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3.0 DESCRIPTION OF AFFECTED ENVIRONMENT

This Chapter serves several purposes. As part of an EIS, this Chapter describes the affected environment (the fisheries, the gears used, the communities involved, etc.). The description should provide a view on the current conditions and serves as a baseline against which to compare impacts of the alternatives. This Chapter also serves as the 2006 SAFE Report required under the guidelines for National Standard 2 of the Magnuson-Stevens Act (50 CFR 600.315(e)). The SAFE Report should provide a summary of information concerning the biological status of the stocks; the marine ecosystems in the fishery management unit; the social and economic condition of the fishing interests, fishing communities, and fish processing industries; and, the best available scientific information concerning the past, present, and possible future condition of the stocks, ecosystems, and fisheries.

3.1 Introduction to HMS Management and HMS Fisheries

Atlantic HMS fisheries are primarily managed directly by the Secretary of Commerce, who designated that responsibility to NMFS. The HMS Management Division within NMFS is the lead in developing regulations for HMS fisheries, although some actions (*e.g.*, Large Whale Take Reduction Plan) are taken by other NMFS offices outside of the HMS Management Division if the main legislation (*e.g.*, Marine Mammal Protection Act) driving the action are not the Magnuson-Stevens Act or ACTA. Because of their migratory nature, HMS fishery management necessitates management at the international, national, and state levels. 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 Federal 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 (see Sections 2.3.4 and 4.3.4 for a preferred alternative that would apply the permit condition to recreationally caught HMS). Additionally, in 2005, the Atlantic States Marine Fisheries Commission agreed to develop an interstate coastal shark FMP. Once complete, this interstate FMP would coordinate management measures among all states along the Atlantic coast (Florida to Maine). NMFS is participating in the development of this interstate FMP. A brief history of HMS management is provided in sections 3.1.1 and 3.1.2.

Generally, on the domestic level, NMFS implements international agreements, as appropriate, and management measures that are required under domestic laws such as the Magnuson-Stevens Act. While NMFS does not generally manage HMS fisheries in state waters, states are invited to send representatives to AP meetings and to participate in stock assessments, public hearings, or other fora. NMFS is working to improve its communication and coordination with state agencies. In the past year, NMFS has reviewed the shark regulations of several states and has asked for some states to consider changing their regulations to become more consistent with Federal regulations. As of May 2006, this request resulted in changes and dialogs with certain states regarding the regulations such as the Commonwealth of Virginia and the State of Florida. Additionally, as a result of ASMFC's decision to develop an interstate FMP, the State of Maine opened a dialog with the NMFS regarding shark regulations. See section 3.1.5 for more information regarding state regulations by state.

On the international level, NMFS participates in the stock assessments conducted by ICCAT's SCRS and in the annual ICCAT meetings. The stock assessments and management recommendations or resolutions are listed on ICCAT's website at http://www.iccat.es/. NMFS also actively participates in other international bodies that could affect U.S. fishermen and the fishing industry including CITES and FAO. A summary of 2005 ICCAT accomplishments is provided in section 3.1.4 below. NMFS expects ICCAT to assess a number of stocks in 2006 including marlin, bluefin tuna, and swordfish. More information on the current status of HMS and the dates of the next ICCAT stock assessments is provided in section 3.2.

3.1.1 History of Atlantic Tunas, Swordfish, and Shark Management

This section and section 3.1.2 give a relatively brief history of the management of HMS. This history is organized by the previous FMPs, with Atlantic tunas, swordfish, and sharks in one section and Atlantic billfish in the next section. For more detail regarding the history of management, please see the original documents. Proposed rule, final rules, and other official notices can be found in the Federal Register at http://www.gpoaccess.gov/fr/index.html. Supporting documents can be found on the HMS Management Division's webpage at http://www.nmfs.noaa.gov/sfa/hms. Documents can also be requested by calling the HMS Management Division at (301) 713-2347. Section 3.1.3 provides information on more recent actions.

3.1.1.1 Pre-1999 Atlantic Tunas Management

Unless otherwise specified, the following history is a combination of a variety of sources including ICCAT recommendations, the 1999 FMP for Atlantic Tuna, Swordfish, and Sharks, and a 1996 document on the historic rationale and effectiveness of the regulations for U.S. Atlantic BFT fisheries (NMFS, 1996).

Bigeye, albacore, yellowfin, and skipjack (BAYS) tunas, as well as bluefin tuna have been exploited in the western Atlantic for many years. In the early 1900s, a sport fishery developed for small and medium tunas off New York and New Jersey, and for giant bluefin tuna in the Gulf of Maine. The rod and reel fishery expanded rapidly during the 1950s and 1960s, as hundreds of private, charter, and partyboats targeted tunas along the Mid-Atlantic coast. This recreational fishery continues today from Cape Hatteras to the Canadian border. In addition, it is locally important in the Straits of Florida. Sport catches of BAYS, particularly yellowfin tuna, are also made in the Gulf of Mexico.

Until the late 1950s, the U.S. commercial fishery for tunas employed mostly harpoons, handlines, and traps. There was no commercial market for bluefin tuna, and giant bluefin tuna (greater than 310 pounds (lb)) were regarded as a nuisance because of the damage they caused to fishing gear. Much of the bluefin tuna catch was incidental to operations targeting other species. In 1958, commercial purse seining for Atlantic tunas began with a single vessel in Cape Cod Bay and expanded rapidly into the region between Cape Hatteras and Cape Cod during the early 1960s. The purse seine fishery between Cape Hatteras and Cape Cod was directed mainly at small and medium bluefin tuna, and at skipjack tuna, all for the canning industry. North of Cape Cod, purse seining was directed at giant bluefin tuna. A pelagic longline fishery for Atlantic tunas also developed rapidly during the 1960s, comprised mainly of Japanese vessels fishing in the Gulf of Mexico. Today U.S. pelagic longline vessels target bigeye and yellowfin tuna, and catch bluefin tuna incidentally.

The U.S. handgear fishery for Atlantic tunas is mainly a summer through early winter fishery. The recreational tuna fishery takes place mainly in the Mid-Atlantic region through the Gulf of Mexico (GOM). Private vessels targeting tuna for recreational purposes only are permitted in the Angling category, while the charter/headboats targeting tunas are permitted in the Charter/Headboat category. Many fishermen who might normally consider themselves "recreational" fishermen participate in the General category in northeast waters during the summer and fall and are classified as commercial fishermen. Recently, a commercial bluefin tuna fishery has developed off of some south Atlantic states, particularly the State of North Carolina, in the early winter. General category permit holders may sell tuna, and specifically bluefin tuna greater than 73 inches. A 1998 regulation prohibiting the retention of bluefin tuna less than 73 inches by fishermen in the General category clarified the distinction between the commercial and recreational fisheries. The commercial handgear fishery for bluefin tuna occurs mainly in New England, with vessels targeting fish using handline, rod and reel, and harpoon.

Bluefin Tuna

Peak yields of bluefin tuna from the western Atlantic (about 8,000 to 19,000 metric tons (mt) whole weight (ww)) occurred between 1963 and 1966 when much of the catch was taken by Asian longline vessels off Brazil. During the late 1960s and 1970s, annual yields averaged about 5,000 mt ww. High catches of juvenile bluefin tuna were sustained throughout the 1960s and into the early 1970s. During the 1960s and 1970s, a North American purse seine fishery for juveniles and the longline fishery, mostly Japanese vessels, usually took 70 to 80 percent of the yield and recreational fisheries usually took 10 percent. By 1973, the United States and other nations began to express concern about the decrease in the abundance of bluefin tuna. In response to this concern, in 1974, ICCAT recommended a minimum size limit of 6.4 kg (14 lb) and recommended that all countries limit fishing mortality to recent (at that time) levels for one year. As a result, the United States limited U.S. harvest by imposing quotas and size limits. In the late 1970s, approximately 10,000 giant bluefin tuna were taken in one year alone from the Gulf of Mexico.

After conducting a series of stock assessments, the ICCAT Standing Committee on Research and Statistics (SCRS) recommended in 1981 that catches of western Atlantic bluefin tuna be reduced to as near zero as possible to stop the decline of the stock and established a 800 mt ww total allowable catch (TAC). This recommendation also prohibited fishing effort in the western Atlantic from transferring to the eastern Atlantic (the stocks were split at 45^0 W longitude through 10^0 N latitude before moving to 25^0 W longitude at the equator). At the 1982 meeting, the TAC was increased to 2,660 mt ww, to be split proportionately between the relevant Contracting Parties. This level was maintained through 1991. Also at the 1982 meeting, ICCAT recommended that there be no directed fishery on bluefin tuna spawning stocks in the western Atlantic in spawning areas such as the Gulf of Mexico.

By the late 1980s, high ex-vessel prices and the increased importance of the Japanese market had blurred the distinction between the commercial and recreational fisheries for bluefin tuna and much of the traditionally recreational catch for medium and giant bluefin tuna was being sold for shipment to Japan. In 1992, NMFS responded by banning the sale of school, large school, and small medium bluefin tuna (27 inches to less than 73 inches curved fork length).

At the 1991 meeting, ICCAT recommended additional measures to prevent further declines in the western Atlantic bluefin tuna stock, including a ten percent reduction in the total allowable catch. In 1993, the western Atlantic bluefin tuna quota was reduced further from 2,394 mt ww to 1,995 mt ww in 1994 and 1,200 mt ww in 1995. At the 1991 meeting, the United States was allocated 693 mt ww per year for both 1993 and 1994. This 1991 recommendation also increased the minimum size to 30 kg (66 lb) or 115 cm (45 in) fork length with a tolerance level of eight percent. Fishermen who caught fish smaller than this size were encouraged to tag and release them.

In 1992, NMFS established base quotas for each permit category in the bluefin tuna fishery based upon the historical share of catch in each of these categories during the period 1983 to 1991. These quotas were used in 1992, 1993, and 1994, with overharvests and underharvests added and subtracted as required by ICCAT, as well as some inseason transfers. At the 1992 ICCAT meeting, ICCAT recommended that by September 1, 1993, all bluefin tuna imports into a Contracting Party be accompanied by an ICCAT Bluefin Tuna Statistical Document that included, among other things, the area that the fish was harvested in, the gear, and a validation by a government official of the flag state of the vessel that harvested the tuna.

The SCRS projections in 1994 indicated that the stock could support higher quota levels and still begin to rebuild, albeit more slowly. Based on the new stock assessment, ICCAT members adopted a recommendation to increase the annual bluefin tuna total allowable catch in the western Atlantic Ocean from 1,995 to 2,200 mt ww. The share allocated to the United States was set at 1,311 mt ww. This allocation reflected trends in fleet size, effort and landings by category, as well as the ICCAT recommendation which specifies that data should be collected for the broadest range of size-classes possible, given size restrictions. At the 1996 meeting, ICCAT recommended an annual western Atlantic bluefin tuna TAC of 2,354 mt ww for 1997 and 1998. The annual quota allocated to the United States for 1997 and 1998 was 1,344 mt ww.

In 1998, the Commission adopted a 20-year Rebuilding Program for the western Atlantic bluefin management area (ICCAT Ref. 98-07) aimed at rebuilding to the stock size that will produce Maximum Sustainable Yield (MSY) by 2018 with a 50 percent or greater probability. The Program states that the TAC for the west would only be adjusted from the 2,500 mt ww level adopted for 2003 – 2004 if SCRS advises that (a) a catch of 2,700 mt ww or more has a 50 percent or greater probability of rebuilding or (b) a catch of 2,300 t or less is necessary to have a 50 percent or greater probability of rebuilding. According to the Program, the MSY rebuilding target can be adjusted according to advice from SCRS. In 2002, the Commission set the annual TAC, inclusive of dead discards, for the western Atlantic management area to 2,700 mt ww, effective beginning in 2003 (ICCAT Ref. 02-07). The current U.S. share of this TAC equals 1,496 mt ww inclusive of 25 mt ww for pelagic longline incidental catch in the Northeast Distant Statistical Reporting area and an allowance for dead discards of an additional 68 mt ww. If there are dead discards in excess of this allowance, they must be counted against the following year's quota. If there are fewer dead discards, then half of the underharvest may be added to the following year's quota while the other half is conserved. The recommendation also allowed four years to balance the eight percent tolerance for bluefin tuna under 115 cm (young school and school bluefin tuna).

Bigeye Tuna

ICCAT adopted a minimum size of 3.2 kg (7 lb) with a 15 percent tolerance level for undersized bigeye tuna in 1979. In 1995, noting the large increases in longline and purse seine catches of bigeye tuna and the large number of undersized fish, ICCAT urged countries to reduce catches below MSY and reduce catches of undersized fish. ICCAT also asked countries that had equatorial fisheries catching undersized fish to place observers on the vessels and allow SCRS to study the data. In 1997, ICCAT issued two resolutions to limit the catch of larger vessels in the Atlantic and the catch of countries that caught more than an average of 200 mt ww between 1992 and 1996 and to collect information on the larger vessels in the fleet (those greater than 80 GRT).

Large numbers of undersized fish are still harvested by the surface fleets operating near the equator. SCRS estimates that approximately 70 percent by number of bigeye tuna landed are smaller than the minimum size, well in excess of the 15 percent tolerance. Total Atlantic bigeye tuna catch has increased substantially since 1990. ICCAT has not recommended Atlantic-wide quotas for bigeye tuna. However, in 1998, ICCAT adopted two new management recommendations that are designed to limit effort in commercial fisheries for bigeye tuna throughout the Atlantic. ICCAT also adopted a resolution in 1998 that tasks SCRS with developing stock rebuilding scenarios for bigeye.

Purse seine fleets in the east Atlantic have developed a fishery that targets schools of tuna near artificial floating objects, also known as fish aggregating devices (FADs). This method of fishing has increased harvesting efficiency and contributed to excessive catch of undersized bigeye tuna. Favorable oceanographic conditions as well as the extensive use of sonar and deeper nets have also contributed to increased bigeye tuna harvest in recent years. In 1998, ICCAT established a mandatory time/area closure for purse seiners using fish aggregating devices in equatorial waters.

Albacore Tuna

Although albacore tuna harvests in the north Atlantic have declined since 1970, catch and effort in newer surface fisheries have increased since 1987. In 1997, SCRS determined that North Atlantic albacore tuna was at or near a level of full exploitation. In 1998, ICCAT adopted a recommendation to limit fishing capacity to the number of vessels in the directed albacore tuna fishery during the years of 1993 to 1995 and for countries to submit a list of vessels fishing for northern albacore. In 2003, ICCAT recommended a TAC of 34,500 mt ww for 2004, 2005, and 2006, of which the United States is allocated 607 mt ww per year.

ICCAT began managing southern Albacore when, in 1994, the SCRS found that catches of southern Albacore exceeded MSY. At this time, ICCAT recommended that countries limit the catch to 90 percent of previous levels. In 1996, ICCAT recommended a 22,000 mt ww quota for all countries fishing below 5º N latitude with the goal of achieving MSY by 2005. In 1998, this TAC was increased to 28,200 mt ww. In 2003, SCRS determined that southern albacore is not overexploited at current fishing levels. Thus, SCRS recommended that the TAC be 29,200 mt ww.

Yellowfin Tuna

Since the early 1970s, ICCAT has expressed concern over the high proportion of juvenile yellowfin tuna that are landed. In 1972, ICCAT passed a recommendation that prohibited the landing of yellowfin tuna less than 3.2 kg (7 lb). This recommendation also included an allowed 15 percent tolerance level on this minimum size. In 1995, an estimated 50 percent by number of yellowfin tuna landed were less than the minimum size. As in the bigeye tuna fisheries, these high catches of juveniles are largely a result of the use of FADs.

Atlantic yellowfin tuna landings reached a record high in 1990, primarily due to increased landings in the east Atlantic. Since 1990, catches across the Atlantic have declined somewhat and then remained stable. In 1993, ICCAT recommended that there be no increase in the level of effective fishing effort over 1992 levels.

Skipjack Tuna

The stock structure of Atlantic skipjack tuna is uncertain; separate management units are maintained in the eastern and western Atlantic. Skipjack tuna fisheries have changed significantly since 1991, with the introduction of fishing on floating objects and the expansion of the purse seine fishery towards the western Atlantic and closer to the equator. SCRS has noted that additional research on skipjack tuna is needed. At this time, there are no ICCAT recommendations or resolutions specific to skipjack tunas.

All Tunas

In April 1999, NMFS published the Final Fishery Management Plan for Atlantic Tunas, Swordfish, and Sharks (1999 FMP). This was the first FMP for Atlantic tunas. Some of the specific tuna management measures included:

- Prohibition of pelagic driftnets for tunas;
- Implementation of the BFT ICCAT Rebuilding Program;
- Establishment of category-specific percent BFT quota allocations;
- Implementation of a Cap on the Purse Seine category of 250 mt ww for BFT (later rescinded);
- Time/area closure in Mid-Atlantic to reduce bluefin tuna dead discards;
- Establishment of the foundation for developing an international 10-year rebuilding program for bigeye tuna;
- Establishment of a recreational retention limit of three yellowfin tuna per person per day; and
- Establishment a fishing year of June 1 to the following May 31.

3.1.1.2 Pre-1999 Atlantic Swordfish Fishery and Management

Unless otherwise specified, the following paragraphs regarding the early history of the swordfish fishery summarize information found in the Source Document to the 1985 Atlantic Swordfish Fishery Management Plan (SAFMC, 1985a). The summary of more recent history is a combination of information from the 1999 Fishery Management Plan for Atlantic Tunas, Swordfish, and Sharks and various ICCAT recommendations.

The recreational fishery for swordfish has existed since the 1920s when the fish were taken mainly by handline trailing a baited hook or occasionally by rod and reel or harpoon. This early fishery was located from Massachusetts to New York and, because it relied on locating the fish and enticing it to strike, occurred mainly during the day. Occasionally, an angler fishing for billfish in the Mid-Atlantic Bight would catch a swordfish.

In the 1970s, a recreational rod and reel fishery developed in Florida. This fishery borrowed techniques from longline fishermen and drifted the bait below the surface at night. Prior to the development of this fishery, fewer than 2,000 swordfish were estimated caught by all recreational fishermen over time in aggregate. In 1976, approximately 25 – 30 swordfish were taken off of Florida by rod and reel. By 1977, approximately 400 to 500 swordfish were taken. In 1978, swordfish tournaments were held in Florida, South Carolina, and New Jersey (the first ones ever for South Carolina and New Jersey) using this new technique. Due to a loss of interest by anglers and a relatively poor fishing year in 1979, there was a decrease in recreational effort in the early 1980s. In 1981 and 1982, only 86 and 53 swordfish were reported captured.

The commercial fishery began as a harpoon fishery between New York and Canada. In the 1960s, longline gear was introduced. This new gear expanded the range of the fishery down to the Gulf of Mexico and dramatically increased the amount of fish caught from approximately 2,800 mt ww in 1960 to 8,800 mt ww in 1963. Landings stabilized in the 1970s at around 5,000 mt ww.

In 1971, the U.S. Food and Drug Administration prohibited the sale of swordfish with more than 0.5 parts per million (ppm) tissue mercury content, leading to decreased landings of swordfish worldwide. In 1978, the permissible level of mercury was raised to 1.0 ppm, which rejuvenated the commercial fishery and landings increased as a result.

In the early years, there were essentially four primary components to the commercial swordfish fleet. There were approximately 25 vessels that used harpoons and spotter aircraft to catch swordfish in northern waters during the summer months. These vessels also participated in other fisheries because of the seasonal nature of the fishery. A mobile New England pelagic longline vessel component was comprised of vessels greater than 50 feet in length, and fished the Florida Straits primarily in winter and spring. Florida longline vessels, approximately 35 – 50 feet in length, fished mainly between Miami and Cape Canaveral and on the west coast of Florida. There were also Cuban-American vessels, usually between 25 to 40 feet in length, which fished between Key West and Miami. The harpoon fishery usually took female swordfish greater than 200 lb. The longline fleet usually took a mixture of male and female fish weighing between 10 and 300 lb.

By the early 1980s, the early styles of longline gear had been replaced by monofilament style gear. Additionally, the components of the fishery had changed. The larger New England vessels were still highly mobile and were now fishing from the Gulf of Mexico to the Florida Keys. The smaller Florida vessels became more mobile and began expanding into the Carolinas and the Mid-Atlantic area. Smaller vessels began to operate up and down the coast and even ventured into the edge of the Grand Banks. Many of these fishermen were either part-time swordfish fishermen who supplemented their income with charterboat fishing or full-time commercial fishermen who also fished for snappers, groupers, tilefish, and tunas.

From the late 1970s until the Atlantic swordfish FMP was approved in 1985, Federal management of swordfish was accomplished through the Preliminary Fishery Management Plan for Atlantic Billfishes and Sharks. This Preliminary FMP (43 FR 3818, January 27, 1978) was prepared by the Department of Commerce and established a number of requirements for foreign vessels fishing within the Atlantic fishery conservation zone (see section 1.1.2 for additional detail on the Preliminary FMP). Starting in June 1984, all vessels intending to catch swordfish by methods other than rod and reel were required to obtain a permit from NMFS Southeast Regional Office. By January 1985, 340 permit applications had been received (SAFMC, 1985b).

The Atlantic Swordfish FMP (February 1985) was prepared by the South Atlantic Fishery Management Council (SAFMC) in cooperation with the Caribbean Fishery Management Council (CFMC), the Gulf of Mexico Fishery Management Council (GMFMC), the Mid-Atlantic Fishery Management Council (MAFMC), and the New England Fishery Management Council (NEFMC). The final rule implementing the FMP published on August 22, 1985 (50 FR 33952; correction notice 50 FR 35563, September 3, 1985). This plan separated the swordfish fishery from the billfish fishery because, by this time, virtually all swordfish were taken commercially with longline or harpoon gear, while the majority of billfish were taken recreationally with rod and reel. However, it should be noted that there was a rapidly expanding market for marlin with increasing commercial landings from the late 1970s until the implementation of the Atlantic Billfish Fishery Management Plan in 1988. In the mid-1980s, Atlantic swordfish were considered to be in or near a state of growth overfishing.[1] The plan specified the following five management objectives (SAFMC, 1985b):

1. Maintain high landings in the form of the larger fish that are preferred in the market by controlling (reducing) the harvest of smaller swordfish.
2. Prevent or reduce growth overfishing to create a buffer against possible recruitment overfishing. This was to be done by maintaining a sufficient number of larger fish by controlling the harvest of smaller fish.
3. Obtain scientific information to continually monitor and refine the management of the swordfish fishery by an onboard technician program on a sample number of commercial boats.
4. Monitor and mitigate user group conflicts using the onboard technician program.

[1] Growth overfishing occurs when excessive numbers of small fish are harvested from a stock, thereby preventing growth to the size at which the maximum yield-per-recruit would be obtained from the stock.

5. Minimize the impacts of foreign fishing on the domestic U.S. swordfish fishery by minimizing the swordfish bycatch of foreign longliners and squid trawls consistent with the requirement to allow opportunities to harvest tuna or catch squid under a Governing International Fisheries Agreement.

Some of the management measures implemented in the Swordfish FMP were: variable season closures to control landings of small swordfish; requiring all commercially-caught swordfish to be landed whole or as carcasses; gear restrictions for closed areas; restrictions to foreign fishing for tuna longliners and squid trawlers; commercial permit requirement; observer or technician requirements; and reporting requirements for vessels in Puerto Rico or the U.S. Virgin Islands. In September 1986, NMFS published a notice stating that the variable season closures would not be implemented (51 FR 31151, September 2, 1986). In August 1990, a final rule published requiring mandatory dealer reporting (55 FR 35643, August 31, 1990).

In November 1990, ICCAT adopted its first Atlantic swordfish recommendation. This recommendation required members to reduce fishing mortality on fish weighing more than 25 kg (55 lb) by 15 percent from 1988 fishing levels and to prohibit the landing of swordfish less than 25 kg with a 15 percent tolerance level. NMFS implemented this recommendation with an emergency rule (56 FR 26934, June 12, 1991) and later a final rule (56 FR 65007; December 13, 1991).

At its 1994 meeting, ICCAT established specific TAC levels for nations fishing for both North and South Atlantic swordfish stocks (the United States was allocated 3,970 mt ww and 3,500 mt ww for 1995 and 1996, respectively). At the 1995 meeting, ICCAT adopted recommendations that allowed nations to maintain the existing minimum size for swordfish with a 15 percent tolerance of smaller fish or alternatively to abide by a smaller minimum size (119 cm or equivalent weight) with no tolerance. ICCAT also adjusted the percentages each country received of the total allowable catch levels for North Atlantic swordfish, and established measures to account for over- and underharvests. Under the 1995 recommendation, the United States receives 29 percent of the available total allowable quota. From 1995 to 1999, NMFS modified the existing U.S. quotas for Atlantic swordfish based on these recommendations and a 1996 recommendation that established the TAC at 11,300, 11,000, and 10,700 mt ww in 1997, 1998, and 1999, respectively (the United States' allocation was 3,277, 3,190, and 3,103 mt ww in 1997, 1998, and 1999, respectively).

In 1999, NMFS implemented a number of regulations that affected swordfish fishermen, including a prohibition on the use of driftnets in the swordfish fishery, and regulations to aid in tracking swordfish trade including dealer permitting and reporting for all swordfish importers, a documentation scheme that indicated the country of origin and flag of the vessel, and a prohibition on importing swordfish less than the minimum size. These regulations were codified in the first quarter of 1999. In April 1999, NMFS published the 1999 FMP. This FMP replaced the 1985 Swordfish FMP that had been drafted by the Fishery Management Councils. The 1999 FMP maintained a number of the management measures from the previous FMP including reporting requirements, annual quotas, authorized gear, and the minimum size. However, the 1999 FMP also called for the United States to negotiate an international rebuilding plan, required that recreational landings be counted against the U.S. portion of the ICCAT-established TAC, and implemented a limited access program for commercial vessel permits.

In November 1999, ICCAT established a 10-year rebuilding program for Atlantic swordfish. This rebuilding program reduced the North Atlantic TAC (10,600, 10,500, and 10,400 mt ww for the years 2000, 2001 and 2002, respectively; 2951 mt ww for the United States in all years), established a dead discard allowance (400 , 300, and 200 mt ww in 2000, 2001, and 2002, respectively; 80 percent to the United States; phased out by 2004; the TAC minus the allowance for dead discards is the amount that could be retained) , restated the need for data reporting, and maintained the existing minimum size limits. In 2002, noting the improvement on the stock, ICCAT increased the overall TAC slightly while simultaneously reemphasizing the need to protect juvenile swordfish.

3.1.1.3 Pre-1999 Atlantic Shark Fisheries and Management

Unless otherwise specified, the main sources of the following history are the 1993 Atlantic Shark Fishery Management Plan and the 1999 FMP for Atlantic Tunas, Swordfish, and Sharks.

Recreational fishing for Atlantic sharks occurs in Federal and state waters from New England to the Gulf of Mexico and Caribbean Sea. In the past, sharks were often called "the poor man's marlin." 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 salt water, with even large specimens available in the nearshore area to surf anglers or small boaters. Most recreational shark fishing takes place from small to medium-size vessels. 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 some shore-based fishermen active in the Florida Keys.

The commercial shark fishery has been sporadic in nature. 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 this time, shark fishing gear included gillnets, hook and line, anchored bottom longlines, 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).

A small fishery for porbeagle existed in the early 1960s off the U.S. Atlantic coast involving Norwegian fishermen. Between the World Wars, Norwegians and Danes had pioneered fishing for porbeagles in the North Sea and in the region of the Shetland, Orkney, and the Faroe Islands. In the late 1940s, these fishermen caught from 1,360 to 2,720 mt yearly, with lesser amounts in the early 1950s (Rae, 1962). The subsequent scarcity of porbeagles in their fishing area forced the Norwegians to explore other grounds, and around 1960, they began fishing the Newfoundland Banks and the waters east of New York. Between 1961 and 1964, their catch increased from 1,800 to 9,300 mt, then declined to 200 mt (Casey *et al*., 1978).

The U.S. Atlantic shark fishery developed rapidly in the late 1970s due to increased demand for their 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 some directed fishery effort expanded as well. 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. As catches accelerated through the 1980s, shark stocks suffered a precipitous decline. Peak commercial landings of large coastal and pelagic sharks were 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. The management measures in the 1993 FMP included:

- Establishing a fishery management unit (FMU) consisting of 39 frequently caught species of Atlantic sharks, separated into three groups for assessment and regulatory purposes (Large Coastal Sharks (LCS), Small Coastal Sharks (SCS), and pelagic sharks);
- Establishing calendar year commercial quotas for the LCS and pelagic sharks and dividing the annual quota into two equal half-year quotas that apply to the following two fishing periods – January 1 through June 30 and July 1 through December 31;
- Establishing a recreational trip limit of four sharks per vessel for LCS or pelagic shark species groups and a daily bag limit of five sharks per person for sharks in the SCS species group;
- Requiring that all sharks not taken as part of a commercial or recreational fishery be released uninjured;
- Establishing a framework procedure for adjusting commercial quotas, recreational bag limits, species size limits, management unit, fishing year, species groups, estimates of maximum sustainable yield, and permitting and reporting requirements;
- Prohibiting finning by requiring that the ratio between wet fins/dressed carcass weight not exceed five percent;
- Prohibiting the sale by recreational fishermen of sharks or shark products caught in the Economic Exclusive Zone (EEZ);

- Requiring annual commercial permits for fishermen who harvest and sell shark (meat products and fins);
- Establishing a permit eligibility requirement that the owner or operator (including charter vessel and headboat owners/operators who intend to sell their catch) must show proof that at least 50 percent of earned income has been derived from the sale of the fish or fish products or charter vessel and headboat operations or at least $20,000 from the sale of fish during one of three years preceding the permit request;
- Requiring trip reports by permitted fishermen and persons conducting shark tournaments and requiring fishermen to provide information to NMFS under the Trip Interview Program; and,
- Requiring NMFS observers on selected shark fishing vessels to document mortality of marine mammals and endangered species.

At that time, NMFS identified LCS as overfished and pelagic and SCS as fully fished. The quotas were 2,436 mt dressed weight (dw) for LCS and 580 mt dw for pelagic sharks. No quota was established for SCS. Under the rebuilding plan established in the 1993 FMP, the LCS quota was expected to increase every year up to the maximum sustainable yield estimated in the 1992 stock assessment, which was 3,787 mt dw.

A number of difficulties arose in the initial year of implementation of the 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. 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 to implement additional measures authorized by the FMP published on October 18, 1994 (59 FR 52453), which:

- Clarified operation of vessels with a Federal commercial permit;
- Established the fishing year;
- Consolidated the regulations for drift gillnets;
- Required dealers to obtain a permit to purchase sharks;
- Required dealer reports;
- Established recreational bag limits;
- Established quotas for commercial landings; and
- Provided for commercial fishery closures when quotas were reached.

In 1994, under the rebuilding plan implemented in the 1993 Shark FMP, the LCS quota was increased to 2,570 mt dw. Additionally, a new stock assessment was completed in March 1994 that indicated rebuilding LCS 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 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 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. 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 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 1999, a court enjoined implementation of the 1999 regulations, as they related to the ongoing litigation on the 1997 quotas. Further history of this litigation and shark management is provided under Section 3.1.1.7 below. A year later, on June 12, 2000, 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).

3.1.1.4 1999 Fishery Management Plan for Atlantic Tunas, Swordfish, & Sharks

As described, the 1999 FMP replaced the existing Atlantic Shark and Atlantic Swordfish FMPs, and established the first FMP for Atlantic tunas. Before the 1999 FMP, Atlantic tunas were managed only under the ATCA; after the 1999 FMP, Atlantic tunas were managed under both the Magnuson-Stevens Act and ATCA.

NMFS began working on the 1999 FMP shortly after the U.S. Congress reauthorized the Magnuson-Stevens Act in 1996. The 1996 Magnuson-Stevens Act amendments added new fishery management requirements including requiring NMFS to halt overfishing; rebuild overfished fisheries; minimize bycatch and bycatch mortality, to the extent practicable; and identify and protect essential fish habitat (EFH). These provisions were coupled with the recognition that the management of HMS requires international cooperation and that rebuilding programs must reflect traditional participation in the fisheries by U.S. fishermen, relative to foreign fleets.

Development of the 1999 HMS FMP began in September 1997 with the formation of the HMS Advisory Panel (AP). The HMS AP was established under a requirement of the Magnuson-Stevens Act, and is composed of representatives of the commercial and recreational fishing communities, conservation and academic organizations, the five regional fishery management councils involved in Atlantic HMS management, the Atlantic and Gulf coastal states, and the U.S. ICCAT Advisory Committee. The HMS AP met seven times during development of the 1999 FMP, including once during the public comment period on the draft FMP, and provided extensive comment and advice to NMFS.

In October 1997, NMFS prepared and distributed a scoping document to serve as the starting point for consideration of issues for the 1999 FMP. The scoping document described major issues in the fishery, legal requirements for management, and potential management measures that could be considered for adoption in the FMP and solicited public comment on these issues. The scoping document was the subject of 21 public hearings that were held in October and November 1997 throughout the management area. The scoping meetings allowed NMFS to gather information from participants in the fisheries, and provided a mechanism by which the public could provide input to NMFS early in the FMP development process.

In October 1998, NMFS announced in the Federal Register the availability of the draft FMP. The comment period on the draft FMP lasted from October 25, 1998, to March 12, 1999. The proposed rule that accompanied the draft FMP was published in the Federal Register on January 20, 1999. The supplemental part that related to the bluefin tuna rebuilding program published in the Federal Register on February 25, 1999. The comment period on the proposed rule and its supplement also went until March 12, 1999. Subsequent to the release of the proposed rule, NMFS held 27 public hearings in communities from Texas to Maine and the Caribbean. During the comment period, NMFS received several thousand comments from commercial and recreational fishermen, scientists, conservationists, and concerned individuals. An HMS AP meeting was held toward the end of the comment period to allow HMS AP members to view most of the comments NMFS had received on the draft FMP and accompanying proposed rule.

The 1999 FMP incorporated all existing management measures for Atlantic tuna and north Atlantic swordfish that have been issued previously under the authority of the ATCA. It also incorporated all existing management measures for north Atlantic swordfish and Atlantic sharks that had previously been issued under the authority of the Magnuson-Stevens Act. Southern Atlantic swordfish and southern Atlantic albacore tuna continue to be managed only under ATCA. In November 2004, ICCAT adopted its first recommendation for Atlantic sharks.

Some of the non-species specific management measures of the 1999 FMP included vessel monitoring systems for all pelagic longline vessels; gear and vessel marking requirements; moving pelagic longline 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 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. Before then, each species had its own part. This often led to confusion and, in some cases, conflicting regulations.

3.1.1.5 Post 1999 FMP

After issuance of the 1999 FMP, a number of constituents (environmental, commercial fishermen, and recreational fishermen) sued the NMFS (the Agency) over aspects of the plan, including the BFT rebuilding program, the use of vessel monitoring systems in the pelagic longline fleet, the time/area closure for the pelagic longline fleet, the pelagic shark quotas, the shark and yellowfin tuna recreational retention limits, the large and small coastal shark quotas, and the bluefin tuna purse seine allocation. The Agency received favorable court rulings, upholding its actions, in most of these cases, and resolved some matters via settlement agreements. All of the briefings and court orders are a matter of the public record.

3.1.1.6 Regulatory Amendments Relating to the Pelagic Longline Fishery

In the 1999 FMP, NMFS committed to implement a closed area that would effectively protect small swordfish. NMFS began to work towards this goal shortly after the publication of the 1999 FMP. After the publication of the 1999 FMP, NMFS was sued by environmentalists who felt, among other things, that the Agency had not done enough to reduce bycatch in HMS fisheries. As a result, NMFS expanded the goal of the rule to reduce all bycatch and bycatch mortality, to the extent practicable, in the HMS pelagic longline fishery. The following objectives were developed to guide agency action for this goal:

- Maximize the reduction in finfish bycatch;
- Minimize the reduction in the target catch of swordfish and other species;
- Consider impacts on the incidental catch of other species to minimize or reduce incidental catch levels; and
- Optimize survival of bycatch and incidental catch species.

NMFS published the final rule implementing the first regulatory amendment to the 1999 FMP on August 1, 2000 (65 FR 47214), which closed three large areas (DeSoto Canyon, Florida East Coast, and Charleston Bump) and prohibited the use of live bait in the Gulf of Mexico

During the course of this rulemaking, the pelagic longline fleet exceeded the incidental take statement for sea turtles established during the Endangered Species Act (ESA) Section 7 Consultation for the 1999 FMP. That, combined with new information on sea turtles and the uncertainty regarding what the closures would mean for sea turtles, resulted in a new Biological Opinion (BiOp) (June 30, 2000) that concluded that the continuation of the pelagic longline fishery would jeopardize the continued existence of leatherback and loggerhead sea turtles. As a result of the jeopardy finding, NMFS needed to implement certain measures to reduce sea turtle bycatch in the pelagic longline fishery.

Shortly after this conclusion, NMFS decided that further analyses of observer data and additional population modeling of loggerhead sea turtles were needed to determine more precisely the impact of the pelagic longline fishery on turtles. Because of this, NMFS reinitiated consultation on the HMS fisheries on September 7, 2000. In the interim, NMFS implemented emergency regulations, based on historical data on sea turtle interactions, to reduce the short-term effects of the pelagic longline fishery on sea turtles. An emergency rule that closed a portion of the Northeast Distant Statistical Area (NED) and required dipnets and line clippers to be carried and used on pelagic longline vessels to aid in the release of any captured sea turtle published on October 13, 2000 (65 FR 60889).

NMFS issued a BiOp on June 8, 2001 (revised on June 14, 2001), that again concluded that the continued operation of the Atlantic pelagic longline fishery is likely to jeopardize the continued existence of loggerhead and leatherback sea turtles. Accordingly, the BiOp provided a reasonable and prudent alternative (RPA) to avoid jeopardy. This BiOp concluded no jeopardy for other HMS fisheries, but did require additional management measures to reduce sea turtle takes in these fisheries. The RPA included the following elements: closing the NED area effective July 15, 2001, and conducting a research experiment in this area to reduce sea turtle bycatch and bycatch mortality in the PLL fishery; requiring gangions to be placed no closer than twice the average gangion length from the suspending floatlines effective August 1, 2001; requiring gangion lengths to be 110 percent of the length of the floatline in sets of 100 meters or less in depth effective August 1, 2001; and, requiring the use of corrodible hooks effective August 1, 2001. Also, the BiOp included a term and condition for the incidental take statement that required NMFS to issue a regulation requiring that all vessels permitted for HMS fisheries, commercial and recreational, post the sea turtle guidelines for safe handling and release following longline interactions inside the wheelhouse by September 15, 2001. The requirement that all vessels permitted for HMS fisheries post sea turtle handling and release guidelines was modified to specify only bottom and pelagic longline vessels by an August 31, 2001, memorandum from the Office of Protected Resources.

On July 13, 2001, NMFS published an emergency rule (66 FR 36711) to implement several of the BiOp requirements. NMFS published an amendment to the emergency rule to incorporate the change in requirement for the handling and release guidelines that was published in the Federal Register on September 24, 2001 (66 FR 48812).

On July 9, 2002, NMFS published the final rule (67 FR 45393) implementing measures required under the June 14, 2001, BiOp on Atlantic HMS to reduce the incidental catch and post-release mortality of sea turtles and other protected species in HMS Fisheries, with the exception of the gangion placement measure. The rule implemented the NED closure, required the length of any gangion to be 10 percent longer than the length of any floatline if the total length of any gangion plus the total length of any floatline is less than 100 meters, and prohibited vessels from having hooks on board other than corrodible, non-stainless steel hooks. In the HMS shark gillnet fishery, both the observer and vessel operator must look for whales, the vessel operator must contact NMFS if a listed whale is taken and shark gillnet fishermen must conduct net checks every 0.5 to 2 hours to look for and remove any sea turtles or marine mammals from their gear. The final rule also required all HMS bottom and pelagic longline vessels to post sea turtle handling and release guidelines in the wheelhouse. NMFS did not implement the gangion placement requirement because it appeared to result in an unchanged number of interactions with loggerhead sea turtles and an apparent increase in interactions with leatherback sea turtles.

In 2001, 2002, and 2003, NMFS in conjunction with the fishing industry conducted an experiment in the NED to see if certain gear restrictions or requirements could reduce sea turtle captures and mortality. The results of this experiment indicated that certain gear types could reduce sea turtle interactions and mortality and that certain methods of handling and releasing turtles could further reduce mortality. For example, using 16/0 non-offset or 18/0 offset hooks of at least 10 degrees could reduce leatherback and loggerhead sea turtle interactions by approximately 50 and 0 percent, respectively. Using 18/0 hooks flat or offset up to 10 degrees could reduce leatherback and loggerhead sea turtle interactions by approximately 50 and 65 percent, respectively. NMFS is currently, in conjunction with the fishing industry, conducting additional experiments to verify these results throughout the fishery. Additionally, NMFS is working to export these results to other countries to reduce sea turtle interactions and mortality throughout the Atlantic and Pacific Oceans.

On November 28, 2003, based on the conclusion of this experiment and based on preliminary data that indicated that the Atlantic pelagic longline fishery may have exceeded the ITS in the June 14, 2001 BiOp, NMFS published a Notice of Intent (NOI) to prepare a Supplemental Environmental Impact Statement (SEIS) to assess the potential effects on the human environment of proposed alternatives and actions under a proposed rule to reduce sea turtle bycatch (68 FR 66783).

In January 2004, NMFS reinitiated consultation after receiving data that indicated the Atlantic pelagic longline fishery exceeded the incidental take statement for leatherback sea turtles in 2001 – 2002 and for loggerhead sea turtles in 2002. In the spring of 2004, NMFS released a proposed rule that would require fishermen to use certain hook and bait types and take other measures to reduce sea turtle takes and mortality. The resulting June 1, 2004, BiOp considered these measures and concluded that the pelagic longline fishery was not likely to jeopardize the continued existence of loggerhead sea turtles, but was still likely to jeopardize the continued existence of leatherback sea turtles. NMFS published a final rule implementing many gear and bait restrictions and requiring certain handling and release tools and methods on July 6, 2004 (69 FR 40734). NMFS also published an Advance Notice of Proposed Rulemaking to receive comments on how to further reduce sea turtle mortality (69 FR 49858, August 12, 2004), held several workshops to demonstrate sea turtle release equipment and techniques (69 FR 44513), and released revised sea turtle handling and release placards, protocols, and a video. The placards, protocols, and video are available in English, Spanish, and Vietnamese. NMFS continues to monitor the sea turtle takes in the pelagic longline fishery and may need to take further action if sea turtle takes do not remain below the levels specified in the June 2004 BiOp.

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

As noted under Section 3.1.1.3, in 1999, a court enjoined the Agency from implementing many of the shark-specific regulations in the 1999 FMP. In 2000, the injunction was lifted when a settlement agreement was entered to resolve the 1997 and 1999 lawsuits. The settlement agreement required, among other things, an independent (*i.e.*, non-NMFS) review of the 1998 LCS stock assessment. The settlement agreement did not address any regulations affecting the pelagic shark, prohibited species, or recreational shark fisheries. Once the injunction was lifted, on January 1, 2001, the pelagic shark quotas adopted in the 1999 HMS FMP were implemented (66 FR 55). Additionally, on March 6, 2001, NMFS published an emergency rule implementing the settlement agreement (66 FR 13441). This emergency rule expired on September 4, 2001, and established the LCS and SCS commercial quotas at 1997 levels.

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

On May 8, 2002, NMFS announced the availability of a SCS stock assessment (67 FR 30879). The Mote Marine Laboratory and the University of Florida provided NMFS with another SCS assessment in August 2002. Both of these stock assessments indicate that overfishing is occurring on finetooth sharks while the three other species in the SCS complex (Atlantic sharpnose, bonnethead, and blacknose) are not overfished and overfishing is not occurring. 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 indicate that the LCS complex is still overfished and overfishing is occurring. Additionally, the 2002 LCS stock assessment found that sandbar sharks are no longer overfished but that overfishing is still occurring and that blacktip sharks are rebuilt and overfishing is 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, set the LCS and SCS quotas based on the results of stock assessments, suspended the commercial ridgeback LCS minimum size, and allowed both the season-specific quota adjustments and the counting of all mortality measures to go into place.

In December 2003, NMFS implemented the regulations in Amendment 1 to the Fishery Management Plan for Atlantic Tunas, Swordfish, and Sharks (68 FR 74746). 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 of North Carolina for bottom longline fishermen; and establishing VMS requirements for bottom longline and gillnet fishermen.

3.1.1.8 Other Post-1999 FMP Regulations for Atlantic Tunas, Swordfish, and Sharks

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

- Removal of the bluefin tuna purse seine category cap: In the 1999 FMP, NMFS finalized an alternative that would have capped the quota for vessels in the purse seine category at 250 mt ww. On November 1, 1999, NMFS published a final rule that removed the purse seine category quota cap (64 FR 58793). In that rule, the purse seine category was given 18.6 percent of the total landings quota available to the United States.

- Change to bluefin tuna incidental category catch limits: In May 2003 (68 FR 32414), NMFS modified the target catch requirements for vessels participating in the Atlantic Tunas Longline category such that pelagic longline vessels would have to land 2,000 lb. of other fish in order to land one bluefin tuna on a trip, 6,000 lb. of other fish in order to land two bluefin tuna on a trip, and 30,000 lb. of other fish to land three bluefin tuna. The rule was designed to reduce the discards of bluefin tuna. This change in the target catch requirements applies to all fishing areas. This rule also maintained separate quotas for the seasonal fisheries, adjusted the Longline category North/South division line to 31°00' N. latitude and adjust the Longline category subquotas to allocate 60 percent to the southern area and 40 percent to the northern area.

- Bluefin tuna amendment: On December 24 , 2003 (68 FR 74504), NMFS published a final rule that changed the opening date of the Purse seine category, established closure dates of the Harpoon and General categories, and set size tolerances of large medium BFT for the Purse seine and Harpoon categories.

- Recreational permits and reporting requirements: On December 18, 2002 (67 FR 77434), NMFS published a final rule requiring all vessel owners fishing recreationally (*i.e.*, no sale) for Atlantic HMS, including billfish, to obtain an Atlantic HMS recreational angling category permit. On January 7, 2003 (68 FR 711), a final rule establishing a mandatory reporting system for all non-tournament recreational landings of Atlantic marlins, sailfish, and swordfish was published. These requirements became effective in March 2003.
- International trade permit: On November 17, 2004, NMFS published a final rule that implements the recommendations of ICCAT and the Inter-American Tropical Tuna Commission (IATTC) for bluefin tuna, swordfish, and bigeye tuna (69 FR 67268). The rule requires all importers and exporters, regardless of ocean basin, of bluefin tuna, swordfish, and bigeye tuna to obtain an HMS International Trade Permit on an annual basis, report imports and exports on species-specific statistical documents and re-export certificates, and submit biweekly activity reports to NMFS. The rule is effective on July 1, 2005.
- Import restrictions: Due to compliance concerns, ICCAT has recommended numerous import restrictions on countries that have not shown that they are complying with ICCAT recommendations. Over the years, the countries and species that have import restrictions placed on them have changed. As of July 2, 2005, bigeye tuna from Bolivia or Georgia will not be allowed to be imported into the United States (May 17, 2005, 70 FR 28218). Additionally, ICCAT established "positive" and "negative" lists. These lists outline all the vessels that have permits and do not conduct IUU fishing (positive list) and those vessels that are not permitted and have conducted IUU fishing in the past (negative list). Fish that were caught on vessels that are not on the positive list or that are on the negative list cannot be imported into the United States (December 6, 2004, 69 FR 70396).
- Quota adjustments: Based on various ICCAT recommendations, NMFS has adjusted the quotas for North and South Atlantic swordfish (69 FR 68090, November 23, 2004) and Atlantic bluefin tuna.
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- National Plan of Action for the Conservation and Management Of Sharks: On February 15, 2001, NMFS released the final National Plan of Action (NPOA) for the Conservation and Management of Sharks (66 FR 10484). The NPOA was developed pursuant to the endorsement of the International Plan of Action (IPOA) by the United Nations' Food and Agriculture Organization Committee on Fisheries Ministerial Meeting in February 1999. The overall objective of the IPOA is to ensure conservation and management of sharks and their long-term sustainable use. The final NPOA, consistent with the Magnuson-Stevens Act, requires NMFS and the Regional Fishery Management Councils to undertake extensive data collection, analysis, and management measures in order to ensure the long-term sustainability of U.S. shark fisheries. The NPOA also encourages Interstate Marine Fisheries Commissions and State agencies to initiate or expand current data collection, analysis, and management measures and to implement regulations consistent with federal regulations, as needed. For additional information on the U.S. NPOA and its implementation, see http://www.nmfs.noaa.gov.
- Shark Finning Prohibition Act: On December 21, 2000, President Clinton signed the Shark Finning Prohibition Act into law (Public Law 106-557). This amended the

Magnuson-Stevens Fishery Conservation and Management Act to prohibit any person under U.S. jurisdiction from (i) engaging in the finning of sharks; (ii) possessing shark fins aboard a fishing vessel without the corresponding carcass; and (iii) landing shark fins without the corresponding carcass. NMFS published final regulations on February 11, 2002 (67 FR 6194). These regulations prohibit the finning of sharks, possession of sharks without the corresponding carcasses, and landings of shark carcasses without the corresponding carcasses in U.S. fisheries in the exclusive economic zone and on the high seas.

Other regulatory actions that have been taken including opening and closing of fisheries and adjustments to quota allocations. All of these actions are not listed here but can be found by searching the Federal Register webpage at http://www.gpoaccess.gov/fr/index.html or by reviewing the annual HMS SAFE reports (http://www.nmfs.noaa.gov/sfa/hms).

3.1.2 History of Atlantic Billfish Fishery Management

Atlantic billfish managed by NMFS are Atlantic blue marlin (*Makaira nigricans*), white marlin (*Tetrapturus albidus*), sailfish (*Istiophorus platypterus*), and longbill spearfish *(Tetrapturus pfluegeri)*. Atlantic billfish management strategies have been guided by international and domestic considerations and mechanisms since the 1970s.

3.1.2.1 Preliminary Fishery Management Plan (PMP) for Atlantic Billfish and Sharks

Domestic management of Atlantic billfish resources has been developed, modified, and implemented in three primary stages and through a series of other rulemakings. In January 1978, NMFS published the Preliminary Fishery Management Plan (PMP) for Atlantic Billfish and Sharks (43 FR 3818), which was supported by an EIS (42 FR 57716). This PMP was a Secretarial effort. The management measures contained in the plan were designed to:

1. minimize conflict between domestic and foreign users of billfish and shark resources;
2. encourage development of an international management regime; and
3. maintain availability of billfishes and sharks to the expanding U.S. fisheries.

Primary management measures in the Atlantic Billfish and Shark PMP included:

- Mandatory data reporting requirements for foreign vessels;
- A prohibition on the foreign commercial retention of all billfishes caught within the Fishery Conservation Zone (FCZ) of the United States and stipulated release in a manner that will maximize the probability of survival;
- A hard cap on the catch of sharks by foreign vessels, which when achieved would prohibit further landings of sharks by foreign vessels;
- Permit requirements for foreign vessels to fish in the FCZ of the United States;
- Radio checks by foreign vessels upon entering and leaving the FCZ;

- Boarding and inspection privileges for U.S. observers; and
- Prohibition on intentional discarding of fishing gears by foreign fishing vessels within the FCZ that may pose environmental or navigational hazards.

3.1.2.2 The Fishery Management Plan for the Atlantic Billfishes

Building upon the PMP for Atlantic Billfish and Sharks was the Fishery Management Plan for the Atlantic Billfishes (53 FR 21501). This plan was jointly developed by five Atlantic regional councils (Caribbean, Gulf, South Atlantic, Mid-Atlantic, New England) and implemented in October 1988 (53 FR 37765). The 1988 FMP defined the Atlantic billfish management unit to include sailfish from the western Atlantic Ocean, white marlin and blue marlin from the North Atlantic Ocean, and longbill spearfish from the entire Atlantic Ocean; described objectives for the Atlantic billfish fishery; and established management measures to achieve those objectives. The objectives identified in the Billfish FMP were to:

1. Maintain the highest availability of billfishes to the U.S. recreational fishery by implementing conservation measures that will reduce fishing mortality;
2. Optimize the social and economic benefits to the nation by reserving the billfish resource for its traditional use, which in the continental United States is almost entirely a recreational fishery; and
3. Increase understanding of the condition of billfish stocks and the billfish fishery.

The primary management measures adopted to achieve the stated objectives of the 1988 Billfish FMP included:

- Defining OY in qualitative terms;
- A prohibition on the sale of Atlantic billfish, with an exemption for small-scale handline (artisanal) fishery in Puerto Rico;
- Establishment of minimum sizes for Atlantic billfish;
- A prohibition on possession of Atlantic billfish by commercial longline and drift net vessels; and
- Establishment of data reporting requirements.

As previously mentioned, passage of the 1996 Magnuson-Stevens Act initiated fundamental changes in U.S. fishery management policy, shifting emphasis to precautionary management strategies. In September 1997, NMFS listed fishery resources considered to be overfished, which included Atlantic blue and white marlin. This action triggered a suite of management requirements, including development of a rebuilding plan for overfished stocks, and reduction in bycatch and bycatch mortality. Further, in 1998, western Atlantic sailfish was added to the list of overfished species. In the international arena, ICCAT made its first-ever binding recommendation for Atlantic blue and white marlin in 1997. ICCAT Recommendation 97-09 required landing reductions of at least 25 percent from 1996 levels by the end of 1999. Improvements in data and monitoring were also included in this recommendation.

3.1.2.3 Interim Rules

On March 24, 1998, NMFS published an interim rule (63 FR 14030) under section 305(c) of the Magnuson-Stevens Act, that increased the minimum size limits for Atlantic blue marlin and Atlantic white marlin to 96 inches lower jaw-fork length (LJFL) and 66 inches LJFL, respectively, and required tournament operators to notify NMFS of tournaments involving any Atlantic billfish at least four weeks prior to commencement. NMFS utilized the increases in size limits to immediately reduce overfishing, and to implement the 1997 ICCAT recommendation, as required by the ATCA. NMFS published an extension and amendment of the interim rule on September 29, 1998 (63 FR 51859), that:

- Further increased the minimum size for Atlantic blue marlin to 99 inches LJFL;
- Restated the minimum size for Atlantic white marlin as 66 inches LJFL;
- Established a recreational bag limit of one Atlantic marlin (blue or white marlin) per vessel per trip;
- Granted the Assistant Administrator for Fisheries (AA) the authority to adjust the bag limit, with a three-day notice, including adjustment to a zero bag limit, if necessary to meet international and domestic management objectives; and
- Continued requirements to notify NMFS of tournaments involving any Atlantic billfish at least 4 weeks prior to commencement. NMFS amended the interim rule on November 13, 1998 (63 FR 63421) by removing the adjustable bag limit provision.

Internationally, ICCAT adopted its second binding recommendation regarding billfish in November 1998. ICCAT Recommendation 98-10 built upon the previously discussed ICCAT Recommendation 97-09 by limiting landings of Atlantic blue and white marlin in the year 2000 to no more than levels required to be achieved by the end of 1999.

3.1.2.4 Amendment One to the Atlantic Billfish Fishery Management Plan

In response to Magnuson-Stevens Act requirements, and concurrent with efforts on the interim rule discussed above, NMFS prepared Amendment One to the Atlantic Billfish Fishery Management Plan and published final regulations on May 28, 1999 (64 FR 29090). Amendment One maintained the objectives of the original 1988 Billfish FMP and identified the following additional objectives. As described in Chapter 1, this document consolidates these objectives with the objectives of the 1999 Atlantic Tunas, Swordfish, and Sharks FMP.

1. Prevent and/or end overfishing of Atlantic billfish and adopt the precautionary approach to fishery management;
2. Rebuild overfished Atlantic billfish stocks, and monitor and control all components of fishing mortality, both directed and incidental, so as to ensure the long term sustainability of the stocks and promote Atlantic-wide stock recovery to the level where MSY can be supported on a continuing basis;
3. Establish a foundation for the adoption of comparable international conservation and management measures, through international entities such as ICCAT, to rebuild

overfished fisheries and to promote achievement of optimum yield for these species throughout their range, both within and beyond the EEZ;

4. Minimize, to the extent practicable, release mortality in the directed billfish fishery, and minimize, to the extend practicable, bycatch and discard mortality of billfish on gears used in other fisheries;
5. Better coordinate domestic conservation and management of the fisheries for Atlantic tunas, swordfish, sharks, and billfish, considering the multispecies nature of many highly migratory species (HMS) fisheries, overlapping regional and individual participation, international management concerns, and other relevant factors;
6. Provide the data necessary for assessing the fish stocks and managing the fisheries, including addressing inadequacies in collection and ongoing collection of social, economic, and bycatch data on Atlantic billfish fisheries;
7. Coordinate domestic regulations and ICCAT conservation measures for controlling Atlantic-wide fishing mortality;
8. Consistent with other objectives of the amendment, manage Atlantic billfish fisheries for the continuing OY, so as to provide the greatest overall benefit to the Nation, particularly with respect to recreational opportunities and taking into account the protection of marine ecosystems. Optimum yield is the maximum sustainable yield from the fishery, as reduced by any relevant social, economic, or ecological factors;
9. Minimize adverse social and economic effects on recreational and commercial activities to the extent practicable, consistent with ensuring achievement of the other objectives of this plan, and with all applicable laws;
10. Maximize protection of areas identified as essential fish habitat for Atlantic billfish, particularly for critical life stages; and
11. Promote the live release of Atlantic billfish through active outreach and educational programs.

Primary management measures included:

- Adjustment of minimum size regulations for Atlantic billfish;
- A prohibition on the retention of longbill spearfish;
- Maintenance of prohibitions on commercial possession and retention;
- Allowed removal of the hook from Atlantic billfish;
- A requirement for permits and logbook reporting for charterboats targeting billfish, if selected, as part of an HMS charter/headboat system;
- Implementation of billfish tournament notification requirements;
- Implementation of a June 1 to May 31 fishing year;
- Development and implementation of outreach programs; and
- An extension of the management unit for Atlantic marlins.

3.1.2.5 ICCAT 2000

ICCAT adopted additional recommendations (00-13) regarding Atlantic billfish, including an international two-phased rebuilding plan for Atlantic blue and white marlin, in November 2000. Phase I of the plan required that countries (other than the United States) capturing marlins in commercial fisheries reduce white marlin landings from pelagic longline and purse seine fisheries by 67 percent and blue marlin landings by 50 percent from 1999 levels. ICCAT adopted the marlin rebuilding strategy based on the SCRS' most recent stock assessments that indicated that marlin stocks continued to be severely overfished. ICCAT Recommendation 00-13 also recommended that the United States restrict annual landings by U.S. recreational fishermen to 250 Atlantic blue and white marlin, combined, for 2001 and 2002 (Phase I). This recommendation was subsequently extended through 2006.

3.1.2.6 White Marlin Endangered Species Act (ESA) Listing Review

In September 2001, NMFS received a petition filed pursuant to ESA to list white marlin as endangered or threatened throughout its range and to designate critical habitat. After conducting a comprehensive review of the status of the species, NMFS determined in September 2002 that, while Atlantic white marlin abundance had declined from historical levels, the stock was not at a level that warranted listing under the ESA. The ESA determination specified that another stock status review would occur in 2007. Also, in 2001, the HMS and Billfish Advisory Panels (Billfish AP), a group of state representatives, regional Fishery Management Council members, commercial fishing representatives, recreational fishing representatives, academics, and environmental interest group representatives, indicated that it was necessary to improve the monitoring of recreational swordfish and Atlantic billfish landings.

3.1.2.7 ICCAT 2002

In 2002, Phase 1 of the ICCAT Atlantic marlin rebuilding plan was extended through the year 2005 by adoption of ICCAT Recommendation 02-13. ICCAT amended the rebuilding program by specifying that, through 2005, the annual amount of blue marlin that can be harvested and retained by pelagic longline and purse seine vessels must be no more than 50 percent of the 1996 or 1999 landing levels, whichever is greater. For white marlin, the annual amount allowed to be harvested and retained by pelagic longline and purse seine vessels must be no more than 33 percent of the 1996 or 1999 landing levels, whichever is greater. The United States had already prohibited commercial retention of billfish since the implementation of the 1988 Atlantic Billfish FMP, so it was already compliant with this recommendation. For ICCAT members other than the United States, the plan required the release of all live marlins taken as bycatch in commercial fisheries, but provided an allowance for the landing of fish unavoidably killed, provided that they were not sold. For its part of the rebuilding program, the United States agreed to continue limiting recreational landings of Atlantic blue and white marlin to 250 fish, annually, maintain its regulations prohibiting the retention of marlins by U.S. pelagic longline vessels, and continue monitoring billfish tournaments through scientific observer coverage of at least five percent initially, with the objective of 10 percent coverage by 2002. As recorded in ICCAT compliance tables, the United States remained within its 250 marlin limit in 2001 and 2003, but exceeded the 250 fish limit in 2002. At present, the United States complies with the ICCAT observer requirements by requiring that all HMS tournaments register with NMFS, selecting all billfish tournaments for reporting their results, and assigning observers to many billfish tournaments.

3.1.2.8 Recreational Permitting and Reporting Rules

A key element in complying with Phase I of the ICCAT marlin rebuilding plan and improving the monitoring of recreational billfish and swordfish landings was establishing a comprehensive monitoring program for all recreational landings of marlin, sailfish and swordfish, particularly those landed outside of fishing tournaments, which are monitored through the Recreational Billfish Survey (RBS).

In early 2002, the HMS and Billfish APs again discussed monitoring U.S. recreational billfish landings, and focused upon both a landings tag program (similar to those operating for the recreational bluefin tuna fisheries in North Carolina and Maryland) and a call-in requirement for all billfish landings.

On December 18, 2002 (67 FR 77434), NMFS published a final rule requiring all vessel owners fishing for Atlantic HMS to obtain an Atlantic HMS recreational angling category permit. On January 7, 2003 (68 FR 711), a final rule establishing a mandatory reporting system for all non-tournament recreational landings of Atlantic marlins, sailfish, and swordfish was published. These requirements became effective in March 2003. These requirements, in combination with mandatory tournament reporting, are improving the ability of the United States to accurately monitor all recreational landings of Atlantic marlins, sailfish, and swordfish, however, non-compliance by recreational anglers remains a significant issue.

3.1.2.9 Proposed Rule to Codify the 250 Marlin Landing Limit

On September 17, 2003, NMFS published a proposed rule (68 FR 54410) to codify an annual landings limit of 250 Atlantic blue and white marlin combined, and to implement a provision to carry forward over- and underharvest of the Atlantic blue and white marlin landing limit into subsequent fishing years, consistent with ICCAT recommendations. To remain in compliance with the landing limit and to maximize allowable landings, NMFS proposed to increase the legal recreational minimum size of Atlantic blue and white marlin for the remainder of a fishing year when 80 percent of the landing limit was projected to be achieved. If the landing limit was attained, NMFS proposed to allow only catch-and-release fishing for these species for the remainder of the fishing year. The proposed rule was not finalized due to a need to review the methodology of calculating recreational marlin landings. The proposed rule incorporated landings as reported by the Recreational Billfish Survey (RBS), and indicated landings levels of 129 fish for 2002. Application of a new methodology (scalar expansion) resulted in the United States reporting 279 marlin to ICCAT for compliance purposes for 2002, which exceeded the annual 250 fish landings limit by 29 fish. NMFS is continuing to review various methodologies to identify the most appropriate approach for estimating recreational marlin landings. The proposed rule for this current Draft HMS FMP formally withdrew this 2003 proposed rule. Similar measures to those in the 2003 proposed rule are analyzed in Chapter 4 of this document.

3.1.2.10 ICCAT 2004

At the November 2004 ICCAT meeting, the United States chose not to apply the scalar expansion methodology for compliance purposes, but rather applied a methodology (RBS + Non-Tournament Reporting System + State Landing Tags) similar, but not identical to that used in the 2001 compliance report and the September 2003 Proposed Rule. Application of this methodology resulted in the United States reporting 131 marlin to ICCAT for compliance purposes in 2004. The United States is continuing to review its methodology to quantify recreationally landed marlins. Further, a new ICCAT Recommendation (as yet unnumbered) was adopted which extended Phase I of the Marlin Rebuilding Plan and delayed the planned 2005 assessment by SCRS of blue and white marlin to 2006 on the basis of inadequate data. This action resulted in an extension of the cap of 250 blue and white marlin, combined, for U.S. recreational landings through 2006.

3.1.3 Summary and Update of Management Measures Taken in 2005 and Early 2006

During calendar year 2005, NMFS' HMS Management Division completed numerous actions, including the release of the Draft HMS FMP, several inseason actions and proposed and final rules, and responses to several petition for rulemakings. Each of the regulatory actions is consistent with existing HMS rebuilding plans, and is supported by a regulatory analysis, as required, of the action's socio-economic and/or ecological effects. These analyses are supplements or updates to previous environmental impact statements and regulatory impact analyses, and are found in supporting documents including but not limited to environmental assessments (EA), environmental impact statements (EIS), and/or regulatory impact reviews (RIR). As reflected in these supporting documents, which are available from NMFS upon request or on the NMFS HMS Management Division's webpage, these actions are not expected to have adverse ecological impacts on target, non-target, or protected species, but are expected overall to have positive cumulative impacts. Table 3.1 provides a list of all Federal Register notices filed during 2005 relating to specific actions taken by NMFS' HMS Management Division.

In the beginning of 2006, NMFS' HMS Management Division completed additional actions including proposing and finalizing adjustment to the U.S. swordfish annual quota, proposing and finalizing the second and third 2006 fishing seasons for the Atlantic shark fishery, proposing the annual specifications for the 2006 BFT fishery, and proposing dehooking and complementary closures for the Atlantic shark bottom longline fishery. NMFS will provide a similar table of all 2006 actions related to Atlantic HMS in the 2007 SAFE Report.

Currently, there is one active lawsuit (The Ocean Conservancy v. Evans, Civ. No. 1:04-cv-1155 (D.D.C.)) relating to an HMS management action. In the summer of 2004, environmental groups challenged the July 2004 sea turtle bycatch mitigation rule that NMFS implemented for the Atlantic pelagic longline fishery and accompanying BiOp. The judge ruled in favor of NMFS in 2005; the plaintiffs have appealed the ruling.

Table 3.1 Summary of 2005 Federal Register Notices Related to HMS.

Action Type NOAA Fisheries ID #	CFR Part	Action Description	Action Pub Info
Rules and Regulations ID 122704C	635	Atlantic Highly Migratory Species; Bluefin Tuna Fisheries; Fishery reopening; quota transfer.	1/4/2005 70 FR 302
Notice ID 020205B		Proposed Information Collection; Comment Request; Highly Migratory Species Vessel Logbooks and Cost-Earnings Data Reports; Notice.	2/7/2005 70 FR 6419
Notice ID 020205C		Notice; Proposed Information Collection; Comment Request; Atlantic Highly Migratory Species Vessel and Gear Marking; Notice.	2/7/2005 70 FR 6420
Notice ID 020105N		Proposed Information Collection; Comment Request; Atlantic Highly Migratory Species Observer Notification Requirements; Notice.	2/7/2005 70 FR 6418
Notice		Proposed Information Collection; Comment Request; Atlantic Highly Migratory Species Permit Family of Forms; Notice.	2/17/2005 70 FR 8074
Rules and Regulations ID 07234B RIN 0648-AR86	635	Atlantic Highly Migratory Species; Atlantic Bluefin Tuna Quota Specifications, General Category Effort Controls, and Catch-and-Release Provision; Final rule.	3/7/2005 70 FR 10897
Proposed Rules ID 021105C RIN 0648-AT05	635	Atlantic Highly Migratory Species; Lifting Trade Restrictive Measures; Proposed rule, request for comments, notice of public hearing.	3/8/2005 70 FR 11190
Proposed Rule ID 020205F RIN 0648-AT07	635	Atlantic Highly Migratory Species; Atlantic Commercial Shark Management Measures; Proposed rule; request for comments.	3/10/2005 70 FR 11922
Rules and Regulations ID 030405B	635	Atlantic Highly Migratory Species; Bluefin Tuna Fisheries; Closure.	3/11/2005 70 FR 12142
Proposed Rules ID 030405C RIN 0648-AT01	635	Atlantic Highly Migratory Species; Atlantic Bluefin Tuna Quota Specifications and General Category Effort Controls; Proposed rule; request for comments; notice of public hearings.	3/23/2005 70 FR 14630
Notices ID 032805A		Highly Migratory Species; Notice of availability; request for comments.	4/4/2005 70 FR 17069
Rules and Regulations ID020205F RIN 0648-AT07		Atlantic Highly Migratory Species; Atlantic Commercial Shark Management Measures; Temporary rule; fishing season notification.	4/27/2005 70 FR 21673
Notices ID 032805A		Atlantic Highly Migratory Species; Exempted Fishing Permits, Notice.	5/9/2005 70 FR 24397
Proposed Rules ID 020205F RIN 0648-AT07	635	Atlantic Highly Migratory Species; Receipt of a petition for rulemaking; request for comments.	5/10/2005 70 FR 11922
Final Rule ID 021105C RIN 0648-AT05	635	Atlantic Highly Migratory Species; Lifting Trade Restrictive Measures; Final rule.	5/17/2005 70 FR 28218
Notices ID 032805A		Atlantic Highly Migratory Species; Notice of public workshops.	5/20/2005 70 FR 29285

Action Type NOAA Fisheries ID #	CFR Part	Action Description	Action Pub Info
Rules and Regulations ID 030405C RIN 0648-AT01	635	Atlantic Highly Migratory Species; Atlantic Bluefin Tuna Quota Specifications and General Category Effort Controls; Final rule.	6/7/2005 70 FR 33033
Rules and Regulations ID 052405D	635	Atlantic Highly Migratory Species; Atlantic Bluefin Tuna Fisheries; Temporary rule; in season retention limit adjustment.	6/7/2005 70 FR 33039
Rules and Regulations ID 080405B	635	Atlantic Highly Migratory Species; Atlantic Bluefin Tuna Fisheries; Temporary rule; in season retention limit adjustment.	8/18/2005 70 FR 48490
Proposed Rules ID 051603 RIN 0648-AQ65	300 600 635	Atlantic Highly Migratory Species; Recreational Atlantic Blue and White Marlin Landings Limit; amendments to the Fishery Management Plan for Atlantic Tunas, Swordfish, and Sharks and the Fishery Management Plan for Atlantic Billfish. Proposed rule; availability of the Fishery Management Plan (FMP); petition for rulemaking; proposed rule withdrawal; request for comments; public hearings.	8/19/2005 70 FR 48804
Notices		Proposed Information Collection; Comment Request; Highly Migratory Species Scientific Research Permits, Exempted Fishing Permits, and Letters of Authorization; Notice.	8/31/2005 70 FR 51754
Proposed Rules ID 051603C RIN 0648-AQ65	635	Atlantic Highly Migratory Species; Cancelling and changing the location and time of certain public hearings.	9/7/2005 70 FR 53146
Notices ID 081705D		Notice; advisory panel meetings; request for nominations.	9/12/2005 70 FR 53777
Notices ID 090205B		Large Coastal Shark 2005/2006 Stock Assessment Data Workshop; Notification of workshop.	9/15/2005 70 FR 54537
Proposed Rules ID 051603C RIN 0648-AQ65	635	Atlantic Highly Migratory Species; Cancellation of a public hearing.	9/23/2005 70 FR 55814
Rules and Regulations ID 091405F	635	Atlantic Highly Migratory Species; Atlantic Bluefin Tuna Fisheries; Temporary rule; inseason catch limit adjustment.	9/28/2005 70 FR 56595
Proposed Rule ID 051603C RIN 0648-AQ65	635	Atlantic Highly Migratory Species: Extension of comment period; rescheduling of the Joint Advisory Panel meeting.	10/5/2005 70 FR 58177
Proposed Rules ID 090805C RIN 06448-AT74	635	Atlantic Highly Migratory Species; Atlantic Commercial Shark Management Measures; Proposed rule; request for comments.	10/6/2005 70 FR 58366
Rules and Regulations ID 102505	635	Atlantic Highly Migratory Species; Atlantic Bluefin Tuna Fisheries; Temporary rule; inseason retention limit adjustment.	11/09/2005 70 FR 67929
Notices ID 110905B		Magnuson-Stevens Act Provisions; Atlantic Highly Migratory Species; Exempted Fishing, Scientific Research, Display, and Chartering Permits; Notice of intent to issue exempted fishing, scientific research, display, and chartering permits; request for comments.	11/29/2005 70 FR 71469
Rules and Regulations ID 090805C RIN 0648-AT74	635	Atlantic Highly Migratory Species; Atlantic Commercial Shark Management Measures; Final rule; fishing season notification.	12/1/2005 70 FR 72080

Action Type NOAA Fisheries ID #	CFR Part	Action Description	Action Pub Info
Notices		Proposed Information Collection; Comment Request; Vessel Monitoring System for Atlantic Highly Migratory Species; Notice.	12/6/2005 70 FR 72611
Rules and Regulations ID 112305D	635	Atlantic Highly Migratory Species; Atlantic Bluefin Tuna Fisheries; Temporary rule; quota transfer.	12/7/2005 70 FR 72724
Proposed Rules ID 040605D	635	Atlantic Highly Migratory Species; Commercial Shark Management Measures; Petition for rulemaking; decision.	12/14/2005 70 FR 73980
Rules and Regulations ID 121205F	635	Atlantic Highly Migratory Species; Atlantic Bluefin Tuna Fisheries; Temporary rule; inseason retention limit adjustment.	12/16/2005 70 FR 74712
Notices ID 120505C		Large Coastal Shark 2005/2006 Stock Assessment Workshop; Notice; Public Workshop.	12/22/2005 70 FR 76031
Notices ID 051603C RIN 0648-AQ65	635	Atlantic Highly Migratory Species; Amendments to the Fishery Management Plan (FMP) for Atlantic Tunas, Swordfish, and Sharks and the FMP for Atlantic Billfish; Rescheduling and addition of public hearings.	12/27/2005 70 FR 76441

3.1.4 2005 Accomplishments of the International Commission for the Conservation of Atlantic Tunas (ICCAT)

The 2005 Regular Meeting of the International Commission for the Conservation of Atlantic Tunas (ICCAT) was held November 14 – 20, 2005, in Seville, Spain. There was no new species stock assessments conducted in 2005. As such, much of the work at the 2005 Commission meeting dealt with issues such as trade and trade monitoring, compliance with existing ICCAT recommendations, bycatch, data collection, and the functioning of the Commission. For purposes of clarity, it should be understood that ICCAT recommendations are binding instruments for Contracting Parties while ICCAT resolutions are non-binding and express the will of the Commission. All ICCAT recommendations and resolutions are available on the ICCAT website at http://www.ICCAT.es.

3.1.4.1 Atlantic Tunas

Despite U.S. concerns over increasing catches of juvenile yellowfin tuna, ICCAT adopted Recommendation 05-01, which repealed the longstanding 3.2 kg size limit on Atlantic yellowfin tuna, as originally established by Recommendation 72-01. The Commission also adopted Recommendation 05-02 which severely reduced the Taiwan's bigeye tuna quota in the Atlantic from 16,500 mt to 4,600 mt. This recommendation provided 3,300 mt to the directed Taiwanese bigeye tuna fleet and 1,300 mt as bycatch in the Taiwanese albacore fishery. Under this recommendation, Taiwan's directed bigeye fleet is also limited to 15 vessels and its albacore fleet is limited to 60 vessels in 2006. In addition, the measure requires Taiwan to improve monitoring and control of its fleet, to reduce overall fleet capacity in the Atlantic, and to take steps to control its business entities involved in supporting illegal, unregulated, and unreported (IUU) activities.

3.1.4.2 Atlantic Sharks

ICCAT adopted Recommendation 05-05 which requires contracting parties to report on domestic implementation of *Recommendation 04-10 Concerning the Conservation of Sharks Caught in Association with Fisheries Managed by ICCAT*. For those contracting parties that had not implemented ICCAT Recommendation 04-10 at the time of the 2005 Commission meeting, Recommendation 05-05 reinforced the requirement to do so.

3.1.4.3 Trade and Trade Monitoring

ICCAT adopted a number of recommendations regarding trade of HMS or tracking of trade during the 2005 Commission meeting. Recommendation 05-04 implements new requirements regarding farmed bluefin tuna including improved tracking of farmed fish for quota monitoring and trade purposes, sampling and data collection programs for assessment purposes, and other requirements to ensure the effectiveness of ICCAT conservation and management measures. To better combat IUU fishing activities, ICCAT adopted Recommendation 05-06 that establishes a program for transshipment by large-scale tuna longline fishing vessels, and procedures for transshipments that occur on the high seas and within areas of national jurisdiction. The measure establishes a record of carrier vessels authorized to receive ICCAT-managed species, and requires carrier vessels to use VMS and to have an ICCAT observer on board. It also establishes the ICCAT Regional Observer Program for placing observers on carrier vessels in the Atlantic – the first of its kind at ICCAT. The observer program will be funded by members and cooperating parties engaging in transshipment operations. The program will be operated by the ICCAT Secretariat, who is responsible for training and placement of observers.

3.1.4.4 Data Compliance

ICCAT adopted Recommendation 05-09, a U.S. sponsored proposal establishing a process and procedure for reviewing compliance by ICCAT parties and cooperating parties with data submission requirements. Specifically, Recommendation 05-09 established a procedure for identifying data gaps and their causes and for developing appropriate actions to address those data problems. The measure tasks the SCRS with providing a report of data gaps and their impacts on assessments. It requires the responsible member or cooperating party to explain the reporting deficiency and provide a plan for corrective action. In addition, the measure provides that the Compliance Committee of the Commission should recommend appropriate action based on relevant information to address problematic data deficiencies.

3.1.4.5 Circle Hooks

A U.S. proposal encouraging ICCAT parties to undertake research on the use of circle hooks in pelagic longline, recreational, and artisanal fisheries was adopted by the Commission as Resolution 05-08. The measure is non-binding and also includes a provision encouraging parties to share information on fishing methods and technological gear changes that improve the safe handling and release of incidentally caught species.

A number of other non-binding resolutions were adopted which can be found on the ICCAT website identified above.

3.1.5 Existing State Regulations

Table 3.2 outlines the existing State regulations as of May 30, 2006, with regard to HMS species. The HMS Management Division updates this table periodically throughout the year. While the HMS Management Division updates this table periodically throughout the year, persons interested in the current regulations for any state should contact that state directly.

Table 3.2 State Rules and Regulations Pertaining to Atlantic HMS, as of May 30, 2006.

Please note that state regulations are subject to change. Please contact the appropriate state personnel to ensure that the regulations listed below remain current. X = Regulations in Effect; n = Regulation Repealed; FL = Fork Length; CL = Carcass Length; TL = Total Length; LJFL = Lower Jaw Fork Length; CFL = Curved Fork Length; DW = Dressed Weight; and SCS = Small Coastal Sharks; LCS = Large Coastal Sharks.

