2.0 RANGE OF POTENTIAL ALTERNATIVES

In this chapter, NMFS considers a broad range of alternatives to address the results of the 2007 SCS stock assessment, the 2008 SCRS shortfin mako shark stock assessment, and other issues involving shark management. This chapter is organized according to the following sections:

- SCS effort controls - This sections considers alternatives for *SCS only* regarding quotas, retention limits, size limits, and gear restrictions.

- Pelagic shark effort controls – This section considers alternatives regarding quotas, species complexes, retention limits and size limits *for pelagic sharks only*.

- Fisheries re-characterization - This section considers alternatives for regarding the need for regions and seasons.

- Time/area closures- This section considers alternatives for regarding the need for time/area closures both in HMS and Council fisheries.

- Monitoring and compliance - This section considers alternatives for *all sharks* regarding improvements in vessel monitoring systems (VMS) and reporting requirements.

- Additional Species Considerations - This section considers alternatives for the inclusion of *other elasmobranch species* into various shark species complexes.

2.1 Small Coastal Shark Effort Controls

2.1.1 SCS Quotas and Species Complexes

In this section, NMFS considers a variety of alternatives in establishing quotas for SCS that would rebuild and prevent overfishing of blacknose sharks. Discussions on pelagic sharks and shortfin mako shark quotas will be discussed in a separate section (see Section 2.2 Pelagic Shark Effort Controls). To aid in review of the quota alternatives, below is a brief description of the species life history, their role in shark fisheries, and the results of the 2007 stock assessments. Note that the alternatives in this section are related to, and could impact, alternatives in other sections (*e.g.*, quotas could impact retention limits, gear restrictions, and time/area closures).

In Amendment 1 to the 1999 Atlantic Tunas, Swordfish, and Sharks FMP, NMFS implemented criteria regarding the addition or removal of sharks to/from the prohibited species list. Sharks may be added to the prohibited list if they meet at least two of the following criteria: (1) there is sufficient biological information to indicate the stock warrants protections, such as indications of depletion or low reproductive potential or the species is on the Endangered Species Act (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).

Unless stated otherwise, all the life history and landings information is from either the Draft Amendment 1 to the Consolidated HMS FMP (NMFS, 2008) or from the different documents presented at the data workshop for the 2007 assessment (NMFS 2007a; SEDAR 13: http://www.sefsc.noaa.gov/sedar/).

Small Coastal Sharks

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

The peer reviewers determined that the data used in the 2007 stock assessment of the SCS complex and the individual species within the complex were considered the best available at the time and the assessment was considered adequate. However, because the species were individually assessed, the peer reviewers recommended using species-specific results rather than the aggregated SCS complex results. As a result of this recommendation, and because the stock assessment covered all SCS species, NMFS decided to stop providing status updates or determinations on the SCS complex as a whole. However, this does not preclude NMFS from managing SCS as a complex.

Finetooth Sharks

Finetooth sharks have a total length (TL) of approximately 48 to 58 cm at birth. They reach maturity at approximately 130-135 cm TL. The age of maturity differs slightly between males and females and the Gulf of Mexico region versus the Atlantic region, with fish in the Atlantic region maturing slightly later in age than fish in the Gulf of Mexico region. Fish in the Gulf of Mexico live to approximately 8 years of age while fish in the Atlantic live to greater than 10 years of age. Maximum size is estimated to be approximately 120-124 cm fork length (FL). A mature female gives birth to an average of 4 pups per litter.

Within the commercial shark fisheries, finetooth sharks are caught almost exclusively in the South Atlantic region. Most of these are caught with drift gillnets. Finetooth sharks are rarely reported caught in recreational fisheries (0.6 to 6 percent of all SCS recreational landings between 1995 and 2005). Most of the recreational fishery for finetooth sharks occurred in the Gulf of Mexico (71 percent) versus the South Atlantic (13 percent).

According to the 2002 SCS stock assessment, finetooth sharks were experiencing overfishing. However, the 2007 SCS stock assessment found that finetooth sharks are not overfished ($N_{2005}/N_{MSY} = 1.80$) and overfishing is not occurring ($F_{2005}/F_{MSY} = 0.17$) (Figure 1.1). Based on this, NMFS has determined that finetooth sharks are not overfished and no overfishing is occurring. However, NMFS also notes that while the peer reviewers agreed that it is reasonable to conclude that the stock is not currently overfished, they also indicated that given the limited data available on the population dynamics for finetooth, management should be cautious.

Atlantic Sharpnose Sharks

Atlantic sharpnose sharks have a total length of approximately 30 cm at birth. They reach maturity at approximately 65 to 90 cm TL, depending on sex (females mature at a longer length). As with finetooth and blacknose sharks, the age of maturity of Atlantic sharpnose sharks differs between fish in the Gulf of Mexico region (approximately 1.3 to 1.6 years) and the Atlantic region (approximately 2 to 2.6 years). The reproductive cycle of sharks in both regions is annual. Fish in the Gulf of Mexico live to approximately 6.5 to 9 years of age (females live longer) while fish in the Atlantic live to 9.8 to 11.4 years of age (females live longer). Maximum size is estimated to be approximately 110 cm FL. A mature female in either region gives birth to an average of 4.5 pups per litter.

Except for a few years, Atlantic sharpnose sharks accounted for over a third of all SCS commercial landings. In 2004 and 2005, Atlantic sharpnose sharks accounted for over half of all SCS commercial landings. Most of these come from Florida's east coast (71 - 93 percent). Except for 1995 when most of the landings came from longline gear, drift gillnet gear is the dominant gear used to catch sharpnose sharks commercially in the Atlantic. In the Gulf of Mexico, longlines are the dominant gear type for commercial sharpnose shark landings. In the recreational fishery, Atlantic sharpnose sharks comprise 54-78 percent of all landings from 1995 to 2005. Approximately 55 percent of the recreational fishery for Atlantic sharpnose sharks occurred in the Gulf of Mexico and 45 percent in the South Atlantic.

The 2002 SCS stock assessment found that Atlantic sharpnose sharks were not overfished and overfishing was not occurring. The 2007 assessment for Atlantic sharpnose sharks also indicated that the stock is not overfished ($SSF_{2005}/SSF_{MSY} = 1.47$) and that no overfishing is occurring ($F_{2005}/F_{MSY} = 0.74$). SSF stands for the spawning stock fecundity and is the number of reproductive-age individuals in a population. Based on these results, NMFS has determined that the Atlantic sharpnose sharks are not overfished with no overfishing occurring (Figure 1.2). However, because estimates of F from the assessment indicate that F is close to, but presently below, F_{MSY} (*i.e.*, overfishing is not occurring), the peer reviewers suggest setting a threshold for F to keep it below the F_{MSY} threshold to prevent overfishing in the future.

Bonnethead Sharks

Bonnethead sharks have a total length of approximately 27 to 35 cm at birth. They reach maturity at approximately 70 to 85 cm TL, depending on sex (females mature at a longer length). Unlike the other SCS, the age of maturity of bonnethead sharks does not differ between the Gulf of Mexico and the Atlantic region. Males appear to mature at approximately 2 years of age and females at 3 years. The reproductive cycle is annual in both regions. Bonnethead sharks appear to live to approximately 5.5 to 7.5 years of age (females live longer). Maximum size is estimated to be approximately 100 to 140 cm FL (females are larger). A mature female gives birth to approximately 8 to 12 pups per litter.

Bonnethead sharks made up over 50 percent of all SCS commercial landings in 1995, but were the least important species in commercial landings between 1996 and 2005. Almost all landings come from Florida with the east coast landing more than the west coast. Except for 1996, gillnet gear was the primary gear used to catch bonnethead sharks. In 1996, both gillnet and longline gears were used to catch bonnethead sharks commercially. In the recreational fishery, bonnethead shark is the 2nd most important SCS and comprised approximately 15 to 34 percent of all recreational landings between 1995 and 2005. Approximately 66 percent of the recreational fishery for bonnethead sharks occurred in the Gulf of Mexico and 35 percent in the South Atlantic.

Based on the bonnethead stock assessment, the peer reviewers determined that bonnethead sharks are not overfished ($SSF_{2005}/SSF_{MSY} = 1.13$). In addition, the estimate of fishing mortality rate in 2005 was less than F_{MSY}, ($F_{2005}/F_{MSY} = 0.61$), thus overfishing was not occurring. While NMFS has determined that bonnethead sharks are not overfished with no overfishing occurring (Figure 1.3), fishing mortality rates in the recent past have fluctuated above and below F_{MSY}.

Blacknose Sharks

Blacknose sharks have a total length of approximately 50 cm at birth. They reach maturity at approximately 100 cm TL. As with finetooth sharks, the age of maturity of blacknose sharks differs between fish in the Gulf of Mexico region and the Atlantic region. The reproductive cycle of sharks in the Atlantic region is biennial while the reproductive cycle of sharks in the Gulf of Mexico is annual. Fish in the Gulf of Mexico live to approximately 23 years of age while fish in the Atlantic live to greater than 18 years of age (Driggers et al, 2007). Maximum size is estimated to be approximately 110 cm FL. A mature female in either region gives birth to an average of 3 pups per litter.

Within the commercial shark fisheries, blacknose sharks were also predominantly landed in the South Atlantic region in most years. Approximately 2/3 of them were caught with drift gillnets. Within the recreational fishery, blacknose sharks made up approximately 2 to 12 percent of all SCS recreational landings. Approximately 77 percent of the recreational fishery for blacknose sharks occurs in the Gulf of Mexico while 14 percent occurs in the South Atlantic. The assessment found that blacknose sharks are also caught in shrimp trawls, which results in approximately 50 percent of all blacknose shark mortality both by weight and number (Table 2.1).

The 2002 SCS stock assessment found that blacknose sharks were not overfished and overfishing was not occurring. However, the 2007 stock assessment for blacknose sharks indicates that SSF in 2005, and the average from 2001 to 2005, was smaller than SSF_{MSY} ($SSF_{2005}/SSF_{MSY} = 0.48$). Therefore, NMFS has determined that blacknose sharks are overfished. In addition, the estimate of fishing mortality rate in 2005, and the average for 2001-2005, was greater than F_{MSY}, and the ratio was substantially greater than 1 in both cases ($F_{2005}/F_{MSY} = 3.77$). Based on these results, NMFS has determined that blacknose sharks are experiencing overfishing (Figure 1.4). With zero fishing mortality, the assessment found that it would take approximately 11 years to rebuild this species (70 percent probability of recovering to SSF_{MSY} by 2019; this recommended rebuilding time is 11 years from 2009). Because this is greater than 10 years, as outlined under the National Standard 1 guidelines (50 CFR 600.310), the assessment scientists looked at the rebuilding plans that would take the amount of time to rebuild under zero fishing mortality plus one mean generation time. As a result, the assessment recommended a rebuilding plan with a constant TAC of 19,200 individuals. This rebuilding plan has a 70 percent probability of success by the year 2027. The constant TAC also allows for rebuilding with 50 percent confidence by 2024.

In reviewing Table 2.1, it appears the data indicate that, on average, 86,381 individual blacknose sharks were killed each year between 1999 and 2005[2] in all fisheries combined (commercial and recreational shark fisheries as well as shrimp trawl fisheries). Approximately 75,973 fish (377,586 lb dw or 171 mt dw) are caught in commercial fisheries, and 10,408 fish (15,612 lb dw or 7 mt dw) are caught in recreational fisheries. If these were the only sources of mortality, NMFS could reduce fishing effort in the shark fisheries alone to achieve the TAC of 19,200 fish. However, there are, on average, an additional 43,482 blacknose sharks that are killed in shrimp trawl fisheries each year. Thus, completely eliminating all blacknose catches in the commercial and recreational shark fisheries would still leave 43,482 blacknose sharks being killed each year in the shrimp trawl fisheries. As a result, NMFS must consider options that will reduce mortality in not just the commercial and recreational shark fisheries, but the shrimp trawl fishery as well. Reducing the 86,381 blacknose sharks that are currently killed each year to achieve the allowable TAC of 19,200 fish is equivalent to a 78-percent reduction in mortality across all fisheries.

Recent landings of SCS in the commercial shark fishery

Table 2.2 shows the commercial landings of SCS from 1999 to 2007. These landings represent what was taken from the commercial shark fishery; it does not include bycatch of SCS in shrimp trawl or other fisheries. On average, 641,648 lb dw (291 mt dw) SCS are taken in the commercial shark fishery. Of these, 135,621 lbs dw (61.5 mt dw) are blacknose sharks. Table 2.2 also indicates that Atlantic sharpnose sharks are the most important commercial SCS. Finetooth and blacknose sharks fluctuate in importance

[2] The information in Table 2.1 comes from the 2007 stock assessment. The stock assessment, which began in February 2007, used data through 2005.

from year to year in terms of commercial landings. Bonnethead sharks have the fewest landings of all SCS.

Potential quotas and species complexes

Based on the information provided above, NMFS is considering establishing separate quotas for species in the SCS complex and different methods of organizing the SCS complex (Table 2.3). The quota and/or species complex considered here could affect the feasibility of management measures discussed later in this document.

Table 2.1 **Sources of blacknose shark mortality, 1999-2005 (NMFS, 2007a). 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).**

	Commercial Average wt = 4.97 lb dw						**Recreational** Average wt = 1.5 lb dw	**Total**
Gear	**Longline**	**Nets**	**Lines**	**Longline Discards**	**GOM Shrimp bycatch**	**SA Shrimp bycatch**	**Landings**	
Number of fish	8,091	19,041	352	5,007	38,626	4,856	10,408	86,381
Percent by number	9%	22%	0%	6%	45%	6%	12%	100%
Weight (lbs dw)	40,212	94,634	1,749	24,885	191,971	24,134	15,612	393,198
Weight (mt dw)	18	43	1	11	87	11	7	178
Percent by weight	10%	24%	0%	6%	49%	6%	4%	100%

Table 2.2 **Commercial landings of SCS in lb dw: 1999-2007.** Source: Cortés and Neer, 2002, 2005; Cortés, 2003; Cortés pers. comm.

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

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

Table 2.3 Potential commercial quotas and species complex alternatives.

