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4.0 ENVIRONMENTAL CONSEQUENCES OF ALTERNATIVES

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

Data sources

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

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

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

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

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

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

Time series

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

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

4.1 Commercial Measures

4.1.1 SCS Commercial Quotas

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

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

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

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

Ecological Impacts

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

Social and Economic Impacts

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

Conclusion

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

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

4.1.2 Commercial Gear Restrictions

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

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

Ecological Impacts

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

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

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

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

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

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

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

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

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

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

Social and Economic Impacts

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

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

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

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

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

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

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

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

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

Conclusion

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

4.1.3 Pelagic Shark Effort Controls

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

There are several ICCAT recommendations that pertain to sharks. In 2004, ICCAT adopted *Recommendation 04-10 Concerning the Conservation of Sharks Caught in Association with Fisheries Managed by ICCAT*. This was the first binding measure passed by ICCAT dealing specifically with sharks. This recommendation included, among other measures: reporting of shark catch data by Contracting Parties, a ban on shark finning, a request for Contracting Parties to live-release sharks that are caught incidentally, a review of management alternatives from the 2004 assessment on blue and shortfin mako sharks, and a commitment to conduct another stock assessment of selected pelagic shark species no later than 2007. In 2005, additional measures pertaining to pelagic sharks were added to the 2004 recommendation. Measures included a requirement for Contracting Parties that have not yet implemented the 2004 recommendation, to reduce shortfin mako mortality and to report their progress to the Secretariat. In 2006, a recommendation was adopted that amended a paragraph in Recommendation 04-10 that recommended management alternatives and a stock assessment for blue and shortfin mako sharks. At the 2007 meeting, ICCAT adopted measures for the conservation of sharks (Recommendation 07-06) that included requirements to submit Task I and Task II data on bycatch and targeted fisheries for sharks, and to reduce fishing mortality in fisheries targeting porbeagle and shortfin mako sharks. Recommendation 08-07, made at the 2008 ICCAT meeting, called for the live release of bigeye thresher sharks (*Alopias superciliosis*).

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

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

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

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

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

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

Ecological Impacts

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

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

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

Alternative C3 would add shortfin mako sharks to the prohibited species list. Adding shortfin mako sharks to the prohibited species list would make it illegal to retain and land shortfin mako sharks commercially or recreationally. NMFS has established criteria for adding shark species to the prohibited species list; a species can be added if two of the following four criteria are met: 1) There is sufficient biological information to indicate the stock warrants protection, such as indications of depletion or low reproductive potential or the species is on the ESA candidate list; 2) the species is rarely encountered or observed caught in HMS fisheries; 3) the species is not commonly encountered or observed caught as bycatch in fishing operations; or 4) the species is difficult to distinguish from other prohibited species (*i.e.*, look-alike issue). Shortfin mako sharks were determined to have overfishing occurring based on the 2008 ICCAT stock assessment and could, therefore, meet the first criterion. In addition, shortfin mako sharks look similar to other sharks on the prohibited species list (*i.e.*, white sharks and longfin mako sharks) and could, therefore, meet the fourth criterion. This alternative is expected to have neutral or slightly positive ecological impacts for this stock. Average commercial landings of shortfin mako sharks from 2004 to 2007 were 72.5 mt dw and were well below the 488 mt dw quota as they are primarily caught as bycatch in the PLL fishery. According to observer reports from 1992-2006, 68.9 percent of shortfin mako sharks are brought to the vessel alive and 30.1 percent come to the vessel dead. Also, of the shortfin mako sharks that are caught, 61.4 percent are kept, 22.1 percent are discarded alive, and 9.9 percent are discarded dead. This data indicates that although prohibiting the retention of shortfin mako sharks may have more positive ecological impacts for this stock than alternative C2, this alternative could also result in a slight increase of dead discards. In addition, the United States does not have a directed commercial fishery for this species and does not contribute to a significant proportion of Atlantic-wide fishing mortality of shortfin mako sharks (Table 3.20). Therefore, NMFS does not prefer alternative C3 at this time.

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

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

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

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

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

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

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

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

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

NMFS assumes that not all shortfin mako sharks kept are alive when reaching the vessel; therefore, imposing a size limit could lead to an increase in dead discards. NMFS calculated additional dead discards associated with a 22 inches IDL size limit using the same methodology for calculating live releases as described above, with an at-vessel mortality rate of 19.6 percent. Alternative C4b would lead to an estimated increase of 1 shortfin mako shark dead discard annually in the PLL and BLL fisheries (Table 4.14). It is important to note that although shortfin mako shark dead discards may increase under the size limit in alternative C4b, no additional shortfin mako shark mortality would result from implementing this size limit.

Table 4.13 Comparison of commercial size limits for shortfin mako sharks (SFM), and their estimated affect on shortfin mako shark live releases.

Alt.	A Size Limit (inches IDL)	B Total SFM catch (POP)	C Total number of SFM kept (POP)	D Number of SFM kept under size limit (POP)	E Estimated number of SFM released alive under size limit	F Percentage of additional shortfin mako released alive under size limit E/B	G Average number of SFM kept per year (logbook) D	H Estimated number of additional SFM released alive under size limit F*G	I Average number of all SFM released alive (logbook)	J Total number of SFM released alive per year H+I
C4a	32	4375	2535	208	136	3.12%	2845	89	47	136
C4b	22	4375	2535	9	7	0.17%	2845	5	47	53

Table 4.14 Comparison of commercial size limits for shortfin mako sharks (SFM), and their estimated affect on shortfin mako shark dead discards.

Alt.	A Size Limit (inches IDL)	B Total SFM catch (POP)	C Total number of SFM kept (POP)	D Number of SFM kept under size limit (POP)	E Estimated number of SFM dead discards under size limit	F Percentage of additional shortfin mako dead discards under size limit E/A	G Average number of SFM kept per year (logbook)	H Estimated number of additional SFM dead discards under size limit F*G	I Average number of SFM dead discards per year (logbook)	J Total number of SFM dead discards per year (logbook) H+I
C4a	32	4375	2535	208	72	1.64%	2845	46	7	53
C4b	22	4375	2535	9	2	0.04%	2845	1	7	8

Alternatives C4a and C4b would both result in positive ecological impacts to the shortfin mako shark stock, as more shortfin mako sharks would be released alive than under the No Action alternative. The positive impacts are less in C4b than in C4a because there are fewer shortfin mako sharks released alive. Also, retention of immature female sharks would still be allowed in alternative C4b because the size limit is set at the size at which 50 percent of males reach sexual maturity, which is lower than the size at which 50 percent of females reach sexual maturity. Alternative C4a would result in 84 more live releases of more shortfin mako sharks than alternative C4b, and retention of immature females would be minimized because the size limit would equal the size at which 50 percent of females reached sexual maturity. However, given the relatively few number of additional live releases of shortfin mako sharks under either alternative C4a or C4b, NMFS does not prefer either alternative at this time.

Under alternative C5, the preferred alternative, NMFS would take action at the international level through international fisheries management organizations to develop management measures applicable to all participating nations to end overfishing of shortfin mako sharks. ICCAT assumes three shortfin mako shark stocks for assessment purposes: northern and southern Atlantic stocks, separated at 5°N latitude, and a Mediterranean stock. Based on the 2008 SCRS stock assessment on the North Atlantic shortfin mako shark population, NMFS determined domestically that the species is experiencing overfishing and approaching an overfished status. According to ICCAT estimates, shortfin mako shark annual commercial landings did not exceed 11,000 fish from 1992 to 2007 (Table 4.15). Most of the landings were attributable to the recreational fishery, whose catches in numbers peaked in 1985 to about 80,000 fish, and ranged from less than 1,400 fish to over 31,000 fish in the remaining years. PLL discards of shortfin mako sharks were negligible since the meat of this species is highly valued, with a median real dollar, U.S. ex-vessel price per pound of $1.59 from 2004 to 2007. Total catches ranged from about 5,600 fish in 1998 to almost 80,000 fish in 1985, when recreational catches peaked (Table 4.15). U.S. commercial harvest of Atlantic shortfin mako sharks has historically been less than ten percent of the recorded total international landings, based on 1997 through 2007 data (Table 3.20). Because of the small U.S. contribution to Atlantic shortfin mako shark mortality, domestic reductions on shortfin mako shark mortality would not end overfishing of the entire North Atlantic stock. Therefore, NMFS believes that ending overfishing and preventing an overfished status would be better accomplished through international efforts where other countries that have large takes of shortfin mako sharks could participate in mortality reduction discussions. Sections 102 and 304(i) of the Magnuson-Stevens Act encourage this approach, particularly where a species is approaching an overfished condition due to excessive international fishing pressure and there are no management measures to end overfishing under an international agreement to which the United States is a party. While this alternative could have negative ecological impacts for the portion of the shortfin mako shark stock that is fished by U.S. fishermen, in the short term, any management recommendations adopted at the international level to end overfishing of shortfin mako sharks could have positive ecological impacts on shortfin mako sharks in the long term. Therefore, NMFS prefers alternative C5 at this time.

Table 4.15 Estimates of commercial and recreational landings and dead discards for shortfin mako sharks in the U.S. Atlantic, Gulf of Mexico, and Caribbean. (ICCAT, 2008)

	Commercial					Recreational			Discards			Total		
Year	mt (ww) [1]	mt (dw) [2]	lb (dw) [3]	av. weight [4]	number [5]	number [6]	av. weight [7]	lb (dw)	number	mt (ww)	lb (dw) [8]	number	lb (dw)	mt (ww)
1981						7,678	56.395	433,001				7,678	433,001	385
1982						13,522	50.996	689,568				13,522	689,568	613
1983						7,375	51.597	380,529				7,375	380,529	338
1984						15,474	67.531	1,044,975				15,474	1,044,975	929
1985						79,912	41.487	3,315,309				79,912	3,315,309	2,947
1986						20,792	70.107	1,457,665				20,792	1,457,665	1,296
1987						14,809	35.069	519,337			0	14,809	519,337	462
1988						19,998	44.693	893,771			0	19,998	893,771	795
1989						8,367	90.117	754,009			0	8,367	754,009	670
1990						8,509	35.483	301,925			0	8,509	301,925	268
1991						3,422	69.02	236,186			0	3,422	236,186	210
1992				64.400	3,782	8,382	33.589	281,543	437	25.57	28,761	12,601	310,304	276
1993	281.09	143.41	316,164	35.800	4,044	15,034	49.883	749,941	460	19.85	22,327	19,538	1,088,432	968
1994	324.66	165.64	365,177	39.100	4,623	4,496	79.296	356,515	487	18.03	20,280	9,606	741,972	660
1995	288.83	147.36	460,767	52.700	8,743	31,212	51.227	1,598,897	446	28.44	31,989	40,401	2,091,653	1,860
1996	238.05	121.46	427,020	87.000	4,908	8,618	30.265	260,824	0	0.00	0	13,526	687,844	612
1997	245.46	125.23	446,305	44.000	10,143	3,025	60.839	184,038	0	0.00	0	13,168	630,343	560
1998	199.76	101.92	401,491	72.600	5,530	5,633	29.590	166,680	0	0.00	0	11,163	568,171	505
1999	90.05	45.94	217,867	47.000	4,635	1,383	51.597	71,359	0	0.00	0	6,018	289,226	257
2000	166.74	85.07	286,764	44.200	6,488	5,813	51.597	299,934	0	0.00	0	12,301	586,698	522
2001	182.02	92.87	347,844	50.700	6,861	2,827	83.938	237,293	0	0.00	0	9,688	585,137	520
2002	165.59	84.48	314,736	38.900	8,091	3,206	87.152	279,409	0	0.00	0	11,297	594,145	528
2003	140.80	71.84	285,222	40.000	7,131	3,906	35.880	140,147	0	0.00	0	11,037	425,369	378
2004	188.31	96.07	392,628	40.023	9,810	5,052	55.796	281,881	0	0.00	0	14,862	674,509	600
2005	186.03	94.91	341,391	61.576	5,544	3,857	31.204	120,354	0	0.00	0	9,401	461,745	411
2006	129.67	66.16	232,757	37.556	6,198	3,352	53.232	178,434	0	0.00	0	9,550	411,191	366
2007	214.88	109.63	352,905	47.920	7,364	2,556	38.975	99,620	0	0.00	0	9,920	452,525	402

[1] In whole weight from weighout data sheets; [2] Whole weight to dressed weight conversion ratio is 1.96; [3] 1982-1994 data are from weighout data sheets, 1995-2007 data are the sum of the southeast quota monitoring program/southeast general canvass and the northeast general canvass/dealer weighout data; [4] In pounds dressed weight from the pelagic longline observer program; [5] 1982-1994 data are taken directly from weighout data sheets, 1995-2007 data obtained by dividing values in fourth column (lb dw) by those in fifth column (av. weight); [6] Almost all recreational landings are from the MRFSS survey; [7] In pounds dressed weight; [8] Whole weight to dressed weight conversion ratio is 1.96.

Under alternative C6, the preferred alternative, NMFS would promote the live release of shortfin mako sharks in the commercial shark fishery, but this alternative would not result in any changes to the current commercial regulations regarding shortfin mako sharks. This alternative is expected to have slightly positive or neutral ecological benefits for shortfin mako sharks because 68.9 percent of shortfin mako sharks are brought to the vessel alive and could be released. This action would not restrict commercial harvest and landing of shortfin mako sharks that are alive at haulback, therefore, this alternative would likely have neutral ecological impacts for this stock since 61.4 percent of shortfin mako sharks that are caught are kept. However, as this alternative could result in the reduction of fishing mortality of shortfin mako sharks by encouraging fishermen to release shortfin mako sharks brought to the fishing vessel alive, NMFS prefers this alternative at this time.

Social and Economic Impacts

Currently, on average, 72.5 mt dw of shortfin mako sharks were commercially landed between 2004 and 2007. Using the median real dollar, ex-vessel price per pound of $1.59 for meat and $12.00 for fins, for shortfin mako sharks during the same timeframe, this is equivalent to $350,039 in average annual gross revenues. Because the No Action Alternative, alternative C1, would not modify or alter commercial fishing practices for shortfin mako sharks or other shark species, it would likely not result in any adverse economic or social impacts.

Alternative C2 would implement a species-specific quota for shortfin mako sharks at the level of the average annual commercial landings for this species. This alternative is expected to have neutral or slightly negative socioeconomic impacts. On average, 72.5 mt dw (159,834 lb dw) of shortfin mako sharks were commercially landed between 2004 and 2007. The average landings weight was then multiplied by the median real dollar, ex-vessel price per pound for shortfin mako shark meat from 2004 to 2007 ($1.59) to generate estimated annual economic revenues from the meat of shortfin mako sharks of $254,135. Fin weight was calculated by using the standard fin to carcass ratio of 5 percent dw. Using this ratio, of the 159,834 lb dw of shortfin mako shark landed, approximately 7,992 lb dw would have been shortfin mako shark fins. The fin weight was then multiplied by the median fin price per pound from 2004 to 2007 ($12.00) to generate estimated annual economic revenues from the fins of shortfin mako sharks of $95,904. Therefore, the estimated annual revenues for both the meat and fins of shortfin mako shark landings from 2004-2007 is equal to approximately $350,039. While fishermen would be able to maintain current fishing effort under this alternative, any increase in effort would be restricted by the species-specific quota of 72.5 mt dw. Under the No Action alternative, commercial fishermen currently have a 488 mt dw quota which could potentially be filled entirely by shortfin mako shark landings. Based on the median real dollar, ex-vessel price per pound of $1.59 for shortfin mako sharks, a quota of 488 mt dw could result in maximum annual revenues equal to $1,710,593. Thus, if the quota is reduced to 72.5 mt dw, which equals $254,135 in ex-vessel annual revenues, this could potentially result in a loss of annual revenues of $1,456,458 for commercial fishermen; however, given that shortfin mako sharks are bycatch in the PLL fishery, it is unlikely that the entire pelagic shark quota would be entirely filled with shortfin mako landings. NMFS does not prefer this alternative at this time because the United States contributes a small portion of shortfin mako shark mortality (due to no directed fishery) compared to the relative cumulative fishing mortality caused by other nations, and the 2008

stock assessment did not recommend a TAC that was necessary to end overfishing of shortfin mako sharks.