State	Species				Cite Reference	Regulatory Details	Contact Information
	Tuna	*Swords*	*Billfish*	*Sharks*			
ME	X			X	Tuna -ME Rev. Stat. Ann. tit. 12, " 6001, 6502, and 6551 Sharks - Code ME R. 13-188 ' 50.02	**Tuna** - Retention limit - 1 tuna/year - non resident special tuna permit holder; Unlawful to fish for tuna with gear other than harpoon or hook and line or possess tuna taken in unlawful manner. No minimum size limits. **Sharks** - Regulations apply to Spiny dogfish only	ME Department of Marine Resources George Lapointe Phone: 207/624-6553 Fax: 207/624-6024
NH	R		X	X	Tuna - FIS 603.10 (REPEALED) Billfish - FIS 603.13 Sharks - FIS 603.19	**Billfish** - Possession limit - 1 billfish/trip; Minimum size (LJFL) - Blue marlin - 99"; White marlin - 66"; Sailfish - 57"; May be taken by hook and line only; Unlawful to sell billfish **Sharks** - Regulations apply to Spiny dogfish only	NH Fish and Game Clare McBane Phone: 603/868-1095 Fax: 603/868-3305
MA	X		R	X	Tuna - 322 CMR ' 6.04 Billfish – 322 CMR ' 6.11 (REPEALED) Sharks – 322 CMR ' 6.35 & 6.37 CMRs available online at http://www.mass.gov/dfwele/dmf/commercialfishing/cmr_index.htm	**Tuna** - Reference to ATCA and Federal regulations **Billfish** – repealed as of December 2005 **Sharks** - Regulations apply to Spiny dogfish; Prohibition on harvest, catch, take, possession, transportation, selling or offer to sell any basking, dusky, sand tiger, or white sharks.	MA Division of Marine Fisheries Melanie Griffin Phone: 617/626-1520 Fax: 617/626-1509
RI				X	Sharks - RIMFC Regulations ' 7.15	**Sharks** - Regulations apply to spiny dogfish only	RI Department of Environment Management Brian Murphy Phone: 401/783-2304
CT				X	Dogfish – Regulations of Connecticut State Agencies § 26-159a-19	**Sharks** - Regulations apply to spiny dogfish only	CT Department of Environmental Protection David Simpson Phone: 860/434-6043 Fax: 860/434-6150

State	Species				Cite Reference	Regulatory Details	Contact Information
	Tuna	*Swords*	*Billfish*	*Sharks*			
NY			X	X	Billfish -NY Environmental Conservation ' 13-0339 (5) Sharks - NY Environmental Conservation ' 13-0338; State of New York Codes, Rules and Regulations (Section 40.1)	**Billfish** - Blue marlin, White marlin, Sailfish, and Longbill spearfish shall not be bought, sold or offered for sale; Striped marlin, Black marlin, Shortbill spearfish shall not be bought, sold or offered for sale **Sharks** - Shark finning prohibited; Reference to the Federal regulations 50 CFR part 635; Prohibited sharks listed	NY Department of Environmental Conservation Gordon Colvin Phone: 631/444-0435 Fax: 631/444-0449
NJ				X	Sharks-NJ Administrative Code, Title 7. Department of Environmental Protection, NJAC 7:25-18.1 and 7:25-18.12(d)	**Sharks** - Commercial/Recreational: min size 48" TL or 23" **f**rom the origin of the first dorsal fin to pre-caudal pit; possession limit - 2 fish/vessel or 2 fish per person if fishing from shore or a land based structure, must hold Federal permit to possess or sell more than 2 sharks; no sale during Federal closures; Finning prohibited; Prohibited Species: basking, bigeye sand tiger, sand tiger, whale and white sharks.	NJ Fish and Wildlife Hugh Carberry Phone: 609/748-2020 Fax: 609/748-2032
DE			X	X	Billfish - DE Code Ann. tit. 7, ' 1310 Sharks - DE Code Regulations 3541	**Billfish/Sharks** - Reference to Federal regulations for sharks; Prohibition on sale of Atlantic Sailfish and Blue/White/Striped marlin **Sharks** – Recreational/Commercial: min size – 54" FL; bag limit – 1 shark/vessel/trip; shorebound anglers – 1 shark/person/day; 2 Atlantic sharpnose/vessel/trip with no min size; Prohibited Species: same as Federal species. Prohibition against fins without being naturally attached to the body.	DE Division of Fish and Wildlife Roy Miller Phone: 302/739-9914

State	Species				Cite Reference	Regulatory Details	Contact Information
	Tuna	***Swords***	***Billfish***	***Sharks***			
MD	X	X	X	X	Tuna - Code of Maryland Regulations tit. 8, ' 02.12.01 and tit. 8, ' 02.05.23 Swordfish - Code of Maryland Regulations tit. 8, ' 02.12.01 and tit. 8, ' 02.05.27 Billfish - Code of Maryland Regulations tit. 8, ' 02.12.01 and tit. 8, ' 02.05.26 Sharks - Code of Maryland Regulations tit 8, ' 02.05.17	**Tuna** - Reference to listing Bluefin Tuna as Ain need of conservation@; Federal regulations used to control size and seasons and recreational catch required to be tagged Swordfish - Reference to listing Swordfish as Ain need of conservation@; Federal regulations used to control size and seasons and recreational catch required to be tagged **Billfish** (blue and white marlin and sailfish) - Reference to listing Billfish as Ain need of conservation@; Federal regulations control size and seasons and recreational catch required to be tagged **Sharks** – Recreational: min size - 54" FL or 31" carcass; 1 shark/vessel/trip; 1 Atlantic sharpnose/person/trip with no min size; Commercial: same as Federal regulations; Finning prohibition; Prohibited Species: same as Federal regulations.	MD Department of Natural Resources Harley Speir Phone: 410/260-8303
VA			X	X	Billfish - 4 VA Administrative Code 20-350 Sharks - 4 VA Administrative Code 20-490	**Billfish** - Prohibition on sale of billfish **Sharks** – Recreational: bag limit – 1 LCS, SCS, or pelagic shark/vessel/day with a min size of less than 54" FL or 30" CL; 1 Atlantic sharpnose and bonnethead/person/day with no min size; No limits on rec harvest of smooth and spiny dogfish; Commercial: possession limit - 4000 lb dw/day, min size - 58" FL or 31" CL west of the COLREGS line and no min size limit east of the COLREGS line; Prohibitions: fillet at sea, finning, longlining, same prohibited shark species as Federal regulations; and spiny dogfish commercial regulations.	VA Marine Resources Commission Jack Travelstead Phone: 757/247-2247 Fax: 757/247-2020

State	Species				Cite Reference	Regulatory Details	Contact Information
	Tuna	*Swords*	*Billfish*	*Sharks*			
NC			X	X * Modify closed area off NC to allow fishing outside 15 fathoms during 1st trimester (Jan 1 - Feb 15)	Billfish -NC Administrative Code tit. 15A, r.3M.0507 Sharks -NC Administrative Code tit. 15A, r.3M.0505; Proclamation FF-24-2004	**Billfish** - Recreational possession limit - 1 Blue or White marlin/vessel/trip; 1 Sailfish/person/day; Minimum size - Blue marlin - 99"; White marlin - 66"; Sailfish - 63"; unlawful to sell or offer for sale Blue or White marlin and Sailfish **Sharks** - Director may impose restrictions for size, seasons, areas, quantity, etc. via proclamation; Commercial: open seasons and species groups same as Federal; 4000 lb trip limit for LCS; retain fins with carcass through point of landing; LL shall only be used to harvest LCS during open season, shall not exceed 500 yds or have more than 50 hooks; Recreational: LCS (54" FL min size) - no more than 1 shark/vessel/day or 1 shark/person/day, SCS (no min size) – no more than 1 finetooth or blacknose shark/vessel/day and no more than 1 Atlantic sharpnose and 1 bonnethead/person/day, pelagics (no min size) -1 shark/vessel/day; Same prohibited shark species as Federal regulations.	NC Division of Marine Fisheries Preston Pate Phone: 252/726-7021 Fax: 252/726-0254
SC	X		X	X	Tuna -SC Code Ann. ' 50-5-2730 Billfish - SC Code Ann. ' 50-5-1700 Sharks -SC Code Ann. ' 50-5-2725	**Tuna** - Reference to ATCA and MSA regulations for Tuna **Billfish** - Unlawful to sell billfish; hook and line gear only; unlawful to possess while transporting gillnets, seines, or other commercial gear **Sharks** – Recreational: 2 Atlantic sharpnose/per/day and 1 Bonnethead/person/day, no min size; All others – 1 shark/boat/trip, min size – 54" FL; Reference to Federal commercial regulations and prohibited species	SC Department of Natural Resources Robert Boyles Phone: 843/953-9050 Fax: 912/262-2318

State	Species				Cite Reference	Regulatory Details	Contact Information
	Tuna	***Swords***	***Billfish***	***Sharks***			
GA			X	X	Gear Restrictions/Prohibitions - GA Code Ann. ' 27-4-7; Billfish - GA Code Ann. ' 27-4-130.2; GA Comp. R. & Regs. ' 391-2-4-.04 Sharks - GA Code Ann. ' 27-4-130.1; OCGA ' 27-4-7(b); GA Comp. R. & Regs. ' 391-2-4-.04	Gear Restrictions/Prohibitions - Use of gillnets is prohibited in state waters. **Billfish** - Possession prohibited in state waters, except for catch and release. **Sharks** – Commercial/Recreational: 2 sharks from the Small Shark Composite (bonnethead, sharpnose, and spiny dogfish, daily limit may consist of 2 of the same species (eg., 2 bonnetheads, 2 sharpnoses) or 2 different species, SCS min size 30" TL; All other sharks - 2 sharks/person or boat, whichever is less, min size 48" TL, may include only 1 greater than 84"; Prohibited Species: sand tiger sharks. All species must be landed head and fins intact. Sharks may not be landed in Georgia if harvested using gill nets.	GA Department of Natural Resources Phone: 912/264-7218 Fax: 912/262-3143

State	Species				Cite Reference	Regulatory Details	Contact Information
	Tuna	*Swords*	*Billfish*	*Sharks*			
FL		X	X	X	Sharks -FL Administrative Code Ann. r.68B-44, F.A.C Swordfish/ Billfish - FL Administrative Cod Ann. r. 68B-33 F.A.C	**Billfish** – Longbill/Mediterranean/roundscale spearfish – harvest/possession/landing/purchase/sale/exchange prohibited. Blue/White Marlin and Sailfish – Sale prohibited; Aggregate possession of 1 fish/person; Gear restriction (hook and line only); Minimum size limit (Blue Marlin – 99" LJFL; White Marlin – 66" LJFL; Sailfish – 63" LJFL); Recreational catch reporting requirement (all non-tournament landings must be reported NOAA within 24 hours); Must land in whole condition (gutting allowed) **Swordfish** - Minimum size - 47 in LJFL/29" cleithrum to keel/33 lbs. dw; Possession limit 1 fish/person/day or 3 fish/vessel/day (with 3 or more persons onboard); Commercial harvest and sale allowed only with Florida saltwater products license and a federal LAP for swordfish; Recreational catch reporting requirement (all non-tournament landings must be reported NOAA within 24 hours) **Sharks** – Commercial/Recreational: min size - none; possession limit – 1 shark/person/day or 2 sharks/vessel on any vessel with 2 or more persons on board; State waters close to commercial harvest when adjacent Federal waters close; Federal permit required for commercial harvest, so Federal regulations apply unless state regulations are more restrictive; Finning & Filleting prohibited; and same prohibited species as Federal regulations, except Caribbean sharpnose is not included.	FL Fish and Wildlife Conservation Commission Phone: 850/488-6058 Fax: 850/488-7152
AL	X	X	X	X	Sharks - AL Administrative Code r. 220-2-.46, r.220-3-.30, r.220-3-.37	**Tuna/Swordfish/Billfish/Sharks** - Reference to Federal regulations **Sharks** – Recreational & Commercial: bag limit – 2 sharpnose/person/day; no min size; all other sharks – 1/person/day; min size – 54" FL or 30" dressed; state waters close when Federal season closes; Prohibition: Atlantic angel, bigeye thresher, dusky, longfin make, sand tiger, basking, whale, white, and nurse sharks.	AL Department of Conservation and Natural Resources Major Jenkins jjenkins@dcnr.state.al.us Phone: 251 861 2882

State	Species				Cite Reference	Regulatory Details	Contact Information
	Tuna	*Swords*	*Billfish*	*Sharks*			
LA	X	X	X	X	Tuna -LA Administrative Code Title 76, Pt. VII, Ch. 3, § 361 Swords/Billfish - LA Administrative Code Title76, Pt. VII, Ch. 3, § 355 Sharks - LA Administrative Code Title 76, Pt. VII, Ch. 3, § 357	**Tuna** - Recreational bag and possession limit Yellowfin (3 fish/person); Rec/Commercial minimum size - Yellowfin, Bigeye and Bluefin (27 in CFL) **Billfish/Swordfish** - Minimum size - Blue marlin (99 in LJFL), White marlin (66" LJFL), Sailfish (63 in LJFL), Swordfish (29 in carcass length or 33 lbs dw); Recreational creel limit - 5 swordfish/vessel/trip **Sharks** - Recreational: min size – 54" FL, except Atlantic sharpnose and bonnethead; bag limit - 1 sharpnose/person/day; all other sharks – 1 fish/person/day; Commercial: 4,000 lb LCS trip limit, no min size; Com & Rec Harvest Prohibited: 4/1-6/30; Prohibition: same as Federal regulations, as well as smalltooth and largetooth sawfish	LA Department of Wildlife and Fisheries Harry Blanchet 225 765-2889 fax (225) 765-2489 hblanchet@wlf.louisiana.gov
MS	X		X	X	Tuna/Billfish/Sharks - MS Code Title-22 part 7	**Tuna** – Min size - Bigeye 27" CFL; Yellowfin 27" CFL; Bag limit none in commercial; Bag limit of 3 yellowfin tuna/person in recreational; No commercial take of bluefin tuna; 1 bluefin tuna/vessel/week and landing must be reported to MDMR. **Billfish** - No take provisions for commercially harvested Blue and White marlin and Sailfish; Recreational minimum size - Blue marlin 99" LJFL; White marlin 66" LJFL; Sailfish 63" LJFL; No position for longbill spear fish. **Sharks** – Recreational: min size - LCS/Pelagics 37" TL; SCS 25" TL; bag limit - LCS/Pelagics 1/person up to 3/vessel; SCS 4/person; Commercial & Prohibited Species - Reference to Federal regulations.	MS Department of Marine Resources Kerwin Cuevas Phone: 228/374-5000

State	Species				Cite Reference	Regulatory Details	Contact Information
	Tuna	***Swords***	***Billfish***	***Sharks***			
TX		X	X	X	Billfish/Swordfish/Sharks - TX Administrative Code Title 31, Part 2, Parks and Wildlife Code Title 5, Parks and Wildlife Proclamations 65.3 and 65.72	**Blue Marlin, White Marlin, Sailfish, Sharks, Longbill spearfish, and Broadbill swordfish** are gamefish and may only be taken with pole and line (including rod and reel); **Blue Marlin, White Marlin, Sailfish, and Longbill spearfish** may not be sold for any purpose; **Billfish** - Bag limit none; min size Blue Marlin – 131" TL; White Marlin – 86" TL; Sailfish – 84" TL; **Sharks** - Commercial/Recreational: bag limit - 1 shark/person/day; Commercial/Recreational possession limit is twice the daily bag limit (i.e., 2 sharks/person/day); min size 24" TL.	TX Parks & Wildlife Randy Blankinship Phone: 956/350-4490 Fax: 956/350-3470
Puerto Rico	X	X	X	X	Regulation #6768 Article 8 – General Fishing Limits Article 13 – Limitations Article 17 – Permits for Recreational Fishing (March 2004)	Sell, offer for sale, or traffic in any billfish or marlin, either whole or processed, captured in jurisdictional waters of Puerto Rico. Swordfish or billfish, tuna and shark are covered under the federal regulation known as Highly Migratory Species of the United States Department of Commerce (50 CFR, Part 635). Fishers who capture these species shall comply with said regulation. Billfish captured incidentally with long line must be released by cutting the line close to the fishhook, avoiding the removal of the fish from the water. In the case of tuna and swordfish, fishers shall obtain a permit according to the requirements of the Federal government.	Puerto Rico Department of Natural and Environmental Resources Craig Lilyestrom Phone: 787-724-8774 x4042 craig@caribe.net
U.S. Virgin Islands	X	X	X	X	US VI Commercial and Recreational Fisher's Information Booklet Revised June 2004	Federal regulations and federal permit requirements apply in territorial waters.	www.caribbeanfmc.com http://www.caribbeanfmc.com/usvi%20booklet/fisher%20booklet%20final.pdf

3.2 Status of the Stocks

The thresholds used to determine the status of Atlantic HMS are fully described in Chapter 3 of the 1999 Tunas, Swordfish, and Shark FMP and Amendment 1 to the Billfish FMP, and are presented in Figure 3.1. These thresholds are based on the thresholds described in a paper describing the technical guidance for implementing National Standard 1 of the Magnuson-Stevens Act (Restrepo *et al.*, 1998). These thresholds will not change as a result this Final Consolidated HMS FMP.

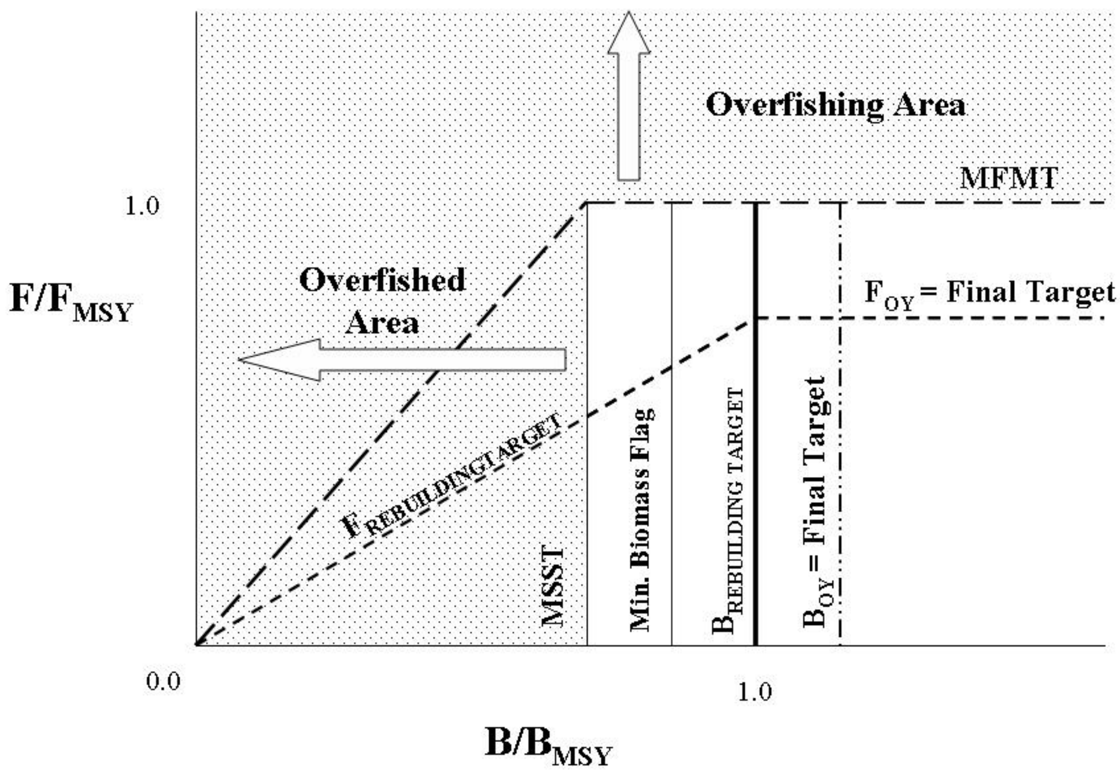


Figure 3.1 Illustration of the status determination criteria and rebuilding terms.

In summary, a species is considered overfished when the current biomass (B) is less than the minimum stock size threshold ($B < B_{MSST}$). The minimum stock size threshold (MSST) is determined based on the natural mortality of the stock and the biomass at maximum sustainable yield (B_{MSY}). Maximum sustainable yield (MSY) is the maximum long-term average yield that can be produced by a stock on a continuing basis. The biomass can be lower than B_{MSY}, and the stock not be declared overfished as long as the biomass is above B_{MSST}.

Overfishing may be occurring on a species if the current fishing mortality (F) is greater than the fishing mortality at MSY (F_{MSY}) ($F > F_{MSY}$). In the case of F, the maximum fishing mortality threshold is F_{MSY}. Thus, if F exceeds F_{MSY}, the stock is experiencing overfishing.

If a species is declared overfished or has overfishing occurring, action to rebuild the stock and/or prevent further overfishing is required by law. A species is considered rebuilt when B is greater than B_{MSY} and F is less than F_{MSY}. A species is considered healthy when B is greater than or equal to the biomass at optimum yield (B_{OY}) and F is less than or equal to the fishing mortality at optimum yield (F_{OY}).

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

- Maximum Fishing Mortality Threshold (MFMT) = F_{limit} = F_{MSY};
- Overfishing is occurring when $F_{year} > F_{MSY}$;
- Minimum Stock Size Threshold (MSST) = B_{limit} = $(1\text{-}M)B_{MSY}$ when $M < 0.5$ = $0.5B_{MSY}$ when $M >= 0.5$ (for billfish, the specific MSST values are: blue marlin = $0.9B_{MSY}$; white marlin = $0.85B_{MSY}$; west Atlantic sailfish = $0.75B_{MSY}$);
- Overfished when $B_{year}/B_{MSY} <$ MSST;
- Biomass target during rebuilding = B_{MSY};
- Fishing mortality during rebuilding < F_{MSY};
- Fishing mortality for healthy stocks = $0.75F_{MSY}$;
- Biomass for healthy stocks = B_{OY} = ~1.25 to $1.30B_{MSY}$;
- Minimum biomass flag = $(1\text{-}M)B_{OY}$; and
- Level of certainty of *at least* 50 percent but depends on species and circumstances.

This final Consolidated HMS FMP does not change these threshold levels. The current status of Atlantic HMS is provided in the table below. Numerous stock assessments are expected to occur in 2006 that could change this status. Those species expected to have new stock assessments in the near future are: LCS (the review workshop – last of three – June 5-9, 2006); marlin (May 15-19, 2006); BFT (June 12-18, 2006); swordfish (September 4-8, 2006); and SCS (first workshop of three early 2007). The results of the LCS stock assessment will not be considered complete until the review workshop document is finalized, likely in summer 2006.

Table 3.3 Stock Assessment Summary Table. Source: SCRS, 2004 and 2005, Cortes, 2002, and Cortes *et al.* 2002.

Species	Current Relative Biomass Level	Minimum Stock Size Threshold	Current Relative Fishing Mortality Rate	Maximum Fishing Mortality Threshold	Outlook**
West Atlantic Bluefin Tuna	SSB_{01}/SSB_{MSY} = 0.31 (low recruitment); 0.06 (high recruitment) SSB_{01}/SSB_{75} = 0.13 (low recruitment); 0.13 (high recruitment)	$0.86SSB_{MSY}$	F_{01}/F_{MSY} = 2.35 (low recruitment scenario) F_{01}/F_{MSY} = 4.64 (high recruitment scenario)	F_{year}/F_{MSY} = 1.00	Overfished; overfishing is occurring.
East Atlantic Bluefin Tuna	SSB_{00}/SSB_{70} = 0.86	*Not estimated*	F_{00}/F_{max} = 2.4	*Not estimated*	Overfished; overfishing is occurring.*
Atlantic Bigeye Tuna	B_{03}/B_{MSY} = 0.85-1.07	$0.6B_{MSY}$ *(age 2+)*	F_{02}/F_{MSY} = 0.73-1.01	F_{year}/F_{MSY} = 1.00	Overfished; overfishing is occurring.
Atlantic Yellowfin Tuna	B_{01}/B_{MSY} = 0.73 - 1.10	$0.5B_{MSY}$ *(age 2+)*	F_{01}/F_{MSY} = 0.87-1.46	F_{year}/F_{MSY} = 1.00	Approaching an overfished condition.
North Atlantic Albacore Tuna	B_{00}/B_{MSY} = 0.68 (0.52-0.86)	$0.7B_{MSY}$	F_{00}/F_{MSY} = 1.10 (0.99 - 1.30)	F_{year}/F_{MSY} = 1.00	Overfished; overfishing is occurring.
South Atlantic Albacore Tuna	B_{02}/B_{MSY} = 1.66 (0.74-1.81)	*Not estimated*	F_{02}/F_{MSY} = 0.62 (0.46-1.48)	*Not estimated*	Not overfished; overfishing not occurring.*
West Atlantic Skipjack Tuna	*Unknown*	*Unknown*	*Unknown*	F_{year}/F_{MSY} = 1.00	Unknown
North Atlantic Swordfish	B_{02}/B_{MSY} = 0.94 (0.75 - 1.26)	*Unknown*	F_{01}/F_{MSY} = 0.75 (0.54 - 1.06)	F_{year}/F_{MSY} = 1.00	Overfished; overfishing not occurring
South Atlantic Swordfish	*Unknown*	*Unknown*	*Unknown*	F_{year}/F_{MSY} = 1.00	Unknown
Blue Marlin	B_{00}/B_{MSY} = 0.4 (0.25 – 0.6)	$0.9B_{MSY}$	F_{99}/F_{MSY} = 4.0 (2.5 – 6.0)	F_{year}/F_{MSY} = 1.00	Overfished: overfishing is occurring
White Marlin	B_{01}/B_{MSY} = 0.12 (0.06 – 0.25)	$0.85B_{MSY}$	F_{00}/F_{MSY} = 8.28 (4.5 – 15.8)	F_{year}/F_{MSY} = 1.00	Overfished: overfishing is occurring

Species	Current Relative Biomass Level	Minimum Stock Size Threshold	Current Relative Fishing Mortality Rate	Maximum Fishing Mortality Threshold	Outlook**
West Atlantic Sailfish	*Unknown*	$0.75B_{MSY}$	*Unknown*	*Not estimated*	Overfished: Overfishing is occurring
Spearfish	*Unknown*	*Unknown*	*Unknown*	*Not estimated*	*Unknown*
LCS	$B_{01}/B_{MSY} = 0.46\text{-}1.18$	$0.8B_{MSY}$	$F_{01}/F_{MSY} = 0.89 – 4.48$	$F_{year}/F_{MSY} = 1.00$	Overfished; Overfishing is occurring
Sandbar	$B_{01}/B_{MSY} = 3.25E4\text{-}2.22$	$0.85B_{MSY}$	$F_{01}/F_{MSY} = 0.0015 – 2.45$	$F_{year}/F_{MSY} = 1.00$	Not overfished; Overfishing is occurring
Blacktip	$B_{01}/B_{MSY} = 0.79\text{-}1.66$	$0.8B_{MSY}$	$F_{01}/F_{MSY} = 0.13 – 1.72$	$F_{year}/F_{MSY} = 1.00$	Not overfished; No overfishing occurring
SCS	$B_{01}/B_{MSY} = 1.38\text{-}2.39$	$0.5 B_{MSY}$ to $0.8B_{MSY}$	$F_{00}/F_{MSY} = 0.24 - 0.78$	$F_{year}/F_{MSY} = 1.00$	Not overfished; No overfishing $F_{2000} => F_{OY}$
Pelagic sharks	*Unknown*	*Unknown*	*Unknown*	*Unknown*	*Unknown****

* South Atlantic albacore and East Atlantic bluefin tuna are not found in the U.S. EEZ.
** Based on "Sustaining and Rebuilding", National Marine Fisheries Service, 2004, - Report to Congress - The Status of U.S. Fisheries, August 2005.
*** Section 3.2.5 provides more information on the results of the stock assessment conducted by the SCRS in 2004 for blue and shortfin mako sharks and the stock assessment conducted by COSEWIC in 2005 for porbeagle sharks.

3.2.1 Atlantic Swordfish

3.2.1.1 Life History and Species Biology

Swordfish are members of the family *Xiphiidae*, in the suborder *Scombroidei*. Atlantic swordfish (*Xiphias gladius*) are one of the largest and fastest predators in the Atlantic Ocean, reaching a maximum size of 530 kg (1165 lb). Like other highly migratory species, they have developed a number of specialized anatomical, physiological, and behavioral adaptations (Helfman *et al*., 1997). Swordfish are distinguished by a long bill that grows forward from the upper jaw. This bill differs from that of marlins (family *Istiophoridae*) in that it is flattened rather than round in cross section, and smooth rather than rough. Swordfish capture prey by slashing this bill back and forth in schools of smaller fish or squid, stunning or injuring their prey in the process. They may also use the bill to spear prey, or as a defense during territorial encounters. Broken swordfish bills have been found embedded in vessel hulls and other objects (Helfman *et al.*, 1997).

Atlantic swordfish are usually found in surface waters but occasionally dive as deep as 650 meters. These large pelagic fishes feed throughout the water column on a wide variety of prey including groundfish, pelagics, deep-water fish, and invertebrate. Swordfish show extensive diel migrations and are typically caught on pelagic longlines at night when they feed in surface waters (SCRS, 2004). They are capable of migrating long distances to maximize prey availability and, as noted above, can prey upon various trophic levels during their daily vertical migrations (NMFS, 1999). As adults and juveniles, swordfish feed at the highest levels of the trophic food chain, implying that their prey species occur at low densities. The foraging behavior of swordfish reflects the broad distribution and scarcity of appropriate prey; they often aggregate in places where they are likely to encounter high densities of prey, including areas near current boundaries, convergence zones, and upwellings (Helfman *et al*., 1997).

Swordfish move thousands of kilometers annually and are distributed globally in tropical and subtropical marine waters. Their broad distribution, large spawning area, and prolific nature have contributed to the resilience of the species in spite of the heavy fishing pressure being exerted on it by many nations. During their annual migration, North Atlantic swordfish follow the major currents which circle the North Atlantic Ocean (including the Gulf Stream, Canary and North Equatorial Currents) and the currents of the Caribbean Sea and Gulf of Mexico. The primary habitat in the western north Atlantic is the Gulf Stream, which flows northeasterly along the U.S. coast, then turns eastward across the Grand Banks. North-south movement along the eastern seaboard of the United States and Canada is significant (NMFS, 2003). They are found in the colder waters during summer months and all year in the subtropical and tropical area (SCRS, 2003). Additional information on life history relating to habitat can be found in Section 3.3, Essential Fish Habitat, as well as the 1999 FMP for Atlantic Tunas, Swordfish, and Sharks.

Like most large pelagic species, swordfish have adapted body contours that enable them to swim at high speeds. Their streamlined bodies are round or slightly compressed in cross section (fusiform), and their stiff, deeply forked tails minimize drag. This streamlined physical form is enhanced by depressions or grooves on the body surface into which the fins can fit during swimming. The extremely small second dorsal and anal fins of the swordfish may function like the finlets of tuna, reducing turbulence and enhancing swimming performance. Their method of respiration, known as ram gill ventilation, requires continuous swimming with the mouth open to keep water flowing across the gill surfaces, thereby maintaining an oxygen supply. This respiratory process is believed to conserve energy compared to the more common mechanism whereby water is actively pumped across the gills (Helfman *et al*., 1997). In addition to the benefits of speed and efficiency, their search for prey is aided by coloring that provides camouflage in pelagic waters. This shading is darker along the dorsal side and lighter underneath, enhanced by silvery tones.

Swordfish exhibit other physiological characteristics that enable them to extend their hunting range. For example, swordfish can maintain elevated body temperatures, conserving the heat generated by active swimming muscles. Swordfish have developed a heat exchange system that allows them to swim into colder, deep water in pursuit of prey. Because warm muscles contract faster than cool ones, heat conservation is believed to enable these predatory fishes to channel more energy into swimming speed. The internal temperatures of these fishes remain fairly stable even as they move from surface waters to deep waters. Swordfish have also adapted specialized eye muscles for deep water hunting. Because their eye muscles do not have the ability to contract, they produce heat when stimulated by the nervous system, locally warming both the brain and eye tissues (Helfman *et al*., 1997). With this modification, swordfish are able to hunt in the frigid temperatures of deep-water ocean environments without experiencing a decrease in brain and visual function that might be expected under such harsh conditions.

Juvenile swordfish are characterized as having exceptionally fast growth during the first year (NMFS, 1999). Swordfish exhibit dimorphic growth, where females show faster growth rates and attain larger sizes than males. Young swordfish grow very rapidly, reaching about 130 cm lower jaw-fork length (LJFL) by age two. Swordfish are difficult to age, but 53 percent of females are considered mature by age 5, at a length of about 130 cm LJFL (SCRS, 2003; SCRS, 2004). Approximately 50 percent of males attain maturity by 112 cm LJFL (Arocha, 1997). All males are mature by 145 to 160 cm LJFL (37 to 50 kg ww), approximately age five, and all females are mature by 195 to 220 cm LJFL (93 to 136 kg ww), approximately age nine. In general, swordfish reach 140 cm LJFL (33 kg ww) by age three and are considered mature by age five. Individual females may spawn numerous times throughout the year (NMFS, 1999).

Swordfish stocks consist of several age classes, a condition that may serve as a buffer against adverse environmental conditions and confer some degree of stability on the stocks. Swordfish are also at a high trophic level, which may make the species less vulnerable to short-term fluctuations in environmental conditions (NMFS, 1999).

When ICCAT's Standing Committee on Research and Statistics (SCRS) scientists assess the status of Atlantic swordfish, the stock is split between the North Atlantic, South Atlantic, and Mediterranean Sea. The SCRS continues to examine existing information, including spawning data, tagging information, genetic studies, and abundance indices to better define stock structure. For the purposes of domestic management, the swordfish population is considered to consist of two discrete stocks divided at 5° N.

3.2.1.2 Stock Status and Outlook

The most recent assessment of North and South Atlantic swordfish stocks was conducted in 2002. In that assessment, updated CPUE and catch data through 2001 were examined. Sex and age-specific (North Atlantic) and biomass standardized catch rates (North and South Atlantic) from the various fleets were updated. The updated North Atlantic CPUE data showed similar trends to previous years, and also showed signs of improvement in stock status since 1998. In particular, the recruitment index (1997 – 2001) and the catch-at-age used in the 2002 North Atlantic assessment showed signs of substantially improved recruitment (age one), which has manifested in several age classes and the biomass index of some fisheries, and have allowed for increases in spawning biomass and a more optimistic outlook. The strong recruitments of the late 1990s promoted improvement in spawning stock biomass and should result in further improvement, if these year classes are not heavily harvested. The CPUE patterns in the South Atlantic by fleet showed contradictory patterns. Lack of important CPUE information from some fleets fishing in the South Atlantic prevented the SCRS from reconciling these conflicts (SCRS, 2004).

North Atlantic Swordfish (all weights are given in whole weight)

An updated estimate of maximum sustainable yield from production model analyses is 14,340 mt (range 11,500 to 15,500 mt). Since 1997, North Atlantic swordfish catches have been estimated to have remained below 14,340 mt, but the most recent years are provisional and probably represent underestimates. Details of catches for recent years are presented below in section 3.2.1.3. The biomass at the beginning of 2002 was estimated to be 94 percent (range: 75

to 124 percent) of the biomass needed to produce MSY. This estimate is up from an estimate of 65 percent of MSY in the 1998 assessment. The 2001 fishing mortality rate was estimated to be 0.75 times the fishing mortality rate at MSY (range: 0.54 to 1.06). The replacement yield for the year 2003 and beyond was estimated to be about the MSY level. As the TAC for North Atlantic swordfish for 2002 was 10,400 mt, it was considered likely that biomass would increase further under those catch levels. The TAC set for 2003 – 2005 was 14,000 mt (ICCAT Recommendation 02 – 02). Given recent fishing mortality patterns, the spawning biomass likely will increase largely owing to the very large recruitments estimated for 1997 – 2000 (SCRS, 2005). Further, given that recent (2002 – 2003) reported catch has been below estimated replacement yield, the North Atlantic swordfish biomass may have already achieved the B_{MSY} level. However, noting the uncertainties inherent in the assessment, the SCRS warned against large increases over the current TAC (SCRS, 2004). The next assessment is scheduled for 2006.

South Atlantic Swordfish

The SCRS noted that reported total catches have been reduced since 1995, as was recommended by the SCRS. SCRS had previously expressed serious concern about the trends in stock biomass of South Atlantic swordfish based on the pattern of rapid increases in catch before 1995 that could result in rapid stock depletion, and in declining CPUE trends of some bycatch fisheries. For the 2002 stock assessment, standardized CPUE series were available for three fleets, the targeted fishery of European Community (EC) - Spain, and the bycatch fisheries of Chinese Taipei and Japan. There was considerable conflict in trends among the three CPUE series and it is unclear which, if any, of the series tracks total biomass. It was noted that there was little overlap in fishing area among the three fleets, and that the three CPUE trends could track different components (or cohorts) of the population. To address this possibility, an age-structured production model was run as a sensitivity test. For the base case production model, the Committee selected the bycatch CPUE series combined using a simple unweighted mean and the targeted CPUE series. Due to some inconsistencies in the available CPUE trends reliable stock assessment results could not be obtained (SCRS, 2004). As stated above, the next assessment is scheduled for 2006.

Reported catches of Atlantic swordfish, including discards for the period 1950 – 2004 can be found in Figure 3.2. Estimated fishing mortality rate relative to the F_{MSY} for the period 1959 – 2001 can be found in Figure 3.3. Annual yield for North Atlantic swordfish relative to the estimated MSY can be found in Figure 3.4. A summary of Atlantic swordfish stock status can be found in Table 3.4

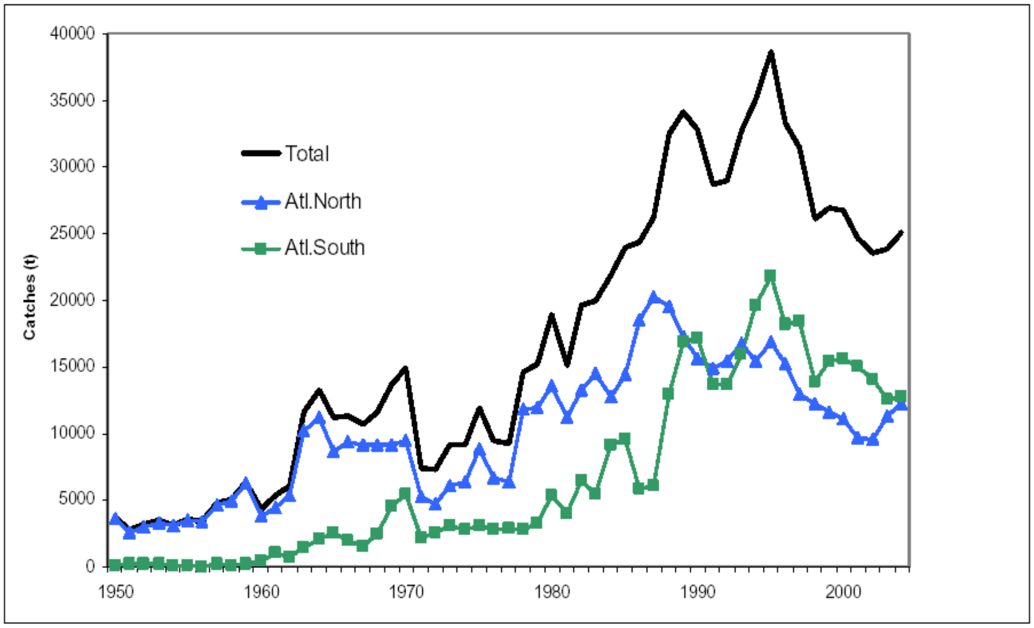


Figure 3.2 Reported catches (mt whole weight) of Atlantic Swordfish, including discards for 1950-2004. Source: SCRS, 2005.

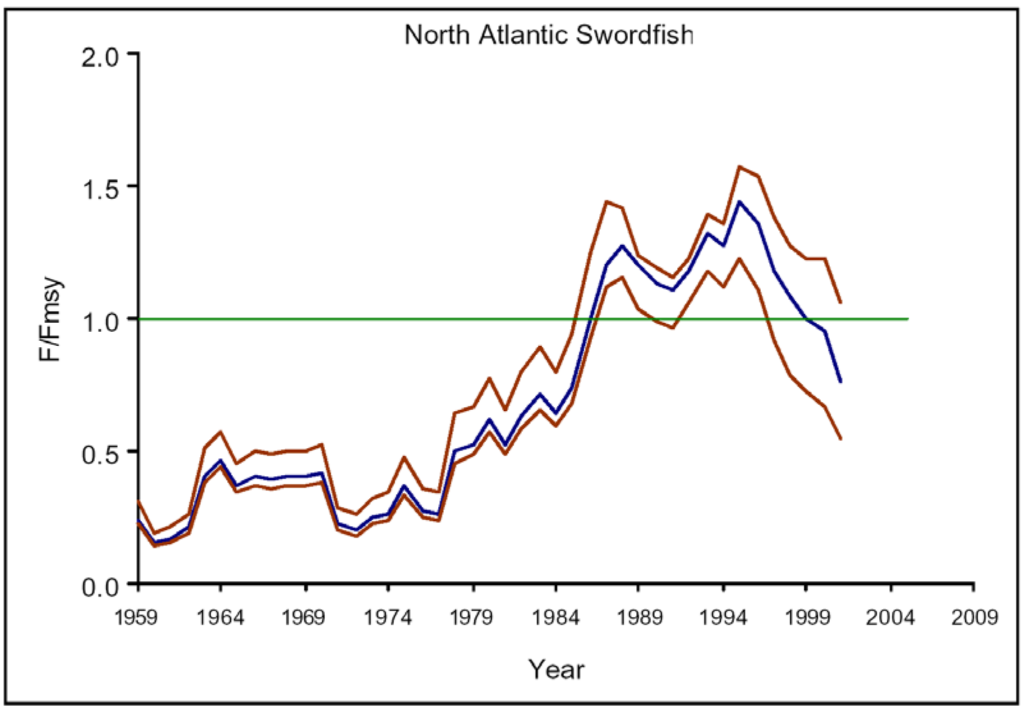


Figure 3.3 Estimated fishing mortality rate relative to FMSY (F/FMSY) for the period 1959-2001 (median with 80 percent confidence bounds based on bootstrapping are shown). Source: SCRS 2004.

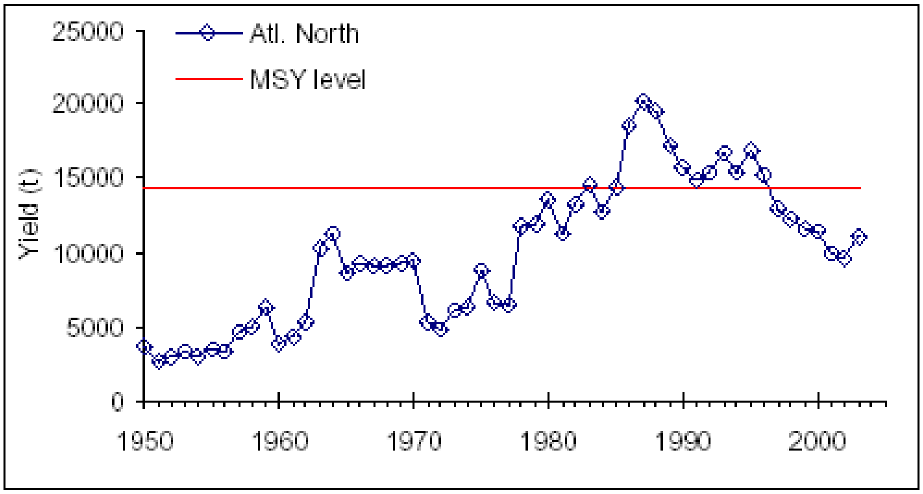


Figure 3.4 Annual yield (mt) (whole weight) for North Atlantic swordfish relative to the estimated MSY level. Source: SCRS 2004

Table 3.4 Atlantic Swordfish Stock Summary (weights given in mt ww). Source: SCRS, 2005.

ATLANTIC SWORDFISH SUMMARY		
	North Atlantic	**South Atlantic**
Maximum Sustainable Yield[1]	14,340 t (11,580-15,530)[4]	Not estimated
Current (2004) Yield[2]	12,283 t	12,779 t
Current (2002) Replacement Yield[3]	about MSY	Not estimated
Relative Biomass (B_{2002}/B_{MSY})	0.94 (0.75 - 1.24)	Not estimated
Relative Fishing Mortality		
F_{2001}/F_{MSY}[1]	0.75 (0.54 - 1.06)	Not estimated
F_{2000}/F_{max}	1.08	Not estimated
$F_{2000}/F_{0.1}$	2.05	Not estimated
$F_{2000}/F_{30\%SPR}$	2.01	Not estimated
Management Measures in Effect	Country-specific TACs [Rec. 02-02]; 125/119 cm LJFL minimum size.	TAC target [Ref. 02-03]; 125/119 cm LJFL minimum size [Rec. 02-02].

1 Base Case production model results based on catch data 1950-2001.
2 Provisional and subject to revision.
3 For next fishing year.
4 80% confidence intervals are shown.

3.2.1.3 Effect of Regulations

ICCAT Catch limits (all weights in this section are given in whole weight)

The total allowable catch in the North Atlantic in 2002 was 10,400 mt (10,200 mt retained and 200 mt discarded). The reported landings were about 9,000 mt and the estimated discards were about 535 mt. The total allowable catch in the North Atlantic in 2003 was 14,000 mt (13,900 mt retained and 100 mt discarded). The reported landings in 2003 were about 10,800 mt and the estimated discards were about 460 mt. The total allowable catch in the North Atlantic in 2004 was 14,000 mt. The reported landings in 2004 were 11,867 mt with discards totaling an estimated 417 mt. Reports for year 2004 are considered provisional and subject to change (SCRS, 2005).

The total allowable catch in the South Atlantic in 2002 was 14,620 mt. The reported landings for 2002 were about 13,660 mt and reported discards were 1 mt. The total allowable catch in the South Atlantic in 2003 was 15,631 mt. The reported landings for 2003 were about 10,900 mt and reported discards were estimated to be less than 1 mt. The total allowable catch in the South Atlantic in 2004 was 15,776. The reported landings in 2004 were 12,778 mt with discards totaling an estimated 1 mt. Reports for year 2004 are considered provisional and subject to change (SCRS, 2005).

ICCAT Minimum size limits (all weights in this section are given in whole weight)

There are two minimum size options that are applied to the entire Atlantic: 125 cm LJFL with a 15 percent tolerance for undersized fish, or 119 cm LJFL with zero tolerance and evaluation of the discards. In the absence of size data, these calculations could not be updated or examined for 2004. In 2000, the percentage of swordfish reported landed (throughout the Atlantic) less than 125 cm LJFL was about 21 percent (in number) overall for all nations fishing in the Atlantic. If this calculation is made using reported landings plus estimated discards, then the percentage less than 125 cm LJFL would be about 25 percent. The SCRS noted that this proportion of small fish did not increase very much even though recruitment in the North has been at a high level in recent years (SCRS, 2005). Literature Cited.

Domestic Regulations

The domestic commercial swordfish fishery is governed by a limited access permit system with three types of permits: directed swordfish, incidental swordfish, and swordfish handgear. Anglers must also possess either a HMS Angling category permit or a CHB permit to for fish for, retain, or possess a North Atlantic swordfish. Only commercial permit holders may sell swordfish. Details of the permitting programs, including the number of permit holders can be found in section 3.9. Data on commercial catches and landings of North Atlantic swordfish are captured through observer programs, logbook reports, and dealer reports. Additional information on commercial catches, landings, and discards can be found in Chapter 0 of this document. Approximately 154,000 square miles of the Atlantic, Gulf and Caribbean have been closed to pelagic longline fishing in an effort to reduce bycatch and discards of Atlantic HMS including juvenile swordfish. Effects of the area closures on bycatch and discards can be found in Chapter 4. Recreational landings of North Atlantic swordfish are captured through mandatory tournament reports (if a tournament is selected for reporting), mandatory self-reporting of non-tournament landings, and various surveys, including the Marine Recreational Fisheries Statistics Survey and the Large Pelagics Survey. .

The United States has implemented minimum legal size regulations for Atlantic swordfish that correspond to the ICCAT 119 cm minimum size limit. Domestic minimum sizes include: the 47" lower jaw fork length, 29" cleithrum to keel length, or 33 lbs. Vessels with commercial directed and handgear swordfish permits are not constrained by trip limits when the fishery is open. Directed swordfish permit holders are limited to 15 swordfish per vessel per trip when the directed swordfish fishery is closed. Incidental commercial permit holders are limited to two swordfish per trip, except for vessels deploying squid trawl gear, which may retain five. There is a recreational bag limit of one North Atlantic swordfish per person per trip, up to a maximum of three per vessel, regardless of the length of the trip.

3.2.1.4 Recent and Ongoing Research

(The following information was taken directly from the 2005 U.S. National Report to ICCAT)

In 2005, data from observer samples were compared against self-reported information from the U.S. large pelagic mandatory logbook reporting system, and estimates of discard mortality of swordfish, billfish, sharks and other species from the U.S. fleet were developed from that analysis for the 2005 SCRS. Estimates of small swordfish bycatch for 2002 – 2004 were compared to the average levels estimated for the late 1990's and were found to be substantially lower. Reported and observed swordfish catches, and size and catch rate patterns through 2004 were examined in support of monitoring the recovery of north Atlantic swordfish. Standardized indices of abundance were updated for the Western North Atlantic using data from the U.S. pelagic longline fleet (SCRS/2005/085). Collaborative research between various ICCAT nations and Venezuelan scientists continues on estimating the age-structure of the catch of swordfish. Results of this research will be available for the next assessment of north Atlantic swordfish. Scientists from the United States collaborated with Brazilian scientists to improve catch rate standardization procedures by offering a course on the topic in Brazil in mid-2005. Central to this collaboration is development of fisheries research capacity in Brazil through graduate student training and of stronger scientific cooperation between Brazil and the United States.

Research on measures to mitigate the interactions between pelagic longline and bycatch of marine turtles continued under a cooperative research program involving the US Atlantic pelagic longline fishery. The Northeast Distant Fishery Experiment was conducted from 2001 through 2003 on the high seas of the Western Atlantic Ocean, in an area off New Foundland known as the Grand Banks. Results of this research which was focused on reducing mortality of marine turtles interacting with pelagic longlines was recently published (Watson, *et.al.* 2005. Fishing methods to reduce sea turtle mortality associated with pelagic longlines. (Can. J. Fish. Aquat. Sci.. 62(5): 965-981). Additional cooperative research in the Gulf of Mexico was carried out in 2004 and in additional regions in 2005.

3.2.2 Atlantic Bluefin Tuna

All text, figures and tables for this section are from the SCRS 2004 and 2005 Reports and the U.S. National Report to ICCAT, 2005. All weights are reported as whole weights unless indicated as otherwise.

3.2.2.1 Life History and Species Biology

Atlantic bluefin tuna are distributed from the Gulf of Mexico to Newfoundland in the West Atlantic, from roughly the Canary Islands to south of Iceland in the East Atlantic, and throughout the Mediterranean Sea. Historically, catches of bluefin were made from a broad geographic range in the Atlantic and Mediterranean.

Atlantic bluefin tuna can grow to over 300 cm and reach more than 650 kg. The oldest age considered reliable is 20 years, based on an estimated age at tagging of two years and about 18 years at liberty, although it is believed that bluefin tuna may live to older ages. Bluefin tuna are, thus, characterized by a late age at maturity (thus, a large number of juvenile classes) and a long life span. These factors contribute to make bluefin tuna well adapted to variations in recruitment success, but more vulnerable to fishing pressure than rapid growth species such as tropical tuna species. Bluefin tuna in the West Atlantic generally reach a larger maximum size compared to bluefin caught in the East Atlantic.

Bluefin tuna in the West Atlantic are assumed to first spawn at age eight compared to ages four to five in the east Atlantic. Distribution expands with age; large bluefin are adapted for migration to colder waters. Bluefin tuna are opportunistic feeders, with fish, squid, and crustaceans common in their diet. In the West Atlantic, bluefin tuna are thought to spawn from mid-April into June in the Gulf of Mexico and in the Florida Straits. Juveniles are thought to occur in the summer over the continental shelf, primarily from about 35°N to 41°N and offshore of that area in the winter. In the East Atlantic, bluefin tuna generally spawn from late May to July depending on the spawning area, primarily in the Mediterranean, with highest concentrations of larvae around the Balearic Islands, Tyrrhenian Sea, and central and eastern Mediterranean where the sea-surface temperature of the water is about 24°C. Sexually mature fishes have also been recently observed in May and June in the eastern Mediterranean (between Cyprus and Turkey). Bluefin tuna are known to be highly migratory and the nature and extent of their ability to conduct transoceanic migrations are the subject of significant research (see section on Research below).

3.2.2.2 Stock Status and Outlook

The last full stock assessments for western Atlantic bluefin tuna were conducted in 2002 by the SCRS with the next scheduled for 2006. Although the next stock assessment will not be conducted until mid-2006, the 2005 SCRS reported a significant number of new research reports and studies (see Research Section below). The assessment results are similar to those from previous assessments (see

Table 3.5). They indicate that the spawning stock biomass (SSB) declined steadily from 1970 (the first year in the assessment time series) through the late 1980s, before leveling off at about 20 percent of the level in 1975 (which has been a reference year used in previous assessments). A steady decline in SSB since 1997 is estimated and leaves SSB in 2001 at 13 percent of the 1975 level. The assessment also indicates that the fishing mortality rate during 2001 on the SSB is the highest level in the series.

A noteworthy pattern of change in the fisheries since 1998 has been the trend of increase followed by a trend of decrease in catches to below TAC level. The reported total catches of western Atlantic bluefin tuna increased from about 2600 mt in 1998 to about 3,200 mt in 2002 and has subsequently fallen below 2,000 mt in 2004. The 2002 catches were the highest since 1981; however the 2004 catches were the lowest since 1982, when ICCAT catch restrictions were first established.

The Japanese longline fishery catch in the West Atlantic in 2003 was a substantial decrease from its 2002 catch level, but increased in 2004 to a level somewhat below its average catch from 1993 – 2002. This variation resulted from the adjustments made by Japan for previous quota overages. The Canadian reported landings remained at relatively stable levels over the past decade. Recent declines in U.S. landings have been attributed to a general lack of availability of large fish in the fisheries off the northeastern U.S. coast for the past several years.

Estimates of recruitment of age one fish have been generally lower since 1976. However, recruitment of age one fish in 1995 and 1998 is estimated to be comparable in size to some of the year classes produced in the first half of the 1970s. While the large decline in SSB since the early 1970s is clear from the assessment, the potential for rebuilding is less clear. Key issues are the reasons for relatively poor recruitment since 1976, and the outlook for recruitment in the future. One school of thought is that recruitment has been poor because the SSB has been low. If so, recruitment should improve to historical levels if SSB is rebuilt. Another school of thought is that the ecosystem changed such that it is less favorable for recruitment and thus recruitment may not improve even if SSB increases. To address both schools of thought, the SCRS considered two recruitment scenarios as described below and summarized in Table 3.5. (East Atlantic Bluefin tuna summary data are also provided for comparison purposes). For both scenarios, the assessment indicates that the fishing mortality on the western Atlantic bluefin resource exceeds F_{MSY} and the SSB is below B_{MSY} (thus overfished according to ICCAT's objective of maintaining stocks at the MSY-biomass level and as indicated in NMFS, Report to Congress, Status of Fisheries, 2005).

Table 3.5 Summary Table for the Status of West Atlantic Bluefin Tuna. Source: ICCAT, 2005.

Age/size at Maturity	Age 8/~ 200 cm fork length
Spawning Sites	Primarily Gulf of Mexico and Florida Straits
Current Relative Biomass Level *Minimum Stock Size Threshold*	SSB_{01}/SSB_{75} (low recruitment) = .13 (.07-.20) SSB_{01}/SSB_{75} (high recruitment) = .13 (.07-.20) SSB_{01}/SSB_{msy} (low recruitment) = .31 (.20-.47) SSB_{01}/SSB_{msy} (high recruitment) = .06 (.03-.10) *0.86*B_{MSY}
Current Relative Fishing Mortality Rate *Maximum Fishing Mortality Threshold*	F_{01}/F_{MSY} (low recruitment) = 2.35 (1.72-3.24) F_{01}/F_{MSY} (high recruitment) = 4.64 (3.63-6.00) F/F_{MSY} = 1.00
Maximum Sustainable Yield	Low recruitment scenario: 3,500 mt (3,300-3,700) High recruitment scenario: 7,200 mt (5,900-9,500)
Catch (2004) including discards	~2,000 mt
Short Term Sustainable Yield	Probably > 3,000 mt
Outlook	Overfished; overfishing continues to occur

Table 3.6 Summary Table for the Status of East Atlantic Bluefin Tuna. Source: ICCAT, 2005.

Age/size at Maturity	Age 4-5
Spawning Sites	Mediterranean Sea
Current Relative Biomass Level	SSB_{00}/SSB_{1970} = .86
Current Relative Fishing Mortality Rate	F_{00}/F_{MAX} = 2.4
Maximum Sustainable Yield	Not estimated
Current (2004) Yield	26,961 mt
Replacement Yield	Not estimated
Outlook	Overfished; overfishing continues to occur.

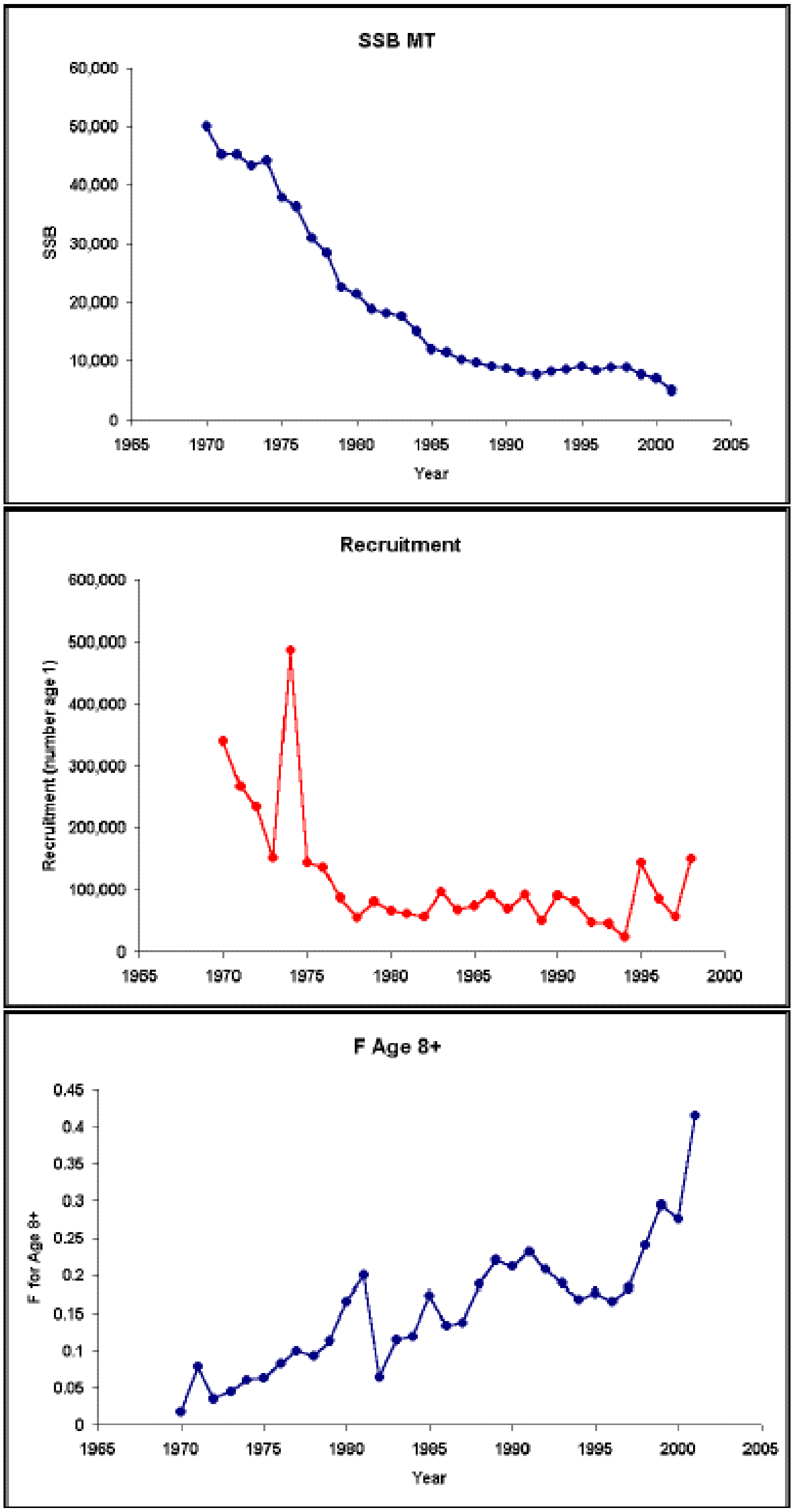


Figure 3.5 Western Atlantic bluefin tuna spawning biomass (t), recruitment (numbers) and fishing mortality rates for fish of age 8+, estimated by the Base Case VPA run. Source: ICCAT, 2004.

In general, the outlook for bluefin tuna in the West Atlantic is similar to the outlook reported based on the 2000 western Atlantic bluefin tuna assessment session. The assessment and projection results for the present assessment are somewhat less optimistic than in 2000 but the confidence in the strength of the 1994 year class has increased. Therefore, the increases associated with different levels of future catch projected for the short-term are smaller but are estimated more confidently. It should be noted that the 1995 year class was estimated to be strong in 2000, but it is now estimated to be only of average strength.

As noted by the previous assessment session, western Atlantic bluefin tuna catches have not varied very much since 1983 (the range over this period is 2,106 to 3,011 mt), and the estimated spawning stock size (Spawning Stock Biomass (SSB) measured as the biomass of fish age 8+) has been relatively stable, notwithstanding the indication of a decline in the most recent years. Thus, over an extended period of time, catches around recent levels have maintained stock size at about the same level, in spite of several past assessments that predicted the stock would either decline or grow if the current catch was maintained. This observation highlights the challenge of predicting the outlook for this stock.

In order to provide advice relative to rebuilding the western Atlantic bluefin resource, the SCRS conducted projections for two scenarios about future recruitment. One scenario assumed that future average recruitment will approximate the average estimated recruitment (at age one) since 1976, unless spawning stock size declines to low levels (such as the current level estimated in the assessment, but generally lower than estimates during most of the assessment history). The second scenario allowed average recruitment to increase with spawning stock size up to a maximum level no greater than the average estimated recruitment for 1970 to 1974. These scenarios are referred to as the low recruitment and high recruitment scenarios, respectively. The low and high recruitment scenarios implied that the B_{MSY} (expressed in SSB) is 42 percent and 183 percent of the biomass in 1975, respectively. With the current information, the SCRS could not determine which recruitment scenario is more likely, but both are plausible, and recommended that management strategies should be chosen to be reasonably robust to this uncertainty.

Table 3.7 below summarizes the results of projections of both scenarios at different catch levels. The projections for the low recruitment scenario estimated that a constant catch of 3,000 mt per year has an 83 percent probability of allowing rebuilding to the associated SSB_{MSY} by 2018. A constant catch of 2,500 mt per year has a 35 percent probability of allowing rebuilding to the 1975 SSB by 2018.

The results of projections based on the high recruitment scenario estimated that a constant catch of 2,500 mt per year has a 60 percent probability of allowing rebuilding to the 1975 level of SSB, and there is a 20 percent chance of rebuilding SSB to SSB_{MSY} by 2018. If the low recruitment scenario is valid, the TAC could be increased to at least 3,000 mt without violating ICCAT's rebuilding plan. If the high recruitment scenario is valid, the TAC should be decreased to less than 1,500 mt to comply with the plan.

The estimate of SSB_{MSY} for the high recruitment scenario is critical to inferences regarding the probability of achieving rebuilding under different future levels of catch, and also less well determined by the data than SSB_{MSY} for the low recruitment scenario. In particular, the estimates of SSB_{MSY} based on the high recruitment scenario are substantially larger than the largest spawning stock size included in the assessment. This extrapolation considerably increases the uncertainty associated with these estimates of SSB_{MSY}. Previous meetings have used SSB_{1975} as a rebuilding target in the context of interpreting projections. Arguably SSB_{1975} is appropriate as a target level for interpreting the implications of projections based on the high recruitment scenario. Under such a target level for the high recruitment scenario, a TAC of 2,700 mt has an estimated probability of reaching the rebuilding level of about 50 percent.

The SCRS cautioned that these conclusions do not capture the full degree of uncertainty in the assessments and projections. An important factor contributing to uncertainty is mixing between fish of eastern and western origin. Furthermore, the projected increases in stock size are strongly dependent on estimates of recent recruitment, which are a particularly uncertain part of the assessment. A sensitivity test in which the estimates of the below average 1996 and the strong 1997 year classes were excluded from the analysis gave somewhat less optimistic results in terms of the estimated probabilities of recovery by 2018. However, these projections still predicted increases in spawning biomass for both recruitment scenarios, except for extreme increases in catch.

Table 3.7 Probability of western Atlantic bluefin tuna achieving rebuilding target by 2018. Source: ICCAT, 2004.

Catch	Low Recruitment Scenario		High Recruitment Scenario	
(MT)	SSB_{1975}	SSB_{MSY}	SSB_{1975}	SSB_{MSY}
500	95 %	100 %	98 %	73 %
1,000	89 %	100 %	96 %	62 %
1,500	77 %	100 %	87 %	47 %
2,000	60 %	99 %	75 %	30 %
2,300	45 %	98 %	66 %	24 %
2,500	35 %	97 %	60 %	20 %
2,700	26 %	95 %	52 %	17 %
3,000	14 %	83 %	38 %	11 %
5,000	0 %	1 %	2 %	0 %

3.2.2.3 Effects of Regulations

The SCRS' management recommendation for the western Atlantic bluefin tuna management area is directed at the Rebuilding Program adopted by ICCAT in 1998. According to the Program, the MSY rebuilding target can be adjusted according to advice from SCRS. In 2002, ICCAT set the annual Total Allowable Catch (TAC), inclusive of dead discards, for the western Atlantic management area at 2,700 mt, effective beginning in 2003. The Program states that the TAC for the west would only be adjusted from the 2,500 mt level adopted for 2003 – 2004 if SCRS advises that (a) a catch of 2,700 mt or more has a 50 percent or greater probability of rebuilding or (b) a catch of 2,300 mt or less is necessary to have a 50 percent or greater probability of rebuilding.

The Program is designed with the intent to rebuild with 50 percent probability by 2018 to the spawning biomass level associated with MSY. In light of the uncertainty in the assessment, the choice between recruitment scenarios and rebuilding targets, and assumptions about mixing, the weight of scientific opinion within the SCRS favored no change from the current TAC of 2,500 mt per year. Projections based on the low recruitment scenario indicate that the TAC could be increased without violating the Rebuilding Program, assuming that relatively large recruitment estimates for some recent year classes are realistic. The high levels of recruitment estimated for some recent year classes are consistent with a higher biomass level as a rebuilding target. In previous assessment sessions, the spawning biomass level in 1975 was considered a useful rebuilding target. The 1975 biomass is more than twice the MSY spawning biomass level associated with the low recruitment scenario. The projections indicate a 35 – 60 percent probability of rebuilding to the 1975 spawning biomass level for a catch of 2,500 mt per year, depending on the recruitment scenario assumed. It seems likely that a recruitment scenario corresponding to a SSB_{MSY} equal to the level in 1975 would indicate a probability of rebuilding by 2018 for a catch of 2,500 mt per year within the range of 35 – 60 percent.

The MSY spawning biomass associated with the high recruitment scenario, which is nearly twice the 1975 level, is unlikely to be reached by 2018 if the recent level of catch (and TAC) is maintained. However, the SCRS does not recommend the sharp reduction in TAC that would be necessary to comply with the rebuilding Program based on the high recruitment scenario because of:

- Uncertainty about the most appropriate recruitment scenario;
- Recognition that for the high recruitment scenario, the spawning biomass associated with MSY is not well determined (because estimation leads to extrapolation beyond biomass levels included within the current assessment); and
- The generally positive outlook for the resource according to the current assessment regardless of the recruitment scenario assumed.

As emphasized in previous assessments, mixing across management unit boundaries of fish of western and eastern origin could be important for management of the resource in both areas. In particular, the condition of the eastern Atlantic stock and fishery could adversely affect recovery in the West Atlantic, which was also noted in the SCRS's 1998, 2000, and 2001 reports. Therefore, the SCRS stressed the importance of continuing efforts to manage the fisheries in both the east and West Atlantic according to ICCAT's objectives.

The first regulatory measure for a scientific monitoring level was adopted for western Atlantic bluefin catches in 1981. Since then, monitoring levels have been changed in various years. Until 1987, both estimated catches and landings were below or equal to the level of the catch limits. However, from 1988 to 1997, estimated landings were very close to the level of the limits and, for some years, exceeded the limit by a maximum of 100 mt. Estimated catches (including discards) were higher than the limits every year during this period (by about 200 to 300 mt) with the exceptions of 1992 and 1997. The estimated catches exceeded the 2,500 mt limit in 2000 by 165 mt, by 218 mt in 2001, and by 715 mt in 2002. It should be pointed out that for compliance purposes, some countries (including the United States) are using fishing years that do not correspond to calendar years. Also, according to the ICCAT regulatory measure, the amount of catch that exceeded quota or was left over from the quota can be carried over to succeeding years. Hence, the catch limit set for each year could have been adjusted accordingly. The SCRS notes that the excess of the catch limits in most recent years is due to some new fisheries that operated without a quota.

For the West Atlantic, a size limit of 6.4 kg with 15 percent allowance, in number of fish, has been in effect since 1975. In addition, a prohibition on the taking and landing bluefin tuna less than 30 kg (or 115 cm) with an eight percent tolerance, by weight on a national basis, became effective in 1992. The SCRS notes that, since 1992, the proportion of undersized fish for all catches combined has been below the allowance level (*e.g.*, one percent and three percent <115cm in 2000 and 2001, respectively). Updated estimates will be available at the upcoming 2006 SCRS stock assessment.

The U.S. bluefin fishery continues to be regulated by quotas, seasons, gear restrictions, limits on catches per trip, and size limits. To varying degrees, these regulations are designed to restrict total U.S. landings and to conform to ICCAT recommendations. U.S. 2004 provisional estimated landings and discards from the northwest Atlantic (including the Gulf of Mexico), as reported by the United States to ICCAT in its annual National Report (NMFS 2005), were 899 mt and 71 mt, respectively. Those estimated landings and discards represent a decrease of 509 mt from the 2003 estimates. (Out of a total western Atlantic management area TAC of 2,700 mt, total reported catches were 2,191 mt in 2003 and about 2,000 mt in 2004). The 2004 United States landings by gear were: 32 mt by purse seine, 41 mt by harpoon, 1 mt by handline, 180 mt by longline (including discards) of which 103 mt were from the Gulf of Mexico, and 716 mt by rod and reel.

In response to 1992 regulations limiting the allowable catch of small fish by U.S. fishermen, in conformity with ICCAT agreements, enhanced monitoring of the rod and reel fishery was implemented in 1993 for the purpose of providing near real-time advice on catch levels by this fishery. This monitoring activity has continued and has included estimation of catches by finer scale size categories than reported above. The preliminary estimates for the 2004 rod and reel fishery off the northeastern United States (including the North Carolina winter fishery) for landings in several size categories were 264 fish < 66 cm, 10,193 fish 66-114 cm, 3,414 fish 115-144 cm, and 634 fish 145-177 cm (an estimated 1.5, 198, 142, and 49 mt, respectively), (NMFS 2005).

3.2.2.4 Recent and Ongoing Research

As part of its commitment to the Bluefin Program, research supported by the United States has concentrated on ichthyoplankton sampling, reproductive biology, and methods to evaluate hypotheses about movement patterns, spawning area fidelity, stock structure investigations and population modeling analyses.

Ichthyoplankton surveys in the Gulf of Mexico during the bluefin spawning season were continued in 2004 and 2005. Data resulting from these surveys, which began in 1977, are used to develop a fishery-independent abundance index of spawning West Atlantic bluefin tuna. This index has continued to provide one measure of bluefin abundance that is used in SCRS assessments of the status of the resource. During the 2004 U.S. ichthyoplankton survey, a plankton net of a type used in the Spanish surveys was fished in addition to the nets normally used to determine the impact of using a wider net mouth and larger mesh on the size and catch rates of bluefin in the Gulf of Mexico. The results of this work will be reported as they become available. U.S. scientists also collaborated in development of the larval working group agenda for the Climate Impacts on Oceanic Top Predators (CLIOTOP) program managed by GLOBEC (Global Ocean Ecosystem Dynamics) initiated by SCOR and the IOC of UNESCO in 1991.

Since 1998, researchers from Texas A & M University and the University of Maryland with assistance of researchers from Canada, Europe, and Japan have studied the feasibility of using otolith chemical composition (microconstituents and isotopes) to distinguish bluefin stocks. Recent research has investigated the value of using additional microconstituent elements (transitional metals) to enhance classification success. By themselves the transitional metals provided little discriminatory power, but when combined with the other trace elements (for 13 elements in all), the classification success for several year-classes has been moderate ranging from 60 – 90 percent, and classification functions show strong year-to-year variability. In SCRS/2005/083 the utility of an alternative chemical marker in otoliths, carbon and oxygen stable isotopes, to discriminate bluefin tuna from natal regions were reported upon. The discriminatory power of stable isotopes ($\delta_{13}C$, $\delta_{18}O$) in otoliths of yearlings (age-1) was high, with 91 percent of individuals classified correctly to eastern and western nurseries. These stable isotopes and in particular $\delta_{18}O$ can be used to reliably predict nursery origin of Atlantic bluefin tuna. An initial application compared otolith core material (corresponding to the first year of life) of large school, medium, and giant category bluefin tuna to reference samples of yearling signatures to determine their origin. A large fraction (~43 – 64 percent) of the Atlantic bluefin tuna collected in the western Atlantic fishery (comprised primarily of large school and medium category fish) originated from nurseries in the east. Alternatively, medium and giant category bluefin tuna from the Mediterranean were largely (~82 – 86 percent) of eastern origin. Thus, initial evidence suggests that the western fishery received high input from the Mediterranean population. (See generally SCRS/2003/105, and Rooker et al 2001a, 2001b and 2003).

Scientists from the University of Maryland, Virginia Institute of Marine Science, and Texas A&M University have continued to sample specimens for genetic and otolith chemistry studies of stock structure. Roughly 10 – 20 young of the year were collected in 2004. In addition, limited sampling of ages 1 and older continues. Efforts are also continuing to obtain samples from juveniles and mature bluefin from the Mediterranean Sea and adjacent waters.

In response to the ICCAT Commission's request for options for alternative approaches for managing mixed populations of Atlantic bluefin tuna, SCRS/2005/108 further examined some implications of incorporating electronic tagging information on transfer rates into virtual population analyses. SCRS/2005/084 examined yield and spawner per recruit consequences of different assumed levels of mixing between eastern and western bluefin stocks to provide guidance to the Commission as requested at the 3rd Meeting of Working Group to Develop Coordinated and Integrated Bluefin Tuna Management Strategies. Researchers at the Imperial College, London, continue work with the University of Miami, the University of New Hampshire and the National Marine Fisheries Service to develop methods to estimate bluefin movement and fishing mortality rate patterns (SCRS/2005/048). Operating models are being developed which will use conventional and electronic tagging data and fishing effort by management area. These models will be used to examine possible harvest control rules and the evaluation of possible management procedures.

U.S. scientists from Stanford and Duke University along with the Monterey Bay Aquarium and NMFS have placed over 700 electronic tags in bluefin tuna in the region along the U.S. coast of North Carolina. The data from implantable archival tags has been critical for establishing the basic biology of Atlantic bluefin and the patterns of movements to feeding and breeding grounds. Results from a large number of these tags were interpreted in a paper in the journal Nature in 2005 (Block *et al.* 2005). Tagging off the Carolinas, in the Gulf of Maine, and elsewhere continued in 2004 and 2005 and more than 90 tags were placed in fish off the Carolinas in 2005. The tags are due to report 7 – 9 months from the deployment dates and will be further reported upon as results become available.

U.S. scientists from the University of New Hampshire have placed over 200 pop-up satellite archival tags on New England bluefin tuna. Ongoing efforts include examining short and long-term dispersals of bluefin in the Gulf of Maine, the identification of spawning grounds, the spatial correlation between bluefin locations and oceanographic features and continuing to determine Atlantic-wide migratory paths. Results from much of this tagging effort were recently published in the journal Marine Biology (Wilson, *et.al.* 2005).

A new research initiative in 2005 involving scientists from the University of New Hampshire, the Virginia Institute of Marine Science, and Virginia SeaGrant will place electronic tags on juvenile bluefin from off the U.S. coast of Virginia. As results become available, they will be reported upon.

A recent publication by Fromentin and Powers (2005), titled "Atlantic bluefin tuna: population dynamics, ecology, fisheries and management" provides an extensive summary of old and new information on the biology and ecology of Atlantic bluefin tuna and associated fishery management implications. The abstract reads as follows:

> "Both old and new information on the biology and ecology of Atlantic bluefin tuna have confronted scientists with research challenges: research needs to be connected to current stock-assessment and management issues. We review recent studies on habitat, migrations and population structure, stressing the importance of electronic tagging results in the modification of our perception of bluefin tuna population dynamics and behavior. Additionally, we question, from both scientific and management perspectives, the usefulness of the classical stock concept and suggest other approaches, such as Clark's contingent and metapopulation theories. Current biological information confirms that a substantial amount of uncertainty still exists in the understanding of reproduction and growth. In particular, we focus on intriguing issues such as the difference in age-at-maturity between West Atlantic and Mediterranean bluefin tuna. Our description of Atlantic bluefin tuna fisheries places today's fishing patterns within the two millennium history of exploitation of this species: we discuss trap fisheries that existed between the 17th and the early 20th centuries; Atlantic fisheries during the 1950s and 1960s; and the consequences of the recent development of the sushi–sashimi market. Finally, we evaluate stock status and management issues since the early 1970s. While important

uncertainties remain, when the fisheries history is confronted with evidence from biological and stock-assessment studies, results indicate that Atlantic bluefin tuna has been undergoing heavy overfishing for a decade. We conclude that the current exploitation of bluefin tuna has many biological and economic traits that have led several fish stocks to extreme depletion in the past."

In 1982, ICCAT established a line separating the eastern and western Atlantic management units based on discontinuities in the distribution of catches at that time in the Atlantic and supported by limited biological knowledge. The United States is allocated quota from the western Atlantic management unit where the U.S. fisheries primarily occur. However, the overall distribution of the catch in the 1990s is much more continuous across the North Atlantic than was seen in previous decades. Tagging evidence indicates that movement of bluefin across the current east/west management boundary in the Atlantic does occur, that movements can be extensive (including trans-atlantic) and complex, that there are areas of concentration of electronically tagged fish (released in the west) in the central North Atlantic just east of the management boundary, and that fisheries for bluefin tuna have developed in this area in the last decade. At least some of these fish have moved from west of the current boundary.

Complementary studies, which might show east to west movement, are less advanced. The composition and natal origin of these fish in the central North Atlantic area are not known. The SCRS emphasizes that "it is clear that the current boundary does not depict our present understanding of the biological distribution and biological stock structure of Atlantic bluefin tuna." The SCRS also notes that "the current boundary is a *management* boundary and its effectiveness for management is a different issue."

There has been an accumulation of evidence on bluefin tuna mixing in the last few years through the collection of tagging data and its examination through the modeling of mixing scenarios for evaluating their effect on management. However, the origin of fish older than one year still remains unknown. Mixing results were reviewed in 2001 by the Workshop on Bluefin Tuna Mixing. This research led to a long-term plan for modeling finer scale spatial mixing and to short-term strategies for assessment to assist the advice for management. The data and research were reviewed again in 2002.

ICCAT, at its 2002 Meeting in Bilbao, called for a *Working Group to Develop Integrated and Coordinated Atlantic Bluefin Tuna Management Strategies,* which met in 2003 and again in 2004. In response to the recommendations from these meetings, the SCRS is developing a revised proposal for initiating a coordinated Bluefin Tuna Research Program to address priority research and data needs for providing scientific advice to ICCAT related to revised management procedures for bluefin tuna. Uncertainty exists regarding the importance and impacts of mixing on western stocks. The most important uncertainty regarding management advice by the SCRS for the eastern stock is the uncertainty in the catch data that are being taken.

More than 20 scientific documents related to bluefin tuna biology were presented to the 2005 SCRS. Many of the contributions dealt with the important issue of stock structure and mixing, and new information is available for both stocks. In particular, studies of otolith microchemistry and genetics have resulted in advances in our understanding of this component of the biology of bluefin tuna. These results continue to advance our knowledge about the overlapping distribution of fish originating from the east and the west. Therefore, the SCRS continues to question present hypotheses on stock identification. While these results are promising, more complete sampling and development of appropriate analytical approaches are required. The SCRS also received contributions relating to age and growth, sampling, parasitology and condition of bluefin tuna.

3.2.3 Atlantic BAYS Tuna

All text, figures and tables for this Section are from the SCRS 2004 and 2005 Reports and the U.S. National Report to ICCAT, 2005. All weights are reported as whole weights unless indicated as otherwise.

3.2.3.1 Atlantic Bigeye Tuna

Life History and Species Biology

The geographical distribution of bigeye tuna is very wide and covers almost the entire Atlantic Ocean between 50°N and 45°S. This species is able to dive deeper than other tuna species and exhibits extensive vertical movements. Similar to the results obtained in other oceans, pop-up tagging and sonic tracking studies conducted on adult fish in the Atlantic has revealed that they exhibit clear diurnal patterns being much deeper in the daytime than at night. Spawning takes place in tropical waters when the environment is favorable. From the nursery areas in tropical waters, juvenile fish tend to diffuse into temperate waters as they grow larger. Catch information from the surface gears indicate that the Gulf of Guinea is a major nursery ground for this species.

Dietary habits of bigeye tuna are varied such that prey organisms like fish, mollusks, and crustaceans are found in stomach contents. A growth study based on otolith and tagging data resulted in the adoption by the SCRS of a new growth curve (Report of the SCRS, 2004). The curve shows bigeye tuna exhibit relatively fast growth: about 105 cm in fork length at age three, 140 cm at age five, and 163 cm at age seven. Bigeye tuna become mature at about age three and a half. Young fish form schools mostly mixed with other tunas such as yellowfin and skipjack. These schools are often associated with drifting objects, whale sharks, and sea mounts. This association appears to weaken as bigeye tuna grow larger. An estimate of natural mortality (M) for juvenile fish was provided based on the results of a tagging program. According to this study, mortality for juvenile fish only is at a similar level of M as that currently used for the entire Atlantic stock as well as the level of M used for all other oceans. Various evidence including a genetic study, the time-area distribution of fish, and movements of tagged fish suggest an Atlantic-wide single stock for this species, which is currently accepted by the SCRS. However, the possibility of other scenarios, such as north and south stocks, should not be disregarded.

Stock Status and Outlook

ICCAT's SCRS conducted a new stock assessment for bigeye tuna in July 2004 using various types of models. However, there were considerable sources of uncertainty arising from the lack of information regarding (a) reliable indices of abundance for small bigeye from surface fisheries, (b) the species composition of Ghanaian fisheries that target tropical tunas, and (c) details on the historical catch and fishing activities of Illegal, Unregulated, Unreported (IUU) fleets (*e.g*., size, location and total catch).