Alternative	Ecological Impacts	Social/Economic Impacts
1. No Action. Maintain the existing SCS quota (454 mt dw) and existing species complex (finetooth, Atlantic sharpnose, bonnethead, and blacknose sharks)	-Continued overfishing of blacknose sharks; rebuilding plan for blacknose sharks would still need to be implemented	-No change in current SCS annual commercial quota (454 mt dw) would not result in negative socioeconomic impacts in the short-term; in the long-term, certain species may not be available if other management measures fail to rebuild stock
2. Reduce overall SCS quota based on the reduction needed to rebuild blacknose sharks		
2a. Treat all sources of mortality equally; reduce mortality caused in the HMS SCS commercial fisheries by 78 percent (SCS quota = 99.8 mt dw)	- Mortality of blacknose sharks would be reduced; rebuilding would only occur if mortality in all fisheries (including non-HMS fisheries such as shrimp trawl) is reduced by 78% - Mortality of SCS other than blacknose sharks would also be reduced; fishery landings would not approach OY - If biomass of other SCS increases, could have negative impacts on prey species and positive impacts on species that prey on them (e.g., larger sharks) - Most SCS caught in gillnets are dead at haulback; therefore, under this alternative, any SCS caught in gillnets above the quota are likely to be discarded dead and will not aid rebuilding of blacknose sharks - Approximately 60% of SCS caught in BLL gear are dead at haulback; therefore, under this alternative, approximately 60% of SCS caught in BLL above the quota are likely to be discarded dead and will not aid rebuilding of blacknose sharks - Blacknose sharks likely will be discarded dead in other fisheries, including shrimp trawl; those discarded dead will not aid rebuilding	- SCS commercial quota would be reduced dramatically likely leading to negative socioeconomic impacts in short-term, and possibly long-term, for commercial shark fishermen, especially for those who target SCS - Reduction of ability to land bycatch in other fisheries could have a short-term negative economic impact (e.g., the cost of changing the method of fishing) and, if shark bycatch is large compared to target catch, a long term positive impact (e.g., greater efficiency if total shark bycatch is reduced) - Depending on ecosystem changes, if the biomass of the three other SCS increases as a result of reduced mortality, other fisheries could have reduced or increased fish availability leading to commensurate socioeconomic impacts

Alternative	Ecological Impacts	Social/Economic Impacts
2b. Reduce mortality only in the commercial shark fisheries (*i.e.*, fisheries targeting SCS) to zero (SCS quota = 0 mt)	- Under this alternative, would need to review the four regulatory criteria to determine if SCS should be placed on shark prohibited species list -Would still not result in a TAC of 19,200 fish because of mortality in other fisheries (*e.g.*, shrimp trawl) - Overall mortality of blacknose sharks would be reduced by approximately 40% (not including discards in the BLL fishery); rebuilding will not occur without additional reductions in mortality in other fisheries (*e.g.*, shrimp trawl) - Mortality of SCS other than blacknose sharks would also be reduced; the SCS other than blacknose sharks would not be landing OY, but could help reduce mortality of bonnethead and finetooth sharks - If biomass of other SCS increases, could have impacts on prey species and other species that prey on them (*e.g.*, larger sharks) - Most SCS caught in gillnet are dead at haulback; therefore, under this alternative, any SCS caught in gillnet will likely to be discarded dead and will not aid rebuilding of blacknose sharks - Approximately 60% of SCS caught in BLL gear are dead when they arrive at the vessel; therefore, under this alternative, approximately 60% of SCS caught in BLL are likely going to be discarded dead and will not aid rebuilding of blacknose sharks - Blacknose likely will be discarded dead in other fisheries, including shrimp trawl; those discarded dead will not aid rebuilding -Also, see alternatives 7 and 9 in Section 2.1.2, particularly for recreational fisheries	- SCS commercial quota would be reduced dramatically likely leading to negative socioeconomic impacts - All SCS would be regulatory discards leading to negative social impacts - Reduction of ability to land bycatch in other fisheries could have a short-term negative economic impact (e.g., the cost of changing the method of fishing) and, if shark bycatch is large compared to target catch, a long term positive impact (e.g., greater efficiency if total shark bycatch is reduced) - Depending on ecosystem changes, if the other SCS biomass increases as a result of reduced mortality, other fisheries could have reduced or increased fish availability leading to socioeconomic impacts -Also, see alternatives 7 and 9 in Section 2.1.2, particularly for recreational fisheries
3. Remove blacknose sharks from SCS complex; establish a quota for the new SCS complex and a species-specific quota for blacknose sharks		

Alternative	Ecological Impacts	Social/Economic Impacts
3a. New SCS complex quota = 392.5 mt dw (current quota (454 mt) - average blacknose landings (61.5 mt); see Table 2.2) Blacknose quota = 0 mt dw (prohibited)	- Under this alternative, would need to review the four regulatory criteria to determine if SCS should be placed on shark prohibited species list - Overall mortality of blacknose sharks would be reduced by approximately 40%; rebuilding not likely to occur without additional reductions in mortality in non-HMS fisheries (e.g., shrimp trawl) so that TAC is achieved - Mortality of other SCS could remain the same - Few, if any, ecosystem-type impacts on other fisheries - Most SCS, including blacknose sharks, caught in gillnet are dead at haulback; therefore, under this alternative, any blacknose sharks caught in gillnet are likely to be discarded dead and will not aid rebuilding of blacknose sharks - Approximately 60% of SCS caught in BLL gear are dead at haulback; therefore, under this alternative, approximately 60% of blacknose sharks caught in BLL are likely going to be discarded dead and will not aid rebuilding of blacknose sharks - Blacknose likely will be discarded dead in other fisheries, including shrimp trawl; those discarded dead will not aid rebuilding -Also, see alternatives 5 and 8 in Section 2.1.2	- Landings of SCS other than blacknose sharks unlikely to change or be reduced resulting in no socioeconomic impacts - Landings of blacknose sharks prohibited resulting in some negative socioeconomic impacts; to the extent that fishermen could land other SCS (overall quota has not been reached), these negative impacts could be offset - Reduction of ability to land bycatch in other fisheries could have a short-term negative economic impact (e.g., the cost of changing the method of fishing) and, if shark bycatch is large compared to target catch, a long term positive impact (e.g., greater efficiency if total shark bycatch is reduced) -Also, see alternatives 5 and 8 in Section 2.1.2

Alternative	Ecological Impacts	Social/Economic Impacts
3b. New SCS complex quota = 392.5 mt dw (current quota (454 mt) - average blacknose landings (61.5 mt)) Blacknose quota = 13.5 mt dw (based on 78% reduction from 61.5 mt)	- Overall mortality of blacknose sharks would be reduced; rebuilding would only occur if mortality in non-HMS fisheries (e.g., shrimp trawl) is similarly reduced - Mortality of other SCS could remain the same - Few, if any, ecosystem-type impacts on other fisheries - Most SCS, including blacknose sharks, caught in gillnet are dead at haulback; therefore, under this alternative, any blacknose sharks caught in gillnet above the quota are likely to be discarded dead and will not aid rebuilding of blacknose sharks - Approximately 60% of SCS caught in BLL gear are dead at haulback; therefore, under this alternative, approximately 60% of blacknose sharks caught in BLL above the quota are likely going to be discarded dead and will not aid rebuilding of blacknose sharks - Blacknose likely will be discarded dead in other fisheries, including shrimp trawl; those discarded dead will not aid rebuilding	- Landings of other SCS unlikely to change resulting in no socioeconomic impacts - Landings of blacknose sharks reduced significantly resulting in some negative socioeconomic impacts; to the extent that fishermen could land other SCS (overall quota has not been reached), these negative impacts could be offset - Reduction of ability to land bycatch in other fisheries could have a short-term negative economic impact (e.g., the cost of changing the method of fishing) and, if shark bycatch is large compared to target catch, a long term positive impact (e.g., greater efficiency if total shark bycatch is reduced)

Alternative	Ecological Impacts	Social/Economic Impacts
4. Establish species-specific quotas for all species in the SCS complex based on average landings (average landings is a proxy for current mortality level): Bonnethead = 21 mt; Finetooth = 81.6 mt; Atl. Sharpnose = 124.4 mt; Blacknose = 13.5 mt (78% reduction of average landings); close each quota individually, as needed	- Mortality of blacknose sharks would be reduced; rebuilding would only occur if mortality in other non-HMS fisheries (e.g., shrimp trawl) is reduced and TAC achieved - Mortality of other SCS could remain the same - Bycatch of blacknose sharks in other SCS fisheries likely to continue - Increases management control over current mortality levels on all SCS, reducing chance of future overfishing - Few, if any, ecosystem-type impacts on other fisheries - Most SCS caught in gillnet are dead at haulback; therefore, under this alternative, any SCS caught in gillnet above the quotas are likely to be discarded dead - Approximately 60% of SCS caught in BLL gear are dead at haulback; therefore, under this alternative, approximately 60% of SCS caught in BLL above the quotas are likely going to be discarded dead - Blacknose likely will be discarded dead in other fisheries, including shrimp trawl; those discarded dead will not aid rebuilding	- Landings of other SCS unlikely to change resulting in no socioeconomic impacts - If quota of one species is reached, SCS fishermen would need to discard that species while targeting the other species; this could result in regulatory discards and continued mortality if the discards are dead; this could also lead to negative social impacts resulting from regulatory discards and lost economic opportunities - Landings of blacknose sharks reduced significantly resulting in some negative socioeconomic impacts; to the extent that fishermen could land other SCS (overall quota has not been reached), these negative impacts could be offset - Reduction of ability to land bycatch in other fisheries could have a short-term negative economic impact (e.g., the cost of changing the method of fishing) and, if shark bycatch is large compared to target catch, a long term positive impact (e.g., greater efficiency if total shark bycatch is reduced)

Alternative	Ecological Impacts	Social/Economic Impacts
5. Establish species-specific quotas for all species in the SCS complex based on average landings (Bonnethead = 21 mt; Finetooth = 81.6 mt; Atl. Sharpnose = 124.4 mt) and prohibit landing of blacknose sharks (0 mt dw); close each quota individually, as needed	- Under this alternative, would need to review the four regulatory criteria to determine if SCS should be placed on shark prohibited species list - Overall mortality of blacknose sharks would be reduced by approximately 40%; rebuilding not likely to occur without additional reductions in mortality in other non-HMS fisheries (e.g., shrimp trawl) to achieve TAC - Mortality of other SCS could remain the same - Bycatch of blacknose sharks in other SCS fisheries likely to continue; discards would occur - Increases management control over current mortality levels on all SCS, reducing chance of future overfishing - Few, if any, ecosystem-type impacts on other fisheries - Most SCS, including blacknose sharks, caught in gillnet are dead at haulback; therefore, under this alternative, any blacknose sharks caught in gillnet are likely to be discarded dead and will not aid rebuilding - Approximately 60% of SCS caught in BLL gear are dead at haulback; therefore, under this alternative, approximately 60% of blacknose sharks caught in BLL are likely going to be discarded dead and will not aid rebuilding - Blacknose likely will be discarded dead in other fisheries, including shrimp trawl; those discarded dead will not aid rebuilding -Also, see alternatives 5 and 8 in Section 2.1.2	- Landings of other SCS unlikely to change resulting in no socioeconomic impacts - If quota of one species is reached, SCS fishermen would need to discard that species while targeting the other species; this could result in regulatory discards and continued mortality if the discards are dead; this could also lead to negative social impacts resulting from regulatory discards and lost economic opportunities - To the extent that fishermen could land other SCS (other quotas have not been reached), any negative impacts from not landing blacknose sharks could be offset - Reduction of ability to land bycatch in other fisheries could have a short-term negative economic impact (e.g., the cost of changing the method of fishing) and, if shark bycatch is large compared to target catch, a long term positive impact (e.g., greater efficiency if total shark bycatch is reduced) -Also, see alternatives 5 and 8 in Section 2.1.2

2.1.2 Retention Limits

As with quota and species complexes, this section will focus on SCS. Retention limits for pelagic sharks, and in particular, shortfin mako sharks, will be discussed in Section 2.2 focusing on pelagic sharks. Currently, the commercial shark fishery is regulated under a limited access permit program. Within this program, there are directed and incidental commercial shark permits that have different trip limits associated with each type of permit. A directed shark permit currently has a 33 non-sandbar LCS per vessel per trip limit, with no limits on the number of SCS or pelagic sharks that can be landed on a given trip. The incidental shark permit has a 3 non-sandbar LCS per vessel per trip limit, with a limit of 16 SCS and pelagic sharks (combined) that can be landed on a given trip. Currently, there is no minimum size for the commercial shark fishery due to concerns regarding dead discards of undersized sharks.

The following alternatives in Table 2.4 define the options that NMFS is considering to rebuild blacknose sharks with respect to commercial and recreational retention limits for SCS. This section addresses retention limits (trip limits for the commercial sector and bag limits for the recreational sector) as well as size limits for the recreational sector. As stated earlier, the impacts of the alternatives presented here could change, depending on the selection of alternatives considered in other sections.

Table 2.4 Potential commercial and recreational retention limit alternatives.

Alternative	Ecological Impacts	Social/Economic Impacts
1. No Action: Maintain current commercial and recreational SCS retention limits	- Continued overfishing of stocks; rebuilding plan for blacknose sharks would not be implemented	- No negative socioeconomic impacts for the commercial or recreational sector in the short-term; in the long-term fisheries may face more restrictive regulations if stocks do not rebuild; -Maintains the current commercial and recreational retention limits
Commercial Measures		
2. Establish commercial SCS trip limits for directed permit holders and reduce the SCS trip limit for incidental permit holders based on revised quotas and estimated number of trips	- Reduce fishing pressure on blacknose sharks and other SCS, such as bonnethead and finetooth sharks, and help rebuild the blacknose stock - May increase dead discards of blacknose sharks and other SCS if fishermen exceed reduced trip limit or increase effort to compensate	- Significant increases in costs if reduced trip limits increase the number of trips fishermen need to make - In long-term, if blacknose sharks rebuild may have positive socio-economic impacts - In short-term, could have negative socio-economic impacts on fishermen who target and rely on SCS, particularly if they normally catch the full trip limit
3. Modify incidental trip limit based on current catches	- Potentially reduce the number of dead discards; could benefit all SCS, including bonnethead and finetooth sharks - If results in a decrease in blacknose discards or landings, could aid in rebuilding	- Significant increases in costs if modified trip limits increase the number of trips fishermen need to make - In long-term, if blacknose sharks rebuild may have positive socio-economic impacts - In short-term, could have negative socio-economic impacts on fishermen who target and rely on SCS, particularly if the trip limit is reduced and the fishermen normally catch the full trip limit
4. Allow the commercial harvest of only male blacknose sharks; maintain existing regulations for other species (*e.g.*, possession of males and females allowed)	- Leave adult blacknose females in the population to reproduce - May increase dead discards of female blacknose sharks, especially given that most SCS are dead at haulback - If a minimum size is implemented as well, removing large males from the population may effectively remove large females from the population if there is size-selective breeding	- Could mitigate negative socioeconomic impacts by allowing some harvest of blacknose sharks - Increased inefficiencies at haulback could lead to additional discards, increased number of trips, longer trips, and safety at sea issues

Alternative	Ecological Impacts	Social/Economic Impacts
5. Prohibit retention of blacknose sharks in HMS commercial fisheries	See alternatives 3a and 5 in Section 2.1.1.	See alternatives 3a and 5 in Section 2.1.1
6. Institute minimum size for SCS for HMS commercial fisheries	- May increase dead discards especially given that many SCS are dead at haulback - May aid in maintaining sub-adult and adult animals in the stock	- Significant increases in costs if increase in the number of trips fishermen need to make
7. Prohibit commercial retention of all SCS sharks in HMS commercial fisheries	- Reduce fishing pressure on blacknose sharks and help rebuild stock - Reduce fishing pressure on other SCS - Not all sharks are overfished; would not be able to land OY for SCS other than blacknose sharks - Also, see alternative 2b of Section 2.1.1	- Significant negative socioeconomic impacts for commercial shark fishermen - Also, see alternative 2b of Section 2.1.1
Recreational Measures		
8. Prohibit retention of blacknose sharks in recreational fisheries (catch and release only)	- Could help rebuild overfished stocks - May increase dead discards if fish are dead at haulback	- Minimum socioeconomic impacts since this species rarely meets the federal minimum size limit - Could have impacts on charter/headboat operators whose passengers have been landing blacknose sharks - Could have impacts on tournaments if participants have been landing blacknose sharks
9. Prohibit recreational retention of SCS	- Reduce fishing pressure on blacknose sharks and allow this stock to rebuild -Reduce fishing pressure on all SCS - Also, see alternative 2b in Section 2.1.1	- Significant socioeconomic impacts, especially for charter/headboat operators who rely on SCS - Also, see alternative 2b in Section 2.1.1
10. Modify the minimum recreational size (currently 54 inches) based on the biology of SCS and/or introduce a slot limit where smaller or larger individuals can be landed	- Increasing minimum size would protect smaller sharks from being landed - May increase dead discards if fish are dead at haulback - Decreasing minimum size would result in higher landings of smaller sharks - Depending on the slot limit chosen, a portion of the population may be offered additional protection; additional protection could help the stock rebuild more quickly if sub-adults are protected and whether or not possession of animals within the slot limit is allowed	- Increase in minimum size may have some negative socioeconomic impacts on charter/headboats if fishermen cannot land smaller sharks - Decrease in minimum size may have some positive socioeconomic impacts on charter/headboats because fishermen would be allowed to land smaller sharks