Alternative C3 would remove shortfin mako sharks from the pelagic shark species complex and add them to the prohibited species list. This alternative is not expected to have negative economic impacts for commercial fishermen because this is not a species that is targeted by commercial fishermen. Shortfin mako sharks are predominately caught as bycatch in the PLL fishery and, on average, the annual commercial landings for shortfin mako sharks from 2004 to 2007 were 72.5 mt dw. Based on the median real dollar, ex-vessel prices per pound of $1.59, this is equivalent to $254,135. However, since shortfin mako sharks would be placed on the prohibited species list under alternative C3, there could be an estimated reduction in annual revenues of $254,135 to the commercial fishermen. This alternative could lead to increased operation time if commercial fishermen have to release and discard all shortfin mako sharks that are caught on the PLL gear. Also, if the commercial PLL fleet expands in the future, placing shortfin mako sharks on the prohibited species list could result in a loss of future revenues for the commercial PLL fishery.

The potential economic impacts of implementing alternatives C4a or C4b were assessed by estimating the annual mt dw of shortfin mako sharks that would normally be landed for sale, which would now have to be released under these alternatives. Size limits in alternatives C4a and C4b would restrict the harvest of smaller shortfin mako sharks. To assess the impact of the size limits, NMFS calculated the average dressed weight percentage of shortfin mako sharks retained below each size limit using POP data and then applied that to landings data from the 2008 SAFE Report. Because the POP data is recorded as number of individuals caught, the data were converted into dressed weight by utilizing records of shortfin mako sharks that were recorded as kept and had an associated length measurement in the POP data. Fork lengths were converted into pounds dressed weight, and each conversion was multiplied by the number of sharks kept at each fork length. The dressed weights of individual sharks were then summed to get a total dressed weight for all shortfin mako sharks kept in the PLL and BLL fisheries (*i.e.*, 184,803.1 lb dw).

For alternative C4a, the summed dressed weight of all kept shortfin mako sharks under the proposed 32 inches IDL size limit was 2,550.5 lb dw. This made up 1.4 percent of total dressed weight landings of shortfin mako sharks ((2,550.5 / 184,803.1)*100). This percentage was then applied to the average commercial landings found in the 2008 SAFE Report from 2004-2007 (*i.e.*, 158,884.8 lb dw) to determine the estimated dressed weight of shortfin mako sharks that would be unavailable for landing under alternative C4a (158,884.8 lb dw * 1.4 percent = 2,061.1 lb dw) (Table 4.16). The 2,061.1 lb dw of unavailable shortfin mako shark meat was then multiplied by the median real dollar price per pound estimate ($1.59) for shortfin mako sharks from 2004 to 2007 to generate an estimated annual economic loss of $3,277. Fin weight was calculated by using the standard fin to carcass ratio of 5 percent dw. Using this ratio, 103 lb of fins would be unavailable for harvest. The unavailable fin weight was then multiplied by the median fin price per pound from 2004 to 2007 ($12.00) to generate an estimated annual economic loss of $1,236.00. Economic losses of meat and fins were then summed to calculate a total economic loss of $4,513 under alternative C4a.

For alternative C4b, the summed dressed weight of all kept shortfin mako sharks under the proposed 22 inches IDL size limit was 39.7 lb dw. This made up 0.02 percent of dressed weight landings of shortfin mako sharks ((39.7 / 184,803.1)*100). This percentage was then applied to the average commercial landings found in the 2008 SAFE Report from 2004-2007 (158,884.8 lb dw) to determine the estimated dressed weight of shortfin mako sharks that would be unavailable for landing under alternative C4b (158,884.8 lb dw * 0.02 percent = 34.3 lb dw) (Table 4.16). The 34.3 lb dw of unavailable shortfin mako shark was then multiplied by the median price per pound estimate ($1.59) for shortfin mako sharks from 2004 to 2007 to generate an estimated annual economic loss of $54.54. Fin weight was calculated by using the standard fin to carcass ratio of 5 percent dw. Using this ratio, 1.72 lb of fins would be unavailable for harvest. The unavailable fin weight was then multiplied by the median fin price per pound from 2004 to 2007 ($12.00) to generate an estimated annual economic loss of $20.64. Economic losses of meat and fins were then summed to calculate a total economic loss of $75.18 under alternative C4b.

Table 4.16 Estimates of shortfin mako shark landings (lb dw) reductions according to size restrictions in alternatives C4a and C4b.

Alternative	Size Limit (inches IDL)	Average shortfin mako shark commercial landings (lb dw) from 2004-2007 (2008 Safe Report)	Percentage of total landings (lb dw) of shortfin mako sharks below size limit (POP)	Estimated total weight (lb dw) of shortfin mako shark prohibited.
C4a	32	159,884.75	1.4	2,061.1
C4b	22	159,884.75	0.02	34.3

Alternatives C4a and C4b would both have minimal economic impacts because only a small percentage of commercial landings would be affected by the size restrictions. Of the two alternatives, the negative economic impact of C4a would be greater, as commercial landings by weight are 2,026.8 lb dw greater than in alternative C4b. Despite these minimum economic impacts, since the size limits would not reduce fishing mortality of shortfin mako sharks in the commercial sector, NMFS does not prefer this alternative at this time.

Under alternative C5, a preferred alternative, NMFS would, take action at the international level through international fishery management organizations to establish management measures to end overfishing of shortfin mako sharks. In the short term, this alternative would not result in any negative economic or social impacts on commercial fishermen as it would not restrict commercial harvest of shortfin mako sharks, nor alter the pelagic shark quota. Therefore, the social and economic impacts of alternative C5 would be the same as described in the No Action alternative, alternative C1. However, although this alternative could have negative social and economic impacts in the long term if management measures were adopted by the United States that would reduce landings domestically for shortfin mako sharks. Those recommendations would ultimately help end overfishing of shortfin mako in the long term. Therefore, NMFS prefers alternative C5 at this time.

Alternative C6, a preferred alternative, would promote the release of shortfin mako sharks brought to fishing vessels alive. This alternative would likely not result in any negative economic or social impacts as it would not restrict commercial harvest of shortfin mako sharks

that are alive at haulback, and quotas and retention limits would remain as described in the No Action alternative, Alternative C1. However, as this alternative could result in the reduction of fishing mortality of shortfin mako sharks by encouraging fishermen to release shortfin mako sharks brought to the fishing vessel alive, NMFS prefer this alternative at this time.

Conclusion

Based on the latest ICCAT stock assessment, the United States has determined that shortfin mako sharks are not overfished but appear to be approaching an overfished condition and have overfishing occurring. In comparison to the cumulative fishing mortality caused by other nations, the minor relative impact of the United States contributes very little to shortfin mako shark mortality in the North Atlantic because there is no directed U.S. commercial fishery. The ICCAT stock assessment did not provide a recommended TAC or mortality reductions to prevent overfishing of shortfin mako sharks, making it difficult to set a quota or other limit to prevent overfishing. Therefore, the preferred alternatives at this time would be to take action at the international level through international fishery management organizations to establish management measures to end overfishing of shortfin mako sharks and to promote the live release of shortfin mako sharks in the domestic commercial shark fishery. Neither of these two preferred alternatives would change the current commercial regulations for shortfin mako sharks. NMFS believes that ending overfishing and preventing an overfished status would be better accomplished through international efforts where other countries that have large takes of shortfin mako sharks could participate in shortfin mako shark mortality reductions. While this alternative would have neutral ecological and socioeconomic impacts for the portion of the shortfin mako shark stock that is fished by U.S. fishermen, in the short term, any international management recommendations adopted by the United States to help protect shortfin mako sharks would be implemented domestically and could have positive ecological impacts on shortfin mako sharks and potentially negative socioeconomic impacts on U.S. fishermen in the long term. Promoting the release of shortfin mako sharks that are brought to the vessel alive could result in the reduction of fishing mortality of shortfin mako sharks and thus, have positive ecological impacts for this species. Compared to alternatives C2, C3, and C4, the preferred alternatives would likely not result in any negative socioeconomic impacts as it would not restrict commercial harvest of shortfin mako sharks that are alive at haulback, and commercial quotas and retention limits would remain as described in the No Action alternative.

4.2 Recreational Measures

4.2.1 Small Coastal Sharks

As with the commercial fishery, NMFS is also considering new management measures within the recreational fishery to ensure that blacknose sharks are rebuilt by 2027. On average, from 1999-2005, the recreational fishery landed 10,408 blacknose sharks per year. However, since most, if not all, blacknose sharks rarely reach the 54 inch FL minimum size limit that is currently in place in federal waters, presumably blacknose sharks are being landed in state waters that have more liberal size limits. NMFS would have to work with states to ensure complementary recreational management measures, including the ASMFC and their interstate FMP for coastal sharks, in order to achieve the needed reduction in recreational landings and in order to rebuild blacknose sharks (*i.e.*, at least a 78-percent reduction in landings or total

mortality of 2,290 blacknose sharks per year by recreational fishermen). As described in Chapter 2, the alternatives considered for small coastal shark in the recreational fishery are:

Alternative D1	No Action. Maintain the current recreational retention and size limit for SCS
Alternative D2	Modify the minimum recreational size limit for blacknose sharks based on their biology
Alternative D3	Increase the retention limit for Atlantic sharpnose sharks based on current catches
Alternative D4	*Prohibit retention of blacknose sharks in recreational fisheries - Preferred Alternative*

Ecological Impacts

Under alternative D1, the No Action alternative, NMFS would maintain the existing recreational retention limits for SCS. Recreational anglers are currently allowed one authorized shark per vessel per trip (including SCS). In addition, they are allowed 1 bonnethead shark and 1 Atlantic sharpnose shark per person per trip. In addition, there is a recreational minimum size of 54 inches (4.5 ft) FL, which does not apply to Atlantic sharpnose or bonnethead sharks. The current recreational harvest of SCS combined from 2004-2007 was 536,886 fish (33,555.4/year). The Atlantic sharpnose shark was the most abundant species caught at a rate of 86,862.8/year. The other average yearly harvest rates were 35,164.8 for bonnethead sharks, 10,360 for blacknose sharks, and 1,834 for finetooth sharks. Since there would be no change to the retention limits under alternative D1, the ecological impacts associated with this alternative would be the same as the status quo. This would have neutral ecological impacts for Atlantic sharpnose, bonnethead, and finetooth sharks, as all species were not determined to be overfished and overfishing is not occurring. However, this could have negative ecological impacts on blacknose sharks as blacknose sharks were determined to be overfished with overfishing occurring. Without reductions in current blacknose shark recreational landings, NMFS would not be able to achieve the TAC of 19,200 blacknose sharks per year recommended by the 2007 blacknose shark stock assessment. To achieve this TAC, NMFS would need to reduce overall blacknose mortality by at least 78 percent. Since this alternative would not reduce blacknose shark recreational landings, NMFS does not prefer this alternative at this time.

Alternative D2 would modify the minimum recreational size for blacknose sharks based on their biology. Currently, the minimum retention size is 54 inches. However, the minimum size was based on the size at which 50 percent of female sandbar sharks reached sexual maturity. Blacknose sharks rarely, if ever, reach 54 inches as a maximum size. Given the difference in sizes for sexual maturity for blacknose and sandbar sharks, such a minimum size would need to be changed. A minimum size for blacknose sharks that corresponds to the size at which 50 percent of the female blacknose sharks reach sexual maturity is 36 inches FL. Thus, if NMFS based a new minimum size for blacknose sharks based on the size at which 50 percent of the female blacknose sharks reach sexual maturity, or 36 in FL, the new restriction would lower the current minimum size for blacknose sharks and could lead to increased landings of blacknose sharks. Based on data from MRFSS, the average length of blacknose sharks landed by recreational anglers was less than 36 inches FL. Thus, landings are not expected to increase by a significant amount by implementing this smaller size limit for blacknose sharks. However, in

order to achieve the TAC recommended by the 2007 blacknose shark stock assessment, NMFS would need to reduce overall blacknose mortality. Since decreasing the minimum size for blacknose sharks could result in increased landings of blacknose sharks, NMFS does not prefer this alternative at this time.

Alternative D3 would increase the retention limit for Atlantic sharpnose sharks based on their current catches and stock status. Based on the 2007 stock assessment for Atlantic sharpnose, the biomass for Atlantic sharpnose sharks is falling towards the maximum sustainable yield (B_{MSY}) threshold (NMFS, 2007). While the stock is not currently overfished or experiencing overfishing, the latest stock assessment suggests that increasing fishing effort, such as increasing the retention limit of Atlantic sharpnose sharks, could result in an overfished status and/or cause overfishing to occur. Thus, since increasing the retention limit for Atlantic sharpnose could result in increased fishing effort and result in negative ecological impacts for the stock, NMFS does not prefer this alternative at this time.

Under alternative D4, the preferred alternative, NMFS would prohibit the retention of blacknose sharks in the recreational fishery. This would have positive ecological impacts for the stock as it would reduce recreational landings of blacknose sharks in federal waters. To the extent that individual states mirror federal regulations, blacknose shark recreational landings could also be reduced in state waters. A reduction of blacknose shark recreational landings of 78 percent is needed to achieve the overall TAC of 19,200 blacknose sharks killed/year. This alternative would help reduce blacknose shark recreational landings and help rebuild the blacknose shark stock. Given that state recreational catch rates were 6,958.3 blacknose/year and total (federal and state) blacknose shark recreational landings were 10,360 blacknose/year, it can be assumed that blacknose shark landings would be reduced by at least 3,402.7 blacknose sharks/year under alternative D4. However, in order to achieve the TAC, blacknose shark recreational landings would need to be reduced by 78 percent or to 2,280 blacknose/year (see alternative D1). Thus, cooperation by individual states to prohibit the retention of blacknose sharks in state waters would be important in achieving the mortality reduction required to achieve the TAC recommended by the latest stock assessment in order to rebuild the blacknose shark stock. Since this alternative reduces the number of blacknose shark recreational landings and aids in reaching the TAC needed to rebuild the stock, NMFS prefers this alternative at this time.

Social and Economic Impacts

Under alternative D1, the No Action alternative, NMFS would maintain current recreational management measures, including the current retention limits and size limits for SCS. Therefore, the social and economic impacts of alternative D1 would be the same as the status quo, and no negative social or economic impacts would be anticipated under alternative D1. However, as this alternative would not help rebuild blacknose sharks, as explained in the ecological impacts of this section, NMFS does not prefer this alternative at this time.