Three indices of relative abundance were available to assess the status of the stock (Figure 3.6). All were from longline fisheries conducted by Japan, Chinese Taipei, and United States. While the Japanese indices have the longest duration since 1961 and represent roughly 20 – 40 percent of the total catch, the other two indices are shorter and generally account for a smaller fraction of the catch than the Japanese fishery. These three indices primarily relate to medium and large-size fish.

Various types of production models were applied to the available data and the SCRS notes that the current year's model fits to the data were better than in past assessments, although they required similar assumptions regarding stock productivity. The point estimates of MSY obtained from different production models ranged from 93,000 mt to 113,000 mt. The lower limit of this range is higher than the one estimated in the 2002 assessment, probably due to the revised indices and the addition of a new index. An estimate obtained from another age-aggregated model was 114,000 mt. The inclusion of estimation uncertainty would broaden this range considerably.

These analyses estimate that the total catch was larger than the upper limit of MSY estimates for most years between 1993 and 1999, causing the stock to decline considerably, and leveling off thereafter as total catches decreased. These results also indicate that the current biomass is slightly below or above (85 – 107 percent) the biomass at MSY (Figure 3.7), and that current fishing mortality is also in the range of 73 percent to 101 percent of the level that would allow production of MSY (Table 3.8). However, indications from the most targeted and wide-ranging fishery are of a more pessimistic status than implied by these model results. Several types of age-structured analyses were conducted using the above-mentioned longline indices from the central fishing grounds and catch-at-age data converted from the available catch-at-size data. In general, the trajectories of biomass and fishing mortality rates are in accordance with the production model analyses. Model fits appeared improved over those of past assessments, apparently as a result of using a new growth curve for the calculation of catch at age.

The most noteworthy trend in fisheries observed is the general declining trend in catches for all gears after a high peak (121,000 mt) in 1999. After that, the total annual catch has steadily declined to a current low of 72,000 mt for 2004. The decline of longline catch is mostly attributable to the decrease of Japanese and estimated IUU catches while the other country/entity's catches are generally maintained. Other gears (purse seine and baitboat) also indicated a similar but more variable decline. The decline of the Japanese catch is related to the reduced fishing effort as well as the declined CPUE in the major fishing grounds in tropical waters.

Among the fisheries catching bigeye, two changes are noted. One is an increase in catch from the northern Islands (Azores and Madeira) area due to baitboat fisheries after four years of low catch for 2000 – 2003. Another change is also observed for the fishing area of Japanese longline fishery. Since around 2001, some of the fleet had operated in central north Atlantic between 25°N – 35°N and 40°W – 75°W. In addition to the above changes in fisheries, several countries increased their individual catch levels in 2004, although the overall catch total did not significantly increase. Such increases are reported for Philippines (1,850 mt), Venezuela (1,060 mt) and Korea (630 mt). The current reported catch of Chinese Taipei for 2003 is considered under-estimated. Chinese Taipei will re-estimate the bigeye catch for 2003 in near future. The new estimate is expected to be higher than the current reported catch.

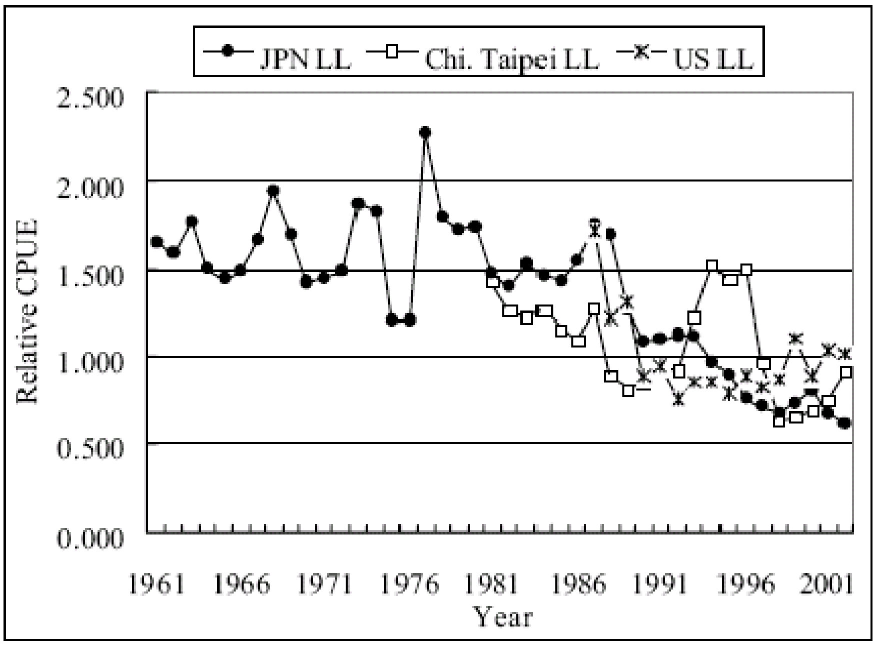


Figure 3.6 Abundance indices in numbers of BET. All ages are aggregated. Source: ICCAT, 2004.

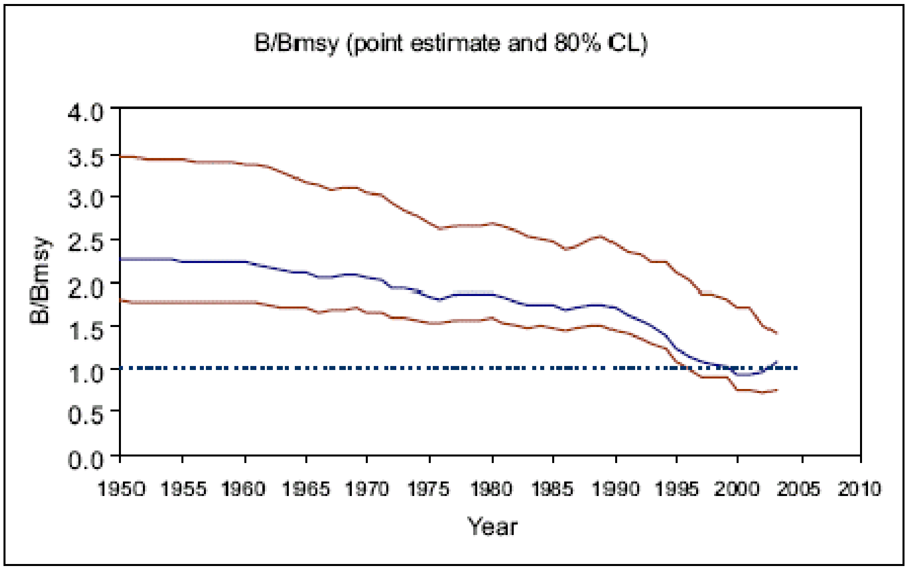


Figure 3.7 **Trajectory of the BET biomass modeled in production model analysis (middle line) bounded by upper and lower lines denoting 80 percent confidence intervals.** Source: ICCAT, 2004.

Table 3.8 **Summary Table for the Status of Atlantic Bigeye Tuna.** Source: ICCAT, 2005.

Age/size at Maturity	Age 3/~100 cm curved fork length
Spawning Sites	Tropical waters
Current Relative Biomass Level *Minimum Stock Size Threshold*	B_{03}/B_{MSY} = 0.85 - 1.07 $0.6B_{MSY}$ (age 2+)
Current Relative Fishing Mortality Rate *Maximum Fishing Mortality Threshold*	F_{02}/F_{MSY} = 0.73-1.01 F_{year}/F_{MSY} = 1.00
Maximum Sustainable Yield	93,000 - 114,000 mt
Current (2004) Yield	72,000 mt
Current (2003) Replacement Yield	89,000 - 103,000 mt
Outlook	Overfished; overfishing is occurring

This assessment indicated that the stock has declined due to the large catches made since the mid-1990s to around or below the level that produces the MSY, and that fishing mortality exceeded F_{MSY} for several years during that time period. Projections indicate that catches of more than 100,000 mt will result in continued stock decline. ICCAT should be aware that if major countries were to take the entire catch limit set under the ICCAT Recommendations and other countries were to maintain recent catch levels, then the total catch could exceed 100,000 mt. The SCRS highly recommended that catch levels of around 90,000 mt or lower be maintained at least for the near future for ICCAT to rebuild the stock.

Effects of Regulations

The bigeye minimum size regulation of 3.2 kg (Recommendation 79-01) was adopted in 1980 to reinforce the same regulation for yellowfin, and was in effect until 2004. The Committee did not evaluate this regulation at this time. However, the recommendation regarding the minimum size regulation was dropped as it was not feasible to sort the undersized bigeye and yellowfin tuna from purse seine and bait-boat catch mixed with regulation sized small skipjack without large quantities of dead discards of small bigeye and yellowfin tuna. Conversely strict enforcement of the regulation would have likely meant the closure of one of the largest tuna fisheries in the Atlantic. While the measure was in effect, it is believed that a large quantity (around 50 percent in total number of fish) of juvenile bigeye tuna smaller than 3.2 kg was caught in 2004 as well, because there are no substantial changes in the fisheries (the equatorial surface fleets) that account for most of the juvenile catch.

ICCAT asked the SCRS to examine the impact on stocks of the current minimum size regulation (bigeye tuna Recommendation 04-01). At the same time, ICCAT also asked the SCRS to recommend the necessary modifications that would improve its effectiveness as well as to review possible modifications to be applied to the closure. Although the new regulation has not been implemented yet, the SCRS met to provide a response to the Commission.

Previous yield-per-recruit and spawner-per-recruit analyses highlighted the potential importance of reducing fishing mortality on small fish. However, the percentage of fish caught less than this minimum size (3.2 kg) is very high (46 – 62 percent of the total fish caught) since 1989. The SCRS, therefore, recommends the full implementation of the moratorium on Fish Aggregation Device (FAD) fishing by all surface fisheries in the Gulf of Guinea. The moratorium on FAD fishing by surface gears in the Gulf of Guinea were observed by all fishing sectors, including Ghanaian surface fleet during 2004/2005 season. However, available purse seine catch and effort data indicated significant fishing on FADs in the moratorium area.

Limiting the annual catch to the average catch in two years of 1991 and 1992 entered into force for the major fishing countries whose 1999 catch reported to the 2000 SCRS was larger than 2,100 mt (Recommendation 01-01). The 2003 and 2004 total reported catch for the major countries and fishing entities to which the catch limit applies (EC-Spain, EC-France, EC-Portugal, Japan, Ghana, China and Chinese Taipei) were 67,000 mt and 59,500 mt, respectively. These were much lower than the total catch limit (84,200 mt) for these counties/entities. As a whole, the total catch in 2003 and 2004 for all countries is about 12,000 mt and 24,000 mt lower than the average total catch of 1991 and 1992 (96,000 mt).

Total reported U.S. bigeye tuna catches and landings (preliminary) for 2004 decreased by 69 mt from 483 mt in 2003 to 414 mt. Note that like yellowfin tuna, the estimates of rod and reel catch are considered provisional and may be revised based on results of a future review of recreational harvest estimates.

The SCRS noted its appreciation for the effort made by ICCAT in establishing the Statistical Document Program for bigeye tuna and expressed hope that the data to be submitted to the Secretariat will be useful to improve estimates of unreported catches. The SCRS also stated its appreciation regarding the initiatives to reduce the IUU activities taken by several fishing authorities. These efforts are helpful in identifying and reducing the unreported catches in the Atlantic and will make the catch limit regulation more effective, and thus will contribute to reduce uncertainties in the bigeye stock assessment. As far as the IUU catches of bigeye tuna are concerned, they are almost disappearing according to the available estimates. Nevertheless, the SCRS expressed concern that unreported catches may have been underestimated.

Recent and Ongoing Research

In addition to monitoring catch and effort statistics for tropical tunas that include bigeye tuna, United States scientists participated in the 2005 ICCAT Workshop on Methods to Reduce Mortality of Juvenile Tropical Tunas, held in Madrid from 4 – 8 July, 2005. Document SCRS/2005/063 used the ICCAT Task 2 catch and effort data to estimate expected changes in the catches of tropical tunas attributable to replacing the current moratorium with a time-area closure (Recommendation 04-01). The results indicate that catches of tropical tunas are expected to increase substantially if the time-area closure replaces the current moratorium. Considering that the current ICCAT hypothesis is that purse-seine fleet efficiency gains three percent per year, the net change could in fact be a large overall increase to levels above the pre-moratoria fishing mortality rate levels. SCRS/2005/079 explored the expectations for catches of undersized bigeye tuna considering the agreement reached in Recommendation 04-01. In all cases examined, total catches can be expected to increase from 5.5 to 6.7 percent as a result of Recommendation 04-01, and catches of bigeye tuna can be expected to increase from 16 to 22.1 percent. In all cases, catch of juvenile bigeye tuna increases.

U.S. scientists from the University of Miami's Rosenstiel School of Marine and Atmospheric Science continue to collaborate with EC scientists on the EU-funded assessment and management modeling project titled Framework for the Evaluation of Management Strategies (FEMS) project, on management strategy evaluations related to tropical tuna fisheries.

3.2.3.2 Atlantic Yellowfin Tuna

Life History and Species Biology

Yellowfin tuna is a cosmopolitan species distributed mainly in the tropical and subtropical oceanic waters of the three oceans, where they form large schools. The sizes exploited range from 30 cm to 170 cm fork length (FL). Smaller fish (juveniles) form mixed schools with skipjack and juvenile bigeye tuna, and are mainly limited to surface waters, while larger fish are found in surface and sub-surface waters. The majority of the long-term recoveries of tagged fish have been tagged in the western Atlantic and recovered in the eastern Atlantic, where several recaptures are recorded each year.

Sexual maturity occurs at about 100 cm FL. Reproductive output among females has been shown to be highly variable, although the extent of this is unknown. The main spawning ground is the equatorial zone of the Gulf of Guinea, with spawning occurring from January to April. Juveniles are generally found in coastal waters off Africa. In addition, spawning occurs in the Gulf of Mexico, in the southeastern Caribbean Sea, and off Cape Verde, although the relative importance of these spawning grounds is unknown.

Although such separate spawning areas might imply separate stocks or substantial heterogeneity in the distribution of yellowfin tuna, a single stock for the entire Atlantic is assumed as a working hypothesis (Atlantic Yellowfin Working Group, Tenerife, 1993). This hypothesis indicates yellowfin are distributed continuously throughout the entire tropical Atlantic Ocean by taking into account tagging data showing transatlantic migration (from west to east), a 40-year time series of longline catch data, and other information such as time-area size frequency distributions and locations of fishing grounds).

Growth patterns are variable with size, being relatively slow initially, and increasing by the time the fish leave the nursery grounds. Males are predominant in the catches of larger sized fish. Natural mortality is assumed to be higher for juveniles than for adults. Tagging studies for Pacific yellowfin supports this assumption.

Stock Status and Outlook

A full assessment was conducted by the SCRS/ICCAT for yellowfin tuna in 2003 applying various age-structured and production models to the available catch data through 2001.

The variability in overall catch-at-age is primarily due to variability in catches of ages zero and one (note that the catches in numbers of age zero and especially age one were particularly high during the period 1998 – 2001). Both equilibrium and non-equilibrium production models were examined in 2003 and the results are summarized in Table 3.9. The estimate of MSY based upon the equilibrium models ranged from 151,300 to 161,300 mt; the estimates of F_{2001}/F_{MSY} ranged from 0.87 to 1.29. The point estimates of MSY, based upon the non-equilibrium models, ranged from 147,200 – 148,300 mt. The point estimates for F_{2001}/F_{MSY} ranged from 1.02 to 1.46. The main differences in the results were related to the assumptions of each model. The SCRS was unable to estimate the level of uncertainty associated with these point estimates. An age-structured virtual population analysis (VPA) was made using eight indices of abundance. The results from this model were more comparable to production model results than in previous assessments, owing in part to a greater consistency between several of the indices used. The VPA results compare well to the trends in fishing mortality and biomass estimated from production models. The VPA estimates that the spawning biomass (Table 3.7) and the levels of fishing mortality (Table 3.8) in recent years have been very close to MSY levels. The estimate of MSY derived from these analyses was 148,200 mt.

In summary, the age-structured and production model analyses implied that although the 2001 catches of 159,000 mt were slightly higher than MSY levels, effective effort may have been either slightly below or above (up to 46 percent) the MSY level, depending on the assumptions. Consistent with these model results, yield-per-recruit analyses also indicated that 2001 fishing mortality rates could have been either above or about the level which could produce MSY. Yield-per-recruit analyses further indicated that an increase in effort is likely to decrease the yield-per-recruit, while reductions in fishing mortality on fish less than 3.2 kg could result in substantial gains in yield-per-recruit and modest gains in spawning biomass-per-recruit.

Table 3.9 Summary Table for the Status of Atlantic Yellowfin Tuna. Source: ICCAT, 2005.

Age/size at Maturity	Age 3/~110 cm curved fork length
Spawning Sites	Tropical waters
Relative Biomass Level *Minimum Stock Size Threshold*	B_{01}/B_{MSY} = 0.73 - 1.10 $0.5B_{MSY}$ (age 2+)
Relative Fishing Mortality Rate *Maximum Fishing Mortality Threshold*	F_{01}/F_{MSY} = 0.87 - 1.46 F_{year}/F_{MSY} = 1.00
Maximum Sustainable Yield	~ 148,000 mt
Current (2004) Yield	116,000 mt
Replacement Yield (2001)	May be somewhat below the 2001 yield (159,000 mt)
Outlook	Approaching an overfished condition

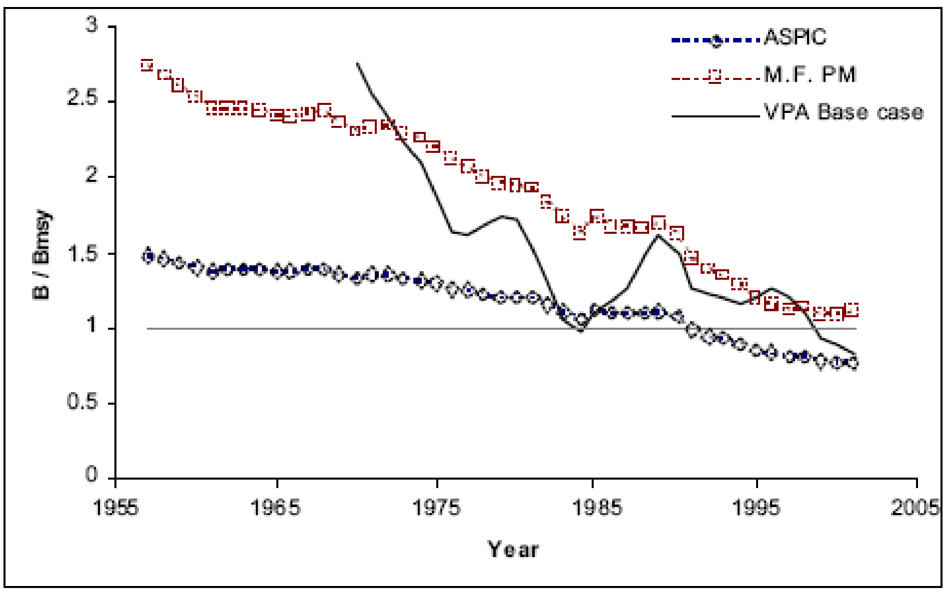


Figure 3.8 Comparison of relative biomass trends calculated using VPA and non-equilibrium production models. Source: ICCAT, 2004.

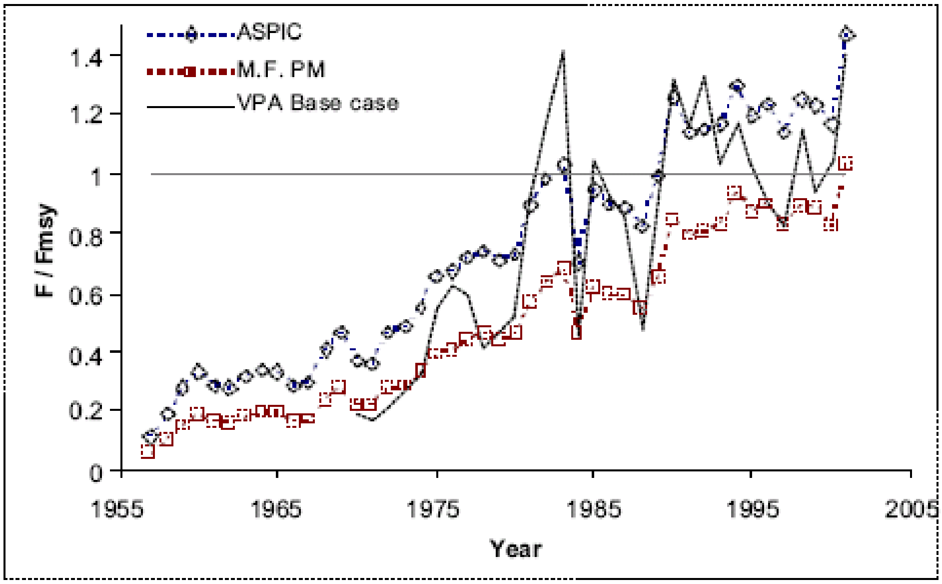


Figure 3.9 Comparison of relative fishing mortality trends calculated using VPA and non-equilibrium production models. Source: ICCAT, 2004.

In contrast to the increasing catches of yellowfin tuna in other oceans worldwide, there has been a steady decline in overall Atlantic catches since 2001. Atlantic surface fishery catches have shown a declining trend from 2001 to 2004, whereas longline catches have increased. In the eastern Atlantic, purse seine catches declined from 89,569 mt in 2001 to 58,632 mt in 2004, a 35 percent reduction. Baitboat catches declined by 23 percent, from 19,886 mt to 15,277 mt. This decrease is almost entirely due to reduced catches by Ghana baitboats, which resulted from a combination of reduced days fishing, a lower number of operational vessels, and the observance of the moratorium on fishing using floating objects. Catches by other baitboat fleets were generally increasing. In the western Atlantic, with the majority of the landings reported by the United States, Mexico, Venezuela, Brazil and St. Vincent and Grenadines, purse seine catches declined from 13,072 mt to 3,217 mt, a 75 percent reduction. In addition, baitboat catches also declined by eight percent from 7,027 mt to 6,735 mt. However, for the same time period, longline catches were increasing. In the eastern Atlantic, longline catches increased from 5,311 mt to 10,851 mt, a 104 percent increase. In the western Atlantic, longline catches increased from 12,740 mt to 15,008 mt, an 18 percent increase.

At the same time, the nominal effort in the purse seine fishery was declining. As an indicator, the number of purse seiners from the European and associated fleet operating in the Atlantic declined from 46 vessels in 2001 to 34 vessels in 2004. On the other hand, the European and associated baitboat fleet increased from 16 to 22 vessels during the same period. Of the relevant scientific documents presented to the 2005 SCRS, most were descriptive of the catches by country fleets. Three papers discussed observer programs in Ghana, Uruguay, and Spain, and three papers analyzed catches in the context of the moratorium. No new standardized catch rate information has been presented since the last assessment. However, examination of nominal catch rate trends from purse seine data suggest that catch-per-unit effort was stable or possibly declining since 2001 in the East Atlantic, and was clearly declining in the West Atlantic.

Since effort efficiency was estimated to have continued to increase, adjustments for such efficiency change would be expected to result in a steeper decline. Also, the average weights in European purse seine catches have been declining since 1994, which is at least in part due to changes in selectivity associated with fishing on floating objects.

Recent signals in the fishery data could result in a substantially different evaluation of stock status than that which is summarized above. It is important that the next assessment take these and other indicators (such as age of vessels and any loss of regional yellowfin fisheries) into account.

Effects of Regulations

Estimated catches of yellowfin tuna have averaged 141,000 mt over the past three years. This average falls near the lower estimate of the range of MSY from the age-structured and production model analyses conducted during the 2003 assessment. The SCRS considers that the yield of 159,000 mt in 2001 is likely somewhat above the replacement yield and those levels of fishing effort and fishing mortality may have been near MSY. Total catches since 2001 have been declining, but without a new assessment the SCRS in 2005 reaffirms its support for ICCAT's 1993 recommendation "that there be no increase in the level of effective fishing effort exerted on Atlantic yellowfin tuna, over the level observed in 1992." (During the 2003 assessment, the SCRS' estimates of effective fishing effort for recent years fell near the estimate for 1992).

In 1973, ICCAT adopted a regulation that imposed a minimum size of 3.2 kg for yellowfin tuna, with a 15 percent tolerance in the number of undersized fish per landing. This regulation has not been adhered to internationally, as the proportion of landings of yellowfin tuna less than 3.2 kg has been far in excess of 15 percent per year for the purse seine and baitboat fisheries. Based on the catch species composition and catch-at-size data available during the 2003 assessment, yearly catches in number ranged between 54 percent and 72 percent undersized yellowfin tuna by purse seiners and from 63 percent to 82 percent undersized fish for baitboats over the period 1997 – 2001. Landings of undersized fish occur primarily in the equatorial fisheries. Unfortunately, it is difficult to realize substantial reductions in catches of undersized fish in these fisheries because small yellowfin tuna are mostly associated with skipjack tuna, especially when fishing occurs on floating objects; thus it is difficult to avoid catching small yellowfin when catching skipjack, the latter being an important component of eastern Atlantic (equatorial) purse seine fleet catches.

Unfortunately, the use of minimum size limits as a means of reducing the mortality of juvenile tuna remains extremely problematic in this fishery for several reasons which are described in detail in "Report of the 2005 ICCAT Workshop on Methods to Reduce Mortality of Juvenile Tropical Tunas (Madrid, July 4 – 8, 2005)." In accordance with the Committee's current recommendation, any minimum size limit (or lack thereof) should be consistent for all species in a multi-species fishery. It follows that, since the minimum size limit for bigeye tuna has been eliminated, the minimum size limit for yellowfin tuna should likewise be eliminated. Notwithstanding this, the protection of juvenile tunas may be important and alternative approaches to accomplish this should be studied.

In 1993, ICCAT recommended "that there be no increase in the level of effective fishing effort exerted on Atlantic yellowfin tuna, over the level observed in 1992." As measured by fishing mortality estimates from the 2003 assessment, effective effort in 2001 appeared to be approaching or exceeding the 1992 levels. Since the relatively high catch levels of 2001 (159,000 t), catches have declined each year to a current level of 116,000 mt, a reduction of 27 percent. (Estimates of total yellowfin landings in 2002 and 2003, which were not available at the time of the assessment, are 139,000 mt and 124,000 mt, respectively). A potential explanation for this decline is the reduction in purse seine effort, but until a full assessment is conducted it is not possible to confirm this, since declines in nominal catch rates could suggest decreases in abundance or availability. Although the catches have been declining since 2001, as has the nominal effort of the purse seiners, the trend in effective effort is not clear.

Yellowfin tuna is listed as approaching an overfished condition by the United States. Several management measures have been implemented in the United States, consistent with ICCAT advice to limit fishing effort and to prevent overfishing. In 1999, NMFS implemented limited access in the pelagic longline fishery for Atlantic tunas, as well as a recreational retention limit for yellowfin tuna. The United States has also maintained its minimum size limit for YFT of 27" which was greater than that recommended by ICCAT before the organization repealed the recommendation.

Yellowfin tuna is the principal species of tropical tuna landed by U.S. fisheries in the western North Atlantic. Total estimated landings decreased to 6,500 mt in 2004, from the 2003 landings estimate of 7,702 mt. The 2004 estimate is considered provisional and may change owing to incorporation of late reports of commercial catches as they become available and to possible revisions in estimates of rod and reel catches made by recreational anglers. A high proportion of the estimated landings were due to rod and reel catches of recreational anglers in the NW Atlantic (3,434 mt). Estimates of U.S. recreational harvests for tuna and tuna-like species continue to be reviewed and this may result in the need to report additional revisions to the available estimates in the future.

Recent and Ongoing Research

In addition to the United States research findings for tropical tunas discussed above under bigeye tuna, one document was presented to the SCRS in 2005 that gave an overview of fishery trends and stock status for yellowfin tuna worldwide. It was noted that the natural mortality vector used by ICCAT in the Atlantic, while the same as that used by the IOTC for the Indian Ocean, is lower than is used by other scientific bodies for other oceans, particularly for the youngest ages. It was further noted that more recent information and methodologies may be available to potentially improve the estimates of natural mortality. Another document considered the estimation of natural mortality from multi-species tagging data. Due to limitations in the data (such as unbalanced design and different size distributions of released fish) and potential fishing differences between fleets, conclusions were limited to ratios of total mortality between fishing periods rather than any direct statement about natural mortality. Considering the importance of natural mortality estimates in the assessment of the stock, the improvement of natural mortality estimates remains a high research priority. It was noted that future stock assessments should include an evaluation of the sensitivity of results to the uncertainty in natural mortality estimates. Differences were also noted for other biological parameters used by the various scientific bodies, such as growth and maturity vectors, the extent to which these differences reflect estimation methodology, data quality, or real differences between stocks warrants investigation.

3.2.3.3 Atlantic Albacore Tuna

Life History and Species Biology

Albacore is a temperate tuna widely distributed throughout the Atlantic Ocean and Mediterranean Sea. For assessment purposes, the existence of three stocks is assumed based on available biological information: northern and southern Atlantic stocks (separated at 5ºN), and a Mediterranean stock. Albacore spawning areas in the Atlantic are found in subtropical western areas of both hemispheres and throughout the Mediterranean Sea. Spawning takes place during austral and boreal spring-summer. Sexual maturity is considered to occur at about 90 cm FL (age five) in the Atlantic, and at smaller size (62 cm, age two) in the Mediterranean. Until this age, they are mainly found in surface waters, where they are targeted by surface gears. Some adult albacore are also caught using surface gears but, as a result of their deeper distribution, they are mainly caught using longlines. Young albacore tuna are also caught by longlines in temperate waters.

Stock Status and Outlook

The last assessment of the northern stock by ICCAT/SCRS was conducted in 2000, using data from 1975 to 1999, and that of the southern stock in 2003; no assessment of the Mediterranean stock has ever been carried out. To coordinate the timing of the assessments of northern and southern albacore tuna, the stock assessment for northern albacore was postponed at the 2004 ICCAT meeting from 2006 to 2007 (note the management measures for northern albacore expire at the end of 2006). The SCRS noted the considerable uncertainty that continues to remain in the catch-at-size data for the northern and southern stocks, and the profound impact this has had on attempts to complete a satisfactory assessment of northern albacore tuna.

<u>North Atlantic</u>

In 2003, the SCRS concluded that it was inappropriate to proceed with a VPA assessment based on the catch-at-age until the catch-at-size to catch-at-age transformation is reviewed and validated. In 2005, a document was presented on the analyses of catch-at-size and identifying the source of bias in the catch-at-age of the North Atlantic albacore stock. The SCRS recommends holding a data preparatory working group meeting to allow for a thorough revision of the North Atlantic stock prior to the next assessment in 2007. Consequently, the current state of the northern albacore stock is based primarily on the last assessment conducted in 2000 together with observations of CPUE and catch data provided to the SCRS in 2003. The results, obtained in 2000, showed consistency with those from previous assessments (Table 3.10).

The SCRS noted that CPUE trends have varied since the last assessment in 2000, and in particular differed between those representatives of the surface fleets (Spain Troll age two and Spain Troll age three) and those of the longline fleets of Japan, Chinese Taipei, and the United States. The Spanish age two troll series, while displaying an upward trend since the last assessment, nonetheless declined over the last ten years. For the Spanish age three troll series, the trend in the years since the last assessment is down; however, the trend for the remainder of the last decade is generally unchanged. For the longline fleets, the trend in CPUE indices is either upwards (Chinese Taipei and United States) or unchanged (Japan) in the period since the last assessment. However, variability associated with all of these catch rate estimates prevented definitive conclusions about recent trends of albacore catch rates.

Equilibrium yield analyses, carried out in 2000 and made on the basis of an estimated relationship between stock size and recruitment, indicate that spawning stock biomass was about 30 percent below that associated with MSY. However, the SCRS noted considerable uncertainties in these estimates of current biomass relative to the biomass associated with MSY (B_{MSY}), owing to the difficulty of estimating how recruitment might decline below historical levels of stock biomass. Thus, the SCRS concluded that the northern stock is probably below B_{MSY}, but the possibility that it is above it should not be dismissed (Figure 3.10). However, equilibrium yield-per-recruit analyses made by the SCRS in 2000 indicate that the northern stock is not being growth overfished ($F < Fmax$).

In terms of yield per recruit, the assessment carried out in 2000 indicates that the fishing intensity is at, or below, the fully exploited level. Concerning MSY-related quantities, the SCRS recalls that they are highly dependent on the specific choice of stock-recruitment relationship. The SCRS believed that using a particular form of stock-recruitment relationship that allows recruitment to increase with spawning stock size provided a reasonable view of reality. This hypothesis together with the results of the assessment conducted in 2000 indicate that the spawning stock biomass (B_{1999}) for the northern stock (29,000 mt) was about 30 percent below the biomass associated with MSY (42,300 mt) and that current F (2000) was about 10 percent above F_{MSY}. However, an alternative model allowing for more stable recruitment values in the range of observed SSB values would provide a lower estimate of SSB at MSY, below the current value.

South Atlantic

In 2003, an age-structured production model, using the same specifications as in 2000, was used to provide a base case assessment for southern Atlantic albacore. Results were similar to those obtained in 2000, but the confidence intervals were substantially narrower in 2003 than in 2000 (Table 3.11). In part, this may be a consequence of additional data now available, but the underlying causes need to be investigated further. The estimated MSY and replacement yield from the 2003 base case (30,915 mt and 29,256 mt, respectively) were similar to those estimated in 2000 (30,274 mt and 29,165 mt). In both 2000 and 2003, the fishing mortality rate was estimated to be about 60 percent of F_{MSY}. Spawning stock biomass has declined substantially relative to the late 1980s, but the decline appears to have leveled off in recent years and the estimate for 2002 remains well above the spawning stock biomass corresponding to MSY.

Catches of albacore in the South Atlantic in 2001 and 2002 were above replacement yield, and were below estimates of MSY in 2003. Nevertheless, both the 2000 and 2003 albacore assessments estimated that the stock is above B_{MSY}. There is now greater confidence in these estimates of MSY and therefore there is justification to base a TAC recommendation on MSY instead of replacement yield estimates from the model as in 2000. This results from the SCRS' view that current stock status is somewhat above B_{MSY} and catch of this level, on average, would be expected to reduce the stock further towards B_{MSY}. Recent estimates of high recruitment could allow for some temporary increase in adult stock abundance under a 31,000 mt catch, but this result is uncertain.

Mediterranean

Given the lack of an assessment, the implications of the rapid increase in landings are unknown.

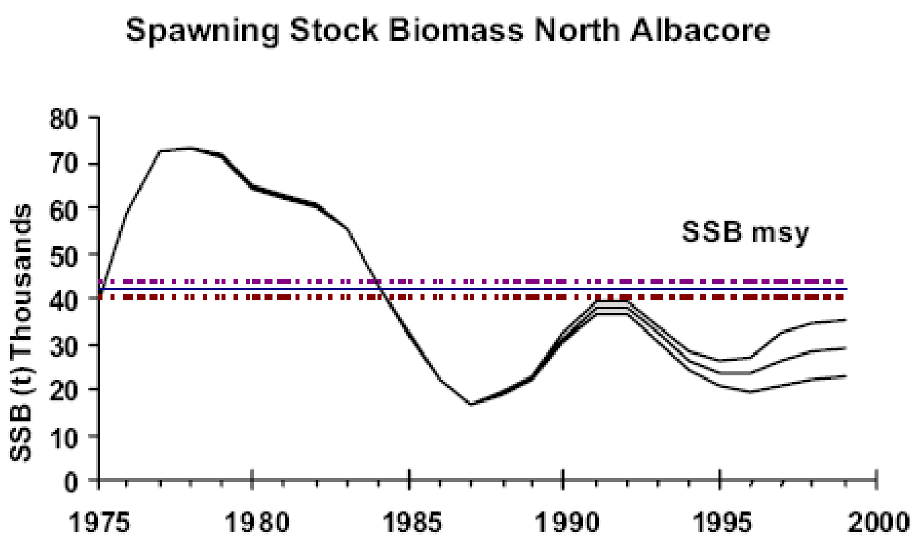


Figure 3.10 North Atlantic albacore spawning stock biomass and recruits with 80 percent confidence limits. Source: ICCAT, 2004.

Table 3.10 Summary Table for the Status of North Atlantic Albacore Tuna. Source: ICCAT, 2005.

Age/size at Maturity	Age 5/~90 cm curved fork length
Spawning Sites	Subtropical western waters of the northern Hemisphere
Current Relative Biomass Level *Minimum Stock Size Threshold*	B_{99}/B_{MSY} = 0.68 (0.52 - 0.86) $0.7B_{MSY}$
Current Relative Fishing Mortality Rate *Maximum Fishing Mortality Threshold*	F_{99}/F_{MSY} = 1.10 (0.99 - 1.30) F_{year}/F_{MSY} = 1.00
Maximum Sustainable Yield	32,600 mt [32,400 - 33,100 mt]
Current (2004) Yield	25,460 mt
Current (2004) Replacement Yield	not estimated
Outlook	Overfished; overfishing is occurring

Table 3.11 Summary Table for the Status of South Atlantic Albacore Tuna. Source: ICCAT, 2005.

Age/size at Maturity	Age 5/~90 cm curved fork length
Spawning Sites	Subtropical western waters of the southern Hemisphere
Current Relative Biomass Level	B_{02}/B_{MSY} = 1.66 (0.74 - 1.81)
Current Relative Fishing Mortality Rate	F_{02}/F_{MSY} = 0.62 (0.46 - 1.48)
Maximum Sustainable Yield	30,915 mt (26,333 - 30,915)
Current (2004) Yield	22,468 mt
Current (2004) Replacement Yield	29,256 mt (24,530 - 32,277)
Outlook	Not overfished; overfishing is not occurring

Effects of Regulations

North Atlantic

In 2000, the SCRS recommended that in order to maintain a stable Spawning Stock Biomass in the near future the catch should not exceed 34,500 mt (the 1999 catch level) in the period 2001 – 2002. The SCRS further noted that should ICCAT wish the spawning stock biomass to begin increasing towards the level estimated to support MSY, and then catches in 2001 and 2002 should not exceed 31,000 mt. In 2004, the SCRS reiterated its previous advice and extended it until the next assessment in 2007. There is no ICCAT rebuilding plan for this species.

Since 2001, ICCAT established a TAC of 34,500 mt for this stock. In 2003, ICCAT extended this TAC through 2006. The SCRS noted that reported catches for 2001, 2002, 2003, and 2004 have been below the TAC. A 1998 recommendation that limits fishing capacity to the average of 1993 – 1995 also remains in force. The SCRS is unable to assess whether or not these recommendations have had a direct effect on the stock.

U.S. harvest of albacore tuna, based on 1997 through 2004 data, is landed primarily by rod and reel and pelagic longline fisheries in the Northwest Atlantic. Approximately 98 percent of total U.S. landings are harvested in the Northwest Atlantic. U.S. landings from the Caribbean increased in 1995 to make up over 14 percent of the total U.S. harvest of Albacore, but have since remained below four percent of the total.

Historically, albacore has not been a main focus of the U.S. commercial tuna fisheries operating in the North Atlantic. The commercial pelagic longline fishery harvests northern albacore tuna as incidental catch in the swordfish and other tuna pelagic fisheries. Reported commercial catches were relatively low prior to 1986; however, these catches increased substantially and have remained at higher levels throughout the 1990s. Commercial longline landings from the Northwest Atlantic over the past five years have ranged from a high of 172 mt in 2001 to a low of approximately 96 mt in 2003. In contrast, recreational estimates show a growing targeted albacore fishery off the United States Atlantic coast with landings increasing from approximately 122 mt in 2001 to over 500 mt in 2004. Calendar year landings vary between years by up to 30 percent for the longline fleet and by as high as a factor of four for the rod and reel fishery.

Since the ICCAT recommendation of a 607 mt TAC was implemented, total U.S. landings have been 453 mt (74 percent), 488 mt (80 percent), and 446 mt (73 percent) in 2001, 2002, and 2003 respectively. Calendar year landings for 2004 were 646 mt. These landings have been well below the annual TAC of 607 mt until 2004. The United States has annually taken less than two percent of the recorded total annual international landings (Table 3.6). In 2004, U.S. calendar year landings remained below the adjusted annual quotas. ICCAT recommendation provides for an adjusted TAC by adding the remaining balance from the previous year as carryover. The U.S. caught only 84 percent of the adjusted quota in 2004 and has a domestic adjusted quota in 2005 of 729 metric tons.

South Atlantic

Recent catches of albacore tuna in the South Atlantic are in the vicinity of the current and recent estimates of MSY (30,915 mt). Both the 2000 and the 2003 albacore assessments estimated that the stock is above B_{MSY} (2003 estimates $B_{current}/B_{MSY} = 1.66$, $F_{current}/F_{MSY} = 0.62$). The SCRS recommends that in order to maintain SSB in the near future the catch should not exceed 31,000 mt until the next assessment in 2007.

Since 1999, ICCAT established the TAC for this stock (in 2001 – 2003, the TAC had been set at 29,200 mt). In 2003, ICCAT extended this TAC through 2004. The SCRS noted that reported catches have not exceeded the TAC in 2004. Also, the total catch by Chinese Taipei, South Africa, Brazil, and Namibia (26,620 mt) did not exceed the 27,500 mt catch limit of parties actively fishing for southern albacore, as stipulated by resolution 02-06. It should be noted that sufficient capacity exists within the fisheries to exceed the TAC as was done in 2000, 2001, and 2002. U.S. landings of South Atlantic Albacore over the past five years have been minimal (two or less mt / year). Japan adhered to its bycatch limit of four percent of the total catch of bigeye tuna in the Atlantic Ocean. However, the SCRS is unable to assess whether or not these catch limits have had a direct effect on the stock.

Mediterranean

There are no ICCAT management recommendations for the Mediterranean stock. However, the SCRS recommended to ICCAT that reliable data be provided on catch, effort and size for Mediterranean albacore tuna. The SCRS also recommended that an effort be made to recover historical data. Improvements to these basic inputs are essential before a stock assessment of Mediterranean albacore tuna can be attempted.

Recent and Ongoing Research

U.S. scientists prepared document SCRS/2005/081 which described population models for North Pacific albacore (*Thunnus alalunga*) that have been developed and reviewed within the North Pacific Albacore Workshop (NPALBW) forum since 2000. Currently, the NPALBW relies on a Virtual Population Analysis (VPA) model for the purposes of formulating an international-based consensus regarding the "status" of this fish stock. Recently, an equally important research directive from the NPALBW has been to develop alternative, more detailed statistical-based models, in efforts to evaluate more fully the relationship between this species' population dynamics and associated fishery operations (*i.e.*, areas of uncertainty in an overall stock assessment). Participants on the NPALBW developed one candidate model based on the Age-structured Assessment Program (ASAP), which generally represents a maximum likelihood-based numerical approach for conducting relatively straightforward, forward-simulation catch-at-age analyses. In addition, the document presents a brief discussion concerning development of other alternative stock assessment models, particularly length-based/age-structured platforms (*e.g.*, MULTIFAN-CL and Stock Synthesis 2).

3.2.3.4 Atlantic Skipjack Tuna

Life History and Species Biology

Skipjack tuna is a gregarious species forming schools in the tropical and subtropical waters of the three oceans. Skipjack spawn opportunistically throughout the year in vast areas of the Atlantic Ocean. The size at first maturity is about 45 cm for males and about 42 cm for females in the East Atlantic, while in the West Atlantic sexual maturity is reached at around 51 cm for females and 52 cm for males. Skipjack growth is seasonal, with substantial differences according to the latitude. There remains considerable uncertainty about the variability of the growth parameters between areas. It is, therefore, a priority to gain more knowledge on the growth schemes of this species.

Skipjack is a species that is often associated with floating objects, both natural objects or fish aggregating devices (FADs) that have been used extensively since the early 1990s by purse seiners and baitboats (during the 1991 to 2003 period, about 55 percent of skipjack were caught with FADs). The concept of viscosity (low interchange between areas) could be appropriate for the skipjack stocks. A stock qualified as "viscous" can have the following characteristics:

- It may be possible to observe a decline in abundance for a local segment of the stock;
- Overfishing of that component may have little, if any, repercussion on the abundance of the stock in other areas; and,
- Only a minor proportion of fish may make large-scale migrations.

The increasing use of FADs could have changed the behavior of the schools and the migrations of this species. It is noted that, in effect, the free schools of mixed species were much more common prior to the introduction of FADs than now. These possible behavioral changes ("ecological trap" concept) may lead to changes in the biological parameters of this species as a result of the changes in the availability of food, predation, and fishing mortality. Skipjack caught with FADs are usually found associated with other species. The typical catch with floating objects is comprised of about 63 percent skipjack, 20 percent small yellowfin, and 17 percent juvenile bigeye and other small tunas. A comparison of size distributions of skipjack between periods prior to and after the introduction of FADs show that, in the eastern Atlantic, there has been an increase in the proportion of small fish in the catches, as well as a decline in the total catch in recent years in some areas.

The SCRS reviewed the current stock structure hypothesis that consists of two separate management units, one in the east Atlantic and another in the West Atlantic, separated at 30°W. The boundary of 30°W was established when the fisheries were coastal, whereas in recent years the East Atlantic fisheries have extended towards the west, surpassing this longitude, and showing the presence of juvenile skipjack tuna along the Equator, west of 30°W, following the drift of the FADs. This implies the potential existence of a certain degree of mixing. Nevertheless, taking into account the large distances between the east and west areas of the ocean, various environmental constraints, the existence of a spawning area in the east Atlantic as well as in the northern zone of the Brazilian fishery, and the lack of additional evidence (*e.g.*, transatlantic migrations in the tagging data), the hypothesis of separate east and west Atlantic stock is maintained as the most plausible alternative. On the other hand, in taking into account the biological characteristics of the species and the different fishing areas, smaller management units could be considered.

Stock Status and Outlook

The last ICCAT/SCRS assessment on Atlantic skipjack tuna was carried out in 1999 (Table 3.12). The state of the Atlantic skipjack stock(s), as well as the stocks of this species in other oceans, show a series of characteristics that make it extremely difficult to conduct an assessment using current models. Among these characteristics, the most noteworthy are:

- The continuous recruitment throughout the year, but heterogeneous in time and area, making it impossible to identify and monitor the individual cohorts;
- Apparent variable growth between areas, which makes it difficult to interpret the size distributions and their conversion to ages; and,
- Exploitation by many and diverse fishing fleets (baitboat and purse seine), having distinct and changing catchabilities, which makes it difficult to estimate the effective effort exerted on the stock in the East Atlantic.

For these reasons, no standardized assessments have been able to be carried out on the Atlantic skipjack stocks. Notwithstanding, some estimates were made by means of different indices of the fishery and some exploratory runs were conducted using a new development of the generalized production model.

<u>Western stock</u>

Standardized abundance indices up to 1998 were available from the Brazilian baitboat fishery and the Venezuelan purse seine fishery, and in both cases the indices seem to show a stable stock status. Uncertainties in the underlying assumptions for the analyses prevent the extracting of definitive conclusions regarding the state of the stock. However, the results suggest that there may be over-exploitation within the FAD fisheries, although it was not clear to what extent this applies to the entire stock. The SCRS could not determine if the effect of the FADs on the resource is only at the local level or if it had a broader impact, affecting the biology and behavior of the species. Under this supposition, maintaining high concentrations of FADs would reduce the productivity of the overall stock. However, since 1997, and due to the implementation of a voluntary Protection Plan for Atlantic tunas, agreed upon by the Spanish and French boat owners in the usual areas of fishing with objects, which later resulted in an ICCAT regulation on the surface fleets that practice this type of fishing, there has been a reduction in the skipjack tuna catches associated with FADs. Maintaining this closure would continue to have a positive effect on the resource. The development of nominal abundance indices of Brazilian baitboat fisheries and Venezuelan purse seiners, obtained up to 2004, seemed to show a stable stock status.

Eastern stock

Standardized catch rates are not available. However, an analysis was made, for the 1969 – 2002 period, of the different indices of the purse seine fishery that could provide valuable information on the state of the stock. For the majority of the indices, the trends were divergent, depending on the area, which may indicate the viscosity of the skipjack stock, with limited mixing rates between areas. Because of the difficulties in assigning ages to the skipjack catches, the estimates of the values of natural mortality by age and obtaining indices of abundance (especially for the eastern stock), no catch-by-age matrices were developed and, consequently, no analytical assessment methods were applied.

There is no quantified information available on the effective fishing effort exerted on skipjack tuna in the East Atlantic. It is supposed, however, that the increase in fishing power linked to the introduction to improved technologies on board the vessels as well as to the development of fishing under floating objects have resulted in an increase in the efficiency of the various fleets. An estimate of the increase in the coefficient of total mortality (Z) between the early 1980s and the end of the 1990s was carried out with a model using tagging data (Workshop on the mortality of juveniles in July 2005). For the range of sizes considered (about 40 – 60 cm FL), the increase in Z on the order of a factor 3 would reflect this increase in efficiency. This interpretation is supported by a comparison of skipjack size distributions in the East Atlantic between the periods prior to, and following, the use of FADs as an increase is observed in the proportion of small fish in the catches.

A document on the Spanish observer program on board purse seiners, presented during the 2005 SCRS, shows that for the 2001-2005 period the average rate of discards of skipjack tunas under FADs in the East Atlantic is estimated at 42 kg per ton of skipjack landed. In the West Atlantic, fishing effort of the Brazilian baitboats (which comprises the major skipjack fishery) decreased by half between 1985 and 1996, but seems to be stabilized since, after a slight increase.

Table 3.12 Summary Table for the Status of West Atlantic Skipjack Tuna. Source: ICCAT, 2005.

Age/size at Maturity	Age 1 to 2/~50 cm curved fork length
Spawning Sites	Opportunistically in tropical and subtropical waters
Current Relative Biomass Level *Minimum Stock Size Threshold*	*Unknown* *Unknown*
Current Relative Fishing Mortality Rate F_{2003}/F_{MSY} *Maximum Fishing Mortality Threshold*	*Unknown* $F_{year}/F_{MSY} = 1.00$
Maximum Sustainable Yield	*Not Estimated*
Current (2004) Yield	26,910 mt
Current Replacement Yield	*Not Estimated*
Outlook	*Unknown*

Effects of Regulations

There is currently no specific ICCAT regulation in effect for skipjack tuna. However, the French and Spanish boat owners voluntarily applied a moratorium on fishing under FADs for the period of November 1997 through January 1998, and November 1998 through January 1999. The moratorium, which was implemented in order to protect juvenile bigeye tuna, has had an influence on the skipjack catches made with FADs. Since 1999, a similar moratorium was applied, recommended by ICCAT, and is still in force. The average purse seine skipjack catches during the months from November to January by the fleets that applied the moratoria were reduced by 64 percent compared to the average catches between the 1993 – 1996 period (before the moratoria) and those corresponding to the 1998 – 2002 period. For the entire period in which the moratoria have been in effect (1998 – 2002), the average annual skipjack catches by the purse seine fleets that applied the moratoria decreased by 41 percent, which is equivalent to 42,000 mt per year. However, this decrease is likely a combined result of the decrease in effort and the moratorium impact; this is supported by the observation that the mean annual catch by boats has decreased only 18 percent between the two periods.

Total catches in 2004 in the Atlantic Ocean amounted to almost 161,000 mt which represents an increase of approximately 12.9 percent compared to the average of the last five years. Since the early 1990s, numerous changes in the fishery (such as the use the FADs and the expansion of the fishing area to the west) have increased skipjack catchability as well as the proportion of the skipjack stock which is exploited. At present, the major fisheries are the purse seine fisheries, particularly those of EC-Spain, EC-France, NEI, Ghana and Netherlands Antilles, followed by the baitboat fisheries of Ghana, EC-Spain and EC-France. The catches made in 2004 in the East Atlantic reached 134,000 mt, representing a 15.8 percent increase as compared to the average of 1999 – 2003. In the West Atlantic, the major fishery is the Brazilian baitboat fishery, followed by the Venezuelan purse seine fleet. The 2004 caches in the West Atlantic amounted to 26,900 mt, which is a level close to the average of the historical period in recent years.

Skipjack tuna are caught by U.S. vessels in the western North Atlantic. Total reported skipjack landings (preliminary) increased from 78 mt in 2003 to 102 mt in 2004. Almost 70 percent of U.S. landings are from recreational rod and reel catches and landings from the NW Atlantic and Caribbean areas, based on LPS statistical surveys of the U.S. recreational harvesting sector. Estimates of recreational harvests of skipjack continue to be reviewed and could be revised again in the future.

Recent and Ongoing Research

U.S. small tuna research is directed mainly on king and Spanish mackerel stocks, as the amount landed of other small tunas such by U.S. fishermen is generally low. The focus of research on skipjack research by the international scientific community is on basic stock structure and abundance and the influence of FADs on increase in efficiency of the various fleets. During the ICCAT Workshop on Methods to Reduce Mortality of Juvenile Tropical Tunas in July 2005 (Document SCI-032), a re-analysis on the tagging data in the Senegalese area showed however that the parameters of the skipjack growth curve obtained in this region were in fact closer to the growth estimates made in the Gulf of Guinea or in other oceans than those done previously in Senegal. In 2004 and 2005, U.S. scientists collaborated with Caribbean nations under the banner of the Caribbean Regional Fisheries Mechanism in initiating stock assessment analyses for small tuna (and other) stocks of mutual concern.

3.2.4 Atlantic Billfish

3.2.4.1 Blue Marlin

Life History/Species Biology

Blue marlin (*Makaira nigricans*) range from Canada to Argentina in the western Atlantic, and from the Azores to South Africa in the eastern Atlantic. Blue marlin are large apex predators with an average weight of 100 – 175 kg (220 – 385 lb). Female blue marlin grow faster and reach a larger maximum size than males. Young blue marlin are one of the fastest growing teleosts, reaching 30 – 45 kg (66 – 99 lb) after the first year. The maximum growth rate of these fish is 1.66 cm/day (0.65 inches/day) which occurs at 39 cm LJFL (15.3 inches) (NMFS, 1999). Life expectancy for blue marlin is between 20 – 30 years based on age and growth analyses of dorsal spines.

Estimates of natural mortality rates for juvenile and adult billfish would be expected to be relatively low, generally in the range of 0.15 to 0.30, based on body size, behavior and physiology (NMFS, 1999). Sagitta otolith weight is suggested to be proportional to age, indicating that both sexes are equally long-lived, based on the maximum otolith weight observed for each sex. Predicting age from length or weight is imprecise due to many age classes in the fishery, and otoliths may provide a more accurate measure of age.

Blue marlin have an extensive geographical range, migratory patterns that include trans-Atlantic as well as trans-equatorial movements, and are generally considered to be a rare and solitary species relative to the schooling Scombrids (tunas). Graves et al. (2002) captured eight blue marlin with recreational fishing gear and then implanted fish with satellite pop-up tags. These fish moved 74 – 248 km (40–134 nautical miles (nm)) over five days, with a mean displacement of 166 km (90 nm). Fish spent the vast majority of their time in waters with temperatures between 22 and 26°C (71–78°F) and at depths less than 10 m. Prince et al. (2005) tagged one blue marlin with a PSAT tag off the coast of Punta Cana, Dominican Republic and found that this fish moved 406.2 km (219.3 nm) during a 40-d deployment (10.15 km/day (5.48 nm/day)). The maximum time at liberty recorded of a tagged individual was 4,024 days (about 11 years) for a blue marlin that was estimated to weigh 29.5 kg (65 lb) at the time of release. Junior et al. (2004) found the depth of capture for blue marlin with pelagic longline gear ranged from 50 – 190 m (164 – 623 feet), with most individuals captured at 90 m (295 feet).

The Cooperative Tagging Center (CTC) program has tagged 24,108 and recaptured over 220 blue marlin and found that these fish moved an average of 903 km (488 nm) (Ortiz et al., 2003). Some individuals have exhibited extended movement patterns, and strong seasonal patterns of movement of individuals between the United States and Venezuela are evident. A blue marlin released off Delaware and recovered off the island of Mauritius in the Indian Ocean represents the only documented inter-ocean movement of a highly migratory species in the history of the CTC. The minimum straight-line distance traveled for a blue marlin was 14,893 km (8,041 nm) and the maximum number of days at large was 4,024 d.

Adults are found primarily in the tropics within the 24°C (75°F) isotherm, and make seasonal movements related to changes in sea surface temperatures. In the northern Gulf of Mexico they are associated with the Loop Current, and are found in blue waters of low productivity rather than in more productive green waters. Off of Puerto Rico, the largest numbers of blue marlin are caught during August, September, and October. Equal numbers of both sexes occur off northwest Puerto Rico in July and August, with larger males found there in May and smaller males in September. Very large individuals, probably females, are found off the southern coast of Jamaica in the summer and off the northern coast in winter, where males are caught in December and January.

There has not been an Atlantic wide survey of spawning activity for blue marlin, however, these fish generally reproduce between the ages of two and four, at 220 – 230 cm (86 – 90 inches) in length, and weigh approximately 120 kg (264 lb). Female blue marlin begin to mature at approximately 47 – 60 kg (104 – 134 lb), while males mature at smaller weights, generally from 35 – 44 kg (77 – 97 lb). There are likely two separate spawning events that occur at different times in the North and South Atlantic. South Atlantic spawning takes place between February and March (NMFS, 1999). Peak spawning activity in the North Atlantic Ocean occurs between July and October, with females capable of spawning up to four times per reproductive season (de Sylva and Breder, 1997). Prince et al. (2005) conducted 23 neuston tows in the vicinity of Punta Cana, Dominican Republic between 23 April and 17 May and successfully identified four larval blue marlin; the size of the larvae indicated that spawning activity was taking place in the same general area where these samples were conducted. Serafy et al. (2003) identified 90 blue marlin larvae in the vicinity of Exuma Sound, Bahamas in the month of July, indicating that spawning activity had taken place 18 days prior to sampling.

During the spawning season, blue marlin release between one and eleven million small (1 – 2 mm), transparent pelagic planktonic eggs. The number of eggs has been correlated to interspecific sizes among billfish and the size of individuals within the same species. Ovaries from a 147 kg (324 lb) female blue marlin from the northwest Atlantic Ocean were estimated to contain 10.9 million eggs, while ovaries of a 125 kg (275 lb) female were estimated to contain seven million eggs. Males are capable of spawning at any time.

Blue marlin are generalist predators feeding primarily on epipelagic fish and cephalopods in coastal and oceanic waters, however, mesopelagic fish and crustaceans associated with rocky, sandy, and reef bottoms are also important components of the diet. Feeding in mesopelagic areas probably takes place at night (Rosas-Alayola et al., 2002). Diet studies of blue marlin off the northeastern coast of Brazil indicate that oceanic pomfret (*Brama brama*) and squid (*Ornithoteuthis antillarum*) were the main prey items and present in at least 50 percent of stomachs. Other important prey species vary by location and include dolphin fishes, bullet tuna (*Auxis. spp*) around the Bahamas, Puerto Rico, and Jamaica, and dolphin fishes and scombrids in the Gulf of Mexico. Stomach contents have also included deep-sea fishes such as chiasmodontids.

Constant ingestion of small quantities of food is necessary. Blue marlin have relatively small stomachs, reducing the proportion of the body allocated for visceral mass, and allocating more volume to musculature for swimming speed and endurance (Junior *et al*., 2004). In the Pacific Ocean, changes in the diet observed are related more with abundance and distribution of prey than preferences in food items, with *Auxis* spp. (bullet and frigate tunas) well represented in all locations. Predators of blue marlin are relatively unknown. Sharks will attack hooked blue marlin, but it is not known if they attack free-swimming, healthy individuals.

Stock Status and Outlook

Since 1995, blue marlin have been managed under a single stock hypothesis because of tagging data and mitochondrial DNA evidence that are consistent with one Atlantic-wide stock. The last stock assessment for blue marlin was in 2000 using similar methods to the previous assessment (1996), however, data was revised in response to concerns raised since the 1996 assessment. The assessment reflects a retrospective pattern wherein improvement in estimated biomass ratios result in estimated lower productivity. The 2000 assessment was slightly more optimistic than the 1996 assessment. Atlantic blue marlin are at approximately 40 percent of B_{MSY} and overfishing has taken place for the last 10 – 15 years. B_{MSY} is estimated at 2,000 mt (4,409,245 lb) and current fishing mortality is approximately four times higher than F_{MSY} (Table 3.13) (SCRS, 2005). There is uncertainty in the assessment because the historical data is not well quantified. The 2000 assessment estimated that overfishing was still occurring and that productivity (MSY and a stock's capacity to replenish) was lower than previously estimated. Therefore, it is expected that landings in excess of estimated replacement yield would result in further stock decline (SCRS, 2005).

No additional assessment information became available in 2005 to modify recommendations currently in force. The current assessment indicates that the stock is unlikely to recover if the landings contemplated by the 1996 ICCAT recommendation continue into the future. While there is additional uncertainty in stock status and replacement yield, estimates are not reflected in bootstrap results, these uncertainties can only be addressed through substantial investment in research into habitat requirements of blue marlin and further verification of historical data. The SCRS recommended that the ICCAT take steps to reduce the catch of blue marlin as much as possible, including: reductions in fleet-wide effort, a better estimation of dead discards, establishment of time area closures, and scientific observer sampling for verification of logbook data. The SCRS noted that future evaluation of management measures relative to the recovery of the blue marlin stock are unlikely to be productive unless new quantitative information on the biology and catch statistics of blue marlin, and additional years of data are available (SCRS, 2004 and 2005).

A summary of Atlantic blue marlin stock assessment data can be found in Table 3.13. Estimated catches of Atlantic blue marlin by region for the period 1956 – 2001 can be found in Figure 3.11. A composite CPUE series for blue marlin for the period 1955 – 2000 can be found in Figure 3.12. The estimated median relative fishing mortality trajectory for Atlantic blue marlin can be found in Figure 3.13. A stock assessment for blue marlin is scheduled for 2006.

Table 3.13 Summary of Atlantic Blue Marlin Stock Assessment data. Weights are in metric tons, whole weight. Source: SCRS, 2005.

ATLANTIC BLUE MARLIN SUMMARY[1]	
	Total Atlantic
Maximum Sustainable Yield (MSY)	~ 2,000 t (~ 1,000 ~ 2,400 t)[2]
2002 Yield	2,626 t
2003 Yield	2,713 t
2004 Yield[4]	2,076 t
1999 Replacement Yield	~ 1,200 t (~ 840 - 1,600 t)[2]
Relative Biomass (B_{2000}/B_{MSY})	~ 0.4 (~ 0.25 - 0.6)[2]
Relative Fishing Mortality (F_{1999}/F_{MSY})	4.0 (~ 2.5 - 6.0)[2]
Management Measures in Effect	- Reduced pelagic longline and purse seine landings to 50% of 1996 or 1999 levels, whichever is greater [Recs. 00-13[3], 01-10[3] and 02-13].

[1] Assessment results are uncertain. Uncertainty in these estimates is not fully quantified by bootstrapping.
[2] Approximate 80% CI from bootstrap for ASPIC model.
[3] These measures did not take effect until mid-2001.
[4] Reported Task I value, which is likely to be a substantial underestimate of the total catch.

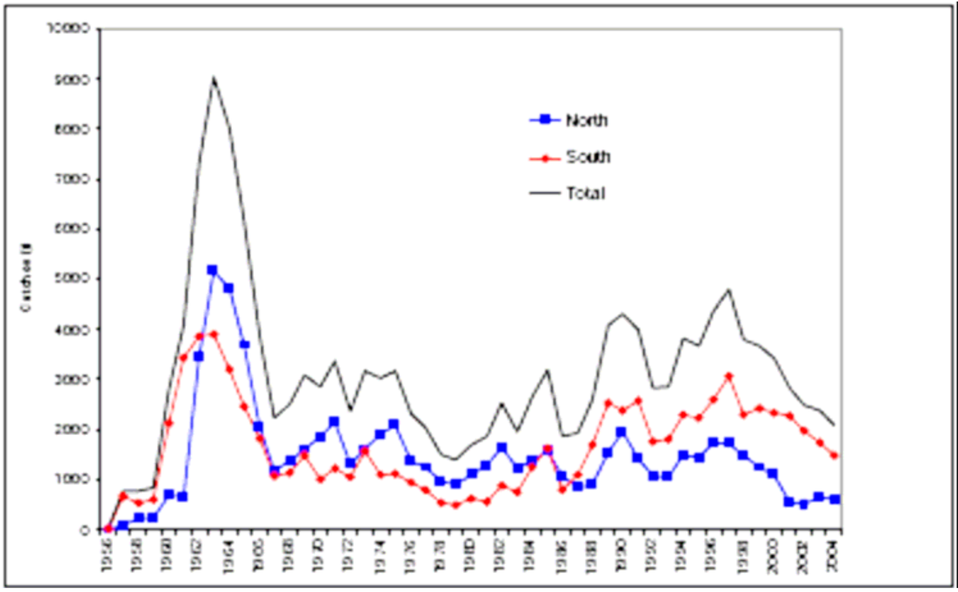


Figure 3.11 Estimated catches (including landings and dead discards in mt) of blue marlin in the Atlantic by region. The 2003 catch reported to ICCAT is preliminary and is not included in this figure. Weights are in metric tones, whole weight. Source: SCRS, 2005.

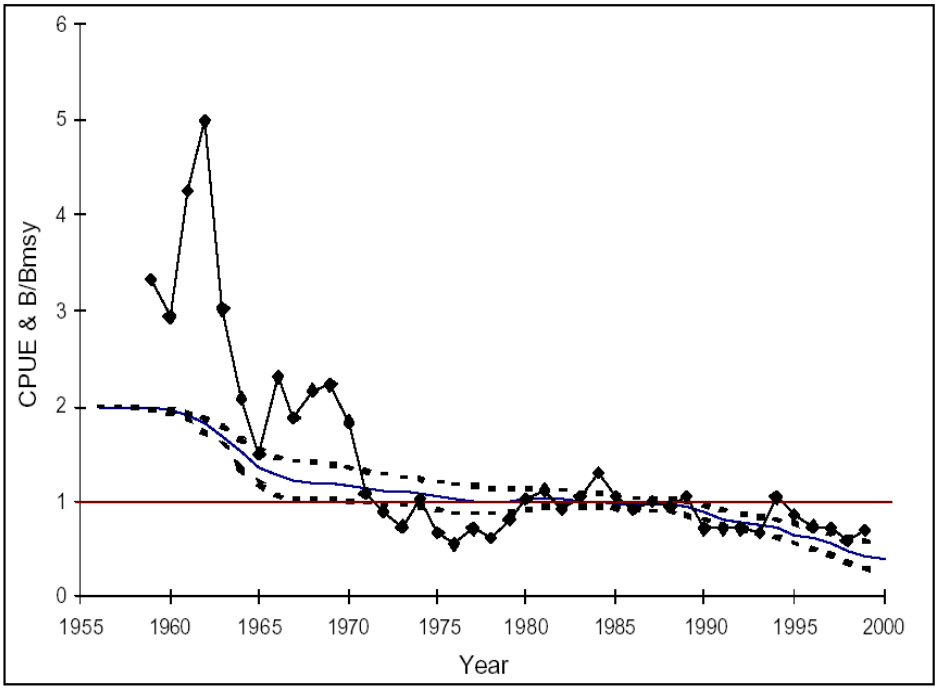


Figure 3.12 Composite CPUE series (symbols) used in the blue marlin assessment compared to model estimated median relative biomass (solid lines) from bootstrap results (80 percent confidence bounds shown by dotted lines). Source: SCRS, 2005.

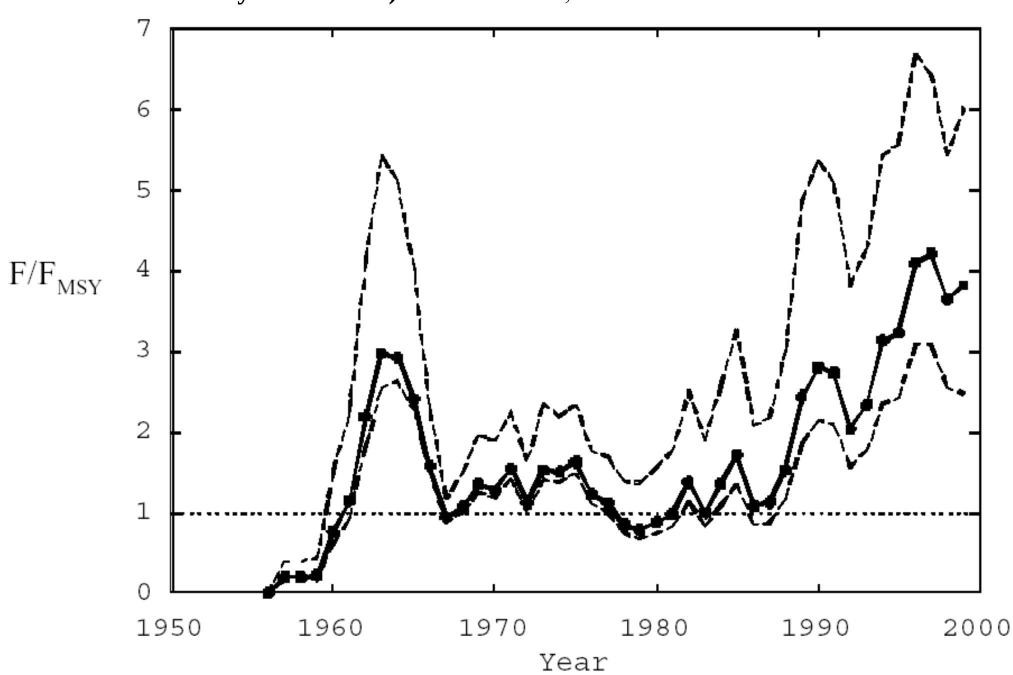


Figure 3.13 Estimated median relative fishing mortality trajectory for Atlantic blue marlin (center, dark line) with approximate 80 percent confidence range (light lines) obtained from bootstrapping. Source: SCRS, 2005.

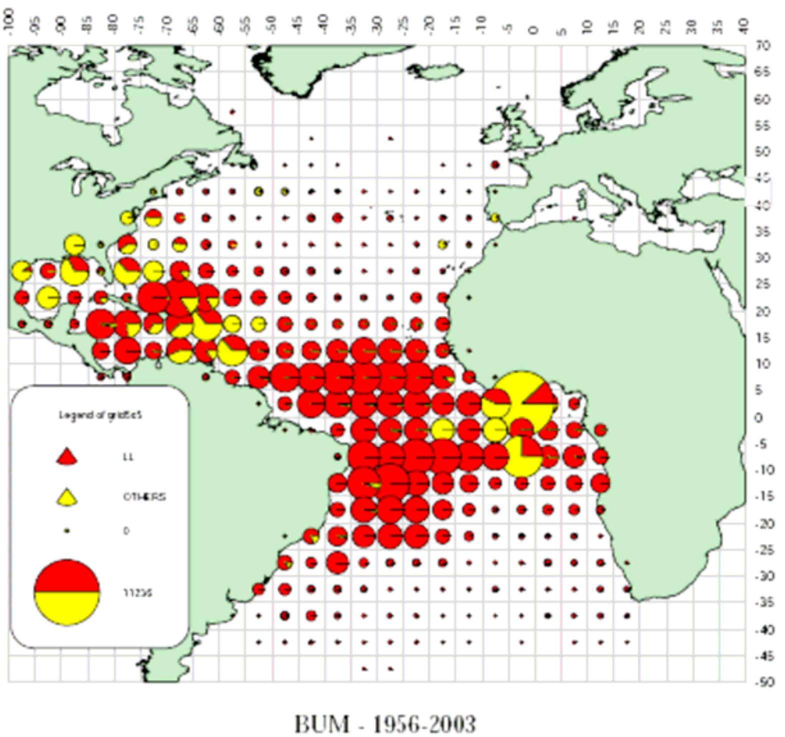


Figure 3.14 Geographical distribution of reported catches of blue marlin for the period 1956-2003. Source: SCRS, 2005.

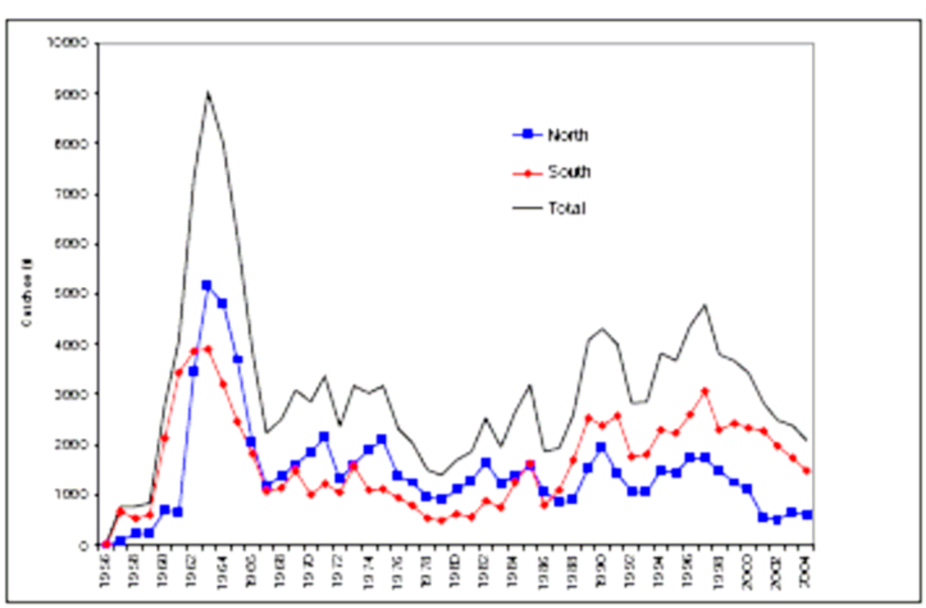


Figure 3.15 Estimated catches (including landings and dead discards in t) of blue marlin in the Atlantic by region (1950-2004). Source: SCRS, 2005.

Effect of Regulations

ICCAT Management Recommendations

ICCAT Recommendation 97-09 required Contracting Parties to reduce, starting in 1998, blue marlin and white marlin landings by at least 25 percent for each species from 1996 landings, by the end of 1999. Recommendations 00-13, 01-10, 02-13, and 04-09 imposed or extended additional catch restrictions for blue marlin. These included limiting the annual amount of blue marlin that can be harvested by pelagic longline and purse seine vessels and retained for landing to no more than 50 percent of the 1996 or 1999 landing levels, whichever is greater, as well as requiring that all blue marlin and white marlin brought to pelagic longline and purse seine vessels alive be released in a manner that maximizes their survival. The live release provision does not apply to marlins that are dead when brought along the side of the vessel or that are not sold or entered into commerce (SCRS, 2004). Globally, catches of blue marlin appear to have been reduced as a result of ICCAT recommendations, which tied reductions in blue marlin landings to 1996 or 1999 levels, whichever was greater. Total Atlantic-wide catches of blue marlin, as reported to ICCAT, decreased by approximately 46 percent from 3,836 mt in 1999 to 2,076 mt in 2004. Total Atlantic-wide longline landings of blue marlin, as reported to ICCAT, decreased by approximately 41 percent from 2,276 mt in 1999 to 1,343 in 2004.

In addition, these recommendations limited recreational landings in the United States to 250 blue and white marlin combined, on an annual basis. Also in 2000, ICCAT recommended that a blue marlin minimum size be established for recreational fisheries (251 cm (98.8 inches) LJFL). Most recently, ICCAT recommendation 04-09, extended phase one of the ICCAT mortality reduction plan, as established and modified by recommendations 00-13, 01-10, 02-13, through 2006 and postponed the next scheduled assessment of Atlantic blue marlin until 2006. The SCRS noted that it does not expect to have enough new information to provide an assessment of these recent regulations until 2006.

Domestic Regulations

The U.S. Atlantic billfish fishery, including blue marlin, white marlin, sailfish, and spearfish, has been reserved as a recreational fishery through domestic regulation since 1988. Possession of Atlantic billfish is prohibited by U.S. pelagic longline vessels and no sales of Atlantic billfish are allowed. Data on bycatch of Atlantic billfish in the domestic Atlantic pelagic longline fishery can be found in Section 3.4.1 and Appendix C. The recreational fishery is an open access fishery. Anglers must possess either a HMS Angling category permit or a CHB category permit to possess a billfish. General category tuna permit holders may possess Atlantic billfish only when participating in a registered HMS tournament. Details of the permitting program, including the number of permit holders can be found in Section 3.9. Data on domestic recreational catches of Atlantic billfish are obtained from a combination of sources, including: the Recreational Billfish Survey; the HMS swordfish and billfish non-tournament reporting line; MRFSS, and LPS. U.S. recreational billfish landings can be seen in section 4.2.3 of this document. The U.S. implemented a minimum legal size of 251 cm (99 inches), 167 cm (66 inches), 160 cm (63 inches) for blue marlin, white marlin, and sailfish respectively, in 1999.

Possession of Atlantic longbill spearfish have been prohibited since 1988. Rod and reel is the only type of gear authorized in the domestic billfish fishery.

Recent and Ongoing Research

The NMFS SEFSC played a substantial role in the ICCAT Enhanced Research Program for Billfish in 2004, with SEFSC scientists acting as the coordinator for the western Atlantic Ocean. Major accomplishments in the western Atlantic in 2004 were documented in SCRS/04/028. Highlights include 11 at-sea sampling trips with observers on Venezuelan industrial longline vessels in September 2004. Of the trips accomplished to date, 4 observer trips were on Korean type vessels fishing under the Venezuelan flag. Most of these vessels are based out of Cumana targeting tuna, swordfish, or both at the same time. Biological sampling of swordfish, Istiophorids, and yellowfin tuna for reproductive and age determination studies, as well as genetics research were continued during the 2004 sampling season. Shore-based sampling of billfish landings for size frequency data, as well as tournament sampling was obtained from Venezuela, Grenada, U.S. Virgin Islands, Bermuda, Barbados, and Turks and Caicos Islands. Program participants in Venezuela, Grenada, and Barbados continued to assist in obtaining information on tag-recaptured billfish, as well as numerous sharks, in the western Atlantic Ocean during 2004; a total of 44 tag recovered billfish and sharks were submitted to the Program Coordinator in 2004. Age, growth, and reproductive samples from several very large billfish were also obtained during 2004.

A study conducted by the Virginia Institute of Marine Science (VIMS) to evaluate post release survival and habitat use from the recreational fishery for Atlantic white marlin using pop-up satellite archival tags (PSATs) was finalized in 2004 and published in the peer review literature. A separate study conducted by VIMS on U.S. longline vessels to evaluate post release survival of marlin, as well as evaluating hook performance and related mortality was also finalized in 2004. These data have been submitted to a peer reviewed journal and are currently under review. The SEFSC has conducted several studies in the Northwest Atlantic and the Pacific coast of Central America to evaluate habitat use and reproductive biology of billfish using PSAT technology. About 200 PSATs have been deployed in this effort over the last 4 years with deployments ranging from a month to 5.5 months. Several peer reviewed papers summarizing these results are in press at this time, while other papers are currently in preparation. In addition, SEFSC is also currently conducting pelagic longline research to evaluate gear behavior, and the effects of gear modification on catch rate and survival of target and non-target species. Three cruises have been completed to date. This work in ongoing and should be finished sometime in 2006. Cooperative billfish research between US and Brazilian scientists was initiated in 2005.

The Fishery Management Group of the University of Miami is carrying out research on Atlantic billfish on three areas, population parameter estimation, population modeling and development of socio-economic indicators. Others at the University of Miami's Rosenstiel School and elsewhere are conducting research on early life history, reproductive biology and ecology of billfishes, as well as age and growth estimation.

Updates of standardized CPUE for blue and white marlin from the United States pelagic longline fishery in the NW Atlantic and Gulf of Mexico and the U.S. recreational tournament fishery in the NW Atlantic and Gulf of Mexico were developed and presented to ICCAT in 2005 (Document SCRS/2005/30 and SCRS/2005/31). Numerous additional papers were presented regarding standardization of CPUEs. Please see http//:www.iccat.es for additional information.

Multiple papers on habitat use were submitted to the ICCAT SCRS in 2005. These included papers on: vertical habitat use of white marlin in numerous locations of the western North Atlantic using PSAT tags (SCRS/2005/034); the depth distributions of 52 blue marlin in relation to exposure to longline gear using PSAT tags (SCRS/2005/035); and, a quantitative framework and numerical method for characterizing vertical habitat use by large pelagic animals using pop-up satellite tag data (SCRS/2005/). Additional information on spawning area research and other topics can be found at http//:www.iccat.es.

3.2.4.2 White Marlin

Life History/Species Biology

White marlin (*Tetrapturus albidus*) are found exclusively in tropical and temperate waters of the Atlantic Ocean and adjacent seas, unlike sailfish and blue marlin, which are also found in the Pacific Ocean. White marlin are found at the higher latitudes of their range only in the warmer months. Junior et al. (2004) captured white marlin with pelagic longline gear off northeastern Brazil in depths ranging from 50 – 230 m (164 – 754 feet), with no obvious depth layer preference. White marlin generally prefer water temperatures above 22°C (71° F) with salinities between 35 – 37 ppt (NMFS, 1999). They may occur in small, same-age schools, however, are generally solitary compared to the Scombrids (tunas). Catches in some areas may include a rare species (*Tetrapturus georgei*) which is superficially similar to white marlin. The so-called “hatchet marlin” may also represent (*T. georgei)*, and has been caught occasionally in the Gulf of Mexico and South Atlantic (NMFS, 1999).