Alternative	Ecological Impacts	Social/Economic Impacts
11. Allow the recreational harvest of only male blacknose sharks; maintain existing regulations for other species (*e.g.*, possession of males and females allowed)	- Could leave adult blacknose females in the population to reproduce - May increase dead discards of female blacknose sharks - If a minimum size is implemented as well, removing large males from the population may effectively remove large females from the population if there is size-selective breeding	- Minimum socioeconomic impacts since recreational fishermen will be able to retain the majority of the species that they already target
12. Due to current stock status, increase the retention limit for Atlantic sharpnose sharks based on current catches	- Increase fishing pressure on Atlantic sharpnose - Increase fishing pressure on all sharks if anglers increase effort to catch as many Atlantic sharpnose sharks as possible	- Positive socioeconomic impacts since recreational fishermen would be able to keep more Atlantic sharpnose sharks per day - May have a positive impact for charter/headboats if passengers can keep more sharks
13. Ask states and ASMFC to implement complementary recreational management measures for all SCS in state waters	- Could aid in rebuilding blacknose sharks given that many blacknose sharks are caught and retained in state waters	- Variable; depends on measures that are implemented

2.1.3 Gear Restrictions

SCS are caught with a variety of gear types in both commercial and recreational fisheries. While Atlantic sharpnose, bonnethead, and finetooth sharks have been determined to not be overfished with no overfishing occurring, blacknose sharks have been determined to be overfished with overfishing occurring. Both targeted and incidental landings of immature blacknose sharks by a variety of commercial and recreational gear types may contribute to their overfished with overfishing occurring status. Therefore, in this amendment, NMFS is considering changes to gear types to reduce mortality of immature blacknose sharks in multiple fisheries. Pelagic sharks, such as the shortfin mako, are predominately caught in PLL fishery and in the recreational rod and reel fishery. However, since there are a number of gear restrictions already in place for the PLL fishery, and pelagic sharks are not targeted in the PLL fishery, NMFS is not considering changes in the regulations for the PLL fishery at this time. Changes in the recreational rod and reel fishery to help rebuild blacknose sharks may also help end overfishing of shortfin mako sharks.

HMS Fisheries

Commercial

In general, SCS are caught with BLL, gillnet, and rod and reel gear. SCS are rarely caught in PLL gear. From 1995 to 2005, drift gillnets were the dominant gear type used to catch SCS in the South Atlantic region according to general canvass data (Cortés and Neer, 2007). In 2005, non-drift gillnets were also used in the South Atlantic region (Cortés and Neer, 2007). In the Gulf of Mexico region, almost all SCS landed were caught on BLL gear in 1995-1997. This was also the dominant gear type in 1998, 2000-2002, and 2004-2005, whereas the proportion landed with gillnets increased in 2004 and 2005 (Cortés and Neer, 2007).

Commercially landed blacknose sharks were generally caught more often in the South Atlantic region (Cortés and Neer, 2007) (Table 2.5). From 1995-2005, 2/3 of blacknose sharks landed in the South Atlantic region were caught with drift gillnets (Table 2.6) whereas BLL gear was more predominant in the Gulf of Mexico region (Cortés and Neer, 2007). At the state level, Florida's east and west coasts had the majority of blacknose commercial shark landings. Alabama also had comparable landings in 2005 as Florida's east coast (Cortés and Neer, 2007).

As mentioned above, gillnets are one of the main commercial gear types used to target SCS, including blacknose sharks. Gillnet gear targeting sharks catch blacknose sharks that are, on average, 9.4 lb dw or 3.6 ft in total length (110 cm) (Carlson *et al*., 2007a), which corresponds to an adult blacknose shark. Gillnets are panels of netting suspended vertically in the water column with floats at the top and weights along the bottom. Gillnets are fished either as strikenets or driftnets, with driftnets being placed near the bottom or higher in the water column. Strikenets target a group of fish and then surround the school with the net. Gillnets 2.5 km (1.5 miles) or longer are prohibited,

and gillnets must be attached to a vessel except during net checks. Net checks must occur every 0.5 to two hours. Nets are normally set in a straight line off the stern at night, allowed to drift at the surface for a period of time, and then hauled onto the vessel when the catch is adequate (Carlson *et al*., 2007a).

Gillnets vessels (both multi and monofilament) carry gillnets ranging in length from 548.6-3,237.6 m. They fish depths from 9.1-13.7 m and use nets with stretched mesh sizes from 12.7-25.4 cm (5 – 10 in) (Trent et al. 1997; Carlson et al. 2005 and references therein). Generally, shark driftnet vessels operate between 4.8 and 14.4 km from shore in areas north of Key West, FL (~24° 37-24° 58' N) and between West Palm Beach, FL (~26° 46'N) and Altamaha Sound, GA (~31° 45' N) (Carlson *et al*., 2007a). Strikenets are generally 500 to 1,600 m long, 4 to 30 m deep, with 22.9 cm stretched mesh (Carlson and Bethea, 2006). Usually little bycatch is associated with strikenets (NMFS, 2006). The number of gillnet vessels issued federal directed shark permits has decreased from about 12 in 1990 to about 6 vessels in 2007, and can vary depending on the market value of sharks and the level of activity in other fisheries (Carlson *et al*., 2007a).

The shark BLL fishery is active in the Atlantic Ocean from about the Mid-Atlantic Bight to south Florida and throughout the Gulf of Mexico (Carlson *et al*., 2007b). On average, BLL vessels catch blacknose sharks that are 5.2 lb dw or 2.8 ft in total length (84 cm) (Cortés and Neer, 2007). This corresponds to a juvenile blacknose shark. Vessels in the fishery are typically fiberglass and average 50 feet in length (Carlson *et al*., 2007b). Longline characteristics vary regionally with gear normally consisting of 5-15 miles of longline and 500-1500 hooks (Carlson *et al*., 2007b). BLL vessels must carry corrodible hooks and practice the necessary protocols and possess the recently updated release equipment for the safe handling, release, and disentanglement of sea turtles and other non-target species. BLL consists of a long mainline that is not suspended in the water column with floats. BLL gear uses weights or anchors to ensure that the gear is placed on or close to the ocean bottom. J-hooks and circle hooks are both currently authorized in the shark BLL fishery. In the Gulf of Mexico, a combination of 14/0 and 18/0 circle hooks and 12/0 J hooks are used (Carlson, 2007). In the South Atlantic, the 12/0 J hook with 18/0 circle hooks are frequently used (Hale *et al*., 2007). Monofilament and steel cable is used for the bottom mainline, with approximately 72 percent of fishermen using monofilament for the mainline, 24 percent using steel mainline, and four percent using a mixture (Smith *et al*., 2006). Gear is set at sunset and allowed to soak overnight before hauling back in the morning (Carlson *et al*., 2007b). There are currently about 100 active vessels in this fishery out of about 250 vessels that possess directed shark fishing permits (Carlson *et al*., 2007b). These vessels make between 4000-9000 sets per year (Carlson *et al*., 2007b). The BLL gear targets LCS, but SCS, pelagic sharks, and dogfish species are also caught (Carlson *et al*., 2007b).

NMFS is considering a number of gear changes in the commercial shark fisheries in order to reduce mortality of juvenile blacknose sharks to help rebuild this species. In the gillnet fishery, potential changes include increasing mesh size to decrease catches of small individuals as well as limiting soak times so that non-target catch may be released with a greater chance of survival. NMFS would take into account the selectivity of the

gillnet gear before introducing any regulatory changes regarding mesh size (see Carlson and Cortés, 2003). In the BLL fishery, preliminary research has shown that hook type can affect CPUE and the size of individuals captured (Carlson, 2007). Circle hooks generally have higher catch rates while J hooks tend to catch larger sharks (Carlson, 2007). Among circle hooks, hooks larger in size also tend to catch larger individuals than those that are smaller (Carlson, 2007). However, while requiring circle hooks in the shark BLL fishery may increase the number of individuals captured, the overall effect of this on sharks and protected resources has not been formally tested. In addition, NMFS may consider limiting soak time and length of BLL gear to allow increased post-release survival of non-target species.

Recreational

Recreational catches of sharks occur primarily with rod and reel gear. The majority of recreational SCS landings in 1981-2005 occurred in the Gulf of Mexico region (annual mean = 77 percent), followed by the South Atlantic region (14 percent) (Cortés and Neer, 2007). The average recreationally landed blacknose shark is 1.5 lb dw or 1.8 feet in total length (55 cm) (Cortés and Neer, 2007), which corresponds to a neonate shark. In the Gulf of Mexico, most blacknose sharks were reported from Florida's west coast from 1995-2005 (Cortés and Neer, 2007) (Figure 2.1).

While there is an authorized list of shark species that recreational anglers are allowed to possess and a 4.5 ft minimum size limit for sharks, currently there are no gear restrictions for the recreational shark fishery. However, NMFS may consider safe handling and release equipment, similar to what is required in commercial BLL shark fishery, and a potential circle hook requirement to increase the post-release survival of non-target or undersized species in the recreational fishery.

Non-HMS Fisheries

Commercial and recreational landings in HMS fisheries represent only a portion of all SCS mortality. Many SCS (with the exception of finetooth) are also caught as bycatch and discarded in other BLL and gillnet fisheries along with the shrimp trawl fishery, predominately in the Gulf of Mexico (NMFS, 2007a). The majority of mortality for blacknose sharks comes as discards in the Gulf of Mexico shrimp trawl fishery, and equals roughly the take of blacknose sharks in HMS shark fisheries (*i.e.*, BLL, gillnet, and recreational catches) (NMFS, 2007a).

The shrimp trawl fishery in the Gulf of Mexico mainly targets brown, white, pink, and royal pink shrimp. Brown shrimp is the most economically important species in the U.S. Gulf fishery with principal catches made from June through October (NMFS, 2007b). This fishery extends offshore to about 40 fathoms (NMFS, 2007b). White shrimp, second in value, are found in near shore waters to about 20 fathoms from Texas through Alabama (NMFS, 2007b). There is a small spring and summer fishery for overwintering individuals, but the majority is taken from August through December (NMFS, 2007b). Pink shrimp are found off all Gulf states but are most abundant off Florida's west coast and particularly in the Dry Tortugas grounds off the Florida Keys

(NMFS, 2007b). Most landings are made from October through May (NMFS, 2007b). In the northern and western Gulf states, pink shrimp are landed mixed with brown shrimp and are usually counted as browns (NMFS, 2007b). Most catches are made within 30 fathoms (NMFS, 2007b). The commercial fishery for royal red shrimp has expanded in recent years with the development of local markets (NMFS, 2007b). This deep-water species is most abundant on the continental shelf from about 140 to 275 fathoms east of the Mississippi River (NMFS, 2007b).

Despite targeting these different shrimp species, bycatch of fish and protected resources in the shrimp trawl fishery has been an ongoing issue (NMFS, 2007b). Turtle exclusion devices (TEDs) were first required by regulation in the early 1990s to reduce sea turtle mortality. Additional bycatch reduction devices (BRDs) were also implemented to reduce finfish bycatch. However, bycatch of small sharks has continued to be a problem and results in the majority of mortality for bonnethead, Atlantic sharpnose, and blacknose sharks (NMFS, 2007a). The current regulations for TED bar spacing in the Southeast Atlantic and Gulf of Mexico is 4-inches (with one exception for the Atlantic summer flounder fishery). The regulations at 50 CFR § 223.207 require that the space between one deflector bar and the adjoining bar, or outer frame of the TED, may not exceed 4-inches. However, small sharks, particularly those that are approximately 3 feet in total length or less (101 cm) (Brewer et al., 2006) are not excluded from the TEDs. These small sharks either go through the TED bars or become impinged on the TED bars and die as they are not strong enough to swim out of the trawl. The SEFSC's video footage of TEDs in shrimp trawls documents large sharks and protected resources (*i.e.*, sea turtles) exclusion from shrimp trawls using TEDs with less than 4-inch bar spacing. The video footage was taken from a shrimp trawler, the R/V *Georgia Bulldog*, off the coast of Georgia, within 10 miles of shore, in water depths less than 40 feet. The footage also shows that some small sharks (blacknose, bonnethead, and Atlantic sharpnose) as well as various other finfish can pass through the TEDs and into the cod end of the trawl; however, there has been no further analysis conducted on the bycatch at this time (*e.g.*, bycatch was not identified to species, length measurements were not taken, etc.).

In addition to passing through the TEDs, there is evidence that small juvenile sharks are not escaping through the BRDs because they have been observed in the cod end of the shrimp trawl by scientific observers. Therefore, NMFS may work with the South Atlantic and Gulf of Mexico Fishery Management Councils to modify TED and/or BRD designs to exclude small sharks (*e.g.*, reduce the spacing between the TED bars), or modify the speed of shrimp trawl vessels to allow small sharks an opportunity to swim out of the trawl and/or escape impingement on the TED bars. Any such actions would be made in cooperation with the South Atlantic and Gulf of Mexico Fishery Management Councils as well any potential changes in the regulations for the shrimp trawl fishery. Table 2.7 shows the potential range of alternatives NMFS would consider for gear restriction in both HMS and non-HMS fisheries.

Table 2.5 **Commercial landings of blacknose shark by region (general canvass data).** (Cortés and Neer, 2007).

