1.0 INTRODUCTION

This document is the Predraft for Amendment 3 to the Consolidated Atlantic Highly Migratory Species (HMS) Fishery Management Plan (FMP). The Predraft document allows the National Marine Fisheries Service (NMFS) to obtain additional information and input from Consulting Parties on potential alternatives prior to development of the formal Draft Environmental Impact Statement (DEIS) for Amendment 3 of the 2006 Consolidated HMS FMP and proposed rule. Consulting Parties for HMS fisheries are defined under the Magnuson-Stevens Fishery Conservation and Management Act (Magnuson-Stevens Act) as affected Fishery Management Councils, International Commission for the Conservation of Atlantic Tunas (ICCAT) commissioners and advisory groups, and the HMS Advisory Panel (AP). The Magnuson-Stevens Act requires NMFS to consult with Consulting Parties regarding amendments to the FMP. As such, we are requesting comments on this Predraft document for Amendment 3 to the 2006 Consolidated HMS FMP. An electronic version of the Predraft is also available on the website of the HMS Management Division at: http://www.nmfs.noaa.gov/sfa/hms.

NMFS anticipates that the proposed rule and DEIS will be available in August of 2009 and the Final Amendment 3 to the Consolidated HMS FMP and its related documents will be available in spring 2010. Given the short time frame, NMFS requests receipt of any comments on this document by **March 16, 2009**.

Any written comments on the Predraft should be submitted to Karyl Brewster-Geisz, HMS Management Division, F/SF1, Office of Sustainable Fisheries, 1315 East-West Highway, Silver Spring, MD 20910 or faxed to (301) 713-1917 by **March 16, 2009.** For further information, contact Jackie Wilson at (240) 338-3936 or Karyl Brewster-Geisz at (301) 713-2347.

This Predraft includes a summary of the anticipated purpose and need (Chapter 1) and tables summarizing the ecological, social, and economic impacts of management alternatives that NMFS is considering at this time (Chapter 2). The alternatives outlined in Chapter 2 may be modified, removed, or supplemented based on any comments received, additional analyses, and other factors, as appropriate.

NMFS specifically solicits opinions and advice on the range of alternatives and whether there are additional alternatives that should be addressed. Additionally, NMFS solicits opinions and advice on the impacts described for each alternative.

1.1 Management History

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

Ocean, Gulf of Mexico, and Caribbean Sea (16 U.S.C. §1854(f)(3)).[1] At that time, the Secretary delegated authority to manage Atlantic HMS to NMFS.

The HMS Management Division within NMFS develops regulations for HMS fisheries, although some actions (*e.g.*, Large Whale Take Reduction Plan) are taken by other NMFS offices if the main legislation (*e.g.*, Marine Mammal Protection Act) driving the action is not the Magnuson-Stevens Act or the Atlantic Tunas Convention Act (ATCA). NMFS manages HMS species at the international, national, and state levels because of the highly migratory nature of these species. NMFS primarily coordinates the management of HMS fisheries in Federal waters (domestic) and the high seas (international) while individual states establish regulations for HMS in their own waters. There are exceptions to this generalization. For example, Federal bluefin tuna regulations apply in most state waters, and Federally permitted shark and swordfish fishermen, as a condition of their permit, are required to follow Federal regulations in all waters unless that state has more restrictive regulations. Additionally, in 2005, the Atlantic States Marine Fisheries Commission (ASMFC) agreed to develop an interstate coastal shark FMP. This interstate FMP will coordinate management measures among all states along the Atlantic coast (Florida to Maine). NMFS participated in the development of this interstate shark FMP, which was effective in 2009.

1.1.1 Pre-1999 Atlantic Shark Fisheries and Management

Recreational fishing for Atlantic sharks occurs in Federal and state waters from New England to the Gulf of Mexico and Caribbean Sea. Recreational shark fishing with rod and reel is now a popular sport at all social and economic levels, largely because of accessibility to the resource. Sharks can be caught virtually anywhere in the marine environment, with even large specimens available in the nearshore areas. Typically, most recreational shark fishing takes place on small to medium-size vessels. Some species such as mako, white, and large pelagic sharks are generally accessible only to those aboard ocean-going vessels. Recreational shark fisheries are exploited primarily by private vessels and charter/headboats although there are many active shore-based fishermen as well.

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

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

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

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

In 1993, the Secretary of Commerce, through NMFS, implemented the FMP for Sharks of the Atlantic Ocean (1993 Shark FMP). At that time, NMFS identified large coastal sharks (LCS) as overfished and pelagic and small coastal sharks (SCS) as fully fished. The quotas were 2,436 mt dressed weight (dw) for LCS and 580 mt dw for pelagic sharks. No quota was established for the SCS complex to limit SCS fishing. Under the rebuilding plan established in the 1993 FMP, the LCS quota was expected to increase every year from 1993 to 1995 up to 3,787 mt dw, which was the maximum sustainable yield estimated in the 1992 stock assessment.

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

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

In June 1996, NMFS convened another stock assessment to examine the status of LCS stocks. The 1996 stock assessment found no clear evidence that LCS stocks were rebuilding and concluded that "[a]nalyses indicate that recovery is more likely to occur with reductions in [the] effective fishing mortality rate of 50 [percent] or more." In response to these results, in 1997, NMFS reduced the LCS commercial quota by 50 percent to 1,285 mt dw and the recreational retention limit to two LCS, SCS, and pelagic sharks combined per trip with an additional allowance of two Atlantic sharpnose sharks (*Rhizoprinodon terraenovae*) per person per trip (62 FR 16648, April 2, 1997). In this same rule, NMFS established an annual commercial quota for

SCS of 1,760 mt dw and prohibited possession of five species (sand tiger, bigeye sand tiger, whale, basking, and white sharks). As a result of litigation, NMFS prepared additional economic analyses on the 1997 LCS quotas and was allowed to maintain those quotas during resolution of the case.

