and Billfish Advisory Panels in 1997 as part of the process for drafting the 1999 FMP for Atlantic Tunas, Swordfish, and Sharks and Amendment 1 to the Atlantic Billfish FMP. As part of this Final Consolidated HMS FMP, NMFS intends to combine those Advisory Panels into one panel that would still provide representation between all user groups and from different geographic locations.

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. None of the preferred management measures in this Final Consolidated HMS FMP are expected to disadvantage U.S. fishermen in relation to foreign competitors. Some of the preferred alternatives could aid U.S. fishermen by providing a more open and flexible fishing period (*e.g.*, changes to BFT management adjustments) or authorizing additional gear types (*e.g.*, speargun or buoy gear). Some of the non-preferred alternatives may provide potential economic benefits (*e.g.*, modifying time/area closures) or, conversely, adverse economic impacts (*e.g.*, additional time/area closures or prohibition of pelagic longline gear) to U.S. fishermen; however, NMFS has described the reasons why it is not preferring those alternatives. If it becomes necessary to implement those alternatives or types of alternatives in the future, NMFS will minimize, to the extent practicable, any disadvantage to U.S. fishermen in relation to foreign competitors.

4. *With respect to HMS for which the United States is authorized to harvest an allocation, quota, or fishing mortality level under a relevant international fishery agreement, provide fishing vessels with a reasonable opportunity to harvest such allocation, quota, or at such fishing mortality level.*

The preferred management measures should not prevent U.S. fishermen from a reasonable opportunity to harvest the quota or landing limit allocated by ICCAT. In the case of Atlantic billfish, NMFS prefers to implement the 250-marlin landing limit and require the use of circle hooks by HMS permitted fishermen when deploying natural baits or natural bait/artificial lure combinations in billfish tournaments. The final rule would codify the U.S. landing limit in U.S. regulations, as established by ICCAT. The ICCAT marlin landing limit alternative was specifically crafted in a manner to allow maximum utilization of the U.S. landing limit without exceeding it and, thus, is both intended and anticipated to provide U.S. fishermen reasonable opportunity to land the full 250 marlin landing limit. For BFT, NMFS prefers alternatives that would ensure more opportunity for fishermen in all of the states to have access to the resource and that would modify the manner in which inseason actions are taken to ensure the quota is taken in an equitable fashion throughout the Atlantic. Regarding swordfish, the preferred alternatives would clarify the definition of handline and authorize the use of buoy gear for targeting swordfish. This could allow U.S. fishermen greater opportunities to harvest the available quota. Unless effort in the swordfish fishery increases, it is unlikely that, in the near future, the United States would catch the entire swordfish quota as adjusted for recent underharvests. In addition, NMFS is not preferring any new time/area closures at this time except for complementary time/area closures to protect gag grouper. These complementary measures would affect all HMS fishermen; however, few HMS sets were reported in those areas. Thus, NMFS does not expect the complementary closures to have any impact on the ability of HMS fishermen to take their ICCAT quotas. Furthermore, NMFS is preferring criteria that would allow NMFS to modify the existing closures and could allow for some of the areas to be re-opened thus providing greater opportunity for U.S. pelagic longline fishermen to take ICCAT quotas, in the future.

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. This Final 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 ICCAT, and other international entities such as CITES, to implement comparable international fishery management measures. To the extent that some of the management measures are exportable, NMFS works to provide foreign nations with the techniques and scientific knowledge to implement similar management measures or conduct experiments to test similar gear modifications.

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 Final Consolidated HMS FMP, particularly 1, 2, 4, 5, 6, 8, 9, 12, 14, and 16 (see Section 1.3), indicate how NMFS promotes the international conservation of the affected fisheries in order to obtain optimum yield while maintaining traditional fisheries and fishing gear and minimizing economic impacts on U.S. fishermen. All of the combined management measures in this Final Consolidated HMS FMP are expected to meet these goals.