	Percent Landings		
Year	**South Atlantic**	**Gulf of Mexico**	**Unknown**
1995	27.6	65.3	7.1
1996	48.1	10.5	41.3
1997	44.7	8.2	47.1
1998	70.7	14.1	15.2
1999	71.5	9.9	18.6
2000	91.0	9.0	0.0
2001	91.7	8.0	0.3
2002	75.1	24.9	0.0
2003	86.6	13.4	0.0
2004	85.6	14.4	0.0
2005	52.9	47.1	0.0

Table 2.6 **Commercial landings of blacknose shark by region and gear type.** (Cortés and Neer, 2007)**.**

South Atlantic Regional Gear Type	**Percentage of Landings (all years combined)**
Gillnets	2.0
Drift nets	66.6
Lines	0.7
Longlines	30.8

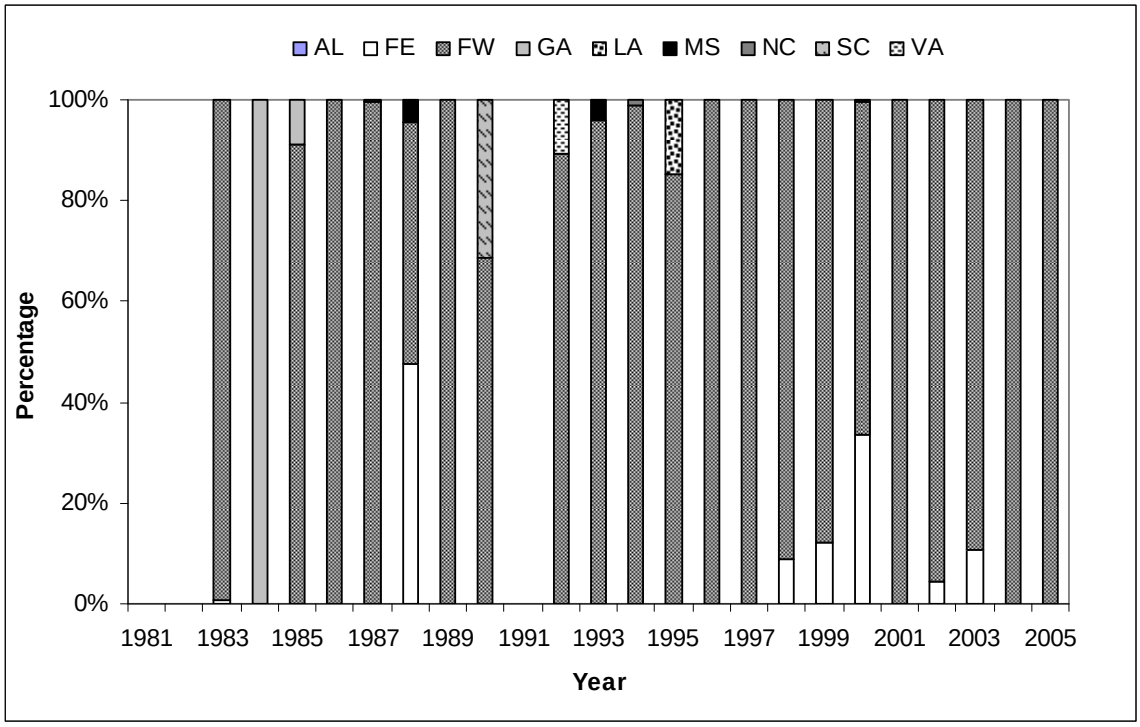

Figure 2.1 **Percentage of recreational landings by state of blacknose sharks from MRFSS (1981 - 2005). Note: Zero landings were reported in AL for all years.** (Cortés and Neer, 2007)**.**

Table 2.7 Potential commercial and recreational gear restriction alternatives.

Alternative	Ecological Impacts	Social/Economic Impacts
1. No Action. Maintain current gear restrictions for rod and reel, gillnet, BLL, and shrimp trawl gear	- Dead discards of blacknose sharks will continue	- No added costs to commercial and recreational shark fishermen
HMS Fisheries		
Commercial Measures		
2. Close gillnet fishery; remove gillnet gear from authorized gear type for commercial shark fishing, consistent with requests from the State of Georgia	- Reduce bycatch and interactions with marine mammals and sea turtles associated with gillnet gear - Dead discards of sharks from other gillnet fisheries in the South Atlantic region will still occur (*e.g.*, menhaden, whiting, and croaker fisheries), and rebuilding not likely to occur without additional reductions in mortality in other fisheries - If fishermen increase effort in other fisheries to make up for lost incidental shark profits, dead discards could increase - The gillnet fishery catches some of largest commercially caught blacknose sharks (on average, 9.4 lb dw or 3.6 ft in total length). Prohibiting gillnet gear may re-distribute effort into other commercial fisheries, which target smaller blacknose sharks, and have negative ecological impacts	- Prohibition would comply with request from State of Georgia to remove gillnet gear from the authorized gear list - Significant negative socioeconomic impacts for existing shark commercial gillnet fishermen due to losses in shark revenues from shark gillnet gear

Alternative	Ecological Impacts	Social/Economic Impacts
3. Ban shark drift gillnets; allow shark strikenets	- Many blacknose sharks are targeted with drift gillnets; would decrease targeted catch of blacknose sharks with drift gillnets, which would reduce mortality and have positive ecological impacts. But rebuilding not likely to occur without additional reductions in incidental mortality in other fisheries - Many blacktip and Atlantic sharpnose sharks are targeted with drift gillnets; these species are not overfished and no overfishing is occurring, so landings would not approach OY if drift gillnets were banned - Dead discards of sharks from other gillnet fisheries in the South Atlantic region will still occur (*e.g.*, menhaden, whiting, and croaker fisheries) - If fishermen increase effort in other fisheries to make up for lost shark profits, dead discards could increase	- Allowing strikenets would mitigate some negative socioeconomic impacts for remaining directed shark gillnet fishermen - Negative socioeconomic impacts would occur on drift gillnet fishermen, including those that land sharks incidentally to other species; could increase their costs if they decide to re-rig for strikenets and have to use spotter planes - Negative impacts on fishermen who use drift gillnets to target blacktip and Atlantic sharpnose sharks; these fishermen would potentially lose income from these species if drift gillnet gear banned since these species do not congregate during summer months, making strikenets ineffective during these time periods - Negative economic impacts for other BLL fishermen that currently use drift gillnet gear because they would no longer be able to use drift gillnet gear - May require additional vessel monitoring system (VMS) requirements (*i.e.*, to increase transmission frequency) to aid with enforcement
4. Gillnet Endorsement: limit use of gillnets to directed shark gillnet vessels that currently use gillnets and have a history of targeting sharks with gillnets	- Prevent increased effort in gillnet fishery - Reduce bycatch associated with expanding gillnet fishery - Dead discards of sharks from other gillnet fisheries in the South Atlantic region will still occur (*e.g.*, menhaden, whiting, and croaker fisheries) - If fishermen increase effort in other fisheries to make up for lost incidental shark profits, dead discards could increase	- Negative economic impacts for other fishermen that currently use gillnet gear to target other species but incidentally land sharks - Restricts flexibility of all fishermen with commercial shark permit

Alternative	Ecological Impacts	Social/Economic Impacts
5. Close the shark BLL fishery; remove BLL as an authorized gear type for the shark fishery.	- Reduce discards and bycatch of protected species associated with the BLL gear - Dead discards of sharks from other BLL fisheries in the South Atlantic region will still occur; rebuilding not likely to occur without additional reductions in mortality in other fisheries - If fishermen increase effort in other fisheries to make up for lost incidental shark profits, dead discards of all sharks could increase	- Significant negative socioeconomic impacts for existing commercial shark BLL fishermen - May have negative impacts in other BLL fisheries; fishermen may allow their shark permits to expire
6. Limit length and number of hooks for shark BLL gear	- Limit dead discards; promote the live release of bycatch - Fewer hooks; may reduce fishing pressure for overfished stocks - Dead discards of sharks from other BLL fisheries in the South Atlantic region will still occur	- Some negative socioeconomic impacts if reduced number of hooks and/or longline length significantly reduces shark catch; may increase costs if fishermen need to increase the number of trips to catch the same amount of sharks - Difficult to enforce the length of longline and number of hooks
7. Limit soak time of shark BLL gear	- Limit dead discards; promote the live release of bycatch - Reduce shark catch	- Some negative socioeconomic impacts if reduced soak time significantly reduces shark catch; may increase costs if fishermen need to increase the number of trips to catch the same amount of sharks - Difficult to enforce soak time; safety concerns if fishermen need to leave gear because of weather
8. Require certain hook size or type of hooks (*i.e*., circle hooks) on shark BLL gear	- May increase post-release survival of bycatch if circle hooks required - If larger J and/or circle hooks are required, may reduce bycatch of immature sharks - Presumed benefits for post-release survival for sharks, however, shark-specific research lacking - Circle hook requirement may result in increased catch of sharks, based on preliminary research (Carlson, 2007)	- Increased cost to commercial fishermen to change from J hooks to circle hooks or to change hook size - Enforcement issues in other BLL fisheries that may incidentally catch sharks but are not required to have circle hooks

Alternative	Ecological Impacts	Social/Economic Impacts
Recreational Measures		
9. Require circle hooks in shark recreational fishery	- May increase post-release survival of bycatch - Presumed benefits for post-release survival for sharks, however, shark-specific research lacking	- Increased cost to recreational fishermen if circle hooks cost more than J hooks - Enforcement issues in the recreational fishery if recreational fishermen are targeting other species but incidentally catching sharks
10. Require safe release and handling tools in the shark recreational fishery	- Increase survival of sharks, and non-target species, caught and released alive	- Increased cost to recreational fishermen to purchase gear - Increased cost to fishermen to attend workshops to be trained on how to use release gear
Non-HMS Fisheries		
Commercial Shrimp Trawl Fishery		
11. Cooperate with the South Atlantic and Gulf of Mexico Fishery Management Councils to reduce the bar spacing in turtle exclusion devices to reduce bycatch of blacknose sharks by a specified percent	- Reduce bycatch of immature blacknose sharks and other small elasmobranchs and finfish, resulting in positive ecological impacts; rebuilding of blacknose not likely to occur without additional reductions in mortality in other fisheries	- Negative socioeconomic impacts to shrimp trawlers if changes result in reduced shrimp catch - Negative socioeconomic impacts if changes result in increased drag of shrimp trawl and increased fuel costs - Implementation cost of replacing/modifying current turtle exclusion devices with new models
12. Cooperate with to the South Atlantic and Gulf of Mexico Fishery Management Councils to reduce shrimp trawl speed to reduce impingement of blacknose sharks in turtle exclusion devices	- Reduce impingement of small elasmobranchs, including blacknose sharks, and finfish on turtle exclusion devices; increase survival of these species; rebuilding of blacknose not likely to occur without additional reductions in mortality in other fisheries	- Negative socioeconomic impacts to shrimp trawlers if reduced speed reduces shrimp catch - Positive/negative socioeconomic impacts depending on how reduced speed translates into fuel costs and length of trip - Lower trawl speed may result in longer trips and increase safety concerns (*i.e.*, time at sea)

2.2 Pelagic Shark Effort Controls

Blue Sharks and Shortfin Mako

Currently, blue and shortfin mako sharks are managed under the 2006 Consolidated HMS FMP. Blue sharks are managed separately and have an annual quota of 273 mt dw. The blue shark quota is mainly used to account for any dead discards. Shortfin mako sharks are managed in the pelagic shark species complex with common thresher and oceanic whitetip sharks. In 2008, the International Commission for the Conservation of Atlantic Tunas' (ICCAT) SCRS completed stock assessments for shortfin mako and blue sharks. For blue sharks, although the stock assessment results were highly uncertain, their biomass is believed to be above the biomass that would support MSY and current harvest levels are below $F_{msy.}$ Therefore, NMFS has determined that blue sharks are not overfished with no overfishing, and no new management measures are being considered for blue sharks at this time. For shortfin mako sharks, estimates of stock status were obtained with different modeling approaches and were more variable than for blue sharks. 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. Given the results of these stock assessments (Chapter 1, Section 1.1.5, SCRS, 2008), NMFS determined shortfin makos are not overfished but are approaching an overfished condition and are experiencing overfishing. As a result, NMFS is examining options to end overfishing of shortfin mako sharks. The alternatives being considered for shortfin mako sharks are shown in Table 2.8.

Porbeagle sharks

During scoping, NMFS received a comment to add porbeagle sharks to the prohibited list. In Amendment 2 to the 2006 Consolidated HMS FMP, based on the results of the 2005 Canadian porbeagle shark stock assessment that found that porbeagle sharks were overfished, NMFS reduced the commercial porbeagle quota from 92 mt dw per year to 1.7 mt dw. A porbeagle stock assessment will be undertaken by ICCAT and the International Council for the Exploration of the Sea (ICES) in 2009. Therefore, NMFS will not be considering new management measures for porbeagle sharks in this amendment and will reevaluate the need for management measure changes after the 2009 stock assessment is completed.

Table 2.8 Potential alternatives for pelagic shark considerations.

Alternative	Ecological Impacts	Social/Economic Impacts
Shortfin Mako Shark Measures		
Commercial		
1. No Action. Keep shortfin mako sharks in the pelagic shark species complex and do not change the quota.	- Continued fishing on a species that is experiencing overfishing - Potential expansion of this species in the commercial PLL fishery	- No negative impacts due to no changes in current management measures - Long term negative impacts if species is fished to unsustainable levels
2. Remove shortfin mako sharks from pelagic shark species complex and establish a shortfin mako quota below current landings.	- Reduce fishing pressure and prevent overfishing of shortfin mako sharks - Increased discards of this species, especially in PLL fishery	- Slight negative socioeconomic impacts on commercial PLL fishermen due to lower quota
3. Remove shortfin mako sharks from pelagic shark species complex and place this species on the prohibited shark species list	- Prevent expansion of fishing effort (prevent potential overfishing) - Could create excessive dead discards	- Negative socioeconomic impacts on commercial PLL fishermen due to prohibition on landing shortfin makos
4. Keep shortfin mako sharks in the pelagic shark species complex and reduce the overall pelagic shark species complex quota (currently quota for shortfin mako, oceanic whitetip, and common thresher is 488 mt dw/year)	- Reduce fishing pressure and prevent overfishing of shortfin mako sharks and all pelagic sharks - Increase discards of all pelagic sharks, especially in PLL fishery	- Slight negative socioeconomic impacts on commercial PLL fishermen if reduces the number of pelagic sharks that can be retained
5. Establish a commercial size limit for shortfin mako sharks	- Reduce commercial fishing pressure on smaller individuals - Could increase dead discards, especially in PLL fishery	- Slight negative impacts to commercial fishermen if implement a minimum size; could decrease the number of shortfin makos they can retain
Recreational		
6. Increase the recreational minimum size limit of shortfin mako	- Reduce recreational fishing pressure on smaller individuals	- Slight negative impacts to recreational and tournament fishermen if minimum size increases
7. Prohibit landing of shortfin mako in recreational fishery	- Reduce recreational fishing pressure - Could increase dead discards	- Negative socioeconomic impacts on recreational fishermen, especially in tournaments

2.3 Fisheries Re-Characterization

2.3.1 Regions

Amendment 1 to the 1999 FMP (December 24, 2003, 68 FR 74746) established three regions for the management of LCS and SCS. The purpose of these regions was to provide managers with flexibility to adjust regional quotas to reduce mortality of juveniles and reproductive female sharks, provide fishing opportunities when sharks are present in the various regions, account for regional differences in catch per unit effort, and account for differences between species' utilization of various pupping grounds. NMFS has always managed Atlantic pelagic sharks with one overall region.

Amendment 2 to the Consolidated HMS FMP (June 24, 2008, 73 FR 35778, corrected on July 15, 2008, at 73 FR 40658) removed these three regions for all shark species and established two regions (Gulf of Mexico and Atlantic) for non-sandbar LCS. The regions were removed for various reasons as described in Amendment 2. The two regions were maintained for non-sandbar LCS due to the results of the 2005/2006 blacktip shark stock assessment, which found that the status of blacktip sharks is "healthy" in the Gulf of Mexico region and "unknown" in the South Atlantic region, and due to the implementation of an Interstate Shark FMP by the ASMFC and the need to coordinate quotas between ASMFC and NMFS. Amendment 2 to the Consolidated HMS FMP also maintained one overall region for management of pelagic sharks. Because a regional split in pelagic shark species has not been observed, NMFS intends to continue with one region for pelagic sharks, but may revisit regional management for these species in the future, as necessary.

For Amendment 3, given the differences in life history of blacknose sharks between the Gulf of Mexico and the Atlantic Ocean and the ASMFC Interstate Shark FMP, NMFS is considering revisiting the need for regions for SCS. The alternatives being considered are outlined below (Table 2.9). As with quotas, implementation of different regions for SCS could affect the feasibility or implementation of management measures discussed elsewhere in this document. For example, establishing two regions for SCS could necessitate creation of different quotas in the different regions.