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

- Reducing commercial LCS and SCS quotas;
- Establishing ridgeback and non-ridgeback categories of LCS;
- Implementing a commercial minimum size for ridgeback LCS;
- Establishing blue shark, porbeagle shark, and other pelagic shark subgroups of the pelagic sharks and establishing a commercial quota for each subgroup;
- Reducing recreational retention limits for all sharks;
- Establishing a recreational minimum size for all sharks except Atlantic sharpnose;
- Expanding the list of prohibited shark species to 19 species;
- Implementing limited access in commercial fisheries;
- Establishing a shark public display quota;
- Establishing new procedures for counting dead discards and state landings of sharks after Federal fishing season closures against Federal quotas; and
- Establishing season-specific over- and underharvest adjustment procedures.

The implementing regulations were published on May 28, 1999 (64 FR 29090). However, in July 1999, the District Court for the Middle District of Florida enjoined implementation of the 1999 shark regulations, because of ongoing litigation on the 1997 quotas. A year later, on June 12, 2000, the case was settled and the court issued an order clarifying that NMFS could proceed with implementation and enforcement of the 1999 prohibited species provisions (64 FR 29090, May 28, 1999).

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

Some of the non-species specific management measures of the 1999 FMP included vessel monitoring systems for all pelagic longline (PLL) vessels; gear and vessel marking requirements; moving PLL gear after an interaction with a protected species; a requirement for

charter/headboats to obtain an annual vessel permit; tournament registration for all HMS tournaments; time limits on completing a vessel logbook; and expanded observer coverage. The 1999 FMP also established the threshold levels for biomass (B) and fishing mortality (F) to determine if a stock is overfished, if overfishing is occurring, or if the stock is rebuilt. Finally, the 1999 FMP identified essential fish habitat (EFH) for all Atlantic tunas, swordfish, and sharks. As part of the 1999 FMP, the regulations for all Atlantic HMS, including billfish, were consolidated into one part of the Code of Federal Regulations, 50 CFR Part 635.

1.1.2 Amendment 1 to the FMP for Atlantic Tunas, Swordfish, and Sharks

As noted in Section 1.1.1, in 1999 a court enjoined the Agency from implementing many of the shark-specific regulations of the 1999 FMP. In 2000, the injunction was lifted when a settlement agreement was entered to resolve the 1997 and 1999 lawsuits. The settlement agreement required, among other things, an independent (*i.e.*, non-NMFS) review of the 1998 LCS stock assessment. The settlement agreement did not address any regulations affecting the pelagic shark, prohibited species, or recreational shark fisheries. Once the injunction was lifted, on January 1, 2001, the pelagic shark quotas adopted in the 1999 FMP were implemented (66 FR 55). On March 6, 2001, NMFS published an emergency rule implementing the settlement agreement (66 FR 13441). This emergency rule expired on September 4, 2001, and established the LCS and SCS commercial quotas at 1997 levels.

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

On October 17, 2002, NMFS announced the availability of the 2002 LCS stock assessment and the workshop meeting report (67 FR 64098). The results of this stock assessment indicated that the LCS complex was still overfished and overfishing was occurring. Additionally, the 2002 LCS stock assessment found that sandbar sharks were no longer overfished but that overfishing was still occurring and that blacktip sharks were rebuilt and overfishing was not occurring.

Based on the results of both the 2002 SCS and LCS stock assessments, NMFS implemented an emergency rule to ensure that the commercial management measures in place for the 2003 fishing year were based on the best available science (67 FR 78990, December 27, 2002; extended 68 FR 31987, May 29, 2003). Specifically, the emergency rule implemented the LCS ridgeback/non-ridgeback split established in the 1999 FMP, set the LCS and SCS quotas

based on the results of stock assessments, suspended the commercial ridgeback LCS minimum size, and allowed both the season-specific quota adjustments and the counting of all mortality measures to go into place.

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

In 2004, ICCAT adopted a recommendation concerning Atlantic sharks caught by contracting parties. The recommendation included measures regarding shark finning, research on gears and shark nursery areas, stock assessment schedules for shortfin mako (*Isurus oxyrinchus*) and blue sharks (*Prionace glauca*), and submission of shark data. ICCAT completed stock assessments for shortfin mako and blue sharks in 2004. This work included a review of their biology, a description of the fisheries, analyses of the state of the stocks and outlook, analyses of the effects of current regulations, and recommendations for statistics and research. The Standing Committee on Research and Statistics (SCRS) assessment indicated that the current biomass of North and South Atlantic blue sharks was above maximum sustainable yield (MSY) ($B>B_{MSY}$), however, these results were conditional and based on assumptions that were made by the committee. These assumptions indicate that blue sharks were not overfished. This conclusion was conditional and based on limited landings data. The North Atlantic shortfin mako population had experienced some level of stock depletion, as suggested by the historical catch-per-unit-effort (CPUE) trend and model outputs. The stock may have been below MSY ($B<B_{MSY}$), suggesting that the species may have been overfished (SCRS, 2004).

1.1.3 The 2006 Consolidated HMS FMP

NMFS issued two separate FMPs in April 1999 for the Atlantic HMS fisheries. The 1999 Fishery Management Plan for Atlantic Tunas, Swordfish, and Sharks, combined, amended, and replaced previous management plans for swordfish and sharks, and was the first FMP for tunas. Amendment 1 to the Billfish Management Plan updated and amended the 1988 Billfish FMP.

During the time that these two FMPs had co-existed, there had been a growing recognition by the Agency of the interrelated nature of these fisheries and the need to consolidate management actions. In addition, the Agency had identified some adverse ramifications stemming from separation of the plans, including unnecessary administrative redundancy and complexity, loss of efficiency, and public confusion over the management process. Therefore, NMFS proposed to improve coordination of the conservation and management of the domestic fisheries for Atlantic swordfish, tunas, sharks and billfish by consolidating all HMS management measures into one FMP. In 2005, NMFS released the draft Consolidated HMS FMP. The final

Consolidated HMS FMP was completed in July 2006 and the implementing regulations were published on October 2, 2006 (71 FR 58058).