Alternative D2 would modify the minimum recreational size for blacknose sharks based on the biology of blacknose sharks. This would lower the current size limit from 54 in FL to 36 in FL, the size at which 50 percent of the female blacknose sharks reach sexual maturity. According to data from MRFSS, the average length of blacknose sharks landed by recreational

anglers is less than 36 in FL. As such, this alternative could increase the landings of recreationally harvested blacknose sharks and, therefore, could have a positive social and economic impact. Since this alternative could result in the increase of blacknose shark recreational landings and NMFS needs to reduce the number of blacknose shark landings in order to rebuild the stock, NMFS does not prefer this alternative at this time.

Alternative D3 would increase the retention limit for Atlantic sharpnose sharks based on their current catches and stock status. Any increase in the retention limit for Atlantic sharpnose sharks would provide positive social and economic impacts, especially if this resulted in more charter trips for charter/headboats. However, since the latest stock assessment suggests that increased fishing effort could result in an overfished status and/or cause overfishing to occur in the future (NMFS, 2007), NMFS does not prefer this alternative at this time.

Under alternative D4, the preferred alternative, NMFS would prohibit the retention of blacknose sharks in the recreational fishery. While recreational fishermen may still catch blacknose sharks when fishing for other species, they would not be permitted to retain blacknose sharks and would have to release them. This could have negative social and economic impacts on recreational fishermen, including tournaments and charter/headboats, if the prohibition of blacknose sharks resulted in fewer charters. However, since blacknose sharks are not one of the primary species targeted by recreational anglers, in tournaments or on charters, NMFS does not anticipate large negative social and economic impacts from this alternative on recreational anglers, tournaments, or in the charter/headboat sector. Therefore, NMFS prefers this alternative at this time.

Conclusion

The preferred alternative D4, to prohibit the retention of blacknose sharks in the recreational fishery, would reduce the number of blacknose sharks recreationally landed in federal waters. This prohibition would help to achieve the overall TAC of 19,200 blacknose sharks/year across all fisheries and would assist in rebuilding the stock. In order to accomplish rebuilding, blacknose shark recreational landings would need to be reduced from 6,958.3 blacknose/year or to 2,280 blacknose/year. Therefore, complementary measures in states waters to prohibit the retention of blacknose sharks would be important in achieving the mortality reduction required to attain the TAC recommended by the latest stock assessment. The other alternatives of no action or modifying the minimum size limit for blacknose sharks would not allow NMFS to reduce the mortality of blacknose sharks and achieve the recommended TAC. Also, increasing the retention limit of Atlantic sharpnose sharks under alternative D3 could cause overfishing of Atlantic sharpnose in the future. Therefore, NMFS prefers alternative D4 at this time.

4.2.2 Pelagic Sharks

As described in Chapter 2, the alternatives considered for pelagic sharks in the recreational fishery are:

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

Alternative E2 Increase the recreational minimum size limit of shortfin mako sharks

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

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

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

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

Alternative E5 Prohibit landing of shortfin mako sharks in the recreational fishery (catch and release only)

Ecological impacts

Under alternative E1, the No Action alternative, NMFS would maintain the current recreational shark fishing regulations that pertain to shortfin mako sharks established in the 2006 Consolidated HMS FMP. The current bag limit for HMS Angling and HMS Charter/Headboat permit holders is one authorized shark species greater than 54 inches FL per vessel per trip, plus one Atlantic sharpnose and one bonnethead shark per person per trip. According to recreational landings data, on average 3,682 shortfin mako sharks were landed from 2004 to 2007 (NMFS 2008). Therefore, due to the low numbers of shortfin mako sharks landed in the commercial fishery, it is unlikely that maintaining the No Action alternative would have significant negative ecological impacts on the shortfin mako stock.

Alternative E2 would increase the current recreational size limit for shortfin mako sharks. Currently, the recreational size limit for shortfin mako sharks is 54 inches FL; therefore, increasing this size limit would result in varying degrees of ecological, social and economic impacts. Two size limits have been analyzed for shortfin mako sharks, one based on the size of sexual maturity of females (Alternative E2a) and one based on the size of sexual maturity of males (Alternative E2b). For each alternative, FL estimates of the size at which 50 percent of shortfin mako sharks reach sexual maturity was used from Natanson *et al*., 2006 (185 cm FL for males and 275 cm FL females, respectively), converted to inches, and rounded to the nearest inch to determine the size limit for each alternative to be analyzed. The size limit in inches for alternative E2a was determined to be 108 inches FL, and the size limit in inches for alternative E2b was determined to be 73 inches FL.

To assess the impacts of alternatives E2a and E2b, NMFS used recreational data obtained from the Large Pelagic Survey (LPS). The LPS data comprised recreational landings of shortfin mako sharks from 2004 to 2008, which is reported as recreational activities that took place during HMS fishing tournaments (tournament) and independent of HMS fishing tournaments (non-tournament).

The LPS data analysis was conducted according to whether shortfin mako sharks were landed during tournament or non-tournament fishing activities. The total number of shortfin

mako sharks recorded as tournament and non-tournament landings were summed (292 and 121 sharks, respectively), along with the number of shortfin mako sharks landed below the current size limit of 54 inches FL (4 and 12 sharks, respectively), the number of shortfin mako sharks below the size limit of 108 inches FL in alternative E2a (292 and 119 sharks, respectively), and the number of shortfin mako sharks below the size limit of 73 inches FL in alternative E2b (151 and 98 sharks, respectively). These totals were then used to determine what percentage of tournament and non-tournament recreational shortfin mako shark landings fall below the current recreational size limit, and the two size limits in alternatives E2a and E2b.

According to the LPS tournament data, 1.4 percent of shortfin mako sharks landed were below the current 54 inch FL minimum size, 100 percent were below the 108 inch FL size limit in alternative E2a, and 50.7 percent were below the 73 inch FL size limit in alternative E2b (Table 4.17). Based on non-tournament landings data of shortfin mako sharks, 3.9 percent were below the current 54 inch FL minimum size, 98.3 percent were under the 108 inch FL minimum size in alternative E2a, and 81 percent were under the 73 inch minimum size under alternative E2b (Table 4.17).

Table 4.17 Percentage of shortfin mako sharks with FL measurements reported as landed to the LPS from 2004 to 2008 under the current size limit and size limits in alternatives E2a and E2b.

	Total reported recreational shortfin mako landings with FL measurements from 2004-2007	Percentage of recreational shortfin mako landings from 2004-2007 below the current 54 inch FL size limit	Percentage of recreational shortfin mako landings from 2004-2007 below 108 inch FL sizes	Percentage of reported recreational shortfin mako shark landings from 2004-2007 below 73 inch FL sizes
Tournament	292	1.4%	100%	51.7%
Non-tournament	121	9.9%	98.3%	81.0%
Total	413	3.9%	99.5%	60.3%

For alternative E2a, NMFS applied the total 99.5 percent reduction (tournament and non-tournament landings combined) of shortfin mako sharks landed that were below the 108 inch FL size limit to the recreational landings data found in the 2008 SAFE Report to determine the estimated reduction in recreational shortfin mako shark landings under this alternative. According to the recreational landings data, on average 3,682 shortfin mako sharks were landed from 2004 to 2007 (NMFS 2008). Therefore, when applying the 99.5 percent reduction to the average shortfin mako recreational landings, this would result in 3,664 shortfin mako sharks that would have to be released (3,682 * 99.5 percent = 3,664), and 18 that could be landed under this alternative.

For alternative E2b, NMFS applied the total 60.3 percent reduction (tournament and non-tournament landings combined) of shortfin mako sharks landed that were below the 73 inch FL size limit to the recreational landings data found in the 2008 SAFE Report to determine the estimated reduction in recreational shortfin mako shark landings under this alternative. According to recreational landings data, on average 3,682 shortfin mako sharks were landed from 2004 to 2007 (NMFS 2008). Therefore, when applying the 60.3 percent reduction to the

average shortfin mako recreational landings, this would result in 2,220 shortfin mako sharks that would have to be released (3,682 * 60.3 percent = 2,220), and 1,462 that could be landed under this alternative.

Alternatives E2a and E2b could have positive ecological impacts on shortfin mako sharks, as both alternatives would lead to a large majority of the recreationally caught shortfin mako sharks to be released alive (99.5 and 81 percent, respectively). Due to the larger size limit of 108 inches FL, alternative E2a would have 65 percent more shortfin mako shark released than alternative E2b; therefore, having the greatest ecological benefit of these two alternatives.

Under alternative E3, NMFS would take action at the international level to end overfishing of shortfin mako sharks through participation in international fisheries organizations such as ICCAT. As discussed under alternative C5, ICCAT assumes three shortfin mako shark stocks for assessment purposes: northern and southern Atlantic stocks, separated at 5°N latitude, and a Mediterranean stock. The recreational fishery contributes to most of the landings, whose catches in numbers peaked in 1985 to about 80,000 fish, and ranged from less than 1,400 fish to over 31,000 fish in the remaining years (Table 4.15). Total catches ranged from about 5,600 fish in 1998 to almost 80,000 fish in 1985, when recreational catches peaked (Table 4.15). However, the Unites States contributes only a minor portion of the mortality for North Atlantic shortfin mako sharks. Therefore, NMFS believes that ending overfishing and preventing an overfished status would best be accomplished through development of management measures at the international level to be adopted and implemented by the United States and other nations. While this alternative would have neutral ecological impacts for shortfin mako sharks in the short term, any management recommendations adopted at the international level to end overfishing of shortfin mako sharks could have positive ecological impacts on shortfin mako sharks in the long term. Therefore, NMFS prefers alternative E3 at this time.

Under alternative E4, NMFS would promote the live release of shortfin mako sharks in the recreational shark fishery, but this alternative would not result in any changes to the current recreational regulations regarding shortfin mako sharks. Recreational shark fishermen would still be able to retain one authorized shark species greater than 54 inches FL per vessel per trip, and one Atlantic sharpnose and one bonnethead shark per person per trip. While this alternative would have neutral ecological impacts to the shortfin mako shark stock in the short term, NMFS would encourage the catch and release of live shortfin mako sharks. If any management recommendations are adopted at ICCAT to help protect shortfin mako sharks under the preferred alternative E3, NMFS would implement those recommendations domestically, which could have positive ecological impacts on shortfin mako sharks in the long term. Therefore, NMFS prefers E4 at this time.

Alternative E5 would prohibit the landings of shortfin mako sharks in the recreational fishery by placing shortfin mako sharks on the prohibited species list. Shark species can only be added to the prohibited species list provided that two of the following four criteria are met: 1) There is sufficient biological information to indicate the stock warrants protection, such as indications of depletion or low reproductive potential or the species is on the ESA candidate list; 2) the species is rarely encountered or observed caught in HMS fisheries; 3) the species is not commonly encountered or observed caught as bycatch in fishing operations; or 4) the species is

difficult to distinguish from other prohibited species (*i.e.*, look-alike issue). Shortfin mako sharks were determined to have overfishing occurring based on the 2008 ICCAT stock assessment. In addition, shortfin mako sharks look similar to other sharks on the prohibited species list (*i.e.*, white sharks, longfin mako sharks). According to recreational landings data, on average 3,682 shortfin mako sharks were landed from 2004 to 2007 (NMFS 2008). Because of the small number of shortfin mako sharks taken in the recreational fishery, placing this species on the prohibited species list is likely to have neutral or slightly positive ecological impacts for shortfin mako sharks.

Social and Economic Impacts

Alternative E1 would likely not result in any adverse economic or social impacts as the No Action alternative would not substantially modify or alter recreational fishing practices for shortfin mako sharks or other shark species.

Alternative E2a could have significant negative social and economic impacts, as almost all of the reported shortfin mako sharks landed (99.5 percent) were smaller than the 108 inch FL size limit and would have to be released. This alternative would create a catch and release fishery for shortfin mako sharks. The social and economic impacts of alternative E2b would be less severe than alternative E2a, but would result in a 60.3 percent overall reduction in recreational shortfin mako shark landings. Under alternative E2b, economic and social impacts would be greater on the non-tournament recreational shortfin mako shark fishery participants, as 81 percent of non-tournament landings would fall below the 73 inch FL size limit. Also, under alternative E2b, the percentage of shortfin mako sharks landed during tournaments that would have to be released under this alternative would be 51.7 percent as opposed to 81 percent that would have to be released in the non-tournament recreational fishery (to, respectively) (Table 4.17). According to LPS data, 41 percent of shortfin mako sharks caught recreationally are kept (Table 4.18); therefore, the size limits considered in alternatives E2a and E2b may have negative economic and social impacts on tournament and non-tournament recreational fishery participants.

Table 4.18 Total number of shortfin mako sharks reported to the LPS from 2004 to 2008.

Year	Kept	Released Alive	Discard Dead	Total
2004	4640	6731	17	11389
2005	2732	3086	7	5825
2006	3639	5485	0	9123
2007	2283	3363	0	5647
2008	2348	3524	0	5872
Total	15643	22189	24	37856
Average	3129	4438	5	7571
% of Average	41%	59%	0%	100%

Under alternative E3, NMFS would take action at the international level to end overfishing of shortfin mako sharks. This alternative would not result in any changes to the current recreational regulations regarding bag or size limits for shortfin mako sharks. Therefore, this alternative would likely not result in any negative social or economic impacts for recreational fishermen compared to the No Action alternative, alternative E1.

Under alternative E4, NMFS would promote the live release of shortfin mako sharks in the recreational shark fishery, but this alternative would not result in any changes in the current recreational regulations regarding bag or size limits for shortfin mako sharks. Therefore, this alternative would likely not result in any negative social or economic impacts.

Under alternative E5, NMFS would remove shortfin mako sharks from the authorized species list and place them on the prohibited species list. Placing shortfin mako sharks on the prohibited species list would result in a recreational catch and release fishery for this species. According to recreational landings data, on average 3,682 shortfin mako sharks were landed from 2004 to 2007 (NMFS 2008). Although a small number of shortfin mako sharks were landed in the recreational fishery during this time period, it is also an important shark species in fishing tournaments. Fishing tournaments are an important component of HMS recreational fisheries. In 2007, there were 42 shark tournaments throughout the U.S. Atlantic, including the Gulf of Mexico and the Caribbean Sea. Therefore, compared to the alternatives discussed above, adding this species to the prohibited species list could have negative social and economic impacts for recreational fishermen and those who participate in recreational shark tournaments that would no longer be able to retain this species.

Conclusion

Shortfin mako sharks have been determined to not be overfished but have overfishing occurring according to the latest ICCAT stock assessment. In comparison to other ICCAT Contracting Parties, the United States contributes very little to shortfin mako shark mortality in the North Atlantic because there is no directed fishery. The ICCAT stock assessment did not provide a recommended TAC necessary to rebuild shortfin mako sharks, making it difficult to set a quota that would aid in rebuilding this species. Therefore, the preferred alternatives at this time would be to take action at the international level through development of management measures to end overfishing of shortfin mako sharks and to promote the live release of shortfin mako sharks in the recreational shark fishery. Neither of these two preferred alternatives would change the current recreational regulations for shortfin mako sharks. Ending overfishing and preventing an overfished status may be better accomplished through international efforts where other countries that have large takes of shortfin mako sharks could participate in shortfin mako shark mortality reductions. While this alternative would have neutral ecological, social and socioeconomic impacts for the portion of the shortfin mako shark stock that is fished by U.S. fishermen, in the short term, any international management recommendations adopted to help protect shortfin mako sharks could be implemented domestically and could have positive ecological impacts on shortfin mako sharks in the long term and potentially negative social and economic impacts on U.S. fishermen. Promoting the release of shortfin mako sharks that are brought to the vessel alive could result in the reduction of fishing mortality of shortfin mako sharks and thus, have positive ecological impacts for this species. Compared to alternatives E2 and E5, the preferred alternatives would likely not result in any negative social or economic impacts on the fishery participants as it does not restrict recreational harvest of shortfin mako sharks that are brought to the vessel alive, and recreational size limits and retention limits would remain as described in the No Action alternative.