Table 2.9 Potential region alternatives.

Alternative	Ecological Impacts	Social/Economic Impacts
1. No Action. One region for all SCS	- Maintains consistency with SCS stock assessment	- Maintains current management system for commercial SCS fisheries; simplifies quota monitoring - Maintains geographic flexibility for commercial fishermen - If one region/area catches the entire quota, all regions/area are closed
2. Create two regions (GOM and Atlantic) for all SCS	- Different regions (and therefore quotas and other management measures) may address biological differences found between SCS in the GOM and Atlantic - Establishing regions would not be consistent with the stock assessment	- If one region/area catches its entire quota, the other region/area could remain open - Management between NMFS and ASMFC more consistent - Allows for mis-allocation/confusion regarding landings location for quota monitoring purposes
3. Create two regions (GOM and Atlantic) for blacknose sharks; maintain one region for other SCS	- Different regions (and therefore quotas and other management measures) may address biological differences found between blacknose sharks in the GOM and Atlantic - Differences in life histories between other SCS not considered - Establishing regions would not be consistent with the stock assessment	- If one region/area catches its entire blacknose shark quota, the other region/area could remain open - If one region/area catches the entire SCS quota, all regions/area are closed - Provides some geographic flexibility for fishermen regarding different areas - Complicates management and allows for mis-allocation/confusion regarding landings location for quota monitoring purposes
4. Create other regions for all or different SCS	- Different regions (and therefore quotas and other management measures) may address biological differences found between SCS in the GOM and Atlantic - Establishing regions would not be consistent with the stock assessment	- If one region/area catches its SCS quota(s), the other region(s)/area(s) could remain open - May provide some geographic flexibility for fishermen regarding different areas - Complicates management and allows for mis-allocation/confusion regarding landings location for quota monitoring purposes

2.3.2 Seasons

NMFS has altered the fishing seasons for Atlantic shark fisheries several times. Starting in 1993, there were two seasons each fishing year (January through June and July through December). In Amendment 1 to the 1999 FMP (December 24, 2003, 68 FR 74746), NMFS established three seasons - January through April; May through August; and September through December. These trimester seasons were created to provide additional fishing opportunities later in the year and to reduce fishing effort during months when LCS are pupping.

There is currently one fishing season for all commercial shark fisheries (June 24, 2008, 73 FR 35778, corrected on July 15, 2008, at 73 FR 40658). The fishing season opens near January 1 of each year, depending on when the final rule announcing available quotas is implemented, and ends on December 31 of each year. A fishery may close before December 31 if NMFS estimates that 80 percent of that fishery's quota has been or is projected to be taken. NMFS established one fishing season for various reasons as described in Amendment 2 to the Consolidated HMS FMP, including the low quotas available for LCS and the desire to minimize dead discards during times when the fishing season may be closed.

Currently, NMFS prefers to maintain the status quo of one season for all shark species/complexes. As of the release of this document, the change to one season has been in place for approximately six months (since July 24, 2008). Also, the overall quota for SCS has rarely been taken and has never been taken for any of the pelagic shark species. If the quotas are reduced dramatically due to the need to rebuild blacknose sharks or to end overfishing of shortfin mako sharks, the desire to minimize dead discards of blacknose or shortfin mako sharks would be similar to the situation with LCS, in that sharks continue to be caught as bycatch outside of the established fishing season. As such, no alternatives are described to change the commercial shark fishing seasons. However, NMFS may consider changing the fishing season, as necessary, in the future.

2.4 Time/Area Closures

This rulemaking would consider time/area closures as a way to reduce bycatch of blacknose sharks, in addition to protected species and non-target HMS, by different gear types. Time/area closures could affect rod and reel, BLL, and gillnet gear. NMFS may also work in cooperation with the Gulf of Mexico and South Atlantic Fishery Management Councils regarding potential time/area closures for shrimp trawl gear. Due to the pelagic and incidental nature of the shortfin mako shark fishery, NMFS is not considering time/area closures for this species at this time. Currently there is no directed commercial fishery for shortfin mako sharks. Shortfin mako sharks are typically caught incidentally by PLL fishermen and are caught by recreational fishermen both in and outside of shark tournaments. NMFS may consider time/area closures for this species in the future, as necessary.

HMS Fisheries

A number of time/area closures have been implemented to reduce bycatch of protected species as well as target and non-target HMS in recent years. The first time/area closure was implemented in the 1999 FMP with the Northeastern U.S. closure to PLL gear off New Jersey in June 1999 to reduce bluefin tuna discards. Since then, additional closures have been implemented in the DeSoto Canyon (2000), East Florida Coast (2001), Charleston Bump (2001), and Northeast Distant (2001) to PLL gear, the mid-Atlantic shark closed area (2005) to BLL gear, and the Steamboat Lumps and Madison Swanson closed areas (2007) for all HMS gears except for trolling from May through October. In addition, year-round BLL closures were implemented to protect reef fish EFH in specific areas in the Caribbean region (2007), and eight, year-round marine protected areas, which were implemented by the South Atlantic Fishery Management Council in their Amendment 14, were also closed for shark BLL gear (2008). There are also restrictions in place for gillnet gear that limits fishing with gillnet gear in Atlantic Ocean. A June 25, 2007 (72 FR 34632), final rule prohibited gillnet fishing, including shark gillnet fishing, from November 15 to April 15, between the NC/SC border and 29° 00' N lat. Limited exemptions to the fishing prohibitions are provided for gillnet fishing for sharks and for Spanish mackerel south of 29°00' N. lat. Shark gillnet vessels fishing between 29° 00' N and 26° 46.5' N have certain requirements as outlined 50 CFR § 229.32 from December 1 through March 31 of each year. Another recent rule (October 5, 2007, 72 FR 57104) amended the restriction in the Southeast U.S. Monitoring Area from December 1 through March 31. In that area, no person may fish with or possess gillnet gear for sharks with webbing of 5" or greater stretched mesh unless the operator of the vessel is in compliance with the VMS requirements found in 50 CFR 635.69. The Southeast U.S. Monitoring Area is from 27°51' N. (near Sebastian Inlet, FL) south to 26°46.5' N. (near West Palm Beach, FL), extending from the shoreline or exemption line eastward to 80°00' W. These restrictions are in place to prevent endangered right whales from entanglement in gillnet gear in the core right whale calving area.

This amendment would focus on blacknose sharks, as well a non-target species and protected resources, with regard to new time/area closures and/or modification of

current time/area closures to reduce bycatch and bycatch mortality of these species. Currently, blacknose sharks have been determined to be overfished with overfishing occurring. Both targeted and incidental landings, using a variety of gear types in recreational and commercial fisheries, may contribute to overfishing. As a result, NMFS is considering additional closures or modifications to existing closures to further reduce these interactions. The goal of all HMS time/area closures is to: (1) maximize the reduction in bycatch; (2) maintain catch levels of target species; (3) consider impacts on the incidental catch of other species to minimize or reduce incidental catch levels; and (4) optimize survival of bycatch and incidental catch species.

During scoping, it was suggested that NMFS consider closing the reef fish longline and buoy gear restricted area in the Gulf of Mexico to shark BLL gear in order to reduce possible juvenile and neonate blacknose mortality (Figure 2.2). However, if this area excludes the majority of historical shark fishing effort in the Gulf of Mexico, NMFS may consider closing the reef fish stressed area in the Gulf of Mexico to shark BLL gear (Figure 2.3). In addition, NMFS may consider time/area closures for rod and reel, BLL, and/or gillnet gear in areas that can be identified as nursery grounds for blacknose sharks as a way to reduce bycatch of neonate blacknose sharks (Figure 2.4 and Figure 2.5). Figure 2.4 and Figure 2.5 show areas where juvenile and neonate blacknose shark interactions have been recorded. Neonate sharks tend to be located off the west and east coasts of Florida, Georgia, and South Carolina. However, identifying small areas for closure may be difficult. Juvenile and adult blacknose are more widely distributed (Figure 2.6), and it is difficult to pinpoint concentrations, which would make specific time/area closures difficult to implement.

Finally, NMFS is also considering closing areas to help reduce interactions with protected resources. A proposed rule proposing critical habitat for smalltooth sawfish published on November 20, 2008 (73 FR 70290). Based on the outcome of this action, NMFS may implement additional closures to protect smalltooth sawfish, if deemed appropriate. Figure 2.7 shows the location of smalltooth sawfish interactions from 1994-2007. NMFS may also consider additional closed areas or modifications to current closed areas to reduce sea turtle interactions. Figure 2.8 shows the location of sea turtle interactions with BLL gear from 1994-2007. NMFS will evaluate these types of data for BLL and gillnet gears when determining if new time/area closures are needed or if modifications to current time/area closures are warranted.

Non-HMS Fisheries

The latest blacknose shark stock assessment indicated that the majority of blacknose mortality is occurring as bycatch in the Gulf of Mexico shrimp trawl fishery (NMFS, 2007a). A lot of small sharks, particularly those that are approximately 3 feet in total length (101 cm) or less are not excluded from the TEDs (Brewer et al., 2006). Therefore, during the scoping process, it was suggested that NMFS consider time/area closures in areas that are considered “hotspots” for blacknose shark bycatch in the Gulf of Mexico shrimp trawl fishery as a way to reduce neonate and juvenile mortality. Figure 2.9 shows the areas where blacknose sharks were observed caught in the Gulf of Mexico shrimp trawl fishery from shrimp trawl observer program data and SEAMAP survey data.

In addition, NMFS may consider time area/closures for shrimp trawl gear in areas that can be identified as nursery grounds for blacknose sharks as a way to reduce bycatch of neonate and juvenile blacknose sharks (Figure 2.4 and Figure 2.5). NMFS will be evaluating these types of data for shrimp trawl gear to determine if new time/area closures are needed and would be effective, or if modifications to current time/area closures are warranted. Any potential closures to the shrimp trawl fishery would need to be coordinated with the Gulf of Mexico and/or South Atlantic Fishery Management Councils. Table 2.10 shows the range of alternatives NMFS is considering for time/area closures.

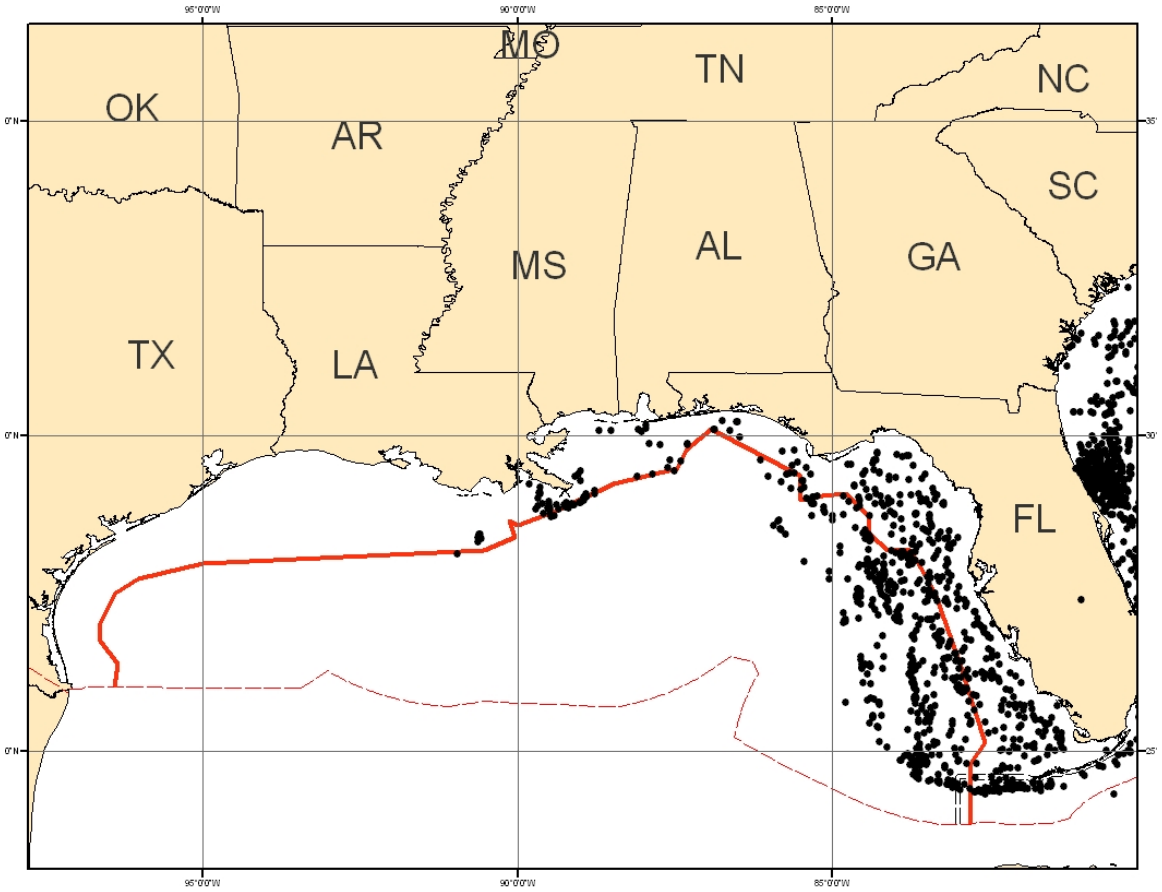

Figure 2.2 **Map of the reef fish longline and buoy gear restricted area in the Gulf of Mexico. Observed BLL sets from 1994-2007 are shown. The solid line is the longline and buoy gear restricted area boundary, and the dashed line is the EEZ. The double dashed line off the tip of Florida is the Gulf of Mexico/South Atlantic Fishery Management Council boundary delineation.** Source: Shark Observer BLL Program.