12.0 LIST OF PREPARERS

The development of both the Draft and Final consolidated HMS FMP involved input from many people within NMFS, NMFS contractors, and input from constituent groups including the HMS and Billfish Advisory Panels. Staff and contractors from the Highly Migratory Species Management Division, in alphabetical order, who worked on this document or the documents resulting in this one include:

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The development of this document also involved considerable input from other staff members and Offices throughout NOAA including, but not limited to:

- Other Divisions within the Office of Sustainable Fisheries (Barbara Comstock, John Dunnigan, Peter Fricke, Myles Raizin, Alan Risenhoover);
- The Southeast Fisheries Science Center (Heather Balchowsky, Charles Bergmann, Jose Castro, John Carlson, Enric Cortes, Sheryann Epperly, Eric Prince, John Lamkin, Arietta Venizelos, John Watson);
- The Northeast Fisheries Science Center (Nancy Kohler, Cami McCandless, Lisa Natanson);
- The Southeast Regional Office (David Bernhart, Vicki Cornish, Peter Hood, Dennis Klemm, Juan Levesque, Jennifer Lee, Shelley Norton, Carolyn Sramek);
- The Pacific Islands Regional Office (Collen Bass, Lewis Van Fossen);
- The Office of Habitat Conservation (Karen Abrams, Andy LoSchiavo, David McDuffee);
- The Office of Protected Resources in Silver Spring (David O'Brien);
- The Office of Law Enforcement (Sara Block, Jeff Radonski, Paul Raymond)
- NOAA General Counsel (Meggan Engelke-Ros, Mark Hodor, Adam Issenberg, Caroline Park, Stacey Nathanson, Constance Sathre, Frank Sprtel);
- National Ocean Service (Gerry Hovis, Sean Legeer); and
- NMFS NEPA coordinator (John Hansel).

13.0 LIST OF AGENCIES, ORGANIZATIONS, AND PERSONS CONSULTED AND TO WHOM COPIES OF THE EIS WILL BE SENT

Under 304(g)(1)(A) of the Magnuson-Stevens Act, NMFS is required to consult with affected Fishery Management Councils, ICCAT Commissioners and advisory groups, and the Advisory Panels established under the Magnuson-Stevens Act regarding amendments to the HMS FMP. As described below, NMFS provided documents and met with the consulting parties and to the Atlantic and Gulf States Marine Fisheries Commissions 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 conduct an Environmental Impact Statement (EIS) and amend the two current FMPs on July 9, 2003 (68 FR 40907). On April 30, 2004 (69 FR 23730), NMFS announced the availability of an Issues and Options Paper and its intent to hold nine scoping meetings (Gloucester, MA; Ocean City, MD; New Orleans, LA; Manteo, NC; San Juan, PR; Destin, FL; Montauk, NY; Port Aransas, TX; and Cocoa Beach, FL). On May 26, 2004 (69 FR 29927), NMFS extended the comment period to July 23, 2004, and announced an additional scoping meeting (Key West, FL). During this time, NMFS presented the Issues and Options Paper to the New England, Mid-Atlantic, and Gulf of Mexico Fishery Management Councils (69 FR 22006, April 23, 2004; 69 FR 31966, June 8, 2004; and 69 FR 36066, June 28, 2004, respectively) and the Atlantic States Marine Fisheries Commission. Council and Commission members from any Council or Commission were invited to attend any of the scoping meetings and to submit comments. A summary of the major comments received during scoping was released in December 2004 and is available on the HMS Management Division webpage at http://www.nmfs.noaa.gov/sfa/hms. Hard copies can be requested at (301) 713-2347 or via fax at (301) 713-1917.

In February 2005, NMFS released the combined Predraft to the Consolidated HMS FMP and annual Stock Assessment and Fishery Evaluation (SAFE) Report. NMFS presented the Predraft document to the five Atlantic Regional Fishery Management Councils (February 9, 2005, 70 FR 6839; February 18, 2005, 70 FR 8345; March 1, 2005, 70 FR 9924; March 11, 2005, 70 FR 12204; April 4, 2005, 70 FR 17068), both the Atlantic and Gulf States Marine Fisheries Commissions, and to the HMS and Billfish Advisory Panels (August 25, 2004, 69 FR 52235). The comments received on the Predraft were summarized in a document released in June 2005. The Predraft and a summary of the comments received on the Predraft are available on the HMS webpage or hard copies can be requested at (301) 713-2347 or via fax at (301) 713-1917. Comments received on both the Issues and Options Paper and the Predraft were considered when drafting and analyzing the ecological, economic, and social impacts of the alternatives presented in both the Draft and Final Consolidated HMS FMPs.