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

The 2002 SCS stock assessment found that finetooth sharks (*Carcharhinus isodon*) were not overfished but that overfishing was occurring. The 2006 Consolidated HMS FMP included a plan for preventing overfishing by expanding observer coverage, collecting more information on where finetooth sharks are being landed, and coordinating with other fisheries management entities that are contributing to finetooth shark fishing mortality. The latest 2007 stock assessment of SCS in the U.S. Atlantic and Gulf of Mexico was recently completed (72 FR 63888, November 13, 2007), and found, among other things, that finetooth sharks were not experiencing overfishing, but blacknose sharks (*Carcharhinus acronotus*) are overfished with overfishing occurring. This peer reviewed assessment, which was conducted according to the Southeast Data, Assessment, and Review (SEDAR) process, provides an update from the 2002 stock assessment on the status of SCS stocks and projects their future abundance under a variety of catch levels in the U.S. Atlantic Ocean, Gulf of Mexico, and Caribbean Sea. The 2007 assessment includes updated catch estimates, new biological data, and a number of fishery-independent catch rate series, as well as fishery-dependent catch rate series.

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

Other actions taken by NMFS affecting the Atlantic shark fishery include a combined emergency and final rule (December 14, 2006, 71 FR 75122) that adjusted the 2007 first season commercial quotas for LCS, SCS, and pelagic sharks based on over- or underharvests from the 2006 fishing season and that announced the season opening and closing dates for the first season

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

1.1.4 Amendment 2 to the Consolidated HMS FMP

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

- Initiating rebuilding plans for porbeagle, dusky, and sandbar sharks consistent with stock assessments;
- Implementing commercial quotas and retention limits consistent with stock assessment recommendations to prevent overfishing and rebuild overfished stocks;
- Modifying recreational measures to reduce fishing mortality of overfished/overfishing stocks;
- Modifying reporting requirements;
- Modifying timing of shark stock assessments;
- Clarifying timing of release for annual Stock Assessment and Fishery Evaluation (SAFE) reports;
- Updating dehooking requirements for smalltooth sawfish;
- Requiring that all Atlantic sharks be offloaded with fins naturally attached;
- Collecting shark life history information via the implementation of a shark research program; and,
- Implementing time/area closures recommended by the South Atlantic Fishery Management Council.

1.1.5 Recent Stock Assessments

Pelagic Shark Assessments

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

Blue Sharks

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

Shortfin Mako Sharks

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

Small Coastal Shark Assessments

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

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 will no longer provide status updates or determinations on the SCS complex as a whole (May 7, 2008, 73 FR 25665). However, this does not preclude NMFS from managing SCS as a complex.

Finetooth Sharks

The 2007 finetooth stock assessment used a Bayesian Surplus Production model as the base model to assess finetooth sharks. The Bayesian Surplus Production model used the number of individuals (N) as a metric for biomass. 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 (May 7, 2008, 73 FR 25665). 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 on this species should be cautious. Peer reviewers noted that this species was not adequately sampled in the time series of CPUE either from fishery dependent or fishery independent indices, and small changes in availability or the timing and location of sampling can result in a different stock status. Thus, NMFS should use a cautious management strategy for this species and not increase fishing pressure on finetooth sharks when considering new management measures for overfished species.

Atlantic Sharpnose Sharks

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 used a state-space, age structured model as the base model to assess Atlantic sharpnose sharks. The state-space, age structured model used spawning stock fecundity (SSF), or number of reproductive-age individuals in a population, as a metric for biomass. The 2007 assessment also indicated that Atlantic sharpnose sharks are not overfished ($SSF_{2005}/SSF_{MSY} = 1.47$) and that no overfishing is occurring ($F_{2005}/F_{MSY} = 0.74$) (Figure 1.2). Based on these results, NMFS has determined that the Atlantic sharpnose sharks are not overfished with no overfishing occurring (May 7, 2008, 73 FR 25665). 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

The 2007 bonnethead stock assessment used a state-space, age structured model as the base model to assess bonnethead sharks (*Sphyrna tiburo*). Based on the 2007 bonnethead stock assessment, the peer reviewers determined that bonnethead sharks are not overfished

(SSF_{2005}/SSF_{MSY} = 1.13) and overfishing is not occurring (F_{2005}/F_{MSY} = 0.61) (Figure 1.3). However, fishing mortality rates in the recent past have fluctuated above and below F_{MSY}. Thus, the peer reviewers said that there is some probability that fishing mortality rates in 2006 and 2007 were in excess of F_{MSY}. Given this, projections showed that if the average F from the past 10 years was maintained, there is some probability that SSF would fall below SSF_{MSY}, in the future, if the current average F's were maintained (*i.e.*, bonnethead sharks would then become overfished). Thus, NMFS should be cautious when developing new management measures for overfished species so as to not increase fishing pressure on bonnethead sharks. However, since the 2005 estimate of SSF was above SSF_{MSY} and the 2005 estimate of F was below F_{MSY}, NMFS has determined that bonnethead sharks are not overfished with no overfishing occurring (May 7, 2008, 73 FR 25665).

Blacknose Sharks

The 2002 SCS stock assessment found that blacknose sharks were not overfished and overfishing was not occurring. However, the 2007 stock assessment, which used a state-space, age structured model as the base model to assess 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 from 2001 to 2005, was greater than F_{MSY}, and the ratio was substantially greater than 1 (F_{2005}/F_{MSY} = 3.77) (Figure 1.4). Based on these results, NMFS has determined that blacknose sharks are experiencing overfishing (May 7, 2008, 73 FR 25665).