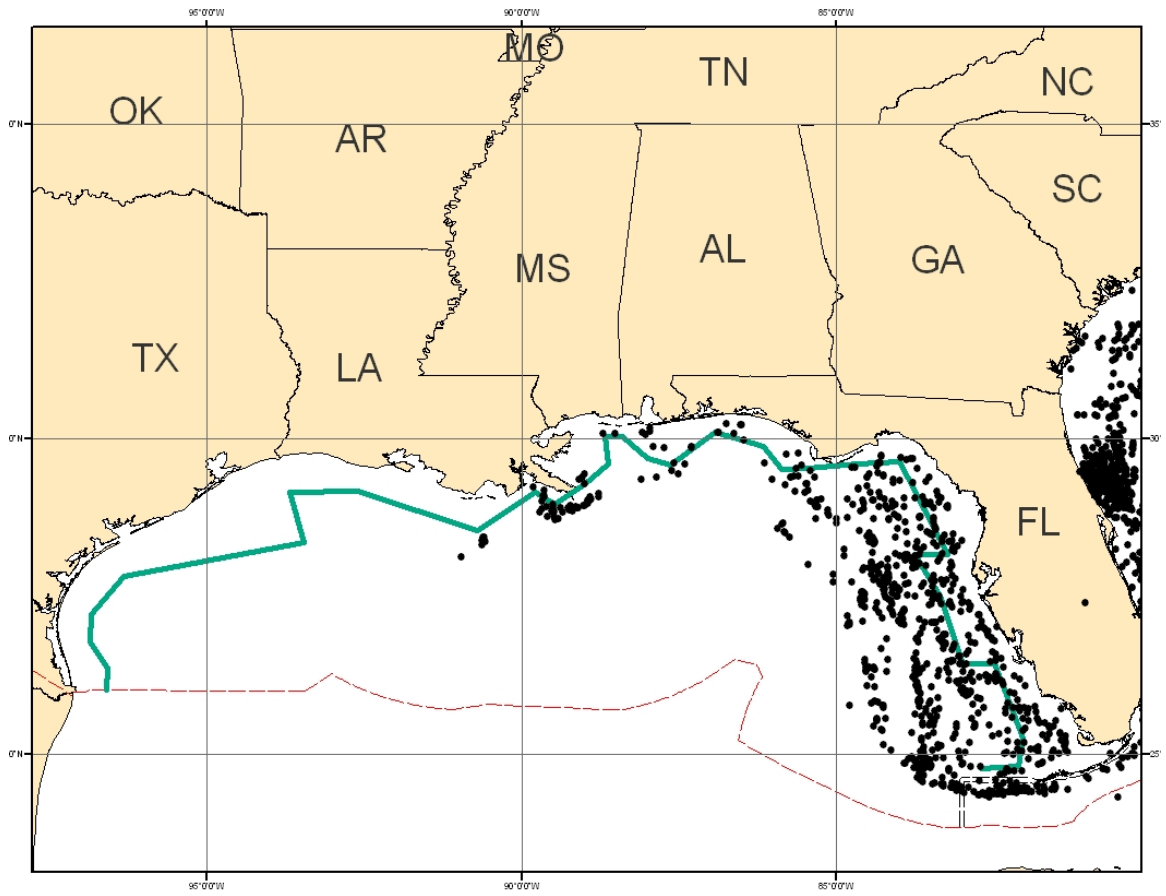

Figure 2.3 **Map of the reef fish stressed area in the Gulf of Mexico. Observed BLL sets from 1994-2007 are shown. The solid line is the reef fish stressed area boundary, and the dashed line is the EEZ. The double dashed line off the tip of Florida is the Gulf of Mexico/South Atlantic Fishery Management Council boundary delineation.** Source: Shark Observer BLL Program.

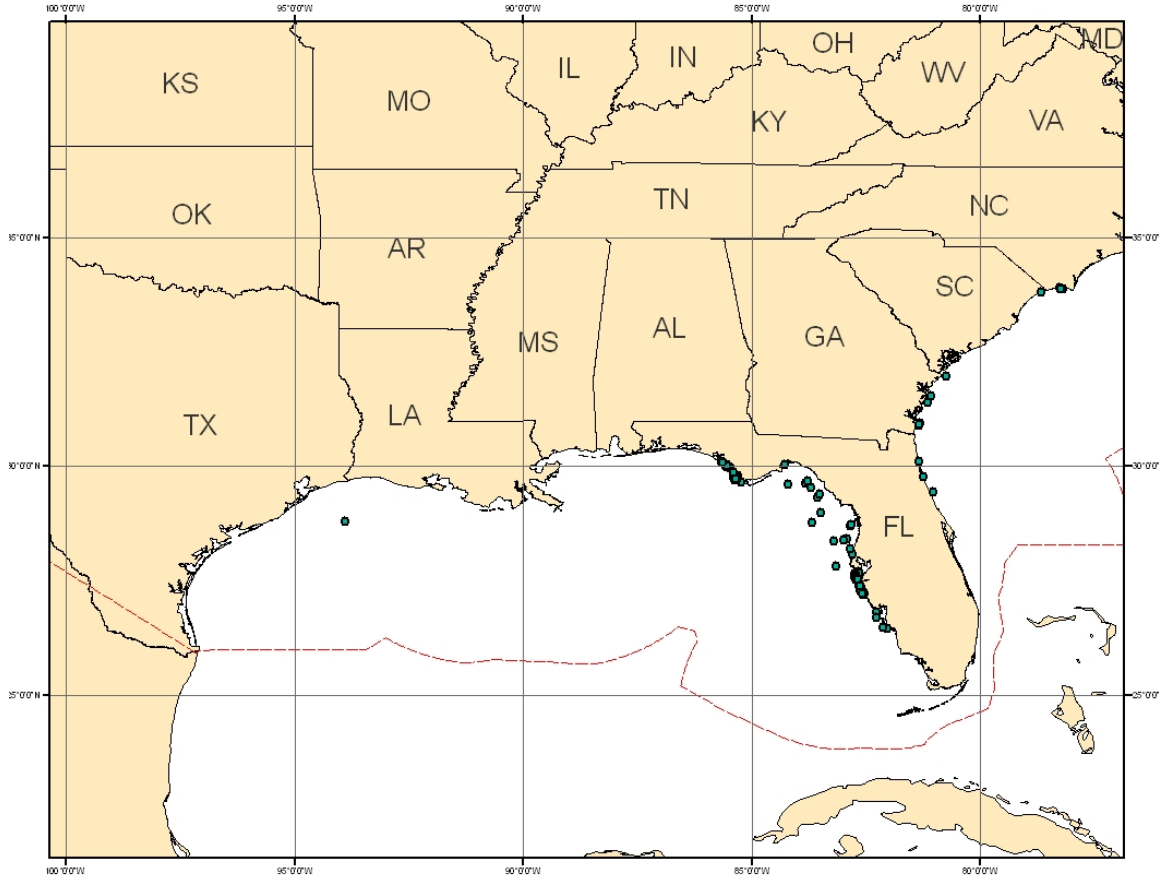

Figure 2.4 **Neonate blacknose shark interactions.** Data sources are from Carlson, 2002; Cooperative Atlantic States Shark Pupping and Nursery Area Program (COASTSPAN); Cooperative Shark Tagging Program (CSTP); Mote Marine Laboratory (MOTE); SEAMAP; Southeast Gillnet Survey (SEGN); Southeast Longline Survey (SELL); and the Shark Observer Program (SOP).

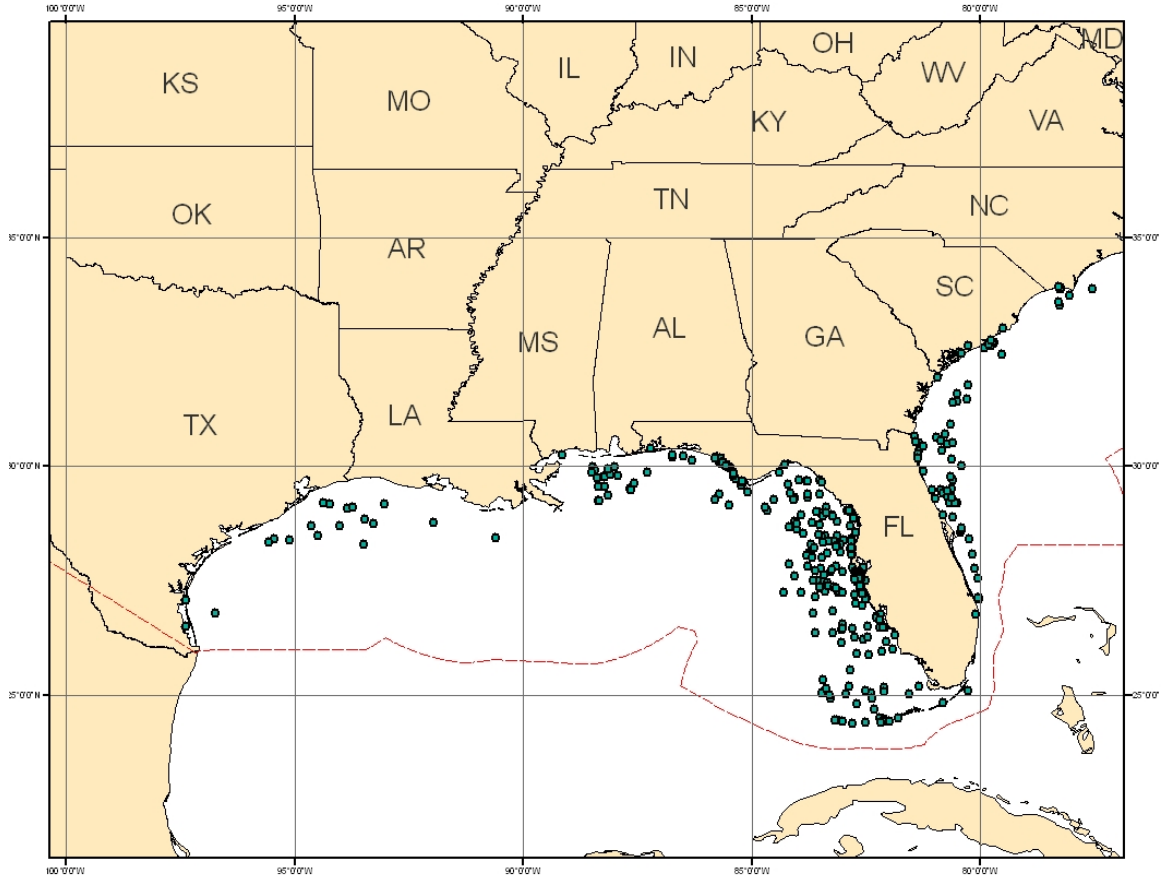

Figure 2.5 **Juvenile blacknose shark interactions.** Data sources are from Carlson, 2002; Cooperative Atlantic States Shark Pupping and Nursery Area Program (COASTSPAN); Cooperative Shark Tagging Program (CSTP); Mote Marine Laboratory (MOTE); SEAMAP; Southeast Gillnet Survey (SEGN); Southeast Longline Survey (SELL); the Shark Observer Program (SOP); Jones and Grace, 2002; and Parsons, 2002.

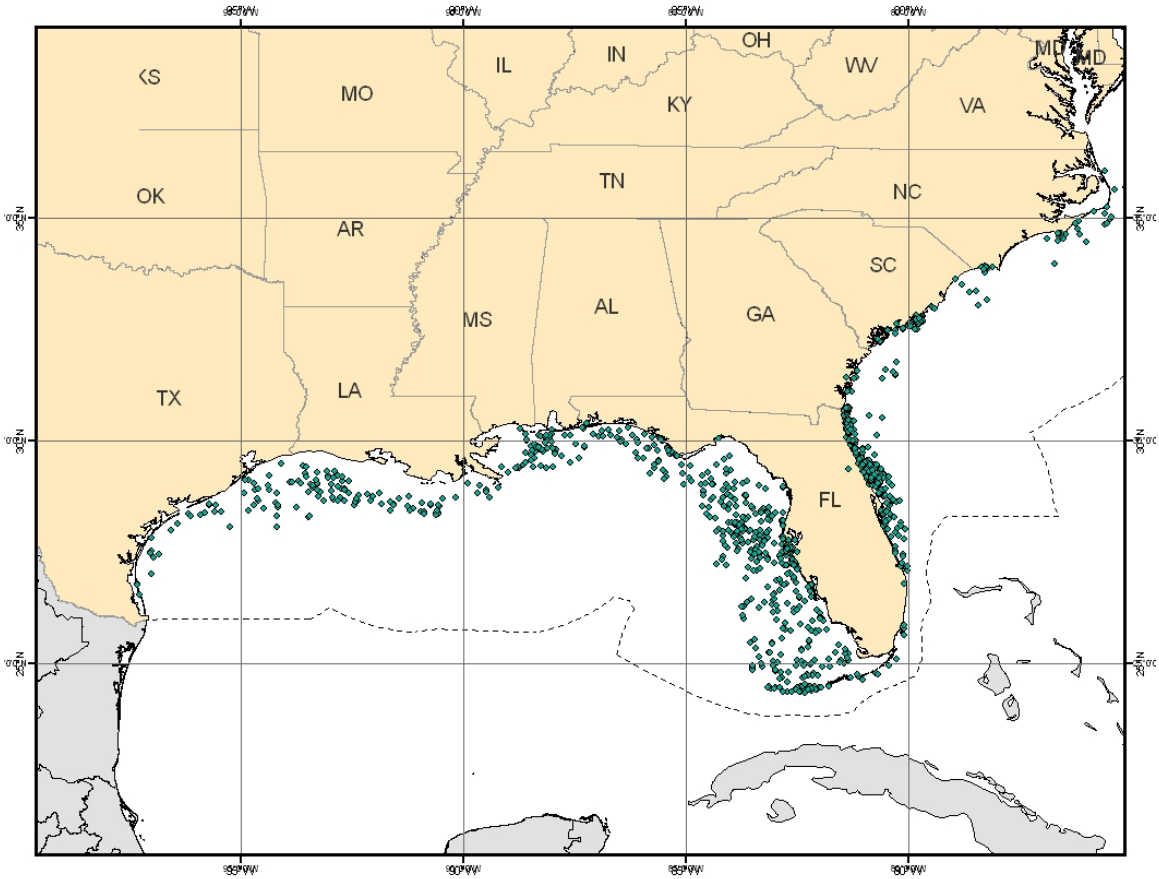

Figure 2.6 **Adult blacknose shark interactions.** Data sources are from Carlson, 2002; Cooperative Atlantic States Shark Pupping and Nursery Area Program (COASTSPAN); Cooperative Shark Tagging Program (CSTP); Mote Marine Laboratory (MOTE); SEAMAP; Southeast Gillnet Survey (SEGN); Southeast Longline Survey (SELL); the Shark Observer Program (SOP); and Parsons, 2002.

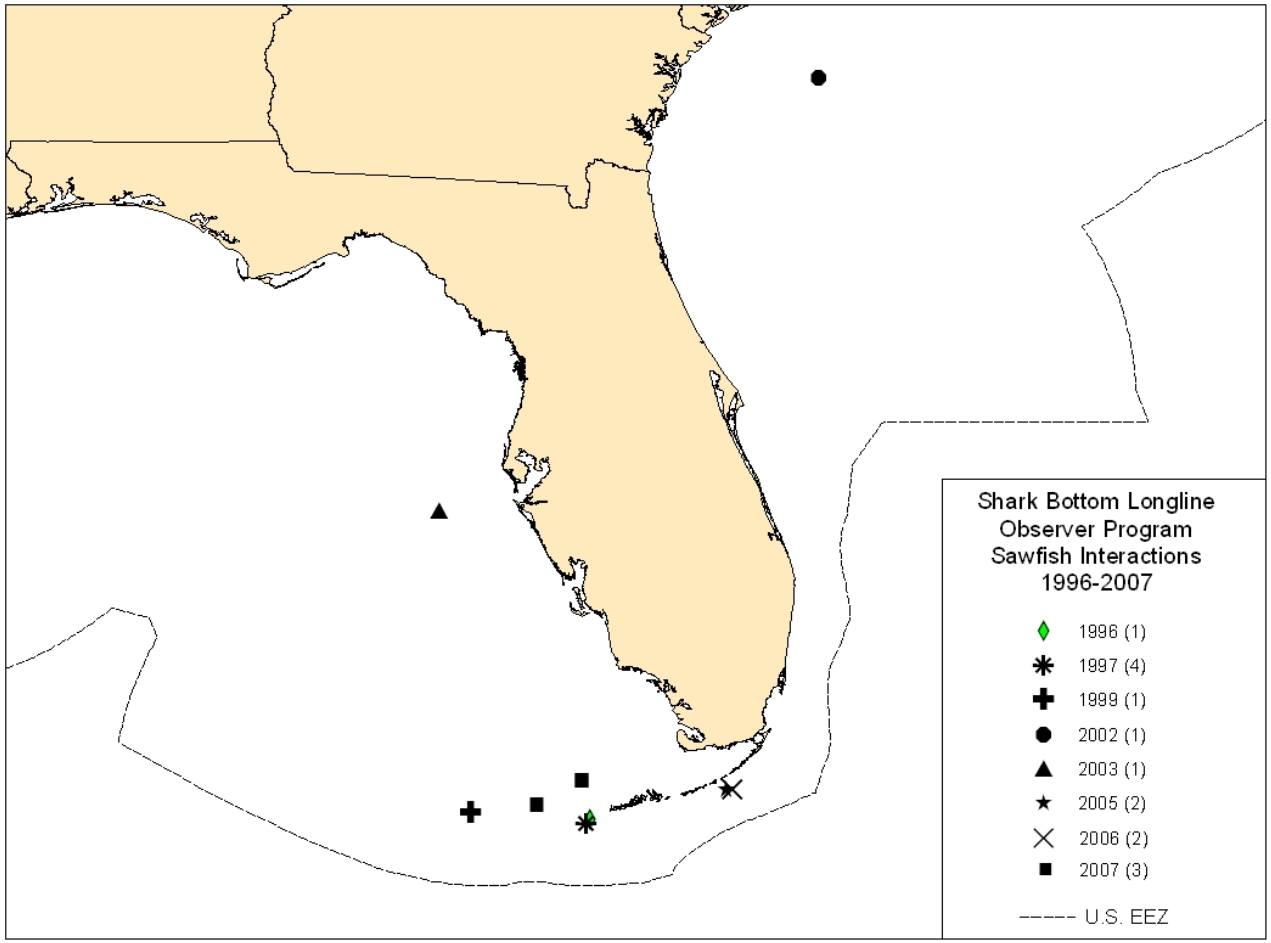

Figure 2.7 **Observed smalltooth sawfish interactions in the shark BLL fishery from 1994-2007.** Source: Shark BLL Observer Program 1994-2007.