White marlin are generally 20 – 30 kg (44 – 66 lb) at harvest. These fish grow quickly, with females attaining a larger maximum size than males, and have a life span of 18 years (SCRS 2004). Adult white marlin grow to over 280 cm (110 inches) TL and 82 kg (184 lb). White marlin exhibit sexually dimorphic growth patterns; females grow larger than males, but the dimorphic growth differences are not as extreme as noted for blue marlin. This species undergoes extensive movements, although not as extreme as those of the bluefin tuna and albacore. Trans-equatorial movements have not been documented for the species. There have been 31,483 white marlin tagged and released by the CTC program, with 577 reported recaptures (1.83 percent of all releases) (Ortiz et al., 2003). The majority of releases took place in the months of July through September, in the western Atlantic off the east coast of the United States. Releases of tagged white marlin also occurred off Venezuela, in the Gulf of Mexico, and in the central west Atlantic. The longest distance traveled is 6,517 km (4,049 miles) and the maximum days at large is 5,488 days (approx. 15 years). A substantial number of individuals moved between the Mid-Atlantic coast of the United States and the northeast coast of South America. Overall, 1.1 percent of documented white marlin recaptures have made trans-Atlantic movements. The longest movement was for a white marlin tagged during July 1995 off the east coast near Cape May, NJ and recaptured off Sierra Leone, West Africa, in November, 1996. The fish traveled a distance of at least 6,517 km (3,519 nm) over 476 days (NMFS, 1999). Prince et al. (2005) tagged six white marlin off the coast of Punta Cana, Dominican Republic and found their displacement to be between 58.7 and 495.8 km (31.7 – 267.7 nm), ranging from 2.1 – 13.3 km/day (mean = 6.3 km/day).

White marlin spawn in the spring (March through June) in the northwestern Atlantic Ocean and females are generally 20 kg (44 lb) in mass and 130 cm (51.2 inches) in length at sexual maturity. White marlin spawn in tropical and sub-tropical waters with relatively high surface temperatures and salinities (20 – 29°C (68 – 84°F) and over 35 ppt) and move to higher latitudes during the summer. There has not been an Atlantic-wide study of the spawning behavior of white marlin. Spawning seems to take place in more offshore areas than for sailfish, although larvae are not found as far offshore as blue marlin. Females may spawn up to four times per spawning season (de Sylva and Breder, 1997). It is believed there are at least three spawning areas in the western north Atlantic: northeast of Little Bahama Bank off the Abaco Islands; northwest of Grand Bahama Island; and southwest of Bermuda. Prince et al. (2005) found eight white marlin larvae in neuston tows in April/May off the coast of Punta Cana, Dominican Republic indicating that there had been recent spawning activity in this general area. Larvae have also been collected from November to April, but these may have been sailfish larvae (*Istiophorus platypterus*), as the two can not readily be distinguished (NMFS, 1999). Spawning concentrations occur off the Bahamas, Cuba, and the Greater Antilles, probably beyond the U.S. EEZ, although the locations are unconfirmed. Concentrations of white marlin in the northern Gulf of Mexico and from Cape Hatteras, NC to Cape Cod, MA are probably related to feeding rather than spawning (NMFS, 1999).

White marlin are primarily piscivorous. Oceanic pomfret and squid were the most important food items in a study that sampled stomachs collected off the coast of Brazil in the southwestern Atlantic Ocean (Junior et al., 2004). The number of food items per stomach ranged from 1 – 12 individuals. The largest prey observed in white marlin stomachs were snake mackerel (*Gempylus serpens*), that were 40 – 73 cm (15.7 – 28.7 inches) in length (Junior et al., 2004). Squid, dolphin, hardtail jack, flying fish, bonitos, mackerels, barracuda, and puffer fish are the most important prey items in the Gulf of Mexico.

Data from a large sport fishery for white marlin that occurs during the summer between Cape Hatteras, NC and Cape Cod, MA indicates that white marlin inhabit offshore (148 km (80 nm)) submarine canyons, extending from Norfolk Canyon in the Mid-Atlantic to Block Canyon off eastern Long Island. Concentrations of white marlin are associated with rip currents and weed lines (fronts), and with bottom features such as steep drop-offs, submarine canyons, and shoals. Sport fishing for white marlin also occurs in the Straits of Florida, southeast Florida, the Bahamas, and off the north coasts of Puerto Rico and the Virgin Islands. Summer concentrations in the Gulf of Mexico are found off the Mississippi River Delta and at DeSoto Canyon, with a peak off the delta in July, and in the vicinity of DeSoto Canyon in August. In the Gulf of Mexico, adults appear to be associated with blue waters of low productivity, being found with less frequency in more productive green waters. While this is also true of the blue marlin, there appears to be a contrast between the factors controlling blue and white marlin abundance, as higher numbers of blue marlin are generally caught when catches of white marlin are low, and vice versa. It is believed that white marlin prefer slightly cooler temperatures than blue marlin.

Stock Status and Outlook

White marlin have been managed under a single stock hypothesis by ICCAT since 2000. The most recent stock assessments for white marlin (1996, 2000, and 2002) all indicated that biomass of white marlin has been below B_{MSY} for more than two decades and the stock is overfished. In 2004, the SCRS indicated that in spite of significant improvements in the relative abundance estimates made available during the last three assessments, they are still not informative enough to provide an accurate estimate of stock status (SCRS, 2004). The 2002 assessment indicated that the relative fishing mortality is 8.28 times that permissible at F_{MSY} (Table 3.14). Given that the stock is severely depressed, the SCRS concluded that ICCAT should take steps to reduce the catch of white marlin as much as possible, first by increasing observer coverage to improve estimates of catch and dead discards of white marlin. Furthermore, SCRS recommended that Contracting Parties conduct research into habitat requirements and post-release survival of white marlin and take steps to verify historical fishery data.

The SCRS suggested that ICCAT take steps to make sure that the intended reductions in catch are complied with, and monitored, so that proper evaluation can be carried out in the future. The SCRS recommended improving observer programs so that better estimates of catch and dead discards of white marlin are obtained. The SCRS further recommended that, in the absence of observing a change in population status resulting from the most recent management measures, the potential for increasing stock size of white marlin may require future catches to be reduced beyond the level apparently intended by its most recent recommendations. However, the SCRS also stated that more definitive advice should be available after several years of data become available. The SCRS also noted that future evaluation of management measures relative to the recovery of the white marlin stock is unlikely to be productive unless new quantitative information on the biology and catch statistics of white marlin, and additional years of data, are available (SCRS, 2004). As such, ICCAT postponed the next white marlin assessment until 2006. A summary of Atlantic white marlin stock assessment data can be found in Table 3.14.

New standardized catch rate information was presented in 2005, updating catch rates from U.S. recreational fisheries in the northwest Atlantic and Gulf of Mexico and the Venezuelan longline and artesinal fisheries. In spite of the progress made, the SCRS can not interpret the historic CPUE trends for white marlin (SCRS, 2005). In 2002, an ESA listing review was completed by NMFS. NMFS determined that listing Atlantic white marlin under the Endangered Species Act was not warranted at that time. NMFS has committed to conducting another ESA listing review in 2007.

Table 3.14 Summary of Atlantic White Marlin Stock Assessment data. Weights are in metric tons, whole weight. Source: SCRS, 2005.

ATLANTIC WHITE MARLIN SUMMARY[1]				
	Likely value	*Continuity case[2] estimate (80% conf. limit)*	*Retrospective adjusted estimate[3]*	*Range of sensitivity[4] estimates*
Maximum Sustainable Yield	Below 2000 Yield	964 t (849-1070)		323-1,320 t
2002 Yield	822 t	--		--
2003 Yield	615 t	--		--
2004 Yield[5]	532 t			
2001 Replacement Yield	Below 2000 Yield	222 t (101-416)	371 t	102-602 t
Relative Biomass (B_{2001}/B_{MSY})	<1 (Over-fished)	0.12 (0.06-0.25)	0.22	0.12-1.76
Relative Fishing Mortality (F_{2000}/F_{MSY})	>1 (Over-fishing)	8.28 (4.5-15.8)	5.05	0.80-10.30
Management Measures in Effect:	- In 2001 and 2002, PS and LL fisheries limit landings to 33% of max (1996, 1999) level. [Rec. 00-13], [Rec. 01-10] and [Rec. 02-13].			

[1] Assessment results are highly uncertain.
[2] The data used are not sufficiently informative to choose a "best case". For consistency, the continuity case presented here is based on data and assumptions that closely resemble the analyses made in 2000. Confidence limits from bootstrapping are conditional on this model-data set and thus may underestimate the real uncertainty.
[3] These results are for the continuity case except that they were adjusted for retrospective biases.
[4] The sensitivity analyses made were not chosen in a systematic way; the range is presented only for qualitative guidance.
[5] Reported Task I value for 2004, which is likely an underestimate of total catch.

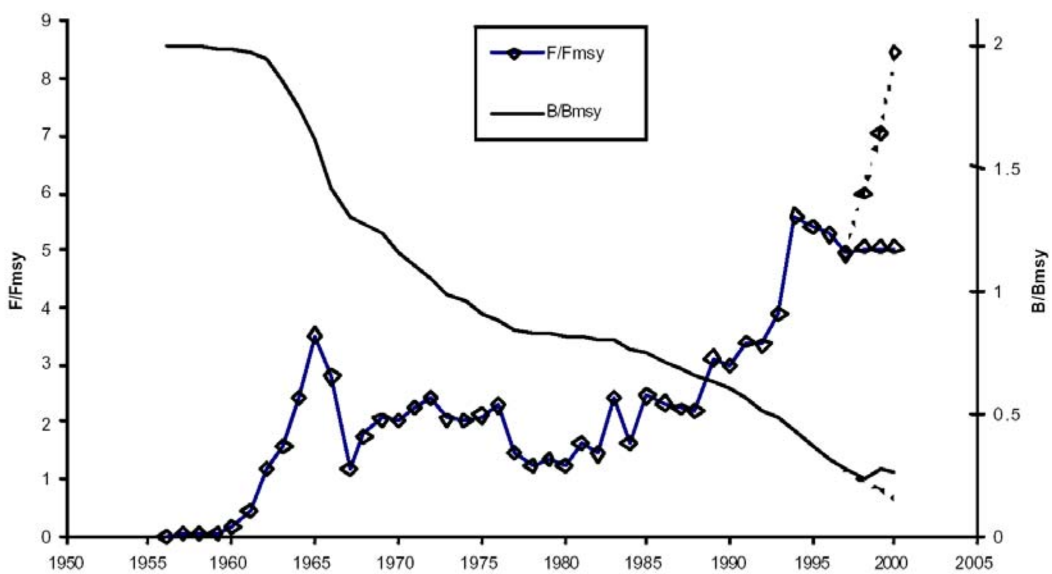


Figure 3.16 Estimated biomass ratio B_{2000}/B_{MSY} (solid line, no symbols) and fishing mortality ratio F2000/FMSY (solid line with symbols) from the production model fitted to the continuity case for white marlin. Ratios of last three years have been adjusted for retrospective pattern. Broken lines show unadjusted ratios. Note that scales are different for each ratio. Source: SCRS, 2004.

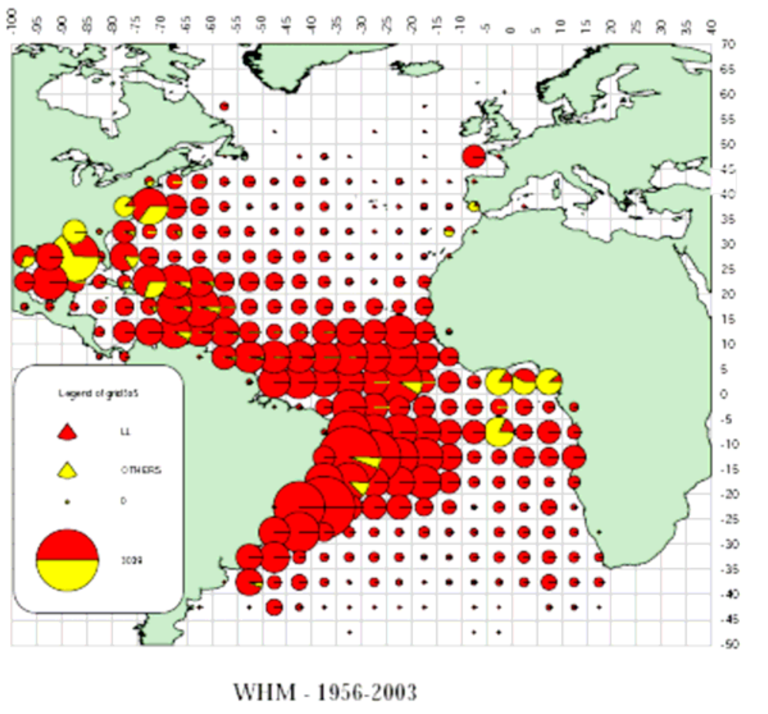


Figure 3.17 Geographical distribution of white marlin catches for the period 1956-2003. Source: SCRS, 2005.

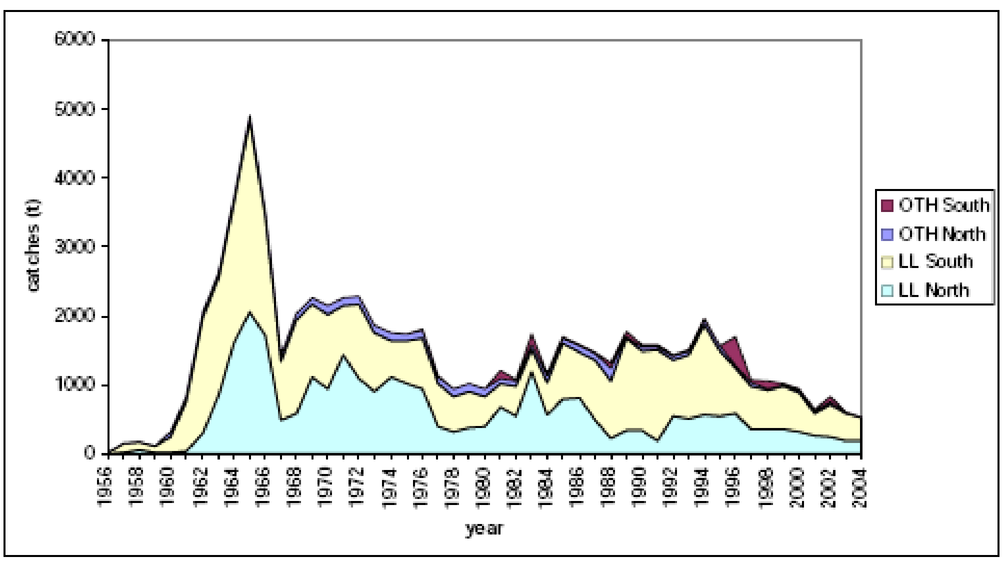


Figure 3.18 Reported catch of white marlin (Task I) in the North and South Atlantic for longline (LL) gear and other (OTH) gears. Source: SCRS, 2005.

Effect of Regulations

ICCAT Management Recommendations

Recommendation 97-09 required ICCAT Contracting Parties to reduce, starting in 1998, blue marlin and white marlin landings by at least 25 percent for each species from 1996 landings, such reduction to be accomplished by the end of 1999. ICCAT Recommendations 00-13, 01-10, and 02-13 imposed or extended additional catch restrictions for white marlin. These included reductions to no more than 33 percent of the 1996 or 1999 landing levels, whichever is greater, in the annual amount of white marlin that can be harvested and retained for landing by pelagic longline and purse seine vessels. Further, all blue marlin and white marlin brought to pelagic longline and purse seine vessels alive are required to be released in a manner that maximizes their survival (SCRS, 2004). Post-release survival studies concluded that white marlin can generally survive the trauma of being captured on pelagic longline gear (SCRS, 2005) and suggest that current management practices requiring the release of live white marlin (Rec. 00-13) will reduce fishing mortality on the stock. The live release provision does not apply to marlins that are dead when brought along the side of the vessel or that are not sold or entered into commerce. While the stock status evaluations are uncertain, projections indicated that the apparent intent of the ICCAT Billfish recommendations has, in the short term, some potential for stabilizing the stock biomass near current levels. Since 2000 is the last year of data used for the last stock assessment, it is too early to evaluate the effect of these recommendations on the stock. A stock assessment for white marlin is scheduled for 2006.

Globally, catches of white marlin appear to have been reduced as a result of ICCAT recommendations to less than 1,000 mt since 2000. Preliminary catches for 2004 were 532 mt, a slight decrease from 2003. Reported catches in 2004 by Brazil are lower than in previous years as a result of the implementation of the ICCAT recommendation to release live marlins, increased observer coverage, and a reduction in longline fishing effort (SCRS, 2005). Total Atlantic-wide catches of white marlin, as reported to ICCAT, decreased by approximately 48 percent from 1,028 mt in 1999 to 532 mt in 2004. Total Atlantic-wide longline landings of white marlin, as reported to ICCAT, decreased by approximately 46 percent from 924 mt in 1999 to 501 mt in 2004. Purse seine fisheries have incidental catches of white marlin, especially those that set on FADs. A temporary ban on FADs implemented by the EU resulted in a 300 – 400 mt (661,386 – 881,849 lb) decrease in incidental purse seine catches of all marlins (Gaertner et al., 2002). In the United States, white marlin are managed exclusively for recreational fisheries. This fishery is subject to an ICCAT imposed, 250-fish limit, annually for both blue and white marlin combined. In 2005, 31 recreationally landed white marlin were reported to ICCAT by the United States. In 2001, time area closures were established in the United States to reduce interactions between longline fisheries and white marlin and other billfish.

Domestic Regulations

Please see the discussion of domestic regulations contained in section 3.2.4.1, above.

Recent and Ongoing Research

Please see the discussion of recent and ongoing research contained in section 3.2.4.1, above.

3.2.4.3 Sailfish

Life History/Species Biology

Sailfish have a pan-tropical distribution and prefer water temperatures between 21 and 28°C (69 – 82°F). Although sailfish are the least oceanic of the Atlantic billfish and have higher concentrations in coastal waters (more than any other Istiophorid), they are also found in offshore waters. They range from 40°N to 40°S in the western Atlantic and 50°N to 32°S in the eastern Atlantic. No trans-Atlantic movements have been recorded, suggesting a lack of mixing between east and west. Although sailfish are generally considered to be rare and solitary species relative to the schooling Scombrids, sailfish are known to occur along tropical coastal waters in small groups consisting of at least a dozen individuals. Junior et al. (2004) captured sailfish in the southwestern Atlantic Ocean with pelagic longline gear at depths between 50 – 210 m (164 – 688 feet), with most individuals captured at 50 m. Sailfish are the most common representative of the Atlantic Istiophorids in U.S. waters (SCRS, 2005). Female sailfish grow faster, and attain a larger maximum size, than males while both sexes have a life expectancy of 15 years (NMFS, 1999).

In the winter, sailfish are found in schools around the Florida Keys and eastern Florida, in the Caribbean, and in offshore waters throughout the Gulf of Mexico. In the summer, they appear to migrate northward along the U.S. coast as far north as the coast of Maine, although there is a population off the east coast of Florida year-round. During the summer, some of these fish move north along the inside edge of the Gulf Stream. In the winter, they regroup off the east coast of Florida. Sailfish appear to spend most of their time above the thermocline, which occurs at depths of 10 – 20 m (32.8 – 65.6 feet) and 200 – 250 m (656 – 820 feet), depending on location. The 28°C (82°F) isotherm appears to be the optimal temperature for this species. Sailfish are mainly oceanic but migrate into shallow coastal waters. Larvae are associated with the warm waters of the Gulf Stream (NMFS, 1999).

A total of 65,868 sailfish have been tagged and released through the efforts of the CTC program, with reported recapture of 1,204 sailfish (1.83 percent of all releases). Most releases occurred off southeast Florida, from north Florida to the Carolinas, the Gulf of Mexico, Venezuela, Mexico, the northern Bahamas and the U.S. Virgin Islands. One tagged and recaptured specimen traveled from Juno, FL to the Mid-Atlantic, a distance of 2,972 km (1,745 miles). The longest movement tracked by tagging was 3,861 km (2,084 miles) and the longest time at large was 6,658 days (18.2 years) (Ortiz et al., 2003). During the winter, sailfish are restricted to the warmer parts of their range and move farther from the tropics during the summer. The summer distribution of sailfish does not extend as far north as for marlins, especially white marlin. Tag-and-recapture efforts have recovered specimens only as far north as Cape Hatteras, NC. Few trans-Atlantic or trans-equatorial movements have been documented using tag-recapture methods (NMFS, 1999).

Most sailfish examined that have been caught off Florida are under three years of age. Mortality is estimated to be high in this area, as most of the population consists of only two year classes. The longest period a recaptured-tagged animal was found to be at-large was 16.1 years. Unfortunately, the size at release is not available for this fish. Growth rate in older individuals is very slow (0.59 kg/yr (1.3 lb/year). Sailfish are probably the slowest growing of the Atlantic istiophorids. Sexual dimorphic growth is found in sailfish, but it is not as extreme as with blue marlin (NMFS, 1999).

Female sailfish spawn at age three and are generally 13 – 18 kg and 157 cm (28.6 – 39.6 lb and 61.8 inches), whereas males generally mature earlier at 10 kg and 140 cm (22 lb and 55.1 inches). Spawning takes place between April and October (de Sylva and Breder, 1997). Spawning has been reported to occur in shallow waters 9 – 12 m (30 – 40 ft) around Florida, from the Florida Keys to the region off Palm Beach on the east coast. Spawning is also assumed to occur, based on presence of larvae, offshore beyond the 100 m (328 feet) isobath from Cuba to the Carolinas, from April to September. However, these spawning activities have not been observed. Sailfish can spawn multiple times in one year, with spawning activity-moving northward in the western Atlantic as the summer progresses. Larvae are found in Gulf Stream waters in the western Atlantic, and in offshore waters throughout the Gulf of Mexico from March to October (NMFS, 1999). Serafy et al. (2003) found three larval sailfish in Exuma Sound, Bahamas, in the month of July indicating that there had been recent spawning activity in this vicinity. In the Pacific Ocean, sailfish spawn in waters between 27 – 30°C (Hernandez-H and Ramirez-H, 1998).

Sailfish are generally piscivorous, but also consume squid. Larvae eat copepods early in life then switch to fish at 6.0 mm (0.2 inches) in length (NMFS, 1999). The diet of adult sailfish caught around Florida consists mainly of pelagic fishes such as little tunny (*Euthynnus alletteratus*), halfbeaks (*Hemiramphus* spp.), cutlassfish (*Trichiurus lepturus*), rudderfish (*Strongylura notatus*), jacks (*Caranx* spp.), pinfish (*Lagodon rhomboides*), and squids (*Argonauta argo* and *Ommastrephes bartrami)*. Sailfish are opportunistic feeders and there is evidence that they may feed on demersal species such as sea robin (*Triglidae*), cephalopods and gastropods found in deep water.

Sailfish collected in the western Gulf of Mexico contained a large proportion of shrimp in their stomachs in addition to little tunny, bullet tuna (*Auxis* spp.), squid, and Atlantic moonfish (*Vomer setapinnis*). Junior et al. (2004) determined that squid were actually the second most important food item in the southwestern Atlantic off the coast of Brazil. Number of food items per stomach ranged from 1-14, and 6 percent of the stomachs were empty upon collection (Junior *et al*., 2004). Adult sailfish are probably not preyed upon often, but predators include killer whales (*Orcinus orca*), bottlenose dolphin (*Tursiops turncatus*), and sharks.

Participants from many nations target sailfish in both the western and eastern Atlantic Ocean. Sailfish are found predominantly in the upper reaches of the water column and are caught in directed sport fisheries (recreational) and as bycatch in the offshore longline fisheries for swordfish and tunas and as a directed catch in coastal fisheries. In coastal waters, artisanal fisheries use many types of shallow water gear to target sailfish (NMFS, 2003).

Stock Status and Outlook

Sailfish and longbill spearfish landings have historically been reported together in annual ICCAT landing statistics. An assessment was conducted in 2001 for the western Atlantic sailfish stock based on sailfish/spearfish composite catches and sailfish "only" catches. The assessment tried to address shortcomings of previous assessments by improving abundance indices and separating the catch of sailfish from that of spearfish in the offshore longline fleets. The 2001 assessment looked at catches reported between 1956 and 2000 and all the quantitative assessment models used produced unsatisfactory fits, therefore the SCRS recommended applying population models that better accounted for these dynamics in order to provide improved assessment advice. For the western Atlantic stock, annual sailfish catches have averaged about 700 mt (1,543,235 lb) over the past two decades and the abundance indices have remained relatively stable. The 2000 yield was 506 mt (1,115,539 lb) (Table 3.15). The reported catches of sailfish/spearfish (Task I) for 2004 were 1,017 and 1,088 mt for the west and east Atlantic, respectively. Recent analyses did not provide any information on the MSY or other stock benchmarks for the 'sailfish only' stock. In the eastern Atlantic, abundance indices based on coastal/inshore fisheries for sailfish have decreased in recent years, while those attained from the Japanese longline fishery indicate constant estimates of abundance since the mid-1970s (SCRS, 2004).

Based on the 2001 assessment, it is unknown if the western or eastern sailfish stocks are undergoing overfishing or if the stocks are currently overfished. Therefore, SCRS recommended that Contracting Parties consider methods to reduce fishing mortality rates, overall, and that western Atlantic catches should not be increased above current levels. Furthermore, the SCRS expressed concern about the incomplete reporting of catches, particularly in recent years.

A summary of Atlantic sailfish stock assessment data is given in Table 3.15. The evolution of estimated sailfish/spearfish catches in the Atlantic during the period 1956 – 2002 for both east and west stocks is given in Figure 3.19. Available CPUE for western Atlantic sailfish/spearfish for the period 1967 – 2000 is shown in Figure 3.20. Estimated sailfish only catches from 1956 – 2000 are shown in Figure 3.21.

Table 3.15 Summary of Atlantic Sailfish Stock Assessment data. Weights are in metric tons, whole weight. Source: SCRS, 2004.

ATLANTIC SAILFISH "ONLY" SUMMARY		
	West Atlantic	**East Atlantic**
Maximum Sustainable Yield (MSY)	Not estimated	Not estimated
Recent Yield (2000)[1]	506 t[2]	969 t[2]
2000 Replacement Yield	~ 600 t	Not estimated
Management Measures in Effect	None	None

[1] Estimated yield includes that carried over from previous years.
[2] Recent yield (2000) was estimated during the 2001 sailfish assessment. To estimate the 2001, 2002 and 2003 yield, catches of sailfish and spearfish would have to be separated. A separation similar to the one conducted in the 2001 assessment has not yet been conducted.

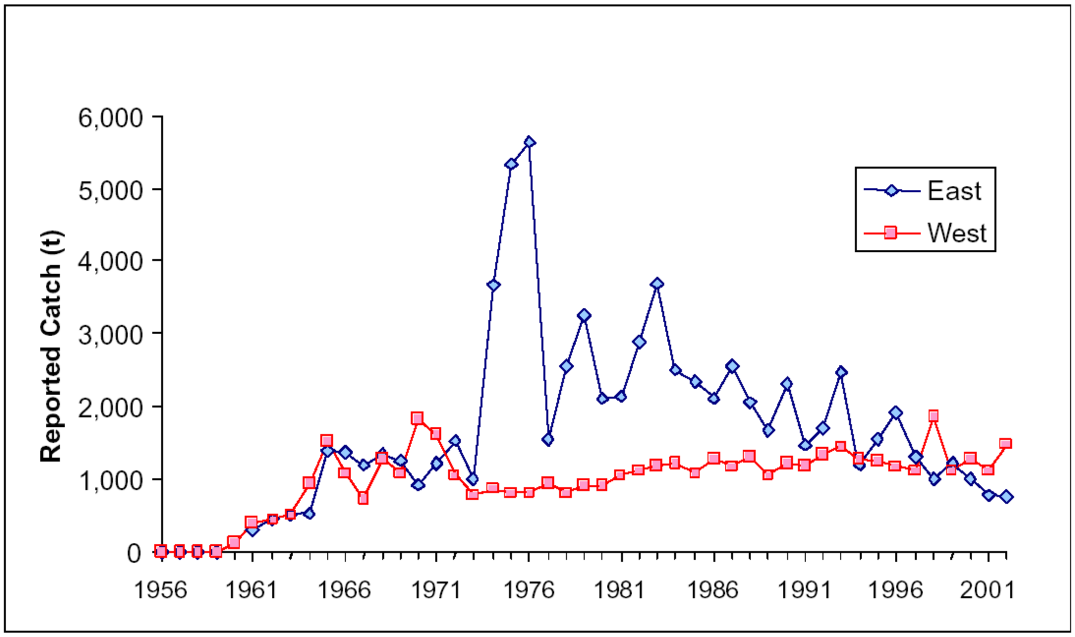


Figure 3.19 Evolution of estimated sailfish/spearfish catches in the Atlantic (landings and dead discards, reported and carried over) in the ICCAT Task I database during 1956-2002 for the east and west stocks. The 2003 catch reported to ICCAT is preliminary and is not included in this figure. Weights are in metric tons, whole weight. Source: SCRS, 2005.

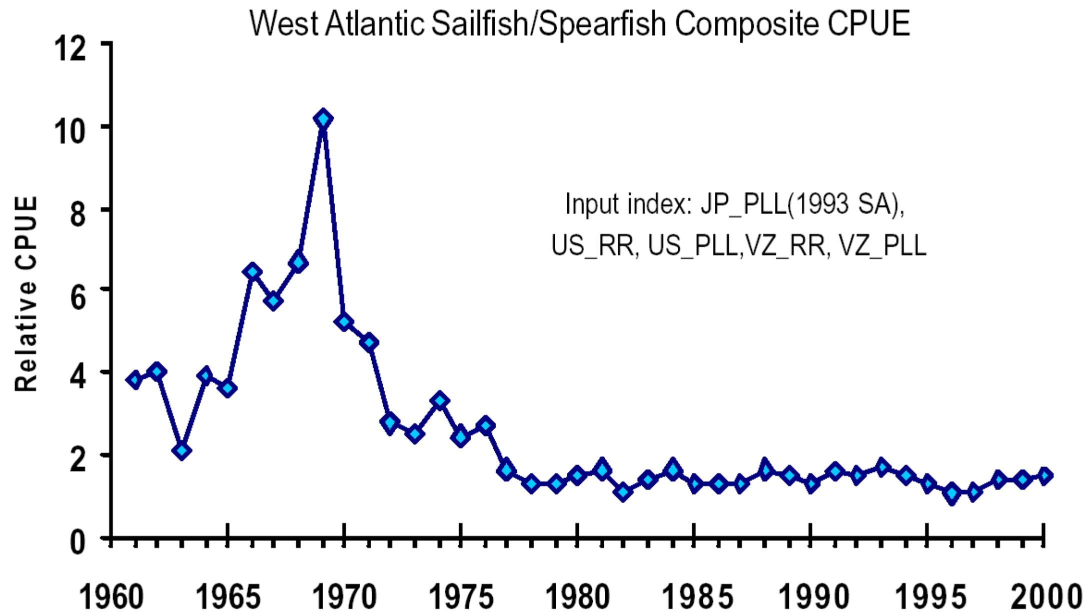


Figure 3.20 Available standardized CPUE for western Atlantic sailfish/spearfish for the period 1967-2000, including Japanese, U.S., and Venezuelan time series data. Source: SCRS, 2005**.**

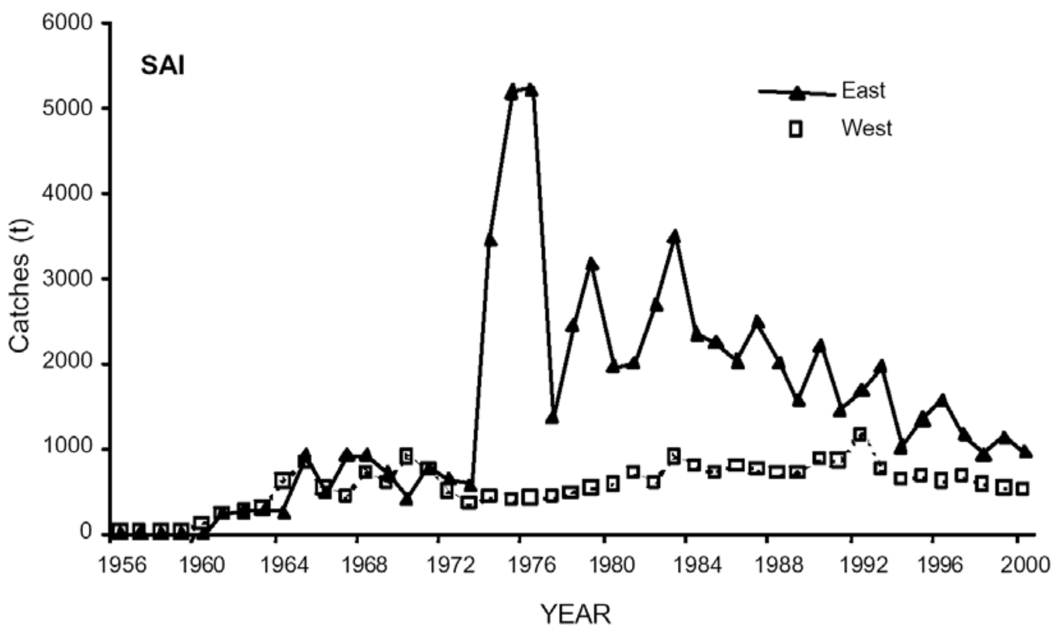


Figure 3.21 Estimated sailfish "only" catches based on the new procedure for splitting combined sailfish and longbill spearfish catches from 1956-2000. Weights are in metric tons, whole weight. Source: SCRS, 2005.

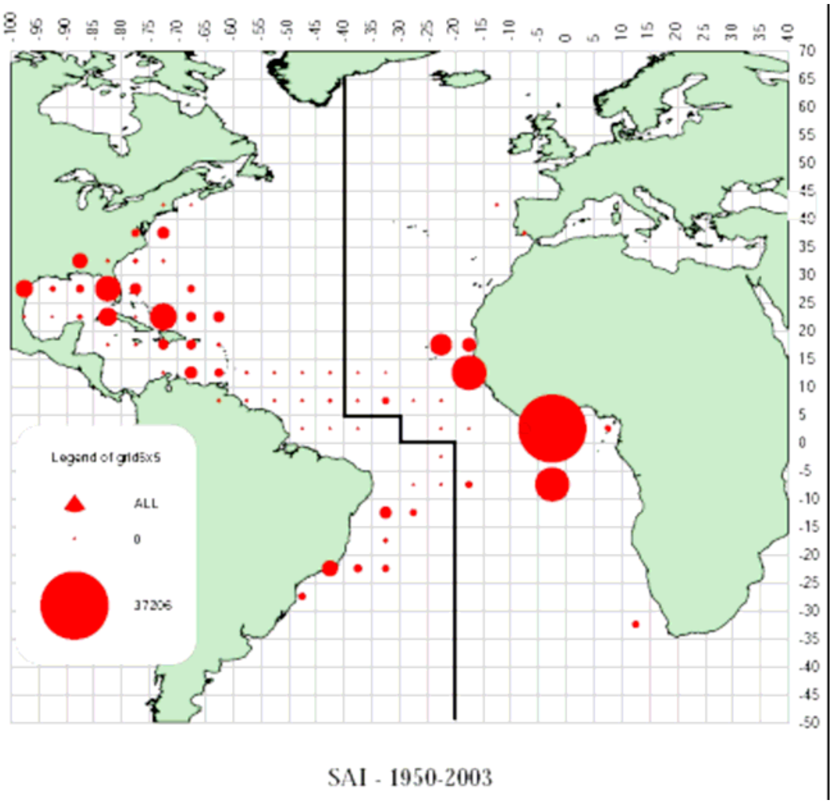


Figure 3.22 Geographical distribution of sailfish/spearfish catches between 1950-2003. Source: SCRS, 2005.

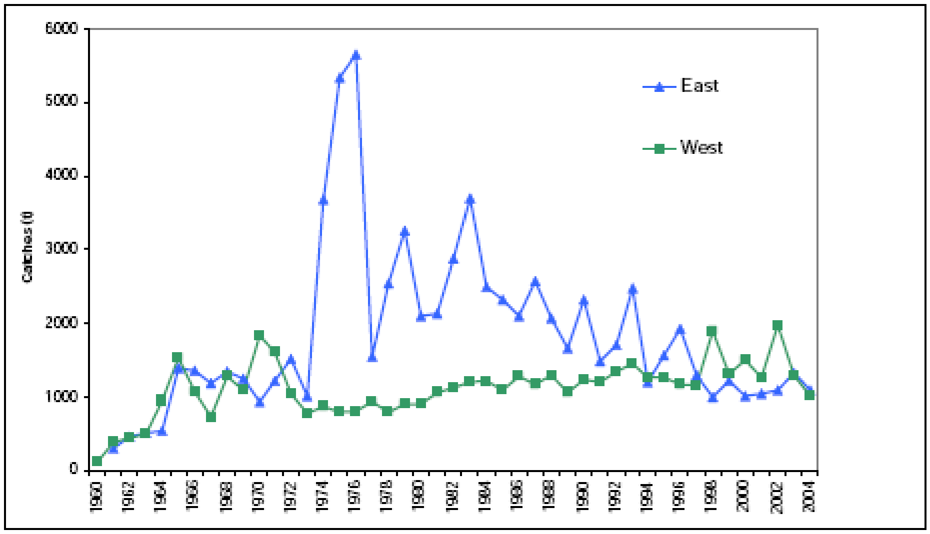


Figure 3.23 Evolution of estimated sailfish/spearfish catches in the Atlantic (landings and dead discards, reported and carried over) in the ICCAT Task I database during 1956-2004 for the east and west stocks. Source: SCRS, 2005.

Effect of Regulations

ICCAT Management Recommendations

No ICCAT management regulations are currently in effect for Atlantic sailfish. Sailfish are managed as distinct eastern and western Atlantic stocks. This separation into two management units is based on life history information. General management recommendations made by the SCRS to ICCAT have remained consistent in recent years. These management recommendations indicated that ICCAT should consider methods for reducing fishing mortality rates. The current western Atlantic assessment led the SCRS to recommend that the West Atlantic sailfish "only" catches should not exceed current levels. For the East Atlantic, the SCRS recommended that sailfish "only" catches should not exceed current levels and that ICCAT should consider practical and alternative methods to reduce fishing mortality and assure data collection systems. SCRS expressed concern about the incomplete reporting of catches, particularly for the most recent years, the lack of sufficient reports by species, and evaluations of the new methods used to split the sailfish and spearfish catch and to index abundance. The SCRS recommended all countries landing sailfish/spearfish or having dead discards, report these data to the ICCAT Secretariat and that the SCRS should consider the possibility of a spearfish "only" assessment in the future (SCRS, 2004).

Domestic Regulations

Please see the discussion of domestic regulations contained in section 3.2.4.1, above.

Recent and Ongoing Research

Please see the discussion of recent and ongoing research contained in section 3.2.4.1, above.

3.2.4.4 Longbill Spearfish

The longbill spearfish (*Tetrapturus pfluegeri*) are the most rare of the Atlantic istiophorids, and were identified as a distinct species in 1963. There is relatively little information available on spearfish life history. A related istiophorid, the Mediterranean spearfish (*Tetrapturus belone*), is the most common representative of this family in the Mediterranean Sea. Longbill spearfish are known to occur in epipelagic waters above the thermocline, off the east-coast of Florida, the Bahamas, the Gulf of Mexico, and from Georges Bank to Puerto Rico. Junior et al. (2004) captured spearfish off the coast of Brazil at depths ranging from 50 – 190 m (164 – 623 feet). The geographic range for this species is from 40°N to 35°S.

Spearfish spawn from November to May and females are generally 17 – 19 kg (37.4 – 41.8 lb) and 160 – 170 cm (63 – 66 inches) at first maturity. These fish are unique among istiophorids in that they are winter spawners. Larval spearfish have been identified from the vicinity of the Mid-Atlantic ridge from December to February, indicating that this species spawns in offshore waters (de Sylva and Breder, 1997).

Common prey items include fish and squid. Specifically, Junior et al. (2004) observed 37 stomachs and found that oceanic pomfret and squid comprised 63 percent of the items identified in stomachs. Most prey items were between 1 – 10 cm (0.39 – 3.9 inches) in length, with a mean length of 6.7 cm (2.63 inches). The maximum number of prey items found in any individual stomach was 33.

Similar to sailfish, spearfish are caught incidentally or as bycatch in offshore longline fisheries by many nations. There are also artisinal fisheries that take place in the Caribbean Sea and in the Gulf of Guinea. Directed recreational fisheries for spearfish are limited due to the fact that the fish are generally located further offshore than other istiophorids. The reported catches of sailfish/spearfish (Task I) for 2003 are 1,310 and 416 mt (2,888,055 and 917,123 lb) for the west and east Atlantic, respectively. The 2001 – 2003 reported catch of unclassified billfish was 12 percent of the reported catch for all billfish and, for some fisheries, this proportion is much greater. This is a problem for species like spearfish for which there is already a paucity of data (SCRS, 2004).

Stock Status and Outlook

Initial stock assessments conducted on spearfish aggregated these landings with sailfish. As mentioned in the Sailfish section, the 2001 assessment included a 'sailfish only' in addition to an aggregate sailfish/spearfish assessment. West Atlantic catch levels for sailfish/spearfish combined seem sustainable because, over the past two decades, CPUE and catch levels have remained constant, however, MSY is unknown. As a result, it is unknown whether or not spearfish are experiencing overfishing or are overfished. Spearfish catch levels are shown in Figure 3.24. The SCRS recommends implementing measures to reduce or keep fishing mortality levels constant and evaluating new methods to split sailfish and spearfish indices of abundance (SCRS, 2004).

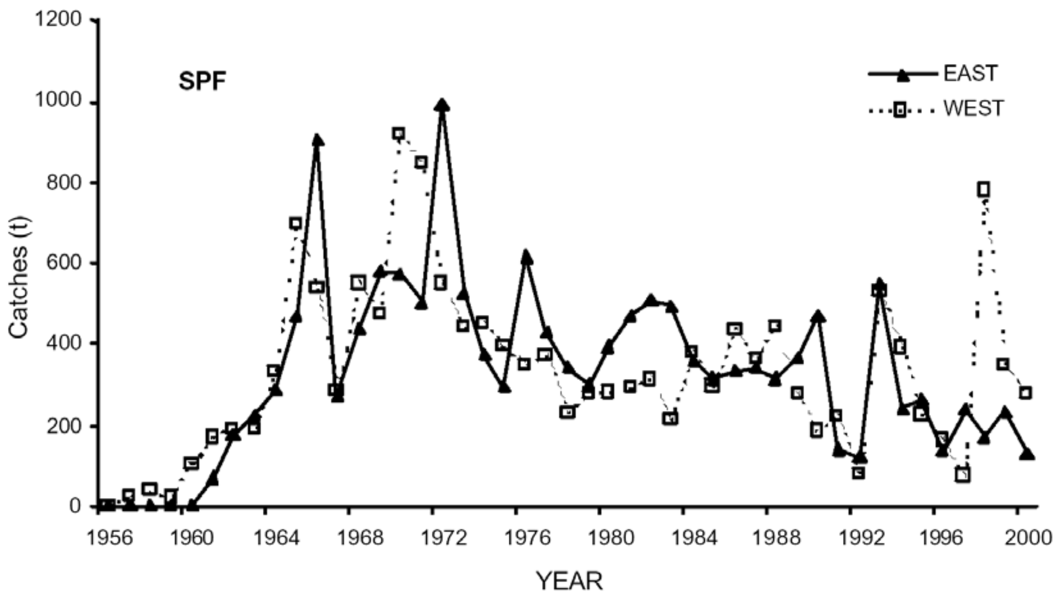


Figure 3.24 Estimated spearfish "only" catches in the Atlantic based on the new procedure for splitting combined sailfish and spearfish catches from 1956-2000. Weights are in metric tons, whole weight. Source: SCRS, 2005.

Effect of Regulations

<u>ICCAT Management Recommendations</u>

No ICCAT management regulations are currently in effect for Atlantic longbill spearfish. Management recommendations are similar to those listed for sailfish, including: consider methods for Contracting Parties to reduce mortality rates, encourage Contracting Parties to provide complete reporting of spearfish catches, evaluate new methods to split the sailfish and spearfish catch/index abundance, and assess sailfish independently of spearfish.

<u>Domestic Regulations</u>

Please see the discussion of domestic regulations contained in section 3.2.4.1, above.

Recent and Ongoing Research

Please see the discussion of recent and ongoing research contained in section 3.2.4.1, above.

3.2.5 Atlantic Sharks

3.2.5.1 Life History/Species Biology

Sharks belong to the class Chondrichthyes (cartilaginous fishes) that also includes rays, skates, and deepwater chimaeras (ratfishes). From an evolutionary perspective, sharks are an old group of fishes characterized by skeletons lacking true bones. The earliest known sharks have been identified from fossils from the Devonian period, over 400 million years ago. These primitive sharks were small creatures, about 60 to 100 cm long, that were preyed upon by larger armored fishes that dominated the seas. The life span of all shark species in the wild is not known, but it is believed that many species may live 30 to 40 years or longer.

Relative to other marine fish, sharks have a very low reproductive potential. Several important commercial species, including large coastal carcharhinids, such as sandbar (*Carcharhinus plumbeus)* (Casey and Hoey, 1985; Sminkey and Musick, 1995; Heist *et al*., 1995), lemon (*Negaprion brevirostris)* (Brown and Gruber, 1988), and bull sharks (Branstetter and Stiles, 1987), do not reach maturity until 12 to 18 years of age. Various factors determine this low reproductive rate: slow growth, late sexual maturity, one to two-year reproductive cycles, a small number of young per brood, and specific requirements for nursery areas. These biological factors leave many species of sharks vulnerable to overfishing.

There is extreme diversity among the approximately 350 species of sharks, ranging from tiny pygmy sharks of only 20 cm (7.8 in) in length to the giant whale sharks, over 12 meters (39 feet) in length. There are fast-moving, streamlined species such as mako (*Isurus* spp.*)* and thresher sharks (*Alopias* spp.), and sharks with flattened, ray-like bodies, such as angel sharks (*Squatina dumerili)*. The most commonly known sharks are large apex predators including the white (*Carcharadon carcharias*), mako, tiger (*Galeocerdo cuvier*), bull (*Carcharhinus leucas)*, and great hammerhead (*Sphyrna mokarran*). Some shark species reproduce by laying eggs, others nourish their embryos through a placenta. Despite their diversity in size, feeding habits, behavior and reproduction, many of these adaptations have contributed greatly to the evolutionary success of sharks.

The most significant reproductive adaptations of sharks are internal fertilization and the production of fully developed young or "pups." These pups are large at birth, effectively reducing the number of potential predators and enhancing their chances of survival. During mating, the male shark inseminates the female with copulatory organs, known as claspers that develop on the pelvic fins. In most species, the embryos spend their entire developmental period protected within their mother's body, although some species lay eggs. The number of young produced by most shark species in each litter is small, usually ranging from two to 25, although large females of some species can produce litters of 100 or more pups. The production of fully-developed pups requires great amounts of nutrients to nourish the developing embryo.

Traditionally, these adaptations have been grouped into three modes of reproduction: oviparity (eggs hatch outside body), ovoviviparity (eggs hatch inside body), and viviparity (live birth).

Adults usually congregate in specific areas to mate and females travel to specific nursery areas to pup. These nurseries are discrete geographic areas, usually in waters shallower than those inhabited by the adults. Frequently, the nursery areas are in highly productive coastal or estuarine waters where abundant small fishes and crustaceans provide food for the growing pups. These areas also may have fewer large predators, thus enhancing the chances of survival of the young sharks. In temperate zones, the young leave the nursery with the onset of winter; in tropical areas, young sharks may stay in the nursery area for a few years.

Shark habitat can be described in four broad categories: (1) coastal, (2) pelagic, (3) coastal-pelagic, and (4) deep-dwelling. Coastal species inhabit estuaries, the nearshore and waters of the continental shelves, *e.g.*, blacktip (*Carcharhinus limbatus*), finetooth, bull, lemon, and sharpnose sharks (*Rhizoprionondon terraenovae*). Pelagic species, on the other hand, range widely in the upper zones of the oceans, often traveling over entire ocean basins. Examples include shortfin mako (*Isurus oxyrinchus*), blue (*Prionace glauca*), and oceanic whitetip (*Carcharhinus longimanus*) sharks. Coastal-pelagic species are intermediate in that they occur both inshore and beyond the continental shelves, but have not demonstrated mid-ocean or transoceanic movements. Sandbar sharks are examples of a coastal-pelagic species. Deep-dwelling species, *e.g.*, most cat sharks (*Apristurus* spp.) and gulper sharks (*Centrophorus* spp.) inhabit the dark, cold waters of the continental slopes and deeper waters of the ocean basins.

Seventy-three species of sharks are known to inhabit the waters along the U.S. Atlantic coast, including the Gulf of Mexico and the waters around Puerto Rico and the U.S. Virgin Islands. Thirty-nine species are managed by HMS; spiny dogfish also occur along the U.S. coast, however management for this species is under the authority of the Atlantic States Marine Fisheries Commission as well as the New England and Mid-Atlantic Fishery Management Councils. Deep-water sharks were removed from the management unit in 2003. Based on the ecology and fishery dynamics, the sharks have been divided into four species groups for management: (1) large coastal sharks, (2) small coastal sharks, (3) pelagic sharks, and (4) prohibited species (Table 3.16).

Table 3.16 Common names of shark species included within the four species management units under the purview of the HMS management division.

Management Unit	Shark Species Included
Large Coastal Sharks (11)	Sandbar, silky, tiger, blacktip, bull, spinner, lemon, nurse, smooth hammerhead, scalloped hammerhead, and great hammerhead sharks
Small Coastal Sharks (4)	Atlantic sharpnose, blacknose, finetooth, and bonnethead sharks
Pelagic Sharks (5)	Shortfin mako, thresher, oceanic whitetip, porbeagle, and blue sharks
Prohibited Species (19)	Whale, basking, sandtiger, bigeye sandtiger, white, dusky, night, bignose, Galapagos, Caribbean reef, narrowtooth, longfin mako, bigeye thresher, sevengill, sixgill, bigeye sixgill, Caribbean sharpnose, smalltail, and Atlantic angel sharks

3.2.5.2 Stock Status and Outlook

NMFS is responsible for conducting stock assessments for the Large and Small Coastal Shark complexes (LCS and SCS) (Cortes, 2002; Cortes *et al*., 2002). ICCAT and the Committee on the Status of Endangered Wildlife in Canada (COSEWIC) have recently conducted assessments of three pelagic shark species. Stock assessments were conducted for the LCS and SCS in 2002. NMFS is conducting stock assessments for LCS and SCS in 2006 and 2007, respectively. NMFS also recently released a stock assessment for dusky sharks (May 25, 2006, 71 FR 30123). Species-specific assessments for blacktip and sandbar sharks within the LCS complex and finetooth sharks, Atlantic sharpnose sharks, blacknose sharks (*Carcharhinus acronotus*), and bonnethead sharks (*Sphyrna tiburo*) within the SCS complex, were also conducted in 2002. The conclusions of these assessments are summarized in Table 3.18 and Table 3.17 and are fully described in Amendment 1 to the 1999 Atlantic Tunas, Swordfish, and Sharks FMP. Summaries of recent stock assessments and reports on several species of pelagic sharks (blue sharks, shortfin mako sharks, and porbeagle sharks (*Lamna nasus*) by Committee on the Status of Endangered Wildlife in Canada (COSEWIC) and ICCAT are also included in this section. More detailed information on life history and distribution of sharks can be found in Appendix B (EFH).

3.2.5.3 Large Coastal Sharks

The last LCS stock assessment was held in June 2002, however, results from a new stock assessment should be released in 2006. Discussions of the 2002 stock assessment focused on the availability of four additional years worth of catch estimates, biological data, catch rate series, and the types of models that should be used. The modeling itself was performed after the Shark Evaluation Workshop and incorporated new catch and effort estimates for the years 1998 – 2001 as well as over 20 catch-per-unit-effort (CPUE) series for the LCS complex, sandbar, and blacktip sharks (

Table 3.17).

A variety of stock assessment models were used to investigate the population dynamics of LCS including: (1) a non-equilibrium Schaefer biomass dynamic model using the sampling/importance re-sampling (SIR) algorithm (Bayesian SPM) and several weighting schemes; (2) a non-equilibrium Schaefer state-space surplus production model (SSSPM) using a Markov Chain Monte Carlo (MCMC) method for numerical integration; (3) a lagged recruitment, survival, and growth (SSLRSG) state-space model; (4) the maximum likelihood estimation model (MLE); and (5) a fully age-structured, state-space population dynamic model (ASPM). General descriptions of these models can be found in the stock assessment. The use of multiple approaches in evaluating stock status can reduce uncertainty in the best available data and can balance individual model strengths and weaknesses.

Due to concerns that catch series may underestimate mortality from the commercial fishery, four separate catch scenarios were considered to evaluate catch histories: updated, baseline, and the alternative scenarios. The updated catch scenario was comprised of catches used in the 1998 SEW, including data through 1997, and additional catches for 1998 – 2001. The baseline catch scenario included similar information and discards from the menhaden fishery, and Mexican catches, bottom longline discards back to 1981, and commercial and recreational catches back to 1981. The alternative scenario reconstructed historical catches back in time (calendar years 1960 – 2001) and applied to the LCS complex only. The age-structured models for sandbar and blacktip shark included both updated and baseline scenarios in which specific catch series were linked to specific catchability and selectivity parameters. The alternative scenarios were used for sandbar and blacktip shark catch history evaluation.

Catch rates were also analyzed for other species included in the LCS complex such as tiger, hammerhead, dusky, and silky shark. Generally, commercial data indicate increasing catch rates for tiger shark (Brown and Cramer, 2002; Cortes *et al.*, 2002) as well as decreasing trends for dusky shark, sand tiger shark, and hammerhead shark (Brown, 2002; Cortes *et al.*, 2002; Brown and Cramer, 2002). Recreational catch data for hammerhead and bull shark point towards declining trends for both species (Cortes *et al.*, 2002).

Considering the outputs of all model analyses combined, the assessment results were considerably more pessimistic for the LCS aggregate as compared to those for individual species within the complex (*i.e.*, sandbar and blacktip sharks). While results illustrate improvements in the LCS complex since 1998, all of the models and catch scenarios described above, with the exception of the Bayesian SPM scenario which used only fishery-independent CPUE series, indicate that overfishing may be occurring and that the LCS complex may be overfished. Tables 3.4 and 3.5 provide biomass and fishing mortality estimates used to make these determinations. As such, the stock assessment finds that at least a 50-percent reduction in 2000 catch levels for the complex could be required for the biomass to reach maximum sustainable yield (MSY) in 10, 20 or 30 years. Furthermore, a 20-percent reduction in 2000 catch levels for the complex would result in less than a 50-percent probability of achieving MSY even after 30 years of implementation under those catch levels. Overall, the stock assessment found that the LCS complex as a whole is overfished and overfishing is occurring (Cortes *et al.*, 2002).

The assessment acknowledges that the results between the complex and sandbar and blacktip sharks may be considered conflicting, given that sandbar and blacktip sharks comprise the majority of LCS commercial harvests. Specifically, sandbar and blacktip sharks make up approximately 44 percent of the total commercial catch (Burgess and Morgan, 2003) and over 70 percent of the landings (Cortes and Neer, 2002). The remainder of the catch is comprised mostly of tiger, scalloped hammerhead, silky, and sand tiger, with catch composition varying by region (Burgess and Morgan, 2003). These species are less marketable and are often released, so they are reflected in the overall catch but not the landings. Nonetheless, the complex represents a variety of species beyond sandbar and blacktip shark, some of which are in apparent decline.

In December 2002, the peer review process of the 2002 LCS stock assessment was completed as required by a court settlement agreement. The peer reviews were conducted by three separate non-NMFS reviewers who were asked to respond to five questions regarding the appropriateness of specific modeling approaches and the selection there of, consideration of available data and the quality of data sets, application of available data in selected models, reliability of projections, and the effects of various catch scenarios on stock trajectories. Peer review findings were generally positive in that reviewers agreed that a state-of-the-art assessment was performed and that the best available science was employed. Reviewers noted assessment strengths including (1) compilation of several indices of abundance, (2) consideration of multiple stock assessment models, including Bayesian analyses, (3) discussion of myriad alternative harvest policies, and (4) analytical changes to address concerns raised by previous reviewers. Further investigation of catch series indices, assessment of individual species within the LCS complex, investigation of age and age-sex-area assessment models, consideration of alternative harvest policies in contrast to the current constant-catch policy, and NMFS support for observer programs to obtain fishery independent estimates of abundance were among the recommendations offered for improvements to future stock assessment for LCS.

The 2005/2006 stock assessment for LCS follows the Southeast Data, Assessment, and Review (SEDAR) process. This process is a cooperative program designed to improve the quality and reliability of the stock assessments. The SEDAR process emphasizes constituent and stakeholder participation in the assessment development, transparency in the assessment process, and a rigorous and independent scientific review of the completed stock assessment. The Data Workshop for the stock assessment, which documented, analyzed, reviewed, and compiled the data for conducting the assessment, was held from October 31 to November 4, 2005, in Panama City, FL (September 15, 2005, 70 FR 54537; correction October 5, 2005, 70 FR 58190). The Assessment Workshop, which developed and refined the population analyses and parameter estimates, was held from February 6 to February 10, 2006, in Miami, FL (December 22, 2005, 70 FR 76031). At the time of writing this Final HMS FMP, the last workshop, the Review Workshop, had not yet occurred. At the Review Workshop, independent scientists should review the assessment and data. This Workshop should be held on June 5 to June 9, 2006, in Panama City, FL (March 9, 2006, 71 FR 12185). The final results should be released after the review workshop. All reports are posted on SEDAR webpage when complete (http://www.sefsc.noaa.gov/sedar/).

Recently, the SEFSC released the first dusky shark stock assessment (May 25, 2006, 71 FR 30123). Results from all of the models used were similar with all models indicating that the stock is heavily exploited. The stock assessment summarizes relevant biological data, discusses the fisheries affecting the species, and details the data and methods used to assess the stock. At the time of writing this Final HMS FMP, NMFS is reviewing the stock assessment and considering implications for management.

3.2.5.4 Small Coastal Sharks

A stock assessment for small coastal sharks (SCS) was also conducted in 2002. This was the first assessment since 1992 and as such the assessment included new information regarding SCS age and growth, reproduction, and population dynamics. Additional information relative to commercial and recreational catches as well as extended bycatch estimates for the shrimp trawl fishery were also considered.

Trends in catch were analyzed for the SCS complex as well as the four species comprising this aggregate grouping (Table 3.18). Overall, SCS commercial landings exceeded recreational harvest in all years since 1996, with the exception of 2000. Of the four species of SCS analyzed, bonnetheads contributed to over 50 percent of all SCS commercial landings in 1995, but Atlantic sharpnose and finetooth sharks each accounted for over 30 percent of the commercial landings in years 1996 – 1999 and 1998 – 2000 respectively. Atlantic sharpnose dominated recreational catch in all years between 1995 and 2000.

Also, in 2002, researchers at the Mote Marine Laboratory and the University of Florida, conducted a stock assessment for SCS using similar data but different models. The results were similar to the NMFS assessment in that current biomass levels for Atlantic sharpnose, bonnethead, and blacknose were at least 69 percent of the biomass in 1972 while the current biomass level for finetooth sharks was only nine percent the level in 1972 (Simpfendorfer and Burgess, 2002). Both stock assessments note that the data used for finetooth sharks is not as high a quality as the data used for Atlantic sharpnose due to shorter catch-per-unit-effort (CPUE) and catch series, lack of bycatch estimates, and no catches reported in some years.

NMFS intends to conduct a new stock assessment for SCS starting in 2007. The new stock assessment would follow the SEDAR process.

Finetooth Sharks

Additional information on finetooth sharks and the results specific to this species from the 2002 SCS stock assessment are provided in this section because finetooth sharks were the only exception to the results of the assessment, in that fishing mortality in the final five years of data considered was above the mortality level associated with producing MSY. As such, finetooth sharks are not overfished, however, overfishing is occurring (Table 3.17 and Table 3.20). Sections 2.2.2 and 4.2.2 provide more detail on the alternatives that were considered to prevent overfishing of finetooth sharks.

Finetooth sharks inhabit shallow coastal waters to depths of 10 m (32.8 feet) near river mouths in the Gulf of Mexico and South Atlantic Ocean between Texas and North Carolina. These fish often form large schools and migrate to warmer waters when water temperatures drop below 20°C (68°F). Finetooth sharks are relatively productive compared to other sharks as fish are sexually mature at 3.9 (TL = 118 cm (46 inches)) and 4.3 (TL = 123 cm (48 inches)) years for males and females, respectively (Carlson *et al*., 2003). Reproduction in finetooth sharks is viviparous with yolk sac placenta and embryos nourished through a placental connection. Females move into the nursery areas in late May and gestation is approximately 12 months. Each litter can have 1 – 6 pups with individuals measuring 51 – 64 cm (20 – 25 inches) in length. The finetooth shark feeds primarily on mullet, Spanish mackerel, spot, Atlantic menhaden, cephalopods, and crustacean (Bester and Burgess, 2004).

In 2002, NMFS conducted a stock assessment for all SCS, including finetooth sharks. Five catch rate series were used, including fishery-independent and -dependent data. The fishery-independent data sources included the NMFS Pascagoula and Panama City Laboratory longline surveys (NMFS SE LL and NMFS LL PC), and the NMFS Panama City Laboratory Gillnet Survey (NMFS GN). Fishery-dependent catch series data were included from the combined recreational series and the Directed Shark Gillnet Fishery Observer Program (DSGFOP). This catch rate series data were combined with life history information for finetooth sharks and evaluated with several stock assessment models. There were four models utilized for the assessment and numerous scenarios within each model, producing a range of point estimates for fishing mortality, relative fishing mortality, biomass, relative stock biomass, maximum fishing mortality threshold, minimum stock size threshold, and other parameters.

Of the catch series data used in the analysis, three of the five showed a positive trend (*i.e.*, had positive slopes) in catch over time, suggesting an increase in finetooth shark abundance. The catch series data showing positive trends were DSGFOP (0.03), NMFS SE LL (0.34), and NMFS LL PC (0.04); however only the slope for the DSGFOP catch series data was statistically significant different from zero ($P = 0.03$). However, it should be noted that data were missing from some years in the NMFS SE LL and the DSGFOP catch series data; therefore, one cannot necessarily assume that finetooth sharks are increasing in abundance. The other two datasets, NMFS LL PC and NMFS GN PC, had negative trends in catch over time as indicated by their negative slopes (-0.24 and -0.11, respectively) but neither trend was statistically significant from zero. Overall, the slopes for the small coastal shark (SCS) complex as a whole and other individual species were relatively flat, indicating that the relative abundance of the stocks remained fairly stable during the exploitation phase (Cortés, 2002).

Four different stock assessment models were used to evaluate the status of SCS using Bayesian statistical techniques. Results of both surplus production models and the Lagged Recruitment Survival and Growth State Space model (LRSG) (using several different scenarios) indicate that the current level of removals is sustainable for the SCS aggregate and the individual species within the complex. Relative stock biomass and fishing mortality trajectories obtained with the Bayesian state-space Schaefer surplus production model (SPM) for the small coastal aggregate and the Atlantic sharpnose sharks followed similar trends, since the catches were dominated by these species. The model predicted that the stock biomass for the small coastal shark complex in any given year from 1972 – 2000 exceeded the biomass producing MSY. Relative fishing mortality (F/F_{MSY}) was generally below one for the SCS complex, but for finetooth sharks, the final five values of F in the series (1996 – 2002) estimated by the model were above the level of F corresponding to MSY.

Results for finetooth sharks were directly influenced by the catch series used, which did not include any bycatch estimates, and this, in turn, influenced certain parameters of the Bayesian models (specifically, the priors chosen for K, which describes uncertainty in assessment models) (Cortés, 2002). The lack of bycatch data in the catch series data lead to low values of MSY predicted for finetooth sharks in the SCS stock assessment (especially those obtained through the SPM models). This lack of bycatch data and shorter catch and catch per unit effort (CPUE) series, coupled with no catches reported in some years, led to some uncertainty in the stock assessment for finetooth sharks. In the case of finetooth sharks, model estimates of recent F levels are above F_{MSY}, indicating that recent levels of effort directed at this species, if continued, could result in an overfished status in the relatively near future. The various stock assessments models used and sensitivity analyses run support these general conclusions (Cortés, 2002). Future work should continue to monitor the status of this individual species (Cortés, 2002).

Landings of finetooth sharks in other fisheries are extensive; however, catch series data from these fisheries are currently unavailable. The inclusion of such data in future stock assessments will provide better information on both fishing effort and estimates of MSY. Thus, it may be prudent to develop a plan to prevent overfishing that first investigates other sources of fishing mortality before initiating a particular set of management actions. In order to capture additional catch series data on fisheries contributing to finetooth fishing mortality, NMFS is expanding observer programs to include DSGFOP observers on all boats that have directed or incidental shark permits to determine if these gillnet vessels in the South Atlantic are contributing to the majority of fishing mortality. A continuation of a pilot program initiated in the spring of 2005 that placed observers on board additional gillnet vessels targeting other fish species will improve data collection efforts. Furthermore, contacting Regional Fishery Management Councils and Interstate Marine Fisheries Commissions to determine sources of mortality occurring under other fishery management plans, and having finetooth sharks included as a select species for sub-sampling of bycatch in the Gulf of Mexico Shrimp Trawl Observer Program will provide additional landings data necessary for appropriate management and conservation actions in the future.

Table 3.17 Summary Table of Biomass and Fishing Mortality for Large Coastal Sharks (LCS). Source: Cortes *et al*., 2002.

Species/Complex	2001 Biomass (N_{2001})	2001 Relative Biomass (N_{2001}/N_{MSY})	Fishing Mortality Rate (F_{2001})	Maximum Fishing Mortality Threshold (F_{MSY})	Outlook
Large Coastal Complex	2,940-10,156	0.46-1.18	0.07-0.21	0.05-0.10	Overfished; Overfishing is occurring
Sandbar Sharks	1,027-4.86 E-8	3.25E4-2.22	0.0001-0.70	0.05-0.46	Not overfished; Overfishing is occurring
Blacktip Sharks	5,587-3.16 E7	0.79-1.66	0.01-0.21	0.06-0.18	Not overfished; No overfishing occurring

Table 3.18 Summary Table of Biomass and Fishing Mortality for Small Coastal Sharks (SCS) Source: Cortes, 2002.

Species/Complex	**MSY mill lb dw**	**2001 Relative Biomass Level (B_{2001}/ B_{MSY})**	**Minimum Stock Size Threshold MSST = $(0.5)B_{MSY}$ if M>=0.5 MSST = (1-M)Bmsy if M<0.5**	**Fishing Mortality Rate (F_{2000})**	**Maximum Fishing Mortality Threshold (F_{MSY})**	**Outlook**
Small Coastal Sharks (SCS)	7.0-2.2	1.38-2.39	16.2-50.2	0.03-0.24	0.04-0.28	Not overfished; No overfishing occuring
Bonnethead Sharks	1.8-0.5	1.46-2.78	2.3-7.3	0.03-0.18	0.05-0.53	Not overfished; No overfishing occuring
Atlantic Sharpnose Sharks	7.8-1.9	1.69-3.16	11.5-33.4	0.02-0.06	0.04-0.42	Not overfished; No overfishing Occurring
Blacknose Sharks	0.8-0.2	1.92-3.15	1.6-4.5	0.02-0.19	0.03-0.32	Not overfished; No overfishing Occurring

Table 3.19 Summary table of the status of the biomass of finetooth sharks. Sources: 2002 SCS stock assessment; E. Cortes, personal communication. **LRSG=lagged recruitment, survival, and growth model; SPM=surplus production model**

Species	Model	Current Biomass B_{2001}	B_{MSY}	Current Relative Biomass Level B_{2001}/B_{MSY}	Over-fished?	Minimum Stock Size Threshold MSST = (1-M)B_{MSY} if M<0.5 MSST = 0.5 B_{MSY} if M>=0.5	Minimum Biomass Flag Bflag = (1-M)B_{OY}	Biomass Target B_{OY} = 125%B_{MSY}	MSY (million lb dw)	Outlook
Finetooth Sharks	Bayesian LRSG using Gibbs sampler	1.9	0.8	2.37	No	0.4 to 0.7	0.5 to 0.8	1.00	0.26 (118)	Stock not overfished $B_{2001} > B_{OY}$
	Bayesian SPM using Gibbs sampler	2.3	1.65	1.39	No	0.8 to 1.4	1.0 to 1.7	2.06	0.05 (23)	

Table 3.20 Summary table of the status of the biomass of finetooth sharks. Sources: 2002 SCS stock assessment; E. Cortes, personal communication. **LRSG=lagged recruitment, survival, and growth; SPM=surplus production model.**

Species	Model	Current F F_{2000}	Maximum Fishing Mortality Threshold MFFT = F_{MSY}	Current Relative fishing Mortality Rate F_{2000}/F_{MSY}	Over-fishing?	Fishing Mortality Target $F_{OY} = 0.75F_{MSY}$	Management Measures to Reduce Fishing Mortality Required? $F_{2000} > F_{OY}$	Outlook
Finetooth Sharks	Bayesian LRSG using Gibbs sampler	1.50	0.44	3.42	YES	0.33	YES	OVERFISHING
	Bayesian SPM using Gibbs sampler	0.13	0.03	4.13	YES	0.02	YES	

3.2.5.5 Pelagic Sharks

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

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

The SCRS decided to conduct an assessment of Atlantic pelagic sharks beginning in 2004. Emphasis was placed on blue sharks and shortfin mako sharks. Several models such as non-equilibrium production and statistical age/length-structured models will be considered to analyze the population dynamics of pelagic shark species.

ICCAT Stock Assessment on Blue and Shortfin Mako Sharks

At the 2004 Inter-Sessional Meeting of the ICCAT Subcommittee on bycatch, stock assessments for Atlantic blue shark (*Prionace glauca*) and shortfin mako (*Isurus oxyrinchus*) were conducted. 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 assessment indicated that the current biomass of North and South Atlantic blue shark seems to be above MSY ($B>B_{MSY}$), however, these results are conditional and based on assumptions that were made by the committee. These assumptions indicate that blue sharks are not currently overfished, again, this conclusion is conditional and based on limited landings data. The committee estimates that between 82,000 and 114,000 mt ww (180,779,054 – 251,326,978 lb) of blue shark are harvested from the Atlantic Ocean each year.

The North Atlantic shortfin mako population has experienced some level of stock depletion as suggested by the historical CPUE trend and model outputs. The current stock may be below MSY ($B<B_{MSY}$), suggesting that the species may be overfished. Overfishing may also be occurring as between 13,000 and 18,000 mt ww (28,660,094 – 39,683,207 lb) of shortfin mako are harvested in the Atlantic Ocean annually. South Atlantic stocks of shortfin mako shark are likely fully exploited as well, but depletion rates are less severe than in the North Atlantic.

The results of both of these assessments should be considered preliminary in nature due to limitations on quality and quantity of catch data available (SCRS, 2004). The subcommittee stated that catch data currently being reported to ICCAT does not represent the total catch actually landed, and are very limited with regard to size, age, and sex of shark harvested or caught incidentally. In order to attain a more accurate estimate of total landings, and improve future stock assessments, the committee made several recommendations, including: increase the infrastructure investment for monitoring the overall catch composition of sharks, standardize catch per unit effort (CPUE) from major fishing fleets, expand use of trade statitistics (fins) to extend historical time series, and include scientists from all Contracting Parties with significant blue and shortfin mako catches in future assessments (SCRS, 2004).

COSEWIC Stock Assessment on Porbeagle

The Committee on the Status of Endangered Wildlife in Canada (COSEWIC) conducted a species report and assessment for porbeagle in 2004. They suggest that significant declines in porbeagle abundance have occurred as a result of overexploitation in fisheries. In 2001, porbeagle biomass was estimated at 4,409 mt ww (9,720,181 lb), a decline of 89 percent from the pre-fishing biomass in 1961 (COSEWIC, 2004). The model employed predicts that populations declined precipitously after the fishery was developed in 1961, recovered slightly in the 1980s, and then declined again to the current level. Porbeagle quotas have been reduced significantly for Canadian fisheries. NMFS is interested in working with the Canadian government to address concerns raised by the COSEWIC report. Currently, NMFS has a species-specific quota of 92 mt dw (202,823 lb) for porbeagle. These fish are generally harvested incidentally in the pelagic longline fisheries. Between 2000 and 2003, landings of porbeagle were approximately 3.4 mt dw for the four fishing years, combined (0.85 mt dw/year). NMFS is currently reviewing the latest Canadian stock assessment in terms of the overfishing and overfished thresholds defined in the FMP. At this time, the status of porbeagle sharks is unknown; however, if the stock is found to meet the thresholds, the status would be redefined.

3.2.5.6 Effects of Regulations

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

The final rule implementing Amendment 1 to the 1999 FMP was published in the Federal Register on December 23, 2003. This final rule revised the shark regulations based on the results of the 2002 stock assessments for SCS and LCS. Results of these stock assessments indicate the SCS complex is not overfished (e.g. depleted in abundance) and overfishing is not occurring; the LCS complex continues to be overfished, and overfishing is occurring; sandbar sharks are not overfished, but overfishing is occurring; blacktip shark stocks are rebuilt and healthy; and finetooth sharks are not overfished, but overfishing is occurring. In Amendment 1 to the 1999 FMP, NMFS revised the rebuilding timeframe for LCS to 26 years from 2004, and implemented several new regulatory changes. Management measures enacted in the amendment included: re-aggregating the large coastal shark complex; using maximum sustainable yield (MSY) as a basis for setting commercial quotas; eliminating the commercial minimum size restrictions; implementing a commercial trip limit for LCS and SCS; implementing trimester commercial fishing seasons effective January 1, 2005; imposing gear restrictions to reduce bycatch; implementing a time/area closure off the coast of North Carolina effective January 1, 2005; and establishing three regional commercial quotas (Gulf of Mexico, South Atlantic, and North Atlantic) for LCS and SCS management units. For more detail on the management history surrounding shark regulations see Section 3.1.

As a result of using the MSY as a basis for setting quotas and implementing a new rebuilding plan, the overall quota for LCS in 2004 of 1,017 metric tons (mt) dressed weight (dw) (2.24 million lbs dw) was lower than both the 2002 LCS quota of 1,285 mt dw (2.83 million lbs dw) and the 2003 LCS quota of 1,714 mt dw (3.78 million lbs dw). The annual SCS quota is 454 mt dw per year. The annual quotas for pelagic sharks are 273 mt dw for blue sharks, 92 mt dw for porbeagle sharks, and 488 mt dw for pelagic sharks other than porbeagle and blue sharks.

The regulations governing the recreational and commercial shark fisheries allow opportunities for participants to pursue sharks for leisure, subsistence, and/or commercial gain while maintaining compliance with statutes that include, but are not limited to, the Magnuson Stevens Act, Endangered Species Act, Marine Mammal Protection Act, and the National Environmental Policy Act. These regulations seek to minimize bycatch of non-target, prohibited shark species, and protected resources by a variety of measures, including, but not limited to: mandating the use of corrodible, non-stainless steel hooks; requiring possession of handling and release equipment for protected resources (long handled line cutters and dipnets); conducting gillnet checks every two hours; mandatory observer coverage for commercial fisheries (if selected); limits on the deployment and operation of authorized gears; and, maintaining 19 species of shark on the prohibited species list (possession not authorized). Rebuilding overfished stocks is another objective of shark fishery regulations, and is accomplished through numerous measures, including, but not limited to: regional and trimester fishing quotas based on MSY; regional and trimester fishing seasons; commercial trip limits (4,000 lbs dw for LCS); recreational bag limits (1 shark/vessel/day for all authorized species except Atlantic sharpnose and bonnethead sharks (1 shark/person/day); and, recreational minimum size limits (>54” FL for all authorized species except Atlantic sharpnose and bonnethead sharks). Controlling fishing effort is accomplished by the requirement to possess a limited access permits for commercial shark fisheries and upgrading restrictions for transferred permits. Reducing fishing mortality of prohibited dusky sharks and juvenile sandbar sharks is achieved by the Mid-Atlantic time area closure (January 1 – July 31) and the requirement to use VMS when bottom longline gear is onboard during this time period.

Shark landings are monitored for adherence to regional and trimester quotas by requiring the submission of shark dealer landings reports every two weeks. Fishermen must also submit trip reports describing target and incidental landings within seven days of offloading. These data are used for stock assessments. Regulations are subject to change based on stock assessments, international obligations, litigation, and public sentiment. An updated LCS stock assessment should be available in 2006 and data workshops for an updated SCS stock assessment are scheduled to begin in early 2007. Domestic management measures affecting the U.S. shark fishery are constantly being evaluated for their effectiveness; furthermore, the United States is taking steps to improve the conservation and management of pelagic sharks within international fora, including ICCAT.

At the 2004 ICCAT annual meeting in New Orleans, ICCAT adopted a recommendation concerning the conservation of sharks caught in association with fisheries managed by ICCAT. This was the first binding measure passed by ICCAT dealing specifically with sharks. This recommendation includes, among other measures: reporting of shark catch data by Contracting Parties, a ban on shark finning, a request for Contracting Parties to live-release sharks that are caught incidentally, a review of management alternatives from the 2004 assessment on blue and shortfin mako sharks, and a commitment to conduct another stock assessment of selected pelagic shark species no later than 2007. In 2005, additional measures pertaining to pelagic sharks were added to the 2004 ICCAT recommendation. Measures included a requirement for contracting parties that have not yet implemented the 2004 recommendation, to reduce shortfin mako mortality, and annually report on their efforts to the commission.

3.2.5.7 Recent and Ongoing Research

Northeast Fisheries Science Center

Fishery Independent Survey for Coastal Sharks

The biannual fishery independent survey of Atlantic large and small coastal sharks in US waters from Florida to Delaware was conducted from April 19 to June 1, 2004. The goals of this survey are to: (1) monitor the species composition, distribution, and abundance of sharks in the coastal Atlantic; (2) tag sharks for migration and age validation studies; (3) collect biological samples for age and growth, feeding ecology, and reproductive studies; and (4) collect morphometric data for other studies. Results from this 2004 survey included 557 sharks representing eight species caught on 69 longline sets. The time series of abundance indices from this survey are critical to the evaluation of coastal Atlantic shark species.

Age and Growth of Coastal and Pelagic Sharks

A comprehensive aging and validation study for the shortfin mako (*Isurus oxyrinchus)*, continued in conjunction with scientists at Moss Landing Marine Laboratories, California using bomb carbon techniques. Additional validation studies have begun on the sandbar shark, (*Carcharhinus plumbeus),* dusky shark, (*Carcharhinus obscurus),* tiger shark, (*Galeocerdo cuvieri)*, and white shark, (*Carcharodon carcharias)*. Age and growth studies on the tiger shark (with scientists at the University of New Hampshire), thresher shark, (*Alopias vulpinus)* (with scientists at the University of Rhode Island), night shark, (*Carcharhinus signatus)* (with NMFS scientists at the SEFSC Panama City Laboratory), and the bull shark, (*Carcharhinus leucas)* (with scientists with the Florida Division of Natural Resources) are underway. Collection, processing, photographing, and reading of samples are in various stages for these species including intercalibration of techniques, criteria, and band readings. This intercalibration process involves sharing samples and comparing counts between researchers including a researcher from the Natal Sharks Board, South Africa for joint work on shortfin mako, blue, and basking shark band periodicity. Collections of vertebra took place at tournaments and on the biannual research cruise with 285 sharks injected with OTC for validation. Night and dusky sharks were prepared with gross sectioning to determine the best method for reading and all processing was initiated using histology. Readings were completed on the thresher and tiger sharks towards intercalibration to generate bias graphs. Vertebrae, length-frequency data, and tag/recapture data collected from 1962 to present are being analyzed on each of these species to obtain growth parameters.

Biology of the Thresher Shark

Life history studies of the thresher shark continued. Data collection was augmented to include reproductive and food habits, in addition to age and growth information.

Biology of the Porbeagle Shark

A cooperative U.S./Canada research program continued on the life history of the porbeagle shark, (*Lamna nasus)* with preliminary analysis of porbeagle tagging and recaptures data using information from U.S., Canadian, and Norwegian sources.

Collection of Recreational Shark Fishing Data and Samples

Biological samples for age and growth, feeding ecology, and reproductive studies and catch data for pelagic sharks were collected at recreational fishing tournaments in the Northeast. Analysis of these tournament landings data was initiated by creating a database of historic information (1961 – 2004) and producing preliminary summaries of one long term tournament. The collection and analysis of these data are critical for input into species and age specific population and demographic models for shark management.

Cooperative Shark Tagging Program (CSTP)

The Cooperative Shark Tagging Program, operated by the Northeast Fisheries Science Center, has involved over 6,500 volunteer recreational and commercial fishermen, scientists, and fisheries observers conducted since 1962, continued to tag large coastal and pelagic sharks and provide information to define essential fish habitat for shark species in U.S. Atlantic and Gulf of Mexico waters. Since its inception, the CSTP has tagged over 128,000 sharks representing 40 species.