Under the National Standard (NS) 1 Guidelines, if a stock is overfished, NMFS is required to "take remedial action by preparing an FMP, FMP amendment, or proposed regulation...to rebuild the stock or stock complex to the MSY level within an appropriate time frame" (50 CFR 600.310(e)(3)(ii)). Additionally, "in cases where a stock or stock complex is overfished, [the] action must specify a time period for rebuilding the stock or stock complex that satisfies the requirements of section 304(e)(4)(A) of the Magnuson-Stevens Act." The time frame to rebuild the stock or stock complex must be as short as possible taking into account a number of factors including (1) the status and biology of the stock or stock complex; (2) interactions between the stock or stock complex and other components of the marine ecosystem; (3) the needs of the fishing communities; (4) recommendations by international organizations in which the United States participates; and (5) management measures under an international agreement in which the United States participates.

The lower limit of the specified time frame for rebuilding is determined by the status and biology of the stock and "is defined as the amount of time that would be required for rebuilding if fishing mortality were eliminated entirely" (50 CFR 600.310 (e)(4)(ii)(B)(1)). The NS 1 Guidelines specify two strategies for determining the rebuilding time frame depending on the lower limit of the specified time frame for rebuilding. The first strategy applies to rebuilding time frames that are less than 10 years. The second strategy applies to rebuilding time frames that are greater than 10 years. In these cases, the rebuilding time frame cannot exceed the rebuilding period calculated in the absence of fishing mortality, plus one mean generation time.

The blacknose stock assessment discussed three rebuilding scenarios, including: 1) rebuilding timeframe under no fishing, 2) a total allowable catch (TAC) corresponding to a 50-percent probability of rebuilding, and 3) a TAC corresponding to a 70-percent probability of rebuilding. Under no fishing, the stock assessment estimated that blacknose sharks would rebuild by 2019 or in 11 years from 2009. Adding a generation time (8 years), as described under NS 1 for species that require more than 10 years to rebuild even if fishing mortality were eliminated entirely, the target year for rebuilding the stock was estimated to be 2027 (8 years mean generation time + 11 years to rebuild if fishing mortality eliminated = 19 years, starting in 2009). The blacknose shark assessment also recommended a blacknose shark specific TAC and corresponding rebuilding time frames. The assessment estimated that blacknose sharks would have a 70-percent probability of rebuilding by 2027 with a TAC of 19,200 individuals per year, and a 50-percent probability of rebuilding by 2024 with the same TAC.

During scoping for Amendment 3 to the 2006 Consolidated HMS FMP, NMFS received numerous comments on the blacknose stock assessment, and in particular, on the bycatch model used to estimate bycatch of blacknose sharks in the Gulf of Mexico and South Atlantic shrimp trawl fisheries (see Appendix A). NMFS will consider all of the comments received during scoping when developing the DEIS; however, many of these issues were discussed and addressed in the Data Workshop, Assessment Workshop, or the Review Workshop of the 2007 blacknose stock assessment (NMFS, 2007a). Because it is important to understand the stock assessment and the need for action, the following paragraphs describe some of the comments specific to the stock assessment, including the model used to estimate blacknose shark bycatch in the shrimp trawl fishery, and how they were addressed during the SEDAR process.

Some of the scoping comments on the blacknose stock assessment ranged from criticism of the data used, how the stock assessment was conducted with regard to one versus two stocks, the level of fishing mortality for the different sectors, the natural mortality rate used for different age classes, determining post-release of survival of blacknose sharks in different fisheries, and questions regarding gear selectivity, and selected stock size indices used in the assessment. During the Data Workshop, the assessment scientists and participants determined which data sources were best available and appropriate for the different models and the different sensitivity runs for the blacknose assessment (Data Workshop Report, pages 114-119; NMFS, 2007a). The assessment scientists used a variety of fishery independent and fishery dependent data sources to assess blacknose sharks. These data sources included observer program data that reported the size of blacknose sharks caught in gillnet and BLL shark fisheries. These data also gave estimates on discard rates, disposition of discards, and the number sharks used as bait, but not reported via logbooks or HMS dealer reports, as a way to incorporate additional sources of unreported mortality. The assessment scientists also used shrimp observer data to estimate the number of blacknose sharks taken in the shrimp trawl fishery. However, the observer data did not indicate the percentage of blacknose sharks taken dead versus alive in the shrimp trawls. Therefore, given the small size of blacknose sharks caught in the shrimp trawl fishery and the gear used in the shrimp trawl fishery, the assessment scientist assumed that all observed blacknose sharks in the shrimp trawl fishery were discarded dead. The peer reviewers determined that the assessment scientists used adequate and appropriate data that were available at the time of the assessment (Review Workshop; page 14; NMFS, 2007a)

The assessment scientists also used fishery independent longline and gillnet surveys (*i.e.*, scientific surveys) in conjunction with fishery dependent data (*i.e.*, commercial fisheries data) to determine catch rates and indices of abundance. In the recreational fisheries, NMFS used three recreational surveys (Marine Recreational Fishery Statistics Survey (MRFSS), the NMFS Headboat Survey, and the Texas Parks and Wildlife Department Recreational Fishing Survey) to estimate recreational landings and dead discards as well as the size of recreationally landed blacknose sharks. From these different commercial and recreational data sets, NMFS also determined gear selectivity and stock size indices. While the peer reviewers gave suggestions for improvements regarding stock size indices and gear selectivity for the different assessment models for future assessments, they also determined that the data used in the assessment were adequate, appropriate, and used properly (Review Workshop; page 15; NMFS, 2007a). Therefore, the peer reviewers determined the blacknose stock assessment is the best available science, and NMFS has accepted this determination as the assessment was conducted according to the SEDAR process and was peer reviewed by independent scientists.