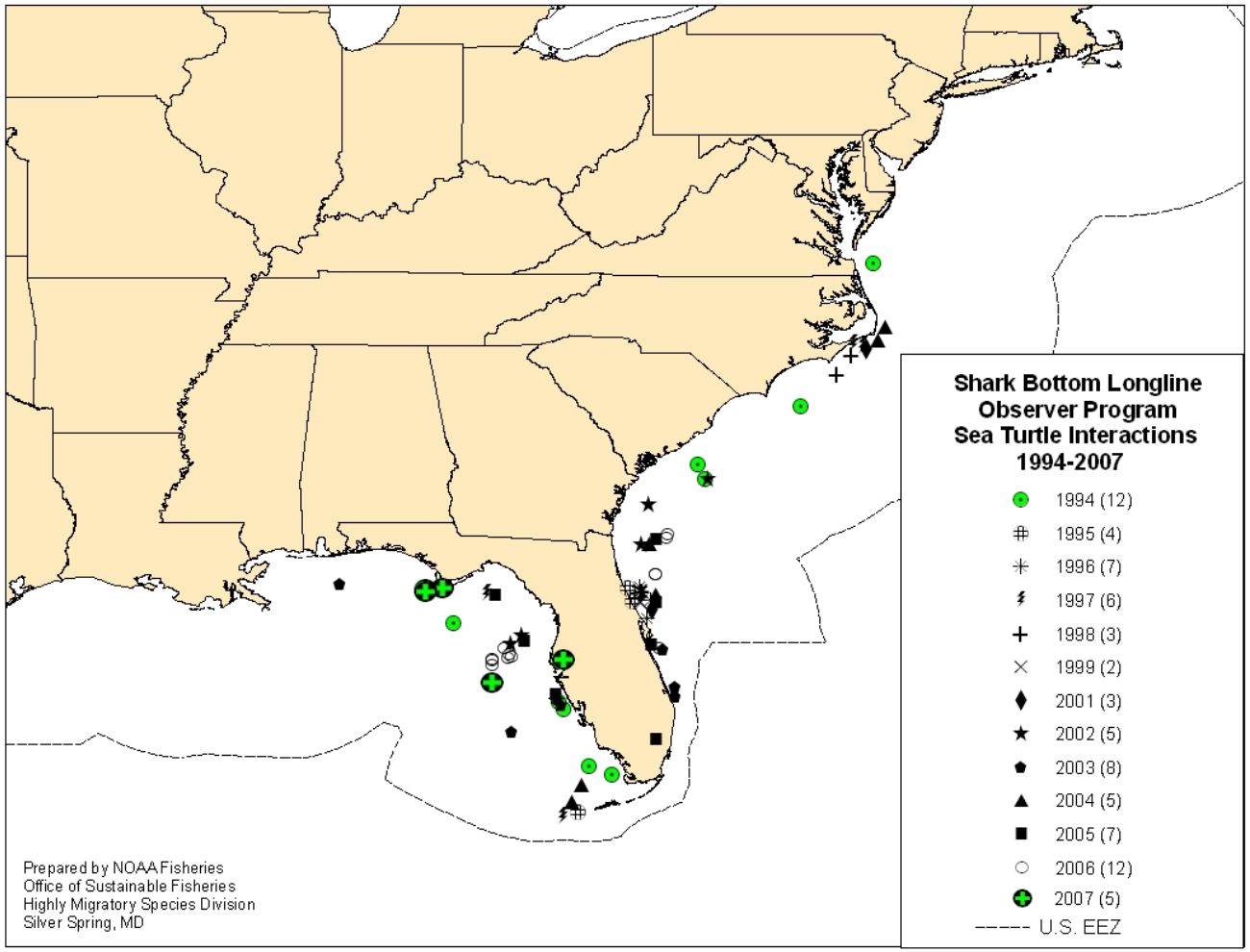

Figure 2.8 Observed sea turtle interactions in the shark BLL fishery from 1994-2007. Source: Shark BLL Observer Program 1994-2007.

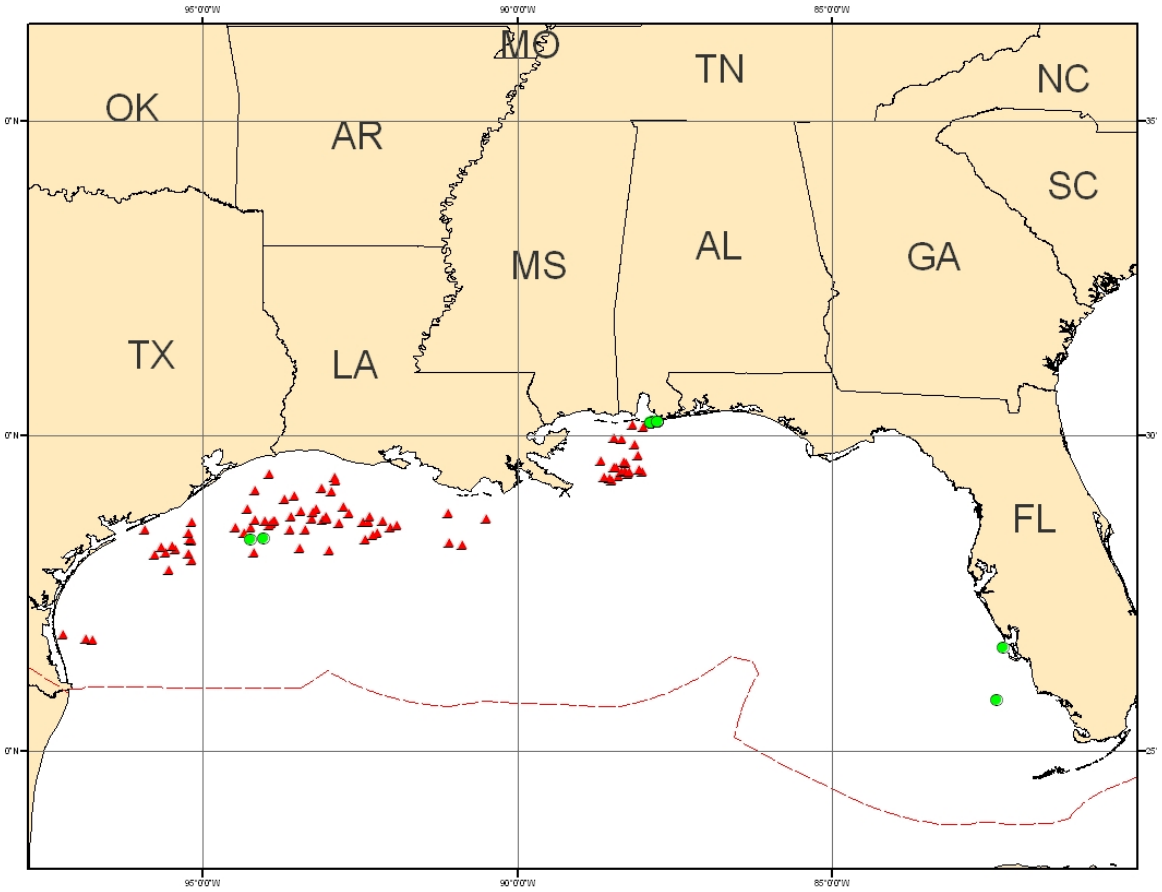

Figure 2.9 **Blacknose shark specific interactions in SEAMAP surveys and commercial shrimp trawl fishery. The triangles are SEAMAP interactions and the circles are observed shrimp trawl interactions.** Data sources from SEAMAP trawl survey (1973-2008) and Shrimp Observer Program (1992-2008).

Table 2.10 Potential time/area closure alternatives.

Alternative	Ecological Impacts	Social/Economic Impacts
1. No Action: Maintain existing time/area closures; no new time/area closures	- Maintain ecological benefits associated with existing time/ area closures, including reduced bycatch of prohibited and protected species and non-target HMS	- No new closures could result in positive socioeconomic impacts in the short-term; in the long-term, certain species may not be available if other management measures fail to rebuild stocks
HMS Fisheries		
2. Modify existing time/area closures for HMS	- Removing or reducing the extent of existing closures could increase bycatch and dead discards of prohibited species, and protected species, as well as catch of overfished species - Increasing existing time/area closures may reduce mortality of blacknose sharks and may decrease interactions with protected resources - Increasing existing closures could displace or shift fishing effort into other area(s) with potential increase in bycatch of other species - Blacknose sharks tend to be distributed over wide areas, and it is difficult to pinpoint concentrations, which would make time/area closures difficult to implement. In order to be effective, potentially large areas may need to be closed	- Reduction or removal of existing closure could have positive socioeconomic impacts in the short-term for commercial fishermen; in the long-term, certain species may not be available if other management measures fail to rebuild stock - Increasing existing time/area closures could have substantial negative economic impacts on commercial fishermen in the short-term by reducing areas where fishermen can deploy gear

Alternative	Ecological Impacts	Social/Economic Impacts
3. Establish new time/area closures for BLL gear to reduce mortality of juvenile and neonate blacknose sharks, smalltooth sawfish, and/or sea turtles	- Decrease mortality of overfished species, such as blacknose sharks, with BLL gear, but rebuilding not likely to occur without additional reductions in mortality in other fisheries - Decrease bycatch of protected species, such as sea turtles and smalltooth sawfish, with BLL gear - New closures could displace or shift fishing effort into other area(s) with potential increase in bycatch of other species - Neonate blacknose sharks are found in waters off the west and east coasts of Florida, Georgia, and South Carolina; closures in these areas could reduce mortality of neonate and juveniles blacknose sharks, depending on post-release mortality in other fisheries - Blacknose sharks tend to be distributed over wide areas, and it is difficult to pinpoint concentrations, which would make time/area closures difficult to implement. In order to be effective, potentially large areas may need to be closed	- New time/area closures may result in negative socioeconomic impacts on commercial fishermen; several time/area closures are already in place for this gear - May reduce safety at sea by requiring fishermen to travel further offshore in pursuit of target species, depending on areas closed - Fishermen may shift effort to other fisheries or gear types to account for lost profits

Alternative	Ecological Impacts	Social/Economic Impacts
4. Establish new time/area closures for gillnet gear to reduce mortality of juvenile and neonate blacknose sharks, smalltooth sawfish, and/or sea turtles	- Decrease bycatch of overfished species, such blacknose sharks, with gillnet gear, but rebuilding not likely to occur without additional reductions in mortality in other fisheries - Decrease bycatch of protected species, such as sea turtles and smalltooth sawfish, with gillnet gear - New closures could displace or shift fishing effort into other area(s) with potential increase in bycatch of other species - This alternative would include re-evaluating the extent of the mid-Atlantic shark closed area for additional gears (*i.e.*, to include gillnet and PLL) - New gillnet gear closures could reduce landings of SCS, which are targeted by the gillnet fishery; this could be beneficial for blacknose, bonnethead, and finetooth sharks - New gillnet gear closures could reduce landings of non-target HMS (*e.g.*, swordfish, billfish, tunas, etc.) - Neonate blacknose sharks are found in waters off the west and east coasts of Florida, Georgia, and South Carolina; closures in these areas could reduce mortality of neonate and juveniles blacknose sharks - Blacknose sharks tend to be distributed over wide areas, and it is difficult to pinpoint concentrations, which would make time/area closures difficult to implement. In order to be effective, potentially large areas may need to be closed	- New time/area closures may result in negative socioeconomic impacts on commercial fishermen, esp. for those that target blacknose sharks and other SCS with gillnet gear; several time/area closures are already in place for this gear - May reduce safety at sea by requiring fishermen to travel further offshore in pursuit of target species, depending on areas closed - Fishermen may transfer effort to other fisheries or gear types to account for lost profits

Alternative	Ecological Impacts	Social/Economic Impacts
5. Establish new time/area closures for recreational rod and reel gear to reduce mortality of juvenile and neonate blacknose sharks	- Decrease mortality of overfished species, such as blacknose sharks, with rod and reel gear (since most rod and reel landings of blacknose sharks are neonate sharks), but rebuilding not likely to occur without additional reductions in mortality in other fisheries - Neonate blacknose sharks are found in waters off the west and east coasts of Florida, Georgia, and South Carolina; closures in these areas could reduce mortality of neonate and juveniles blacknose sharks - Blacknose sharks tend to be distributed over wide areas, and it is difficult to pinpoint concentrations, which would make time/area closures difficult to implement. In order to be effective, potentially large areas may need to be closed	- May reduce safety at sea by requiring fishermen to travel further offshore in pursuit of target species, depending on areas closed - May have significant economic impacts for charter/headboats - Difficulty to enforce time/area closures without VMS units, especially for transiting areas - VMS units could cost significant economic impacts to HMS anglers and charter/headboats
6. Close all Federal waters in the Atlantic region to commercial blacknose shark fishing; fisheries remain open in the Gulf of Mexico region	- Decrease overall mortality of overfished species, such as blacknose sharks, with gillnet, rod and reel, and BLL gear, but rebuilding not likely to occur without additional reductions in mortality in other fisheries - Most SCS caught in gillnets are dead at the vessel; therefore any blacknose sharks caught in gillnets are likely to be discarded dead and will not aid rebuilding - Approximately 60% of SCS caught in BLL gear are dead when it arrives at the vessel; therefore approximately 60% of blacknose sharks caught in BLL are likely going to be discarded dead and will not aid rebuilding - Could decrease mortality of juvenile and neonate blacknose sharks, but rebuilding not likely to occur without additional reductions in mortality in other fisheries - Could displace or shift fishing effort into other area(s) with potential increase in bycatch of other species, especially in the Gulf of Mexico	- Closing all Federal waters in the Atlantic region to blacknose shark fishing would result in negative socioeconomic impacts on commercial fishermen due to losses from blacknose shark income; loss in income may be mitigated by other SCS landings - Fishermen may transfer effort to other fisheries or gear types to account for lost profits - Reduction of bycatch in other fisheries could have a short term negative impact (cost of changing method of fishing) and a long term positive impact (greater efficiency if total shark bycatch is reduced)