Atlantic Blue Shark Life History and Assessment Studies

A collaborative program to examine the biology and population dynamics of the blue shark, *Prionace glauca,* in the North Atlantic is ongoing. Research on the food and feeding ecology of the blue shark is being conducted cooperatively with University of Rhode Island staff with additional samples collected and a manuscript under revision. A detailed reexamination of the reproductive parameters of the blue shark continued with collection of additional biological samples to determine if any changes have occurred since the 1970s. A manuscript on blue shark stock structure based on tagging data was completed detailing size composition and movements between Atlantic regions. Additionally, a research focus on the population dynamics in the North Atlantic with the objectives of constructing a time series of blue shark catch rates (CPUE) from research surveys, estimation of blue shark migration and survival rates, and the development of an integrated tagging and population dynamics model for the North Atlantic for use in stock assessment continued in collaboration between NEFSC scientists and scientists at the School of Aquatic and Fishery Sciences, University of Washington. Progress to date includes the preliminary recovery of historical research survey catch data, size composition, and biological sampling data on pelagic sharks and preliminary analysis of survival and movement rates for blue sharks based on tag and release data from the NMFS CSTP. Preparation of standardized catch rate and size composition data compatible with pelagic longline observer data continued with a resulting ICCAT submission. As part of this comprehensive program, cooperative research continued with the Irish Marine Institute and Central Fisheries Board on mark-recapture databases including coordination of formats and programs with the NMFS CSTP for joint data analyses.

Atlantic Shortfin Mako Life History and Assessment Studies

A collaborative program with students and scientists at the University of Rhode Island to examine the biology and population dynamics of the shortfin mako in the North Atlantic was continued. Ongoing research included an update on age and growth and reproductive parameters and an examination of the predator-prey relationships between the shortfin mako and its primary prey, bluefish (*Pomatomus saltatrix)*. A manuscript was completed comparing contemporary and historic levels of bluefish predation. Future research includes the estimation of shortfin mako migration rates and patterns and survival rates using CSTP mark/recapture data and satellite tags with movements correlated with Advanced Very High Resolution Radiometer (AVHRR) sea surface temperature data. Toward these goals, two shortfin mako sharks were tagged with pop-up archival transmitting tags.

Blacktip Shark Migrations

Analysis of movements of the blacktip shark (*Carcharhinus limbatus)* in the western North Atlantic and Gulf of Mexico based on release and recapture data is ongoing with the examination of general migration patterns and exchange between and within regions of U.S. and Mexican waters. Release and recapture data were analyzed for evidence of Atlantic and Gulf primary and secondary blacktip nursery grounds.

Cooperative Atlantic States Shark Pupping and Nursery Survey (COASTSPAN)

NEFSC Apex Predators Program staff manages and coordinates this project that uses researchers in major coastal Atlantic states from Florida to Delaware to conduct a cooperative, comprehensive, and standardized investigation of valuable shark nursery areas. This research identifies which shark species utilize coastal zones as pupping and nursery grounds, gauges the relative importance of these areas, and determines migration and distribution patterns of neonate and juvenile sharks. This program is described in further detail in Section 3.3 of this document.

Juvenile Shark Survey for Monitoring and Assessing Delaware Bay Sandbar Sharks

NEFSC staff conduct this part of the COASTSPAN monitoring and assessment project for the juvenile sandbar shark population in the Delaware Bay nursery grounds using monthly longline surveys from June to September each year. A random stratified sampling plan based on depth and geographic location is ongoing to assess and monitor the juvenile sandbar shark population during the nursery season. In addition, the tagging and recapture data from this project are being used to examine the temporal and spatial relative abundance and distribution of sandbar sharks in Delaware Bay.

Habitat Utilization, Food Habits, and Essential Fish Habitat of Delaware Bay Sandbar and Smooth Dogfish Sharks

The food habits portion of the study characterizes the diet, feeding periodicity, and foraging habits of the sandbar shark as well as examines the overlap in diet and distribution with the smooth dogfish shark (*Mustelus canis)*. Stomach contents from over 800 sandbar sharks and over 200 smooth dogfish sharks have been sampled through a non-lethal lavage method. Acquired data will be coupled with environmental data, providing information on preferred habitat. This information is an important contribution towards understanding essential fish habitat and provides information necessary for nursery ground management and rebuilding of depleted shark populations.

Ecosystems Modeling

Ecosystem modeling, focusing on the role of sharks as top predators, will be conducted using ECOPATH - ECOSIM models, using the sandbar shark as a model species and examining the ecological interactions between sandbar and smooth dogfish sharks in Delaware Bay.

Overview of Gulf and Atlantic Shark Nurseries

Due to the requirement for a better understanding of shark nursery habitat in U.S. coastal waters, NEFSC staff serves as editors for an American Fisheries Society symposium proceedings volume on U.S. Atlantic and Gulf of Mexico coastal shark nursery ground and habitat studies.

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

This ongoing research is directed towards the sandbar shark (*Carcharhinus plumbeus)*, and is being conducted cooperatively with Massachusetts Division of Marine Fisheries biologists. The study utilizes blood and muscle sampling methods in addition to acoustic tracking to obtain physiological profiles of individual sharks to characterize stamina and to determine ultimate post release survival. These analyses are requisite in view of the extensive current and proposed catch-and-release management strategies for coastal and pelagic shark species.

Southeast Fisheries Science Center

Stock Assessments of Pelagic, Large Coastal, and Prohibited Sharks

The ICCAT Subcommittee on Bycatch conducted a stock assessment of blue sharks and shortfin makos in Tokyo, Japan, in June 2004. All information available on biology, fisheries, stock identity, catch, CPUE, and size of these species was reviewed and an evaluation of the status of stocks conducted using surplus production, age-structured, and catch-free stock assessment models. U.S. scientists contributed eight working documents for this meeting on various aspects of shark biology and methods to assess stock status; SEFSC scientists participated in the assessment process and authored or co-authored six of those documents. A stock assessment of dusky shark, a prohibited species under the shark FMP and candidate for listing under the ESA, is under way with expected completion in summer of 2006. Biological and fishery information available for this species is being synthesized and stock status will be evaluated using multiple stock assessment methodologies. The next assessment of large coastal sharks is planned for FY06, but data collection, synthesis, analysis, and preliminary stock evaluations will begin in late FY05.

Update on Catches of Atlantic Sharks

An update on catches of large and small coastal and pelagic sharks in U.S. Atlantic, Gulf of Mexico, and Caribbean waters was generated in FY 05 for inclusion in the 2005 SAFE Annual Report and future shark stock assessments. Time series of commercial and recreational landings and discard estimates from several sources were compiled for the large coastal shark complex and sandbar and blacktip sharks. In addition, recent species-specific commercial and recreational landings were provided for sharks in the large coastal, small coastal, and pelagic groups. Species-specific information on the geographical distribution of commercial landings by gear type and geographical distribution of the recreational catches was also provided. Trends in length-frequency distributions and average weights and lengths of selected species reported from three separate recreational surveys and in the directed shark bottom-longline observer program were also included. Another update on catches of Atlantic sharks will be generated in FY 06.

Ecosystem Modeling

A dynamic mass-balance ecosystem model was used to investigate how relative changes in fishing mortality on sharks can affect the structure and function of Apalachicola Bay, Florida, a coastal marine ecosystem. Simulations were run for 25 years wherein fishing mortality rates from recreational and trawl fisheries were doubled for ten years and then decreased to initial levels. Effect of time/area closures on ecosystem components were also tested by eliminating recreational fishing mortality on juvenile blacktip sharks. Simulations indicated biomass of sharks declined up to 57 percent when recreational fishing mortality was doubled. Simulating a time/area closure for juvenile blacktip sharks caused increases in their biomass but decreases in juvenile coastal shark biomass, a competing multispecies assemblage that is the apparent competitor. In general, reduction of targeted sharks did not cause strong top-down cascades. Another update on catches of Atlantic sharks was generated in FY05

Elasmobranch Feeding Ecology and Shark Diet Database

The current Fishery Management Plan for Atlantic Tunas, Swordfish, and Sharks gives little consideration to ecosystem function because there is little quantitative species-specific data on diet, competition, predator-prey interactions, and habitat requirements of sharks. Given this, several studies are currently underway describing the diet and foraging ecology, habitat use, and predator-prey interactions of elasmobranchs in various communities. In 2005, a study on latitudinal variation in diet and daily ration of the bonnethead shark from the eastern Gulf of Mexico was completed and a manuscript is being prepared for publication. A database containing information on quantitative food and feeding studies of sharks conducted around the world has been in development for several years and presently includes over 200 studies. This fully searchable database will continue to be updated and fine-tuned in FY 06. The goal is to make this tool available to researchers in the relatively near future.

Cooperative Gulf of Mexico States Shark Pupping and Nursery Survey (GULFSPAN)

The SEFSC Panama City Shark Population Assessment Group manages and coordinates a survey of coastal bays and estuaries between the Panhandle of Florida and Texas. Surveys identify the presence/absence of neonate and juvenile sharks and attempt to quantify the relative importance of each area as it pertains to essential fish habitat requirements for sharks. The SEFSC Panama City Shark Population Assessment Group also initiated a juvenile shark abundance index survey in 1996. The index is based on random, depth-stratified gillnet sets conducted throughout coastal bays and estuaries in northwest Florida monthly from April to October. The species targeted for the index of abundance are juvenile sharks in the large and small coastal management groups. More information on this program can be found in Section 3.3 of this document.

Angel Shark Life History

The Atlantic Angel Shark is a benthic species inhabiting deep waters of the Gulf of Mexico and the Atlantic Ocean. This species is listed as prohibited by the 1999 Fisheries Management Plan for Atlantic Tunas, Swordfish, and Sharks due to the lack of biological data and a precautionary approach for species thought to be highly susceptible to exploitation. Life history studies began in 2003. Samples are obtained from commercial fishers and fishery-independent surveys. Preliminary reproductive parameters were determined in 2004 and results presented at the annual American Elasmobranch Society meeting held in Norman, Oklahoma, in May 2004.

Life History Studies of Elasmobranchs

Biological samples are obtained through research surveys and cruises, recreational fishers, and through collection by onboard observers on commercial fishing vessels. Age and growth rates and other life history aspects of selected species are processed and data analyzed following standard methodology. This information is vital as input to population models incorporating variation and uncertainty in estimates of life-history traits to predict the productivity of the stocks and ensure that they are harvested at sustainable levels. The age and growth parameters of bull shark (*Carcharhinus leucas*) and spinner shark (*C. brevipinna*) were completed and submitted for publication in 2004.

Cooperative Research – Definition of Winter Habitats for Blacktip Sharks in the Eastern Gulf of Mexico

A collaborative effort between SEFSC Panama City Shark Population Assessment Group and Mote Marine Laboratory is underway to define essential winter habitats for blacktip sharks (*Carcharhinus limbatus*). Deployment of archival Pop-Up Archival Transmitting (PAT) tags on sharks during January and February of FY05 in the Florida Keys and north Florida will be executed with the cooperation of the charterboat industry. PAT tags will be programmed to detach from individuals during late spring and early summer when sharks have recruited to coastal areas.

Cooperative Research – Habitat Utilization among Coastal Sharks

Through a collaborative effort between SEFSC Panama City Shark Population Assessment Group and Mote Marine Laboratory, the utilization of coastal habitats by neonate and young-of-the-year blacktip and Atlantic sharpnose sharks will be monitored through an array of underwater acoustic receivers (VR2, Vemco Ltd.) placed throughout each study site. Movement patterns, home ranges, activity space, survival, and length of residence of individuals will be compared by species and area to provide information to better manage critical species and essential fish habitats.

Cooperative Research – Characterization of Bycatch in the Gulf Butterfish, (*Peprilus burti*), Trawl Fishery, with an Emphasis on Identification of Life History Parameters for several Potentially High-Risk Species

A proposal with the SEFSC Panama City Shark Population Assessment Group and the University of Florida was submitted to MARFIN to quantify and qualify the elasmobranch bycatch in the butterfish, (*Peprilus triacanthus)*, trawl fishery in the Gulf of Mexico. Determination of life history parameters for the roundel skate, (*R. texana)*, the clearnose skate, (*R. eglanteria)*, the spreadfin skate (*Dipturus olseni)*, and the Atlantic angel shark, (*Squatina dumerili)* will be developed ultimately for the estimation of vital rates. Vital rate information will be used to determine the productivity of the stocks and ensure that they are harvested at sustainable levels.

Using elemental chemistry of shark vertebrae to reconstruct large-scale movement patterns of sharks

A project examining ontogenetic shifts in habitat utilization of bull sharks using Sr:Ca ratios of vertebrae will begin in FY06, funds permitting. Laser ablation ICPMS will be used to assay transects across the entire vertebral section along the corpus calcareum. Given the relationship of Sr:Ca to habitat developed from the reference samples, habitat type (freshwater, estuarine, or marine) will be assigned to each growth band, thereby reconstructing the migration history of the shark on a year-by-year basis over its lifetime.

Coastal Shark Assessment Research Surveys

The SEFSC Mississippi Laboratories in Pascagoula have been operating annual research cruises aboard NOAA vessels since 1995. The objectives of this program are to conduct bottom longline surveys to assess the distribution and relative abundance of coastal sharks along U.S. and Mexican waters of the Gulf of Mexico and the U.S. eastern seaboard. This is the only long-term, nearly stock-wide, fishery-independent survey of Atlantic sharks conducted in U.S. and neighboring waters. Ancillary objectives are to collect biological and environmental data, and to tag-and-release sharks. Starting in 2001 and under the auspices of the Mex-US-Gulf Program, the Pascagoula Laboratories have provided logistical and technical support to Mexico's Instituto Nacional de la Pesca to conduct a cooperative research cruise aboard the Mexican research vessel Onjuku in Mexican waters of the Gulf of Mexico. The cruise also took place in 2002, but was suspended in 2003 and 2004 because of mechanical problems with the research vessel and other issues.

A proposal was submitted in 2005 to gather data to help clarify the uncertainty on the current status of oceanic whitetip sharks in the western North Atlantic Ocean. Data on behavior and movement patterns will be collected using on-board observers on pelagic longline vessels. Archival satellite pop-up tags will be utilized to monitor the movement patterns, depth, and temperature preferences of this species. In addition, time-depth recorders, and hook-timers will be used to determine the depth and times at which sharks take baits. These data will be incorporated with sea surface temperature data from satellites and incorporated into new habitat-based analyses of the data to provide a better understanding of the status of oceanic whitetip sharks.

Cooperative Research – The capture depth, time, and hooked survival rate for bottom longline-caught large coastal sharks

A collaborative effort between SEFSC Panama City Shark Population Assessment Group and the University of Florida to examine alternative measures in the shark bottom longline fishery to reduce mortality on prohibited sharks such as reduced soak time, restrictions on the length of gear, and fishing depth restrictions will be tested using hook timers. Funding is being sought through the NMFS Cooperative Research Program.

Utilizing Bioenergetics and Matrix Projection Modeling to Quantify Population Fluctuations in Long-lived Elasmobranchs: Tools for Fisheries Conservation and Management

Under the supervision of SEFSC scientists at the Panama City Laboratory, the NMFS-Sea Grant Fellow in Population Dynamics and Resource Economics conducted research that sought to use a bioenergetics and matrix approach to examine the population dynamics of the cownose ray (*Rhinoptera bonasus*). Laboratory experiments and field data were used to obtain basic life history information, and that information configured the individual-based bioenergetics model. The bioenergetics model was coupled to a matrix projection model, and the coupled models were used to predict how warmer and cooler water temperatures would affect the growth and population dynamics of the cownose rays. Changes in growth rates under the warmer and cooler conditions lead to changes in age-specific survivorship, maturity, and pup production, which were used as inputs to a matrix projection model. Faster growth of individuals under the cooler scenarios translated into an increased population growth rate (4.4 – 4.7 percent/year versus 2.7 percent/year under baseline), shorter generation time, and higher net reproductive rates, while slower growth under the warmer scenarios translated into slower population growth rate (0.05 – 1.2 percent/year), longer generation times, and lower net reproductive rates. Elasticity analysis indicated that population growth rate was most sensitive to adult survival. Reproductive values by age were highest for intermediate ages.

Cooperative Research – Definition of Winter Habitats for Blacktip Sharks in the Eastern Gulf of Mexico

A collaborative effort between SEFSC Panama City Shark Population Assessment Group and Mote Marine Laboratory is underway to define essential winter habitats for blacktip sharks (*Carcharhinus limbatus*). Deployment of two pop-off satellite archival tags (PAT) on sharks during January and February of 2005 in the Florida Keys was accomplished with the cooperation of the charter boat industry. Preliminary results from these two sharks indicate one shark remained in the Keys while the other moved to an area southwest of the coast of Cuba. Additional PAT tags will be placed on sharks during the summer of 2005.

Cooperative Research – Definition of Summer Habitats and Migration Patterns for Bull Sharks in the Eastern Gulf of Mexico

A collaborative effort between SEFSC Panama City Shark Population Assessment Group, University of Florida, and Mote Marine Laboratory is underway to determine summer habitat use and short-term migration patterns of bull sharks (*Carcharhinus leucas*). Sharks are being outfitted with Pop-Up Satellite Archival Tags (PSAT) during July and August of 2005 and scheduled to deploy in autumn. This project is driven by the lack of data for this species and its current prominence within the Florida coastal community. A better understanding of this species is required to effectively manage this species for both commercial and recreational fishers as well as the general public. Concerns regarding this species will continue to be an issue as fishers and the public demand that state and federal governments provide better information concerning the presence and movements of these sharks.

3.3 Habitat

3.3.1 Regulatory Requirements

Section 303(a)(7) of the Magnuson-Stevens Act, 16 U.S.C. §§ 1801 *et seq*., as amended by the Sustainable Fisheries Act in 1996, requires FMPs to describe and identify essential fish habitat (EFH), minimize to the extent practicable adverse effects on such habitat caused by fishing, and identify other actions to encourage the conservation and enhancement of such habitat. The Magnuson-Stevens Act defines EFH as “those waters and substrate necessary to fish for spawning, breeding, feeding or growth to maturity.” (16 U.S.C. § 1802 (10)). The EFH regulations (at 50 C.F.R. 600 Subpart J) provide additional interpretation of the definition of essential fish habitat:

> “Waters’ include aquatic areas and their associated physical, chemical, and biological properties that are used by fish, and may include aquatic

> areas historically used by fish where appropriate; 'substrate' includes sediment, hard bottom, structures underlying the waters, and associated biological communities; 'necessary' means the habitat required to support a sustainable fishery and the managed species' contribution to a healthy ecosystem; and 'spawning, breeding, feeding, or growth to maturity' covers a species' full life cycle."

The EFH regulations require that EFH be described and identified within the U.S. Exclusive Economic Zone (EEZ) for all life stages of each species in a fishery management unit. FMPs must describe EFH in text, tables, and figures that provide information on the biological requirements for each life history stage of the species. According to the EFH regulations, an initial inventory of available environmental and fisheries data sources should be undertaken to compile information necessary to describe and identify EFH and to identify major species-specific habitat data gaps. Habitats that satisfy the criteria in the Magnuson-Stevens Act have been identified and described as EFH in the 1999 FMPs and in Amendment 1 to the 1999 Tunas, Swordfish, and Shark FMP.

NMFS originally described and identified EFH and related EFH regulatory elements for all HMS in the management unit in the 1999 FMPs, and more recently updated EFH for five shark species (blacktip, sandbar, dusky, nurse, and finetooth sharks) in Amendment 1 to the 1999 Tunas, Swordfish, and Shark FMP, which was implemented in 2003. The EFH regulations further require NMFS to conduct a comprehensive review of all EFH related information at least once every five years and revise or amend the EFH boundaries if warranted. To that effect, NMFS is currently undertaking the comprehensive five-year review of information pertaining to EFH for all HMS in the management unit in this draft FMP. Based on the findings of this review, NMFS may recommend that certain EFH boundaries may need to be modified in a subsequent rulemaking. At that time, alternatives for boundary modifications would be proposed. For a complete description of the comprehensive five-year review of all new EFH information see Chapter 10 and Appendix B.

3.3.1.1 Habitat Areas of Particular Concern

To further the conservation and enhancement of EFH, the EFH guidelines encourage FMPs to identify Habitat Areas of Particular Concern (HAPCs). HAPCs are areas within EFH that meet one or more of the following criteria: they are ecologically important, particularly vulnerable to degradation, undergoing stress from development, or are a rare habitat type. HAPCs can be used to focus conservation efforts on specific habitat types that are particularly important to managed species. Currently, only one area, for sandbar sharks off of North Carolina, Chesapeake Bay, MD, and Great Bay, NJ, has been identified as a HAPC for HMS (1999 FMP). Although no new HAPCs have been identified since the 1999 FMP, and no new HAPCs are proposed in this draft FMP, the information being compiled during this review may be used to identify HAPC areas in a future rulemaking.

3.3.2 Habitat Types and Distributions

HMS may be found in large expanses of the world's oceans, straddling jurisdictional boundaries. Although many of the species frequent other oceans of the world, the Magnuson-

Stevens Act only authorizes the description and identification of EFH in Federal, state or territorial waters, including areas of the U.S. Caribbean, the Gulf of Mexico and the Atlantic coast of the United States to the seaward limit of the U.S. EEZ. These areas are connected by currents and water patterns that influence the occurrence of HMS at particular times of the year. On the largest scale, the North and South Equatorial currents occur in the U.S. Caribbean islands. The North Equatorial Current continues through the Caribbean Basin to enter the Gulf of Mexico through the Yucatan Straits. The current continues through the Florida Straits to join the other water masses (including the Antilles Current) to form the Gulf Stream along the eastern coast of the United States. Variations in flow capacities of the Florida Straits and the Yucatan Straits produce the Loop Current, the major hydrographic feature of the Gulf of Mexico. These water movements in large part influence the distributions of the pelagic life stages of HMS.

Tuna, swordfish, and billfish distributions are most frequently associated with hydrographic features such as density fronts between different water masses. The scales of these features may vary. For example, the river plume of the Mississippi River extends for miles into the Gulf of Mexico and is a fairly predictable feature, depending on the season. Fronts that set up over the De Soto Canyon in the Gulf of Mexico, or over the Charleston Bump or the Baltimore Canyon in the Mid-Atlantic, may be of a much smaller scale. The locations of many fronts or frontal features are statistically consistent within broad geographic boundaries. These locations are influenced by riverine inputs, movement of water masses, and the presence of topographic structures underlying the water column, thereby influencing the habitat of HMS. Those areas that are known spawning grounds, or areas of aggregation for feeding or other reasons, are considered to be EFH for those species.

Sharks are found in a wide variety of coastal and ocean habitats including estuaries, nearshore areas, the continental shelf, continental slope, and open ocean. Many species are migratory and, like other marine species, are affected by the condition of the habitat. Atlantic sharks are broadly distributed as adults but have been found to utilize specific estuaries as pupping and nursery areas during pupping season and throughout their neonate (newborn) life stages which may vary from a few to many months. Since coastal and coastal pelagic species frequently appear near shore and have pupping and nursery areas near shore, much more is known about their habitat requirements, particularly for early life history stages. Much less is known about the habitat requirements, pupping areas, and other details of pelagic and deep dwelling species.

The following sections are intended to provide a general overview of the various habitats with which HMS are most frequently associated. A more detailed description is contained in the 1999 Tunas, Swordfish, and Shark FMP.

3.3.2.1 Atlantic Ocean

(Material in this section is largely a summary of information in MMS, 1992; 1996. Original sources of information are referenced in those documents)

The region of the Atlantic Ocean within which EFH for Federally managed HMS is identified spans the area between the Canadian border in the north and the Dry Tortugas in the south. It includes a diverse spectrum of aquatic species of commercial, recreational, and ecological importance. The distribution of marine species along the Atlantic seaboard is strongly affected by the cold Labrador Current in the northern part, the warm Gulf Stream in the middle and southern portions of the region, and generally by the combination of high summer and low winter temperatures. For many species Cape Hatteras forms a strong zoogeographic boundary between the Mid- and South Atlantic areas, while the Cape Cod/Nantucket Island area is a somewhat weaker zoogeographic boundary in the north.

Coastal and Estuarine Habitat

Although HMS move primarily through open ocean waters, they do periodically utilize coastal or inshore habitats. This is especially true for several species of sharks that move inshore, often into shallow coastal waters and estuaries, to give birth; these areas then become nursery areas as the young develop. Examples include Great Bay, New Jersey, Chesapeake Bay, Maryland and Delaware Bay, Delaware which provide important nursery habitat for sandbar sharks, and Bull's Bay, South Carolina, and Terrebone Bay, Louisiana which are important blacktip shark nursery areas. Typically, the pups (neonates) remain in these same areas throughout their early life stages, which may vary from a few to many months. Recent tagging studies have shown that some sharks return to summer nursery areas in subsequent years. Although billfish move primarily throughout open-ocean waters, two species, the white marlin and the sailfish can be found inshore. Sailfish are also known to move inshore to spawn off the east coast of Florida and in the Florida Keys.

Coastal habitats that may be encountered by HMS are described in this section. Those areas that are known nursery or spawning grounds, or areas of HMS aggregation for feeding or other reasons, are considered to be EFH for those species. It should be noted that characteristics of coastal and offshore habitats may be affected by activities and conditions occurring outside of those areas (farther up-current) due to water flow or current patterns that may transport materials that could cause negative impacts.

Estuaries are highly productive, yet fragile, environments that support a great diversity of fish and wildlife species, including sharks. Many commercially valuable fish and shellfish stocks are dependent on these areas during some stage of their development. In the vicinity of North Carolina, Virginia, and Maryland, approximately 90 percent of the commercially valuable fish species are dependent on estuaries for at least part of their life cycle.

Along the Atlantic seaboard coastal wetlands are located predominantly south of New York because these coastal areas have not been glaciated. Nearly 75 percent of the Atlantic coast salt marshes are found in the states of North Carolina, South Carolina, and Georgia. These three states contain approximately nine million acres of salt marsh. Wetland vegetation plays an important role in nutrient cycling, and provides stability to coastal habitats by preventing the erosion of sediments and by absorbing the energy of storms.

There are 13,900 square miles (sq mi) (36,000 square kilometers (sq km)) of estuarine habitat along the Atlantic coast, of which approximately 68 percent (9,400 sq mi) occurs north of the Virginia/ North Carolina border, with Chesapeake Bay contributing significantly to the total. South of the Gulf of Maine, where there is a wider coastal plain and greater agricultural activity, estuaries carry higher sediment and nutrient loads. The increased fertility and generally higher water temperatures resulting from these nutrient loads allow these estuaries to support greater numbers of fish and other aquatic organisms.

South of the Virginia/North Carolina border, there are approximately 4,500 sq mi (11,655 sq km) of estuarine habitat. The Currituck, Albemarle, and Pamlico Sounds, which together constitute the largest estuarine system along the entire Atlantic coast, make up a large portion of these southern estuaries. A unique feature of these sounds is that they are partially enclosed and protected by a chain of fringing islands, the Outer Banks, located 32 to 48 km (20 to 30 mi) from the mainland.

Because of their low tidal flushing rates, estuaries are generally more susceptible to pollution than other coastal water bodies. The severity of the problem varies depending on the extent of tidal flushing. In Maryland and Virginia, the primary problems reported are excessive nutrients (nitrates and phosphates), particularly in the Chesapeake Bay and adjoining estuarine areas. Other problems included elevated bacterial and suspended sediment levels. Non-point sources of pollution are considered one of the main causes of pollution. Elevated bacterial levels were also listed as a local coastal pollution problem in Maryland.

In North Carolina, the primary problems occurring in estuarine areas are enrichment in organics and nutrients, fecal coliform bacteria, and low dissolved oxygen. Insufficient sewage treatment, wide-spread use of septic systems in coastal areas, and agricultural runoff are considered to be major causes of these pollution problems. Oil spills from vessel collisions and groundings, as well as illegal dumping of waste oil, are a common cause of local, short-term water quality problems, especially in estuaries along the North and Mid-Atlantic coasts. These sources of pollution and habitat degradation may have a negative impact on coastal shark populations, particularly during vulnerable early life stages.

Many of the coastal bays and estuaries along the Atlantic East Coast and Gulf of Mexico are described in greater detail in the 1999 Tunas, Swordfish, and Shark FMP, including the distribution, size, depth, freshwater inflow, habitat types, tidal range and salinity for each of the major estuaries and bays on the East coast and Gulf coast, and are not repeated here.

Continental Shelf and Slope Areas

Moving seaward away from the coast, the next major geologic features encountered are the continental shelf and slope areas. The continental shelf is characterized by depths ranging from a few meters to approximately 60 m (198 ft), with a variety of bottom habitat types. Far less research has been done in this area than on the coasts and estuaries, and consequently much less is known about the specific habitat requirements of HMS within these regions.

The shelf area of the Mid-Atlantic Bight averages about 100 km (60 mi) in width, reaching a maximum of 150 km (90 mi) near Georges Bank, off New England, and a minimum of 50 km (30 mi) offshore Cape Hatteras, NC. Current speeds are strongest at the narrowest part of the shelf where wind-driven current variability is highest. The distribution of marine species, including HMS, along the Atlantic seaboard may be strongly influenced by currents, the warm Gulf Stream in the middle and south portions of the region, and generally by the combination of high summer and low winter temperatures.

The continental shelf in the South Atlantic Bight varies in width from 50 km (32 mi) off Cape Canaveral, FL to a maximum of 120 km (75 mi) off Savannah, GA, and a minimum of 30 km (19 mi) off Cape Hatteras. The shelf is divided into three cross-shelf zones. Waters on the inner shelf (0 to 20 m (0 to 66 ft)) interact extensively with rivers, coastal sounds, and estuaries. This interaction tends to form a band of low-salinity, stratified water near the coast that responds quickly to local wind-forcing and seasonal atmospheric changes. Mid-shelf (20 – 40 m (66 – 132 ft)) current flow is strongly influenced by local wind events with frequencies of two days to two weeks. In this region, vertically well mixed conditions in fall and winter contrast with vertically stratified conditions in the spring and summer. Gulf Stream frontal disturbances (*e.g.*, meanders and cyclonic cold core rings) that occur on time scales of two days to two weeks dominate currents on the outer shelf (40 to 60 m (132 to 197 ft)).

The Mid-Atlantic area from Cape Cod, MA to Cape Hatteras, NC represents a transition zone between northern cold-temperate waters of the north and the warm-temperate waters to the south. Water temperatures in the Mid-Atlantic vary greatly by season. Consequently, many of the fish species of importance in the Mid-Atlantic area migrate seasonally, whereas the major species in the other three areas are typically resident throughout the year (MMS, 1992; 1996). The shelf-edge habitat may range in water depth between 40 and 100 m (131 and 328 ft). The bottom topography varies from smooth sand to mud to areas of high relief with associated corals and sponges. The fish species found in this area include parrotfish (*Scaridae*) and the deep-water species of the snapper-grouper assemblage.

The continental slope generally has smooth mud bottoms in water depths of 100 to 200 m (328 to 656 ft). Many of the species in this zone are representatives of cold-water northern species exhibiting tropical submergence (*i.e.*, being located in deeper, cooler water as latitude decreases).

A topographic irregularity southeast of Charleston, SC, known as the Charleston Bump, is an area of productive sea floor, which rises abruptly from 700 – 300 m (2,300 – 980 ft) within a distance of about 20 km (12 mi), and at an angle which is approximately transverse to both the general isobath pattern and the Gulf Stream currents. The Charleston Gyre is a persistent oceanographic feature that forms in the lee of the Charleston Bump. It is a location in which larval swordfish have been commonly found and may serve as nursery habitat.

Pelagic Environment

Many HMS spend their entire lives in the pelagic, or open ocean environment. These species are highly mobile and physiologically adapted to traveling great distances with minimal effort. Much of what is known about the association between HMS and their migrations across vast open ocean habitat comes from tagging studies.

While the open ocean may appear featureless, there are major oceanographic features such as currents, temperature gradients, eddies, and fronts that occur on a large scale and may influence the distribution patterns of many oceanic species, including HMS. For instance, the Gulf Stream produces meanders, filaments, and warm and cold core rings that significantly affect the physical oceanography of the continental shelf and slope. These features tend to aggregate both predators and prey, and are frequently targeted by commercial fishing vessels. This western boundary current has its origins in the tropical Atlantic Ocean (*i.e.*, the Caribbean Sea). The Gulf Stream system is made up of the Yucatan Current that enters the Gulf of Mexico through the Yucatan Straits; the Loop Current which is the Yucatan Current after it separates from Campeche Bank and penetrates the Gulf of Mexico in a clockwise flowing loop; the Florida Current, as it travels through the Straits of Florida and along the continental slope into the South Atlantic Bight; and the Antilles Current as it follows the continental slope (Bahamian Bank) northeast to Cape Hatteras. From Cape Hatteras it leaves the slope environment and flows into the deeper waters of the Atlantic Ocean.

The flow of the Gulf Stream as it leaves the Straits of Florida reaches maximum speeds of about 200 cm/s. During strong events, maximum current speeds greater than 250 cm/s have been recorded offshore of Cape Hatteras. The width of the Gulf Stream at the ocean surface ranges from 80 – 100 km (50 – 63 mi) and extends to depths of between 800 and 1,200 m (2,624 – 3,937 ft).

As a meander passes, the Gulf Stream boundary oscillates sequentially onshore (crest) and offshore (trough). A meander can cause the Gulf Stream to shift slightly shoreward or well offshore into deeper waters. The Gulf Stream behaves in two distinct meander modes (small and large), with the size of the meanders decreasing as they move northward along the coast. During the large meander mode the Gulf Stream front is seaward of the shelf break, with its meanders having large amplitudes. Additionally, frontal eddies and accompanying warm-water filaments are larger and closer to shore. During the small meander mode the Gulf Stream front is at the shelf break. Frontal eddies and warm-water filaments associated with small amplitude meanders are smaller and farther from shore. Since HMS tend to follow the edge of the Gulf Stream, their distance from shore can be greatly influenced by the patterns of meanders and eddies.

Meanders have definite circulation patterns and conditions superimposed on the statistical mean (average) condition. As a meander trough migrates in the direction of the Gulf Stream's flow, it upwells cool nutrient-rich water, which at times may move onto the shelf and may evolve into an eddy. These boundary features move south-southwest. As warm-water filaments, they transfer momentum, mass, heat, and nutrients to the waters of the shelf break.

Gulf Stream filaments are mesoscale events, which occur regularly offshore the southeast United States. The filament is a tongue of water extending from the Gulf Stream pointing to the south. These form when meanders cause the extrusion of a warm surface filament of Gulf Stream water onto the outer shelf. The cul-de-sac formed by this extrusion contains a cold core that consists of a mix of outer-shelf water and nutrient-rich water. This water mix is a result of upwelling as the filament/meander passes along the slope. The period from genesis to decay typically is about two to three weeks.

The Charleston Gyre is a permanent oceanographic feature of the South Atlantic Bight, caused by the interaction of the Gulf Stream waters with the topographically irregular Charleston Bump. The gyre produces an upwelling of nutrients, which contributes significantly to primary and secondary productivity of the Bight. The degree of upwelling varies with the seasonal position and velocity of the Gulf Stream currents.

In the warm waters between the west edge of the Florida Current/Gulf Stream and 20° N and 40° N, pelagic brown algae, *Sargassum natans* and *S. fluitans*, form a dynamic structural habitat. The greatest concentrations are found within the North Atlantic Central Gyre in the Sargasso Sea. Large quantities of *Sargassum* frequently occur on the continental shelf off the southeastern United States. Depending on prevailing surface currents, this material may remain on the shelf for extended periods, be entrained into the Gulf Stream, or be cast ashore. During calm conditions *Sargassum* may form irregular mats or simply be scattered in small clumps. Oceanographic features such as internal waves and convergence zones along fronts aggregate the algae along with other flotsam into long linear or meandering rows collectively termed "windrows."

Pelagic *Sargassum* supports a diverse assemblage of marine organisms including fungi, micro- and macro-epiphytes, sea turtles, numerous marine birds, at least 145 species of invertebrates, and over 100 species of fishes. The fishes associated with pelagic *Sargassum* include juveniles as well as adults, including large pelagic adult fishes. Swordfish and billfish are among the fishes that can be found associated with *Sargassum*. The *Sargassum* community, consisting of the floating *Sargassum* (associated with other algae, sessile and free-moving invertebrates, and finfish) is important to some epipelagic predators such as wahoo and dolphin. The *Sargassum* community provides food and shelter from predation for juvenile and adult fish, including HMS, and may have other functions such as habitat for fish eggs and larvae.

Offshore water quality in the Atlantic is controlled by oceanic circulation, which, in the Mid-Atlantic is dominated by the Gulf Stream and by oceanic gyres. A shoreward, tidal and wind-driven circulation dominates as the primary means of pollutant transport between estuaries and the nearshore. Water quality in nearshore water masses adjacent to estuarine plumes and in water masses within estuaries is also influenced by density-driven circulation. Suspended sediment concentration can also be used as an indication of water quality. For the Atlantic coastal areas, suspended sediment concentration varies with respect to depth and distance from shore, the variability being greatest in the Mid-Atlantic and South Atlantic. Re-suspended bottom sediment is the principal source of suspended sediments in offshore waters.

3.3.2.2 Gulf of Mexico

(Material in this section is largely a summary of information in MMS, 1996; Field *et al.*, 1991; and NOAA 1997. Original sources of information are referenced in those documents.)

The Gulf of Mexico supports a great diversity of fish resources that are related to a variety of ecological factors, such as salinity, primary productivity, and bottom type. These factors differ widely across the Gulf of Mexico and between inshore and offshore waters. Characteristic fish resources are not randomly distributed; high densities of fish resources are associated with particular habitat types (*e.g.*, east Mississippi Delta area, Florida Big Bend sea grass beds, Florida Middle Grounds, mid-outer shelf, and the De Soto Canyon area). The highest values of surface primary production are found in the upwelling area north of the Yucatan Channel and in the De Soto Canyon region. In terms of general biological productivity, the western Gulf is considered to be more productive in the oceanic region than is the eastern Gulf. Productivity of areas where HMS are known to occur varies between the eastern and western Gulf, depending on the influence of the Loop Current.

Coastal and Estuarine Habitats

There are 5.62 million hectares (ha) (13.88 million acres) of estuarine habitat among the five states bordering the Gulf. This includes 3.2 million ha (8 million acres) of open water, 2.43 million ha (6 million acres) of emergent tidal vegetation (including about 162,000 ha (400,318 acres) of mangroves), and 324,000 ha (800, 636 acres) of submerged vegetation. Estuaries are found from east Texas through Louisiana, Mississippi, Alabama, and northwest Florida and encompass more than 62,000 sq km (23,938 sq mi) of water surface area. Estuaries of the Gulf of Mexico export considerable quantities of organic material, thereby enriching the adjacent continental shelf areas, and many of these estuaries provide important habitat as pupping and nursery grounds for juvenile stages of many important invertebrate and fish species including many species of Atlantic sharks.

Coastal wetland habitat types that occur along the Gulf Coast include mangroves, non-forested wetlands (fresh, brackish, and saline marshes), and forested wetlands. Marshes and mangroves form an interface between marine and terrestrial habitats, while forested wetlands occur inland from marsh areas. Wetland habitats may occupy narrow bands or vast expanses, and can consist of sharply delineated zones of different species, monospecific stands of a single species, or mixed plant species communities.

Continental Shelf and Slope Areas

The Gulf of Mexico is a semi-enclosed, subtropical sea with a surface area of approximately 1.6 million sq km (0.6 million sq mi). The main physiographic regions of the Gulf basin are the continental shelf, continental slope and associated canyons, the Yucatan and Florida Straits, and the abyssal plains. The U.S. continental shelf is narrowest, only 16 km (9.9 mi) wide, off the Mississippi River. The continental shelf width varies significantly from about 350 km (217 mi) offshore western Florida, 156 km (97 mi) off Galveston, TX, and decreasing to 88 km (55 mi) off Port Isabel near the Mexican border. The depth of the central abyss ranges to 4,000 m (13,000 ft). The Gulf is unique because it has two entrances: the Yucatan Strait and the Straits of Florida. The Loop Current dominates the Gulf's general circulation and its associated eddies. The Loop current is caused by differences between the sill depths of the two straits. Coastal and shelf circulation, on the other hand, is driven by several forcing mechanisms: wind stress, freshwater input, buoyancy and mass fluxes, and transfer of momentum and energy through the seaward boundary.

In the Gulf, the continental shelf extends seaward from the shoreline to about the 200-m water depth (660 ft), and is characterized by a gentle slope of less than one degree. The continental slope extends from the shelf edge to the continental rise, usually at about the 2,000-m (6,500 ft) water depth. The topography of the slope in the Gulf is uneven and is broken by canyons, troughs, and escarpments. The gradient on the slope is characteristically one to six degrees, but may exceed 20 degrees in some places, particularly along escarpments. The continental rise is the apron of sediment accumulated at the base of the slope. The incline is gentle with slopes of less than one degree. The abyssal plain is the basin floor at the base of the continental rise.

Physical Oceanography

The Gulf receives large amounts of freshwater runoff from the Mississippi River as well as from a host of other drainage systems. In recent years, large amount of nutrient laden runoff from the Mississippi River have resulted in large hypoxic or low oxygen areas in the Gulf. This "dead zone" may affect up to 16,500 sq km (6,371 sq mi) during the summer, resulting in unfavorable habitat conditions for a wide variety of species.

Sea-surface temperatures in the Gulf range from nearly constant throughout (isothermal) (29° to 30°C (84° to 86°F)) in August to a sharp horizontal gradient in January, (25°C (77°F) in the Loop Current core to 14° to 15°C (57° to 59°F) along the northern shelf). The vertical distribution of temperature reveals that in January, the thermocline depth is about 30 to 61 m (98 to 200 ft) in the northeast Gulf and 91 to 107 m (298 to 350 ft) in the northwest Gulf. In May, the thermocline depth is about 46 m (150 ft) throughout the entire Gulf.

Sea surface salinities along the north Gulf vary seasonally. During months of low freshwater input, salinities near the coastline range between 29 to 32 ppt. High freshwater input conditions during the spring and summer months result in strong horizontal gradients and inner shelf salinities less than 20 ppt. The mixed layer in the open Gulf, from the surface to a depth of approximately 100 to 150 m (330 to 495 ft), is characterized by salinities between 36.0 and 36.5 ppt.

Sharp discontinuities of temperature and/or salinity at the sea surface, such as the Loop Current front or fronts associated with eddies or river plumes, are dynamic features that may act to concentrate buoyant material such as detritus, plankton, or eggs and larvae. These materials are transported, not by the front's movements or motion across the front, but mainly by lateral movement along the front. In addition to open ocean fronts, a coastal front, which separates turbid, lower salinity water from the open-shelf regime, is probably a permanent feature of the north Gulf shelf. This front lies about 30 – 50 km (19 – 31 mi) offshore. In the Gulf, these fronts are the most commonly utilized habitat of the pelagic HMS species.

The Loop Current is a highly variable current entering the Gulf through the Yucatan Straits and exiting through the Straits of Florida (as a component of the Gulf Stream) after tracing an arc that may intrude as far north as the Mississippi-Alabama shelf. This current has been detected down to about 1,000 m (3,300 ft) below the surface. Below that level there is evidence of a countercurrent. When the Loop Current extends into or near shelf areas, instabilities, such as eddies, may develop that can push warm water onto the shelf or entrain cold water from the shelf. These eddies consist of warm water rotating in a clockwise fashion. Major Loop Current eddies have diameters on the order of 300 – 400 km (186 – 249 miles), and may extend to a depth of about 1,000 m. Once these eddies are free from the Loop Current, they travel into the western Gulf along various paths to a region between 25° N to 28° N and 93° W to 96° W. As eddies travel westward a decrease in size occurs due to mixing with resident waters and friction with the slope and shelf bottoms. The life of an individual eddy, until its eventual assimilation by regional circulation in the western Gulf, is about one year. Along the Louisiana/Texas slope, eddies are frequently observed to affect local current patterns, hydrographic properties, and possibly the biota of fixed oil and gas platforms or hard bottoms.

Once an eddy is shed, the Loop Current undergoes major dimensional adjustments and reorganization.

3.3.2.3 U.S. Caribbean

(Material in this section is largely a summary of information in Appeldoorn and Meyers, 1993. Original sources of information are referenced in that document.)

The waters of the Caribbean region include the coastal waters surrounding the U.S. Virgin Islands and Puerto Rico. All of these Caribbean islands, with the exception of St. Croix, are part of a volcanic chain of islands formed by the subduction of one tectonic plate beneath another. Tremendously diverse habitats (rocky shores, sandy beaches, mangroves, seagrasses, algal plains, and coral reefs) and the consistent light and temperature regimes characteristic of the tropics are conducive to high species diversity.

The waters of the Florida Keys and southeast Florida are intrinsically linked with the waters of the Gulf of Mexico and the waters of the Caribbean to the west, south, and east, and to the waters of the South Atlantic Bight to the north. These waters represent a transition from insular to continental regimes and from tropical to temperate regimes. This zone, therefore, contains one of the richest floral and faunal complexes.

Coastal and Estuarine Habitats

Although the U.S. waters of the Caribbean are relatively nutrient poor, and therefore have low rates of primary and secondary productivity, they display some of the greatest diversity of any part of the South Atlantic region. High and diverse concentrations of biota are found where habitat is abundant. Coral reefs, sea grass beds, and mangrove ecosystems are the most productive of the habitat types found in the Caribbean, but other areas such as soft-bottom lagoons, algal hard grounds, mud flats, salt ponds, sandy beaches, and rocky shores are also important in overall productivity. These diverse habitats allow for a variety of floral and faunal populations.

Offshore, between the sea grass beds and the coral reefs and in deeper waters, sandy bottoms and algal plains dominate. These areas may be sparsely or densely vegetated with a canopy of up to one meter of red and brown algae. Algal plains are not areas of active sand transport. These are algae-dominated sandy bottoms, often covered with carbonate nodules. They occur primarily in deep water (> 15 m, or 50 ft), and account for roughly 70 percent of the area of the insular shelf of the U.S. Virgin Islands. Algal plains support a variety of organisms including algae, sponges, gorgonians, solitary corals, mollusks, fish, and worms, and may serve as critical juvenile habitat for commercially important (and diminishing) species such as queen triggerfish and spiny lobsters.

Coral reefs and other coral communities are some of the most important ecological (and economic) coastal resources in the Caribbean. They act as barriers to storm waves and provide habitat for a wide variety of marine organisms, including most of the economically important species of fish and shellfish. They are the primary source for carbonate sand, and serve as the basis for much of the tourism. Coral communities are made by the build up of calcium carbonate produced by living animals, coral polyps, in symbiosis with a dinoflagellate, known as zooxanthellae. During summer and early fall, most of the coral building organisms are at or near the upper temperature limit for survival and so are living under natural conditions of stress. Further increase in local or global temperature could prove devastating.

Sea grass beds are highly productive ecosystems that are quite extensive in the Caribbean; some of the largest sea grass beds in the world lie beyond the shore on both sides of the Keys. Sea grass beds often occur in close association with shallow-water coral reefs. Seagrasses are flowering plants that spread through the growth of roots and rhizomes. These act to trap and stabilize sediments, reduce shoreline erosion, and buffer coral reefs; they provide food for fish, sea turtles (heavy grazers), conch, and urchins; they provide shelter and habitat for many adult species and numerous juvenile species that rely on the sea grass beds as nursery areas; and they provide attachment surfaces for calcareous algae.

Mangrove habitats are very productive coastal systems that support a wide variety of organisms. The mangrove food web is based largely on the release of nutrients from the decomposition of mangrove leaves, and in part on the trapping of terrestrial material. Red mangroves (*Rhizophora mangle*), with their distinctive aerial prop roots; grow along the shoreline, often in mono-specific stands. The roots of the red mangroves help to trap sediments and pollutants associated with terrestrial runoff and help to buffer the shore from storm waves. Red mangrove forests support a diverse community of sponges, tunicates, algae, larvae, and corals, as well as juvenile and adult fish and shellfish. Black mangroves (*Aveicennia germinans*) and white mangroves (*Laguncularia racemosa*) grow landward of the red mangroves. They also act as important sediment traps. Exposed and sheltered mangrove shorelines are common throughout the U.S. Caribbean.

Throughout the U.S. Caribbean, both rocky shores and sandy beaches are common. While many of these beaches are high-energy and extremely dynamic, buffering by reefs and seagrasses allows some salt-tolerant plants to colonize the beach periphery. Birds, sea turtles, crabs, clams, worms, and urchins use the intertidal areas.

Salt ponds, common in the U.S. Virgin Islands, are formed when mangroves or fringing coral reefs grow or storm debris is deposited, effectively isolating a portion of a bay. The resulting "pond" undergoes significant fluctuations of salinity with changes in relative evaporation and runoff. The biota associated with salt ponds are, therefore, very specialized, and usually somewhat limited. Salt ponds are extremely important in trapping terrestrial sediments before they reach the coastal waters.

Insular Shelf and Slope Areas

Puerto Rico and the U.S. Virgin Islands contain a wide variety of coastal marine habitats, including coral and rock reefs, sea grass beds, mangrove lagoons, sand and algal plains, soft bottom areas, and sandy beaches. These habitats are, however, very patchily distributed. Nearshore waters range from zero to 20 m (66 ft) in depth, and outer shelf waters range from 20 to 30 m (66 to 99 ft) in depth, the depth of the shelf break. Along the north coast the insular shelf is very narrow (two to three km wide), seas are generally rough, and few good harbors are present. The coast is a mixture of coral and rock reefs, and sandy beaches. The east coast has an extensive shelf that extends to the British Virgin Islands. Depth ranges from 18 to 30 m (59 to 99 ft). Much of the bottom is sandy, commonly with algal and sponge communities. The southeast coast has a narrow shelf (eight km wide). About 25 km (15.5 mi) to the southeast is Grappler Bank, a small seamount with its summit at a depth of 70 m (231 ft). The central south coast broadens slightly to 15 km (99 mi) and an extensive sea grass bed extends nine kilometers offshore to Caja de Muertos Island. Further westward, the shelf narrows again to just two km (1.2 mi) before widening at the southwest corner to over 10 km (6 mi). The entirety of the southern shelf is characterized by hard or sand-algal bottoms with emergent coral reefs, grass beds, and shelf edge. Along the southern portion of the west coast the expanse of shelf continues to widen, reaching 25 km (15.5 mi) at its maximum. A broad expanse of the shelf is found between 14 and 27 m (46 and 99 ft), where habitats are similar to those of the south coast. To the north, along the west coast, the shelf rapidly narrows to two to three kilometers.

Physical Oceanography

U.S. Caribbean waters are primarily influenced by the westward flowing North Equatorial Current, the predominant hydrological driving force in the Caribbean region. It flows from east to west along the northern boundary of the Caribbean plateau and splits at the Lesser Antilles, flowing westward along the north coasts of the islands.

The north branch of the Caribbean Current flows west into the Caribbean Basin at roughly 0.5 m (1.7 ft) per second. It is located about 100 km (62 mi) south of the islands, but its position varies seasonally. During the winter it is found further to the south than in summer. Flow along the south coast of Puerto Rico is generally westerly, but this is offset by gyres formed between the Caribbean Current and the island. The Antilles Current flows to the west along the northern edge of the Bahamas Bank and links the waters of the Caribbean to those of southeast Florida.

Coastal surface water temperatures remain fairly constant throughout the year and average between 26° and 30°C (79° and 86°F). Salinity of coastal waters is purely oceanic and therefore is usually around 36 ppt. However, in the enclosed or semi-enclosed embayments salinity may vary widely depending on fluvial and evaporational influences.

It is believed that no upwelling occurs in the waters of the U.S. Caribbean (except perhaps during storm events) and, since the waters are relatively stratified, they are severely nutrient-limited. In tropical waters nitrogen is the principal limiting nutrient.

3.4 Fishery Data Update

In this section, HMS fishery data, with the exception of some data on Atlantic sharks, are analyzed by gear type; Section 3.4.6 provides a summary of landings by species. While HMS fishermen generally target particular species, the non-selective nature of most fishing gears promotes effective analysis and management on a gear-by-gear basis. In addition, issues such as bycatch, and safety are generally better addressed by gear type. A summary of catch statistics can be found in Section 3.4.6 of this document.

The revised list of authorized fisheries (LOF) and fishing gear used in those fisheries became effective December 1, 1999 (64 FR 67511). The rule applies to all U.S. marine fisheries, including Atlantic HMS. As stated in the rule, "no person or vessel may employ fishing gear or participate in a fishery in the exclusive economic zone (EEZ) not included in this LOF without giving 90 days' advance notice to the appropriate Fishery Management Council (Council) or, with respect to Atlantic HMS, the Secretary of Commerce (Secretary)." Acceptable HMS fisheries and authorized gear types for Atlantic tunas, swordfish, and sharks include: swordfish handgear fishery – rod and reel, harpoon, handline, bandit gear; pelagic longline fishery – longline; shark drift gillnet fishery – gillnet; shark bottom longline fishery – longline; shark recreational fishery – rod and reel, handline; tuna purse seine fishery – purse seine; tuna recreational fishery– rod and reel, handline; and tuna handgear fishery – rod and reel, harpoon, handline, bandit gear. For Atlantic billfish, the only acceptable fishery and authorized gear type is recreational fishery – rod and reel. Species whose life history characteristics may lead to their eventual categorization as highly migratory, but which are not currently under the Secretary or Regional Council management authority, are covered in two broad categories: Recreational Fisheries (Non-FMP) and Commercial Fisheries (Non-FMP). Species that fit this description may be harvested with the gears listed for these catchall categories.

Due to the nature of SCRS data collection,

Table 3.21 depicts a summary of U.S. and international HMS catches by species rather than gear type. International catch levels and U.S. reported catches for HMS, other than sharks, are taken from the 2005 Standing Report of the SCRS (SCRS, 2005). The U.S. percentage of regional and total catches for HMS species is presented (

Table 3.21) to provide a basis for comparison of the U.S.' catches relative to other nations/entities. Catch of billfish includes both recreational landings and dead discards from commercial fisheries; catch for bluefin tuna includes commercial landings and discards and recreational landings; and swordfish include commercial landings and discards. International catch and landings tables are included for the pelagic longline and purse seine fisheries in Sections 3.4.1 and 3.4.2 of this document. At this point, data necessary to assess the U.S. regional and total percentage of international catch levels for Atlantic shark species are unavailable.

Table 3.21 Calendar Year 2004 U.S. vs International Catch of HMS (mt ww) other than sharks. Source: SCRS, 2005.

Species	Total International Reported Catch	Region of U.S. Involvement	Total Regional Catch	U.S. Catch	U.S. Percentage of Regional Catch	U.S. Percentage of Total Atlantic Catch
Atlantic Swordfish	25,173* (includes N. & S. Atlantic)	North Atlantic	12,283*	2,600	21.17%	10.39%
		South Atlantic	12,779*	16	0.13%	
Atlantic Bluefin Tuna	28,889**	West Atlantic	1,928	971	50.36%	3.36%
Atlantic Bigeye Tuna	72,349	Total Atlantic	72,349	414	0.57%	0.57%
Atlantic Yellowfin Tuna	116,275	West Atlantic	29,829	6,500	21.79%	5.59%
Atlantic Albacore Tuna	52,775 (includes N. & S. Atlantic and Mediterranean)	North Atlantic	25,460	646	2.54%	1.23%
		South Atlantic	22,468	1	0.004%	
Atlantic Skipjack Tuna	161,089	West Atlantic	26,910	102	0.38%	0.06%
Atlantic Blue Marlin	2,076	North Atlantic	596	59***	9.90%	2.84%
Atlantic White Marlin	532	North Atlantic	190	28***	14.74%	5.26%
Atlantic Sailfish	2,167	West Atlantic	1,017	40	3.93%	1.85%

* Actual catches are likely higher given significant non-compliance with ICCAT reporting requirements.
** Significant non-compliance with ICCAT reporting requirements affects SCRS from estimating aggregate 2004 eastern Atlantic bluefin tuna catches accurately.
***The U.S. catch of marlins reported in the DEIS was lower as discards were inadvertently omitted.

3.4.1 Pelagic Longline Fishery

3.4.1.1 Domestic History and Current Management

The U.S. pelagic longline fishery for Atlantic HMS primarily targets swordfish, yellowfin tuna, and bigeye tuna in various areas and seasons. Secondary target species include dolphin, albacore tuna, pelagic sharks (including mako, thresher, and porbeagle sharks), as well as several species of large coastal sharks. Although this gear can be modified (*e.g.*, depth of set, hook type, etc.) to target swordfish, tunas, or sharks, it is generally a multi-species fishery. These vessel operators are opportunistic, switching gear style and making subtle changes to target the best available economic opportunity of each individual trip. Pelagic longline gear sometimes attracts and hooks non-target finfish with little or no commercial value, as well as species that cannot be retained by commercial fishermen due to regulations, such as billfish. Pelagic longlines may also interact with protected species such as marine mammals, sea turtles, and seabirds. Thus, this gear has been classified as a Category I fishery with respect to the Marine Mammal Protection Act. Any species (or undersized catch of permitted species) that cannot be landed due to fishery regulations is required to be released, whether dead or alive. Pelagic longline gear is composed of several parts (see Figure 3.25[2]) (NMFS, 1999).

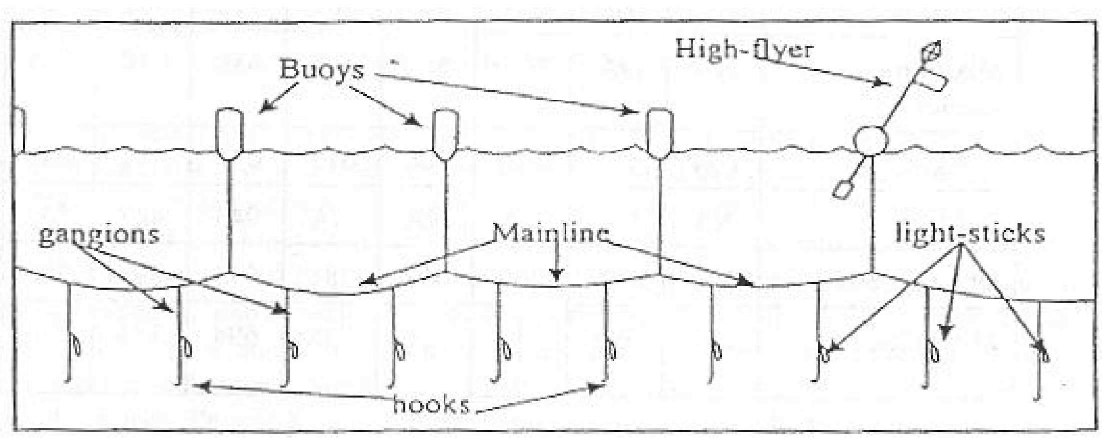


Figure 3.25 Typical U.S. Pelagic Longline Gear. Source: Arocha, 1996

The primary fishing line, or mainline of the longline system, can vary from five to 40 miles in length, with approximately 20 to 30 hooks per mile. The depth of the mainline is determined by ocean currents and the length of the floatline, which connects the mainline to several buoys, and periodic markers which can have radar reflectors or radio beacons attached. Each individual hook is connected by a leader, or gangion, to the mainline. Lightsticks, which contain chemicals that emit a glowing light, are often used, particularly when targeting swordfish. When attached to the hook and suspended at a certain depth, lightsticks attract baitfish, which may, in turn, attract pelagic predators (NMFS, 1999).

[2] As of April 1, 2001, (66 FR 17370) a vessel is considered to have pelagic longline gear on board when a power-operated longline hauler, a mainline, floats capable of supporting the mainline, and leaders (gangions) with hooks are on board.

When targeting swordfish, pelagic longline gear is generally deployed at sunset and hauled at sunrise to take advantage of swordfish nocturnal near-surface feeding habits (NMFS, 1999). In general, longlines targeting tunas are set in the morning, deeper in the water column, and hauled in the evening. Except for vessels of the distant water fleet, which undertake extended trips, fishing vessels preferentially target swordfish during periods when the moon is full to take advantage of increased densities of pelagic species near the surface. The number of hooks per set varies with line configuration and target species (Table 3.22) (NMFS, 1999). The pelagic longline gear components may also be deployed as a trolling gear to target surface feeding tunas. Under this configuration, the mainline and gangions are elevated and actively trolled so that the baits fish on or above the water's surface. This style of fishing is often referred to as "green-stick fishing," and reports indicate that it can be extremely efficient compared to conventional fishing techniques. For more information on green-stick fishing gear and the configurations allowed under current regulations, please refer to the discussions of alternative H4 in Chapters 2 and 4 of this document.

Table 3.22 Average Number of Hooks per Pelagic Longline Set, 1999-2004. Source: Data reported in pelagic longline logbook.

Target Species	1999	2000	2001	2002	2003	2004
Swordfish	521	550	625	695	712	701
Bigeye Tuna	768	454	671	755	967	400
Yellowfin Tuna	741	772	731	715	723	696
Mix of tuna species	NA	638	719	767	764	779
Shark	613	621	571	640	970	1,046
Dolphin	NA	943	447	542	692	1,033
Other species	781	504	318	300	865	270
Mix of species	738	694	754	756	750	777

Figure 3.26 illustrates basic differences between swordfish (shallow) sets and tuna (deep) longline sets. Swordfish sets are buoyed to the surface, have few hooks between floats, and are relatively shallow. This same type of gear arrangement is used for mixed target sets. Tuna sets use a different type of float placed much further apart. Compared with swordfish sets, tuna sets have more hooks between the floats and the hooks are set much deeper in the water column. It is believed that because of the difference in fishing depth, tuna sets hook fewer turtles than the swordfish sets. In addition, tuna sets use bait only, while swordfish fishing uses a combination of bait and lightsticks. Compared with vessels targeting swordfish or mixed species, vessels specifically targeting tuna are typically smaller and fish different grounds.

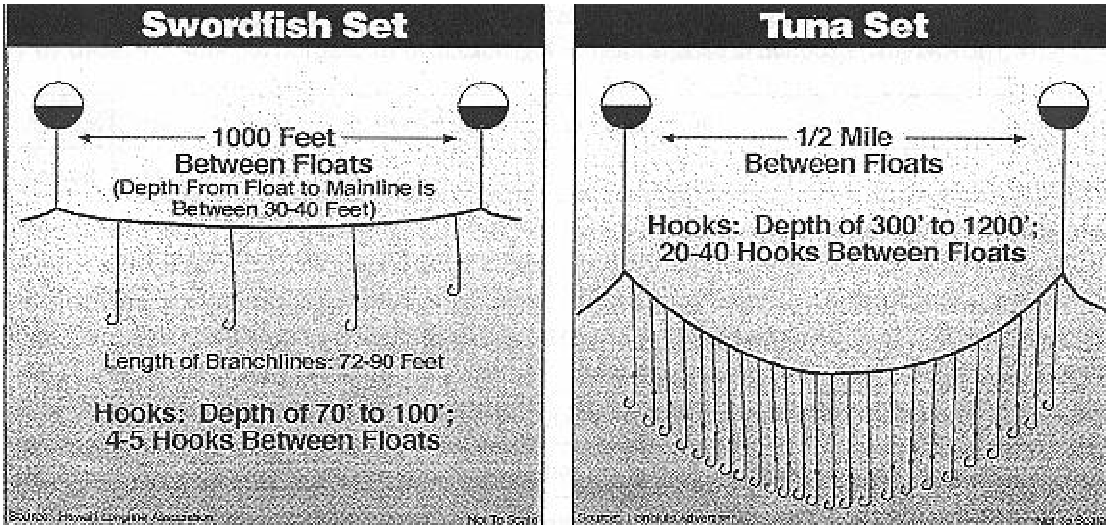


Figure 3.26 Different Pelagic Longline Gear Deployment Techniques. Source: Hawaii Longline Association and Honolulu Advertiser.

NOTE: This figure is only included to show basic differences in pelagic longline gear configuration and to illustrate that this gear may be altered to target different species.

Regional U.S. Pelagic Longline Fisheries Description

The U.S. pelagic longline fishery sector has historically been comprised of five relatively distinct segments with different fishing practices and strategies, including the Gulf of Mexico yellowfin tuna fishery, the South Atlantic-Florida east coast to Cape Hatteras swordfish fishery, the Mid-Atlantic and New England swordfish and bigeye tuna fishery, the U.S. distant water swordfish fishery, and the Caribbean Islands tuna and swordfish fishery. Each vessel type has different range capabilities due to fuel capacity, hold capacity, size, and construction. In addition to geographical area, these segments have historically differed by percentage of various target and non-target species, gear characteristics, and deployment techniques. Some vessels fish in more than one fishery segment during the course of the year (NMFS, 1999). Due to the many changes in the regulations since 1999 (*e.g.*, time/area closures and gear restrictions), the fishing practices and strategies of these different segments may have changed.

The Gulf of Mexico Yellowfin Tuna Fishery

Gulf of Mexico vessels primarily target yellowfin tuna year-round; however, each port has one to three vessels that directly target swordfish, either seasonally or year-round. Longline fishing vessels that target yellowfin tuna in the Gulf of Mexico also catch and sell dolphin, swordfish, other tunas, and sharks. During yellowfin tuna fishing, few swordfish are captured incidentally. Many of these vessels participate in other Gulf of Mexico fisheries (targeting shrimp, shark, and snapper/grouper) during allowed seasons. Home ports for this fishery include Madiera Beach, Florida; Panama City, Florida; Dulac, Louisiana; and Venice, Louisiana (NMFS, 1999).

For catching tuna, the longline gear is configured similar to swordfish longline gear but is deployed differently. The gear is typically set out at dawn (between two a.m. and noon) and retrieved at sunset (4 p.m. to midnight). The water temperature varies based on the location of fishing. However, yellowfin tuna are targeted in the western Gulf of Mexico during the summer when water temperatures are high. In the past, fishermen have used live bait, however, NMFS prohibited the use of live bait in an effort to decrease bycatch and bycatch mortality of billfish (65 FR 47214, August 1, 2000). This rule also closed the Desoto Canyon area (year-round closure) to pelagic longline gear. In the Gulf of Mexico, and all other areas, except the NED, specific circle hooks (16/0 or larger non-offset and 18/0 or larger with an offset not to exceed 10 degrees) are currently required, as are whole finfish and squid baits.

The South Atlantic – Florida East Coast to Cape Hatteras Swordfish Fishery

Historically, South Atlantic pelagic longline vessels targeted swordfish year-round, although yellowfin tuna and dolphin fish were other important marketable components of the catch. In 2001 (65 FR 47214, August 1, 2000), the Florida East Coast closed area (year-round closure) and the Charleston Bump closed area (February through April closure) became effective. NMFS analyzed logbook data to determine the effectiveness of these closed areas (Sections 2.1.2 and 4.1.2).

Prior to these closures, smaller vessels used to fish short trips from the Florida Straits north to the bend in the Gulf Stream off Charleston, South Carolina (Charleston Bump). Mid-sized and larger vessels migrate seasonally on longer trips from the Yucatan Peninsula throughout the West Indies and Caribbean Sea, and some trips range as far north as the Mid-Atlantic coast of the United States to target bigeye tuna and swordfish during the late summer and fall. Fishing trips in this fishery average nine sets over 12 days. Home ports (including seasonal ports) for this fishery include Georgetown, South Carolina; Charleston, South Carolina; Fort Pierce, Florida; Pompano Beach, Florida; and Key West, Florida. This sector of the fishery consists of small to mid-size vessels, which typically sell fresh swordfish to local high-quality markets (NMFS, 1999).

The Mid-Atlantic and New England Swordfish and Bigeye Tuna Fishery

Fishing in this area has evolved during recent years to focus almost year-round on directed tuna trips, with substantial numbers of swordfish trips as well. Some vessels participate in directed bigeye/yellowfin tuna fishing during the summer and fall months and then switch to bottom longline and/or shark fishing during the winter when the large coastal shark season is open. In 1999, NMFS closed the Northeastern U.S. area in June to pelagic longline gear to reduce bluefin tuna discards (64 FR 29090, May 28, 1999). Fishing trips in this fishery sector average 12 sets over 18 days. During the season, vessels primarily offload in the ports of New Bedford, Massachusetts; Barnegat Light, New Jersey; Ocean City, Maryland; and Wanchese, North Carolina (NMFS, 1999).

The U.S. Atlantic Distant Water Swordfish Fishery

This fishing ground covers virtually the entire span of the western north Atlantic to as far east as the Azores and the Mid-Atlantic Ridge. Approximately 12 large fishing vessels that fish in the distant water operate out of Mid-Atlantic and New England ports during the summer and fall months targeting swordfish and tunas, and then move to Caribbean ports during the winter and spring months. Many of the current distant water operations were among the early participants in the U.S. directed Atlantic commercial swordfish fishery. These larger vessels, with greater ranges and capacities than the coastal fishing vessels, enabled the United States to become a significant participant in the north Atlantic fishery. They also fish for swordfish in the south Atlantic. The distant water vessels traditionally have been larger than their southeast counterparts because of the distances required traveling to the fishing grounds. Fishing trips in this fishery tend to be longer than in other fisheries, averaging 30 days and 16 sets. Ports for this fishery range from San Juan, Puerto Rico through Portland, Maine, and include New Bedford, Massachusetts, and Barnegat Light, New Jersey (NMFS, 1999). This segment of the fleet was directly affected by the L-shaped closure in 2000 and the NED closure implemented in 2001. A number of vessels have recently returned to this fishery with the issuance of the July 6, 2004, rule (69 FR 40734) to reduce sea turtle bycatch and bycatch mortality. Unlike in other areas, vessels fishing in the NED are required to use 18/0 or larger circle hooks with an offset not to exceed 10 degrees and whole mackerel or squid baits.

The Caribbean Tuna and Swordfish Fishery

This fleet is similar to the southeast coastal fishing fleet in that both are comprised primarily of smaller vessels that make short trips relatively near-shore, producing high quality fresh product. Both fleets also encounter relatively high numbers of undersized swordfish at certain times of the year. Longline vessels targeting HMS in the Caribbean use fewer hooks per set, on average, fishing deeper in the water column than the distant water fleet off New England, the northeast coastal fleet, and the Gulf of Mexico yellowfin tuna fleet. This fishery is typical of most pelagic fisheries, being truly a multi-species fishery, with swordfish as a substantial portion of the total catch. Yellowfin tuna, dolphin and, to a lesser extent, bigeye tuna, are other important components of the landed catch. Ports for this fishery include St. Croix, U.S. Virgin Islands; and San Juan, Puerto Rico. Many of these high quality fresh fish are sold to local markets to support the tourist trade in the Caribbean (NMFS, 1999).

Management of the U.S. Pelagic Longline Fishery

The U.S. Atlantic pelagic longline fishery is restricted by a limited swordfish quota, divided between the North and South Atlantic (separated at 5°N. Lat.). Other regulations include minimum sizes for swordfish, yellowfin, bigeye, and bluefin tuna, limited access permitting, bluefin tuna catch requirements, shark quotas, protected species incidental take limits, reporting requirements (including logbooks), and gear and bait requirements. Current billfish regulations prohibit the retention of billfish by pelagic longline vessels, or the sale of billfish from the Atlantic Ocean. As a result, all billfish hooked on pelagic longlines must be discarded, and are considered bycatch. This is a heavily managed gear type and, as such, is strictly monitored. Because it is difficult for pelagic longline fishermen to avoid undersized fish in some areas, NMFS has closed areas in the Gulf of Mexico and along the east coast. The intent of these closures is to decrease bycatch in the pelagic longline fishery by closing those areas with the highest rates of bycatch. There are also time/area closures for pelagic longline fishermen designed to reduce the incidental catch of bluefin tuna and sea turtles. In order to enforce time/area closures and to monitor the fishery, NMFS requires all pelagic longline vessels to report positions on an approved vessel monitoring system (VMS).

In June 2004, NMFS conditionally re-opened the NED to pelagic longline fishing. NMFS limited vessels with pelagic longline gear onboard in that area, at all times, to possessing onboard and/or using only 18/0 or larger circle hooks with an offset not to exceed ten degrees. Only whole mackerel and squid baits may be possessed and or utilized with allowable hooks. In August of 2004, NMFS limited vessels with pelagic longline gear onboard, at all times, in all areas open to pelagic longline fishing, excluding the NED, to possessing onboard and/or using only 16/0 or larger non-offset circle hooks and/or 18/0 or larger circle hooks with an offset not to exceed ten degrees. Only whole finfish and squid baits may be possessed and/or utilized with allowable hooks. All pelagic longline vessels must possess and use sea turtle handling and release gear in compliance with NMFS careful release protocols.

Permits

The 1999 FMP established six different limited access permit types: (1) directed swordfish, (2) incidental swordfish, (3) swordfish handgear, (4) directed shark, (5) incidental shark, and (6) tuna longline. To reduce bycatch in the pelagic longline fishery, these permits were designed so that the swordfish directed and incidental permits are valid only if the permit holder also holds both a tuna longline and a shark permit. Similarly, the tuna longline permit is valid only if the permit holder also holds both a swordfish (directed or incidental, not handgear) and a shark permit. This allows limited retention of species that might otherwise have been discarded.

As of February 1, 2006, approximately 214 tuna longline limited access permits had been issued. In addition, approximately 191 directed swordfish limited access permits, 86 incidental swordfish limited access permits, 240 directed shark limited access permits, and 312 incidental shark limited access permits had been issued. Vessels with limited access swordfish and shark permits do not necessarily use pelagic longline gear, but these are the only permits that allow for the use of pelagic longline gear in HMS fisheries.

Monitoring and Reporting

Pelagic longline fishermen and the dealers who purchase HMS from them are subject to reporting requirements. NMFS has extended dealer reporting requirements to all swordfish importers as well as dealers who buy domestic swordfish from the Atlantic. These data are used to evaluate the impacts of harvesting on the stock and the impacts of regulations on affected entities.

Commercial HMS fisheries are monitored through a combination of vessel logbooks, dealer reports, port sampling, cooperative agreements with states, and scientific observer coverage. Logbooks contain information on fishing vessel activity, including dates of trips, number of sets, area fished, number of fish, and other marine species caught, released, and retained. In some cases, social and economic data such as volume and cost of fishing inputs are also required.

Pelagic Longline Observer Program

During 2005, NMFS observers recorded 796 pelagic longline sets for an overall fishery coverage of 10.1 percent. In non-experimental fishing, the overall observer coverage was 7.2 percent. A total of 247 experimental pelagic longline sets were observed in the NEC, GOM, FEC, MAB, and SAB areas, primarily during the second and third quarters. These experimental sets (EXP) had 100 percent observer coverage and are separated from the normal commercial fishery in Table 3.23 (Walsh and Garrison, 2006). In 2004, NMFS observers recorded 702 pelagic longline sets for an overall coverage of 7.3 percent. During the first and second quarters of 2004, 60 experimental sets employing circle hooks were made in the Gulf of Mexico (EXP). These sets had 100 percent observer coverage (Garrison, 2005). One thousand eighty-eight pelagic longline sets were observed and recorded by NMFS observers in 2003 (11.5 percent overall coverage – 100 percent coverage in the NED; and 6.2 percent coverage in remaining areas) (Garrison and Richards, 2004). Table 3.23 details the amount of observer coverage in past years for this fleet. Generally, due to logistical problems, it has not always been possible to place observers on all selected trips. NMFS is working towards improving compliance with observer requirements and facilitating communication between vessel operators and observer program coordinators. In addition, fishermen are reminded of the safety requirements for the placement of observers specified at 50 CFR 600.746, and the need to have all safety equipment on board required by the U.S. Coast Guard.

Table 3.23 Observer Coverage of the Pelagic Longline Fishery. Source: Yeung, 2001; Garrison, 2003; Garrison and Richards, 2004; Garrison, 2005; Walsh and Garrison, 2006.

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

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

3.4.1.2 Recent Catch and Landings

U.S. pelagic longline catch (including bycatch, incidental catch, and target catch) is largely related to these vessel and gear characteristics, but is summarized for the whole fishery in Table 3.24. U.S. pelagic longline landings of Atlantic tunas and swordfish for 1999 – 2004 are summarized in Table 3.25. Additional information related to landings can be seen in Section 3.4.6

From May 1992 through December 2000, the Pelagic Observer Program (POP) recorded a total of 4,612 elasmobranchs (15 percent of the total catch) caught off the southeastern U.S. coast in fisheries targeting tunas and swordfish (Beerkircher *et al.*, 2004). Of the 22 elasmobranch species observed, silky sharks were numerically dominant (31.4 percent of the elasmobranch catch), with silky, dusky, night, blue, tiger, scalloped hammerhead, and unidentified sharks making up the majority (84.6 percent) (Beerkircher *et al.*, 2004).

Table 3.24 Reported Catch of Species Caught by U.S. Atlantic Pelagic Longlines, in Number of Fish, for 1999-2004. Source: Pelagic Longline Logbook Data.

Species	1999	2000	2001	2002	2003	2004
Swordfish Kept	67,120	62,978	47,560	49,320	51,835	46,440
Swordfish Discarded	20,558	17,074	13,993	13,035	11,829	10,675
Blue Marlin Discarded	1,253	1,443	635	1,175	595	712
White Marlin Discarded	1,969	1,261	848	1,438	809	1,053
Sailfish Discarded	1,407	1,091	356	379	277	424
Spearfish Discarded	151	78	137	148	108	172
Bluefin Tuna Kept	263	235	177	178	273	475
Bluefin Tuna Discarded	604	737	348	585	881	1,031
Bigeye, Albacore, Yellowfin, Skipjack Tunas Kept	114,438	94,136	80,466	79,917	63,321	76,962
Pelagic Sharks Kept	2,894	3,065	3,460	2,987	3,037	3,440
Pelagic Sharks Discarded	28,967	28,046	23,813	22,828	21,705	25,355
Large Coastal Sharks Kept	6,382	7,896	6,478	4,077	5,326	2,292
Large Coastal Sharks Discarded	5,442	6,973	4,836	3,815	4,813	5,230
Dolphin Kept	31,536	29,125	27,586	30,384	29,372	38,769
Wahoo Kept	5,136	4,193	3,068	4,188	3,919	4,633
Turtles Discarded	631	271	424	465	399	369
Number of Hooks (X 1,000)	*7,902*	*7,976*	*7,564*	*7,150*	*7,008*	*7,276*

Table 3.25 Reported Landings in the U.S. Atlantic Pelagic Longline Fishery (in mt ww) for 1999-2004. **Source: NMFS, 2004a; NMFS, 2005.**

Species	1999	2000	2001	2002	2003	2004
Yellowfin Tuna	3,374	2,901	2,201	2,573	2,154	2,489
Skipjack Tuna	2.0	1.8	4.3	2.5	4.2	0.7
Bigeye Tuna	929.1	531.9	682.4	535.8	284.9	308.7
Bluefin Tuna	73.5	66.1	37.5	49.9	81.4	96.1
Albacore Tuna	194.5	147.3	193.8	155	110.9	117.4
Swordfish N.*	3,362.4	3,315.8	2,483	2,598.8	2,772.1	2,551
Swordfish S.*	185.2	143.8	43.2	199.9	20.9	15.7

* Includes landings and estimated discards from scientific observer and logbook sampling programs.

Marine Mammals

Of the marine mammals that are hooked by U.S. pelagic longline fishermen, many are released alive, although some animals suffer serious injuries and may die after being released. The observed and estimated marine mammal interactions for 1992 – 2005 are summarized in Table 3.26 and Table 3.27. Marine mammals are caught primarily during the third and fourth quarters in the Mid-Atlantic Bight (MAB) and Northeast Coastal (NEC) areas (Figure 3.27). In 2005, the majority of observed interactions were with pilot whales in the MAB area (Walsh and Garrison, 2006).

In 2000, there were 14 observed takes of marine mammals by pelagic longlines. This number has been extrapolated based on reported fishing effort to an estimated 403 mammals fleet-wide (32 common dolphin, 93 Risso's dolphin, 231 pilot whales, 19 whales, 29 pygmy sperm whales) (Yeung, 2001). In 2001 and 2002, there were 16 and 24 observed takes of marine mammals, respectively. The majority of these interactions were observed in the MAB, followed by the NED research experiment. In 2001, there were an estimated total of 84 Risso's dolphin and 93 pilot whale interactions in the pelagic longline fishery. In 2002, there were an estimated 87 Risso's dolphin and 114 pilot whale interactions in the pelagic longline fishery. In the NED research experiment, an additional four Risso's dolphin and one northern bottlenose whale were recorded with serious injuries during 2001, as well as three Risso's dolphin, one unidentified dolphin, and one unidentified marine mammal in 2002. One striped dolphin was recorded as released alive during the NED experiment in 2001, as well as one Risso's dolphin, one common dolphin, one pilot whale, and one unidentified dolphin in 2002 (Garrison, 2003).

In 2003, there were 28 observed takes of marine mammals in the pelagic longline fishery. The majority of these interactions were observed in the MAB, followed by the NED experimental fishery, and the NEC area. This number has been extrapolated based on reported fishing effort to an estimated 300 mammals fleet wide (49 beaked whales, 16 dolphin, 30 Atlantic spotted dolphin, 46 common dolphin, 105 Risso's dolphin, 32 pilot whales, 22 minke whales). In addition, five Risso's dolphin, one striped dolphin, and one baleen whale were observed captured in the 2003 NED research experiment, with one Risso's dolphin recorded as dead (Garrison and Richards, 2004).