NMFS also received scoping comments that the assessment should have assessed blacknose sharks as separate South Atlantic and Gulf of Mexico populations, given tagging and genetic studies and their different reproductive rates, instead of one overall population. In the Data Workshop Report (page 6; NMFS 2007a), the assessment scientists decided after reviewing the available data, that blacknose sharks should be assessed as one stock. The scientists noted that there was conflicting genetic data regarding the existence of two separate stocks, and they recognized the potential differences in the reproductive cycle for South Atlantic and Gulf of Mexico populations. As such, they conducted the assessment using an average reproductive cycle of 1.5-years (the average between reproductive cycles of one year in the Gulf of Mexico and two years in the South Atlantic region). Sensitivities were conducted during the Assessment Workshop to determine the effect of different reproductive cycles on stock status (Assessment Workshop Report, page 72; NMFS, 2007a). Under both reproductive scenarios, the overall stock status of blacknose sharks did not change (*i.e.*, blacknose sharks are still overfished with overfishing occurring). Thus, the reviewers and assessment scientists agreed that the base case scenario of a 1.5-year reproductive cycle was appropriate for the assessment.

NMFS also received scoping comments on the value used for the natural mortality rate (M) for pup survival in the assessment. The range of M values used in the assessment was recommended during the Data Workshop by the Life History Working Group and were explained in the following excerpt:

> There are no natural mortality estimates for small coastal sharks currently available based on empirical data. After consultation with the stock assessment analysts, the Working Group decided survivorship of age 0 (first-year survivorship) and age-1+ individuals should be based on the maximum estimate from values obtained using the methods of Hoenig (1983), Chen and Watanabe (1989), Pauly (1980), Peterson and Wroblewski (1984), and Lorenzen (1996) (Data Workshop Report, page 6; NMFS, 2007a).

More details about the application of these indirect methods to estimate M can be found in Cortés (2004), Simpfendorfer et al. (2004), and Cortés et al. (2006). Constituents asked if it was valid for the natural mortality rate to be the highest for the pup stage. The peer reviewers

stated that the values chosen appeared plausible but the choice of M has a direct bearing on the estimate of MSY and needs to be considered carefully (Review Workshop Report, page 14, NMFS, 2007a). The rationale for using the maximum estimate from the multiple methods was to attempt to emulate a density-dependent response since the stock methods are all based on density-dependent theory, as deemed appropriate by the assessment scientists.

NMFS received scoping comments on why an age-structured model was used as the base model for the blacknose shark assessment rather than a Bayesian surplus model that was used for other SCS. Surplus production models are simpler in their formulation, take less time to run, and require less input information. However, due to their formulation, the surplus production models do not describe changes that occur in subgroups of the population (*e.g.*, adults, juveniles, etc.). Sensitivity runs are also limited with surplus production models, and the model cannot incorporate time lags into the results (NMFS, 2007a). In addition to the age-structured model used in the blacknose shark assessment, two different surplus production models were also used in the blacknose assessment: the Bayesian surplus production model (BSP) and the WinBUGS state-space Bayesian surplus production model. Both of these models use Bayesian inference to estimate stock status, and the BSP model further performs Bayesian decision analysis to examine the sustainability of various levels of future catch (NMFS, 2007a). Where frequentist statistics assumes random data from fixed processes, Bayesian statistics assumes data are observations from dynamic or changing processes. In a Bayesian approach, the data are treated as observations of a changing population whereas in a frequentist approach, the data are considered random data of a fixed population.

An age-structured population dynamics model describes the dynamics of each age class in the population separately, and therefore, requires age-specific input information. Age-structured models are more complex and require a longer time to run and a higher volume of information relative to simpler models, but they can account for age-dependent differences in biology, dynamics, and exploitation of fish, and provide an insight into the structure of the population and the processes that are more important at different life stages (NMFS, 2007a). They also allow for sensitivity runs on age-specific parameters. Given that age-specific information was available for blacknose sharks, the assessment scientists chose a state-space, age-structured production model as the base model to assess blacknose sharks and to determine their stock status as it allowed for the incorporation of age-specific biological and selectivity information. The age structured model estimated the fishing mortality rate of each age class by year, thus estimating the fishing mortality rate for animals of different sizes and those caught in different fisheries (based on their size). The age-structured model in the blacknose assessment was based on a frequentist approach to estimate stock status, which basically assumes fixed population parameter values over time. Blacknose sharks were determined to be overfished with overfishing in the age-structured model. However, blacknose sharks also approached overfishing with particular catch scenarios in the Bayesian surplus production models.

During scoping, NMFS also received comments specific to the model used to estimate blacknose bycatch in the shrimp trawl fishery. NMFS used a Bayesian model to estimate the level of blacknose shark bycatch occurring in the Gulf of Mexico and South Atlantic shrimp trawl fisheries (Nichols, 2007). This model used data from 1972 through 2005 to estimate blacknose shark bycatch in shrimp trawl fisheries. NMFS understands that other models may

have been developed since the 2007 blacknose stock assessment (*e.g.*, Gelman-Gazey model). However, NMFS considered all the publically available information at the time of the assessment when developing the methods in Nichols (2007). No independent, non-published models were presented to NMFS at the time of the blacknose shark assessment. However, NMFS will evaluate any such information in the future, including any necessary modifications to future shrimp trawl bycatch models.

NMFS received several comments critiquing the data used in the Bayesian model to estimate bycatch of blacknose sharks. Due to the low number of blacknose observations in both fishery dependent and independent sources, NMFS used both fishery dependent and independent data to estimate bycatch. During the Data Workshop for the assessment, the assessment scientists agreed upon the use of the Bayesian model to estimate blacknose bycatch in both the South Atlantic and Gulf of Mexico because the model had been extensively reviewed and used in other assessments to estimate bycatch (*i.e.*, SEDAR 7 for red snapper; Data Workshop Report, page 23; NMFS, 2007a). In the Bayesian model, NMFS used shrimp observer data from 1992-2006 and six different fisheries independent data series: the fall time series Fall Groundfish 1972-1986, First Fall 1987, Fall SEAMAP 1988-2006; and the summer time series Summer SEAMAP 1987-2006, Early SEAMAP 1982-1986, and Texas Closure 1981. Data from these different sources varied spatially and temporally and in how shrimp trawl fishing was conducted. For instance, the majority of the observer data came from 2002 and 2003 when turtle exclusion devices (TEDs) or bycatch reduction devices (BRDs) were required for the fishery. However, the fisheries independent trawls did not use TEDs or BRDs to maintain consistency in their data collection through time (*i.e.,* this data collection did not always focus on blacknose shark bycatch issues and began in 1972 before the implementation of TEDs or BRDs for the shrimp trawl fishery).