4.3 Smooth Dogfish

NMFS currently manages sharks in four management units (small coastal sharks, pelagic sharks, large coastal sharks, and prohibited species). There are additional species of sharks that are HMS that fall outside of the current management units but remain under Secretarial authority should the Secretary determine the species is in need of conservation and management. One of these species, smooth dogfish, is not currently managed at the federal level. Due to increasing concerns regarding the lack of management on smooth dogfish along with the addition of smooth dogfish to the Atlantic States Marine Fisheries Commission (ASMFC) Interstate Coastal Shark FMP, NMFS is considering several alternatives regarding smooth dogfish. Although smooth dogfish were previously included in a fishery management unit (FMU) that included deepwater and other sharks, these species were removed from the FMU in the 2003 Amendment 1 to the Fishery Management Plan for Atlantic Tunas, Swordfish, and Sharks since they were protected under the Shark Finning Prohibition Act (67 FR 6124, February 11, 2002). The Magnuson-Stevens Act grants authority to manage oceanic shark species within the U.S. EEZ to the Secretary. NMFS has determined that smooth dogfish is an oceanic shark species. The Magnuson-Stevens Act further defines Secretarial authority for HMS that crosses the jurisdiction of more than one of the following five Councils: NEFMC, MAFMC, SAFMC, GMFMC, and CFMC. Smooth dogfish range crosses the jurisdiction of all five of eastern United States Councils. Based on public comments and its independent review of the species, NMFS has determined that smooth dogfish are in need of conservation and management under HMS authority. However, limited data regarding landings, effort, or participants in the fishery complicates new regulations. Any management measures implemented for smooth dogfish would also apply to Florida smoothhounds (*Mustelus norrisi*). Emerging molecular and morphological research has determined that Florida smoothhounds have been misclassified as a separate species from smooth dogfish (Jones, pers. comm.). Because of this taxonomic correction, Florida smoothhounds would be considered smooth dogfish and would fall under all smooth dogfish management measures, such as permit requirements and quotas.

While there are no data regarding stock status and data on participants in the fishery are sparse, a number of sources exist that document smooth dogfish landings. Despite the lack of management, many fishermen in the mid-Atlantic region have been reporting their landings. Some of these fishermen have federal permits for other species and are required to report all landings, including smooth dogfish, due to the regulations in those other fisheries. Other fishermen do not have federal permits and report smooth dogfish landings voluntarily. These landings, and the number of vessels reporting these landings, have remained fairly constant since the late 1990s. Existing sources, particularly the Atlantic Coastal Cooperative Statistics Program (ACCSP) for commercial catches and the Marine Recreational Fishing Statistics Survey (MRFSS) for recreational catches, offer insight into the current state of the fishery. A third source, NMFS' Science and Technology's (S&T) Annual Commercial Landings Statistics, available on the S&T webpage (http://www.st.nmfs.noaa.gov), is also available, however this system only contains non-confidential landings data, and, thus, underestimates commercial landings. For this reason, ACCSP data was used instead of S&T data for analysis.

As described in Chapter 2, the alternatives considered for smooth dogfish management are:

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

Alternative F2 Add smooth dogfish under NMFS management and develop management measures, such as a federal permit requirement-Preferred Alternative

- Alternative F2a1) Establish a smooth dogfish quota that is equal to the average annual landings from 1998-2007 (950,859 lb dw)
- Alternative F2a2) Establish a smooth dogfish quota equal to the maximum annual landing between 1998-2007 (1,270,137 lb dw)
- *Alternative F2a3) Establish a smooth dogfish quota equal to the maximum annual landing between 1998-2007 plus one standard deviation (1,423,727 lb dw) – Preferred Alternative*
- *Alternative F2b1) Establish a separate smooth dogfish set-aside quota for the exempted fishing program of 6 mt ww – Preferred Alternative*
- Alternative F2b2) Establish a smooth dogfish set-aside quota for the exempted fishing program and add it to the current 60 mt ww set-aside quota for the exempted fishing program

Alternative F3 Add smooth dogfish under NMFS management and mirror management measures implemented in the ASMFC Interstate Shark FMP

Ecological Impacts

The No Action alternative, alternative F1, would likely not have any ecological impacts beyond the status quo as it would not implement any new management measures for the smooth dogfish fishery. However, under the No Action alternative, there would continue to be a lack of data collection regarding numbers of participants in the fishery and catch and effort information that could be used to characterize the fishery and determine stock status for smooth dogfish. Thus, if current fishing effort is putting too much pressure on the stock, negative ecological impacts could persist but would continue to go undocumented under the No Action alternative. NMFS does not prefer alternative F1 at this time.

Alternative F2, the preferred alternative, would implement federal management measures for smooth dogfish and establish a permit requirement for commercial and recreational retention of smooth dogfish in federal waters. This alternative would also provide NMFS the ability to select vessels to carry an observer. These management measures would focus on characterizing the fishery in terms of permitting the universe of fishermen (both commercial and recreational) that retain smooth dogfish in federal waters and collecting landing data through dealer reports, but would not actively change catch levels or rates. Similarly, at this time, this alternative would not require fishermen to attend the protected species release, disentanglement, and identification workshops. As NMFS gathers information about the fishery and the fishermen, NMFS may decide to require fishermen attend these workshops as is required in other HMS longline and gillnet fisheries. This alternative would likely not have significant positive or negative ecological impacts on smooth dogfish unless the requirement of a federal permit reduces the number of participants in the fishery, which could have positive ecological impacts on the stock.

In the future, NMFS may implement additional management measures for smooth dogfish, such as reporting requirements, or additional measures if warranted by future stock assessments. Over time, NMFS would likely implement logbook or other reporting for smooth dogfish fishermen. NMFS would not do this, however, until the universe of fishermen is known and until NMFS can determine the appropriate mechanism of reporting without duplicating current reporting requirements. Alternative F2 would establish federal management measures and could begin collection of smooth dogfish catch data, effort data, and data regarding participants in the fishery.

The proposed EFH for smooth dogfish would not have any ecological, social, or economic impacts. The designation satisfies a statutory requirement, and no management measures are associated with its designation. In the 2006 Consolidated HMS FMP and Amendment 1 to the 2006 Consolidated HMS FMP, NMFS reviewed the various gear types with the potential to affect EFH and, based on the best information available at this time, NMFS has determined that fishing is not likely to adversely affect EFH for smooth dogfish. Authorized gear types for HMS fishing that contact the ocean floor include sink gillnets and BLL. Sink gillnets are only used over non-complex bottom types such as sand and mud, and are not likely to damage or alter the substrate. Thus any impacts from gillnet gear would be minimal and only temporary in nature. In the FEIS for Amendment 1 to the 2006 Consolidated HMS FMP, NMFS determined that shark BLL gear does not have adverse effects on EFH. Based on these conclusions, NMFS has decided that it is not necessary to develop management measures to mitigate adverse impacts to EFH for smooth dogfish.

Gillnets are the primary gear type in the smooth dogfish fishery and if the fishery is brought under federal management, fishermen using gillnets to target smooth dogfish would be required to comply with federal marine mammal take reduction programs mandated in the Marine Mammal Protection Act at 50 CFR 229.32, including frequent net-checks (every 0.5-2 hours) and the requirement for gillnets to remain attached to the vessel**.** Positive ecological impacts are expected to continue from this compliance due to a decreased risk of marine mammal interactions with smooth dogfish gillnets. In addition, alternative F2 in combination with the preferred alternative B3, would preclude fishermen that use gillnets in federal waters to retain any sharks, including smooth dogfish, from South Carolina south. This would reduce gillnet fishing effort in this area and would reduce bycatch of non-target species and protected resource interactions with gillnet gear.

As described in Chapter 1, NMFS, on January 16, 2009, published the final NSG1 (74 FR 3178) implementing, among other things, ACL and AM requirements of the Magnuson-Stevens Act 16 U.S.C. §1853(a)(15). Per NSG1, ACLs and AMs apply to all species in a federally managed fishery under the Magnuson-Stevens Act unless otherwise exempted. Because smooth dogfish are not subject to an exemption from the statutory requirement, NMFS must establish an ACL and AMs for smooth dogfish if it is incorporated in this draft amendment. The Amendment 3 to the 2006 Consolidated HMS FMP will include a “mechanism” for establishing ACLs, including those for smooth dogfish. This “mechanism” is described more fully in Chapter 1. The five alternatives under alternative F2 would implement a smooth dogfish commercial quota and a set-aside quota for smooth dogfish to be taken under the exempted fishing program. Each alternative aims to set a quota around current catch levels of smooth dogfish to minimize

restrictions on the current fishery. Therefore, it is not anticipated that these quotas would have any additional ecological impacts beyond those discussed for alternative F2.

Alternative F2a1 would establish a smooth dogfish quota that is equal to the average annual landings from 1998-2007 or 950,859 lb dw. While this alternative could have positive ecological impacts on the stock by capping effort at the average level of landings, as fishermen are not currently required to report smooth dogfish landings, such a quota could be overly restrictive to the fishery. Thus, NMFS does not prefer this alternative at this time.

Alternative F2a2 would establish a smooth dogfish quota equal to the maximum annual landing between 1998-2007 or 1,270,137 lb dw. Similarly to alternative F2a1, this alternative could have positive ecological impacts on the stock by capping effort at the maximum reported level of landings. However, this quota could also be overly restrictive to the fishery due to underreporting, and therefore, NMFS does not prefer this alternative at this time.

Alternative F2a3, the preferred alternative, would have similar positive ecological impacts to the previous two alternatives by capping total landings. Establishing a smooth dogfish quota equal to the maximum annual landing between 1998-2007 plus one standard deviation (1,423,727 lb dw), would maintain the quota near historical landing levels. The one standard deviation buffer would ensure that the fishery is not unnecessarily restricted while also ensuring that effort does not increase significantly until a stock assessment is conducted. For this reason, NMFS prefers alternative F2a3. NMFS would also account for underharvest and overharvest of smooth dogfish as it does for other shark species and would close the smooth dogfish shark quota with five days notice upon filing in the Federal Register when the smooth dogfish shark quota reaches or is projected to reach 80 percent. This would help prevent overharvest from occurring while still giving the public 5 days notice that the fishery would close.

Alternative F2b1, the preferred alternative, would establish a separate smooth dogfish set-aside quota for the exempted fishing program. Currently, there is a 60 mt ww set-aside quota for sharks for the exempted fishing program. However, as smooth dogfish have not been federally managed in the past, smooth dogfish were not included in this 60 mt ww set-aside. Thus, to allow fishermen to take smooth dogfish for research purposes and outside of any established regulations for smooth dogfish, NMFS would establish a separate set-aside for smooth dogfish based on the maximum yearly smooth dogfish takes during research over the past 10 years or 6 mt ww. Thus, the set-aside would not be expected to have any negative ecological impacts on smooth dogfish as these takes are already occurring. In addition, by establishing a separate set-aside for smooth dogfish, there would be no negative ecological impacts on other shark species taken under the exempted fishing program, as they would be limited to the current 60 mt ww set-aside.

Under alternative F2b2, NMFS would establish a smooth dogfish set-aside quota for the exempted fishing program and add it to the current 60 mt ww set-aside quota for the exempted fishing program. As explained under alternative F2b1, smooth dogfish are not included in the current 60 mt ww set-aside quota for sharks for the exempted fishing program. Thus, the inclusion of smooth dogfish under the exempted fishing program shark quota set-aside would

allow fishermen to take smooth dogfish for research purposes and outside of any established regulations for smooth dogfish. NMFS would establish a set-aside for smooth dogfish based on the maximum yearly smooth dogfish takes during research over the past 10 years or 6 mt ww, and add it to the existing 60 mt ww research set-aside for a total of 66 mt ww. Thus, the set-aside would not be expected to have any negative ecological impacts on smooth dogfish as these takes are already occurring. However, increasing the overall 60 mt ww shark quota set-aside to allow the inclusion of smooth dogfish, could allow the increased take of other shark species. Thus, NMFS would need to monitor the number of smooth dogfish and other species of sharks allocated to research programs to ensure there is no increased mortality of other shark species under the exempted fishing program. For this reason, NMFS does not prefer alternative F2b2 at this time.

Alternative F3 would also implement federal management measures for smooth dogfish, however, NMFS management measures would mirror and/or complement, to the extent practicable, ASMFC measures included in the Coastal Shark FMP. On May 6, 2009, the ASMFC approved a smooth dogfish Addendum to the Atlantic Coastal Sharks FMP for public comment. Included within this Addendum is an exception for smooth dogfish to allow at-sea processing (*i.e.*, removal of shark fins while still onboard a fishing vessel), removal of recreational retention limits for smooth dogfish, and removal of the two hour net-check requirement for shark gillnets. The at-sea processing would require a 5 percent fin to carcass ratio but would allow for the removal of fins at sea. The allowance for the removal of shark fins while still onboard a fishing vessel and the removal of the two hour net-check requirement differs from current federal regulations. NMFS considers the requirements for gillnet checks and maintaining shark fins naturally attached through offloading to be necessary to minimize impacts on protected resources and to prevent shark finning. NMFS recently implemented the fins attached regulation for all Atlantic sharks for enforcement and species identification reasons and would not want to open a loophole that would hinder enforcement. Additionally, both the House of Representatives and the Senate are reviewing bills that, if approved and signed by the President, would require all fins be naturally attached for all sharks in U.S. federal waters. Second, ASMFC has not established a quota for the smooth dogfish fishery. As noted above, NMFS is required to establish ACLs and AMs under the Magnuson-Stevens Act. Third, ASMFC has not established a permitting requirement. NMFS believes that permitting is the first step to gaining information about the fishery. Thus, NMFS is not preferring to mirror the ASMFC regulations at this time. Nonetheless, if NMFS implements alternative F2, NMFS would continue to work with ASMFC to ensure federal and state regulations are consistent to the extent practicable.

Social and Economic Impacts

Alternative F1 would likely not have any new social or economic impacts beyond the status quo, as no action would be taken. However, applying the No Action alternative would preclude gathering fishery participant information. Therefore, NMFS does not prefer this alternative at this time.

Implementing federal management of smooth dogfish through alternative F2 would focus on characterizing the fishery and would not actively change catch levels or rates. Therefore, this alternative would likely not have significant positive or negative economic impacts, except that

fishermen would have to purchase an open access smooth dogfish commercial fishing permit or HMS Angling or CHB permit and dealers would be required to report smooth dogfish on HMS dealer reports or through the Standard Atlantic Fisheries Information System (SAFIS). However, if the federal permitting system creates enough of an inconvenience as to prevent some participants from remaining in the fishery, negative social and economic impacts could result. Permitted smooth dogfish fishermen would be eligible for observer coverage selection which could result in negative social and economic impacts due to increased cost and burden. Utilizing VTR and Coastal Fisheries Logbook data, an estimate of the number of participants with current federal permits in the commercial smooth dogfish fishery could be calculated. Within the VTR data, a primarily Northeast U.S. reporting system, an average of 213 vessels reported smooth dogfish landings per year between 2004 and 2007. Within the Coastal Fisheries Logbooks data, a primarily Southeast U.S. reporting system, an average of 10 vessels reported smooth dogfish landings per year between 2004 and 2007. From this data, an estimate of 223 vessels would require a smooth dogfish permit; however, as fishermen are currently not required to have a permit to retain smooth dogfish, this could be an underestimate of the number of fishermen that would require a federal commercial permit for smooth dogfish in the future. As noted in the previous section, the proposed EFH for smooth dogfish would not have any social or economic impacts.