There were a total of 12 observed interactions with marine mammals in the pelagic longline fishery in 2004. The majority of these interactions was with pilot whales and was observed in the MAB area. During 2004, the pelagic longline fishery was estimated to have interacted with 108 pilot whales, 49 Risso's dolphins, and seven common dolphins (Garrison, 2005). In 2005, there were a total of 24 observed interactions with marine mammals in the pelagic longline fishery. The majority of these interactions was with pilot whales and was observed in the MAB area. During 2005, the pelagic longline fishery was estimated to have interacted with 294 pilot whales, 42 Risso's dolphin, six common dolphin, five bottlenose dolphin, four Atlantic spotted dolphin, one beaked whale, 13 unidentified marine mammals, three unidentified whales, and three unidentified dolphin (Walsh and Garrison, 2006). NMFS monitors observed interactions with sea turtles and marine mammals on a quarterly basis and reviews data for appropriate action, if any, as necessary. In June 2005, NMFS convened the Pelagic Longline Take Reduction Team (PLTRT) to assess and reduce marine mammal takes, specifically pilot whales and Risso's dolphins, by the pelagic longline fishery. At the time of writing, the Pelagic Longline Take Reduction Plan (PLTRP) was expected to be finalized soon.

Table 3.26 Summary of Marine Mammal Interactions in the Pelagic Longline Fishery, 1992-1998. Source: Yeung, 1999a; Yeung, 1999b.

Year	Species	Total		Mortality		Alive	
		Obs	Est	Obs	Est	Obs	Est
1992	Risso's Dolphin	3	121	2	74	1	47
	Common Dolphin	1	24			1	24
	Dolphin	1	17			1	17
	Pilot Whale	12	420	3	105	9	319
1993	Risso's Dolphin	3	62	1	36	2	26
	Bottlenose Dolphin	2	29			2	29
	Pilot Whale	16	193	1	15	15	178
	Spotted Dolphin	1	11			1	11
1994	Atlantic Spotted Dolphin	1	17	1	17		
	Pantropical Spotted Dolphin	1	20			1	20
	Killer Whale	1	16	1	16		
	Pilot Whale	14	161	12	137	2	26
	Risso's Dolphin	7	87	7	87		
1995	Risso's Dolphin	5	101	4	85	1	16
	Unidentified Marine Mammal	1	22			1	22
	Pilot Whale	13	252	11	200	2	53
	Shortfin Pilot Whale	2	58	2	58		
1996	Risso's Dolphin	4	99	2	52	2	47
	Unidentified Marine Mammal	1	43			1	43
1997	Pilot Whale	1	29			1	29
	Short-Beaked Spinner Dolphin	1	16			1	16
1998	Beaked Whale	1	88			1	88
	Bottlenose Dolphin	2	46	1	31	1	15
	Risso's Dolphin	2	47	1	23	1	24
	Pilot Whale	1	24			1	24

Table 3.27 Summary of Marine Mammal Interactions in the Pelagic Longline Fishery, 1999-2005. Sources: Yeung, 2001; Garrison, 2003; Garrison and Richards, 2004; Garrison, 2005; Walsh and Garrison, 2006.

Year	Species	Total		Mortality		Serious Injury		Alive	
		Obs	Est	Obs	Est	Obs	Est	Obs	Est
1999	Risso's Dolphin	1	23			1	23		
	Unidentified Marine Mammal	1	14					1	14
	Pilot Whale	5	385	1	94	4	291		
2000	Common Dolphin	1	32					1	32
	Risso's Dolphin	3	93	1	41	1	23	1	29
	Pilot Whale	8	231	1	24	4	109	3	98
	Whale	1	19			1	19		
	Pygmy Sperm Whale	1	28			1	28		
2001	Risso's Dolphin	8	83.6	1	24.4	6	48.9	1	14.3
	Pilot Whale	6	92.9	1	19.8	4	50.2	1	22.7
	Striped Dolphin	1	1					1	1
	Northern Bottlenose Whale	1	1			1	1		
2002	Risso's Dolphin	10	87.2			4	11	6	59.6
	Pilot Whale	10	113.5			4	49.9	6	67.8
	Common Dolphin	1	1					1	1
	Unidentified Dolphin	2	2			1	1	1	1
	Unidentified Marine Mammal	1	1			1	1		
2003	Beaked Whale	2	48.8			1	5.3	1	43.5
	Dolphin	1	16.2			1	16.2		
	Atlantic Spotted Dolphin	1	29.8			1	29.8		
	Bottlenose Dolphin	1	2					1	2
	Common Dolphin	2	45.6					2	45.6
	Risso's Dolphin	14	109.5	1	1	3	40.1	10	68.4
	Striped Dolphin	1	1					1	1
	Pilot Whale	4	32.1			2	21.4	1	11.3
	Baleen Whale	1	1					1	1
	Minke Whale	1	22.3					1	22.3
2004	Pilot Whale	8	107.5			6	74.1	2	33.8
	Common Dolphin	1	6.8					1	6.8
	Risso's Dolphin	3	49.4			2	27.5	1	21.9
2005	Pilot Whale	18	294.4			9	211.5	9	79.5
	Risso's Dolphin	2	42.1				2.9	2	39.2
	Common Dolphin		5.7						5.7
	Bottlenose Dolphin	1	5.2					1	5.2
	Beaked Whale		1				1		
	Atlantic Spotted Dolphin	1	4.3					1	4.3
	Unidentified Marine Mammal	1	13.2			1	13.2		
	Unidentified Whale		3.4				3.4		
	Unidentified Dolphin	1	2.6					1	2.6

Sea Turtles

Currently, many sea turtles are taken in the GOM and NEC areas (Figure 3.27) and most are released alive. In the past, the bycatch rate was highest in the third and fourth quarters. Loggerhead and leatherback turtles dominate the catch of sea turtles. In general, sea turtle captures are rare, but takes appear to be clustered (Hoey and Moore, 1999).

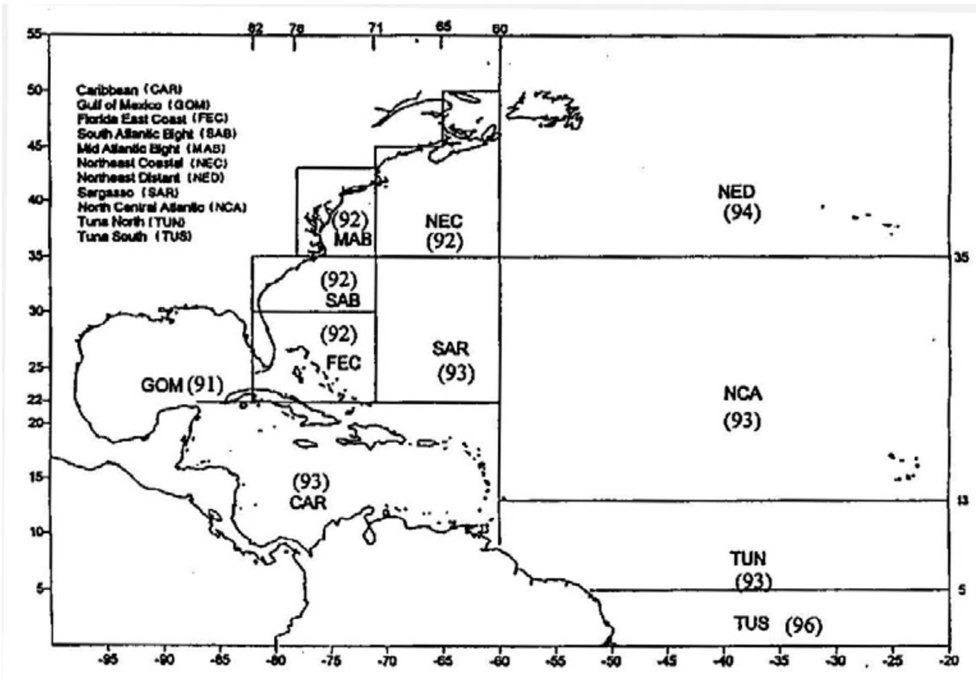


Figure 3.27 Geographic Areas Used in Summaries of Pelagic Logbook Data. Source: Cramer and Adams, 2000

The estimated take levels for 2000 were 1,256 loggerhead and 769 leatherback sea turtles (Yeung, 2001). The estimated sea turtle takes for regular fishing and experimental fishing effort for 2001 - 2005 are summarized in Table 3.28. The majority of leatherback interactions have occurred in the Gulf of Mexico. Loggerhead interactions are more widely distributed, however, the NEC, FEC, and Gulf of Mexico appear to be areas with high interaction levels each year.

In 2005, the pelagic longline fishery interacted with an estimated 351 leatherback sea turtles and 275 loggerhead sea turtles outside of experimental fishing operations. During 2005, the interactions with leatherback sea turtles were highest in the Gulf of Mexico (179 animals). The majority of loggerhead sea turtle interactions occurred in the NEC, MAB, CAR, SAR, and SAB areas (Walsh and Garrison, 2006). NMFS monitors observed interactions with sea turtles and marine mammals on a quarterly basis and reviews data for appropriate action, if any, as necessary.

Table 3.28 Estimated number of leatherback and loggerhead sea turtle interactions in the U.S. Atlantic pelagic longline fishery, 2001-2005 by statistical area. Sources: Walsh and Garrison, 2006; Garrison, 2005; Garrison and Richards, 2004; Garrison 2003.

	Leatherback					Loggerhead				
Area	**2001**	**2002**	**2003**	**2004**	**2005**	**2001**	**2002**	**2003**	**2004**	**2005**
CAR	61	0	0	17	2	27	43	36	61	40
GOM	393	695	838	780	179	0	170	135	45	19
FEC	313	100	27	64	62	0	99	137	99	0
SAB	241	93	75	164	7	39	22	52	194	34
MAB	139	70	94	184	11	43	94	18	92	54
NEC	30	5	76	33	6	117	147	241	150	67
NED	32	0	0	98	63	72	0	0	52	20
SAR	0	0	0	18	20	0	0	70	41	38
NCA	1	0	2	0	0	13	0	39	0	3
TUN	0	0	0	0	0	0	0	0	0	0
TUS	0	0	0	0	0	0	0	0	0	0
Total	1208	962	1113	1359	351	312	575	728	734	275
NED exp'tal fishery (2001-03)	77	158	79	--	--	142	100	92	--	--
Exp'tal fishery (2004-05)	--	--	--	3	17	--	--	--	0	8
Total	1285	1120	1192	1362	368	454	675	820	734	283

As a result of the increased sea turtle interactions in 2001 and 2002, NMFS reinitiated consultation for the pelagic longline fishery and completed a new BiOp on June 1, 2004. The June 2004 BiOp concluded that long-term continued operation of the Atlantic pelagic longline fishery is not likely to jeopardize the continued existence of loggerhead, green, hawksbill, Kemp's ridley, or olive ridley sea turtles, but is likely to jeopardize the continued existence of leatherback sea turtles. The BiOp included a reasonable and prudent alternative (RPA) and an incidental take statement (ITS) for the combined years 2004 – 2006, and for each subsequent three-year period (NMFS, 2004b).

A final rule published in July 2004 (69 FR 40734) prohibited the possession of "J"-style hooks in the pelagic longline fishery and required the possession and use of specific sea turtle release and disentanglement gears, handling and release protocols, as well as requiring the use of specific circle hooks and baits.

NED Research Experiment

Consistent with the conservation recommendation of an earlier, 2001 BiOp, NMFS initiated a research experiment in the NED area in consultation and cooperation with the domestic pelagic longline fleet. The goal was to develop and evaluate the efficacy of new technologies and changes in fishing practices to reduce sea turtle interactions. In 2001, the experiment attempted to evaluate the effect of gangions placed two gangion lengths from floatlines, the effect of blue-dyed bait on target catch and sea turtle interactions, and the effectiveness of dipnets, line clippers, and dehooking devices. Eight vessels participated, making 186 sets, between August and November. During the course of the research experiment, 142 loggerhead and 77 leatherback sea turtles were incidentally captured and no turtles were released dead.

The data gathered during the 2001 experiment were analyzed to determine if the tested measures reduced the incidental capture of sea turtles by a statistically significant amount. The blue-dyed bait parameter decreased the catch of loggerheads by 9.5 percent and increased the catch of leatherbacks by 45 percent. Neither value is statistically significant. In examining the gangion placement provision, the treatment sections of the gear (with gangions placed 20 fathoms from floatlines) did not result in a statistically significant reduction in the number of loggerhead and leatherback sea turtle interactions than the control sections of the gear (with a gangion located under a floatline). The treatment section of the gear recorded an insignificant increase in the number of leatherback interactions. Following an examination of the data, NMFS discovered that the measures had no significant effect upon the catch of sea turtles (Watson *et al.*, 2003).

Dipnets and line clippers were examined for general effectiveness. The dipnets were found to be adequate in boating loggerhead sea turtles. Several line clippers were tested, with the La Force line clipper having the best performance. Several types of dehooking devices were tested, with the work on these devices continuing in the 2002 and 2003 NED research experiment.

In the summer and fall of 2002, NMFS conducted the second year of the research experiment. The use of circle and "J"-hooks, whole mackerel bait, squid bait, and shortened daylight soak time were tested to examine their effectiveness in reducing the capture of sea turtles. The data indicate there were 501 sets made by 13 vessels with 100 percent observer coverage. During the course of the experiment, 100 loggerhead and 158 leatherback sea turtles were captured and 11 were tagged with satellite tags. In addition to the sea turtles, the vessels interacted with one unidentified marine mammal, one unidentified dolphin, one common dolphin, one longfin pilot whale, and four Risso's dolphins; all were released alive (Watson *et al.*, 2003).

In 2003, the research experiment tested a number of treatments to verify the results of the 2002 experiment in addition to testing additional treatments. Data indicate that there were 539 sets made by 11 vessels with 100 percent observer coverage. During the course of the experiment, one olive ridley, 92 loggerhead, and 79 leatherback sea turtles were captured; all were released alive (Foster *et al.*, 2004; Watson *et al.*, 2004). In addition to the sea turtles, the vessels interacted with one striped dolphin, one baleen whale, and five Risso's dolphin resulting in one mortality (Garrison and Richards, 2004).

From 2001 through 2003, NMFS worked with the commercial fishing industry to develop new pelagic longline fishing technology to reduce interaction rates and bycatch mortality of threatened and endangered sea turtles. The cooperative gear technology research investigated line configurations, setting and retrieving procedures, hook types, hook sizes, bait types, and release and disentanglement gears. Ultimately, specific hook designs and bait types were found to be the most effective measures for reducing sea turtle interactions. Large circle hooks and mackerel baits were found to substantially reduce sea turtle interactions over the use of the industry standard “J”-hooks and squid baits. The gears developed to remove hooks and line from hooked and entangled sea turtles are anticipated to reduce post-hooking mortality associated with those interactions not avoided. Since the conclusion of the NED research experiment, NMFS has continued to investigate pelagic longline bycatch mitigation techniques in the Gulf of Mexico, Atlantic Ocean, and the Caribbean Sea. Additionally, NMFS held a series of voluntary workshops for U.S. pelagic longline fishermen providing outreach and training in sea turtle handling and release techniques.

NMFS believes that the transfer of this information to other fishing countries will result in significant reductions in interaction rates and post-release mortalities of threatened and endangered sea turtles throughout their ranges.

Seabirds

Gannets, gulls, greater shearwaters, and storm petrels are occasionally hooked by Atlantic pelagic longlines. These species and all other seabirds are protected under the Migratory Bird Treaty Act. Seabird populations are often slow to recover from excess mortality as a consequence of their low reproductive potential (one egg per year and late sexual maturation). The majority of longline interactions with seabirds occur as the gear is being set. The birds eat the bait and become hooked on the line. The line then sinks and the birds are subsequently drowned.

The United States has developed a National Plan of Action in response to the Food and Agriculture Organization of the United Nations (FAO) International Plan of Action to reduce the incidental takes of seabirds (www.nmfs.gov.gov/NPOA-S.html). Although Atlantic pelagic longline interactions will be considered in the plan, NMFS has not identified a need to implement gear modifications to reduce seabird takes by Atlantic pelagic longlines. Takes of seabirds have been minimal in the fishery, most likely due to the setting of longlines at night and/or fishing in areas where birds are largely absent.

Observer data from 1992 through 2005 indicate that seabird bycatch is relatively low in the U.S. Atlantic pelagic longline fishery (Table 3.29). Since 1992, a total of 129 seabird interactions have been observed, with 95 observed killed (73.6 percent). In 2005, a total of four seabirds were observed taken.

Observed bycatch has ranged from one to 18 seabirds observed dead per year and zero to 15 seabirds observed released alive per year from 1992 through 2003. Half of the seabirds observed were not identified to species (n = 59). Of the seabirds identified, gulls represent the largest group (n = 35), followed by greater shearwaters (n = 23), and northern gannets (n = 8) (Table 3.30). Greater shearwaters experienced the highest mortality (96.2 percent), followed by gulls (80 percent), and unidentified seabirds (67.8 percent). Northern gannets had the lowest mortality rate (12.5 percent).

Preliminary estimates of expanded seabird bycatch and bycatch rates from 1995 – 2004, varied by year and species with no apparent pattern (Table 3.31). The estimated number of all seabirds caught and discarded dead ranged from zero to 468 per year, while live discards ranged from zero to 292 per year. The annual bycatch rate of birds discarded dead ranged from zero to 0.0486 birds per 1,000 hooks, while live discards ranged from zero to 0.0303 birds per 1,000 hooks.

Table 3.29 Seabird Bycatch in the U.S. Atlantic Pelagic Longline Fishery, 1992-2005. Source: NMFS, 2004a; NMFS PLL fishery observer program (POP) data.

Year	Month [1]	Area	Type of Bird	Number observed	Status
1992	10	MAB	GULL	4	dead
1992	10	MAB	SHEARWATER GREATER	2	dead
1993	2	SAB	GANNET NORTHERN	2	alive
1993	2	MAB	GANNET NORTHERN	2	alive
1993	2	MAB	GULL BLACK BACKED	1	alive
1993	2	MAB	GULL BLACK BACKED	3	dead
1993	11	MAB	GULL	1	alive
1994	6	MAB	SHEARWATER GREATER	3	dead
1994	8	MAB	SHEARWATER GREATER	1	dead
1994	11	MAB	GULL	4	dead
1994	12	MAB	GULL HERRING	7	dead
1995	7	MAB	SEA BIRD	5	dead
1995	8	GOM	SEA BIRD	1	dead
1995	10	MAB	STORM PETREL	1	dead
1995	11	NEC	GANNET NORTHERN	2	alive
1995	11	NEC	GULL	1	alive
1997	6	SAB	SEA BIRD	11	dead
1997	7	MAB	SEA BIRD	1	dead
1997	7	NEC	SEA BIRD	15	alive
1997	7	NEC	SEA BIRD	6	dead
1998	2	MAB	SEA BIRD	7	dead
1998	7	NEC	SEA BIRD	1	dead
1999	6	SAB	SEA BIRD	1	dead
2000	6	SAB	GULL LAUGHING	1	alive
2000	11	NEC	GANNET NORTHERN	1	dead
2001	6	NEC	SHEARWATER GREATER	7	dead
2001	7	NEC	SHEARWATER GREATER	1	dead
2002	7	NEC	SEABIRD	1	dead
2002	8	NED	SHEARWATER GREATER	1	dead
2002	8	NED	SEABIRD	1	dead
2002	9	NED	SHEARWATER GREATER	3	dead
2002	9	NED	SEABIRD	3	alive
2002	9	NED	SHEARWATER SPP	1	dead
2002	10	NED	GANNET NORTHERN	1	alive

Year	Month [1]	Area	Type of Bird	Number observed	Status
2002	10	NED	SHEARWATER SPP	1	dead
2002	10	NED	SEABIRD	2	dead
2002	10	MAB	GULL	3	alive
2002	10	MAB	GULL	1	dead
2002	11	MAB	GULL	3	dead
2003	1	GOM	SEABIRD	1	alive
2003	8	NED	SEABIRD	1	dead
2003	9	MAB	SEABIRD	1	dead
2004	1	MAB	GULL	5	dead
2004	3	MAB	GREATER SHEARWATER	1	alive
2004	3	MAB	GREATER SHEARWATER	4	dead
2004	4	NED	SEABIRD	1	dead
2005	1	SAB	HERRING GULL	1	dead
2005	1	SAB	SHEARWATER	1	dead
2005	3 [2]	NEC	GREATER SHEARWATER	1	alive
2005	3 [2]	NEC	GREATER SHEARWATER	1	dead

[1] Beginning in 2004, reports based on Quarters not month.
[2] Experimental fishery takes.

Table 3.30 Status of Seabird Bycatch in the U.S. Atlantic Pelagic Longline Fishery, 1992-2005. Source: NMFS PLL fishery observer program (POP) data.

Species	Release Status		Total	Percent Dead
	Dead	Alive		
GULLS (incl. Blackback, Herring, Laughing, and unid. gulls)	28	7	34	80%
UNIDENTIFIED SEABIRD	40	19	59	67.8%
GREATER SHEARWATER	22	1	23	95.6%
SHEARWATER SPP	3	0	3	100%
NORTHERN GANNET	1	7	8	12.5%
STORM PETREL	1	0	1	100%
TOTAL ALL SEABIRDS	95	34	129	73.6%

Table 3.31 Preliminary Expanded Estimates of Seabird Bycatch (D = discarded dead and A = discarded alive) and bycatch rates (all seabirds per 1,000 hooks) in the U.S. Atlantic pelagic longline fishery, 1997-2004. Source: NMFS, 2004a; NMFS PLL fishery observer program (POP) data.

	1997		1998		1999		2000		2001		2002		2003		2004	
Species	**D**	**A**	**D**	**A**	**D**	**A**	**D**	**A**	**D**	**A**	**D**	**A**	**D**	**A**	**D**	**A**
Unid. seabirds	468	292	155	0	14	0	0	0	0	0	3	3	8	13	4	0
Gulls	0	0	0	0	0	0	0	18	0	0	14	83	0	0	48	0
Shearwaters	0	0	0	0	0	0	0	0	210	0	6	0	0	0	59	15
Northern gannet	0	0	0	0	0	0	11	0	0	0	0	1	0	0	0	0
Storm petrel	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
All seabirds	468	292	155	0	14	0	11	18	210	0	23	87	8	13	111	15
Total hooks set	9,637,807		8,019,183		7,901,789		7,975,529		7,563,951		7,150,231		7,008,500		7,186,000	
Bycatch rate	0.0486	0.0303	0.0194	0	0.0017	0	0.0014	0.0023	0.0278	0	0.0032	0.0121	0.0011	0.0019	0.015	0.002

Finfish

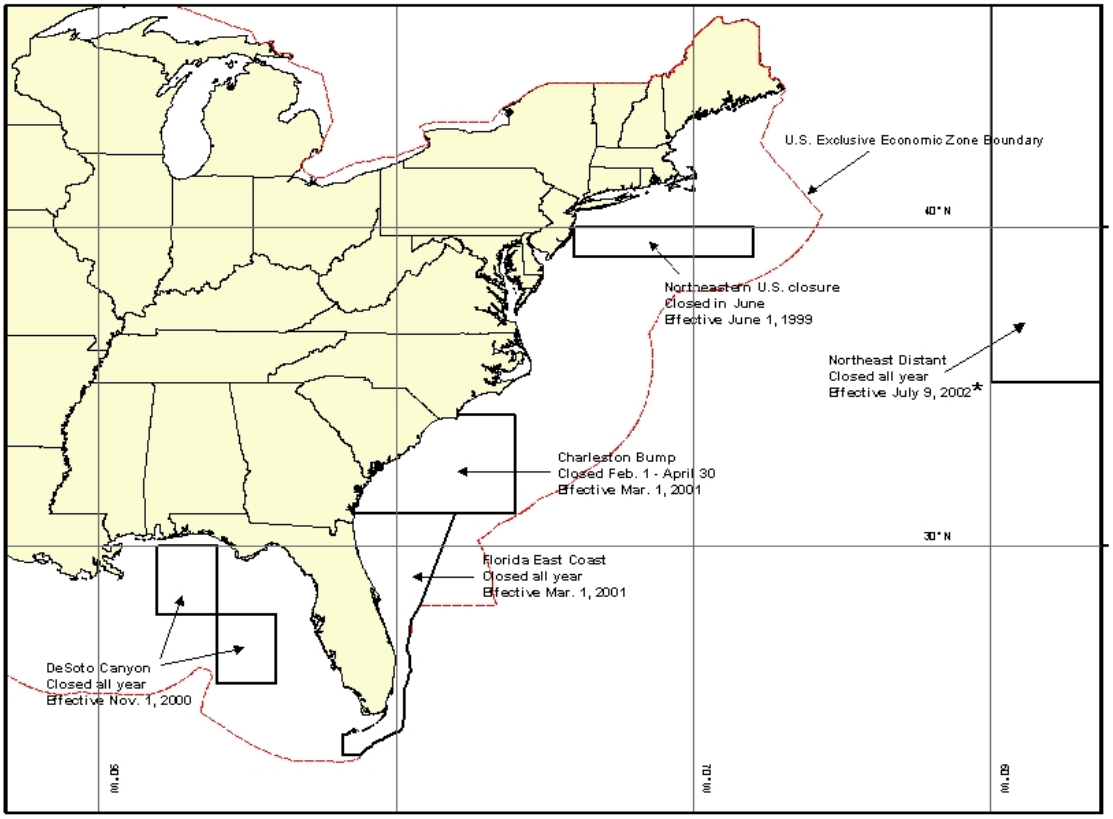
In the U.S. pelagic longline fishery, fish are discarded for a variety reasons. Swordfish, yellowfin tuna, and bigeye tuna may be discarded because they are undersized or unmarketable (*e.g.*, shark bitten). Blue sharks, as well as other species, are discarded because of a limited markets (resulting in low prices) and perishability of the product. Large coastal sharks are discarded during times when the shark season is closed. Bluefin tuna may be discarded because target catch requirements for other species have not been met. Also, all billfish are required to be released. In the past, swordfish have been discarded when the swordfish season was closed. Reported catch from 1999 – 2004 for the U.S. pelagic longline fishery (including reported bycatch, incidental catch, and target catch) is summarized in Table 3.24. Additional U.S. landings and discard data are available in the 2005 U.S. National Report to ICCAT (NMFS, 2005).

At this time, direct use of observer data with pooling for estimating dead discards in this fishery represents the best scientific information available for use in stock assessments. Direct use of observer data has been employed for a number of years to estimate dead discards in Atlantic and Pacific longline fisheries, including billfish, sharks, and undersized swordfish. Furthermore, the data have been used for scientific analyses by both ICCAT and the Inter-American Tropical Tuna Commission (IATTC) for a number of years.

Bycatch mortality of marlins, swordfish, and bluefin tuna from all fishing nations may significantly reduce the ability of these populations to rebuild, and it remains an important management issue. In order to minimize bycatch and bycatch mortality in the domestic pelagic longline fishery, NMFS implemented regulations to close areas to this gear type (Figure 3.28) and has banned the use of live bait by pelagic longline vessels in the Gulf of Mexico.

As part of the bluefin tuna rebuilding program, ICCAT recommends an allowance for dead discards. The U.S. annual dead discard allowance is approximately 68 mt ww. The estimate for the 2004 calendar year was used as a proxy to calculate the amount to be added to, or subtracted from, the U.S. bluefin tuna landings quota for 2005. The 2004 calendar year preliminary estimate of U.S. dead discards, as reported per the longline discards calculated from logbook tallies, adjusted as warranted when observer counts in quarterly/geographic stratum exceeded logbook reports, totaled 72 mt ww. Estimates of dead discards from other gear types and fishing sectors that do not use the pelagic longline vessel logbook are unavailable at this time, and thus, are not included in this calculation. As U.S. fishing activity is estimated to have exceeded the approximate 68 mt ww dead discard allowance by approximately 4.0 mt, the ICCAT recommendation and U.S. regulations state that the United States must account for this excess. Therefore, NMFS shall subtract the amount in excess (approximately 4.0 mt) from the amount of bluefin tuna that can be landed in the subsequent fishing year by those categories accounting for the dead discards.

The 2005 calendar year preliminary dead discard estimate is not yet available. The 2004 calendar year preliminary dead discard estimate, as reported in pelagic longline vessel logbooks and published in 2005 Final Initial Quota Specifications (70 FR 33033, June 7, 2005), totaled 71.8 mt ww. This preliminary estimate has been revised using the longline discards calculated from logbook tallies, adjusted as warranted when observer counts in stratum exceeded logbook reports. The revised 2004 calendar year dead discard estimate is 72.0 mt ww.



* Closed except to vessels complying with specific conditions (see 50 CFR 635 for details).

Figure 3.28 Areas Closed to Pelagic Longline Fishing by U.S. Flagged Vessels

3.4.1.3 Safety Issues

Like all offshore fisheries, pelagic longlining can be dangerous. Trips are often long, the work is arduous, and the nature of setting and hauling longline gear may result in injury or death. Like all other HMS fisheries, longline fishermen are exposed to unpredictable weather. NMFS does not wish to exacerbate unsafe conditions through the implementation of regulations. Therefore, NMFS considers safety factors when implementing management measures in the pelagic longline fishery. For example, all time/area closures are expected to be closed to fishing, not transiting, in order to allow fishermen to make a direct route to and from fishing grounds. NMFS seeks comments from fishermen on any safety concerns they may have. Fishermen have pointed out that, due to decreasing profit margins, they may fish with less crew or less experienced crew or may not have the time or money to complete necessary maintenance tasks. NMFS encourages fishermen to be responsible in fishing and maintenance activities.

3.4.1.4 International Issues and Catch

Pelagic longline fisheries for Atlantic HMS primarily target swordfish and tunas. Directed pelagic longline fisheries in the Atlantic have been operated by Spain, the United States, and Canada since the late 1950s or early 1960s. The Japanese pelagic longline tuna fishery started in 1956 and has operated throughout the Atlantic since then (NMFS, 1999). Most of the 35 other ICCAT nations now also operate pelagic longline vessels.

ICCAT generally establishes management recommendations on a species (*e.g.*, swordfish) or issue basis (*e.g.*, data collection) rather than by gear type. For example, ICCAT typically establishes quotas or landing limits by species, not gear type. In terms of data collection, ICCAT may require use of specific collection protocols or specific observer coverage levels in certain fisheries or on vessels of a certain size, but these are usually applicable to all gears, and not specific to any one gear type. However, there are a handful of management recommendations that are specifically applicable to the international pelagic longline fishery. These include, a prohibition on longlining in the Mediterranean Sea in June and July by vessels over 24 meters in length, a prohibition on pelagic longline fishing for bluefin tuna in the Gulf of Mexico, and mandated reductions in Atlantic white and blue marlin landings for pelagic longline and purse seine vessels from specified levels, among others.

Because most ICCAT management recommendations pertain to individual species or issues, as discussed above, it is often difficult to obtain information specific to the international pelagic longline fishery. For example, a discussion of authorized total allowable catches (TAC) for specific species in this section of the document would be of limited utility because it is not possible to identify what percentage of quotas are allocated to pelagic longline. Division of quota, by gear type, is typically done by individual countries.

Nevertheless, ICCAT does report landings by gear type. Available data indicate that longline effort produces the second highest volume of catch and effort, and is the most broadly distributed (longitudinally and latitudinally) of the gears used to target ICCAT managed species (Figure 3.29) (SCRS, 2004). Purse seines produce the highest volume of catch of ICCAT managed species from the Atlantic (SCRS, 2004). From 1999 through 2002 (inclusive) there was a declining trend in estimated international landings of HMS for fisheries in which the United States participated. In 2004, international landings of HMS for fisheries in which the U.S. participated totaled 106,774 mt, which represented a modest decrease from 2003 (SCRS, 2005). Detailed information on international Atlantic pelagic longline catches can be found in

Table 3.33.

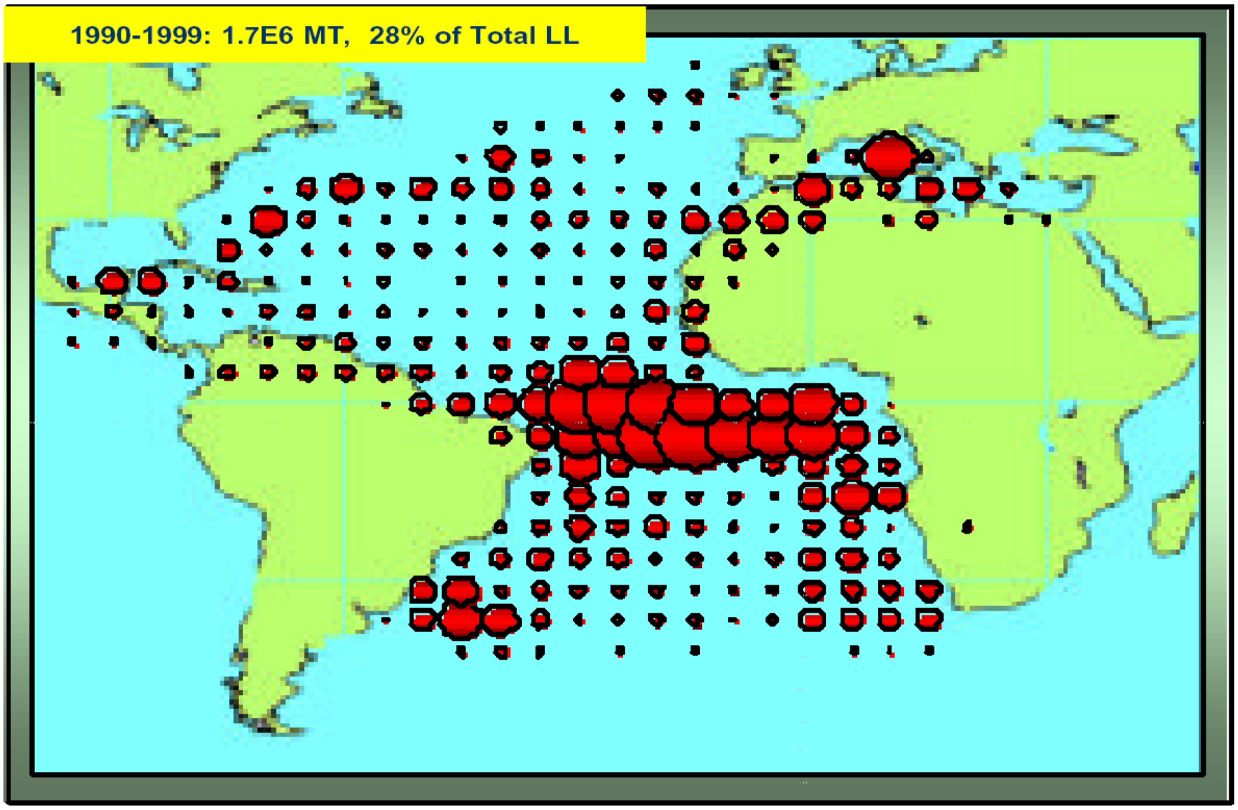


Figure 3.29 Distribution of Atlantic Longline Catches for all Countries 1990-1999. Source: SCRS, 2004

Scientific observer data are being collected on a range of pelagic longline fleets in the Atlantic and will be increasingly useful in better quantifying total catch, catch composition, and disposition of catch as these observer programs mature. Previous ICCAT observer coverage requirements of five percent for non-purse seine vessels that participated in the bigeye and yellowfin tuna fishery, including pelagic longline (per ICCAT Recommendation 96-01), are no longer in force. There is currently no ICCAT required minimum level of observer coverage specific to pelagic longline fishing. Nevertheless, the United States has implemented a mandatory observer program in the U.S. pelagic longline fishery. Japan is required to have eight percent observer coverage of its vessels fishing for swordfish in the North Atlantic, which are primarily pelagic longline vessels, however, the recommendation is not specific to vessel or gear type. ICCAT recommendation 04-01, a conservation and management recommendation for the bigeye tuna fishery, entered into force in mid-2005 and requires at least five percent observer coverage of pelagic longline vessels over 24 meters fishing for bigeye.

ICCAT has also developed a running tabulation of the diversity of species caught by the various gears used to target tunas and tuna like species in the Atlantic and Mediterranean (Table 3.32). For all fish species, longline gear shows the highest documented diversity of catch, followed by gillnets and purse seine. For seabirds, longline gear again shows the highest diversity of catch, while for sea turtles and marine mammals, purse seine and gillnet have a higher documented diversity of species for Atlantic tuna fleets (SCRS, 2004).

Table 3.32 ICCAT Bycatch Table (LL, longline; GILL, gillnets; PS, purse-seine; BB, baitboat; HARP, harpoon; Trap, traps). Source: SCRS, 2004.

ICCAT Bycatch Table (www.iccat.es)

Count	Group	LL	GILL	PS	BB	HARP	TRAP	OTHER
214	*All Groups*	149	110	78	12	33	20	43
		69.6%	51.4%	36.4%	5.6%	15.4%	9.3%	20.1%
12	*Skates and Rays*	10	6	6	0	2	0	1
		83.3%	50.0%	50.0%	0.0%	16.7%	0.0%	8.3%
46	*Coastal Sharks*	45	19	6	1	7	2	9
		97.8%	41.3%	13.0%	2.2%	15.2%	4.3%	19.6%
11	*Pelagic Sharks*	10	7	5	0	5	2	4
		90.9%	63.6%	45.5%	0.0%	45.5%	18.2%	36.4%
23	*Teleosts (ICCAT Species)*	23	18	16	9	6	7	11
		100.0%	78.3%	69.6%	39.1%	26.1%	30.4%	47.8%
82	*Teleosts (excluding Scombridae and billfishes)*	44	37	25	2	5	4	17
		53.7%	45.1%	30.5%	2.4%	6.1%	4.9%	20.7%
5	*Sea Turtles*	3	4	5	0	2	1	1
		60.0%	80.0%	100.0%	0.0%	40.0%	20.0%	20.0%
9	*Sea Birds*	8	2	0	0	0	0	0
		88.9%	22.2%	0.0%	0.0%	0.0%	0.0%	0.0%
26	*Marine Mammals*	6	17	15	0	6	4	0
		23.1%	65.4%	57.7%	0.0%	23.1%	15.4%	0.0%

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

Highly Migratory Species

The U.S. pelagic longline fleet represents a small fraction of the international pelagic longline fleet that competes on the high seas for catches of tunas and swordfish. In recent years, the proportion of U.S. pelagic longline landings of HMS, for the fisheries in which the United States participates, has remained relatively stable in proportion to international landings (Table 3.33). The U.S. fleet accounts for less than 0.5 percent of the landings of swordfish and tuna from the Atlantic Ocean south of 5°N. latitude, and does not operate at all in the Mediterranean Sea. Tuna and swordfish landings by foreign fleets operating in the tropical Atlantic and Mediterranean are greater than the catches from the north Atlantic area where the U.S. fleet operates. Even within the area where the U.S. fleet operates, the U.S. portion of fishing effort (in numbers of hooks fished) is less than 10 percent of the entire international fleet's effort, and likely less than that due to differences in reporting effort between ICCAT countries (NMFS, 2001).

Table 3.33 Estimated International Longline Landings of HMS, Other than Sharks, for All Countries in the Atlantic: 1999-2004 (mt ww)[1]. Source: SCRS, 2005.

	1999	2000	2001	2002	2003	2004
Swordfish (N. Atl + S. Atl)	25,268	25,091	22,702	22,278	21,746	23,872
Yellowfin Tuna (W. Atl)[2]	11,596	11,638	12,740	11,605	9,996	15,008
Bigeye Tuna	76,527	71,194	55,265	46,584	51,065	43,620
Bluefin Tuna (W. Atl.)[2]	914	859	610	727	228	542
Albacore Tuna (N. Atl + S. Atl)	27,209	28,896	29,722	27,798	27,893	20,940
Skipjack Tuna (W. Atl)[2]	58	23	60	143	95	231
Blue Marlin (N. Atl. + S. Atl.)[3]	2,359	2,209	1,638	1,331	1,690	1,376
White Marlin (N. Atl. + S. Atl.)[3]	981	893	592	725	582	528
Sailfish (W. Atl.)[4]	524	815	812	1,271	860	657
Total	**145,436**	**141,618**	**124,141**	**112,462**	**114,155**	**106,774**
U.S. Longline Landings (from 2003, 2004, and 2005 U.S. Natl. Reports)[5]	**8,331.1**	**7,253.5**	**5,694.9**	**6,193.7**	**5,442.3**	**5649.1**
U.S. Longline Landings as a Percent of Total Longline Landings	**5.7**	**5.1**	**4.6**	**5.5**	**4.8**	**5.3**

[1]Landings include those classified by the SCRS as longline landings for all areas
[2]Note that the United States has not reported participation in the E. Atl yellowfin tuna fishery since 1983 and has not participated in the E. Atl bluefin or the E. Atl skipjack tuna fishery since 1982.
[3]Includes U.S. *dead discards and Brazilian live discards.*
[4]Includes U.S. *dead discards.*
[5]Includes swordfish, blue marlin, white marlin, and sailfish longline discards.

Atlantic Sharks

There is currently no comprehensive international reporting system for Atlantic shark catches and landings. While there are some international data, not all countries report shark catches and landings and those that do use varying reporting methods. The most recent landings reports for blue and shortfin mako sharks are presented in Table 3.34 and Table 3.35, respectively. In 2001, ICCAT passed a resolution on Atlantic sharks to determine needed improvements in data collection for Atlantic shortfin mako and blue sharks, and to conduct an interim meeting in 2003 to discuss the issue. In addition, the resolution called upon contracting parties and non-contracting parties to: (1) submit catch and effort data on Atlantic shortfin mako, porbeagle, and blue sharks; (2) encourage the release of live sharks that are caught incidentally; (3) minimize waste and discards from shark catches; and (4) voluntarily agree not to increase fishing effort targeting Atlantic porbeagle, shortfin mako and blue sharks until sustainable levels of harvest can be determined through stock assessments.

At its annual meeting in New Orleans in 2004, ICCAT adopted a recommendation to, among other things, ban shark finning, require vessels to fully utilize their entire catches of sharks, encourage the release of live sharks that are caught incidentally and are not used for food, and review the assessment of shortfin mako sharks in 2005, and reassess blue sharks and shortfin mako no later than 2007. The ICCAT recommendation also encouraged countries to engage in research to identify shark nursery areas, and collect data on shark catches.

Table 3.34 Nominal Catches of Blue Shark Reported to ICCAT (landings and discards in t) by Major Gear and Flag between 1990 and 2002. Source: SCRS, 2004; SCRS, 2005.

		1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002
Atlantic Total		2,348	3,533	2,343	7,879	8,310	8,422	9,036	36,895	33,211	34,208	33,462	34,301	31,357
LANDINGS	longline	1,387	2,265	1,667	5,749	7,366	7,501	7,767	36,279	32,578	33,790	32,616	33,415	31,146
	others	220	496	491	994	372	300	558	431	422	309	709	780	143
DISCARDS	longline	741	772	184	1136	572	618	609	185	189	105	137	105	68
	others	0	0	0	0	0	3	102	0	22	4	0	0	0
LANDINGS	BENIN	0	0	0	0	0	0	0	6	4	27	0	0	0
	BRASIL	0	0	0	0	0	0	743	1103	0	179	1689	2173	1971
	CANADA	0	0	0	0	0	276	12	11	5	54	18	0	5
	CAP-VERT	0	0	0	0	0	0	0	0	0	0	0	0	0
	CHINA.PR	0	0	0	0	0	0	0	0	0	0	0	750	420
	EC-CYPRUS	0	0	0	0	0	0	0	0	0	0	9	0	0
	EC-DENMARK	2	1	1	0	1	2	3	1	1	0	2	1	13
	EC-ESPANA	0	0	0	0	0	0	0	29,917	28,137	29,005	26,046	25,110	21,037
	EC-FRANCE	130	187	276	322	350	266	278	213	163	0	395	207	109
	EC-IRELAND	0	0	0	0	0	0	0	0	0	66	9	66	11
	EC-PORTUGAL	1,387	2,257	1,583	5,726	4,669	5,569	5,710	3,966	3,318	3,337	4,220	4,713	4,602
	EC-U.K	1	0	0	0	0	12	0	0	1	0	12	9	6
	JAPAN	0	0	0	0	2,596	1,589	1,044	996	850	893	492	518	675
	MEXICO	0	0	0	0	0	0	0	0	0	0	0	6	0
	NAMIBIA	0	0	0	0	0	0	0	0	0	0	0	0	2213
	PANAMA	0	0	0	0	0	0	0	0	0	177	22	0	0
	SENEGAL	0	0	0	0	0	0	0	0	0	0	0	456	0
	SOUTHAFRICA	0	0	0	0	0	0	0	0	23	21	0	83	63
	TRINIDAD&TOBAG	0	0	0	0	0	0	0	0	0	0	0	0	6
	U.S.A	87	308	215	680	29	23	283	211	255	217	291	42	0
	UK-BERMUDA	0	0	0	0	0	0	0	1	2	0	0	0	0
	URUGUAY	0	8	84	15	93	64	252	286	242	126	119	59	159
DISCARDS	CANADA	0	0	0	0	0	0	0	0	16	0	0	0	0
	U.S.A	741	772	184	1,136	572	618	710	185	195	101	137	106	68
	UK-BERMUDA	0	0	0	0	0	3	1	0	0	8	0	0	0

Table 3.35 Nominal Catches of Shortfin Mako Shark Reported to ICCAT (landings and discards in t) by Major Gear and Flag between 1990 and 2002. Source: SCRS, 2004; SCRS, 2005.

		1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002
Atlantic Total		*486*	*538*	*511*	*1,824*	*1,352*	*2,646*	*1,680*	*5,300*	*4,105*	*3,731*	*4,366*	*4,522*	*4,792*
LANDINGS	longline	218	328	235	1,137	1,017	1,177	1,421	5,125	3,941	3,630	4,044	4,278	4,527
	others	268	210	250	667	317	1440	259	175	165	100	322	244	266
DISCARDS	longline	0	0	26	20	18	29	0	0	0	2	0	0	0
LANDINGS	BRASIL	0	0	0	0	0	0	83	190	0	27	219	409	226
	CANADA	0	0	0	0	0	111	67	110	69	70	78	69	78
	CHINA.PR	0	0	0	34	45	23	27	19	74	126	306	22	208
	COTE D'IVOIRE	0	0	0	0	0	0	15	0	0	10	9	15	0
	EC-ESPANA	0	0	0	0	0	0	0	3,777	3,347	2,895	2,679	2,921	2,859
	EC-PORTUGAL	193	314	220	796	649	749	785	519	425	446	706	523	471
	EC-U.K	0	0	0	0	0	0	0	0	0	2	3	2	1
	JAPAN	0	0	0	0	0	0	213	248	0	0	0	0	0
	MEXICO	0	0	0	0	0	10	0	0	0	0	10	16	0
	NAMIBIA	0	0	0	0	0	0	0	0	0	1	0	0	459
	PANAMA	0	0	0	0	0	0	0	0	0	25	1	0	0
	SOUTH AFRICA	0	0	0	0	0	0	0	0	19	13	0	79	19
	ST.VINCENT	0	0	0	0	0	0	0	0	0	3	0	0	0
	TRINIDAD&TOBAGO	0	0	0	0	0	0	0	0	0	0	0	0	1
	U.S.A	268	210	250	945	628	1703	465	408	148	69	292	395	413
	UK-BERMUDA	0	0	0	0	0	0	1	1	2	0	0	0	0
	URUGUAY	25	14	15	29	12	21	24	28	21	43	63	70	58
DISCARDS	MEXICO	0	0	0	0	0	1	0	0	0	0	0	0	0
	U.S.A	0	0	26	20	18	28	0	0	0	0	0	0	0
	UK-BERMUDA	0	0	0	0	0	0	0	0	0	2	0	0	0

Sea Turtles

From 1999 to 2003, the U.S. pelagic longline fleet targeting HMS captured an average of 772 loggerhead and 1,013 leatherback sea turtles per year, based on observed takes and total reported effort. In 2004, the U.S. pelagic longline fleet was estimated to have captured 734 loggerhead and 1,359 leatherback sea turtles (Garrison, 2005). In 2005, the U.S. pelagic longline fishery was estimated to have interacted with 274 loggerhead and 351 leatherback sea turtles outside of experimental fishing operations (Walsh and Garrison, 2006). Since other ICCAT nations do not monitor incidental catches of sea turtles, an exact assessment of their impact is not possible. However, high absolute numbers of sea turtle catches in the foreign fleets have been reported from other sources (NMFS, 2001). Throughout the Atlantic basin, including the Mediterranean Sea, a total of 210,000 – 280,000 loggerhead and 30,250 – 70,000 leatherback sea turtles are estimated to be captured by pelagic longline fisheries each year (Lewiston *et al*., 2004).

Mortality in the domestic and foreign pelagic longline fisheries is just one of numerous factors affecting sea turtle populations in the Atlantic (National Research Council, 1990). Many sources of anthropogenic mortality are outside of U.S. jurisdiction and control. If the U.S. swordfish quota was relinquished to other fishing nations, the effort now expended by the U.S. fleet would likely be replaced by foreign effort. This could significantly alter the U.S. position at ICCAT and make the implementation of international conservation efforts more difficult. This would also eliminate the option of gear or other experimentation with the U.S. longline fleet, thus making it difficult to find take reduction solutions which could be transferred to other longlining nations to effect a greater global reduction in sea turtle takes in pelagic longline fisheries. The United States has, and will continue to make efforts at ICCAT, Inter-American Tropical Tuna Commission (IATTC), and other international forums, to encourage adoption of sea turtle conservation measures by international fishing fleets.

The first international agreement devoted solely to the protection of sea turtles – the Inter-American Convention for the Protection and Conservation of Sea Turtles – was concluded on September 5, 1996, in Salvador, Brazil, and entered into force in May 2001. The Inter-American Convention called for the Parties to establish national sea turtle conservation programs. In addition to domestic rulemaking in various fisheries, NMFS has been active at the international level in promoting sea turtle conservation efforts. A summery of some of these efforts is provided below.

In February 2003, the United States supported a workshop consisting of technical experts on sea turtle biology and longline fishery operations from interested nations in order to share information and discuss possible solutions to reduce incidental capture of marine turtles in these fisheries. The United States introduced the NED sea turtle bycatch mitigation research at the November 2003, ICCAT meeting in Dublin, Ireland, and co-sponsored ICCAT Resolution 03-11 which encouraged other nations to improve data collection and reporting on sea turtle bycatch and promote the safe handling and release of incidentally captured sea turtles. A poster and video describing the NED research experiment and preliminary results were displayed, as well as many of the experimentally tested release gears.

In January 2004, the Northeast Distant Waters Longline Research ad hoc advisory group met in Miami, Florida. The purpose of this meeting was to present a summary of the 2001 and 2002 NED pelagic longline sea turtle bycatch mitigation research and the preliminary results for the 2003 research, and to discuss future research needs. Also in January 2004, the IATTC - CIAT Bycatch Working Group met in Kobe, Japan. The purpose of U.S. attendance at this meeting was to present results of sea turtle mitigation research by the U.S, to hear research results on bycatch mitigation from other countries, to encourage IATTC countries to evaluate or adopt sea turtle mitigation technology in their fisheries, and to address other bycatch issues in longline fisheries. A Workshop was held in conjunction with the Sea Turtle Symposium in San Jose, Costa Rica in February 2004. The focus of this workshop was on providing information on the safe release of sea turtles to participants from nations with longline fleets. In June 2004, NMFS SEFSC staff conducted longline mitigation training and workshops in Peru, in cooperation with the IATTC. In August 2004, a workshop was held in Panama on conducting circle hook experiments similar to those undertaken in Ecuador (see description below) and on the use of dehooking devices and safe handling and release techniques. Also in August 2004, a workshop was held in Guatemala on conducting circle hook experiments similar to Ecuador and on the use of dehooking devices, safe handling and release techniques. In October 2004, Southwest Fisheries Science Center (SWFSC) staff followed up on a training workshop held in 2003 in cooperation with the Instituo del Mar del Peru (IMARPE) for fisheries observers, by working with Peruvian researchers to initiate circle hook implementation and experiments in the artisanal dolphin and shark fisheries.

At the Annual ICCAT meeting in New Orleans in November 2004, NMFS staff conducted a workshop discussing experimental results and the use of circle hooks, the use of dehooking devices, and safe handling and release techniques. Also in November, a workshop was conducted at the meeting of the Gulf and Caribbean Fisheries Institute in Saint Petersburg, Florida.

In collaboration with the World Wildlife Fund (WWF), IATTC, and the Western Pacific Regional Fishery Management Council (WPRFMC), NMFS provided hooks, dehooking devices, and technical assistance to Ecuador for the testing of non-offset 14/0 and 15/0 circle hooks in the dolphin fishery and 10 degree offset 16/0 and 18/0 circle hooks in the tuna/shark fisheries. Work began in March 2004 and initial results indicate that the majority of the bycatch is entangled, not hooked. Pacific Islands Fisheries Science Center (PIFSC) staff has been consulting with WPRFMC, Blue Ocean Institute, and Japan on a cooperative research design to test the efficiency of circle hooks in the Japanese tuna fishery. A draft research plan was reviewed in May 2004, and a meeting to refine the draft was held in Honolulu in Sept 2004. In June 2004, NMFS staff gave a presentation promoting cooperative research and the use of circle hooks at a Symposium on Bycatch Reduction hosted by the National Fisheries Research and Development Institute (NFRDI) in Korea.

The first Technical Assistance Workshop on Sea Turtle Bycatch Reduction Experiments in Longline Fisheries was held in April 2005, in Honolulu. This workshop was held to provide technical assistance for participants from the FAO Technical Consultation to design programs for the development and testing of turtle bycatch reducing technology appropriate to the longline fisheries of participating nations. The Third International Fishers Forum was held in Yokahama, Japan in July 2005, and United States' and regional research results on sea turtle bycatch avoidance methods were presented. In 2005, the United States assisted in designing experiments to evaluate sea turtle mitigation techniques and provided technical assistance for the following countries: Australia; Brazil; Costa Rica; Ecuador; Iceland; Italy; Japan; Korea; Taiwan; Mexico; Peru; Philippines; Spain; Uraquay; and, Vietnam.

3.4.2 Purse Seine

3.4.2.1 Domestic History and Current Management

Purse seine gear consists of a floated and weighted encircling net that is closed by means of a drawstring; know as a purseline, threaded through rings attached to the bottom of the net. The efficiency of this gear can be enhanced by the assistance of spotter planes used to locate schools of tuna. Once a school is spotted, the vessel, with the aid of a smaller skiff, intercepts and uses the large net to encircle it. Once encircled, the purseline is pulled, closing the bottom of the net and preventing escape. The net is hauled back onboard using a powerblock, and the tunas are removed and placed onboard the larger vessel. Economic and social aspects of the fisheries are described in Sections 3.5 and Chapter 9.0 of this document, respectively.

Vessels using purse seine nets have participated in the U.S. Atlantic tuna fishery continuously since the 1950s; although a number of purse seine vessels did target and land BFT off the coast of Gloucester, MA as early as the 1930s. In 1958, continued commercial purse seining effort for Atlantic tunas began with a single vessel in Cape Cod Bay and expanded rapidly into the region between Cape Hatteras and Cape Cod during the early 1960s. The purse seine fishery between Cape Hatteras and Cape Cod was directed mainly at small and medium BFT, YFT, and at skipjack tuna, primarily for the canning industry. North of Cape Cod, purse seining was directed at giant BFT. High catches of juvenile BFT were sustained throughout the 1960s and into the early 1970s. These high catch rates by U.S. purse seine vessels are believed to have played a role in the decline in abundance during subsequent years. Currently these purse seine vessels focus their effort on giant BFT, versus other tunas, due to the international market that developed for giant BFT in the late 1970s. These fresh caught BFT are primarily flown directly to Japan for processing into sushi or sashimi. By the late 1980s, high ex-vessel prices and the increased importance of the Japanese market had increased effort on all size classes of BFT. In 1992, NMFS responded by banning the sale of school, large school, and small medium BFT (27 inches to less than 73 inches curved fork length).

A limited entry system with non-transferable individual vessel quotas (IVQs) for purse seining was established in 1982, effectively excluding any new entrants into this category. Equal baseline quotas of BFT are assigned to individual vessels by regulation; the IVQ system is possible given the small pool of ownership in this sector of the fishery. Currently, only five vessels comprise the Atlantic tuna purse seine fleet and in 1996 the quotas were made transferable among the five vessels.

Vessels that are participating in the Atlantic tunas purse seine fishery are required to target the larger size class BFT, more specifically the giant sized class (81 inches or larger) and are granted a tolerance limit of 15 percent by weight, of the total amount of giant BFT landed during a season. These vessels may commence fishing starting on July 15 of each year and may continue through December 31, provided the vessel has not fully attained its IVQ. Over the last few years, the Purse seine category has not fully harvested its allocated quota. This can be attributed to a number of different reasons outside of the industry's or NMFS' control, such as lack of availability or schools being comprised of mixed size classes. NMFS has issued several EFPs to this sector of the fishery and will continue to assess current regulations and their impact on providing reasonable opportunities to harvest available quota.

3.4.2.2 Recent Catch and Landings

Table 3.36 shows purse seine landings of Atlantic tunas from 1999 through 2004. Purse seine landings typically make up approximately 20 percent of the total annual U.S. landings of BFT (about 25 percent of total commercial landings), but account for only a small percentage, if any, of the landings of other HMS. In the 1980s and early 1990s, purse seine landings of YFT were often over several hundred metric tons. Over 4,000 mt ww of YFT were recorded landed in 1985. In recent years, via informal agreements with other sectors of the tuna industry, the purse seine fleet has opted not to direct any effort on HMS other than BFT.

Table 3.36 Domestic Atlantic Tuna Landings for the Purse Seine Fishery: 1999-2004 (mt ww). Northwest Atlantic Fishing Area. Source: U.S. National Report to ICCAT: 2005.

Species	1999	2000	2001	2002	2003	2004
Bluefin Tuna	247.9	275.2	195.9	207.7	265.4	31.8
Yellowfin Tuna	0	0	0	0	0	0
Skipjack Tuna	0	0	0	0	0	0

3.4.2.3 Safety Issues

Accidents that can occur on purse seine vessels include general injuries caused by handling fish (e.g., poisoning from being stuck by fin spines), as well as accidents related to the vessels fishing operations themselves, such as, deploying the skiff or using cables and winches to move giant BFT from the net to the hold.

3.4.2.4 International Issues and Catch

The U.S. purse seine fleet has historically accounted for a small percentage of the total International Atlantic tuna landings. Over the past six years, the U.S. purse seine fishery has contributed to less than 0.15 percent of the total purse seine landings reported to ICCAT.

Table 3.37 Estimated International Purse Seine Atlantic Tuna Landings in the Atlantic and Mediterranean: 1999-2004 (mt ww). Source: SCRS, 2005

Species	1999	2000	2001	2002	2003	2004
Bluefin Tuna	15,884	17,616	17,520	18,548	15,525	122,309
Yellowfin Tuna	83,445	80,253	102,641	95,613	80,111	61,849
Skipjack Tuna	95,367	80,762	77,995	70,714	92,770	89,317
Bigeye Tuna	20,923	17,909	22,060	16,192	22,237	13,388
Albacore	238	244	288	158	998	674
Total	**215,857**	**196,784**	**220,504**	**201,225**	**211,641**	**177,537**
U.S. Total	**248**	**275**	**196**	**208**	**265**	**32**
U.S. Percentage	**0.12%**	**0.14%**	**0.09%**	**0.10%**	**0.13%**	**0.02%**

Since the 1999 ICCAT meeting, ICCAT has continued to implement a Fish Aggregation Device (FAD) closed area in the Gulf of Guinea. The closure (which became mandatory in mid-1999) was in response to concern over catches of juvenile and undersize tunas by non-U.S. internationally flagged purse seiners relying on FADs. The full evaluation of this program is somewhat hindered by the multi-species nature of surface fisheries and the existence of other types of fisheries. The updated analysis indicated that this regulation appeared effective at reducing mortality for juvenile bigeye. Full compliance with this regulation by all surface fisheries will greatly increase the effectiveness of this regulation.

3.4.3 Commercial Handgear

3.4.3.1 Domestic History and Current Management

Commercial handgears, including handline, harpoon, rod and reel, and bandit gear are often used to fish for Atlantic HMS by fishermen on private vessels, charter vessels, and headboat vessels. Rod and reel gear may be deployed from a vessel that is at anchor, drifting, or underway (*i.e.*, trolling). In general, trolling consists of dragging baits or lures through, on top of, or even above the water's surface. While trolling, vessels often use outriggers, kites, or green-sticks to assist in spreading out or elevating baits or lures and to prevent fishing lines from tangling. For more information on green-stick fishing gear, and the configurations allowed under current regulations, please refer to the discussions of alternative H4 in Chapters 2 and 4 of this document. Operations, frequency and duration of trips, and distance ventured offshore vary widely. Most of the vessels are greater than seven meters in length and are privately owned by individual fishermen.

The handgear fisheries are typically most active during the summer and fall, although in the South Atlantic and Gulf of Mexico fishing occurs during the winter months. Fishing usually takes place between eight and 200 km from shore and for those vessels using bait, the baitfish typically includes herring, mackerel, whiting, mullet, menhaden, ballyhoo, butterfish, and squid. The commercial handgear fishery for BFT occurs mainly in New England, and more recently off the coast of southern Atlantic states, such as Virginia, North Carolina and South Carolina, with vessels targeting large medium and giant BFT. The majority of U.S. commercial handgear fishing activities for bigeye, albacore, yellowfin, and skipjack tunas take place in the northwest Atlantic. Beyond these general patterns, the availability of Atlantic tunas at a specific location and time is highly dependent on environmental variables that fluctuate from year to year.

Currently the U.S. Atlantic tuna commercial handgear fisheries are managed through an open access vessel permit program. Vessels that wish to sell their Atlantic tunas must obtain a commercial handgear permit in one of the following categories: General (rod and reel, harpoon, handline, bandit gear), Harpoon (harpoon only), or Charter/Headboat (rod and reel and handline). These vessels may also need permits from the states they operate out of in order to land and sell their catch. All commercial permit holders are encouraged to check with their local state fish/natural resource management office regarding these requirements. Permitted vessels are also required to sell their Atlantic tunas to federally permitted Atlantic tuna dealers. As the Atlantic tunas dealer permits are issued by the Northeast Region Permit Office, vessel owner/operators are encouraged to contact the permitting office directly, either by phone at (978) 281-9438 or via the web at http://www.nero.noaa.gov/ro/doc/vesdata1.htm, to obtain a list of permitted dealers in their area.

Vessels that are permitted in the General and Charter/Headboat categories commercially fish under the General category rules and regulations. For instance, regarding BFT, vessels that possess either of the two permits mentioned above have the ability to retain a daily bag limit of zero to three BFT, measuring 73 inches or greater curved fork length per vessel per day while the General category BFT fishery is open. The General category BFT fishery opens on June 1 of each year and remains open until January 31 of the subsequent year, or until the quota is filled. Vessel owner/operators should check with the agency via websites (www.hmspermits.gov) or telephone information lines (1-888-872-8862) to verify the BFT retention limit on any given day. The General category BFT quota is approximately 47 percent of the U.S. quota and equates to a base line allocation of approximately 690 mt.

Vessels that are permitted in the Harpoon category fish under the Harpoon category rules and regulations. For instance, regarding BFT, vessels have the ability to keep two bluefin measuring 73 inches to less than 81 inches curved fork length per vessel trip per day while the fishery is open. There is no limit on the number of BFT that measure longer than 81 inches curved fork length, as long as the Harpoon category season is open. The Harpoon category season also opens on June 1 of each year and remains open until November 15, or until the quota is filled. The Harpoon category BFT quota is approximately 3.9 percent of the U.S. quota and equates to a base line allocation of approximately 57 mt.

U.S. commercial swordfish fishing in the Atlantic Ocean is reported to have begun in the early 1800s as a harpoon fishery off the coast of New England. This fishery traditionally consisted of harpoon vessels operating out of Rhode Island and Massachusetts where they took extended trips for swordfish north and east of the Hudson Canyon and particularly off Georges Bank, and could land as many as 20 to 25 large swordfish over a ten-day period. These fish primarily consisted of large fish that finned on the surface and were available to the harpoon gear, some weighing as much as 600 lbs dw, but averaging about 225 to 300 lbs dw at the turn of the century. Because of the limited effort directed towards large fish, the stock was sufficient to support a sustainable seasonal swordfish fishery for more than 150 years. Most swordfish caught in the United States in the early 1900s were harvested with harpoons; harpoon landings declined from the 1940s through the 1960s. Due to a decreased availability of the large swordfish in the northeast this fishery has essentially ceased to exist. However, a recently emerging swordfish handgear fishery, both commercial and recreational, has appeared to develop off the east coast of Florida. This fishery is essentially prosecuted at night with rod and reel or handline gear. Some vessels participating in this fishery are currently utilizing individual handlines attached to free-floating buoys. This fishery has been operating under the current regulations, which require that handlines be restricted to no more than two hooks and be released and retrieved by hand. The current regulations do not limit the number of individual handlines/buoys that may be possessed or deployed.

Currently the U.S. commercial swordfish fishery is managed through limited access vessel permits. Vessels that possess a limited access handgear permit must abide by the minimum size limits for swordfish (*i.e.,* 29 inches form cleithrum to caudal keel; 47 inches lower jaw fork length; or 33 lbs dressed weight) and seasonal retention limits. When the directed swordfish fishery is open, permitted handgear vessel do not have a possession limit. However, during a directed fishery closure, permitted handgear vessels may land two swordfish per trip, provided these two fish were not taken with harpoon gear. Fishermen with a commercial handgear swordfish permit are required to report fishing activities in an approved logbook within 48 hours of each day's fishing activities for multi-day trips, or before offloading for one-day trips, and submit the logbook within seven days of offloading.

The shark commercial handgear fishery plays a very minor role in contributing to the overall shark landing statistics. For further information regarding the shark fishery refer to Section 3.4.5. Economic and social aspects of all the domestic handgear fisheries are described later in this document (Section 3.5 and Chapter 9.0 respectively).

3.4.3.2 Recent Catch and Landings

The proportion of domestic HMS landings harvested with handgear varies by species, with Atlantic tunas comprising the majority of commercial landings. Commercial handgear landings of all Atlantic HMS (other than sharks) in the United States are shown in Table 3.38.

In 2004, BFT commercial handgear landings accounted for approximately 42 percent of the total U.S. BFT landings, and almost 75 percent of commercial BFT landings.

Also in 2004, four percent of the total yellowfin catch, or nine percent of the commercial yellowfin catch, was attributable to commercial handgear. Commercial handgear landings of skipjack tuna accounted for approximately ten percent of total skipjack landings, or about 30 percent of commercial skipjack landings. For albacore, commercial handgear landings accounted for approximately one percent of total albacore landings, or about six percent of commercial albacore landings. Commercial handgear landings of bigeye tuna accounted for approximately one percent of total bigeye landings and one percent of total commercial bigeye landings.

Updated tables of landings for the commercial handgear fisheries by gear and by area for 1999 – 2004 are presented in the following tables.

Table 3.38 Domestic Landings for the Commercial Handgear Fishery, by Species and Gear, for 1999-2004 (mt ww). Source: U.S. National Report to ICCAT: 2005

Species	Gear	1999	2000	2001	2002	2003	2004
Bluefin Tuna	Rod and Reel	643.6	590.9	889.7	878.5	529.2	331.4
	Handline	15.5	3.2	9.0	4.5	2.6	1.3
	Harpoon	115.8	184.2	102.1	55.6	75.5	41.2
	TOTAL	**774.9**	**778.3**	**1,000.8**	**938.6**	**607.3**	**373.9**
Bigeye Tuna	Troll	0.0	0.0	0.0	0.0	0.0	0.0
	Handline	12.3	5.7	33.7	14.4	6.3	3.1
	TOTAL	**12.3**	**5.7**	**33.7**	**14.4**	**6.3**	**3.1**
Albacore Tuna	Troll	0.0	0.0	0.0	0.0	0.0	0.0
	Handline	4.4	7.9	3.9	6.6	3.4	5.6
	TOTAL	**4.4**	**7.9**	**3.9**	**6.6**	**3.4**	**5.6**
Yellowfin Tuna	Troll	0.0	0.0	0.0	0.0	0.0	0.0
	Handline	220.0	284.0	300.0	244.0	216.0	234.0
	TOTAL	**220.0**	**284.0**	**300.0**	**244.0**	**216.0**	**234.0**
Skipjack Tuna	Troll	0.0	0.0	0.0	0.0	0.0	0.0
	Handline	6.4	9.7	10.5	12.7	9.4	10.4
	TOTAL	**6.4**	**9.7**	**10.5**	**12.7**	**9.4**	**10.4**
Swordfish	Handline	5.0	8.9	8.9	11.7	20.6	20.0
	Harpoon	0.0	0.6	7.4	2.8	0.0	0.5
	TOTAL	**5.0**	**9.5**	**16.3**	**14.5**	**20.6**	**20.5**

Table 3.39 Domestic Landings for the Commercial Handgear Fishery by Species and Region for 1999-2004 (mt ww). Source: U.S. National Report to ICCAT: 2005

Species	Region	1999	2000	2001	2002	2003	2004
Bluefin Tuna	NW Atl	774.4	778.3	1,000.8	938.3	607.3	373.9
Bigeye Tuna	NW Atl	11.9	4.1	33.2	13.8	6.0	3.0
	GOM	0.2	0.1	0.5	0.6	0.3	0.1
	Caribbean	0.2	1.5	0.0	0.0	0.0	0.0
Albacore Tuna	NW Atl	0.6	2.9	1.7	3.9	1.4	5.4
	GOM	≤ .05	0.0	0.0	0.0	≤ .05	0.0
	Caribbean	3.8	5.0	2.2	2.7	2.0	2.1
Yellowfin Tuna	NW Atl	192.0	235.7	242.5	137.0	148.0	208.0
	GOM	12.7	28.6	43.4	100.0	59.0	19.0
	Caribbean	14.5	19.4	14.3	7.0	9.0	7.0
Skipjack Tuna	NW Atl	0.2	0.2	0.2	0.2	0.2	0.6
	GOM	0.4	0.7	0.0	0.0	0.0	0.2
	Caribbean	5.8	8.8	10.3	12.5	9.2	9.6
Swordfish	NW Atl	5.0	8.3	16.0	11.6	10.8	18.9
	GOM	≤ .05	1.2	0.3	2.9	9.8	1.6

Handgear Trip Estimates

Table 3.40 displays the estimated number of rod and reel and handline trips targeting large pelagic species in 2001 through 2004. The trips include commercial and recreational trips, and are not specific to any particular species. It should be noted that these estimates are still preliminary and subject to change.

Table 3.40 Estimated number of vessel trips targeting large pelagic species, 2001-2004. Source: Large Pelagics Survey database

Year	AREA							Total
	NH/ME	MA	CT/RI	NY	NJ (north)	NJ (south) + MD/DE	VA	
Private Vessels								
2001	1,944	3,641	497	2,039	3,040	2,675	910	14,746
2002	5,090	15,180	2,558	7,692	2,762	22,757	6,524	62,563
2003	4,501	13,411	2,869	12,466	3,214	21,619	5,067	63,147
2004	2,025	10,033	3,491	11,525	3,632	22,433	4,406	57,545
Charter Vessels								
2001	133	567	203	280	660	655	307	2,805
2002	1,132	3,357	937	1,686	1,331	6,300	1,510	16,253
2003	221	2,561	1,246	2,035	1,331	5,201	546	13,141
2004	312	2,021	1,564	2,285	1,094	5,080	1,579	13,935

3.4.3.3 Safety Issues Associated with the Fishery

The U.S. Coast Guard (USCG) conducts routine vessel safety inspections at sea on a variety of vessels throughout the year. During the busy General category BFT season the USCG has been known to concentrate patrol activities on General category BFT boats. Boarding officers indicate that the majority of the commercial handgear vessels have the necessary safety equipment; however, many part-time fishermen operating smaller vessels do not meet the necessary safety standards. There have been several cases of vessels participating in the commercial handgear fishery that have capsized due to weight while attempting to boat commercial-sized BFT (measuring 73 inches or greater and weighing several hundred pounds).

Over the last few years, the USCG focused boardings on small vessels, especially those owned by "part-time" commercial handgear fishermen, and terminated several dozen trips due to the lack of safety equipment on board. If a vessel is boarded at sea and found to be lacking major survival equipment, the USCG will terminate the trip and escort the vessels back to port.

Currently, NMFS does not require proof of proper safety equipment as a condition to obtain a commercial handgear permit. Instead, NMFS informs permit applicants that commercial vessels are subject to the Fishing Vessel Safety Act of 1988 and advises them to contact their local USCG office for further information. The USCG District Boston office reports receiving 50 to 75 calls a week during the peak fishing season; officers speak with all callers to answer vessel questions. Since NMFS regulations do not require USCG inspection or safety equipment in order to obtain a commercial handgear permit, NMFS cannot be certain that all participants in the commercial handgear fisheries are adequately prepared for the conditions they may encounter. NMFS is concerned about the safety of all vessels participating in the commercial handgear fisheries and continues to work with the USCG to improve communication of vessel safety requirements to commercial handgear vessel operators.

It is unlawful for Atlantic tuna vessels to engage in fishing unless the vessel travels to and from the area where it will be fishing under its own power and the person operating that vessel brings any BFT under control (secured to the catching vessel or on board) with no assistance from another vessel, except when shown by the operator that the safety of the vessel or its crew was jeopardized or other circumstances existed that were beyond the control of the operator. NMFS Enforcement and USCG boarding officers have recently encountered vessels participating in the BFT fishery that are unable to transit to and from the fishing grounds due to their limited fuel capacity. Occasionally these smaller vessels will work in cooperation with a larger documented vessel to catch a BFT; others have been observed leaving lifesaving equipment at the dock to make room for extra fuel, bait, and staples. NMFS is concerned that use of such inadequately equipped vessels jeopardizes crew in that the vessel may not be able to safely return to shore without assistance of the larger vessel due to insufficient fuel or to adverse weather conditions.

Over the last couple of years, NMFS has received a number of vessel permit applications from kayak owner/operators. In addition to the requirement mentioned above, NMFS only issues permits to vessels that possess a USCG Documentation number, a state registration number, or a foreign registration number (recreational permit only). As kayaks typically do not require such documentation NMFS has denied all applications for a kayak to date.

NMFS also has concerns regarding individuals embarking on HMS trips by themselves. Recently there have been a few incidents of fishermen either severely injuring themselves or dying while pursing HMS by themselves. Certain hazardous situations could be mitigated by having an additional person onboard the vessel while conducting a trip targeting large pelagics. NMFS encourages vessel owner/operators to practice safe fishing techniques.

NMFS will consider all safety comments and information, including those from the USCG and NMFS Enforcement, when planning future General category effort control schedules and will discuss these issues in future meetings with the AP.

3.4.3.4 U.S. vs. International Issues and Catch

SCRS data do not lend themselves to organize international landings into a commercial handgear category. While some countries report rod and reel landings, these numbers may include both commercial and recreational landings. International catches of all Atlantic HMS for 2004 are summarized in Table 3.21.

3.4.4 Recreational Handgear

The following section describes the recreational portion of the handgear fishery, and is primarily focused upon rod and reel fishing. The HMS Handgear (rod and reel, handline, and harpoon) fishery includes both commercial and recreational fisheries and is described fully in Section 2.5.8 of the 1999 FMP. Handgear components may also be deployed as a specialized trolling gear to target surface-feeding tunas. Under this configuration, the line and leaders are elevated and actively trolled so that the baits fish on or above the water's surface. This style of fishing is often referred to as "green-stick fishing," and reports indicate that it can be extremely efficient compared to conventional fishing techniques. For more information on green-stick fishing gear and the configurations allowed under current regulations, please refer to the discussions of alternative H4 in Chapters 2 and 4 of this document. The recreational billfish fishery is described fully in Section 2.1.3 of the 1999 Billfish Amendment. The commercial sale, barter or trade of Atlantic billfish by U.S. commercial interests is prohibited, only recreational landings are authorized.

3.4.4.1 Overview of History and Current Management

Atlantic tunas, swordfish, and sharks are managed under the 1999 FMP and Amendment 1 to the 1999 FMP, while Atlantic billfish are managed separately under the Billfish FMP, as amended. Summaries of the domestic aspects of the Atlantic tuna fishery, the Atlantic swordfish fishery, and the Atlantic shark fishery are found in Sections 2.2.3, 2.3.3, and 2.4.3, respectively, of the 1999 FMP. A history of Atlantic billfish management is provided in Section 1.1.1 of the Billfish Amendment and Section 3.1.2 of this document.

Atlantic tunas, sharks, swordfish, and billfish are all targeted by domestic recreational fishermen using rod and reel gear. The recreational swordfish fishery had declined dramatically over the past twenty years, but recent information indicates that the recreational swordfish fishery is rebuilding in the Mid-Atlantic Bight, and off the east coast of Florida. Effective March 1, 2003, an HMS Angling category permit has been required to fish recreationally for any HMS-managed species (Atlantic tunas, sharks, swordfish, and billfish) (67 FR 77434, December 18, 2002). Prior to March 1, 2003, the regulations only required vessels fishing recreationally for Atlantic tunas to possess an Atlantic Tunas Angling category permit.

Recreational fishing for Atlantic HMS is managed primarily through the use of minimum size limits and bag limits. Recreational tuna fishing regulations are the most complex and include a combination of minimum sizes, bag limits, limited season-based quota allotment for bluefin tuna, and reporting requirements (depending upon the particular species and vessel type).

The recreational swordfish fishery has been managed through the use of a minimum size requirement and landings requirement (swordfish may be headed and gutted but may not be cut into smaller pieces). However, regulations effective March 2003 (68 FR 711) established a recreational retention limit of one swordfish per person up to three per vessel per day. Regardless of the length of a trip, no more than the daily limit of North Atlantic swordfish can be possessed onboard a vessel.

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

Atlantic blue and white marlin have a combined landings limit (*i.e.*, a maximum of 250 fish that can be landed per year); however, the primary management strategy for the recreational billfish fishery is through the use of minimum size limits. There are no recreational retention limits for Atlantic sailfish, blue marlin, and white marlin. Recreational anglers may not land longbill spearfish.

ICCAT has made several recommendations to recover billfish resources throughout the Atlantic Ocean that are discussed in detail in Section 3.1.2.

3.4.4.2 Most Recent Catch and Landings Data

The recreational landings database for HMS consists of information obtained through surveys including the Marine Recreational Fishery Statistics Survey (MRFSS), Large Pelagic Survey (LPS), Southeast Headboat Survey (HBS), Texas Headboat Survey, and Recreational Billfish Survey Tournament Data (RBS). Descriptions of these surveys, the geographic areas they include, and their limitations, are discussed in Section 2.6.2 of the 1999 FMP and Section 2.3.2 of the 1999 Billfish Amendment.

Reported domestic landings of Atlantic bluefin tuna (1983 through 1998) and BAYS tuna (1995 through 1997) were presented in Section 2.2.3 of the 1999 FMP. As landings figures for 1997 and 1998 were preliminary in the 1999 FMP, updated landings for recreational rod and reel fisheries are presented in Table 3.41 through 2004. Recreational landings of swordfish are monitored by the LPS and the MRFSS. However, because swordfish landings are considered rare events, it is difficult to extrapolate the total recreational landings from dockside intercepts.

An ad hoc committee of NMFS scientists reviewed the methodology and data used to estimate recreational landings of Atlantic HMS during 2004. The Committee was charged with reviewing the 2002 estimates of U.S. recreational landings of bluefin tuna, white marlin and blue marlin reported by NMFS to ICCAT. The committee was also charged with recommending methods to be used for the estimation of 2003 recreational fishery landings of bluefin tuna and marlin. Although the Committee discovered and corrected a few problems with the raw data from the LPS and the estimation program used to produce the estimates, the Committee concluded that the estimation methods for producing the 2002 estimates were consistent with methods used in previous years. The report of the Committee is available at: http://www.nmfs.noaa.gov/sfa/hms/Tuna/2002-2003_Bluefin-Marlin_Report-120304.pdf.

Table 3.41 Updated Domestic Landings for the Atlantic Tunas, Swordfish and Billfish Recreational Rod and Reel Fishery, 1997-2004 (mt ww)*. Sources: NMFS, 2004; NMFS, 2005. (Recreational shark landings are provided in Table 3.44 through Table 3.47).