The Bayesian model accounted for the different data. In particular, the model accounted for the increase in blacknose shark bycatch in the SEAMAP surveys, which did not use TEDs or BRDs, and did not increase commercial shrimp trawl blacknose bycatch estimates based on SEAMAP surveys. In addition, the model calculated bycatch by year, depth, and area, but not by season. By accounting for bycatch rates in different depths and areas, the model was able to estimate bycatch rates in different shrimp fisheries, which are prosecuted at different depths and areas, depending on shrimp species. Some shrimp fisheries are also prosecuted during the day and some at night; however, the model did not explicitly incorporate time of day as a factor. However, fisheries that operate at different times of the day are also conducted at different depths, and the model accounted for depth, which was a significant factor in the model. Thus, the model indirectly accounted for differences in bycatch rates in day versus night shrimp trawl fisheries.

NMFS also received the comment that the extrapolated blacknose bycatch seemed to increase with the implementation of TEDs in the early 1990s. NMFS recognizes an increase in blacknose bycatch in the early 1990s, which coincided with the implementation of the shrimp trawl observer program. The shrimp observer program intensified in 1992 due to concerns about significant mortality of fish species important to both commercial and recreational fisheries. The increased observer coverage and attention to identifying bycatch to species may explain the rise in the number of blacknose estimated as bycatch in the shrimp fishery. Unfortunately, since the

observer program started around the time TEDs were implemented in the shrimp trawl fishery, it is not possible to compare observer data prior to the implementation of TEDs. However, TED use, itself, did not increase retention of blacknose sharks.

Overall, the number of blacknose shark observations was low in both the fishery independent and dependent datasets; however, the model was able to converge, and the participants at the Data Review Workshop agreed that the model provided satisfactory bycatch estimates (Data Workshop Report, pages 23; NMFS, 2007a; Nichols, 2007). As described in Nichols (2007), NMFS was not able to proportion out the number of blacknose sharks that were categorized as generic "sharks" in the shrimp trawl observer data. NMFS recognizes that the current blacknose shark bycatch estimates may be conservative and may underestimate current blacknose shark mortality in the shrimp trawl fishery; however, the Bayesian model used in the blacknose assessment was also used to estimate bycatch in other assessments (*i.e.*, SEDAR 7 for red snapper) and has been extensively reviewed. Thus, the modeling approached used by Nichols (2007) was determined to be the best available at the time of the assessment (Review Workshop Report, pages 14-15; NMFS, 2007a).

NMFS also received scoping comments that the SEAMAP surveys are not routinely conducted in the areas where the blacknose shark abundance is the highest. SEAMAP surveys are conducted more routinely in the western Gulf of Mexico region. Commenters stated that blacknose sharks are more abundant in the eastern Gulf of Mexico. However, NMFS is not aware of any research that was presented during the blacknose shark assessment that would give support to this comment. There were discussions during the Assessment Workshop concerning the stock size indices and whether or not the SEAMAP data covered a large enough proportion of the range of the species; however, the decisions to use the indices are discussed in the Data Workshop Report (NMFS, 2007a). In addition, if the SEAMAP surveys were not conducted in areas with highest blacknose shark abundance, then the bycatch estimates based on the SEAMAP data would underestimate the mortality experienced by blacknose sharks in Gulf of Mexico shrimp trawl fishery.

NMFS will continue to consider the comments received during scoping on the blacknose shark stock assessment and the Bayesian model used to estimate blacknose shark bycatch in shrimp trawls during the development of the DEIS and will include additional information in its analyses, as necessary and appropriate. In addition, NMFS has consulted with shrimp trawl industry representatives and has vetted their concerns with assessment scientists of the Southeast Fisheries Science Centers (SEFSC). NMFS will continue to work with constituents to address their concerns during future stock assessments. However, based on the recommendations from the peer reviewed blacknose shark stock assessment, NMFS has determined that the blacknose stock assessment and blacknose bycatch estimates in the shrimp trawl fishery represent the best available science at this time, and NMFS must develop management measures based on this latest assessment.

1.2 Purpose and Need for Action

Based on the results of the 2007 SCS stock assessment and the 2008 SCRS shortfin mako shark stock assessment, NMFS has determined that blacknose sharks are overfished with overfishing occurring, and shortfin mako sharks are experiencing overfishing. Thus, an

amendment to the 2006 Consolidated HMS FMP is needed to implement management measures to rebuild blacknose shark stocks and end overfishing of blacknose and shortfin mako sharks, consistent with the mandates of the Magnuson-Stevens Act. NMFS anticipates changes to the Atlantic SCS and pelagic shark management measures in this amendment. Since the majority of blacknose bycatch occurs in the shrimp trawl fishery, NMFS will also consider management recommendations in cooperation with the Gulf of Mexico and South Atlantic Fishery Management Councils. The purpose of this amendment is to enact management measures that will rebuild blacknose shark populations, and to end and/or prevent overfishing of blacknose and shortfin mako sharks. The changes to the SCS management structure will likely be implemented by the spring of 2010.