Based on MRFSS data from 2004 to 2007, an average of 58,161 smooth dogfish were retained per year in the recreational fishery. This number may be used as a proxy for the upper limit of participants in the federal recreational fishery that catch this species since a single fisherman may have caught multiple smooth dogfish. Based on the life history of this species and the fact that most recreational fisherman are shore-based, most smooth dogfish are likely caught in state waters, and would not require a federal HMS angling permit. Of those that fish in federal waters, the nominal fee of $16.00 for a recreational HMS Angling category or CHB permit is not expected to create an impediment to entering or remaining in the recreational fishery.

Based on ACCSP data from 1998-2007, in the commercial fishery an average of 1,321,695 lb ww of smooth dogfish were retained per year. Of this whole weight, 950,860 lb dw fish and 47,543 lb of fins would be available for sale (conversion of 1.39 for ww to dw, and 5 percent of dw for shark fins). Using the median ex-vessel price of these products between 2004 and 2007 ($0.29 for smooth dogfish meat and $2.02 for smooth dogfish fins), the fishery averaged $371,786 in value per year.

Social impacts resulting from alternative F2 and the associated sub-alternatives primarily relate to perceptions and attitudes regarding the current state of the fishery. Anecdotal evidence suggests that smooth dogfish are often considered an incidental catch and are only rarely targeted. A portion of the catch enters the commercial market, but some are retained only for bait in other fisheries. Due to the lack of reporting requirements, NMFS is unsure of the extent of these different uses. Furthermore, smooth dogfish are considered by some to be a nuisance species, sometimes interrupting more desirable commercial and recreational fisheries. Attitudes and perceptions such as these, to the extent they exist, could confound management actions if participants in the fishery do not see the need to manage a bycatch, bait, or nuisance species. Establishing federal management could alter these attitudes and change the low perception of the

species. This change in perception would likely have neutral impacts except in the case of participants using smooth dogfish as bait. In this case, participants may feel the requirements associated with federal level management are unnecessary and hinder the use of the species as an inexpensive source of bait. This could lead to negative social impacts as the current fishery changes from having minimal federal interference to requiring management measures such as the purchase of a federal smooth dogfish permit

Alternatives F2a1, which would establish a smooth dogfish quota that is equal to the average annual landings from 1998-2007, and F2a2, which would establish a smooth dogfish quota equal to the maximum annual landing between 1998-2007, could potentially have negative economic impacts to fishermen if the associated quotas reflect a significantly underreported fishery. If the actual landings are higher than these two quotas, fishermen would be prevented from fishing at status quo levels, thus, negative economic impacts could result. Therefore, NMFS does not prefer these two alternatives at this time.

Alternative F2a3, which would establish a smooth dogfish quota above the maximum annual landings between 1998-2007, would have neutral economic impacts. The quota of maximum historical annual landings plus one standard deviation between the years 1998 and 2007 would allow a buffer for potential unreported landings during that time. This would allow the fishery to continue in the future without having to be shut down prematurely, which may be warranted given smooth dogfish sharks have not been assessed. Thus, alternative F2a3 is NMFS' preferred alternative at this time.

There are no negative economic impacts anticipated with alternative F2b1. There is no charge associated with fishermen and researchers obtaining an exempted fishing permit (EFP), scientific permit (SRP), display permit, or letter of acknowledgement (LOA) for research or the collection for public display. In addition, NMFS would establish a smooth dogfish set-aside that would accommodate current and future research activities. Thus, NMFS does not anticipate any negative economic impacts associated with alternative F2b1.

As with alternative F2b1, there are no negative economic impacts anticipated with alternative F2b2. There is no charge associated with fishermen and researchers obtaining an EFP, SRP, display permit, or LOA for research or for the collection for public display. In addition, NMFS would establish a smooth dogfish set-aside that would accommodate current and future research activities. Thus, NMFS does not anticipate any negative economic impacts associated with alternative F2b2.

Alternative F3 would likely have neutral to slightly positive economic impacts. Most of the ASMFC regulations would not change the smooth dogfish fishery, and would therefore, have neutral impacts on fishermen. In addition, the ASMFC's consideration of removing the two hour-net check provision and allowing fishermen to process smooth dogfish while at sea would allow fishermen to conduct the fishery as they have in the past, and therefore, result in neutral or slightly positive economic impacts. However, since NMFS considers the requirements for gillnet checks and maintaining shark fins naturally attached through offloading necessary conservation tools for protected resources and to prevent shark finning, NMFS does not prefer

this alternative at this time. Social impacts resulting from alternative F3 are likely the same as those described for alternative F2.

Conclusion

Under the Magnuson-Stevens Act, NMFS must, consistent with the National Standards, manage fisheries to maintain OY when rebuilding overfished fisheries and preventing overfishing. Thus, NMFS prefers alternative F2 to include smooth dogfish in a federal management plan and implement a federal permit requirement to better characterize the universe of fishermen landing smooth dogfish and collect landings data from dealer reports. In addition, the Magnuson-Stevens Act requires the establishment of ACLs and AMs for each species within a fishery unless the species is subject to narrow exemptions. Smooth dogfish are not exempt from the requirement. NMFS prefers to establish a quota equal to the maximum annual landings plus one standard deviation between the years 1998 and 2007 to serve as an ACL: a specific level of catch that could prevent overfishing of the species. This quota would allow the fishery to operate as it has without unintentional restrictions. The quota would be set above the maximum recorded landings given fishermen have not had to report smooth dogfish landings in the past. For AMs, smooth dogfish would be subject to the same closure requirements as other shark species when 80% of quota is reached and would include additional provisions for addressing overharvest in subsequent seasons. The set-aside quota of 6 mt under alternative F2b1 would allow for continued research on smooth dogfish as well as some limited collection for public display.

Ecological and socioeconomic impacts are expected to be minimal since no restrictions would be placed on the fishery beyond a federal permit and the requirement that federal dealers report smooth dogfish landings. Fees associated with the permit would be minimal, and are not expected to create any impediment to entering or remaining in the fishery.

4.4 Impacts on Essential Fish Habitat

The Magnuson-Stevens Act requires NMFS, 16 U.S.C. 1855((b)(1), as implemented by 50 C.F.R. §800.815, to identify and describe essential fish habitat (EFH) for each life stage of managed species and to evaluate the potential adverse effects of fishing activities on EFH §800.815(a)(2) including the cumulative effects of multiple fisheries activities. If NMFS determines that fishing gears are having an adverse effect on HMS EFH, or other species' EFH, then NMFS must include management measures that minimize adverse effects to the extent practicable. Ecological impacts to EFH due to actions in this proposed amendment would likely be positive and have no adverse effects as the preferred alternatives would decrease SCS fishing effort with BLL gear as a result of reduced non-blacknose SCS and blacknose shark quotas. In the 2006 Consolidated HMS FMP and Amendment 1 to the 2006 Consolidated HMS FMP, NMFS reviewed the various gear types with the potential to affect EFH and, based on the best information available at this time, NMFS has determined that fishing is not likely to adversely affect EFH for smooth dogfish. Thus, there is no evidence to suggest that implementing any of the preferred alternatives in this amendment would adversely affect EFH to the extent that adverse effects could be identified on the habitat or fisheries.

4.5 Impacts on Protected Resources

The combination of the preferred alternatives A4 and B3 could have positive ecological impacts on protected resources, including sea turtles, marine mammals, smalltooth sawfish, and prohibited shark species, since NMFS would reduce the non-blacknose SCS quota and blacknose quota under alternative A4 and remove shark gillnet gear as an authorized gear for sharks under alternative B3. These alternatives would reduce fishing effort, prevent overfishing, and rebuild overfished stocks. Alternatives A1 through A3 would not have large, positive ecological impacts on protected resources when compared to Alternative A4. Alternative A5 would have large ecological impacts, but the alternative would have significant negative social and economic impacts on fishermen. The alternative B1 would have neutral ecological impacts on protected resources, while alternative B2 would have significant positive ecological impacts by removing gillnet gear for sharks everywhere and large, significant negative social and economic impacts. If gillnets are prohibited for sharks from South Carolina south under Alternative B3, the interactions with the protected species could decrease (see Chapter 3). For example, from 2004-2006, 9 loggerhead (2 discarded dead) and 1 leatherback sea turtles were observed caught in gillnets from South Carolina south (Garrison, 2007). Also, this alternative would remove gillnet gear from the southeast region and prevent the significant risk to north Atlantic right whales from entanglement in gillnet gear in the right whale calving area during calving season. NMFS has designated critical habitat for right whales during their calving season (December-March) in this area, and there are strict requirements in place when fishermen use gillnet during certain periods of time in this area. In 2006, a right whale calf was observed dead off the coast of Florida. Available evidence suggested that the entanglement and injuries of the whale were caused by gillnet gear, which eventually led to the death of the animal. It is still unknown if the gillnet gear was from a shark fishermen. NMFS believes reducing fishing effort and removing gillnet gear under alternatives A4 and B3 would reduce bycatch and interactions of protected species with shark fishermen. Redistributed effort to these other fisheries could result in indirect negative ecological impacts in those fisheries. However, due to the cost associated with shifting from gillnet gear to BLL gear and because most of those fisheries are limited access and have quotas and/or fishing seasons in place to limit catch and prevent overfishing, NMFS feels any negative ecological impacts due to redistributed effort would likely be limited.

The other preferred alternatives would likely have neutral ecological impacts on protected resources. Under preferred alternatives C5, C6, E3 and E4, NMFS would promote conservation and management measures at the international level to end overfishing of shortfin mako sharks and promote the live release of shortfin mako sharks brought alive to a fishing vessel in both the recreational and commercial sectors. In addition, under the preferred alternative D4, NMFS would prohibit the retention of blacknose sharks in the HMS recreational shark fishery. Finally, under the preferred alternative F2, NMFS would establish a federal permit for smooth dogfish as well as set a smooth dogfish quota and EFP set-aside quota. The combination of these alternatives and the other non-preferred alternatives are not anticipated to have any adverse ecological impacts on protected resources as they are not expected to increase fishing effort in the recreational or commercial fishery for pelagic sharks and smooth dogfish.

4.6 Environmental Justice

Executive Order 12898 requires agencies to identify and address disproportionately high and adverse environmental effects of its regulations on minority and low-income populations. To determine whether environmental justice concerns exist, the demographics of the affected area should be examined to ascertain whether minority populations and low-income populations are present. If so, a determination must be made as to whether implementation of the alternatives may cause disproportionately high and adverse human health or environmental effects on these populations.

In addition to the community profile information found in the 2006 Consolidated HMS FMP (Chapter 9), a recent report was completed by MRAG Americas, and Jepson (2008) titled "Updated Profiles for HMS Dependent Fishing Communities" (Appendix E of Amendment 2 to the 2006 Consolidated HMS FMP). This report includes updated community profiles and new social impacts assessments for HMS fishing communities along the Atlantic and Gulf of Mexico coasts. The communities of Dulac, Louisiana and Fort Pierce, Florida have significant populations of Native Americans and African-Americans, respectively. The 2000 Census data indicates that Native Americans made up 39 percent of the Dulac population, specifically the Houma Indians, which is not a federally recognized tribe. About 30 percent of the Dulac population was living below poverty level in 2000. In 2000, African-Americans were about 41 percent of the Fort Pierce, Florida population with about 30 percent of the entire Fort Pierce population living below the poverty line. These two communities also have significant populations of low-income residents. In addition to Dulac and Fort Pierce, there is a diffuse of low-income, minority Vietnamese-American population in Louisiana, actively participating in the PLL fishery, and commuting to fishing ports, but not living in "fishing communities" as defined by the Magnuson-Stevens Act and identified in Chapter 9 of this document. Each of the management alternatives in Chapter 4 includes an assessment of the potential social and economic impacts associated with the proposed alternatives. The preferred alternatives were selected to minimize economic impacts and provide for the sustained participation of fishing communities, while taking the necessary actions to rebuild overfished fisheries as required by the Magnuson-Stevens Act. More in-depth information about potential social impacts of each preferred alternatives is briefly described below with detailed information provided earlier in this chapter. Demographic data indicate that coastal counties with fishing communities are variable in terms of social indicators like income, employment, and race and ethnic composition.

The preferred alternative A4, to establish a new SCS quota and a blacknose shark commercial quota, would have negative economic and social impacts throughout the fishery. NMFS does not anticipate that these effects would fall disproportionately on minority or low-income populations. Alternative A4 was designed to reduce quotas necessary to rebuild and end overfishing of blacknose sharks. Quota reductions were chosen instead of large time-area closures or complete fishery closures as a quota reduction would meet the conservation goals necessary to rebuild blacknose sharks and allow data collections while mitigating some of the significant economic impacts that are necessary and expected under these alternatives to reduce fishing mortality as prescribed by recent stock assessments. In addition, the preferred alternative B3 would prohibit retention of any shark species from South Carolina south including the Gulf of Mexico and the Caribbean Sea with gillnet gear. Gillnet gear is the primary gear used to harvest blacknose sharks and non-blacknose SCS in this area. By removing this gear in the

primary area where blacknose sharks are harvested, NMFS could implement a larger overall non-blacknose SCS quota, which would benefit more fishermen than the few fishermen that use gillnets to target SCS from South Carolina south. Thus, by redistributing their efforts and gear selection, shark fishermen would be able to continue collecting revenue from SCS. NMFS believes these alternatives would provide an appropriate balance between positive ecological impacts that must be achieved in order to rebuild and end overfishing on overfished stocks, while minimizing the severity of negative economic impacts that would occur as a result of these measures.

The other preferred alternatives are not anticipated to have any significant negative social or economic impacts on minority or low-income populations. Under preferred alternatives C5, C6, E3, and E4, NMFS would work in at the international level to develop measures for implementation by other nations to end overfishing in addition to promoting domestically the live release of shortfin mako sharks in both the commercial and recreational sectors. These alternatives would not change the current commercial harvest regulations for shortfin mako sharks. Under preferred alternative D4, NMFS would prohibit the retention of blacknose sharks in the recreational fishery. Since blacknose sharks are not one of the primary species targeted by recreational anglers, this alternative is anticipated to cause minimal social and economic impacts on recreational fishermen. Finally, under preferred alternative F2, NMFS would implement a federal permit requirement for smooth dogfish. This alternative would not change the retention limits for this fishery so there would not be any disproportionate negative social or economic impacts on minority or low-income populations.

4.7 Coastal Zone Management Act

The Coastal Zone Management Act (CZMA, 1972, reauthorized 1996) requires that federal actions be consistent to the extent practicable, with the enforceable policies of all state coastal zone management programs. NMFS has determined that the preferred alternatives would be implemented in a manner consistent to the maximum extent practicable with the enforceable policies of the coastal states in the Atlantic, Gulf of Mexico, and Caribbean that have federally approved coastal zone management programs. All of the alternatives do not affect coastal resources to the extent practicable, and NMFS is seeking concurrence with respect to the preferred alternatives. NMFS will ask for states' agreement with this determination during the proposed rule stage. NMFS has worked closely with states in the past and would continue to work with the states to ensure consistency between state and federal regulations.