Alternative	Ecological Impacts	Social/Economic Impacts
7. Close all Federal waters in the Gulf of Mexico region to commercial blacknose fishing; fisheries remain open in the Atlantic region	- Decrease overall mortality of overfished species, such as blacknose sharks, with gillnet, rod and reel, and BLL gear, but rebuilding not likely to occur without additional reductions in mortality in other fisheries - Most SCS caught in gillnets are dead at the vessel; therefore any blacknose sharks caught in gillnets are likely to be discarded dead and will not aid rebuilding - Approximately 60% of SCS caught in BLL gear are dead when they arrives at the vessel; therefore approximately 60% of blacknose sharks caught in BLL are likely going to be discarded dead and will not aid rebuilding - Could decrease mortality of juvenile and neonate blacknose sharks, but rebuilding not likely to occur without additional reductions in mortality in other fisheries - Could displace or shift fishing effort into other area(s) with potential increase in bycatch of other species, especially in the Atlantic	- Closing all Federal waters in the Gulf of Mexico region to blacknose shark fishing would result in negative socioeconomic impacts on commercial fishermen due to losses from blacknose shark income; loss in income may be mitigated by other SCS landings - Fishermen may transfer effort to other fisheries or gear types to account for lost profits - Reduction of bycatch in other fisheries could have a short term negative impact (cost of changing method of fishing) and a long term positive impact (greater efficiency if total shark bycatch is reduced)
Non-HMS Fisheries		
8. Work with the Gulf of Mexico and South Atlantic Fishery Management Councils to implement closures to reduce mortality of juvenile and neonate blacknose sharks in Council-managed fisheries	- Decrease mortality of overfished species, such as blacknose sharks, with shrimp trawl gear, but rebuilding not likely to occur without additional reductions in mortality in other fisheries - Could displace shrimp fishing effort into other areas(s) with potential increase in bycatch of other species - Closures in blacknose nursery areas would reduce mortality of neonate and juveniles blacknose sharks - Decrease bycatch of protected species, such as sea turtles and smalltooth sawfish, with shrimp trawl gear, depending on post-release mortality - Blacknose sharks tend to be distributed over wide areas, and it is difficult to pinpoint concentrations, which would make time/area closures difficult to implement. In order to be effective, potentially large areas may need to be closed	- New time/area closures may result in negative socioeconomic impacts on commercial fishermen - Fishermen may transfer effort to other fisheries or gear types to account for lost profits - May reduce safety at sea by requiring fishermen to travel further offshore in pursuit of target species, depending on areas closed

2.5 Monitoring and Compliance

2.5.1 Vessel Monitoring Systems

All PLL vessels in possession of HMS permits are currently required to possess and operate Vessel Monitoring Systems (VMS) units while conducting fishing activities, year-round, and in all areas. Amendment 1 to the 1999 FMP required vessels that possess a directed shark permit and have BLL gear onboard to have a VMS unit installed and operating in the vicinity (Federal waters adjacent to Virginia, South Carolina, and North Carolina) of the mid-Atlantic shark closed area from January 1 through July 31 every year. Furthermore, directed shark vessels with gillnet gear onboard, regardless of location, are also required to have a VMS unit installed and operating during the Atlantic right whale calving season (November 15 and April 15) every year. These requirements were implemented to monitor fishing activities in the vicinity of the mid-Atlantic shark closed area and the Atlantic right whale calving area/season.

In 2004, NMFS initiated a program to loan VMS units to participants in the commercial shark fishery that were going to be affected by the VMS requirements implemented in Amendment 1 to the 1999 FMP. Approximately 25 gillnet and BLL vessels participated in the program and received VMS units from the Agency. Vessel operators are responsible for all transmission costs associated with the use of these VMS units.

Implementation of additional time/area closures or other gear restrictions (*e.g.*, soak time) to reduce fishing effort and/or mortality of overfished or prohibited shark species might necessitate expanding the current universe of vessels required to possess and operate VMS. Furthermore, increasing the reporting frequency of VMS from one hour to more frequent transmissions (15-30 minutes) would improve enforcement of time/area closures and other regulations by providing more precise location information for fishing vessels. Changing the reporting frequency would also make the existing regulations more consistent with those of Council-managed species that also deploy BLL and gillnet gear. In the Gulf of Mexico, vessels participating in the reef fish fishery are required to declare permitted activity and gear type to be deployed before/during fishing activities and then transmit VMS locations every hour (unless entering a closed area, then every 10 minutes), 24 hours/day, seven days a week. Finally, professional installation and repair of VMS units and a visual indicator that shows when the VMS unit is powered on and transmitting will improve monitoring by ensuring that units are correctly installed. The visual indicator would notify vessel operators of unit failure and professional installation would ensure the proper installation of VMS units. Table 2.11 shows the range of alternatives NMFS is considering for VMS requirements.

Table 2.11 Potential vessel monitoring system alternatives.

Alternative	Ecological Impacts	Social/Economic Impacts
1. No Action; Maintain current VMS requirements		- No change in cost to fishermen - May continue in difficulty monitoring and enforcing fishing activities
2. Increased reporting frequency for gillnet/BLL vessels that are currently required to possess VMS (every 15-30 minutes, 24/7, even when in port)	- Improved monitoring and compliance with regulations	- Consistency with other management entities - Increased transmission costs - Increased reporting burden
3. Mandatory VMS for all BLL/gillnet vessels that possess directed shark permits and fish in the vicinity of new time/area closures implemented in this amendment (same reporting frequency as Alternative 2, however, expand universe of vessels to account for any additional time/area closures implemented in Amendment 3)	- Improved monitoring and compliance with regulations	- Increased transmission costs to the fishermen - Increased reporting burden - Increased costs for vessels that do not already possess VMS units
4. Hail-in and Hail-out requirement to declare what fishing gear will be used on a given trip	- Time/area closure monitoring for specific gear types and improved compliance	- Increased reporting burden
5. Additional requirements to improve proper VMS unit operation including professional installation and repair of units and a visual indicator that shows when the VMS unit is powered on and transmitting	- Improved monitoring and compliance with regulations	- Potentially increased installation/repair costs - Minimal financial burden for purchase of power/transmission indicator for existing units

2.5.2 Dealer Reporting Requirements

Currently, fish dealers interested in buying shark products from Federal shark permit holders must obtain a Federal shark dealer permit. In addition, Federal dealer permit holders must only purchase sharks harvested from a vessel that has a valid Federal commercial permit for sharks unless that vessel fishes exclusively in state waters. The ASMFC interstate costal shark FMP now requires that all state dealers that purchase sharks must have a federal shark dealer permit. Shark dealers must report all sharks to NMFS that are purchased from U. S. vessels via bimonthly reports that must be received within 10 days of the end of each biweekly period (*i.e.*, by the 25th and 10th of each month). Dealers may not purchase shark fins if the animals were not offloaded with the fins naturally attached, nor may dealers purchase sharks in excess of the existing trip limits for incidental and directed permit holders.

NMFS is considering a range of alternatives that would modify the current shark dealer reporting requirements. As quotas are reduced to allow rebuilding of overfished stock, and the Agency moves towards more species-specific management (*i.e.*, separate quota for blacknose sharks), more frequent dealer reporting would be critical to effective quota monitoring and preventing overfishing. Additionally, during the rulemaking for Amendment 2 to the Consolidated HMS FMP, NMFS received many comments from fishermen asking NMFS to require more real-time dealer reporting. Table 2.12 shows the range of alternatives NMFS is considering for dealer reporting requirements.

Table 2.12 Potential dealer reporting requirement alternatives.

Alternative	Ecological Impacts	Social/Economic Impacts
1. No Action; Dealer reports on a bi-weekly basis	- Reporting may not be frequent enough to prevent overharvests, especially if quotas are reduced	- No increase in cost/burden to fishermen - Overharvests may occur due to longer reporting periods, resulting in shorter seasons and negative socioeconomic impacts
2. Dealer reports received by NMFS within 5 days of receiving product	- More frequent reporting would allow NMFS to take timely action to prevent overharvests	- Additional burden on dealers to report more frequently - Enforcement more difficult as there is not a set date for reporting or declaring that no fish were bought
3. Dealer reports faxed/emailed to NMFS within 24 hours of receiving product	- More frequent reporting would allow NMFS to take timely action to prevent overharvests	- Additional burden on dealers to report more frequently - Potential decrease in burden if reporting is electronic - Enforcement more difficult as there is not a set date for reporting or declaring that no fish were bought

2.5.3 Recreational Reporting Requirements

NMFS is considering a range of alternatives that would modify the recreational reporting requirements. Currently, recreational fishermen are not required to report landings of authorized shark species, unless contacted via phone or on the dock by the Large Pelagic Survey (LPS) or Marine Recreational Information Program (MRIP). NMFS also selects certain tournaments for reporting. Table 2.13 shows the range of alternatives NMFS is considering for dealer reporting requirements.

Table 2.13 Potential recreational reporting requirement alternatives.

Alternative	Ecological Impacts	Social/Economic Impacts
1. No Action; Recreational fishermen not required to report shark landings	- NMFS receives survey information on recreational catches; these surveys may not be representative of the entire recreational catch	- No increase in cost/burden to fishermen
2. Recreational fishermen required to report landed sharks	- Improved quota monitoring/data for assessments	- Additional reporting burden on fishermen - Added consistency with bluefin tuna, billfish and swordfish reporting requirements - Additional burden on the Agency - Difficult to enforce
3. Recreational fishermen required to report released and landed sharks	- Improved quota monitoring/data for assessments	- Additional reporting burden on fishermen - Added consistency with bluefin tuna, billfish and swordfish reporting requirements - Additional burden on the Agency - Difficult to enforce
4. Anglers or tournament operators to report all sharks landed in tournaments	- Improved quota monitoring/data for assessments	- Additional reporting burden on tournament operators and/or fishermen - Additional burden on the Agency - Difficult to enforce

2.6 Additional Species Considerations

Smooth dogfish

Currently, smooth dogfish are not managed in Federal waters. ASMFC has included smooth dogfish in the Interstate Shark FMP that will be implemented by each Atlantic state in early 2009 and has requested that NMFS manage smooth dogfish in Federal waters with measures complementary to the Interstate Shark FMP. The Mid-Atlantic Fishery Management Council has the lead for the management of the spiny dogfish in Federal waters and has expressed interest in managing smooth dogfish in Federal waters. NMFS is considering adding smooth dogfish to the Atlantic HMS management unit, since NMFS has direct management authority of Atlantic sharks. The range of alternatives regarding the management of smooth dogfish is outlined in Table 2.14.

Deepwater sharks and ragged-tooth sharks

Deepwater sharks were added to the Atlantic HMS management unit in 1999 to prohibit finning, and then removed from the management unit in Amendment 1 to the 1999 FMP for Atlantic Tunas, Swordfish and Sharks because the Shark Finning Prohibition Act was implemented by NMFS. There are no catch limits in place and no reporting requirements for these species. Although there are no directed fisheries for these species, some bycatch occurs in deepwater trawls and in the monkfish fishery. There are many different deepwater shark species, and they are typically long-lived and very slow-growing. The status of deepwater sharks is currently unknown and there is limited data due to the rarity of encounters in commercial fishing operations. During scoping, NMFS received requests to add deepwater sharks to the Atlantic HMS management unit and add all deepwater sharks to the prohibited species list.

Ragged-tooth sharks (*Odontaspis ferox*) are currently not in the management unit established in the 2006 Consolidated HMS FMP. This species looks very similar to the sand tiger shark (*Carcharias taurus*), which is on the prohibited species list. Ragged-tooth sharks are rarely encountered during commercial fishing and research activities. During scoping, NMFS received a request to add ragged tooth sharks to the Atlantic HMS management unit and to add them to the prohibited species list due to look alike issues with sand tiger sharks, as a precautionary measure and to close any potential loopholes.

The current prohibited shark list consists of sand tiger, bigeye sand tiger, whale, basking, white, dusky, bignose, Galapagos, night, Caribbean reef, smalltail, Caribbean sharpnose, narrowtooth, Atlantic angel, longfin mako, bigeye thresher, sevengill, sixgill, and bigeye sixgill sharks. Sharks may be added to the prohibited list if they meet at least two of the following criteria: (1) there is sufficient biological information to indicate the stock warrants protections, such as indications of depletion or low reproductive potential or the species is on the Endangered Species Act (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). Based on these criteria and other pertinent information, NMFS may consider adding deepwater sharks and ragged-tooth sharks to the prohibited species list. Table 2.14 shows the potential alternatives for additional species consideration.

Table 2.14 Potential alternatives for the additional species considerations.

Alternative	Ecological Impacts	Social/Economic Impacts
Smooth Dogfish Measures		
1. No Action. Do not add smooth dogfish to the Atlantic HMS management unit	- Continued fishing of this species in Federal waters without management measures in place; - Could lead to unsustainable fishery	- No economic impacts in the short-term due to no Federal restrictions for this species; - Could lead to confusion between management in state and federal waters - Long-term impacts may arise if management measures are needed to sustain fishery
2. Add smooth dogfish to the Atlantic HMS Management unit and implement management measures	- Potentially reduce fishing pressure on smooth dogfish; - Improved monitoring and data collection for this species, which could help in future stock assessments - Maintain a sustainable fishery in Federal waters	- Increased restrictions for Federally permitted fishermen - May need to obtain new permit - Could lead to confusion if state and federal management measures are different - Increased data reporting requirements - Positive impacts if species is maintained at sustainable levels
3. Add smooth dogfish to the Atlantic HMS Management unit and mirror management measures implemented in the ASMFC Interstate Shark FMP	- Maintain sustainable fishery in state and federal waters - Improved monitoring and data collection for this species, which could help in future stock assessments	- Increased restrictions on Federally permitted fishermen - May need to obtain new permit - Increased data reporting requirements - Positive impacts if species is maintained at sustainable levels - Federal consistency with ASMFC Interstate Shark plan would make it easier for fishermen who fish in state and federal waters to comply with management measures
Deepwater Shark Measures		
4. No Action. Do not add deepwater sharks to the Atlantic HMS management unit	- Minimal negative ecological impacts due to rarity of interactions with deepwater sharks	- No negative impacts due to no change in management measures

Alternative	Ecological Impacts	Social/Economic Impacts
5. Add deepwater sharks to the management unit and place these species on the prohibited list	- Prevent any potential future fishery development for deepwater sharks - Increased dead discards since all are dead at vessel - Could reduce scientific knowledge of species if none can be landed during rare encounters.	- Minimal negative impacts since deepwater sharks are rarely encountered during commercial fishing operations
6. Add deepwater sharks to the management unit and require all catches be given to NMFS for scientific research	- Could add to scientific knowledge of species	- Potential increase of burden for fishermen if required to land deepwater sharks and provide to NMFS
Ragged-tooth Shark Measures		
7. No Action. Do not add ragged-tooth sharks to the Atlantic HMS management unit	- Minimal negative ecological impacts due to rarity of interactions with this species of sharks	- No negative impacts due to no change in management measures
8. Add ragged-tooth sharks to the management unit and place these species on the prohibited list	- Added protection for ragged-tooth sharks - Prevent any potential future fishery development for this species	- Minimal negative impacts since ragged-tooth sharks are rarely encountered during commercial fishing operations

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