On August 19, 2005, NMFS released the draft Consolidated HMS FMP and its proposed rule (70 FR 48704; 70 FR 48804). The comment period was expected to end on October 18, 2005 (60 days). Additionally, in the proposed rule, NMFS announced that 24 public hearings would be held from Massachusetts to Texas and in the Caribbean. On September 7, 2005, NMFS announced that the New Orleans, LA, and Orange Beach, AL, public hearings would be

postponed due to the impact of Hurricane Katrina (70 FR 53146). On September 12, 2005, NMFS announced that the HMS and Billfish Advisory Panels would meet in October 2005 to discuss the draft Consolidated HMS FMP. On September 23, 2005, NMFS announced that the Key West, FL, public hearing would be postponed due to the impact of Hurricane Rita (70 FR 55814). On October 5, 2005, NMFS announced that the comment period was extended until March 1, 2006 (194 days in total), in order to ensure that entities affected by Hurricanes Katrina and Rita that could be impacted by the measures in the draft Consolidated HMS FMP would have an adequate time period in which to provide comments (70 FR 58177). In this same notice, NMFS announced that the Billfish and HMS Advisory Panels meeting scheduled for October 2005 would be delayed and that the Advisory Panels would meet instead on February 21 - 23, 2006. On December 27, 2005 (70 FR 76441), NMFS announced that the hearings that were postponed would be held in January and February 2006. Due to the damage from the hurricanes, the New Orleans, LA, hearing was moved to Houma, LA. In addition to the 24 public hearings, NMFS also attended and presented the draft Consolidated HMS FMP to the five Atlantic Regional Fishery Management Councils (July 29, 2005, 70 FR 43847; August 24, 2005, 70 FR 49567; September 6, 2005, 70 FR 52989; September 16, 2005, 70 FR 54714; and September 20, 2005, 70 FR 55112) and to both the Atlantic States and Gulf States Marine Fisheries Commissions. During the public comment period, NMFS received over 3,300 form letter comments, which were mainly in regard to the proposed billfish measures, and over 200 individual written comments on all issues including the proposed billfish measures. A list of all the entities that provided written comments is available upon request. The summary of the comments and NMFS' responses is provided in Appendix D and will also be in the final rule.

On December 16, 2004, the Office of Management and Budget (OMB) issued a directive requiring Federal Agencies to have "influential scientific information" and "highly influential scientific assessments" peer reviewed. NMFS decided that certain sections of the Draft Consolidated Atlantic HMS FMP could contain "influential scientific information," which is defined as: scientific information (factual inputs, data, models, analyses, technical information, or scientific assessments) that the Agency reasonably can determine does have or will have a clear and substantial impact on important public policies or private sector decisions. As such, during the public comment period, NMFS requested three scientists who were not involved in the drafting of the Consolidated HMS FMP to review certain sections of the HMS FMP. Specifically, NMFS asked them to review the standardized bycatch reporting methodology (Sections 3.8.2 through 3.8.5 of the draft HMS FMP), time/area closure analyses (Section 4.4.2 and Appendix A of the draft HMS FMP), and essential fish habitat (EFH) sections (Chapter 10 and Appendix B of the draft HMS FMP).

Per the OMB peer review bulletin, NMFS noted that such a peer review should evaluate the clarity of hypotheses, the validity of the research design, the quality of data collection procedures, the robustness of the methods employed, the appropriateness of the methods for the hypotheses being tested, the extent to which the conclusions follow from the analysis, and the strengths and limitations of the overall product. The peer reviews were used, as appropriate, to clarify assumptions, findings, and conclusions of the bycatch, time/area closure, and EFH sections of this Final Consolidated HMS FMP. Their reviews and NMFS' responses are provided in Appendix E.

After the end of the comment period, NMFS reviewed the comments, the peer reviews,

and the analyses for the alternatives and made changes to the preferred alternatives and/or the supporting analyses, as needed, in order to address the comments received and/or other concerns that were raised during the comment period. All comments were considered when finalizing this document. NMFS also received comments from the Environmental Protection Agency (EPA) regarding the DEIS (March 31, 2006, 71 FR 16301). The DEIS received a rating of "LO," which means lack of objection. NMFS responds to EPA's specific comments in Appendix D with the other public comments received. Copies of this final document will be sent to the EPA regional offices, the HMS consulting parties (the affected Regional Fishery Management Councils, ICCAT Commissioners and advisory groups, and the Advisory Panels), the Atlantic and Gulf States Marine Fisheries Commissions, and other interested parties. An electronic version will also be placed on the HMS Management Division's webpage.