4.8 Cumulative Impacts

Cumulative impact are the impacts on the environment, which results from the incremental impacts of the action when added to other past, present, and reasonably foreseeable future actions. Cumulative impacts can result from individually minor but collectively significant actions taking place over a period of time (40 CFR § 1508.7). A cumulative impact includes the total effect on a natural resource, ecosystem, or human community due to past, present, and reasonably foreseeable future activities or actions of federal, non–federal, public, and private entities. Cumulative impacts may also include the effects of natural processes and events, depending on the specific resource in question. Cumulative impacts include the total of all impacts to a particular resource that have occurred, are occurring, and would likely occur as a

result of any action or influence, including the direct and reasonably foreseeable indirect impacts of a federal activity. The goal of this section is to describe the cumulative ecological, economic and social impacts of past, present and reasonably foreseeable future actions with regard to the management measures presented in this document.

Table 4.19 Comparison of alternatives considered. (+) denotes positive impact, (-) denotes negative impact, (0) denotes neutral impact

Alternative	Alternative Description	Ecological Impacts	Social Impacts	Economic Impacts
Alternative A1	No Action. Maintain the existing SCS quota and species complex	0/-	0/-	0/-
Alternative A2	Establish a new SCS complex quota of 392.5 mt dw and a blacknose commercial quota of 13.5 mt dw	0/-	0/-	0/-
Alternative A3	Establish a new SCS complex quota of 42.7 mt dw and a blacknose commercial quota of 16.6 mt dw; allow all current authorized gears for sharks	+	-	-
Alternative A4	*Establish a new SCS quota of 56.9 mt dw and a blacknose commercial quota of 14.9 mt dw; remove shark gillnet gear as an authorized gear for sharks – Preferred Alternative*	+	-	-
Alternative A5	Close the SCS fishery	+/-	-	-
Alternative B1	No Action. Maintain current authorized gears for commercial shark fishing	0/-	0/-	0/-
Alternative B2	Close shark gillnet fishery; remove gillnet gear as an authorized gear type for commercial shark fishing	+	-	-
Alternative B3	*Close the gillnet fishery to commercial shark fishing from South Carolina south, including the Gulf of Mexico and the Caribbean Sea – Preferred Alternative*	+	-	-

Alternative	Alternative Description	Ecological Impacts	Social Impacts	Economic Impacts
Alternative C1	No Action. Keep shortfin mako sharks in the pelagic shark species complex and do not change the quota	0/-	0/-	0/-
Alternative C2	Remove shortfin mako sharks from pelagic shark species quota and establish a shortfin mako quota	0/+	0/-	0/-
Alternative C3	Remove shortfin mako sharks from pelagic shark species complex and place this species on the prohibited shark species list	+	-	-
Alternative C4	Establish a commercial size limit for shortfin mako sharks	0/+	0/-	0/-
Alternative C4a	Establish a minimum size limit for shortfin mako sharks that is based on the size at which 50 percent of female shortfin mako sharks reach sexual maturity or 32 inches interdorsal length (IDL)	0/+	0/-	0/-
Alternative C4b	Establish a minimum size limit for shortfin mako sharks that is based on the size at which 50 percent of male shortfin mako sharks reach sexual maturity or 22 inches IDL	0/+	0/-	0/-
Alternative C5	*Take action at the international level to end overfishing of shortfin mako sharks - Preferred Alternative*	0/+	0/-	0/-
Alternative C6	*Promote the release of shortfin mako sharks brought to fishing vessels alive – Preferred Alternative*	0/+	0/-	0/-

Alternative	Alternative Description	Ecological Impacts	Social Impacts	Economic Impacts
Alternative D1	No Action. Maintain the current recreational retention and size limit for SCS	0/-	0/-	0/-
Alternative D2	Modify the minimum recreational size limit for blacknose sharks based on their biology	-	+	+
Alternative D3	Increase the retention limit for Atlantic sharpnose sharks based on current catches	-	+	+
Alternative D4	*Prohibit retention of blacknose sharks in recreational fisheries - Preferred Alternative*	+	-	-
Alternative E1	No Action. Maintain the current recreational retention and size limits for shortfin mako sharks	0/-	0/-	0/-
Alternative E2	Increase the recreational minimum size limit of shortfin mako sharks	+	-	-
Alternative E2a	Establish a minimum size limit for shortfin mako sharks that is based on the size at which 50 percent of female shortfin mako sharks reach sexual maturity or 108 in FL	+	-	-
Alternative E2b	Establish a minimum size limit for shortfin mako sharks that is based on the size at which 50 percent of male shortfin mako sharks reach sexual maturity or 73 inches FL	+	-	-
Alternative E3	*Take action at the international level to end overfishing of shortfin mako sharks– Preferred Alternative*	0/+	0/-	0/-

Alternative	Alternative Description	Ecological Impacts	Social Impacts	Economic Impacts
Alternative E4	*Promote the release of shortfin mako sharks brought to fishing vessels alive – Preferred Alternative*	0/+	0/-	0/-
Alternative E5	Prohibit landing of shortfin mako sharks in recreational fisheries (catch and release only)	0/+	-	-
Alternative F1	No Action. Do not add smooth dogfish under NMFS management	+/0/-	0/-	0/-
Alternative F2	*Add smooth dogfish under NMFS management and develop management measures, such as a federal permit requirement - Preferred Alternative*	0/+	0	0
Alternative F2 a1	Establish a smooth dogfish quota that is equal to the average annual landings from 1998-2007 (950,859 lb dw)	0	0	0
Alternative F2 a2	Establish a smooth dogfish quota equal to the maximum annual landings from 1998-2007 (1,270,137 lb dw)	0	0	0
Alternative F2 a3	*Establish a smooth dogfish quota equal to the maximum annual landings from 1998-2007 plus one standard deviation (1,423,727 lb dw) – Preferred Alternative*	0/+	-	-
Alternative F2 b1	*Establish a separate smooth dogfish set-aside quota for the exempted fishing program of 6 mt ww– Preferred Alternative*	0/+	0	0

Alternative	Alternative Description	Ecological Impacts	Social Impacts	Economic Impacts
Alternative F2 b2	Establish a smooth dogfish set-aside quota for the exempted fishing program and add it to the current 60 mt ww set-aside quota for the exempted fishing program	0/+	0	0
Alternative F3	Add smooth dogfish under NMFS management and mirror management measures implemented in the ASMFC Interstate Shark FMP	0/+	0	0

4.9 Past, Present, and Reasonably Foreseeable Actions

As discussed in Section 3.1, NMFS has taken a number of actions in the past in order to, among other things, rebuild overfished and prevent overfishing of Atlantic sharks. These actions have included FMPs, FMP amendments, and framework actions. The goals and objectives of these past rules are summarized in Section 3.1. NMFS is required to take similar actions in this document, and can reasonably expect to implement regulations in the future to address the management and conservation of Atlantic sharks. The need and objectives of this document are described in earlier sections, particularly Chapter 1, and are not repeated here.

Other recent actions within HMS fisheries that may affect shark fishermen both directly and indirectly include Amendment 2 to the 2006 Consolidated HMS FMP that changed quotas, retention limits, and authorized species for the commercial shark fishery. (corrected rule: 73 FR 40658; July 15, 2008), Amendment 1 to the 2006 Consolidated HMS FMP that amended essential fish habitat designations for HMS (Notice of Availability of final EIS: 74 FR 28018; June 12, 2009), an inseason action (or temporary rule) that closed the Gulf of Mexico commercial non-sandbar LCS fishery (74 FR 26803; June 4, 2009); implementation of the Atlantic Pelagic Longline Take Reduction Plan (74 FR 23349; May 19, 2009) to reduce protected species interactions in HMS fisheries; an inseason action (or temporary rule) that closed the commercial porbeagle shark fishery for the remainder of 2008 (73 FR 68361; November 18, 2008); a rule authorizing greenstick gear for the harvest of Atlantic tunas and a requirement for PLL and BLL HMS fishermen to possess and use an authorized sea turtle control device (73 FR 54721; September 23, 2008); a rule that amends the regulations governing the Atlantic tunas longline LAPs and amends the workshop attendance requirements for businesses issued Atlantic shark dealer permits (73 FR 38144; July 3, 2008); and a rule modifying permitting and reporting requirements for the HMS International Trade Permit program (73 FR 31380; June 2, 2008).

These actions would have varying degrees of impacts on the human environment when considered in conjunction with Amendment 3 to the 2006 Consolidated HMS FMP:

- Amendment 2 to the 2006 Consolidated HMS FMP changed quotas, retention limits, and authorized species for the commercial shark fishery. Changes in this amendment could result in positive ecological impacts for SCS by decreasing fishing mortality, but reductions in SCS quotas could lead to additional negative socioeconomic impacts when considered in conjunction with Amendment 2 to the 2006 Consolidated HMS FMP.
- Amendment 1 to the 2006 Consolidated HMS FMP amended essential fish habitat designations for HMS. This is not expected to have any additional impacts with the implementation of Amendment 3.
- The temporary closure of the commercial shark fishery in the Gulf of Mexico is not expected to have any ecological or socioeconomic impacts in conjunction with Amendment 3 to the 2006 Consolidated HMS FMP as the fishery will reopen in 2010 with quotas adjusted for any 2009 overharvest of non-sandbar LCS.
- The Atlantic Pelagic Longline Take Reduction (APLTR) final rule may have cumulative ecological or socioeconomic impacts in conjunction with Amendment 3 to the 2006 Consolidated HMS FMP, as restrictions on maximum pelagic longline mainline length in the mid-Atlantic Bight could reduce commercial access to sharks. The ecological impacts may be positive for pelagic sharks if the APLTR rule results in decreasing fishing mortality, but socioeconomic impacts may be negative if pelagic shark landings are reduced.
- The temporary rule closing the commercial porbeagle fishing season is not expected to have any ecological or socioeconomic impacts in conjunction with Amendment 3 to the 2006 Consolidated HMS FMP as the fishery has reopened in 2009 with quotas adjusted for the 2008 overharvest of porbeagle sharks.
- The rule authorizing greenstick gear for the harvest of Atlantic tunas and a requirement for PLL and BLL HMS fishermen to possess and use an authorized sea turtle control device should not increase the mortality rates of Atlantic tunas and should help in the safe release of sea turtles caught in PLL and BLL gear. The authorization of greenstick gear creates more economic opportunities to harvest Atlantic tunas. This is not expected to have any additional impacts with the implementation of Amendment 3.
- The rule that amends the regulations governing the Atlantic tunas longline LAPs and amends the workshop attendance requirements for businesses issued Atlantic shark dealer permits slightly modifies requirements that were already in place. Therefore, this is not expected to have any additional impacts with the implementation of Amendment 3.
- Finally, the rule modifying permitting and reporting requirements for the HMS ITP program slightly modifies requirements that were already in place. Therefore, this is not expected to have any additional impacts with the implementation of Amendment 3.

Foreseeable future actions may include: 2010 shark season specifications; changes to swordfish management measures; modifications in Atlantic bluefin tuna management measures; establishing reporting requirements for recreational and commercial U.S. Caribbean HMS

fisheries, and changes to HMS permitting requirements recently announced in an Advanced Notice of Proposed Rulemaking (74 FR 26174; June 1, 2009). These are measures that, while not all directly related to sharks, could be implemented in other rulemakings and affect participants in shark fisheries in conjunction with the preferred alternatives selected in this proposed amendment. Such actions would have varied effects on shark fishermen. Additional actions that reduce fishing opportunity would have negative impacts on shark fishermen in conjunction with Amendment 3 to the 2006 Consolidated HMS FMP. However, other actions that address regional issues in the Caribbean region could increase fishing opportunities and would have positive impacts on fishermen, which could help mitigate some of the negative socioeconomic impacts under Amendment 3 to the Consolidated HMS FMP.

In general, preferred alternatives for SCS would implement quotas necessary to rebuild and stop overfishing of blacknose sharks, and mitigate some of the significant economic impacts that are necessary and expected to reduce fishing mortality as prescribed by recent stock assessments. Preferred alternatives for pelagic sharks and smooth dogfish sharks would include ending overfishing internationally and promoting the live release of shortfin mako sharks, and establishing an HMS permit requirement to possess smooth dogfish, respectively. These actions are anticipated to have positive ecological impacts on SCS and shortfin mako shark populations, and neutral ecological impacts on smooth dogfish populations. Socioeconomic impacts from the alternatives could be negative for fishermen that catch SCS and shortfin mako sharks, and may be neutral for fishermen that catch smooth dogfish sharks. While NMFS has evaluated the cumulative ecological and socioeconomic impacts of these preferred alternatives below, NMFS also evaluated how other non-HMS fisheries may be impacted by the preferred alternative suite. In particular, NMFS evaluated other fisheries that fishermen currently have permits for, shark fishermen's ability to enter other fisheries, and the subsequent impacts those fisheries might experience as a result of redirected shark fishing effort.

As part of this analysis, NMFS investigated the different types of commercial permits that directed and incidental shark permit holders currently have in addition to their HMS permits (see Table 3.32). NMFS found that many directed and incidental shark permit holders also have Gulf of Mexico reef fish, dolphin/wahoo, mackerel (including king and Spanish mackerel), South Atlantic snapper/grouper commercial permits, and non-HMS Charter/Headboat permits. A few fishermen also have lobster permits. NMFS also evaluated the ability of shark fishermen to move into these other fisheries (*i.e.*, Gulf of Mexico reef fish, dolphin/wahoo, mackerel, and South Atlantic snapper/grouper fisheries) as a result of quota and retention limit reductions in the Atlantic shark fishery under the preferred alternatives. Shark fishermen may also participate in shark fisheries in state waters or may participate in other HMS fisheries for which they may already possess permits (*i.e.*, swordfish). Table 3.32 includes vessels that possess swordfish permits in addition to commercial shark permits. An overview of each fishery is listed below, and the cumulative ecological and socioeconomic impacts of the preferred alternative, including impacts of any redistributed effort to other fisheries, are discussed below.

Gulf of Mexico Reef Fish Fishery

The GMFMC originally established the Gulf of Mexico Reef Fish FMP in 1984. Thirty amendments have been made to this plan and currently Amendment 31 is under development.

A Gulf of Mexico commercial reef fish vessel permit allows the harvest and sale of all reef fish listed in the Reef Fish FMP under quota (where applicable) and in excess of the bag limits (where applicable), except goliath grouper (all harvest prohibited), Nassau grouper (all harvest prohibited), and red snapper. Fishermen wanting to harvest and sell red snapper must also possess individual fishing quota (IFQ) shares. Issuance of new reef fish permits is under a moratorium. Access to this fishery is limited to existing permits holders. However, existing permits are transferable. As of March 18, 2009, shark directed and incidental permit holders possessed 115 Gulf of Mexico reef fish permits (Table 3.32). There are 97 Gulf of Mexico reef fish permits held by shark permitted vessels are concentrated in Florida, which represent approximately 84 percent of the total number of Gulf of Mexico reef fish permits held by commercial shark permit holders.