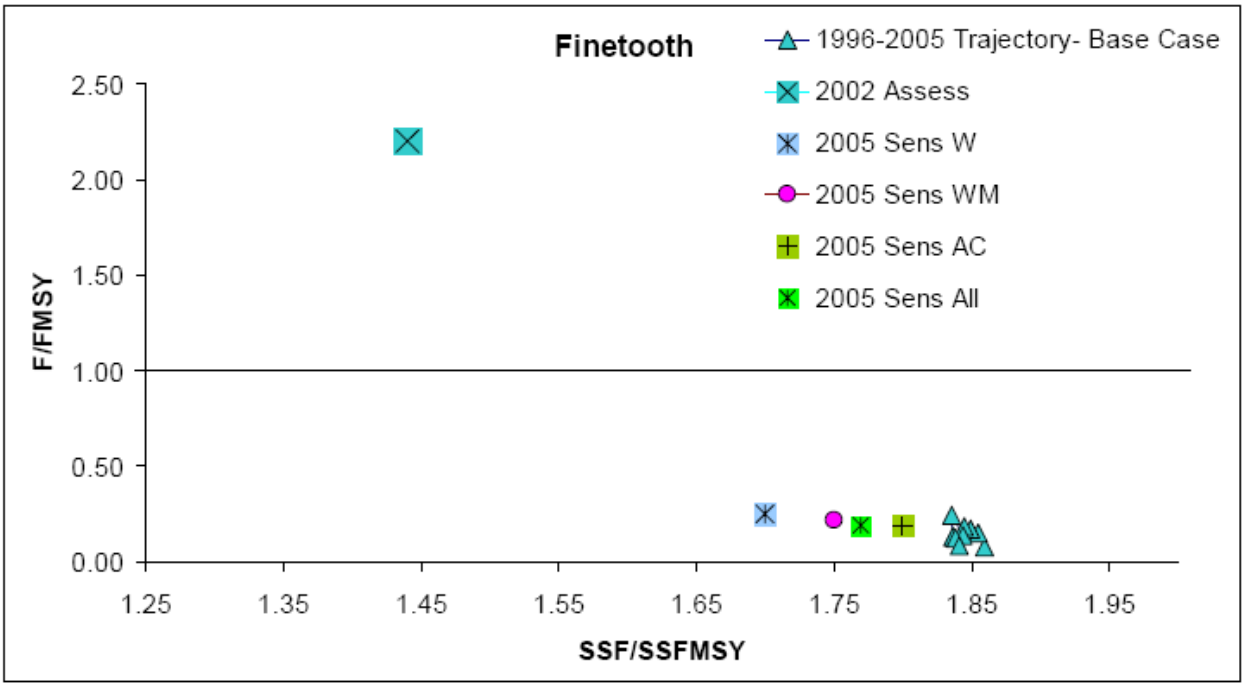

Figure 1.1 **Phase plot for finetooth sharks. Sens = sensitivity model. W = WinBUGS surplus production model. WM = inverse CV weighting. AC = Alternative catch starting in 1950. All = all CPUE series** (NMFS, 2007a)

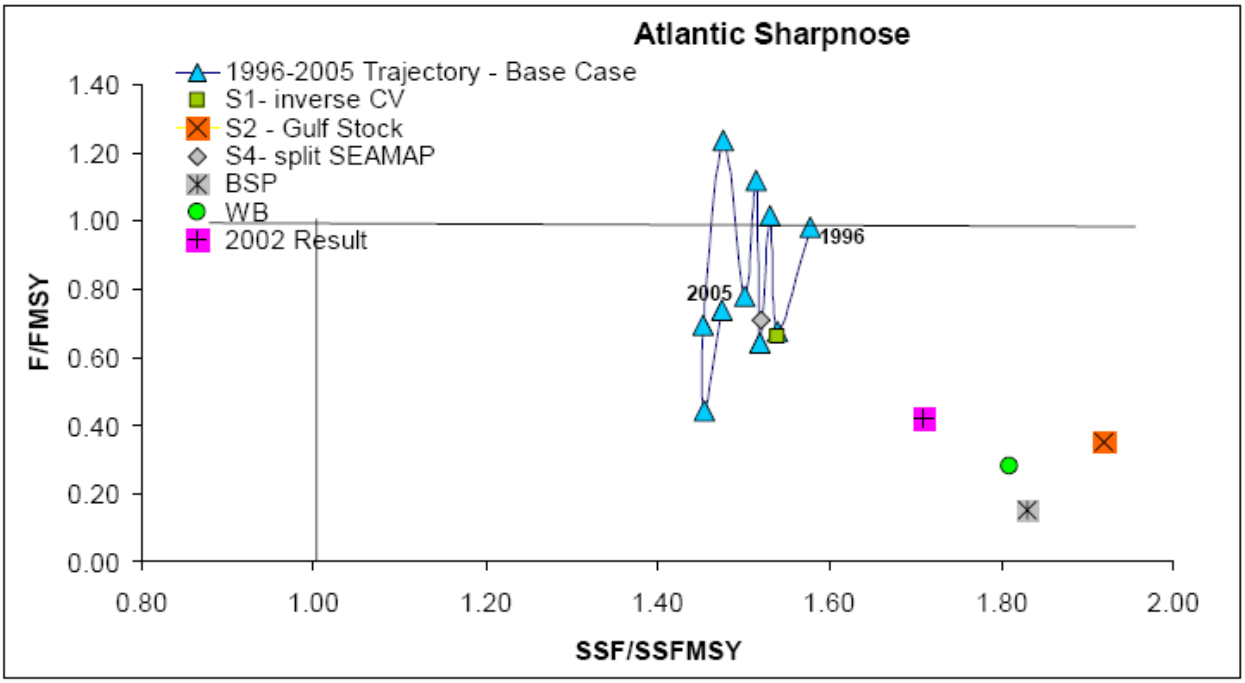

Figure 1.2 **Phase plot of Atlantic sharpnose sharks. S1, S2, and S4 were sensitivity model runs. S1 = same as the base model with the exception that indices were weighted by their inverse CV. S2 = assessments were run separately for a Gulf of Mexico and an Atlantic stock; only the Gulf of Mexico model converged. S4 = the fall SEAMAP index split; gave results that were very similar to the base model. BSP and WB are the results from the Bayesian Surplus Production and the WinBUGS surplus production model, respectively** (NMFS, 2007a).