Species	Region	1997	1998	1999	2000	2001	2002	2003	2004
Bluefin tuna**	NW Atlantic	299	184	103.0	49.5	242.9	519.4	314.6	387.8
	GOM	0	0	0.4	0.9	1.7	1.5	0	0
	Total	**299**	**184**	**103.4**	**50.4**	**244.6**	**520.9**	**314.6**	**387.8**
Bigeye tuna	NW Atlantic	333.5	228.0	316.1	34.4	366.2	49.6	188.5	94.6
	GOM	0	0	1.8	0	0	0	0	6
	Caribbean					0	0	4.0	0
	Total	**333.5**	**228.0**	**317.9**	**34.4**	**366.2**	**49.6**	**192.5**	**100.6**
Albacore	NW Atlantic	269.5	601.1	90.1	250.75	122.3	323.0	333.8	500.5
	GOM	65.2	0	0	0	0	0	0	0
	Total	**334.7**	**601.1**	**90.1**	**250.75**	**122.3**	**323.0**	**333.8**	**500.5**
Yellowfin tuna	NW Atlantic	3,560.9	2,845.7	3,818.2	3,809.5	3,690.5	2,624	4,672	3,434
	GOM	7.7	80.9	149.4	52.3	494.2	200	640	247
	Caribbean			0	0	0.1	7.2	16	0
	Total	**3,569**	**2,927**	**3,967.6**	**3,861.8**	**4184.7**	**2,831.2**	**5,328**	**3,681**
Skipjack tuna	NW Atlantic	42.0	49.5	63.6	13.1	32.9	23.3	34.0	27.3
	GOM	21.7	37.0	34.8	16.7	16.1	13.2	11.0	6.3
	Caribbean			0	0	0	13.2	15.7	40.4
	Total	**63.7**	**86.5**	**98.4**	**29.8**	**49.0**	**49.7**	**60.7**	**74.0**
Blue marlin***	NW Atlantic	25.0	34.1	24.8	13.8	9.0			
	GOM	11.5	4.5	7.5	4.7	5.1			
	Caribbean	8.6	10.6	4.6	5.7	2.3			
	Total	**45.1**	**49.2**	**36.9**	**24.2**	**16.4**	**5.6**	**19**	**24**

Species	Region	1997	1998	1999	2000	2001	2002	2003	2004
White marlin ***	NW Atlantic	0.9	2.4	1.5	0.23	2.8			
	GOM	0.9	0.2	0.1	0	0.3			
	Caribbean	0.0	0.02	0	0	0			
	Total	**1.8**	**2.6**	**1.6**	**0.23**	**3.1**	**5.6**	**0.6**	**0.8**
Sailfish***	NW Atlantic	0	0.1	0.07	1.75	61.2			
	GOM	0.4	1.0	0.6	0.24	0.6			
	Caribbean	0.2	0.05	0	0.06	0			
	Total	**0.6**	**1.5**	**0.67**	**2.05**	**61.8**	**103**	**53**	**33**
Swordfish	**Total**	**10.9**	**4.7**	**21.3**	**15.6**	**1.5**	**21.5**	**5.9**	**24.3**

* Rod and reel catches and landings for Atlantic tunas represent estimates of landings and dead discards based on statistical surveys of the U.S. recreational harvesting sector.
** Rod and reel catch and landings estimates of bluefin tuna less than 73" curved fork length (CFL) based on statistical surveys of the U.S. recreational harvesting sector. Rod and reel catch of bluefin > 73" CFL are commercial and may also include a few metric tons of "trophy" bluefin (recreational bluefin 73").
*** Blue and white marlin (1997-2003), and sailfish (1997-2002) landings are based on prior U.S. National Reports to ICCAT and consist primarily of reported tournament landings. Reporting method was changed to a total count (blue and white marlin) in 2004.

Atlantic Billfish Recreational Fishery

Due to the rare nature of billfish encounters and the difficulty of monitoring landings outside of tournament events, reports of recreational billfish landings are sparse. However, the RBS provides a preliminary source for analyzing recreational billfish landings. Table 3.42 documents the number of billfish landed in 1999 – 2004, as reported by the RBS.

Table 3.42 Preliminary RBS Recreational Billfish Landings in numbers of fish (calendar year). Source: NMFS Recreational Billfish Survey (RBS).

Species	1999	2000	2001	2002	2003	2004
Blue Marlin	172	117	75	84	96	110
White Marlin	36	8	22	33	20	25
Sailfish	30	18	11	14	24	9
Swordfish	-	-	0	16	48	168

In support of the sailfish assessment conducted at the 2001 SCRS billfish species group meeting, document SCRS/01/106 developed indices of abundance of sailfish from the U.S. recreational billfish tournament fishery for the period 1973 – 2000. The index of weight per 100 hours fishing was estimated from numbers of sailfish caught and reported in the logbooks submitted by tournament coordinators and NMFS observers under the RBS, as well as available size information. Document SCRS/01/138 estimated U.S. sailfish catch estimates from various recreational fishery surveys.

All recreational, non-tournament landings of billfish, including swordfish, must be reported within 24 hours of landing to NMFS by the permitted owner of the vessel landing the fish. This requirement is applicable to all permit holders, both private and charter/headboat vessels, not fishing in a tournament. In Maryland and North Carolina, vessel owners should report their billfish landings at state-operated landings stations. A landed fish means a fish that is kept and brought to shore. Due to large-scale non-compliance with the call-in requirement, the landings in Table 3.43 are considered a minimum estimate of the non-tournament landings of billfish.

Table 3.43 Number of billfish reported to NMFS via call-in system by fishing year, 2002-2005. Source: G. Fairclough, pers. comm.

Species	2002*	2003	2004	2005**
Blue Marlin	0	7	2	5
White Marlin	0	1	0	2
Sailfish	3	16	57	58
Swordfish	28	188	314	381

Based on a fishing year of June 1 – May 31.
* Reporting requirement did not go into effect until March 1, 2003
** 2005 landings as of May 16, 2006

Swordfish Recreational Fishery

The recreational swordfish fishery in the North Atlantic Ocean has been steadily expanding in recent years, probably due to increased availability of small swordfish and an increased interest in the sport. Fishermen typically fish off the east coast of Florida and off the coasts of New Jersey and New York. Fish have also occasionally been encountered on trips off Maryland and Virginia. In the past, the New York swordfish fishery occurred incidental to overnight yellowfin tuna trips. During the day, fishermen targeted tunas, while at night they fished deeper for swordfish. This appears to have evolved into a year-round directed fishery off Florida and a summer fishery off of New Jersey. The Florida fishery occurs at night with fishermen targeting swordfish using live or dead bait and additional attractants such as lightsticks, LED lights, and light bars suspended under the boat.

Historically, fishery survey strategies have not captured all landings of recreational handgear-caught swordfish. Although some handgear swordfish fishermen have commercial permits[1], many others land swordfish strictly for personal consumption. Therefore, NMFS published regulations to improve recreational swordfish monitoring and conservation. A trip limit of one swordfish per person, up to three per vessel, and mandatory reporting of all recreationally-landed swordfish and billfish via a toll-free call-in system became effective on March 2, 2003 (68 FR 711). Accordingly, all reported recreational swordfish landings are counted against the incidental swordfish quota.

Recreational fishing tournaments allow for the collection of a large volume of fishery-dependent data in a relatively short time period. Tournaments also provide a “snapshot” of the recreational fishery at a particular time and location. Analysis of tournament data collected over a period of years could provide valuable information regarding trends in the recreational swordfish fishery. A recent study documented recreational handgear-caught swordfish in three south Florida tournaments (J. Levesque, pers. comm.). The tournaments occurred from July though September 2002, two in Lighthouse Point and the other in Ft. Lauderdale. Data was obtained through direct at-sea observation, dockside interviews with anglers landing swordfish, and a telephone interview with a tournament organizer. A total of 156 vessels and between 468 – 624 individuals participated in the three tournaments.

[3] Access to the commercial swordfish fishery is limited; hand gear fishermen however may purchase permits from other permitted fishermen because the permits are transferable.

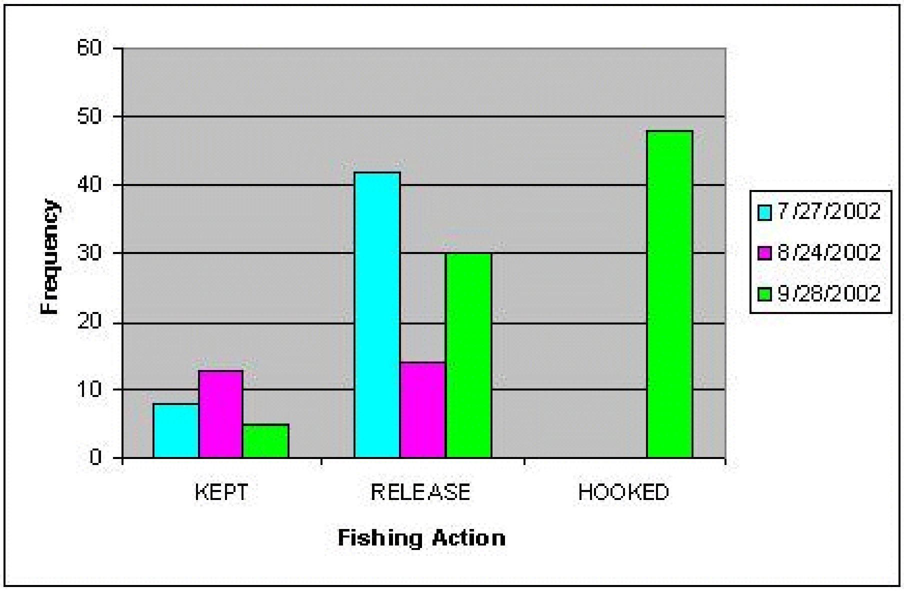


Figure 3.30 Total Number of Swordfish Caught, Kept and Released in Three Sampled Recreational Swordfish Tournaments off Southeast Florida during 2002. Source: J. Levesque, pers. comm.

Figure 3.30 indicates that 112 swordfish were caught during the three monitored tournaments. Of these, 26 swordfish were retained and 86 swordfish were released alive. Additional data from the September 28, 2002, tournament indicated that, in that tournament, 48 swordfish were hooked, 30 were released, and four were kept. The definition of hooked, for these purposes, was a swordfish that was on the line for any given amount of time. All hooked fish were assumed to be swordfish. The three fishing tournaments implemented a 55-inch, or 140 cm LJFL minimum size requirement for landed swordfish, although current federal regulations are 119 cm (46.9 in) LJFL.

Sizes for landed swordfish ranged from 130 – 230 cm (51.2 – 90.6 in) fork length. The mean size for landed swordfish was 160 cm (63 in) fork length. Weights for landed swordfish ranged from 36 – 144 kg (79.3 – 317.2 lb). The mean weight for the landed swordfish was 62.6 kg (137.9 lb). Estimated weights for the released swordfish ranged from 13 – 32 kg (28.6 – 70.5 lb). The mean estimated weight for released swordfish was 19.5 kg (43 lb).

The overall number of swordfish hooked per-unit-effort was .0615-swordfish/hr. or 6.15 swordfish per 100-hrs. drifting. The catch per-unit-effort was .0143-swordfish landed/hr. or 1.43 fish per 100-hrs. drifting.

Tournament caught swordfish reported to the RBS have increased in recent years. There were none reported in 2001, 16 in 2002, 48 in 2003, and 168 in 2004. While total tournament landings of swordfish are still low in terms of numbers of fish, it appears that as swordfish have recovered in the past few years, tournament landings of swordfish have increased.

Shark Recreational Fishery

Recreational landings of sharks are an important component of HMS fisheries. Recreational shark fishing with rod and reel is a popular sport at all social and economic levels, largely because the resource is accessible. Sharks can be caught virtually anywhere in salt water, depending upon the species. Recreational shark fisheries are oftentimes exploited in nearshore waters by private vessels and charter/headboats. However, there is also some shore-based fishing and some offshore fishing. The following tables provide a summary of landings for each of the three species groups. Amendment 1 to the 1999 Atlantic Tunas, Swordfish, and Shark FMP limited the recreational fishery to rod and reel and handline gear only.

Table 3.44 Estimates of Total Recreational Harvest of Atlantic Sharks: 1998-2004 (numbers of fish in thousands). Source: 1998-2000 (Cortés, pers. comm.); 2001-2004 (Cortés, 2005a; 2005b). Estimates for 2001-2004 do not include prohibited species.

Species Group	1998	1999	2000	2001	2002	2003	2004
LCS	169.6	92.3	131.5	127.9	76.3	86.1	66.3
Pelagic	11.8	11.1	13.3	3.8	4.7	4.3	5.1
SCS	175.1	125.7	197.8	211.6	154.6	134.7	128.5
Unclassified	8.0	6.9	11.0	22.2	5.3	18.1	27.3

Table 3.45 Recreational Harvest of Atlantic Large Coastal Sharks (LCS) by Species, in number of fish: 1998-2004. Sources: 1998-2000 (Cortés, pers. comm.); 2001-2004 (Cortés, 2005a; 2005b). Total estimates for 2001-2004 do not include prohibited species.

LCS Species	1998	1999	2000	2001	2002	2003	2004
Basking**	0	0	0	0	0	0	0
Bignose*	0	0	0	0	0	0	71
Bigeye sand tiger**	0	0	0	0	0	0	0
Blacktip	83,045	35,585	69,668	48,757	38,237	40,442	31,197
Bull	1,663	3,150	6,116	4,151	1,893	3,344	4,885
Caribbean Reef*	74	3	122	0	741	0	692
Dusky*	4,499	5,570	2,501	5,583	1,047	2,731	0
Galapagos*	0	0	0	0	0	0	0
Hammerhead, Great	476	388	925	3,382	4	68	9
Hammerhead, Scalloped	2,052	1,367	3,433	1,087	1,061	2,816	714
Hammerhead, Smooth	375	1	2	703	2	1	0
Hammerhead, Unclassified	390	75	3,675	0	5,293	0	0
Lemon	2,161	173	2,785	5,488	3,454	4,879	5,710
Night*	133	50	24	0	0	0	0
Nurse	2,455	1,503	2,233	3,672	2,680	647	3,594
Sandbar	35,766	20,602	10,878	36,094	8,324	5,185	3,843
Sand tiger**	0	0	0	604	0	0	0

LCS Species	1998	1999	2000	2001	2002	2003	2004
Silky	5,376	3,863	5,120	3,808	1,780	1,998	502
Spinner	10,805	6,361	5,402	3,651	3,835	4,460	3,380
Tiger	1,380	153	1,480	758	170	110	1
Whale**	0	0	0	0	0	0	0
White**	0	0	0	0	0	0	0
Large Coastal Unclassified	18,979	13,444	17,102	16,211	9,535	22,086	12,466
Total:	169,62	92,288	131,466	134,045	76,294	86,036	66,301

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

Table 3.46 Recreational Harvest of Atlantic Pelagic Sharks by Species, in number of fish: 1998-2004. Sources: 1998-2000 (Cortés, pers. comm.); 2001-2004 (Cortés, 2005a; 2005b). Total estimates for 2001-2004 do not include prohibited species**.**

Pelagic Shark Species	1998	1999	2000	2001	2002	2003	2004
Bigeye thresher*	0	0	0	0	65	0	0
Bigeye sixgill*	0	0	0	0	0	0	0
Blue Shark	6,085	5,218	7,010	950	0	376	0
Mako, Longfin*	0	0	0	0	0	0	0
Mako, Shortfin	5,633	1,383	5,813	2,871	3,206	3,957	5,144
Mako, Unclassified	8	9	0	0	0	0	0
Oceanic whitetip	0	0	0	0	0	0	0
Porbeagle	0	0	0	0	0	0	0
Sevengill*	0	0	0	0	0	0	0
Sixgill*	0	0	0	0	0	0	0
Thresher	36	4,512	528	0	1,467	0	0
Total:	11,762	11,122	13,351	3,821	4,673	4,333	5,144

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

Table 3.47 Recreational Harvest of Atlantic SCS by Species, in number of fish: 1998-2004. Source: 1998-2000 (Cortés, pers. comm.); 2001-2004 (Cortés, 2005a; 2005b). Total estimates for 2001-2004 do not include prohibited species.

SCS Species	1998	1999	2000	2001	2002	2003	2004
Atlantic Angel*	110	0	0	0	0	0	0
Blacknose	10,523	6,049	9,795	15,179	11,416	6,705	15,126
Bonnethead	29,147	38,835	56,142	58,511	50,903	39,863	42,354
Finetooth	139	78	1,438	6,701	2,942	1,774	581
Sharpnose, Atlantic	135,137	80,694	130,371	131,165	89,365	86,340	70,469
Sharpnose, Caribbean*	0	0	0	0	0	0	0
Smalltail*	0	4	26	26	0	0	11
Total:	175,056	125,660	197,772	211,582	154,626	134,682	128,530

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

3.4.4.3 Bycatch Issues and Data Associated with the Fishery

Bycatch in the recreational rod and reel fishery is difficult to quantify because many fishermen value the experience of fishing and may not be targeting a particular pelagic species. Recreational "marlin" or "tuna" trips may yield dolphin, tunas, wahoo, and other species, both undersized and legal sized. Bluefin tuna trips may yield undersized bluefin, or a seasonal closure may prevent landing of a bluefin tuna above a minimum or maximum size. In some cases, therefore, rod and reel catch may be discarded. The Magnuson-Stevens Act (16 USC 1802 (2)) stipulates that bycatch does not include fish under recreational catch-and-release.

The 1999 Billfish Amendment established a catch-and-release fishery management program for the recreational Atlantic billfish fishery. As a result of this program, all Atlantic billfish that are released alive, regardless of size, are not considered bycatch. NMFS believes that establishing a catch-and-release fishery in this situation will further solidify the existing catch-and-release ethic of recreational billfish fishermen, and thereby increase release rates of billfish caught in this fishery. Current billfish release rates range from 89 to 99 percent. The recreational white shark fishery is by regulation a catch-and-release fishery only and white sharks are not considered bycatch.

Bycatch can result in death or injury to discarded fish. Therefore, bycatch mortality should be incorporated into fish stock assessments, and into the evaluation of management measures. Rod and reel discard estimates from Virginia to Maine during June – October could be monitored through the expansion of survey data derived from the LPS (dockside and telephone surveys). However, the actual numbers of fish discarded for many species are so low that presenting the data by area could be misleading, particularly if the estimates are expanded for unreported effort in the future. The number of kept and released fish reported or observed through the LPS dockside intercepts for 1997 – 2004 is presented in Table 3.48.

Outreach programs to address bycatch were included in the 1999 FMP and the Billfish Amendment. These programs have not yet been implemented, but the preparation of program designs is currently in progress. One of the key elements in the outreach program will be to provide information that leads to an improvement in post-release survival from both commercial and recreational gear. Additionally, an outreach program to encourage the use of circle hooks to increase post-release survival within HMS fisheries was introduced in a proposed rule published in 2001 (66 FR 66386, December 26, 2001). The final rule to promote the voluntary use of circle hooks published in 2003 (68 FR 711, January 7, 2003). Initial implementation of the outreach program began in 2004 with workshops conducted on the proper handling and release of sea turtles.

A study by Graves *et al.* (2002), investigated short-term (five days) post-release mortality of Atlantic blue marlin using pop-up satellite tag technology. A total of nine recreationally caught blue marlin were tagged and released during July and August of 1999. All hooks employed in the study were "J" hooks. The attached tags were programmed to detach from the fish after five days and to record direct temperature and inclination of the buoyant tag to determine if the fish were actively swimming after being released. After detachment, the tags floated to the surface and began transmitting recorded position, temperature and inclination data to satellites of the Argos™ system. Three different lines of evidence provided by the tags (movement, water temperature, and tag inclination) suggested that at least eight of the nine blue marlin survived for five days after being tagged and released. One of the tags did not transmit any data, which precluded the derivation of a conclusion regarding the tagged marlin's survival.

This study was continued in 2003 for white marlin to evaluate post release survival and habitat use (NMFS, 2004). Pop-up satellite archival tags (PSATs) were used to estimate survival of white marlin released from four locations in the western North Atlantic recreational fishery. Forty-one tags were attached to white marlin caught using dead baits rigged on straight-shank ("J") hooks (n=21) or circle hooks (n=20) offshore of the U.S. Mid-Atlantic, the Dominican Republic, Mexico, and Venezuela. Survival was significantly higher ($p<0.01$) for white marlin caught on circle hooks (100 percent) relative to those caught on straight-shank ("J") hooks (65 percent). These results, along with previous studies on circle hook performance, suggest that a simple change in hook type can significantly increase the survival of white marlin released from recreational fishing gear. Data from these short term deployments also suggest that white marlin strongly associated with warm, near surface waters. However, based on the frequency, persistence, and patterns of vertical movements, white marlin appear to direct a considerable proportion of foraging effort well below surface waters, a behavior that may account for relatively high catch rates of white marlin on some pelagic longline sets.

Table 3.48 Observed or reported number of HMS kept [1] and released in the rod and reel fishery, Maine through Virginia, 1997-2004. Source: Large Pelagic Survey (LPS) Preliminary Data.

	Number of Fish Kept [1]								Number of Fish Released Alive							
Species	**1997**	**1998**	**1999**	**2000**	**2001**	**2002**	**2003**	**2004**	**1997**	**1998**	**1999**	**2000**	**2001**	**2002**	**2003**	**2004**
White Marlin [2]	7	11	6	2	5	8	12	6	203	465	156	59	118	215	160	378
Blue Marlin[2]	3	3	3	0	1	0	4	5	30	27	28	17	14	30	39	80
Sailfish[2]	0	1	0	6	0	0	0	0	2	2	3	0	2	6	6	2
Swordfish	5	1	3	14	1	5	9	9	6	5	1	5	10	6	21	22
Giant Bluefin Tuna [3]	51	69	56	34	20	176	58	50	6	11	6	0	0	8	0	3
Large Medium Bluefin Tuna[3]	6	26	13	3	7	11	11	13	3	8	5	3	6	2	0	36
Small Medium Bluefin Tuna	28	19	8	30	87	62	83	30	34	26	44	37	5	8	13	21
Large School Bluefin Tuna	60	134	106	95	457	391	287	291	158	67	42	22	128	47	40	107
School Bluefin	1,000	392	212	151	338	556	509	927	840	412	136	159	58	200	174	1,297
Young School Bluefin	5	13	1	4	0	7	4	16	139	581	94	23	40	182	10	1,885
Bigeye Tuna	26	17	27	16	9	32	21	46	6	9	0	0	8	1	3	2
Yellowfin Tuna	2,472	2,646	2,501	2,366	2,423	2,595	3,216	3,858	222	645	682	97	74	328	200	1,093
Skipjack Tuna	296	261	146	32	100	117	681	197	468	267	88	69	130	250	526	362
Albacore	146	558	133	513	302	534	546	1,458	43	92	52	17	52	95	31	66
Thresher Shark	7	7	3	2	5	20	24	58	2	2	2	1	0	5	8	27
Mako Shark	74	78	49	49	27	72	141	216	94	92	49	114	65	120	208	350
Sandbar Shark	5	2	2	1	2	0	9	7	30	56	6	4	10	17	26	68
Dusky Shark	6	6	1	0	0	1	0	0	50	54	7	32	8	9	0	60
Tiger Shark	0	2	0	0	1	1	0	0	5	5	0	3	2	3	12	0
Porbeagle	0	1	0	0	0	1	0	1	5	6	0	0	0	14	3	1
Blacktip Shark	2	1	0	0	1	0	1	0	0	2	5	0	0	6	0	1
Atlantic	0	1	0	0	0	0	0	0	0	3	0	0	0	0	0	0

	Number of Fish Kept [1]								Number of Fish Released Alive							
Species	**1997**	**1998**	**1999**	**2000**	**2001**	**2002**	**2003**	**2004**	**1997**	**1998**	**1999**	**2000**	**2001**	**2002**	**2003**	**2004**
Sharpnose Shark																
Blue Shark	27	26	11	12	2	36	65	74	1,897	780	572	374	141	505	2,061	2,242
Hammerhead Shark	2	1	1	1	2	0	0	1	4	4	5	0	1	6	38	2
Wahoo	10	71	45	41	34	49	68	110	1	2	0	0	13	6	3	5
Dolphin	1,022	7,263	2,139	955	1,294	2,509	4,209	3,050	61	194	73	48	108	111	677	192
King Mackerel	171	198	141	289	19	36	66	11	1	10	8	24	10	5	5	1
Atlantic Bonito	384	328	254	194	77	704	315	410	203	300	166	27	49	176	282	389
Little Tunny	428	1,231	97	139	48	240	121	231	1,015	1,507	133	118	118	585	443	1,130
Amberjack	3	6	9	6	19	7	44	0	18	40	24	20	14	57	111	1
Spanish Mackerel	0	2	1	13	3	5	35	9	1	1	0	0	0	0	1	0

[1] NMFS typically expands these "raw" data to report discards of bluefin tuna by the rod and reel fishery to ICCAT. If sample sizes are large enough to make reasonable estimates for other species, NMFS may produce estimates for other species in future SAFE reports.
[2] Amendment One to the Atlantic Billfish FMP established billfish released in the recreational fishery as a "catch-and-release" program, thereby exempting these fish from bycatch considerations.
[3] Includes some commercial handgear landings.

3.4.4.4 Safety Issues Associated with the Fishery

The USCG does not maintain statistics on boating accidents, rescue, or casualty data specifically pertaining to recreational fishing as it does for the commercial industry. As a result, the 1999 FMP and the Billfish Amendment contain only minimal safety information regarding recreational HMS fisheries. Safety issues associated with handline fisheries for tunas are discussed in Section 3.4.4.4. The USCG compiles statistics on the total number of recreational boating accidents and casualties, independent of the activity or fishery in which they are engaged (Table 3.49). Two common situations often place recreational boaters in potential danger. Individuals in small vessels often venture out farther than their vessels are designed to travel without proper navigational equipment, and may encounter rougher water than their boats are designed to withstand. Since fishermen targeting HMS species, particularly marlin, often travel 75 to 100 miles offshore, having a properly equipped vessel of adequate size is very important for the safety of recreational HMS constituents. Additionally, as the recreational swordfish fishery off the southeastern coast of Florida occurs at night and usually in small boats ranging from 23 to 40 feet in length, it presents other unique risks. Shipping traffic regularly runs through the recreational swordfish fleet, which could lead to incidents if someone is not on watch at all times. Another frequent safety concern of the Coast Guard is when someone is up in the flying bridge. Both of these situations can lead to people falling overboard. In 2004, approximately 72 percent of all boating casualties were due to drowning and in 89 percent of the drowning deaths, the victim was not wearing a personal floatation device (PFD) (Table 3.50).

Table 3.49 Total 2004 Reported Boating Accident Types. Source: USCG Boating Statistics, 2004.

Accident Type	# Accidents	# of Injuries	# of Fatalities	Total Property Damage
Capsizing	393	229	184	$2,267,043
Carbon Monoxide	12	28	3	$0
Collision with Fixed Object	525	382	46	$4,271,785
Collision with Floating Object	95	62	6	$499,692
Vessel Collision	1,479	999	68	$8,037,552
Departed Vessel	19	10	9	$0
Ejected from Vessel	45	32	16	$244,500
Falls within Boat	176	189	3	$106,496
Falls on PWC	50	49	2	$27,433
Fall Overboard	488	339	199	$288,205
Fire/Explosion (fuel)	162	89	4	$8,297,780
Fire/Explosion (other than fuel)	56	14	1	$2,462,181
Flooding or Swamping	257	81	52	$1,853,848
Grounding	215	159	5	$2,488,744

Accident Type	# Accidents	# of Injuries	# of Fatalities	Total Property Damage
Other Casualty	69	56	3	$93,200
Sinking	131	30	10	$2,507,989
Skier Mishap	380	388	7	$25,050
Struck by Boat	108	96	6	$158,719
Struck by Motor	64	61	5	$500
Struck Submerged Object	102	32	8	$974,112
Total	**4,904**	**3,363**	**676**	**$35,038,306**

Table 3.50 Overall 2004 Reported Boating Accident Cause-of-Death Statistics. Source: USCG Boating Statistics, 2004.

Cause of Death	# Fatalities	PFD Worn	
		Yes	No
Carbon Monoxide Poisoning	2	0	2
Drowning	484	53	431
Hypothermia	10	3	7
Other	32	11	21
Trauma	114	50	64
Unknown	34	6	28
Total	**676**	**123**	**553**

3.4.4.5 U.S. vs. International Catch

Important directed recreational fisheries for HMS occur in the United States, Venezuela, the Bahamas, and Brazil. Many other countries and entities in the Caribbean and the west coast of Africa are also responsible for significant HMS recreational landings. Directed recreational fisheries for sailfish occur in the Western Atlantic and include the United States, Venezuela, the Bahamas, Brazil, Dominican Republic, Mexico, and other Caribbean nations. However, of these countries, the United States is the only country that currently reports recreational landings to ICCAT. Therefore, a comparison of the percentage of U.S. landings relative to recreational fisheries in other countries is not possible. Further, total landings data are incomplete because many countries that reported landings in 1996 failed to report their 1998 and 1999 landings, which hampered the 2000 Atlantic marlin stock assessments, as well.

As part of a 1997 SCRS survey, 12 ICCAT member countries as well as Chinese Taipei and Senegal provided information on the existence of, and level of data collection for, recreational and artisinal fisheries. The survey results indicated that Brazil, Canada, France, Italy, Morocco, UK, Bermuda, and the United States have recreational fisheries in the ICCAT area of concern. Levels of data collection varied widely from country to country, making any comparison of catch levels difficult and potentially inaccurate. The wide range of recreational catches across nations and species warrants further exploration of potential data sources and the feasibility of increased recreational monitoring.

At the 1999 ICCAT meeting in Rio de Janeiro, Brazil, the Commission adopted a resolution to improve the quantity and quality of recreational data collection. Recreational fisheries were to be discussed and assessed in each country's National Report beginning in the year 2000. In addition, the SCRS was called upon to examine the impact of recreational fishing on tuna and tuna-like species. At this time additional information is not available regarding international HMS recreational catches.

At the 2004 ICCAT meeting in New Orleans, U.S., the Commission adopted a recommendation concerning prohibited gear in the sport and recreational fisheries in the Mediterranean Sea (04-12). Prohibited gear includes towed and encircling nets, seine sliding, dredgers, gill nets, trammel net and longline to fish for tuna and tuna-like species. The recommendation also prohibits the sale of sport and recreational tuna and tuna-like species and stipulates that data on these fisheries be collected and transmitted to the SCRS.

3.4.5 Bottom Longline

3.4.5.1 Domestic History and Current Management

In 1993, NMFS implemented the FMP for Sharks of the Atlantic Ocean, which established three management units: large coastal sharks (LCS), small coastal sharks (SCS), and pelagic sharks. At that time, NMFS identified LCS as overfished, and implemented commercial quotas for LCS and established recreational harvest limits for all sharks. In 2003, NMFS amended the measures enacted in the 1999 FMP based on the 2002 LCS and SCS stock assessments, litigation, and public comments. Implementing regulations for Amendment 1 to the 1999 FMP were published on December 24, 2003 (68 FR 74746). Management measures enacted in the amendment included: re-aggregating the large coastal shark complex, using maximum sustainable yield (MSY) as a basis for setting commercial quotas, eliminating the commercial minimum size restrictions, establishing three regional commercial quotas (Gulf of Mexico, South Atlantic, and North Atlantic) for LCS and SCS management units, implementing trimester commercial fishing seasons effective January 1, 2005, imposing gear restrictions to reduce bycatch, and a time/area closure off the coast of North Carolina effective January 1, 2005. As a result of using MSY to establish quotas, and implementing a new rebuilding plan, the overall annual landings quota for LCS in 2004 was established at 1,017 metric tons (mt) dressed weight (dw). The overall annual landings quota for SCS was established at 454 mt dw and the pelagic, blue, and porbeagle shark quotas were established at 488 mt dw, 273 mt dw, and 92 mt dw, respectively.

The regional quotas which were established in Amendment 1 to the 1999 HMS FMP for LCS and SCS were intended to improve overall management of the stocks by tailoring quotas to specific regions based on landings information. These quotas were based upon average historical landings (1999 – 2001) from the canvass and quota monitoring databases. The canvass database provides a near-census of the landings at major dealers in the southeast United States (including state landings) and the quota monitoring database collects information from dealers in the South Atlantic and Gulf of Mexico.

On November 30, 2004, NMFS issued a final rule (69 FR 69537), which established, among other things, new regional quotas based on updated landings information from 1999 –

2003. This final rule did not change the overall quotas for LCS, SCS, and pelagic sharks established in Amendment 1 to the 1999 HMS FMP, but did revise the percentages allocated to each of the regions. The updated information was based on several different databases, including the canvass and quota monitoring databases, the Northeast Commercial Fisheries Database (CFDBS), and the snapper grouper logbook. The new regional quotas and trimester seasons for the commercial Atlantic shark fishery became effective January 1, 2005.

Commercial shark fishing effort is generally concentrated in the southeastern United States and Gulf of Mexico (Cortes and Neer, 2002). During 1997 – 2003, 92 – 98 percent of LCS, 38 – 49 percent of pelagic sharks, and nearly all SCS (80 – 100 percent) came from the southeast region (Cortes, pers. comm.). McHugh and Murray (1997) found in a survey of shark fishery participants that the largest concentration of bottom longline fishing vessels is found along the central Gulf coast of Florida, with the John's Pass - Madeira Beach area considered the center of directed shark fishing activities. Consistent with other HMS fisheries, some shark fishery participants move from their homeports to other fishing areas as the seasons change and fish stocks move.

The Atlantic bottom longline fishery targets both LCS and SCS. Bottom longline is the primary commercial gear employed in the LCS and SCS fisheries in all regions. Gear characteristics vary by region, but in general, an approximately ten-mile long bottom longline, containing about 600 hooks, is fished overnight. Skates, sharks, or various finfishes are used as bait. The gear typically consists of a heavy monofilament mainline with lighter weight monofilament gangions. Some fishermen may occasionally use a flexible 1/16 inch wire rope as gangion material or as a short leader above the hook.

3.4.5.2 Recent Catch and Landings Data

The following section provides information on shark landings as reported in the shark bottom longline observer program. For recent catch and landings data for the shark fishery as a whole, which includes landings from BLL and other gears combined, please refer to Section 3.4.7. In January 2002, the observer coverage requirements in the shark bottom longline fishery changed from voluntary to mandatory participation if selected. NMFS selects approximately 40 - 50 vessels for observer coverage during each season. Vessels are randomly selected if they have a directed shark limited access permit, have reported landings from sharks during the previous year, and have not been selected for observer coverage during each of the three previous seasons.

The U.S. Atlantic commercial shark bottom longline fishery has been monitored by the University of Florida and Florida Museum of Natural History, Commercial Shark Fishery Observer Program (CSFOP) since 1994. In June 2005, responsibility for the observer program was transferred to the Southeast Fisheries Science Center's Panama City Laboratory. The observer program trains and places the observers aboard vessels in the directed shark bottom longline fishery in the Atlantic and Gulf of Mexico to collect data on the commercial shark fishery and thus improve overall management strategies for the fishery. Observers provide baseline characterization information, by region, on catch rates, species composition, catch disposition, relative abundance, and size composition within species for the large coastal and small coastal shark bottom longline fisheries.

During 2003, six observers logged 263 sea days on shark fishing trips aboard 20 vessels in the Atlantic from North Carolina to Florida and in the eastern Gulf of Mexico off Florida. The number of trips taken on each vessel ranged from one to five and the number of sea days each observer logged ranged from nine to 35. Observers documented the catches and fishing effort on approximately 150 longline sets that fished 103,351 hooks. During 2004, five observers logged 196 sea days on 56 shark fishing trips aboard 11 vessels. Observers documented the catches and fishing effort during 120 longline sets that fished 90,980 hooks.

Data from the shark observer program between 2000 and 2002 show that LCS comprised 66.2 percent of the total catch (Burgess and Morgan, 2002). During 2003, LCS comprised 68.4 percent of the total catch, and in 2004 LCS comprised 66.7 percent of the total catch. Sandbar sharks dominated the observed catches with 30.6 percent of total LCS catch in 2003 and 26.6 percent in 2004 (Table 3.52). The overall catch and disposition of species for 2004 is listed in Table 3.53. Regional differences in sandbar shark abundance were evident. For example, in the Carolina region, sandbar sharks comprised 67.4 percent of the total catch and 77.2 percent of the large coastal shark catch. In the Florida Gulf region, sandbar sharks comprised 62.0 percent of the total catch and 66.5 percent of the large coastal catch, whereas in the Florida East Coast region, sandbar sharks comprised only 17.2 percent of the total observed catch, and 37.1 percent of the large coastal shark catch (Burgess and Morgan, 2003). Blacktip sharks comprised 13.9 percent of total observed catch and 20.3 percent of the large coastal catch (Burgess and Morgan, 2002). Tiger sharks comprised 7.5 percent of the total observed catch and 11.0 percent of the large coastal shark catch. A majority of tiger sharks (71.7 percent) and nurse sharks (98.8 percent) were tagged and released.

During 2003, shark observer program data indicate that SCS comprised 28.0 percent of the total observed catch (Burgess and Morgan, 2003; Burgess and Morgan 2004). Atlantic sharpnose shark dominated the SCS catch (80.3 percent). The remainder of the small coastal catch consisted of blacknose sharks (5.5 percent), bonnethead (0.03 percent), and finetooth (0.02 percent)(Table 3.52). In previous seasons, the Atlantic sharpnose shark was the most frequently caught shark in the Florida East Coast region and accounted for 51.6 percent of the total observed catch, and 96.0 percent of the small coastal catch in that region (Burgess and Morgan, 2002).

Bottom longlining for sharks has relatively low observed bycatch rates. Historically, finfish bycatch has averaged approximately five percent in the bottom longline fishery. Finfish bycatch for the bottom longline fishery includes, but is not limited to, skates, rays, cobia, redfish, bluefish, and great barracuda. During the second semi-annual season of 2003, observer data indicate that approximately 4,320 sharks were caught compared to 432 other fish, four invertebrates, and three sea turtles (Burgess and Johns, 1999). In terms of bycatch rates, observed shark catches constitute 91 percent of the 4,759 total animals caught, with other fish comprising 10 percent, invertebrates less than .01 percent, and sea turtles less than .01 percent. For more information on bycatch see Section 3.8.

3.4.5.3 Bottom Longline Bycatch

Under the Marine Mammal Protection Act (MMPA) (16 U.S.C. 1361 et seq.) the Atlantic shark gillnet fishery is classified as Category II (occasional serious injuries and mortalities), and the shark bottom longline as Category III (remote likelihood or no known serious injuries or mortalities) (July 20, 2004, 69 FR 43338). On October 29, 2003, NMFS issued a biological opinion (BiOp) pursuant to the Endangered Species Act (ESA) regarding Atlantic shark fisheries. This BiOp concluded that the level of anticipated take in the Atlantic shark fishery resulting from measures implemented in Amendment 1 to the 1999 FMP (68 FR 74746), were not likely to jeopardize the continued existence of endangered green, leatherback, and Kemp's ridley sea turtles, the endangered smalltooth sawfish, or the threatened loggerhead sea turtle. Furthermore, it concluded that the actions in the rule were not likely to adversely affect marine mammals. As a result of this conclusion, NMFS (NMFS, 2003) anticipates that the continued operation of the shark bottom longline fishery will result in a five year total incidental take of the following numbers of sea turtles: Leatherback – 172; loggerhead – 1,370; a total of 30 in any combination of hawksbill, green, and Kemp's ridley sea turtles. NMFS also anticipates a five year take of 261 smalltooth sawfish, of which no lethal takes are expected. If the actual calculated incidental captures or mortalities exceed the incidental take statement, a formal consultation for that gear type must be re-initiated immediately. More information is available in Amendment 1 to the 1999 FMP and the October 2003 BiOp and is not repeated here.

Loggerhead Sea Turtles

In the bottom longline fishery, a total of 65 sea turtles were observed caught from 1994 through 2006 (Table 3.54 Table 3.55 and Figure 3.31). Seasonal variation indicates that most of the sea turtles were caught early in the year. Of the 65 observed sea turtles, 50 were loggerhead sea turtles, of which 26 were released alive. Another nine loggerheads were released in an unknown condition and eight were released dead. Based on extrapolation of observer data in Amendment 1 to the 1999 FMP, it was estimated that a total of 2,003 loggerhead sea turtles were taken in the shark bottom longline fishery from 1994 through 2002 (NMFS, 2003a). An additional 503 unidentified sea turtles were estimated to have been taken. On average, 222 loggerhead sea turtles and 56 unidentified sea turtles were estimated to have been taken annually during this time period in the shark bottom longline fishery.

Leatherback Sea Turtles

Of the 65 observed sea turtle interactions in the bottom longline fishery from 1994 – 2006, six were leatherback sea turtles of which one was dead and three were released with their condition unknown (Table 3.54 Table 3.55 and Figure 3.31). Based on extrapolation of observer data done for Amendment 1 to the FMP, it was estimated that 269 leatherback sea turtles were taken in the shark bottom longline fishery from 1994 through 2002 (NMFS, 2003a). On average, 30 leatherback sea turtle interactions occurred each year in the shark bottom longline fishery during this period. This analysis only estimates takes without discriminating between live and dead releases. Of the observed leatherback takes, approximately 25 percent were lethal. Applying the observed mortality rate of 25 percent to the total leatherback takes and an additional 42 percent post-release mortality estimate due to hook ingestion to the remaining, results in an estimated total number of leatherbacks killed as a result of the interaction with bottom longline gear at 17 per year. The leatherback mortality is very conservative because it is known that leatherbacks rarely ingest or bite hooks, but are usually foul hooked on their flippers or carapaces, reducing the likelihood of post-hooking release mortality. However, leatherback-specific data for this fishery is not available and therefore the most conservative estimate is used.

Smalltooth Sawfish

As of April 1, 2003, NMFS listed smalltooth sawfish as an endangered species (68 FR 15674) under the ESA. After reviewing the best scientific and commercial information, the status review team determined that the continued existence of the U.S. Distinct Population Segment of smalltooth sawfish was in danger of extinction throughout all or a significant portion of its range from a combination of the following four listing factors: the present or threatened destruction, modification, or curtailment of habitat or range; overutilization for commercial, recreational, scientific, or educational purposes; inadequacy of existing regulatory mechanisms; and other natural or manmade factors affecting its continued existence. NMFS is working on designating critical habitat for smalltooth sawfish.

Sawfish have been observed caught (12 known interactions, 11 released alive, one released in unknown condition) in shark bottom longline fisheries from 1994 through 2006 (Morgan pers. comm., Burgess and Morgan, 2004; Carlson) (Figure 3.32). Based on these observations, expanded sawfish take estimates for 1994 – 2002 were developed for the shark bottom longline fishery (NMFS, 2003a). A total of 466 sawfish were estimated to have been taken in this fishery from 1994 – 2002, resulting in an average of 52 per year. All but one of the observed sawfish was released alive.

Marine Mammals

Four delphinids have been observed caught and released alive between 1994 and 2004 (G. Burgess, pers. comm.). Bycatch estimates for the shark bottom longline fishery have not been extrapolated for marine mammals.

Seabirds

Bycatch of seabirds in the shark bottom longline fishery has been virtually non-existent. A single pelican has been observed killed from 1994 through 2005. The pelican was caught in January 1995 off the Florida Gulf Coast (between 25° 18.68 N, 81° 35.47 W and 25° 19.11 N, 81° 23.83 W) (G. Burgess, University of Florida, pers. comm., 2001). No expanded estimates of seabird bycatch or catch rates are available for the bottom longline fishery.

Table 3.51 Species composition of observed bottom longline catch during 2003. Source: Burgess and Morgan, 2004.

Species	Total Number Caught	% Total Catch	% Management Category
Large Coastal Sharks			
Sandbar shark	2719	30.63	44.78
Blacktip shark	1232	13.88	20.29
Tiger shark	665	7.49	10.95
Spinner shark	309	3.48	5.09
Scalloped hammerhead	259	2.92	4.27
Bull shark	257	2.90	4.23
Nurse shark	175	1.97	2.88
Sand tiger	108	1.22	1.78

Species	Total Number Caught	% Total Catch	% Management Category
Dusky shark	108	1.22	1.78
Silky shark	105	1.18	1.73
Lemon shark	60	0.68	0.99
Great hammerhead	55	0.62	0.91
Bignose shark	8	0.09	0.13
Night shark	8	0.09	0.13
White shark	3	0.03	0.05
Caribbean shark	1	0.01	0.02
Total	6072	68.41	100
Small Coastal Sharks			
Atlantic sharpnose shark	1996	22.49	80.32
Blacknose shark	484	5.45	19.48
Bonnethead	3	0.03	0.12
Finetooth	2	0.02	0.08
Total	2485	28.00	100.00
Pelagic Sharks			
Sevengill	5	0.06	45.45
Shortfin mako	2	0.02	18.18
Bigeye sixgill	2	0.02	18.18
Bigeye thresher shark	1	0.01	9.09
Sixgill shark	1	0.01	9.09
Total	11	0.12	100.00
Dogfish/Other Sharks			
Smooth dogfish	298	3.36	
Unidentified sharks	10	0.113	

Table 3.52 Species composition of observed bottom longline catch during 2004. Source: Burgess and Morgan, 2005.

Species	Total Number Caught	% Total Catch	% Management Category
Large Coastal Sharks			
Sandbar shark	2157	26.6	39.8
Blacktip shark	1107	13.6	20.4
Tiger shark	972	12.0	18.0
Nurse shark	440	5.4	8.1
Silky shark	254	3.1	4.7
Scalloped hammerhead	155	1.9	2.9
Bull shark	108	1.3	2.0
Great hammerhead	92	1.1	1.7

Species	Total Number Caught	% Total Catch	% Management Category
Dusky shark	54	0.7	1.0
Night shark	42	0.5	0.8
Lemon shark	17	0.2	0.3
Sandtiger shark	12	0.1	0.2
Bignose shark	5	0.1	0.1
Total	5415	66.7	100
Small Coastal Sharks			
Atlantic sharpnose shark	2231	27.5	85.8
Blacknose shark	353	4.3	13.6
Bonnetheat shark	10	0.1	0.4
Finetooth shark	5	0.1	0.2
Total	2599	32.0	100
Pelagic Sharks			
Sevengill shark	2	0.02	25.0
Sixgill shark	1	0.01	12.5
Shortfin mako shark	3	0.01	37.5
Bigeye thresher shark	2	0.02	25.0
Total	8	0.1	100
Dogfish Sharks			
Smooth dogfish	85	1.0	97.7
Spiny dogfish	2	0.02	2.3
Total	87	1.1	100
Other Sharks			
Unidentified	5	0.1	71.4
Carcharhinus sp.	2	0.02	28.6
Total	7	0.1	100

Table 3.53 Directed bottom longline shark observed catch and disposition, 2003. Source: Burgess and Morgan, 2004.

	Number caught	Percent total mortality	Number Carcassed*	Percent Carcassed	Other mortality**	Percent other mortality	Number Tagged released	Percent Released
Small Coastal	2,485	94.85	295	11.87	2,062	82.98	127	5.11
Large Coastal	6,072	86.68	4,677	77.03	586	9.65	809	13.32
Pelagic	11	90.91	2	18.18	8	72.73	1	9.09
Large coastal sharks:								
Sandbar	2,719	97.35	2,597	95.51	50	1.84	72	2.65
Blacktip	1,232	99.51	1,207	97.97	19	1.54	6	0.49
Tiger	665	40.60	41	6.17	229	34.44	395	59.40
Spinner	309	100.00	302	97.73	7	2.27		0.00
Scalloped hammerhead	259	98.84	86	33.20	170	65.64	3	1.16
Bull	257	96.89	248	96.50	1	0.39	8	3.11
Nurse	175	0.57	0	0.00	1	0.57	174	99.43
Dusky	108	76.85	38	35.19	45	41.67	25	23.15
Sand tiger	108	0.00	0	0.00	0	0.00	108	100.00
Silky	105	97.14	78	74.29	24	22.86	3	2.86
Lemon	60	86.67	52	86.67	0	0.00	8	13.33
Great hammerhead	55	96.36	25	45.45	28	50.91	2	3.64
Bignose	8	75.00	3	37.50	3	37.50	2	25.00
Night	8	100.00	0	0.00	8	100.00		0.00
White	3	33.33	0	0.00	1	33.33	2	66.67
Caribbean	1	0.00	0	0.00	0	0.00	1	100.00
Small coastal sharks:								
Sharpnose	1,996	96.24	14	0.70	1,907	95.54	74	3.71
Blacknose	484	89.05	276	57.02	155	32.02	53	10.95
Bonnethead	3	100.00	3	100.00	0	0.00	0	0.00
Finetooth	2	100.00	2	100.00	0	0.00	0	0.00
Pelagic sharks:								
Bigeye thresher	5	100.00	0	0.00	5	100.00	0	0.00
Sevengill	2	0.00	0	0.00	2	100.00	0	0.00
Shortfin mako	2	0.00	2	100.00	0	0.00	0	0.00
Sixgill	1	0.00	0	0.00	0	0.00	1	100.00
Bigeye sixgill	1	0.00	0	0.00	1	100.00	0	0.00

* Carcassed means sharks that are retained

** Other mortality refers to sharks brought to the vessel dead, but not retained

Table 3.54 Total number of Observed Sea Turtle Interactions by Species by Month for Years 1994-2006 in the Shark Bottom Longline Fishery. Source: Shark Bottom Longline Observer Program.

Month	Leatherback Sea Turtle	Loggerhead Sea Turtle	Other Sea Turtles	Total
Jan	1	12	1	14
Feb	3	10	6	19
Mar		7		7
Apr		4		4
May	1			1
Jun				
July		11		11
Aug		3		3
Sept	1	2	1	4
Oct		1	1	2
Nov				
Dec				
Total	6	50	9	65

Table 3.55 Total number of Observed Sea Turtle Interactions by Year for Years 1994-2006 in the Shark Bottom Longline Fishery. Source: Shark Bottom Longline Observer Program. Letters in parentheses indicate whether the sea turtle was released alive (A), dead (D), or in an unknown (U) condition.

Year	Leatherback Sea Turtle	Loggerhead Sea Turtle	Other Sea Turtle	Total
1994	1 (1U)	5 (5U)	6 (6U)	12
1995		4 (3A, 1D)		4
1996	1 (1U)	6 (3A, 2D, 1U)		7
1997	1 (1U)	5 (3A, 2U)		6
1998		2 (1A, 1D)	1 (1A)	3
1999		2 (2A)		2
2001	1 (1D)	2 (2A)		3
2002		5 (3A, 1D, 1U)		5
2003		7 (6A, 1D)	1 (1U)	8
2004		5 (3A, 2D)		5
2005	2 (1A, 1D)	4 (1A, 3D)	1 (1U)	7
2006		2 (1D, 1U)		3
Total	6	50	9	65

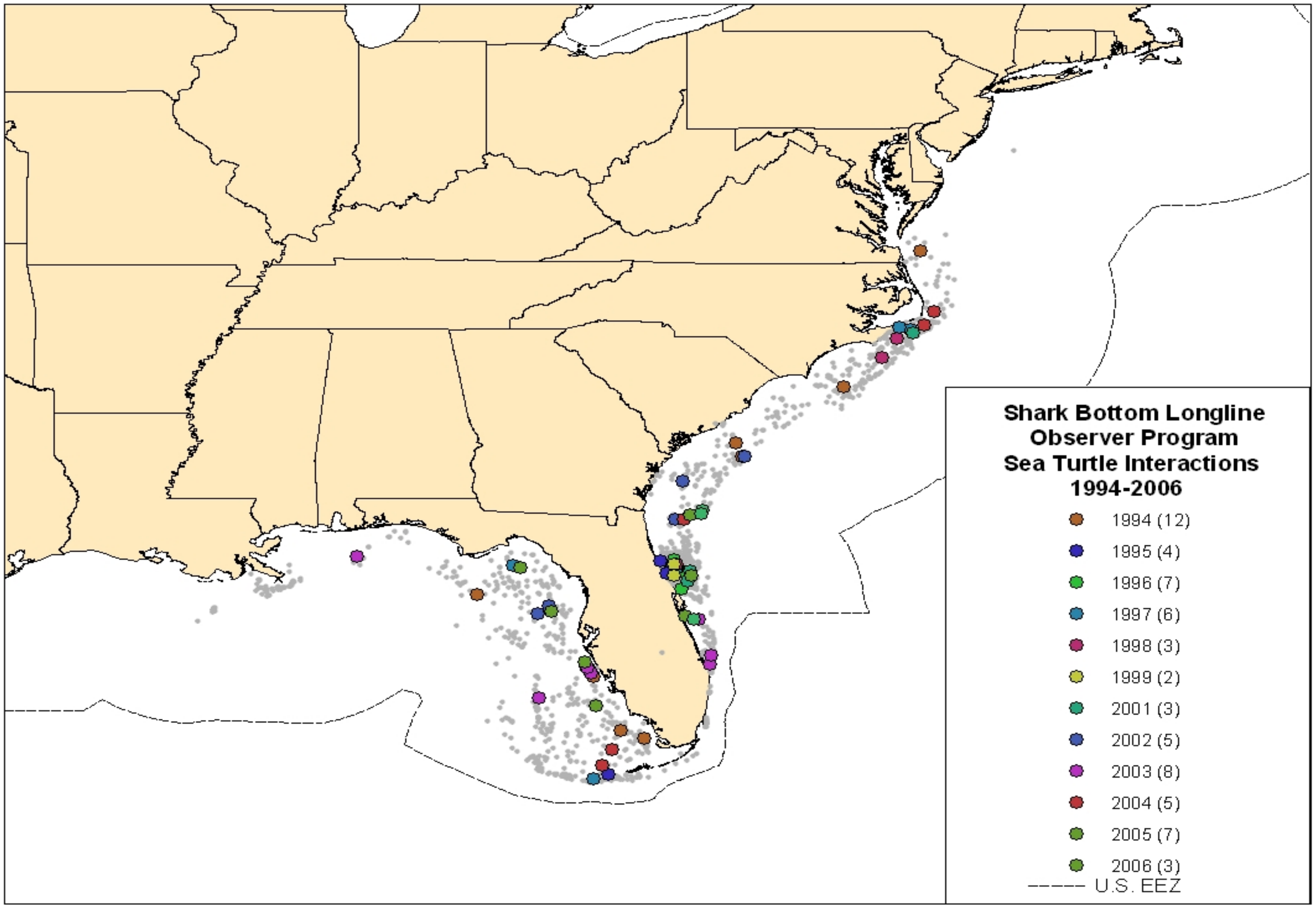


Figure 3.31 **Observed sea turtle interactions and observed sets (smaller grey circles) in the shark bottom longline fishery from 1994-2004**. Source: Burgess and Morgan, 2004.

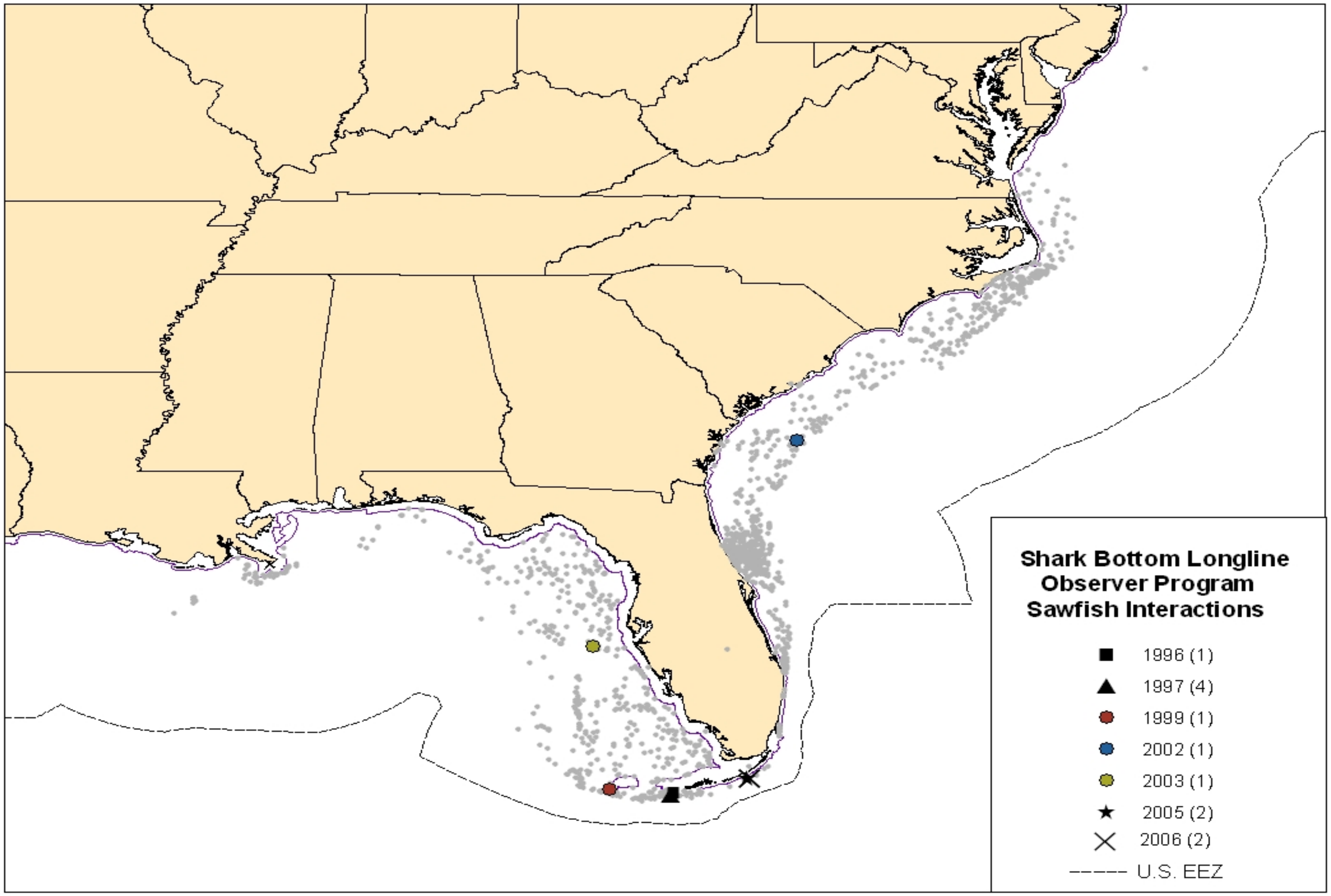


Figure 3.32 Observed sawfish interactions and observed sets (smaller grey circles) in the shark bottom longline fishery from 1994-2006. Source: Burgess and Morgan, 2004.

3.4.6 Gillnet Fishery

3.4.6.1 Domestic History and Current Management

The southeast shark gillnet fishery is comprised of several vessels based primarily out of ports in northern Florida (South Atlantic Region) that use nets typically 456 to 2,280 meters long and 6.1 to 15.2 meters deep, with stretched mesh from 12.7 to 22.9 cm. This fishery is currently prohibited in the state waters off South Carolina, Georgia, and Florida, thereby forcing some of these vessels to operate in deeper waters under Federal jurisdiction, where gillnets are less effective. The entire process (set to haulback) takes approximately 9 hours (Carlson and Baremore, 2002a).

The 2005 Directed Shark Gillnet Fishery Observer Program report described the gear and soak time deployed by drift gillnet, strike gillnet, and sink gillnet fishermen. Set duration was generally 0.3 hours and haulback averaged 2.9 hours. The average time from setting the net through completion of haulback was 10.2 hours. The most frequently used mesh size for drift gillnets was 12.7 cm. Strikenetters use the largest mesh size (22.9 cm) and the set times were 2.7 hours. Sink gillnets used to target sharks generally use 17.8 cm mesh size and were soaked for approximately 0.8 hours. This gear was also observed being deployed to target non-HMS (kingfish or Spanish mackerel); using a stretched mesh size of 7.6 cm, to comply with mesh size regulations for the Spanish mackerel fishery, and soaked for approximately 5.9 hours (Carlson and Bethea, 2006).

In the southeast shark gillnet fishery, NMFS modified the requirement to have 100 percent observer coverage at all times on March 30, 2001 (66 FR 17370), by reducing the level required to a statistically significant level outside of right whale calving season (100 percent observer coverage is still required during the right whale calving season from November 15 through March 31). This modification of observer coverage reduced administrative costs while maintaining statistically significant and adequate levels of coverage to provide reasonable estimates of sea turtle and marine mammal takes outside the right whale calving season. The level of observer coverage necessary to maintain statistical significance will be reevaluated annually and adjusted accordingly. Additionally, in 2001, NMFS established a requirement to conduct net checks every two hours to look for and remove any protected species.

3.4.6.2 Recent Catch and Landings

The following section provides information on shark landings as reported in the shark gillnet observer program. For recent catch and landings data for the shark fishery as a whole, which includes landings from gillnet, BLL, and other gears combined, please refer to Section 3.4.7. A total of 24 driftnet sets were observed on five vessels from February through September, 2004. Driftnet vessels carried nets ranging in length from 547.2 – 2736 m; depths from 7.6 – 13.7 m and stretched mesh sizes from 12.7 – 22.9 cm. The most frequently used mesh size was 12.7 cm. For all observed driftnet sets, set duration averaged 0.4 hrs. Sets were made in seawater averaging 15.4 m deep. Haulback and processing of the catch averaged 3.4 hrs. Average soak time for the driftnet (time net was first set minus time haulback began) was 10.8 hrs.

The observed driftnet catch consisted of nine species of sharks. Three species of sharks made up 92.9 percent (by number) of the observed shark catch (Table 3.57). These species were the Atlantic sharpnose shark, blacknose shark, and finetooth shark. By weight, the shark catch was made up of Atlantic sharpnose shark, (55.3 percent), blacknose shark (17.1 percent), blacktip shark (10.7 percent), and finetooth shark (10.3 percent). Total observed catch composition (percent of numbers caught) was 79.0 percent sharks, 20.7 percent teleosts, 0.3 percent rays, and 0.03 percent protected species (*i.e*., marine mammals, sea turtles, sawfish).

Gillnet Bycatch

On September 23, 2002, NMFS implemented a restricted area to reduce bycatch of right whales from November 15 through March 31 (67 FR 59471). In this area, only gillnets used in a strikenet fashion can operate during times when right whales are present. Operation in this area at that time requires 100 percent observer coverage. Vessels fishing in a strikenet fashion used nets 364.8 meters long, 30.4 meters deep, and with mesh size 22.9 cm. Observed catch in the strikenet fishery consisted of 6 species of sharks (96.7 percent of total number caught) and seven species of teleosts and rays (3.3 percent of total number caught). No marine mammals or sea turtles were observed caught. The blacktip shark made up 97.5 percent of the number of sharks caught, and 86 percent of the overall catch. Bycatch included crevalle jack, red drum, and great barracuda (Table 3.56).

There were 23 species of teleosts, two species of rays, and one species of marine mammal observed caught during the driftnet season (Table 3.58). Four species of teleosts and rays made up 90.8 percent by number of the overall non-shark species in observed strikenet catches. These species were little tunny (45.6 percent); king mackerel (23.3 percent); great barracuda (11.8 percent); and red drum (10.2 percent). For incidental driftnet catch species, the highest proportion discarded dead (with observed catch greater than 10 specimens) was Atlantic sailfish, (100.0 percent), king mackerel (78.3 percent), and cobia (28.7 percent). Red drum had the highest discard proportion alive (98.1 percent) (Carlson and Baremore, 2003). Observed driftnet sets caught 23 species of teleosts and rays and no sea turtles or marine mammals. Only the great barracuda were retained, with all remaining bycatch discarded alive (Carlson, 2002).

Outside of right whale calving season, observed drift gillnet catch consisted of 26 species of teleosts and rays and one species of marine mammal, which was discarded dead. Five species of teleosts and one species of ray made up 90.6 percent by number of the overall non-shark catch. Little tunny (44.1 percent), king mackerel (20.8 percent), great barracuda (12.5 percent), Atlantic moonfish (9.4 percent), and cobia (3.8 percent) dominated the bycatch (Carlson and Baremore, 2002). During drift gillnet fishing, the highest proportion of species discarded dead (for species with greater than 10 individuals) was for tarpon, crevalle jack, king mackerel, and red drum. Cownose rays and red drum had the highest proportion of discarded alive with 78.1 percent and 50.0 percent, respectively (Carlson and Baremore, 2002).

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

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

The regulations at 50 CFR 229.32(g)(1) also require NMFS to close the Southeast U.S. Restricted Area for the rest of the time period, and for the time period November 15 through March 31 in each subsequent year, unless NMFS revises the restricted period or unless other measures are implemented. NMFS plans to seek assistance and recommendations from the ALWTRT at their next meeting in order to evaluate whether permanent closures within the Southeast U.S. Restricted Area are necessary.

Loggerhead Sea Turtles

Loggerhead sea turtles are rarely caught in the shark gillnet fishery. During the 1999 right whale calving season, no loggerhead sea turtles were observed caught in this fishery (Carlson and Lee, 1999), and no loggerheads were observed caught with strikenets during the 2000 – 2002 right whale calving seasons (Carlson 2000; Carlson and Baremore, 2001; Carlson and Baremore, 2002a). However, three loggerhead sea turtles were observed caught with drift gillnets during right whale calving season, one each year from 2000 to 2002 (Carlson, 2000; Carlson and Baremore, 2001; Carlson and Baremore, 2002a; Garrison, 2003). In 2004 there were no observed sea turtle interactions in either the strikenet or drift gillnet fisheries.

No loggerhead sea turtles were caught outside of the right whale calving season in 2002 (Carlson and Baremore, 2002b), and no loggerhead turtles were observed caught during or after the right whale calving season in 2003 or 2004 in the directed shark gillnet fishery (Carlson and Baremore 2003; Carlson, pers. comm). In 2005 five loggerheads were observed caught, and in 2006 three loggerheads were observed caught (Table 3.59). All but two were released alive. One loggerhead sea turtle mortality was reported in abandoned fishing gear in January 2004, and was not considered part of normal fishing operations.

Leatherback Sea Turtles

In the shark gillnet fishery, leatherback sea turtles are sporadically caught. During the 1999 right whale calving season, two leatherback sea turtles were caught in this fishery, and both were released alive (Carlson and Lee, 1999). No leatherback sea turtles were observed caught with strikenets during the 2000 – 2002 right whale calving seasons (Carlson, 2000; Carlson and Baremore, 2001; Carlson and Baremore, 2002a). Leatherback sea turtles have been observed caught in shark drift gillnets including 14 in 2001 and two in 2002 (Carlson, 2000; Carlson and

Baremore, 2001; Carlson and Baremore, 2002a; Garrison, 2003). NMFS temporarily closed the shark gillnet fishery (strikenetting was allowed) from March 9 to April 9, 2001, due to the increased number of leatherback interactions that year (66 FR 15045, March 15, 2001).

From 2003 – 2004, no leatherback sea turtles were observed caught in gillnets fished in strikenet or driftnet methods (Carlson and Baremore 2003; Carlson, pers. comm.).

Smalltooth Sawfish

To date there has been only one observed catch of a smalltooth sawfish in shark gillnet fisheries (Table 3.60). The sawfish was taken on June 25, 2003, in a gillnet off southeast Florida and was released alive (Carlson and Baremore, 2003). The set was characteristic of a typical drift gillnet set, with gear extending 30 to 40 feet deep in 50 to 60 feet of water. Prior to this event it was speculated that the depth at which drift gillnets are set above the sea floor may preclude smalltooth sawfish from being caught. Although sometimes described as a lethargic demersal species, smalltooth sawfish feed mostly on schooling fish, thus they would occur higher in the water column during feeding activity. In fact, smalltooth sawfish and Atlantic sharks may be attracted to the same schools of fish, potentially making smalltooth sawfish quite vulnerable if present in the area fished. The previous absence of smalltooth sawfish incidental capture records is more likely attributed to the relatively low effort in this fishery and the rarity of smalltooth sawfish, especially in Federal waters. These factors may result in little overlap of the species with the gear. The sawfish was cut from the net and released alive with no visible injuries. This indicates that smalltooth sawfish can be removed safely if entangled gear is sacrificed.

Given the high rate of observer coverage in the shark gillnet fishery, NMFS believes that smalltooth sawfish takes in this fishery are very rare. The fact that there were no smalltooth sawfish caught during 2001 when 100 percent of the fishing effort was observed indicates that smalltooth sawfish takes (observed or total) most likely do not occur on an annual basis. Based on this information, the 2003 BiOp estimated that one incidental capture of a sawfish (released alive) over the next five years, will occur as a result of the use of gillnets in this fishery (NMFS, 2003a).

Marine Mammals

Observed takes of marine mammals in the Southeast Atlantic shark gillnet fishery during 1999 – 2004, totaled 12 bottlenose dolphins and four spotted dolphins. Extrapolated observations from these data suggest serious injury and mortality of 25 bottlenose dolphin and one Atlantic spotted dolphin in the shark gillnet fishery from 1999 through 2002 (Garrison, 2003).

Table 3.56 Total Strikenet Shark Catch and Bycatch by Species in order of Decreasing Abundance for all Observed Trips, 2003. **Source: Carlson and Baremore, 2003.**

Species	Total Number Caught	Kept (%)	Discarded Alive (%)	Discarded Dead (%)
Blacktip shark	6,401	97.5	.6	1.9
Blacknose shark	343	100.0	0	0
Crevalle jack	215	96.2	3.3	.5
Red Drum	18	0	100	0
Great barracuda	13	92.3	0	7.7
Manta ray	10	0	100	0
Bull shark	8	75	12.5	12.5
Permit	8	50	37.5	12.5
Nurse shark	1	0	100	0
Spinner shark	1	100	0	0
Finetooth shark	1	100	0	0
Cobia	1	100	0	0
Atlantic bonito	1	0	0	100
Total	**7,021**			

Table 3.57 Total Shark Catch by Species and Species Disposition in Order of Decreasing Abundance for all Observed Driftnet Sets, 2003. Source: Carlson and Baremore, 2003.

Species	Total Number Caught	Kept (%)	Discarded Alive (%)	Discarded Dead (%)
Atlantic sharpnose	6,917	99.8	0	.2
Blacknose	799	100	0	0
Finetooth	620	100	0	0
Blacktip	375	45	24	31
Bonnethead	168	100	0	0
Scalloped Hammerhead	62	3.2	0	96.8
Spinner	20	5	0	95
Great Hammerhead	6	100	0	0
Lemon	1	0	100	0
Total	**8,968**			

Table 3.58 Total bycatch in NMFS observed drift gillnet sets in order of decreasing abundance and species disposition for all observed trips, 2003. Source: Carlson, 2003.

Species	Total Number Caught	Kept (%)	Discard Alive (%)	Discard Dead (%)
Little tunny	1169	92.6	0	7.4
King mackerel	596	21.5	.2	78.3
Barracuda	300	100	0	0
Red drum	262	0	98.1	1.9
Cobia	80	70	1.3	28.7
Blackfin tuna	36	100	0	0
Atlantic sailfish	30	0	0	100
Cownose ray	22	0	59.1	40.9
Spanish mackerel	11	100	0	0
Remora	9	0	33.4	66.6
Crevalle jack	8	0	0	100
Blue runner	8	87.5	0	12.5
Tarpon	5	0	0	100
Manta ray	5	0	100	0
Dolphin	5	100	0	0
Tripletail	4	100	0	0
Spotted eagle ray	2	0	100	0
Blue marlin	2	0	0	100
Balloonfish	2	0	0	100
Wahoo	1	100	0	0
Pompano	1	100	0	0
Rainbow runner	1	100	0	0
Black drum	1	0	100	0
Bluefish	1	0	0	100

Table 3.59 Total number of Observed Sea Turtle Interactions by Year from 2000-2006 in the Shark Gillnet Fishery. Source: Directed Shark Gillnet Observer Program. Letters in parentheses indicate whether the sea turtle was released alive (A), dead (D), or unknown (U).

Year	Leatherback Sea Turtle	Loggerhead Sea Turtle	Total
2000		1 (U)	1
2001		1 (U)	1
2002		1 (U)	1
2003			0
2004			0
2005	1(A)	5 (4A, 1D)	6
2006		3 (2A, 1D)	3
Total	1	11	12

Table 3.60 Protected Species Interactions in Drift Gillnet Sets During the Directed Shark Gillnet Fishery for All Observed Trips, 2003. Source: Carlson, 2003.

Species	Total Number Caught	Released Alive	Discarded Dead	Released Condition Unknown or Comatose
Bottlenose dolphin	2	0	1	1
Smalltooth sawfish	1	1	0	0

3.4.7 Fishery Data: Landings by Species

The following tables of finfish landings are taken from the 2005 National Report of the United States to ICCAT (NAT-038) (NMFS, 2005). The purpose of this section is to provide a summary of recent landings of HMS on a species by species basis for comparison to Sections 4.1 through 4.5 of the 2004 HMS SAFE report. Landings for sharks were compiled from the most recent stock assessment documents.

Table 3.61 U.S. Landings (mt) of Bluefin Tuna by Gear and Area, 1997-2004. Source: NMFS, 2005

Area	Gear	1997	1998	1999	2000	2001	2002	2003	2004
NW Atlantic	Longline	26.0	30.5	25.1	22.8	17.7	7.8	16.3	28.8
	Handline	17.4	29.2	15.5	3.2	9.0	4.5	2.5	1.5
	Purse Seine	249.7	248.6	247.9	275.2	195.9	207.7	265.4	31.8
	Harpoon	97.5	133.1	115.8	184.2	101.9	55.5	87.9	41.2
	*Rod and reel (>145 cm LJFL)	752.6	610.4	657.5	632.8	993.4	1,008.4	684.8	329.0
	*Rod and reel (<145 cm LJFL)	178.9	166.3	103.0	49.5	249.3	519.3	314.6	387.8
	Unclassified	2.2	0.6	0.1	0.2	0.5	0.0	0.0	0.2
Gulf of Mexico	Longline	23.8	18.3	48.4	43.3	19.8	32.8	53.8	67.3
	*Rod and reel	0.0	0.0	0.4	0.9	1.7	1.5	0.0	0.0
NC Area 94a	Longline			0.0	0.0	0.0	9.3	11.3	
All Areas	All Gears	1,348.1	1,237	1,214.1	1,212.1	1,582.8	1,840.2	1,428.2	887.6

* Rod and Reel catches and landings represent estimates of landings and dead discards when available based on statistical surveys of the U.S. recreational harvesting sector.

Table 3.62 U.S. Landings (mt) of Yellowfin Tuna by Gear and Area, 1997-2004. Source: NMFS, 2005.

Area	Gear	1997	1998	1999	2000	2001	2002	2003	2004
NW Atlantic	Longline	838.9	464.9	581.3	734.5	631.8	400	272	654
	Rod and reel*	3,560.9	2,845.7	3,818.2	3,809.5	3,690.5	2,624	4,672	3,434
	Troll	218	177.5	0.0	0.0	0.0	0.0	0.0	0.0
	Purse seine	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	Gillnet	1.3	1.7	0.2	0.2	7.6	5	1	3
	Trawl	1.9	0.7	4.1	1.8	2.7	0	2	1
	Harpoon	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	Handline	34.3	0.0	192	235.7	242.5	137	148	208
	Trap	**	0.1	0.8	0.5	0.1	0.0	0.0	0
	Unclassified	0.0	0.0	2.1	1.3	6.8	**	0.0	13
Gulf of Mexico	Longline	2,571.3	1,864.5	2,736.6	2,133	1,505.5	2,109	1,828	1,813
	Rod and reel*	7.7	80.9	149.4	52.3	494.2	200	640	247
	Handline	55.6	60.8	12.7	28.6	43.4	100	59	19
	Gillnet	0.0	0.0	**	0.0	0.0	0.0	0.0	0.0
	Unclassified	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Caribbean	Longline	135.4	58.6	24.4	11.8	23.1	12	7	5
	Troll	19.6	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	Handline	0.7	3.9	14.5	19.4	14.3	7	9	7
	Gillnet	**	0.0	0.0	0.1	0.3	0.0	**	0.0
	Trap	0.1	0.0	0.1	0.3	0.3	0.0	0.0	0.0
NC Area 94a	Longline	6.1	4.6	0.2	2.1	3.5	0.0	5	0.0
SW Atlantic	Longline	221.9	55.3	32.4	19.8	36.2	52	42	17
All Areas	All Gears	7,673.7	5,619.2	7,569	7,050.9	6,702.8	5,646	7,685	6,421

* Rod and Reel catches and landings represent estimates of landings and dead discards based on statistical surveys of the U.S. recreational harvesting sector.
** <u><</u>= 0.05 mt

Table 3.63 U.S. Landings (mt) of Skipjack Tuna by Gear and Area, 1997-2004. Source: NMFS, 2005.

Area	Gear	1997	1998	1999	2000	2001	2002	2003	2004
NW Atlantic	Longline	1.0	0.7	0.3	0.0	0.1	**	0.9	0.1
	Rod and reel*	42.0	49.5	63.6	13.1	32.9	23.3	34.0	27.3
	Troll	0.6	0.4	0.0	0.0	0.0	0.0	0.0	0.0
	Purse seine	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	Gillnet	8.9	16.9	26.5	1.9	3.6	**	0.9	15.8
	Trawl	0.0	0.2	1.0	0.0	0.2	**	0.5	0.2
	Handline	0.1	0.0	0.2	0.2	0.2	0.2	0.2	0.6
	Trap	0.0	0.0	17.5	0.0	0.0	**	1.5	**
	Pound	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	Unclassified	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Gulf of Mexico	Longline	1.3	0.6	0.4	0.2	0.2	**	**	0.3
	Rod and reel*	21.7	37.0	34.8	16.7	16.1	13.2	11.0	6.3
	Handline	0.0	0.0	0.4	0.7	0.0	0.0	**	0.2
	Trap	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	Unclassified	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Caribbean	Longline	1.2	0.0	1.3	1.6	4.0	2.5	3.3	0.3
	Gillnet	0.2	0.0	0.4	0.6	1.6	0.6	0.4	0.3
	Rod and Reel*	NA	NA	NA	NA	NA	NA	15.7	40.4
	Harpoon	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	Handline	0.0	0.0	5.8	8.8	10.3	12.5	9.2	9.6
	Trap	**	0.0	0.1	0.3	0.4	0.7	0.2	**
	Troll	7.3	0.0	0.0	0.0	0.0	0.0	0.0	0.0
SW Atlantic	Unclassified	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
All Areas	Longline	**	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	All Gears	84.3	105.3	152.3	44.1	69.6	53.0	77.8	101.4

* Rod and Reel catches and landings represent estimates of landings and dead discards based on statistical surveys of the U.S. recreational harvesting sector.
** $\leq$= 0.05 mt

Table 3.64 U.S. Landings (mt) of Bigeye Tuna by Area and Gear, 1997-2004. Source: NMFS, 2005.

Area	Gear	1997	1998	1999	2000	2001	2002	2003	2004
NW Atlantic	Longline	476.3	544.3	737.8	333.2	506.1	328.6	168.7	264.9
	Rod and reel*	333.5	228.0	316.1	34.4	366.2	49.6	188.5	94.6
	Troll	3.9	4.0	0.0	0.0	0.0	0.0	0.0	0.0
	Gillnet	**	0.4	0.2	0.0	0.2	0.0	0.0	0.0
	Handline	2.7	0.0	11.9	4.1	33.2	13.8	6.0	3.0
	Trawl	1.0	0.5	1.2	1.7	0.4	0.5	**	0.3
	Unclassified	0.5	0.0	0.9	0.0	1.8	0.0	0.0	1.4
Gulf of Mexico	Longline	33.9	25.6	54.6	44.5	15.3	41.0	27.5	20.2
	Rod and reel*	0.0	0.0	1.8	0.0	0.0	0.0	0.0	6.0
	Handline	**	0.1	0.2	0.1	0.5	0.6	0.3	0.1
Caribbean	Longline	50.0	48.5	23.2	13.7	31.9	29.7	7.2	3.5
	Handline	0.0	0.0	0.2	1.5	0.0	0.0	0.0	0.0
NC Area 94a	Longline	91.8	48.4	35.3	63.1	61.0	45.2	36.9	5.0
SW Atlantic	Longline	142.8	28.5	78.2	77.4	68.2	91.3	44.6	14.4
All Areas	All Gears	1,136.4	928.3	1,261.4	573.6	1,084.7	600.3	479.8	413.3

* Rod and Reel catches and landings represent estimates of landings and dead discards based on statistical surveys of the U.S. recreational harvesting sector.
** ≤= 0.05

Table 3.65 U.S. Landings (mt) of Albacore Tuna by Gear and Area, 1997-2004. Source: NMFS, 2005.

Area	Gear	1997	1998	1999	2000	2001	2002	2003	2004
NW Atlantic	Longline	140.0	155.4	179.5	130.5	171.7	124.0	95.6	106.9
	Gillnet	42.8	40.1	27.0	0.8	3.3	2.6	0.1	4.7
	Handline	4.8	0.0	0.6	2.9	1.7	3.9	1.4	5.4
	Trawl	2.6	2.4	0.4	0.0	0.0	0.3	**	2.6
	Troll	1.6	5.8	0.0	0.0	0.0	0.0	0.0	0.0
	Rod and reel*	220.2	601.1	90.1	250.8	122.3	323.0	333.8	500.5
	Pound	1.3	0.9	0.4	0.0	0.0	0.0	0.0	0.0
	Unclassified	0.2	0.0	0.0	0.1	0.1	0.0	0.0	0.0
Gulf of Mexico	Longline	16.9	3.9	3.8	4.1	4.9	9.5	7.7	9.8
	Rod and reel*	49.3	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	Handline	0.0	0.0	**	0.0	0.0	0.0	**	0.0
Caribbean	Longline	16.1	17.8	8.3	9.2	8.7	8.4	4.0	3.2
	Troll	3.6	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	Gillnet	**	0.0	0.2	0.1	0.5	**	**	**
	Trap	**	0.0	**	0.2	0.3	0.6	0.2	0.0
	Handline	0.0	0.0	3.8	5.0	2.2	2.7	2.0	2.1
NC Area 94a	Longline	11.4	1.6	1.5	2.6	6.1	4.8	1.6	0.2
SW Atlantic	Longline	4.7	1.4	1.4	0.9	2.4	8.3	2.0	0.5
All Areas	All Gears	515.5	830.4	317	407.2	324.2	488.1	448.4	635.9

* Rod and Reel catches and landings represent estimates of landings and dead discards based on statistical surveys of the U.S. recreational harvesting sector.
** $\leq$= 0.05 mt

Table 3.66 **U.S. Catches and Landings (mt) of Swordfish by Gear and Area, 1997-2004.** Source: NMFS, 2005.