A portion of the reef fish permit holders also possess IFQ shares, which allow them to land red snapper in addition to other reef fish. Anyone commercially fishing for red snapper now must possess an IFQ allocation and follow the established reporting protocol. Quota shares are freely transferable to any other reef fish permit holders during the first five years following implementation of the IFQ program and then to anyone thereafter. Shark permit holders that also possess a reef fish permit, but did not receive an IFQ allocation will likely find that it would be costly to attain such an allocation.

The Gulf of Mexico Reef Fish FMP authorizes the use of longline, hook and line, handline, bandit gear, rod and reel, buoy gear, spear, powerhead, cast net, and trawl. There is a 6,000 lb gutted weight trip limit for all groupers, deep-water and shallow-water, combined. In January 2008, NMFS published a final rule implementing the Joint Reef Fish Amendment 27/Shrimp Amendment 14. This amendment reduced the commercial red snapper quota to 2.55 million pounds (mp) and a recreational quota of 2.45 mp between 2008 and 2010. The amendment also reduced the commercial minimum size limit to 13 inches total length, requires the use of non-stainless steel circle hooks, venting tools, and dehooking devices when fishing for reef fish, establish a red snapper bycatch mortality reduction goal for the shrimp trawl fishery, and, if necessary, shrimp fishery seasonal closures if the reduction target is not met.

Gulf of Mexico commercial grouper and tilefish fishermen in December 2008 approved a referendum that allowed the Council to approve Amendment 29 to the Reef Fish FMP in January 2009. The amendment is currently under review by the Secretary of Commerce, and if approved, would establish an IFQ management program for grouper and tilefish. Fishermen would receive quota according to a percentage of their average landings from 1999 and 2004.

The GMFMC submitted Amendment 30B to the Reef Fish FMP to NMFS in August 2008 for approval. An interim rule became effective on January 1, 2009, and set seasonal closures, size limits, and catch quotas for the commercial and recreational grouper fisheries. The final rule for Amendment 30B was published on April 16, 2009, and includes reducing the recreational aggregate grouper and gag grouper bag limit, increasing the recreational red grouper bag limit, decreasing the commercial red grouper minimum size, increasing the commercial red grouper closure, eliminating the commercial fishing season closure, and eliminates the end date for the Madison-Swanson and Steamboat Lumps marine reserves. A seasonal closure area for recreational and commercial fishing from January 1 to April 30, “The Edges”, was removed from

the Amendment 30B final rule because of a error contained in the proposed rule and was proposed in separate rule on April 17, 2009 (74 FR 17812). NMFS implemented an emergency rule (74 FR 20229) that bans BLL fishing shoreward of 50 fathoms east of Cape San Blas, FL from May 18, 2009, to October 28, 2009, to reduce sea turtle bycatch in the GOM BLL reef fish fishery. This sea turtle issue would be addressed for the long-term in Amendment 31, which is currently in the draft stage (GMFMC, 2009).

Approximately 23 percent of all shark permit holders (directed and incidental combined) already possess the LAPs necessary to participate in the Gulf of Mexico reef fish fishery. Of these, the Agency did not estimate the number of vessels that were selected to participate in the red snapper fishery since the inception of an IFQ program for that fishery because permits to participate in this fishery are no longer being issued. Since the fishery is limited access and has extensive measures in place to control effort and harvest levels, it is not likely that shark fishermen would be able to compensate all potential losses from reductions in quota and retention limits proposed for sharks solely by transferring effort to the Gulf of Mexico reef fish fishery.

Dolphin/Wahoo Fishery

In the Gulf of Mexico, dolphin is included in the management unit under the Coastal Migratory Pelagic Resources FMP, and a charter/headboat vessel permit is required to fish for or possess dolphin in the Gulf of Mexico. Otherwise, there are no regulations controlling the harvest of these species in the Gulf of Mexico.

In the South Atlantic, historically, the dolphin/wahoo fishery has been a recreational fishery (NMFS, 2003). However, during the 1990s, commercial landings in the Atlantic Ocean increased, due in part to an increasing number of pelagic longliners targeting dolphin (NMFS, 2003). As a result, the SAFMC, in cooperation with the MAFMC and NEFMC, developed a comprehensive FMP for both dolphin and wahoo in the Atlantic Ocean (NMFS, 2003). This FMP was approved in December of 2003. The final rule implementing the regulations in this FMP was published on May 27, 2004 (69 FR 30235). Owing to the significant importance of the dolphin/wahoo fishery to the recreational fishing community in the Atlantic, the overall goal of the FMP was to adopt a precautionary and risk-averse approach to management that set harvest limits based on the status quo at that time, which was average catch and effort levels from 1993 to 1997 (NMFS, 2003). These limits were implemented to deter shifts in the historical PLL fisheries for sharks, tunas, and swordfish or expansions into nearshore coastal waters to target dolphin, which could create user conflicts and possible localized depletion in abundance (NMFS, 2003).

As such, the dolphin/wahoo fishery is an open access fishery where people can purchase a vessel, dealer, or operator permit in the South Atlantic. Operators of commercial vessels, charter vessels, and headboats in the South Atlantic that fish south of 39° N. Latitude are required to have a federal vessel permit for dolphin/wahoo and must have and display operator permits. There is no trip limit for dolphin for a vessel with a commercial federal vessel permit. However, there is a 500 pound commercial trip limit for wahoo for vessels with such a permit. For commercially permitted vessels fishing north of 39° N. Latitude that do not have a federal commercial vessel permit for dolphin/wahoo, there is a trip limit of 200 pounds combined of

dolphin and wahoo. In addition, there is a 20 inch fork length minimum size limit for dolphin off the coasts of Georgia and Florida with no size restrictions elsewhere, and PLL fishing for dolphin and wahoo is prohibited in areas closed to the use of such gear for HMS. Dolphin/wahoo longline vessels must also comply with sea turtle protection measures. Finally, there is also a non-binding 1.5 million pound (or 13 percent of the total harvest) cap on commercial landings for dolphin. Should the catch exceed this level, the SAFMC would review the data and evaluate the need for additional regulations, which may be established through a framework action.

The recreational dolphin fishery has the same minimum size restrictions as the commercial fishery. In addition, there is a recreational bag limit of 2 wahoo per person per day and 10 dolphin per person per day or 60 dolphin per vessel per day, whichever is less (headboats are excluded from the vessel limit). There is a prohibition on recreational sale of dolphin and wahoo caught under the bag limit unless the seller holds the necessary commercial permits.

The authorized gears for dolphin and wahoo fishery are hook-and-line gear including manual, electric, and hydraulic rods and reels; bandit gear; handlines; longlines; and spearfishing (including powerheads) gear. PLL vessels permitted in the shark and swordfish fisheries are subject to the hook size regulations regarding the HMS fishery, which has impacted their ability to simultaneously fish for dolphin by attaching smaller-hooked gangions directly to their PLL gear. The total 1999 recreational harvest accounted for 91 percent (10,127,970 pounds total recreational harvest and 1,050,090 pounds commercial harvest) of the total U.S. harvest (NMFS, 2003).

The commercial fishery for wahoo appears to be incidental to fishing for dolphin or other pelagic species. Like dolphin, the recreational landings of wahoo account for a larger proportion of the total harvest in the Gulf of Mexico and Atlantic Ocean. In 1999, the total commercial harvest amounted to 99,159 pounds, compared to 1.41 million pounds harvested by recreational anglers (NMFS, 2003).

The dolphin/wahoo fishery is extremely seasonal in nature. This seasonality would influence the number of displaced shark fishermen's ability to direct effort towards dolphin and wahoo. In addition, there have been no formal stock assessments for dolphin or wahoo. The status of wahoo is considered unknown, and time-series data seems to indicate neither a decline in stock abundance nor a decrease in mean size of individual dolphin fish (SAFMC, 1998). However, a precautionary approach to management was taken in 2003 since the dolphin and wahoo tend to aggregate, they are economically valuable before the age of maturity, and there is high interannual variability in these stocks due to environmental factors. Therefore, the 2003 FMP set harvest limits based on the status quo at that time.

As of March 18, 2009, 290 dolphin/wahoo permit holders also have directed or incidental shark permits (Table 3.32). One hundred sixty five of these dolphin/wahoo permit holders are from the state of Florida (Table 3.32). Because the dolphin/wahoo fishery is an open access fishery, shark permit holders who do not currently have a dolphin/wahoo permit would be able to enter the fishery in the south Atlantic. Fishermen in the Gulf of Mexico could switch to the dolphin/wahoo fishery without trip limits or any permit requirements. However, gear

modification may be difficult since dolphin and wahoo are pelagic in nature, and PLL gear requires the use of 18/0 (with an offset not to exceed 10°) or 16/0 non-offset circle hooks. These larger hooks would make it difficult to catch small dolphin and wahoo, thus limiting catch to larger individuals. In addition, because of the seasonal nature of this fishery, directed fishing year-round would be difficult.

Spanish mackerel

In the south Atlantic, fisheries for Spanish mackerel (*Scomberomorus maculatus*) are important for commercial participants who also engage in shark fisheries. Fisheries are managed by the SAFMC and the GMFMC under the FMP for Coastal Migratory Pelagic Resources and its amendments. A stock assessment for south Atlantic Spanish mackerel was completed in 2008 and concluded that the population is not overfished or experiencing overfishing (SEDAR, 2008).

Authorized gear for Spanish mackerel in the south Atlantic include automatic reel, bandit gear, rod and reel, cast net, run-around gill nets, and stab nets; in the Gulf of Mexico, all gears are legal except drift and long gillnets and purse seines. However, there is an incidental catch allowance for vessels with purse seines onboard. A minimum size of 3.5 inches (8.9 cm) stretched mesh is required for all run-around gill nets and soak time is limited to one hour. The fishing year in the south Atlantic is from March 1 through the end of February. The fishing year in the Gulf of Mexico is April 1 through March 31. A federal vessel permit is required for commercial fisheries; however, the fishery is open to new participants who can demonstrate they meet an income requirement.

In the south Atlantic, the fishery is managed in two zones with differing regulations: a northern zone (Georgia to New York) and a southern zone (east coast of Florida to Dade-Monroe County). Catch restrictions vary by month and are dependant on the percentage of each zones allocation that is actually harvested. The majority of landings occur off Florida, where the commercial trip limit from April – November is 3,500 lb/trip. Trip limits are unlimited on weekdays beginning December 1 with a 1,500 lb trip limit on weekends until 75 percent of the quota is reached, and 1,500 lb daily trip limits are established. When 100 percent of the adjusted quota is met, trip limits are reduced to 500 pounds through the end of fishing year (SAFMC 2009a).

Gillnets were the predominant gear type for Spanish mackerel prior to the net ban in Florida (NMFS, 2004). As of 2003, approximately 60 percent of the overall catch came from cast nets and approximately 25 percent are caught with gillnets, the remainder being caught with other authorized gears (NMFS, 2004). In Florida, the majority of the effort is still in state waters, where gillnets are not allowed (NMFS, 2004). Some netting occurs in federal waters; however, the cast net is used more often (NMFS, 2004). Fishing effort follows the fish migrating north to waters off North Carolina in the summer and then following the fish back to Florida during the winter months (NMFS, 2004). Sinknets are the primary gear type off North Carolina (NMFS, 2004).

Shark fishermen could transfer fishing effort to Spanish mackerel fisheries to replace some of the lost revenues as a result of measures in this proposed amendment, such as the prohibition of the retention of sharks with gillnet gear from South Carolina south. Many vessels

that deploy gillnets for sharks also possess Spanish mackerel permits. Of vessels that possess directed and incidental shark permits, 216 also possess Spanish mackerel permits (Table 3.32). Because the commercial fishery for Spanish mackerel is not limited access, with only an income qualifier restriction and the stocks are healthy, this could be an attractive fishery for participants to engage in, especially those who possess vessels that are already set up for fishing with gillnet or castnet gear.

NMFS published a final rule (June 25, 2007, 72 FR 34632) revising regulations implementing the ALWTRP by expanding the Southeast U.S. Restricted Area and modifying regulations pertaining to gillnetting within the Southeast U.S. Restricted Area. NMFS prohibits gillnet fishing or gillnet possession during annual restricted periods associated with the right whale calving season. Limited exemptions to the fishing prohibitions are provided for gillnet fishing for sharks and for Spanish mackerel south of 29°00' N. Latitude. An exemption to the possession prohibition is provided for transiting through the area if gear is stowed in accordance with this final rule. This action is required to meet the goals of the MMPA and the ESA. This action is necessary to protect northern right whales from serious injury or mortality from entanglement in gillnet gear in their calving area in Atlantic Ocean waters off the Southeast U.S.

King Mackerel

Commercial fisheries for king mackerel (*Scomberomorus cavalla*) are an important source of revenue for participants in the Atlantic and Gulf of Mexico regions. Similar to Spanish mackerel, king mackerel is managed by both the SAFMC and GMFMC under the Coastal Migratory Pelagic Resources FMP.

A stock assessment was conducted for king mackerel in 2009. The assessment determined that the Atlantic and Gulf of Mexico migratory groups of king mackerel are not overfished and that it was uncertain if the two stocks are experiencing overfishing (SEDAR, 2009). Permits in the commercial fishery are limited access and there is currently a permit moratorium in place. The minimum size for king mackerel is 24 inches (61 cm); however, vessels may possess up to five percent of the fish on board as undersized fish. In the south Atlantic, the fishing season is March 1 through the end of February, or until the quota of 3.71 million pounds is met. In the Gulf of Mexico, the fishing year is July 1 through June 30, or until the quota of 1.01 million pounds is met.

In the south Atlantic, trip limits vary by region and time of year, including:

- From New York to Flagler/Volusia County, Florida from April 1 to March 31, the trip limit is 3,500 pounds;
- From Flagler/Volusia to Volusia/Brevard County lines from April to October 31, the trip limit is 75 fish; and,
- In Monroe County, Florida, from April 1 to October 31, the trip limit is 1,250 pounds.

Authorized gear for king mackerel varies by region, including: rod and reel, bandit gear, handline, automatic reel, gillnets, and long gillnets (except north of Cape Lookout, North Carolina); PLL, run-around gillnets (>4.75 inches (12.1 cm) stretched mesh); and purse seine (no more than 400,000 lb may be harvested by purse seine) (SAFMC, 2009b).

In the Gulf of Mexico, trip limits are established according to regional sub-divisions, each with their own quota.

- From the Florida/Alabama state boundary through Texas, the trip limit is 3,000 pounds.
- From The Florida/Alabama state boundary to the Lee/Collier County, Florida, boundary, the trip limit is 1,250 pounds.
- From the Lee/Collier County boundary to the Monroe/Miami-Dade County boundaries, from November 1 through March 31, the trip limit is 1,250 pounds.
- From the Monroe/Miami-Dade County boundary to the Broward/Volusia County boundary, from November 1 through March 31, the trip limit is 50 fish until February 1, when it increases to 75 fish if 75 percent of the quota is not taken.

There are 176 king mackerel permits held by shark permit holders (directed and incidental combined) as of March 18, 2009 (Table 3.32). The king mackerel fishery is limited access so entry by those who do not currently possess a permit would be more difficult. Because approximately one-third of shark permit holders also have king mackerel permits, NMFS anticipates that shark fishermen may increase fishing effort in king mackerel fisheries. Vessels that are already set up to deploy run-around gillnets, PLL, bandit gear, or other gillnets are most likely to increase fishing effort in the king mackerel fishery as they would have the least difficulty reconfiguring their vessel.