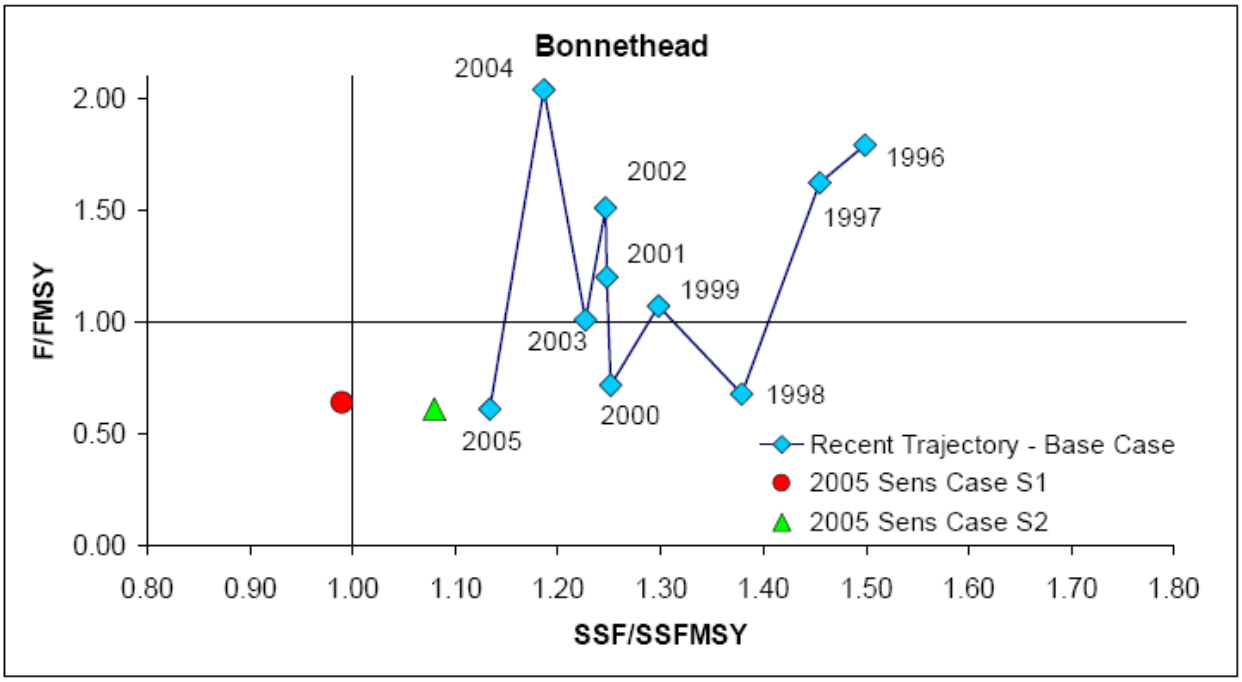

Figure 1.3 **Phase plot for bonnethead sharks. Sens = sensitivity runs. S1 = inverse CV weighting method. S2 = all indices are included** (NMFS, 2007a).

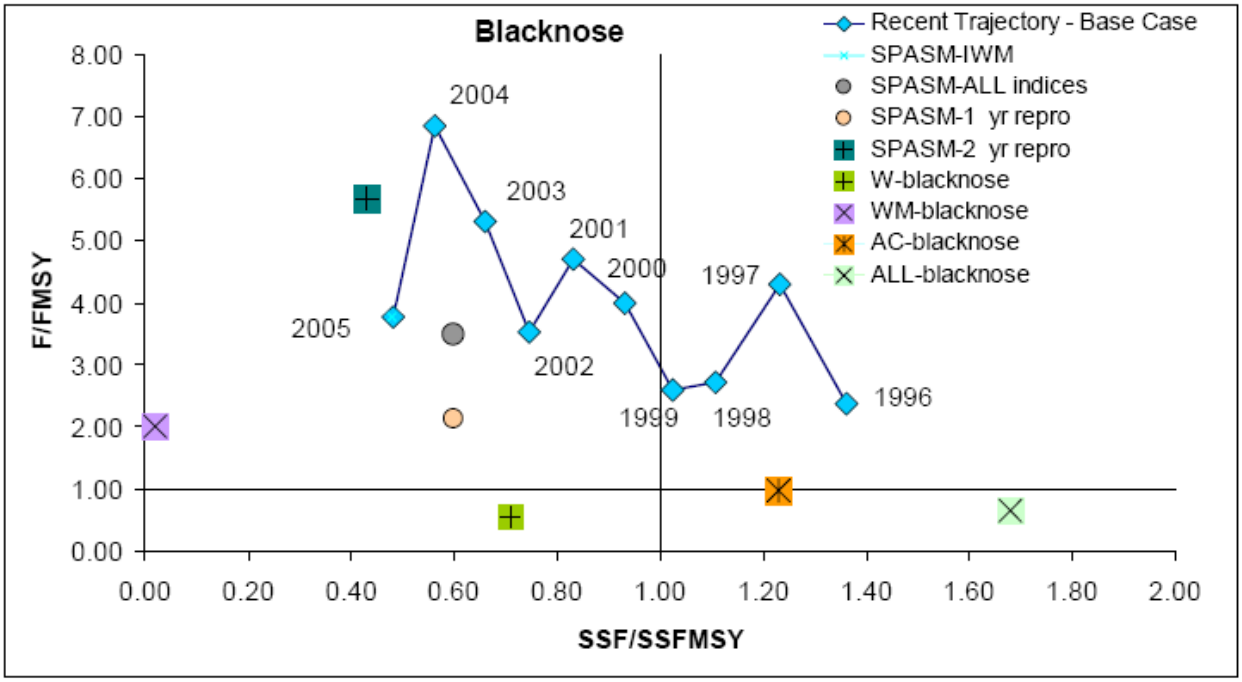

Figure 1.4 **Phase plot for blacknose sharks. SPASM = State-Space, Age-Structured Production Model. W = WinBUGS complementary surplus production model. WM = inverse CV weighting. AC = alternative catch starting in 1950. All = all CPUE series** (NMFS, 2007a).

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