South Atlantic Snapper-Grouper Fishery

The SAFMC manages the 73 species that comprise the south Atlantic snapper-grouper fishery management unit (FMU). In 1998, Amendment 8 to the snapper-grouper FMP was implemented initiating a limited access program. Recent stock assessments were conducted for two deepwater snapper-grouper species, snowy grouper and golden tilefish as well as some shallower snapper-grouper species (red porgy, vermilion snapper, and black sea bass). Snowy grouper, black seabass, and red porgy were found to be overfished. Red porgy and golden tilefish were determined to not be overfished, and the overfished status of vermilion snapper was unknown. Snowy grouper, golden tilefish, black seabass, and vermilion snapper were determined to be experiencing overfishing. An assessment of south Atlantic red snapper conducted in 2008 determined that the stock is overfished and experiencing overfishing. Stock assessments for south Atlantic and Gulf of Mexico black grouper, and south Atlantic red grouper are scheduled to be completed in January 2010.

NMFS implemented the final rule for Amendment 13C to the FMP for the south Atlantic snapper-grouper Fishery on October 23, 2006 (71 FR 55096). The intent of the amendment was to reduce harvests, end overfishing, and achieve optimum yield. The management measures included in the final rule included reductions in annual commercial quotas for snowy grouper and golden tilefish. Quotas were specified for black sea bass, red porgy, and vermilion snapper, and commercial trip limits were increased for red porgy. Amendment 14 was recently approved in January 2009 (74 FR 1621) and established eight MPAs off south Atlantic states to protect a portion of the population and habitat of deepwater snapper-grouper species from directed fishing

pressure. Amendment 2 to the 2006 Consolidated HMS FMP prohibited use of shark BLL gear in the MPAs, and prohibits harvest for all species in the snapper-grouper complex in these eight MPAs.

In response to the 2006 Magnuson-Stevens Reauthorization Act and the 2008 red snapper stock assessment, the SAFMC is developing Amendment 17 to address overfishing requirements by 2010. This includes increasing catch limits and establishing new closed areas for snapper-grouper fishing. The amendment would also establish ACLs and AMs for 10 species (red snapper, golden tilefish, snowy grouper, speckled hind, warsaw grouper, black grouper, black sea bass, gag, red grouper, and vermilion snapper) within the snapper-grouper fishery. Amendment 17 is projected to be approved by the SAFMC in December 2009 (SAFMC, 2009c).

In December 2006, the SAFMC voted to explore the use of a LAPP for the snapper-grouper fishery, which could include the use of IFQ. Shark directed and incidental permit holders that already possess limited access permits in the snapper-grouper fishery may benefit from a future IFQ program as it may mitigate the more restrictive management measures that are in place for some of the snapper-grouper species. However, entrance into the snapper-grouper fishery is difficult due to the need to find two transferable limited access permits available for purchase.

As of March 18, 2009, 103 shark directed and incidental permit holders also held permits in the south Atlantic snapper-grouper fishery (Table 3.32). New entrants into the snapper-grouper fishery must obtain two existing snapper-grouper transferable permits and exchange them for one new permit. Allowable commercial gear for the snapper-grouper fishery includes vertical hook and line including bandit gear, black seabass pots, sink nets (North Carolina only), and BLL. Vessels with BLL gear onboard may only possess snowy grouper, one warsaw grouper, yellowedge grouper, misty grouper, golden tilefish, blueline tilefish, and sand tilefish. No other snapper-grouper species may be possessed or harvested.

4.10 Cumulative Ecological Impacts

Fishing Impacts

The commercial SCS preferred alternative, alternative A4, which would establish a separate blacknose shark quota and remove shark gillnet gear as an authorized gear for sharks, would provide positive ecological impacts by stopping overfishing of blacknose sharks and rebuild the stock. By allowing a limited blacknose shark quota, the Agency would ensure that data for stock assessments and life history samples would continue to be collected, which would help with future stock assessments and management of these stocks. In addition, under the preferred alternative D4, NMFS would prohibit the retention of blacknose sharks by recreational anglers in federal waters. This prohibition would help reduce mortality of blacknose sharks. Thus, the establishment of a small non-blacknose SCS quota, the banning of shark gillnet gear from South Carolina south under the preferred alternative B3, and the prohibition of the retention of blacknose sharks by recreational anglers would be the primary way through which blacknose mortality would be reduced. A significant portion of blacknose shark mortality also occurs in the shrimp trawl fisheries in the South Atlantic and Gulf of Mexico. The management measures proposed in this amendment assume a reduction in blacknose bycatch in the shrimp trawl

fisheries is also occurring. NMFS will continue to work closely with the Councils in these regions to reduce bycatch of this species, as appropriate, in order to meet the bycatch reduction target needed to rebuild the stock.

Under the preferred alternative B3, NMFS would close the shark gillnet fishery from South Carolina south (including the Gulf of Mexico and Caribbean Sea). NMFS assumes that some of the shark gillnet fishing effort may be displaced to other gillnet and BLL fisheries in which shark fishery participants are currently permitted (Table 3.32 in Chapter 3) and some of this redistributed effort may interact with protected resources. However, other fisheries, such as the South Atlantic snapper-grouper and Gulf of Mexico reef fish fisheries, are limited access fisheries. If fishermen do not currently hold permits in these fisheries, it would be difficult and expensive for them to enter these fisheries in the future. In addition, for shark fishermen that are currently permitted in these fisheries, strict retention limits and quotas are in place which would protect these stocks from further overfishing and from being further overfished by any redirected shark fishing effort. Therefore, redistributed effort is not anticipated to result in significant negative ecological impacts, including increases in bycatch or interactions with protected resources.

Other fisheries that are open access that shark fishermen could pursue, such as the mackerel fishery and the dolphin/wahoo fishery, generally have few interactions with protected resources and little bycatch compared to directed shark fishing trips (see NMFS, 2003 and Carlson and Bethea, 2007). Therefore, redistributed effort into these fisheries is not anticipated to increase interactions with protected resources or result in significant increases in bycatch. In addition, retention limits, quotas and other effort controls are in place for these fisheries to protect the stocks from overfishing and from being overfished.

In addition to these impacts, cumulative ecological impacts on HMS stocks and fisheries due to actions under consideration by Regional Fishery Management Councils, Interstate Marine Fisheries Commissions, or other management bodies may be slightly positive. NMFS backstopped the Caribbean Fishery Management Council's area closures which could have minor positive benefits for Atlantic HMS (72 FR 5633, February 7, 2007). NMFS also published a rule that requires sea turtle handling and release equipment in the shark BLL fishery (72 FR 5633, February 7, 2007). Additionally, NMFS backstopped the eight marine protected areas implemented by the South Atlantic Fishery Management Council in Amendment 2 to the 2006 Consolidated HMS FMP (June 24, 2008, 73 FR 35778; July 15, 2008, 73 FR 40658). The Gulf of Mexico Fishery Management Council implemented regulations that would implement similar dehooking requirements to those required in the HMS PLL fishery and to those for the HMS BLL fishery (71 FR 45428, August 9, 2006). New requirements for non-stainless steel circle hooks in the reef fish fishery under Amendment 27 were implemented on January 29, 2008 (73 FR 5117) by the Gulf of Mexico Fishery Management Council. NMFS has also recently implemented workshops for the safe handling and release and identification of protected resources for all HMS gillnet and longline fishery participants, and identification workshops for shark dealers (71 FR 58058, October 2, 2006). NMFS implemented an emergency rule that bans BLL reef fish fishing shoreward of 50 fathoms east of Cape San Blas, FL from May 18, 2009 to October 28, 2009, to reduce sea turtle bycatch in the Gulf of Mexico BLL reef fish fishery (add FR notice when we know it). This sea turtle issue would be addressed for the long-term in

Amendment 31, which is currently in the draft stage (GMFMC, 2009). NMFS would closely monitor any resulting redistribution of effort from the reef fish fishery to the shark BLL fishery in the Gulf of Mexico.

The incremental contribution of the actions proposed in Amendment 3 to the 2006 Consolidated HMS FMP, when considered in conjunction with the activities listed above, is considered a significant ecological benefit to the ecology of the managed species. The measures listed above were implemented to help reduce interactions with protected species, or increase post-release survival of non-target species and protected species, to help rebuild overfished fish stocks and end overfishing, or to protect EFH for deep water species. In conjunction with Amendment 3 to the 2006 Consolidated HMS FMP , which would help rebuild blacknose shark stocks and end overfishing, such measures would help conserve fishery resources in the long-term, which would ultimately have positive ecological impacts.

The preferred alternatives regarding smooth dogfish (alternative F2 and sub-alternatives F2a3 and F2b1) and shortfin mako sharks (alternatives C5, C6, E3 and E4) would likely not have any significant cumulative ecological impacts. The smooth dogfish preferred alternative would establish a federal permit and would not significantly alter fishing practices. The shortfin mako shark preferred alternatives would encourage the live release of the species in both the commercial and recreational sectors, which would only affect post-catch behavior and not fishing practices, and would establish a foundation to work at the international level to implement an international plan to end overfishing of this species.

Non-Fishing Impacts

Other actions that might affect shark populations, such as offshore oil and gas production, and non-fishing activities that may affect EFH are described in Section 10.5 of the 2006 Consolidated HMS FMP (NMFS, 2006) and Amendment 1 to the 2006 Consolidated HMS FMP (NMFS, 2009).

4.11 Cumulative Social and Economic Impacts

The commercial SCS preferred alternatives, which would establish a separate blacknose shark quota and remove shark gillnet gear as an authorized gear for sharks from South Carolina south, would likely result in negative social and economic impacts on Atlantic shark fishermen. It is unlikely that shark fishermen would be able to recuperate all of these economic losses by switching to other southeast fisheries due to quota reductions and/or limited access programs in these other fisheries. The Agency presumes that since some shark fishermen also possess several permits in other fisheries (Table 3.32 in Chapter 3), they do not receive all of their revenues from shark products. At the present time, NMFS estimates that fishermen make decisions about which fisheries to participate in based on the ex-vessel prices they can expect from a given species of fish, seasonality, quotas, trip limits, and other factors. In the past, due to higher quotas, revenues received from sharks likely comprised a larger share of fishermen's overall revenues from fishing activities than is expected in the future. However, it could be difficult for all lost shark revenues to be replaced by transferring more effort to other fisheries in which they have historically participated due to restrictions in those fisheries as well.

The preferred alternative D4, which would prohibit retention of blacknose sharks in the recreational shark fishery, is not expected to have large, negative social and economic impacts on recreational fishermen. Recreational fishermen could still catch blacknose sharks; they would just have to release them. Also, blacknose sharks are not one of the primary species targeted by recreational anglers, in tournaments, or on charters.

There are limited-access permit programs in place for the South Atlantic snapper-grouper fishery as well as the Gulf of Mexico reef fish fishery, where no new permits are being issued. Therefore, if shark fishermen do not currently possess a South Atlantic snapper-grouper permit or a Gulf of Mexico reef fish permit, it would be difficult and costly to enter these fisheries in the future. There are also quota reductions for many reef fish species (see above), which would affect current Gulf of Mexico reef fish permit holders. Thus, shark fishermen who have shark and reef fish permits could experience economic hardships in both fisheries.

In addition, there is an IFQ program in place for the Gulf of Mexico red snapper fishery, with limitations on transfers during the first five years (see above), and a new IFQ program would be implemented in the near future for the South Atlantic snapper-grouper fishery. These IFQ programs could benefit current South Atlantic snapper-grouper or Gulf of Mexico red snapper permit holders; however, it would make it difficult and expensive for shark fishermen who do not currently possess these permits to enter these fisheries in the future.

As mentioned in Section 4.9, the dolphin/wahoo fishery is an open access fishery. However, redistribution of commercial shark fishing effort into this fishery may result in user conflicts between recreational and commercial fishermen. Additionally, commercial PLL fishermen that currently fish for dolphin and wahoo could suffer economically if a large proportion of the shark fishermen redirect their effort to the dolphin/wahoo fishery, given the 1.5 million pounds commercial landings cap (or 13 percent of total landings, whichever is greater) for the dolphin fishery. If this cap is exceeded, the SAFMC may decide to take more stringent measures in this fishery to reduce overall catch. More importantly, due to the seasonality of the dolphin/wahoo fishery, it would be difficult for commercial fishermen to direct on dolphin/wahoo (S. Branstetter, NOAA, personal communication). Finally, it would be difficult for shark fishermen using PLL gear to catch smaller dolphin and wahoo due to hook requirements in the PLL fishery (see discussion above). Shark fishermen would have to either target larger fish with larger circle hooks or relinquish their HMS permit(s) so that they could use smaller hook sizes to target smaller dolphin/wahoo. The latter would preclude them from retaining any HMS catch.

It is likely that shark fishermen using gillnet gear for sharks would transfer some fishing effort to the Spanish mackerel fishery. Participants currently using other gears for sharks may consider purchasing the necessary gear (*e.g.*, gillnets, *etc*.) to become involved in this fishery. Since this fishery is not limited access, transferring effort into this fishery would not require paying high costs to acquire permits from other vessels. Furthermore, since the stock status of Spanish mackerel is healthy, there does not appear to be any significant restrictions on quotas or other effort controls necessary at this time or in the foreseeable future. However, this fishery is seasonal, so year-round revenues from Spanish mackerel may not be realized. Rather,

participants in North Carolina would be expected to fish for Spanish mackerel in the summer while participants in Florida could target these fish in the winter.

The commercial fishery for King mackerel is managed via a limited access permit system, and shark fishermen who do not currently possess a King mackerel permit may have a difficult time entering this fishery. However, there are 176 participants in the shark fishery that currently possess these king mackerel permits. Therefore, effort in this fishery is expected to increase as a result of shark management measures in this proposed amendment.

The additional management measures taken by other Councils and Commissions, such as the eight MPAs implemented by the SAFMC's Amendment 14, dehooking requirements by the GMFMC, the interstate shark plan being implemented by the ASMFC, and the requirement to use non-stainless steel, circle hooks in the reef fish fishery as well as the measures that NMFS has backstopped or other rules that NMFS has recently implemented, such as requiring safe handling and release gear on shark BLL and gillnet boats and backstopping closed areas in the Caribbean to protect EFH, would all have negative economic and social impacts on fishermen in the short-term. Therefore, the incremental contribution of the proposed measures in Amendment 3 to the 2006 Consolidated HMS FMP, when considered with these other actions, is expected to have a significant socioeconomic impact over the short-term on participants in the shark fishery. However, because these measures were implemented to help reduce interactions with protected species or increase post-release survival of non-target species and protected species, to help rebuild overfished fish stocks and end overfishing or to protect EFH for deep-water species, such measures would help conserve fishery resources in the long-term, which would ultimately have positive economic and social impacts for fishermen in the long-term.

The preferred alternatives regarding smooth dogfish and shortfin mako sharks would likely not have any significant cumulative socioeconomic impacts. The smooth dogfish preferred alternative would establish a federal permit and the associated fees are expected to be minimal and not present a significant impediment for fishermen wishing to enter or remain in the fishery. The shortfin mako shark preferred alternative would encourage the live release of the species in the commercial and recreational sectors, and would only affect post-catch behavior and not fishing practices. In addition, the preferred alternative to work at the international level with other countries to implement a plan to end overfishing of shortfin mako sharks would only have negative economic impacts if and when those management measures would reduce fishing opportunities for U.S. shortfin mako sharks.

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