Area	Gear	1997	1998	1999	2000	2001	2002	2003	2004
NW Atlantic	*Longline	1,262.2	1,624.1	1,872.3	1,547.6	1,220.8	1,132.8	1,341.3	1,157.8
	Gillnet	0.4	36.3	0.0	0.0	0.0	0.1	0.0	**
	Pair Trawl	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	Handline	1.3	0.0	5.0	7.7	8.6	8.8	10.8	18.4
	Trawl	8.0	5.9	7.5	10.9	2.5	3.9	6.0	7.6
	Troll	0.4	0.7	0.0	0.0	0.0	0.0	0.0	0.0
	*Unclassified	11.9	9.1	3.8	1.4	1.8	0.1	1.6	9.8
	Harpoon	0.7	1.5	0.0	0.6	7.4	2.8	0.0	0.5
	***Rod and Reel	10.9	4.7	21.3	15.6	1.5	21.5	5.9	24.3
	Trap	0.0	0.1	**	0.0	0.0	**	0.1	0.0
Gulf of Mexico	*Longline	759.9	633.1	579.6	631.7	494.6	549.1	507.6	500.0
	Handline	0.0	0.0	**	1.2	0.3	2.9	9.8	1.6
Caribbean	*Longline	688.9	516.0	260.5	331.9	347.0	329.0	274.5	295.8
	Trap			0.0	0.3	0.0	0.1	**	**
NC Atlantic	*Longline	688.2	658.6	650.0	804.6	420.6	587.9	632.8	597.4
SW Atlantic	*Longline	417.9	170.1	185.2	143.8	43.2	199.9	20.9	15.7
All Areas	All Gears	3,850.7	3,660.2	3,585.2	3,497.3	2,548.3	2,838.9	2,811.3	2,628.9

* Includes landings and estimated dead discards from scientific observer and logbook sampling programs.
** $\leq$ = 0.5 mt
*** Rod and Reel catches and landings represent estimates of landings and dead discards based on statistical surveys of the U.S. recreational harvesting sector.

Table 3.67 U.S. Landings (mt) and dead discards of Blue Marlin, White Marlin and Sailfish by Gear and Area, 1998-2002. Source: NMFS, 2003.

		Blue Marlin					White Marlin					Sailfish				
Area	**Gear**	**1998**	**1999**	**2000**	**2001**	**2002**	**1998**	**1999**	**2000**	**2001**	**2002**	**1998**	**1999**	**2000**	**2001**	**2002**
NW Atlantic	Longline*	23.3	22.0	28.8	10.9	17.3	15.3	18.6	10.3	5.1	11.5	6.4	13.7	11.2	2.2	0.4
	Unclassified*	0.6	0.0	0.1	0.0	0.2	0.7	0.1	0.0	0.0	0.4	0.1	0.0	0.0	0.0	0.0
	Rod and reel**	34.1	24.8	13.8	9.0	9.8	2.4	-	-	-	-	0.1	-	-	-	-
Gulf of Mexico	Longline*	18.5	55.2	29.6	9.4	17.8	11.8	31.5	29.9	10.1	15.6	17.0	57.4	33.9	8.2	6.3
	Rod and reel**	4.5	7.5	4.7	5.1	4.4	0.2	-	-	-	-	1.0	-	-	-	-
Caribbean	Longline*	2.3	1.6	0.5	1.2	0.8	1.3	5.0	0.5	0.7	1.5	0.2	0.5	0.1	0.0	0.2
	Rod and reel**	10.6	4.6	5.7	2.3	2.9	<.05	-	-	-	-	0.05	-	-	-	-
	Other	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Unknown & NC Area 94a	Longline*	6.1	1.6	0.7	0.9	0.5	2.8	1.1	0.1	0.6	0.7	0.8	<.05	0.1	0.3	<.05
SW Atlantic	Longline*	1.6	1.7	0.0	0.0	0.0	0.9	0.5	0.0	0.0	0.0	2.7	<.05	0.1	0.0	0.0
NW Atlantic & Caribbean & Gulf of Mexico	Rod and reel***	-	-	-	-	-	-	5.2	1.3	3.4	5.6	-	163.0	75.7	57.8	103.0
All Areas	All Gears	101.6	119.0	83.9	38.8	54.7	35.4	62.0	42.1	19.9	35.3	28.3	234.6	121.1	68.5	109.9

* Includes landings and estimated discards from scientific observer and logbook sampling programs.
** Recreational billfish landings estimates are based on tournament reports and the Large Pelagic Survey (see Section 2.3 of the Billfish Amendment).
*** Estimation method no longer provides area-specific information.

Table 3.68 Commercial landings of large coastal sharks in lb dw: 1999-2004. Sources: Data from 1999-2001, Cortés pers. Comm.; data from 2002-2003, Cortés 2003; Cortés and Neer, 2005.

Large Coastal Sharks	1999	2000	2001	2002	2003	2004
Basking**	0	0	0	0	0	0
Bignose*	9,050	672	1,442	0	318	0
Bigeye sand tiger**	0	0	0	0	0	0
Blacktip	1,259,016	1,633,919	1,135,199	1,099,194	1,487,604	1,092,600
Bull	28,603	24,980	27,037	40,463	93,816	49,556
Caribbean Reef*	0	0	1	0	0	0
Dusky*	110,942	205,746	1,973	8,779	23,288	1,025
Galapagos*	0	0	0	0	0	0
Hammerhead, Great	0	0	0	0	0	0
Hammerhead, Scalloped	0	0	0	0	0	0
Hammerhead, Smooth	0	0	0	0	0	92
Hammerhead, Unclassified	53,393	35,060	69,356	108,160	153,548	116,546
Large Coastal, Unclassified	67,197	16,575	172,494	147,359	51,433	0
Lemon	25,298	45,269	24,453	56,921	80,688	67,460
Narrowtooth*	0	0	0	0	0	0
Night*	4,287	0	0	0	20	0
Nurse	1,176	429	387	69	70	317
Sandbar	1,320,239	1,491,908	1,407,550	1,863,420	1,436,838	1,223,082
Sand Tiger**	6,401	6,554	1,248	409	975	1,832
Silky	9,961	31,959	14,197	30,731	51,588	11,808
Spinner	629	14,473	6,970	8,447	12,133	14,806

Large Coastal Sharks	1999	2000	2001	2002	2003	2004
Tiger	30,779	24,443	26,973	16,115	18,536	30,976
Whale**	0	0	0	0	0	0
White**	82	1,201	26	0	1,454	58
Unclassified, assigned to large coastal	821,648	92,117	525,661	771,450	853,564	599,134
Unclassified, fins	116,570	87,820	23,988	142,565	181,431	128,409
Total	**3,865,271 (1,753 mt dw)**	**3,713,125 (1,684 mt dw)**	**3,438,955 (1,560 mt dw)**	**4,294,082 (1,948 mt dw)**	**4,447,304 (2,017 mt dw)**	**3,206,377 (1,454 mt dw)**

* indicates species that were prohibited in the commercial fishery as of June 21, 2000.
** indicates species that were prohibited as of April 1997.
*** Preliminary data, species not yet available.

Table 3.69 Commercial landings of small coastal sharks in lb dw: 1999-2004. Source: Cortés and Neer, 2002; Cortés, 2003. Cortés and Neer, 2005.

Small coastal sharks	1999	2000	2001	2002	2003	2004
Atlantic Angel*	0	97	0	495	0	818
Blacknose	137,619	178,083	160,990	144,615	131,511	68,108
Bonnethead	58,150	69,411	63,461	36,553	38,614	29,402
Finetooth	285,230	202,572	303,184	185,120	163,407	121,036
Sharpnose, Atlantic	244,356	142,511	196,650	213,301	190,960	230,880
Sharpnose, Atlantic, fins	0	0	209	10	0	0
Sharpnose, Caribbean*	2,039	353	205	0	0	0
Unclassified Small Coastal	336	0	51	35,831	25,307	1,407
Total:	**727,730 (330 mt dw)**	**593,027 (269 mt dw)**	**724,541 (329 mt dw)**	**615,915 (279 mt dw)**	**549,799 (249 mt dw)**	**450,833 (204 mt dw)**

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

Table 3.70 Commercial landings of pelagic sharks in lb dw: 1999-2004. Sources: Data from 2000-2001, Cortés pers. comm.; Cortés, 2003; Cortés and Neer, 2005.

Pelagic Sharks	1999	2000	2001	2002	2003	2004
Bigeye thresher*	18,683	4,376	330	0	0	719
Bigeye sixgill*	0	0	0	0	0	0
Blue shark	886	3,508	65	137	6,324	423
Mako, longfin*	3,394	6,560	9,453	3,008	1,831	1,827
Mako, shortfin	150,073	129,088	171,888	159,840	150,076	217,171
Mako, Unclassified	56,625	74,690	73,556	58,392	33,203	51,413
Oceanic whitetip	1,480	657	922	1,590	2,559	1,082

Pelagic Sharks	1999	2000	2001	2002	2003	2004
Porbeagle	5,650	5,272	1,152	2,690	1,738	5,779
Sevengill*	0	0	0	0	0	0
Sixgill*	0	0	0	0	0	0
Thresher	96,266	81,624	56,893	53,077	46,502	44,915
Unclassified, pelagic	0	233	0	5,965	79,439	0
Unclassified, assigned to pelagic	41,006	40,951	31,636	182,983	297,126	356,522
Unclassified, pelagic, fins	2,408	3,746	12,239	0	0	0
Total:	**376,471 (171 mt dw)**	**350,705 (159 mt dw)**	**358,134 (162 mt dw)**	**467,682 (212 mt dw)**	**618,798 (281 mt dw)**	**677,305 (307 mt dw)**

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

Table 3.71 Estimates of total landings and dead discards for large coastal sharks from 1981 through 2004 (numbers of fish in thousands). Modified from the 1998 and 2002 Report of the Shark Evaluation Workshop (NMFS 1998, 2002), Cortés and Neer (2002), and Cortés (2003, 2005).

Year	Commercial Landings	Longline Discards	Recreational Catches	Unreported	Coastal Discards	Menhaden Fishery Bycatch	Total
1981	16.2	0.9	265.0				282.1
1982	16.2	0.9	413.9				431.0
1983	17.5	0.9	746.6				765.0
1984	23.9	1.3	254.6				279.8
1985	22.2	1.2	365.6				389.0
1986	54.0	2.9	426.1	24.9			507.9
1987	104.7	9.7	314.4	70.3			499.0
1988	274.6	11.4	300.6	113.3			699.9

Year	Commercial Landings	Longline Discards	Recreational Catches	Unreported	Coastal Discards	Menhaden Fishery Bycatch	Total
1989	351.0	10.5	221.1	96.3			678.8
1990	267.5	8.0	213.2	52.1			540.8
1991	200.2	7.5	293.4	11.3			512.4
1992	215.2	20.9	304.9				541.1
1993	169.4	7.3	249.0		11.3		437.0
1994	228.0	8.8	160.9		16.3	26.2	440.2
1995	222.4	5.2	180.8		13.9	24.0	446.3
1996	160.6	5.7	191.5		7.6	25.1	390.5
1997	130.6	5.6	168.1		8.3	25.1	337.7
1998	174.9	4.3	170.7		9.9	25.1	384.9
1999	111.5	9.0	91.7		3.8	25.1	241.1
2000	111.2	9.4	131.9		4.8	25.1	282.4
2001	95.7	5.6	128.6		6.1	25.1	261.1
2002	123.4	2.4	76.3		4.9	25.1	232.1
2003	122.1	3.5	86.0		6.7	25.1	243.4
2004	98.9	5.2	66.3		3.6	25.1	199.1

Table 3.72 Commercial landings of LCS (including unclassified sharks) in the Atlantic and Gulf of Mexico by region and year in mt dw for QMS and Logbook data and mt ww for Canvass and CFDBS data from 1999-2003.

Year	**South Atlantic**			**Gulf of Mexico**			**North Atlantic**		**Total**		
	Canvass	**QMS**	**Logbook**	**Canvass**	**QMS**	**Logbook**	**CFDBS***	**Logbook**	**Canvass**	**QMS**	**Logbook**
1999	1246.9	474.5	789.2	1342.7	739.8	803.9	135.5	75.6	258.9	1415	1668.7
2000	1107	503.8	662.1	1255.3	912.1	760	168.7	167.6	2362.3	1591.3	1589.7
2001	1078.4	488.1	632.6	1270.4	639.4	898.8	254.4	98.9	2348.8	1390.1	1630.3
2002	1542	678.8	680.4	1406.5	614.7	1034.6	191.2	104	2948.5	1492.3	1819
2003	1226.7	674.9	635.7	1829.7	934.3	1168.4	178.3	64.6	3056.4	1804.9	1868.7
Total	6201	2820.1	3400	7104.6	3840.3	4665.7	928.1	510.7	13305.6	7693.6	8576.4
Average	1240.2	564.0	680	1420.9	768.1	933.1	185.6	102.1	2661.1	1538.7	1715.3
Total Combined	12526.2			15610.6			1438.8		29575.6		
Average Combined	835.1			1040.7			143.9		2019.7		
Percent	41% (416.9 mt dw)			52% (528.8 mt dw)			7% (71.2 mt dw)		100%		

*Northeast Commercial Fisheries Database System (CFDBS). There is no canvass data available for the North Atlantic.

Table 3.73 Commercial landings of SCS in the Atlantic and Gulf of Mexico by region and year year in mt dw for QMS and Logbook data and mt ww for Canvass and CFDBS data from 1999-2003.

Year	South Atlantic			Gulf of Mexico			North Atlantic		Total		
	Canvass	QMS	Logbook	Canvass	QMS	Logbook	CFDBS*	Logbook	Canvass	QMS	Logbook
1999	391.3	317.3	198.4	11.8	14.5	26.5	3.7	2.07	403.1	335.7	226.97
2000	357.5	229.9	74.5	11.6	24.1	13	12.6	9.3	369.1	266.6	96.8
2001	446.3	309	143.9	8.8	18.9	34.5	0.1	7.8	455.1	328	186.2
2002	311.1	248.9	156.7	36.9	11.4	42.4	15.4	5.4	348	275.7	204.5
2003	168.3	197.4	147.1	47.9	46.1	73.6	0	7.4	216.2	243.5	228.1
Total	1674.5	1302.5	720.6	117.0	115.0	190.0	31.8	31.97	1791.5	1449.5	942.57
Average	334.9	260.5	144.12	23.4	23.0	38.0	6.4	6.394	358.3	289.9	188.514
Total Combined	3697.6			422			63.8		4183.4		
Average Combined	246.5			28.1			6.4		281.0		
Percent	88% (398.2 mt dw)			10% (45.4 mt dw)			2% (10.3 mt dw)		100%		

*Northeast Commercial Fisheries Database System (CFDBS). There is no canvass data available for the North Atlantic.

3.5 Economic Status of HMS Fisheries

The review of each rule, and of HMS fisheries as a whole, is facilitated when there is a baseline against which the rule or fishery may be evaluated. In this analysis, as in past SAFE reports, NMFS used 1996 as a baseline. NMFS believes that this baseline is appropriate because the Regulatory Flexibility Act (RFA) and Magnuson-Stevens Act were both amended in 1996, NMFS began to collect economic information voluntarily for vessels using the pelagic logbook in 1996, and regarding HMS specifically, no rules were implemented in 1996 that were classified as significant under RFA. Additionally, while the Atlantic Tunas, Swordfish, and Shark FMP and the Billfish Amendment 1 were finalized in 1999, scoping for these two major documents and its final rule began in 1997. It is possible that anticipation of these documents and any potential changes in their implementing regulations could have begun to impact the decisions made by HMS fishermen and any associated businesses.

In addition to using the 1996 baseline, this FEIS also provides six years of data, when possible, in order to facilitate the analysis of trends. It also should be noted that all dollar figures are reported in nominal dollars (*i.e.,* current dollars). If analysis of real dollar (*i.e.,* constant dollar) trends controlled for inflation is desired, price indexes for 1996 to 2004 are provided in. To determine the real price in base year dollars, divide the base year price index by the current year price index, and then multiply this result by the price that is being adjusted for inflation. From 1996 to 2004, the Consumer Price Index (CPI-U) indicates that prices have risen by 20.4 percent, the Gross Domestic Product (GDP) Implicit Price Deflator indicates that prices have risen 16.3 percent, and the Producer Price Index (PPI) for unprocessed finfish indicates a 20.8 percent rise in prices. From 2002 to 2003, the CPI, GDP Deflator, and the PPI for unprocessed finfish indicate prices rose by 2.3 percent, 2.0 percent, and declined by 2.8 percent respectively. From 2003 to 2004, the CPI, GDP Deflator, and the PPI for unprocessed finfish indicate prices rose by 2.7 percent, 2.6 percent, and 14.5 percent respectively.

Table 3.74 **Inflation Price Indexes.** The CPI-U is the standard Consumer Price Index for all urban consumers (1982-1984=100) produced by U.S. Department of Labor Bureau of Labor Statistics. The source of the Producer Price Index (PPI) for unprocessed finfish (1982=100) is also the Bureau of Labor Statistics. The Gross Domestic Product Implicit Price Deflator (200=100) is produced by the U.S. Department of Commerce Bureau of Economic Analysis and obtained from the Federal Reserve Bank of St. Louis (**http://www.stlouisfed.org/**).

Year	CPI-U	GDP Deflator	PPI Unprocessed Finfish
1996	156.9	93.8	185.5
1997	160.5	95.4	165.7
1998	163	96.5	170.7
1999	166.6	97.9	191.7
2000	172.2	100.0	182.4
2001	177.1	102.4	176.1
2002	179.9	104.2	201.5
2003	184	106.3	195.8
2004	188.9	109.1	224.1

3.5.1 Commercial Fisheries[4]

In 2003, the total commercial landings at ports in the 50 states by U.S. fishermen were 9.5 billion pounds valued at $3.3 billion. In 2004, the total commercial landings at ports in the 50 states by U.S. fishermen were 9.6 billion pounds and were valued at $3.7 billion. The overall value of landings between 2003 and 2004 had increased by nine percent. The total value of commercial HMS landings in 2004 was $43.9 million (Table 3.77). The 2004 ex-vessel price index indicated that 12 of the 17 finfish species tracked had increasing ex-vessel prices and five species had decreasing ex-vessel prices since 2003. The total edible finfish ex-vessel price index for 2004 was up eight percent from 2003.

The estimated value of the 2004 domestic production of all fishery products was $6.6 billion. This is $909 million less than the estimated value in 2003. The total import value of fishery products was $22.9 billion in 2004. This is an increase of $1.7 billion from 2003. The total import value in 1996 was $13.1 billion. The total export value of fishery products was $13.6 billion in 2004. This is an increase of $1.6 billion from 2003. The total export value in 1996 was $8.7 billion.

Consumers spent an estimated $61.9 billion for fishery products in 2004 including $42.8 billion at food service establishments, $18.9 billion in retail sales for home consumption, and $213.3 million for industrial fish products. The commercial marine fishing industry contributed $31.6 billion to the U.S. Gross National Product in 2004. In 1996, consumers spent an estimated $41.2 billion including $27.8 billion at food service establishments, $13.2 billion for home consumption, and $283.9 billion for industrial fish products. The commercial marine fishing industry contributed $21.0 billion to the U.S. Gross National Product in 1996.

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

3.5.1.1 Ex-Vessel Prices

The average ex-vessel prices per pound dressed weight (dw) for 1996 and 1999 to 2004 by area, Atlantic HMS, and major gear types are summarized in Table 3.75. The average ex-vessel prices per lb dw for 1996 and 1999 to 2004 by species and area are summarized in Table 3.76. For both of these tables, prices are reported in nominal dollars. The ex-vessel price depends on a number of factors including the quality of the fish (*e.g.,* freshness, fat content, method of storage), the weight of the fish, the supply of fish, and consumer demand.

Table 3.75 Average ex-vessel prices per lb dw for Atlantic HMS by gear and area. Source: Dealer weighout slips from the Southeast Fisheries Science Center and Northeast Fisheries Science Center, and bluefin tuna dealer reports from the Northeast Regional Office. HND=Handline, harpoon, spears, trot lines, and trolls, PLL=Pelagic longline, BLL=Bottom longline, Net=Gillnets and pound nets, TWL=Trawls, SEN=Seines, TRP=Pots and traps, DRG=Dredge, and UNK=Unknown. Gulf of Mexico includes: TX, LA, MS, AL, and the west coast of FL. S. Atlantic includes: east coast of FL. GA, SC, and NC dealers reporting to Southeast Fisheries Science Center. Mid-Atlantic includes: NC dealers reporting to Northeast Fisheries Science Center, VA, MD, DE, NJ, NY, and CT. N. Atlantic includes: RI, MA, NH, and ME. For bluefin tuna, all NC landings are included in the Mid-Atlantic.

Gulf of Mexico								
Species	**Gear**	**1996**	**1999**	**2000**	**2001**	**2002**	**2003**	**2004**
Bigeye tuna	HND	$0.68	$2.13	$1.83	$1.82	$1.44	$1.25	$3.45
	PLL	-	$4.04	$2.82	$2.64	$5.09	$3.41	$4.58
	BLL	-	$4.41	$2.31	$0.50	$4.24	$3.53	$5.67
Bluefin tuna	HND	-	-	$1.86	$1.25	$2.69	-	-
	PLL	$5.83	$6.32	-	-	$6.40	$6.32	$4.64
	BLL	-	-	-	-	$4.50	-	-
Yellowfin tuna	HND	-	$2.38	$2.48	$2.55	$2.83	$2.34	$2.56
	PLL	-	$3.18	$3.40	$3.25	$3.68	$3.64	$4.01
	BLL	-	$3.06	$3.68	$3.31	$3.23	$3.73	$4.01
Other tunas	HND	$0.28	$0.90	$0.76	$0.79	$0.91	$0.87	$1.04
	PLL	-	$0.78	$0.72	$0.70	$0.79	$0.66	$0.58
	BLL	-	$0.67	$0.85	$0.74	$0.75	$0.55	$0.65
	NET	$0.38	$0.33	$0.58	$0.33	$0.83	$0.29	$0.41
	TWL	-	$0.70	$0.61	$0.78	$0.40	$0.30	-
	SEN	-	$0.52	-	$0.61	$0.19	-	$0.21
	TRP	-	-	-	-	$0.30	$0.30	-
Swordfish	HND	-	$3.21	$3.91	$2.84	$3.19	$3.68	$3.38
	PLL	-	$3.39	$3.33	$3.41	$2.94	$2.91	$3.32
	BLL	-	$3.29	$3.10	$3.25	$2.88	$2.67	$2.89
Large coastal sharks	HND	$0.23	$0.64	$0.59	$0.51	$0.44	$0.45	$0.45
	PLL	-	$0.79	$0.48	$0.45	$0.36	$0.38	$0.53
	BLL	$0.60	$0.55	$0.43	$0.44	$0.36	$0.38	$0.34
	NET	$0.38	$0.41	$0.48	$0.50	$0.39	$0.43	$0.39
	TWL	$0.15	$0.49	$0.15	$0.25	$0.25	$0.25	$0.25
Pelagic sharks	HND	-	$1.35	$1.38	$1.48	$0.93	$1.04	$1.21
	PLL	-	$1.27	$1.27	$1.32	$1.06	$1.11	$1.08
	BLL	-	$1.43	$1.31	$1.42	$1.19	$1.15	$1.03

Small coastal sharks	HND	-	$0.59	$0.93	$0.37	$0.38	$0.32	$0.59
	PLL	-	$0.50	$0.47	$0.74	$0.32	$0.33	$0.37
	BLL	-	$0.52	$0.41	$0.61	$0.53	$0.50	$0.45
	NET	-	$0.67	-	$0.45	$0.46	$0.36	$0.50
	TRP	-	-	-	$0.74	-	-	-
Shark fins	HND	-	$8.51	$21.57	$15.90	$21.28	$13.97	$12.49
	PLL	-	$14.02	$15.65	$21.08	-	$15.21	$17.81
	BLL	-	$14.34	$15.89	$21.50	$22.72	$20.17	$21.95
	NET	-	$7.78	$15.50	$11.02	-	$6.05	$5.86
	TWL	-	-	$9.17	-	-	-	-
South Atlantic								
Species	**Gear**	**1996**	**1999**	**2000**	**2001**	**2002**	**2003**	**2004**
Bigeye tuna	HND	$1.30	$2.02	$1.02	$2.14	$2.29	$1.89	$2.97
	PLL	$1.33	$2.87	$2.27	$2.78	$2.33	$2.26	$2.85
	BLL	$1.30	$3.00	$1.87	$2.63	$2.74	$2.66	-
	NET	$1.30	-	-	-	-	-	-
Bluefin tuna	HND	-	-	$7.99	$3.52	$3.35	-	$5.94
	PLL	$4.62	$4.71	$5.36	$4.82	$4.95	$4.11	$4.91
	BLL	-	-	-	$3.61	$5.15	-	-
Yellowfin tuna	HND	$1.55	$1.41	$1.56	$1.41	$1.54	$1.54	$1.24
	PLL	$1.63	$2.17	$2.23	$2.14	$1.89	$2.09	$2.00
	BLL	$1.41	$2.45	$2.29	$2.45	$2.29	$2.60	$0.90
	NET	$1.07	$0.87	-	$1.21	$1.12	-	-
	TWL	-	-	-	-	$0.44	-	-
Other tunas	HND	$0.75	$0.67	$0.59	$0.61	$0.47	$0.58	$0.52
	PLL	$0.79	$1.47	$1.31	$1.33	$1.09	$1.26	$1.28
	BLL	$0.87	$1.41	$1.49	$1.86	$1.67	$1.13	$0.48
	NET	$0.35	$0.19	$0.20	$0.23	$0.21	$0.21	$0.20
	TWL	$0.31	$0.56	$0.25	$0.47	$0.26	-	$0.20
	SEN	-	$0.11	-	-	-	-	-
	TRP	-	-	-	$0.18	-	-	-
Swordfish	HND	$2.48	$3.04	$3.92	$4.24	$3.93	$3.91	$4.44
	PLL	$2.88	$3.27	$3.12	$3.27	$2.84	$2.98	$3.18
	BLL	$2.46	$3.39	$3.42	$3.14	$2.76	$3.19	-
	NET	-	-	-	-	$2.50	-	-
Large coastal sharks	HND	$0.72	$0.66	$0.59	$0.96	$1.01	$0.49	$0.43
	PLL	$1.54	$1.32	$1.21	$1.69	$2.63	$0.35	$0.54
	BLL	$0.73	$1.13	$0.78	$0.89	$1.10	$0.39	$0.44
	NET	$1.30	$1.70	$0.91	$1.49	$1.59	$0.30	$0.35
	TWL	$0.86	$0.67	$0.49	$0.51	$0.81	$0.41	$0.71
	TRP	-	-	-	-	$0.23	-	-
Pelagic sharks	HND	$0.82	$0.95	$0.78	$0.71	$0.68	$0.84	$0.97
	PLL	$0.68	$1.04	$0.95	$0.95	$0.93	$0.93	$0.84
	BLL	$0.59	$0.89	$0.90	$0.78	$0.75	$0.87	$0.81
	NET	$0.33	$0.28	$0.35	$0.36	$0.34	$0.34	$0.29
	TWL	-	$0.21	$0.20	$0.26	$0.26	-	-

Small coastal sharks	HND	$0.25	$0.39	$0.40	$0.46	$0.53	$0.49	$0.44
	PLL	-	$0.57	$0.57	$0.63	$0.41	$0.24	-
	BLL	-	$0.57	$0.56	$0.53	$0.54	$3.19	$0.61
	NET	$0.25	$0.52	$0.48	$0.54	$0.54	$0.53	$0.65
	TWL	-	$0.52	$0.23	$0.23	-	-	-
Shark fins	HND	$14.00	$5.65	$11.92	$19.75	$15.53	$17.17	$20.31
	PLL	-	$11.18	$10.34	$11.44	$6.81	$12.72	$9.91
	BLL	$14.00	$15.76	$17.57	$22.21	$22.26	$17.83	$19.48
	NET	-	$5.19	$6.95	$10.60	$10.41	$12.85	$8.76
	TWL	$9.11	$6.61	-	$12.17	$14.00	$10.77	$5.90
Mid-Atlantic								
Species	**Gear**	**1996**	**1999**	**2000**	**2001**	**2002**	**2003**	**2004**
Bigeye tuna	HND	$5.74	$3.62	$4.45	$4.32	$3.97	$3.79	$4.93
	PLL	$3.51	$3.19	$4.30	$3.81	$4.12	$3.92	$4.48
	BLL	$2.61	$4.33	$3.45	$4.37	$2.84	$3.91	$4.34
	NET	$3.87	$4.63	$5.55	$4.50	-	-	-
	TWL	$4.68	$3.16	$5.68	-	-	-	-
	DRG	-	-	-	-	$1.50	-	-
	UNK	-	-	-	-	$5.00	-	$5.36
Bluefin tuna	HND	$14.70	$3.51	$6.60	$4.93	$4.06	$7.54	$10.25
	PLL	$6.12	$7.34	$5.73	$6.83	$5.72	$6.25	$6.03
	NET	$15.71	-	-	$2.23	-	-	-
	BLL	-	-	-	$7.00	$7.00	-	-
Yellowfin tuna	HND	$2.49	$1.60	$2.14	$2.11	$2.00	$1.93	$1.76
	PLL	$2.51	$2.15	$2.32	$2.30	$2.14	$2.00	$1.91
	BLL	$3.28	$1.51	$1.86	$2.11	$1.81	$1.89	$2.20
	NET	$1.07	$1.07	$1.77	$1.49	$1.81	$1.50	$2.08
	TWL	$2.40	$1.59	$1.56	$1.53	-	$1.48	-
	TRP	-	-	-	-	$1.97	$1.57	$1.59
	DRG	-	-	-	-	$1.94	-	-
	UNK	-	-	-	-	$2.75	-	$2.62
Other tunas	HND	$1.34	$0.89	$0.94	$0.89	$0.69	$0.66	$0.65
	PLL	$1.84	$1.59	$1.03	$0.88	$0.86	$0.93	$1.09
	BLL	-	$0.83	$1.17	$0.78	$0.83	$1.08	$0.97
	NET	$0.45	$0.54	$0.44	$0.49	$0.75	$0.48	$0.35
	TWL	$0.45	$0.66	$0.70	$0.47	$0.42	$0.62	$0.52
	TRP	-	-	-	-	$0.57	$0.47	$0.58
	DRG	-	-	-	-	$1.00	-	-
	UNK	-	-	-	-	$1.03	$1.69	$0.65
Swordfish	HND	$3.61	$3.13	$3.25	$3.70	-	-	-
	PLL	$4.31	$3.53	$3.59	$3.47	$3.18	$2.97	$2.86
	BLL	$4.88	$3.77	$2.91	$3.45	$4.00	-	$3.43
	NET	$4.63	$3.81	-	$4.19	$3.51	-	-
	TWL	$4.56	$3.29	$3.94	$2.86	$3.34	$3.21	$3.55
Large coastal sharks	HND	$0.74	$0.96	$0.50	$0.88	$2.09	$2.19	$1.06
	PLL	$0.58	$0.79	$0.45	$2.62	$2.78	$2.32	$3.37

sharks	BLL	$0.54	$0.56	$0.41	$0.55	$1.11	$2.08	$2.32
	NET	$0.45	$0.46	$0.53	$0.89	$1.02	$1.02	$1.52
	TWL	$0.47	$0.49	$0.72	$0.55	$0.52	$0.50	$0.80
	TRP	-	-	-	-	$2.50	-	-
	SEN	-	-	-	-	$1.26	-	-
	UNK	-	-	-	-	$0.50	-	$0.68
Pelagic sharks	HND	$1.47	$1.71	$1.41	$1.26	$1.41	$1.57	$1.26
	PLL	$1.25	$1.39	$1.45	$1.56	$1.31	$1.32	$1.22
	BLL	$1.47	$1.04	$1.24	$0.97	$1.12	$1.17	$1.41
	NET	$0.99	$0.99	$1.02	$1.02	$0.97	$1.08	$1.32
	TWL	$1.00	$1.10	$0.90	$0.69	$1.03	$0.88	$0.55
	TRP	-	-	-	$0.40	-	$1.43	-
	DRG	-	-	-	$0.49	$2.00	-	-
	UNK	-	-	-	-	-	$0.57	$1.78
Small coastal sharks	HND	-	$0.46	$0.38	$0.51	$0.45	$0.36	$0.50
	PLL	$0.25	-	$0.20	$0.44	$0.50	$0.39	-
	BLL	-	-	-	$0.95	-	-	-
	NET	-	$0.45	$0.40	-	$0.42	$0.39	$0.44
	TWL	-	$0.53	-	-	$1.26	-	-
Shark fins	HND	$2.74	$3.60	$6.17	-	-	-	-
	PLL	$7.79	$3.35	$8.57	-	-	-	-
	BLL	$8.00	-	-	-	-	-	-
	NET	$4.77	$3.96	$3.38	-	-	-	-
North Atlantic								
Species	**Gear**	**1996**	**1999**	**2000**	**2001**	**2002**	**2003**	**2004**
Bigeye tuna	HND	$3.69	$3.41	$4.22	$6.00	-	-	$4.89
	PLL	$3.36	$3.26	$4.39	$3.42	$4.08	$3.50	$3.79
	BLL	$2.15	-	-	-	-	-	$4.30
	NET	$3.31	-	$0.42	-	-	-	-
	TWL	$8.00	$3.29	$3.87	$3.54	$3.76	-	-
Bluefin tuna	HND	$10.73	$8.44	$10.02	$8.21	$7.94	$6.33	$7.79
	PLL	$5.56	$7.06	$5.65	$5.24	$5.96	$4.21	$5.38
	NET	-	-	-	$4.26	-	-	-
	SEN	$11.05	$7.83	$7.80	$7.43	$6.61	$4.92	$5.92
	TWL	-	-	-	$3.80	-	-	-
Yellowfin tuna	HND	$2.50	$1.16	$2.66	$2.87	$3.25	$1.90	$2.90
	PLL	$2.14	$2.44	$2.77	$3.01	$2.76	$2.57	$2.89
	BLL	$2.03	$0.51	$2.32	$3.77	-	-	$2.51
	NET	$2.43	$0.50	-	-	$4.75	-	-
	TWL	$2.67	$2.21	$2.31	$2.10	$2.19	$1.65	$3.25
	TRP	-	-	-	-	$4.50	$3.10	-
Other tunas	HND	$1.90	$1.41	$1.59	$2.39	$2.03	$1.56	$1.78
	PLL	$0.98	$0.60	$1.13	$0.70	$1.15	$1.00	$1.17

	BLL	$1.50	-	$0.50	$3.00	-	-	$0.66
	NET	$0.73	$0.20	$0.50	$0.36	$0.70	$1.14	$0.44
	TWL	$1.08	$0.37	$0.22	$0.80	$0.69	$0.37	$0.89
	TRP	-	-	-	-	$0.34	$0.44	-
	DRG	-	-	-	-	$3.00	-	-
Swordfish	HND	$5.20	-	$8.00	$5.69	$5.32	-	$4.79
	PLL	$4.01	$3.30	$3.67	$3.58	$3.30	$3.36	$3.85
	BLL	$3.07	-	$2.00	-	-	-	$3.75
	NET	$5.62	-	-	-	$4.25	-	-
	TWL	$3.08	$3.77	$4.05	$4.75	$3.05	$3.18	$4.89
	TRP	-	-	-	-	$3.74	-	-
Large coastal sharks	HND	-	$0.74	-	$0.50	$0.45	$0.74	-
	PLL	$1.03	-	$1.00	$1.21	$0.29	$0.28	$1.03
	BLL	$0.99	$1.03	$0.65	$1.43	$1.00	-	-
	NET	$0.83	$0.64	$1.06	$0.99	$0.89	$0.89	$0.68
	TWL	$0.80	$1.00	$1.08	$0.93	$0.86	$0.66	$0.56
	TRP	-	-	-	-	$0.28	$0.22	-
Pelagic sharks	HND	$1.60	-	-	$1.38	$1.71	-	-
	PLL	$1.26	$3.30	$1.38	$1.37	$1.31	$1.30	$1.34
	BLL	$1.85	$0.89	$1.50	-	$0.65	-	$1.07
	NET	$1.12	$0.70	$0.82	$0.98	$0.60	$1.30	$1.99
	TWL	$0.96	$0.77	$0.97	$1.19	$0.81	$0.63	$0.78
	TRP	-	-	-	-	$0.69	$0.68	-
Small coastal sharks	HND	-	-	-	-	-	-	-
	NET	-	-	-	$1.51	-	-	-
	TWL	-	-	-	-	$0.58	-	-
Shark fins	PLL	$4.25	-	$5.54	-	-	-	-
	BLL	$3.00	$0.33	$25.19	-	-	-	-
	NET	$1.96	$2.79	$2.41	-	-	-	-
	TWL	$2.32	$0.49	$3.00	-	-	-	-

Table 3.76 Average ex-vessel prices per lb for Atlantic HMS by area.

Species	Area	1996	1999	2000	2001	2002	2003	2004
Bigeye tuna	Gulf of Mexico	$0.68	$3.38	$2.26	$1.94	$4.33	$3.29	$4.54
	S. Atlantic	$1.32	$2.77	$1.98	$2.57	$2.45	$2.24	$2.86
	Mid-Atlantic	$3.99	$3.52	$4.39	$4.26	$3.82	$3.77	$4.56
	N. Atlantic	$3.59	$3.30	$4.12	$4.32	$4.03	$3.45	$4.42
Bluefin tuna	Gulf of Mexico	$5.83	$6.32	$1.86	$1.25	$5.56	$6.32	$4.64
	S. Atlantic	$4.62	$4.70	$6.83	$4.00	$3.77	$4.11	$4.91
	Mid-Atlantic	$9.48	$5.90	$5.98	$5.25	$4.70	$7.38	$9.62
	N. Atlantic	$10.78	$8.26	$8.94	$5.79	$7.31	$5.71	$7.42
Yellowfin tuna	Gulf of Mexico	-	$2.94	$3.22	$2.98	$3.23	$3.31	$3.75
	S. Atlantic	$1.56	$1.77	$1.88	$1.70	$1.73	$1.76	$1.53
	Mid-Atlantic	$2.43	$1.61	$2.12	$1.91	$2.02	$1.91	$1.98
	N. Atlantic	$2.35	$1.52	$2.65	$2.93	$2.90	$2.38	$2.65
Other tunas	Gulf of Mexico	$0.29	$0.86	$0.74	$0.76	$0.84	$0.75	$0.89
	S. Atlantic	$0.62	$0.61	$0.58	$0.58	$0.49	$0.59	$0.49
	Mid-Atlantic	$1.10	$0.80	$0.76	$0.70	$0.73	$0.70	$0.63
	N. Atlantic	$1.31	$0.51	$0.93	$1.46	$1.17	$0.95	$0.94
Swordfish	Gulf of Mexico	-	$3.35	$3.25	$3.31	$2.91	$2.95	$3.31
	S. Atlantic	$2.79	$3.27	$3.24	$3.43	$3.14	$3.26	$3.52
	Mid-Atlantic	$4.43	$3.47	$3.67	$3.53	$3.25	$2.97	$3.37
	N. Atlantic	$4.09	$3.45	$3.87	$4.67	$3.47	$3.33	$4.06
Large coastal sharks	Gulf of Mexico	$0.21	$0.56	$0.43	$0.44	$0.36	$0.38	$0.37
	S. Atlantic	$1.02	$1.10	$0.78	$1.12	$1.27	$0.39	$0.44
	Mid-Atlantic	$0.55	$0.59	$0.53	$1.09	$1.56	$1.62	$1.93
	N. Atlantic	$0.88	$0.77	$1.01	$1.02	$0.77	$0.72	$0.70
Pelagic sharks	Gulf of Mexico	-	$1.36	$1.31	$1.42	$1.11	$1.13	$1.08
	S. Atlantic	$0.62	$0.83	$0.76	$0.68	$0.67	$0.71	$0.65
	Mid-Atlantic	$1.21	$1.23	$1.20	$1.09	$1.17	$1.21	$1.29
	N. Atlantic	$1.31	$0.81	$1.10	$1.23	$1.00	$1.12	$1.46
Small coastal sharks	Gulf of Mexico	-	$0.55	$0.52	$0.58	$0.48	$0.40	$0.45
	S. Atlantic	$0.25	$0.50	$0.48	$0.52	$0.53	$0.51	$0.61
	Mid-Atlantic	$0.25	$0.47	$0.38	$0.55	$0.48	$0.38	$0.44
	N. Atlantic	-	-	-	$1.51	$0.58	-	-
Shark fins	Gulf of Mexico	-	$14.01	$15.99	$20.90	$22.64	$18.12	$17.93
	S. Atlantic	$10.74	$11.10	$14.16	$18.43	$17.10	$15.85	$14.57
	Mid-Atlantic	$4.60	$3.41	$4.90	-	-	-	-
	N. Atlantic	$2.69	$1.19	$6.83	-	-	-	-

Table 3.75 and Table 3.76 indicate that the average ex-vessel prices for bigeye tuna have generally increased since 1996. Prices from 2003 to 2004 have increased in all four regions. The gears used also influenced the average price of bigeye tuna.

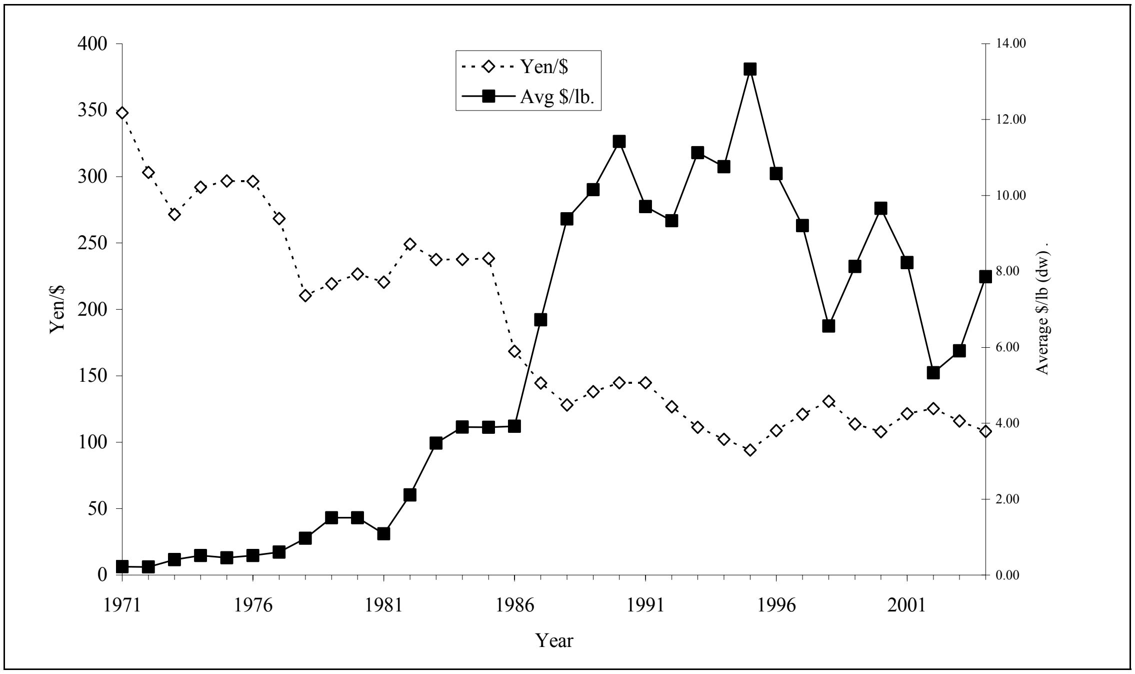


Figure 3.33 Average Annual Yen/$ Exchange Rate and Average U.S. BFT Ex-vessel $/lb (dw) for all gears: 1971-2003. Source: Federal Reserve Bank (www.stls.frb.org) and Northeast Regional Office.

Average ex-vessel prices for bluefin tuna have generally declined since 1996. Since 2002, however, prices increased in all regions except the North Atlantic (Table 3.76). The gear used also made a difference in the ex-vessel price (Table 3.75). In the North Atlantic and Mid-Atlantic, bluefin tuna caught with handgear had higher average prices than those caught with longline. This trend has been fairly consistent over the years between 1996 and 2004. The ex-vessel prices for bluefin tuna can be influenced by many factors, including market supply and the Japanese Yen/U.S. Dollar (¥/$) exchange rate. Figure 3.33 shows the average ¥/$ exchange rate, plotted with average ex-vessel bluefin tuna prices, from 1971 to 2003.

The average ex-vessel prices for yellowfin tuna have increased in 2004 in the Gulf of Mexico, Mid-Atlantic and North Atlantic while increasing slightly in the South Atlantic (Table 3.76). Yellowfin tuna caught with longline gear had higher average ex-vessel prices than fish caught with other gear types in 2004 (Table 3.75). The average ex-vessel price for other tunas decreased in all regions except the Gulf of Mexico in 2004 (Table 3.76). The average price of other tunas is lowest in the South Atlantic compared to other regions. The type of gear used did not appear to consistently influence the average ex-vessel prices of other tuna. Average ex-vessel prices for swordfish increased in 2004 in all regions (Table 3.76). Swordfish caught using handline gear had higher average ex-vessel prices than other gear types, except in the Mid-Atlantic where it was trawls (Table 3.75).

The average ex-vessel price for LCS slightly decreased in the Gulf of Mexico in 2004 and North Atlantic. However, prices for LCS increased in the Mid-Atlantic and South Atlantic (Table 3.76). The average ex-vessel prices for pelagic sharks increased in the Mid-Atlantic and North Atlantic regions in 2004 (Table 3.76), while prices decreased in Gulf of Mexico and South Atlantic. The 2004 prices for pelagic sharks are not significantly different than 1996 prices and are actually lower than 1996 when adjusting for inflation. The average ex-vessel prices for small coastal sharks (SCS) rebounded in all regions in 2004 (Table 3.76). Gear type did not consistently affect ex-vessel price of small coastal sharks in 2004 (Table 3.75).

3.5.1.2 Revenues

Table 3.77 summarizes the average annual revenues of the Atlantic HMS fishery based on average ex-vessel prices and the weight reported landed as per the U.S. National Report (NMFS 2005), the Shark Evaluation Reports, information given to ICCAT (Cortes, 2005), as well as price and weight reported to the NMFS Northeast Regional Office by Atlantic bluefin tuna dealers. These values indicate that the estimated total annual revenue of Atlantic HMS fisheries has decreased 34 percent from approximately $66.4 million in 1996 to approximately $43.9 million in 2004. From 2003 to 2004, the tuna fishery's total revenue decreased significantly. A majority of that decrease can be attributed to reduced commercial landings of bluefin tuna and yellowfin tuna. From 2003 to 2004, the annual revenues from shark decreased by over 21 percent. In contrast, the annual revenues from swordfish from 2003 to 2004 increased by five percent after having been in decline for several years.

Table 3.77 Estimates of the total ex-vessel annual revenues of Atlantic HMS fisheries. Sources: NMFS, 1997; NMFS 2004a; Cortes, 2003; and bluefin tuna dealer reports from the Northeast Regional Office.

Species		1996	1999	2000	2001	2002	2003	2004
Bigeye tuna	Ex-vessel $/lb dw	$2.40	$3.24	$3.18	$3.27	$3.66	$3.19	$4.10
	Weight lb dw	1,212,706	1,664,385	1,012,352	2,391,350	1,267,645	846,191	551,503
	Fishery Revenue	$2,910,494	$5,395,971	$3,222,636	$7,827,218	$4,637,372	$2,697,233	$2,258,404
Bluefin tuna	Ex-vessel $/lb dw	$10.58	$8.14	$9.66	$8.23	$5.33	$5.91	$7.86
	Weight lb dw	1,652,989	1,926,442	2,137,580	2,176,016	4,133,625	2,519,345	885,720
	Fishery Revenue	$17,488,624	$15,677,959	$20,648,413	$17,904,240	$22,042,839	$14,889,328	$6,961,760
Yellowfin tuna	Ex-vessel $/lb dw	$2.11	$1.96	$2.46	$2.38	$2.48	$2.34	$2.48
	Weight lb dw	6,679,938	6,351,717	12,435,708	14,777,800	12,885,887	13,556,340	4,832,483
	Fishery Revenue	$14,094,669	$12,433,149	$30,577,372	$35,193,181	$31,919,170	$31,721,836	$11,972,477
Other tunas*	Ex-vessel $/lb dw	$0.83	$0.69	$0.75	$0.87	$0.81	$0.75	$0.74
	Weight lb dw	368,433	495,241	795,243	867,960	1,298,509	900,522	287,127
	Fishery Revenue	$305,799	$343,771	$593,595	$754,322	$1,057,273	$673,140	$211,756
Total tuna	**Fishery Revenue**	**$34,799,586**	**$33,850,849**	**$55,042,015**	**$61,678,960**	**$59,656,653**	**$49,981,537**	**$21,404,397**
Swordfish**	Ex-vessel $/lb dw	$3.77	$3.38	$3.51	$3.74	$3.20	$3.13	$3.57
	Weight lb dw	7,170,619	5,942,839	4,832,384	5,662,350	5,985,489	4,668,466	4,317,369
	Fishery Revenue	$27,033,234	$20,104,498	$16,974,346	$21,153,927	$19,150,819	$14,600,627	$15,391,422
Large coastal sharks	Ex-vessel $/lb dw	$0.67	$0.76	$0.68	$0.91	$0.99	$0.78	$0.86
	Weight lb dw	5,262,314	3,919,570	3,762,000	3,562,546	4,097,363	4,421,249	3,206,377
	Fishery Revenue	$3,525,750	$2,950,102	$2,560,307	$3,256,955	$4,040,977	$3,437,521	$2,757,484
Pelagic sharks	Ex-vessel $/lb dw	$1.05	$1.06	$1.09	$1.11	$0.99	$1.04	$1.12
	Weight lb dw	695,531	400,821	215,005	362,925	303,666	616,967	450,833
	Fishery Revenue	$730,308	$424,273	$233,650	$401,430	$299,487	$643,188	$504,933
Small coastal sharks	Ex-vessel $/lb dw	$0.25	$0.51	$0.46	$0.79	$0.52	$0.43	$0.50
	Weight lb dw	460,667	672,245	672245*	719,484	579,441	549,799	677,305
	Fishery Revenue	$115,167	$340,890	$309,926	$568,441	$299,023	$236,414	$338,653
Shark fins (weight = 5% of all sharks landed)	Ex-vessel $/lb dw	$6.01	$7.43	$10.47	$19.67	$19.87	$17.09	$16.25
	Weight lb dw	320,926	249,632	232,462	232,248	249,024	279,401	216,726
	Fishery Revenue	$218,561	$1,854,313	$2,434,344	$4,568,937	$4,949,056	$4,774,959	$3,521,793
Total sharks	**Fishery Revenue**	**$4,589,786**	**$5,569,578**	**$5,538,227**	**$8,795,763**	**$9,588,545**	**$9,092,082**	**$7,112,863**
Total HMS	Fishery Revenue	$66,422,606	$59,524,926	$77,554,588	$91,628,650	$88,396,016	$73,674,245	$43,918,682

Note: Average ex-vessel prices may have some weighting errors, except for bluefin tuna which is based on a fleet-wide average. Other tunas includes skipjack and albacore. ** Swordfish estimates do not include dead discards.

3.5.1.3 Wholesale Market

Currently, NMFS does not collect wholesale price information from dealers. However, the wholesale price of some fish species is available off the web (http://www.st.nmfs.gov/st1/market_news/index.html). The wholesale prices presented in Table 3.78 are from the annual reports of the Fulton Fish Market. As with ex-vessel prices, wholesale prices depend on a number of factors including the quality of the fish, the weight of the fish, the supply of fish, and consumer demand.

As reported by the Fulton Fish Market, Table 3.78 indicates that the average wholesale price of HMS sold in Atlantic and Gulf of Mexico states generally decreased from 1996 to 2003, except for blacktip shark. Prices have appeared to have rebounded in 2004, breaking from the declining trend. During that same period, the wholesale price of swordfish weighing over 100 pounds decreased 19 percent, swordfish weighing between 50 and 99 pounds decreased 25 percent, and swordfish cuts decreased 15 percent. The wholesale price of blacktip shark increased 27 percent from 1996 to 2003, with most of the increase occurring in 2003. The wholesale price of mako shark decreased 14 percent from 1996 to 2003, however 2003 wholesale prices were up from 2002. The wholesale price of thresher shark has decreased 22 percent from 1996 to 2003. Wholesale yellowfin tuna prices have remained relatively stable from 1996 to 2003. The yellowfin tuna wholesale price of #2 quality fish had decreased eight percent while the price of #2 cuts has increased seven percent from 1996 to 2003. Bigeye tuna wholesale prices from 1999 to 2003 have increased significantly for both high grade cuts and fish.

Table 3.78 The overall average wholesale price per lb of fresh HMS sold in Atlantic and Gulf of Mexico states as reported by the Fulton Fish Market. Source: NMFS, 2004.

Species	Description	1996 Price/lb	1999 Price/lb	2000 Price/lb	2001 Price/lb	2002 Price/lb	2003 Price/lb	2004 Price/lb
Blacktip	-	$1.05	$1.04	$1.04	$1.05	$1.00	$1.33	$1.08
Mako	-	$2.77	$2.74	$3.18	$3.00	$2.00	$2.37	$2.24
Thresher	-	$1.00	$0.91	$0.82	$1.25	$1.25	$0.78	$1.24
Swordfish	100# and up	$6.28	$5.26	$5.26	$5.42	$5.19	$5.08	$5.66
	50-99#	$6.02	$4.54	$4.72	$4.81	$4.59	$4.50	$5.15
	26-49#	$5.50	$3.36	$3.58	$4.05	$3.50	-	$3.25
	Cuts	$7.74	$6.55	$6.54	$6.73	$6.84	$6.55	$7.13
Yellowfin tuna	#1: BTF	$7.00	$5.97	$5.69	$5.50	$7.42	-	$6.00
	#1: Cuts	$9.38	$8.23	$8.00	$8.23	$10.67	-	$8.50
	#2: BTF	$5.00	$4.24	$4.36	$3.97	$4.92	$4.60	$4.62
	#2: Cuts	$6.52	$6.22	$6.20	$6.00	$7.29	$6.98	$7.32
	#3: BTF	-	$3.00	-	-	-	$2.50	-
	#3: Cuts	-	$4.50	-	-	-	-	$3.00
Bigeye tuna	#1: BTF	-	$4.00	-	-	-	$6.50	$7.75
	#1: Cuts	-	$5.50	-	-	-	$8.50	$11.00
	#2: BTF	-	$4.26	-	-	-	-	-
	#2: Cuts	-	$6.00	-	-	-	-	-

Note: #'s indicate quality (1 is highest, 3 is lowest); BTF is by the fish.

3.5.2 Recreational Fisheries

Although NMFS believes that recreational fisheries have a large influence on the economies of coastal communities, NMFS has only recently been able to gather additional information on the costs and expenditures of anglers or the businesses that rely on them.

An economic survey done by the U.S. Fish and Wildlife Service[2] in 2001 found that for the entire United States 9.1 million saltwater anglers (including anglers in state waters) went on approximately 72 million fishing trips and spent approximately $8.4 billion (USFWS, 2001). Expenditures included lodging, transportation to and from the coastal community, vessel fees, equipment rental, bait, auxiliary purchases (*e.g.*, binoculars, cameras, film, foul weather clothing, *etc.*), and fishing licenses (USFWS, 2001). Saltwater anglers spent $4.5 billion on trip-related costs and $3.9 billion on equipment (USFWS, 2001). Approximately 76 percent of the saltwater anglers surveyed fished in their home state (USFWS, 2001). The next USFWS survey is expected in 2006.

Specific information regarding angler expenditures for trips targeting HMS species was extracted from the recreational fishing expenditure survey add-on (1998 in the Northeast, 1999 – 2000 in the Southeast) to the National Marine Fisheries Service's Marine Recreational Fisheries Statistics Survey (MRFSS). These angler expenditure data were analyzed on a per person per trip-day level and reported in 2003 dollars. The expenditure data include the costs of tackle, food, lodging, bait, ice, boat fuel, processing, transportation, party/charter fees, access/boat launching, and equipment rental. The overall average expenditure on HMS related trips is estimated to be $122 per person per day. Specifically, expenditures are estimated to be $686 per person per day on billfish directed trips (based on a low sample size), $85 on pelagic shark directed trips, $95 on large coastal shark directed trips, $81 on small coastal sharks, and $106 on tuna trips.

The American Sportfishing Association (ASA) also has a report listing the 2001 economic impact of sportfishing on specific states. This report states that all sportfishing (in both Federal and state waters) has an overall economic importance of $116 billion dollars (ASA, 2001). Florida, Texas, North Carolina, New York, and Alabama are among the top ten states in terms of overall economic impact for both saltwater and freshwater fishing (ASA, 2001). Florida is also one of the top states in terms of economic impact of saltwater fishing with $2.9 billion in angler expenditures, $5.4 billion in overall economic impact, $1.5 billion in salaries and wages related to fishing, and 59,418 fishing related jobs (ASA, 2001). California followed Florida with $0.8 billion in angler expenditures, $1.7 billion in overall economic impact, $0.4 billion in salaries and wages, and 15,652 jobs (ASA, 2001). Texas and New Jersey were the next highest states in terms of economic impact (ASA, 2001).

At the end of 2004, NMFS began collecting market information regarding advertised charterboat rates. This preliminary analysis of the data collected includes 99 observations of advertised rates on the internet for full day charters. Full day charters vary from six to 14 hours long with a typical trip being 10 hours. Most vessels can accommodate six passengers, but this

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[2] This survey interviewed over 77,000 households during phase 1 and approximately 25,070 sports persons during phase 2. The response rate during phase two of the survey was 75 percent.

also varies from two to 12 passengers. Table 3.79 summarizes the average charterboat rate for full day trips on vessels with HMS Charter/Headboat permits. The average price for a full day boat charter was $1,053 in 2004. Sutton *et al.*, (1999) surveyed charterboats throughout Alabama, Mississippi, Louisiana, and Texas in 1998 and found the average charterboat base fee to be $762 for a full day trip. Holland *et al.* (1999) conducted a similar study on charterboats in Florida, Georgia, South Carolina, and North Carolina and found the average fee for full day trips to be $554, $562, $661, and $701, respectively. Comparing these two studies conducted in the late 1990s to the average advertised daily HMS charterboat rate in 2004, it is apparent that there has been a significant gain in charterboat rates.

Table 3.79 Average Atlantic HMS charterboat rates for day trips. Source: NMFS searches for advertised daily charter rates of HMS Charter/Headboat permit holders. (Observations=99)

State	2004 Average Daily Charter Rate
AL	$1,783
CT	$1,500
DE	$1,060
FL	$894
LA	$1,050
MA	$777
MD	$1,167
ME	$900
NC	$1,130
NJ	$1,298
NY	$1,113
RI	$917
SC	$1,300
TX	$767
VA	$825
Overall Average	**$1,053**

In 2003, Ditton and Stoll published a paper that surveyed the literature regarding what is currently known about the social and economic aspects of recreational billfish fisheries. It was estimated that 230,000 anglers in the United States spent 2,136,899 days fishing for billfish in 1991. This is approximately 3.6 percent of all saltwater anglers over age 16. The states with the highest number of billfish anglers are Florida, California, North Carolina, Hawaii, and Texas in descending order. Billfish anglers studied in the U.S. Atlantic, Puerto Rico, and Costa Rica fished between 39 and 43 days per year.

Billfish recreational anglers tend to spend a great deal of money on trips. Ditton and Stoll (2003) report that a 1990 study of U.S. total trip costs for a typical billfish angler estimated a mean expenditure of $2,105 per trip for the Atlantic and $1,052 per trip for Puerto Rico. The aggregate economic impact of billfish fishing trips in the U.S. Atlantic is conservatively estimated to be $22.7 million annually.

In addition to the economic impact of recreational billfish angling, Ditton and Stoll (2003) report that using a contingent valuation method they estimated consumer's surplus or net economic benefit to maintain current billfish populations in the U.S. Atlantic to be $497 per billfish angler per year in the U.S. Atlantic and $480 in Puerto Rico. They also estimate that the number of annual billfish anglers in the U.S. Atlantic to be 7,915 and 1,627 in Puerto Rico. The aggregate willingness-to-pay for maintaining current billfish populations is $3.93 million in the U.S. Atlantic and 0.78 million in Puerto Rico. The aggregate direct impact of billfish expenditures is estimated to be $15.13 million for the U.S. Atlantic and $32.40 million for Puerto Rico. Thus, the total aggregate economic value of billfish angler fishing is $19.06 million per year for the U.S. Atlantic and $33.18 million per year for Puerto Rico.

Generally, HMS tournaments last from three to seven days, but lengths can range from one day to an entire fishing season. Similarly, average entry fees can range from approximately $0 to $5,000 per boat (average approximately $500/boat – $1,000/boat), depending largely upon the magnitude of the prize money that is being awarded. The entry fee would pay for a maximum of two to six anglers per team during the course of the tournament. Additional anglers can, in some tournaments, join the team at a reduced rate of between $50 and $450. The team entry fee did not appear to be directly proportional to the number of anglers per team, but rather with the amount of money available for prizes and, possibly, the species being targeted. Prizes may include citations, T-shirts, trophies, fishing tackle, automobiles, boats, or other similar items, but most often consists of cash awards. In general, it appears that billfish and tuna tournaments charge higher entry fees and award more prize money than shark and swordfish tournaments, although all species have a wide range.

Cash awards distributed in HMS tournaments can be quite substantial. Several of the largest tournaments, some of which are described below, are part of the World Billfish Series Tournament Trail whereby regional winners are invited to compete in the World Billfish Series Grand Championship for a new automobile and a bronze sculpture. Other tournament series include the International Game Fish Association (IGFA) Rolex Tournament of Champions, and the South Carolina Governor's Cup. White marlin is a top billfish species from Cape Hatteras, North Carolina to the eastern tip of Georges Bank from June through October each year. The White Marlin Open in Ocean City, Maryland, which is billed as the "world's richest fishing tournament," established a new world record payout for catching a fish when it awarded $1.32 million in 2004 to the vessel catching the largest white marlin. The 21st Annual Pirates Cove Billfish Tournament in North Carolina awarded over $1 million in prizes in 2004, with the top boat garnering over $400,000 for winning in six categories. Total prize money awarded in the Big Rock Tournament in North Carolina has exceeded $1 million since 1998.

Blue marlin, sailfish, and tunas are also often targeted in fishing tournaments, including those discussed above. In 2004, blue marlin was the HMS most frequently identified as a prize category in registered HMS tournaments. Forty-five teams participated in the 2004 Emerald Coast Blue Marlin Classic at Sandestin, Florida, with over $482,000 in cash prizes and the top boat receiving over $58,000. The 34th Annual Pensacola (Florida) International Billfish

Tournament indicated that it would award over $325,000 in cash and prizes in 2004. The World Sailfish Championship in Key West, Florida has a $100,000 guaranteed first prize for 2005. In South Carolina, the Megadock Billfishing Tournament offers a $1,000,000 prize for any boat exceeding the current blue marlin state record. The 2004 Florida Billfish Masters Tournament in Miami, Florida awarded over $123,000 in prize money, with the top boat receiving over $74,000. Sixty-two boats competed in the 2003 Babylon Tuna Club Invitational in Babylon, New York for over $75,000 in cash prizes, and the Mid-Atlantic Tuna Tournament sponsored by the South Jersey Marina in Cape May, New Jersey anticipates awarding over $25,000 in prizes in 2005.

Several tournaments target sharks. Many shark tournaments occur in New England, New York, and New Jersey, although other regions hold shark tournaments as well. In 2004, the 24th Annual South Jersey Shark Tournament hosted over 200 boats and awarded over $220,000 in prize money, with an entry fee of $450 per boat. The "Mako Fever" tournament, sponsored by the Jersey Coast Shark Anglers, in 2004 awarded over $55,000 in prizes, with the first place vessel receiving $25,000. In 2004, the 18th Annual Monster Shark Tournament in Martha's Vineyard, Massachusetts was broadcast on ESPN, and featured a new fishing boat valued at over $130,000 awarded to the winner.

Swordfish tournaments have gained increased popularity in recent years, especially on the east coast of Florida, as the swordfish population has recovered. Events include the Islamorada Swordfish Tournament that began in 2004, and the Miami Swordfish Tournament that began in 2003. Both of these tournaments anticipated awarding over $30,000 in total cash and prizes, assuming that 50 boats would participate.

In addition to official prize money, many fishing tournaments may also conduct a "calcutta" whereby anglers pay from $200 to $5,000 to win more money than the advertised tournament prizes for a particular fish. Tournament participants do not have to enter calcuttas. Tournaments with calcuttas generally offer different levels depending upon the amount of money an angler is willing to put down. Calcutta prize money is distributed based on the percentage of the total amount entered into that Calcutta. Therefore, first place winner of a low level Calcutta (entry fee ~$200) could win less than a last place winner in a high level calcutta (entry fee ~$1000). On the tournament websites, it was not always clear if the total amount of prizes distributed by the tournament included prize money from the calcuttas or the estimated price of any equipment. As such, the range of prizes discussed above could be a combination of fish prize money, Calcutta prize money, and equipment/trophies.

Fishing tournaments can sometimes generate a substantial amount of money for surrounding communities and local businesses. Besides the entry fee to the tournament and possibly the calcutta, anglers may also pay for marina space and gas (if they have their own vessel), vessel rental (if they do not have their own vessel), meals and awards dinners (if not covered by the entry fee), hotel, fishing equipment, travel costs to and from the tournament, camera equipment, and other miscellaneous expenses. Fisher and Ditton (1992) found that the average angler who attended a billfish tournament spent $2,147 per trip (2.59 days), and that billfish tournament anglers spent an estimated $180 million (tournament and non-tournament trips) in 1989. Ditton and Clark (1994) estimated annual expenditures for Puerto Rican billfish fishing trips (tournaments and non-tournaments) at $21.5 million. More recently, Ditton, *et al.*,

(2000) estimated that the total expenditure (direct economic impact) associated with the 1999 Pirates Cove Billfish Tournament, not including registration fees, was approximately $2,072,518. The total expenditure (direct economic impact) associated with the 2000 Virginia Beach Red, White, and Blue Tournament was estimated at approximately $450,359 (Thailing, *et al*., 2001). These estimated direct expenditures do not include economic effects that may ripple through the local economy leading to a total impact exceeding that of the original purchases by anglers (*i.e*., the multiplier effect). Less direct, but equally important, fishing tournaments may serve to generally promote the local tourist industry in coastal communities. In a survey of participants in the 1999 Pirates Cove Billfish Tournament, Ditton, *et al*., (2000) found that almost 80 percent of tournament anglers were from outside of the tournament's county. For this reason, tourism bureaus, chambers of commerce, resorts, and state and local governments often sponsor fishing tournaments.

3.6 Community and Social Update

According to National Standard 8 (NS 8), conservation and management measures should, consistent with conservation requirements, attempt to both provide for the continued participation of a community and, to the extent practicable, minimize the economic effects on the community. The information presented here addresses new data concerning the social and economic well-being of participants in the fishery and considers the impact of significant regulatory measures enacted in the past year.

3.6.1 Overview of Current Information and Rationale

The Magnuson-Stevens Act requires, among other things, that all FMPs include a fishery impact statement intended to assess, specify, and describe the likely effects of the measures on fishermen and fishing communities (§303(a)).

The National Environmental Policy Act (NEPA) also requires federal agencies to consider the interactions of natural and human environments by using a "systematic, interdisciplinary approach which will ensure the integrated use of the natural and social sciences...in planning and decision-making" (§102(2)(A)). Moreover, agencies need to address the aesthetic, historic, cultural, economic, social, or health effects which may be direct, indirect, or cumulative. Consideration of social impacts is a growing concern as fisheries experience increased participation and/or declines in stocks. The consequences of management actions need to be examined to better ascertain and, if necessary, mitigate impacts of regulations on affected constituents.

Social impacts are generally the consequences to human populations that follow from some type of public or private action. Those consequences may include alterations to the ways in which people live, work or play, relate to one another, and organize to meet their needs. In addition, cultural impacts which may involve changes in values and beliefs that affect people's way of identifying themselves within their occupation, communities, and society in general are included under this interpretation. Social impact analyses help determine the consequences of policy action in advance by comparing the status quo with the projected impacts. Although public hearings and scoping meetings provide input from those concerned with a particular action, they do not constitute a full overview of the fishery.

While geographic location is an important component of a fishing community, the transient nature of HMS may necessitate permitted fishermen to shift location in an attempt to follow the fish. Because of this characteristic, management measures for HMS often have the most identifiable impacts on fishing fleets that use specific gear types. The geographic concentrations of HMS fisheries may also vary from year to year as the behavior of these migratory fish is unpredictable. The relationship between these fleets, gear types, and geographic fishing communities is not always a direct one; however, they are important variables for understanding social and cultural impacts. As a result, the inclusion of typical community profiles in HMS management decisions is somewhat difficult as geographic factors and the use of a specific gear type have to be considered.

NMFS (2001) guidelines for social impact assessments specify that the following elements are utilized in the development of FMPs and FMP amendments:

1. The size and demographic characteristics of the fishery-related work force residing in the area; these determine demographic, income, and employment effects in relation to the work force as a whole, by community and region.
2. The cultural issues of attitudes, beliefs, and values of fishermen, fishery-related workers, other stakeholders, and their communities.
3. The effects of proposed actions on social structure and organization; that is, on the ability to provide necessary social support and services to families and communities.
4. The non-economic social aspects of the proposed action or policy; these include life-style issues, health and safety issues, and the non-consumptive and recreational use of living marine resources and their habitats.
5. The historical dependence on and participation in the fishery by fishermen and communities, reflected in the structure of fishing practices, income distribution and rights.

The information used in the 1999 FMP and the 1999 Billfish Amendment was obtained through a contract with Dr. Doug Wilson, from the Ecopolicy Center for Agriculture, Environmental and Resource Issues at Rutgers, the State University of New Jersey. Dr. Wilson and his colleagues completed their field work in July 1998. Their study considered HMS that have important commercial and recreational fisheries extending along the Atlantic and Gulf Coast from Maine to Texas and in the Caribbean. The study investigated the social and cultural characteristics of fishing communities in five states and one U.S. territory: Massachusetts, New Jersey, North Carolina, Florida, Louisiana, and Puerto Rico. These areas were selected because they each have important fishing communities that could be affected by measures included in the 1999 FMP and the 1999 Billfish Amendment, and because they are fairly evenly spread along the Atlantic and Gulf Coast and the Caribbean. For each state or territory, a profile of basic sociologic information was compiled, with at least two coastal communities visited for further analysis. Towns were selected based on HMS landings data, the relationship between the geographic communities and the fishing fleets, the existence of other community studies, and inputs from the Advisory Panels for HMS and Billfish. Complete descriptions of the study results can be found in Chapter 9 of the 1999 FMP and Chapter 7 of the Billfish Amendment.

In 2002, NMFS contracted the Virginia Institute of Marine Science (VIMS) at the College of William and Mary to re-evaluate several of the baseline communities and, specifically, to determine if the 1999 HMS FMP had a negative social impact on the communities dependent upon HMS. The 2005 report provided a brief overview and examination of changes in social and economic structures of communities which land HMS. The analysis of change since the 1999 HMS FMP regulations were implemented was based on demographics, landings information, and informal interviews with individuals from three different communities. Some of the report's findings are incorporated into the community profiles in Chapter 9 of this document.

3.6.2 Social Impacts of Selected 2005 Regulatory Actions

Final Rule Implementing Atlantic Bluefin Tuna Quota Specifications for 2004 (70 CFR 43, March 7, 2005)

This action set BFT quotas for each of the established domestic fishing categories and sets General category effort controls for the 2004 fishing year (June 1, 2004 – May 31, 2005) and established a catch-and-release provision, in addition to the tag-and release provision, for recreational and commercial BFT handgear vessels during a respective quota category closure.

The action was not expected to have any significant, positive or negative, social or economic impacts. The final action was expected to have modest positive social and economic impacts, by implementing the ICCAT-recommended adjusted BFT TAC for the United States in the western Atlantic management area of 1,489.6 mt. The action was not expected to have highly controversial effects on the human environment. There were no highly uncertain effects associated with this action due to the fact that the BFT fishery has been in operation for years. Thus, implementing the 2002 ICCAT BFT quota recommendation is consistent with the past, would not set a new precedence, and would provide positive economic impacts due to the application of the additional BFT quota. Although controversial issues associated with the BFT fishery remain, they are beyond the scope of this particular rulemaking and will be addressed in future regulatory and FMP amendments. The action is not expected to have substantial adverse impacts on public health and safety. Fishing activity or behavior would not change, although fishing effort may increase slightly as a result of this action.

Final Rule Implementing Atlantic Bluefin Tuna Quota Specifications and General Category Effort Controls for 2005 (70 FR 108, June 7, 2005)

This action set BFT quotas for each of the established domestic fishing categories and set General category effort controls for the 2005 fishing year (June 1, 2005 – May 31, 2006). NMFS also established the restricted fishing days to extend the General category BFT fishery into the late season for the southern Atlantic region. This action implemented the recommendations of the International Commission for the Conservation of Atlantic Tunas (ICCAT), as required by the Atlantic Tunas Convention Act, and were implemented to achieve domestic management objectives under the Magnuson-Stevens Fishery Conservation and Management Act.

NMFS prepared an EA for the final rule, concluding that the action is not expected to have any significant, positive or negative, social or economic impacts. The selected action was expected to have modest positive social and economic impacts, by implementing the ICCAT-recommended adjusted BFT TAC for the United States in the western Atlantic management area of 1,489.6 mt and is consistent with the ICCAT recommendation regarding the eight-percent tolerance of school BFT harvest. The action is not expected to be highly controversial on the human environment. There are no highly uncertain effects associated with this action due to the fact that the BFT fishery has been in operation for years. The action is not expected to have substantial adverse impacts on public health and safety. Fishing activity or behavior would not change, although fishing effort may increase slightly. For further background information, please see the Environmental Assessment and associated Final Regulatory Flexibility Analysis for this rule, http://www.nmfs.noaa.gov/sfa/hms/Tuna/05_Specs_Final_EA.RIR.FRFA.0523.pdf.

3.6.3 Summary of New Social and Economic Data Available

3.6.3.1 2005 Social Science Publications

The following two reports were delivered in 2005. An additional two reports, completing the community profiles for the Gulf of Mexico, are currently in peer review. Both reports are summarized in the abstract below.

Impact Assessment. 2005. *Identifying communities associated with the fishing industry in Alabama and Mississippi.* La Jolla, California. (NOAA-NMFS-Contract WC133F-02-SE-0297). p.661.

Impact Assessment. 2005. *Identifying communities associated with the fishing industry in Louisiana*. La Jolla, California. (NOAA-NMFS-Contract WC133F-02-SE-0297). p. 661.

> *Abstract*. The research has been conducted for NOAA Fisheries Southeast Regional Office (SERO), in fulfillment of its goal to effectively manage the various fisheries upon which residents of certain towns and cities in the Gulf of Mexico have depended and/or continue to depend, to greater and lesser degrees, for economic and social purposes. A systematic methodology was developed to investigate and describe Gulf communities likely to exhibit some or all of the attributes of "fishing communities" as defined by the Magnuson-Stevens Fishery Conservation and Management Act as Amended (the Magnuson Act; MSFCMA), and by National Standard 8 (NS-8). The project methodology emphasized: (a) collection and geospatial analysis of various fishing license, landings, economic, and demographic attribute data, and (b) collection and analysis of a variety of descriptive economic and social data considered viable indicators of fishing community status. The scope of this study is quite large, encompassing 30 communities in three counties in Alabama, 14 communities in three counties in Mississippi, and 106 communities in Louisiana. The overarching goal of the project was to provide the information needed to make preliminary determinations about whether, or to what degree, each community fits the federal definition of "fishing community." This report provides: (a) fisheries-relevant narrative description of historic and contemporary life in the study parishes, cities, and towns, (b) tabular and spatial description of fisheries infrastructure and services, and fleet characteristics specific to those study areas; and (c) preliminary assessment of the manner in, and degree to which, each study town or city does or does not approximate the National Standard 8 definition of fishing community. As the final version of these reports is being submitted

immediately following the passage of Hurricane Katrina in late August of 2005, the reports and associated data may also serve as a timely and accurate baseline for assessing the effects of the event on the study counties, cities, and towns, and their residents.

Jacob, S., M. Jepson, and F.L. Farmer. 2005. *What you see is not always what you get: Aspect dominance as a confounding factor in the determination of fishing dependent communities. Human Organization* 64(4):374-385.

Abstract. Many residents of coastal towns believe that they live in communities that are economically dependent upon commercial fishing. However, employment data indicate that fishing is a relatively minor economic component of many of these communities. We apply the concept of aspect dominance from the field of ecology to help explain this discrepancy. In addition we explore other forms of ecological dominance in regard to perceptions of fishing dependence. A key idea is that residents and sometimes researchers confuse forms of ecological dominance with economic dependence. Our study relied upon secondary and key informant data for six Florida coastal communities. In addition, we conducted a random telephone sample with 1,200 residents of these villages to establish their perceptions of the importance of commercial fishing to their communities.

Sutton, S.G., and R.B. Ditton. 2005. *The substitutability of one type of fishing for another*. North American Journal of Fisheries Management 25:536-546.

Abstract. We investigated the willingness of saltwater anglers in Florida and Texas to substitute other types of fishing for the type of fishing they most preferred. Anglers were asked if there was a suitable substitute for their most preferred species and, if so, what species would provide them with the same satisfaction and enjoyment as their most preferred species at the same cost. Most anglers (86 percent) reported that other species would provide acceptable substitutes for their preferred species and were able to identify acceptable substitutes from a list of common saltwater species in Texas and Florida. Logistic regression was used to determine the effects of demographic and fishing participation variables on willingness to substitute. Willingness to substitute was positively related to years of education and negatively related to age and the importance placed on trophy-seeking experiences. Also, females were more willing to substitute than males. Results suggest that for some species substitution behavior in response to biologically or managerially imposed constraints on fishing activity could result in increased effort for other species in the saltwater fisheries of Texas and Florida.

3.6.3.2 Summary of Social Data and Information for FEIS

This document consolidates all of the community profiles from previous HMS management plans or amendments and updates the community information, where possible. To ensure continuity with the 1999 HMS FMP and previous amendments, if a community was selected and described as being involved with an HMS fishery, the same community was included in this assessment. The communities profiled were originally selected due to the proportion of HMS landings, the relationship between the geographic communities and the fishing fleets, the existence of other community studies, and input from the HMS and Billfish Advisory Panels. The communities selected for detailed study are Gloucester and New Bedford, Massachusetts; Barnegat Light and Brielle, New Jersey; Wanchese, and Hatteras Township, North Carolina; Pompano Beach, Fort Pierce, Madeira Beach, Panama City Beach, and Islamorada, Florida; Boothville/Venice and Dulac, Louisiana; and Arecibo, Puerto Rico. These communities are not intended to be an exhaustive list of every HMS-related community in the United States; rather the objective is to give a broad perspective of representative areas.

The demographic profiles in this document have been modified to include the same baseline information for each community profiled; as a result, most of the tables include more information than portrayed in the 1999 HMS FMP and its amendments. The demographic tables still use both 1990 and 2000 Bureau of the Census data for comparative purposes. The descriptive community profiles include the same information provided by the Wilson, *et al.,* (1998) and Kirkley (2005) analyses with some new information provided by Impact Assessment, Inc (2004) on the Gulf of Mexico communities. Unlike the Wilson, *et al.,* (1998) study used in the 1999 HMS FMP, it was not possible to undertake field research for this assessment.

This assessment also reviewed the HMS permit databases to incorporate information about residence. This information was also used to identify additional HMS-related fishing communities that should be profiled in the future. Six GIS maps were generated to identify the communities where angler, charter/headboat, HMS dealers (tunas, shark, and swordfish combined), commercial tuna (all gear categories combined), directed and incidental shark, and swordfish (directed, incidental, and handgear combined) permit holders reside (Figure 9.1 to Figure 9.6). In past community profile and social impact analyses, it was difficult to identify where recreational HMS fishermen were located because no data were available for the number of recreational fishermen, as well as recreational landings by community. Previous social impact assessments report on charter fishing operations, fishing tournaments, and related activities to identify the scope of recreational fishing for each of the communities described. The information provided by the HMS permit databases should facilitate the identification of recreational HMS communities that should be profiled in the future.

3.6.3.3 HMS Community Profile Needs

For future social impact analyses, the HMS permit databases, landings information, and HMS APs should be consulted to determine the most appropriate community profiles for HMS-related fisheries. The 2005 HMS permit data indicate that several new community profiles should be developed and some of the previously profiled communities may no longer be as significantly involved in the fishery as they were in the past (Figure 9.1 to Figure 9.6). Wakefield, Rhode Island should be considered due to the number of commercial tuna and swordfish permit holders in the area. Montauk, New York has a large concentration of charter/headboat, commercial tuna, and HMS dealer permit holders in the community. A large number of Cape May, New Jersey residents hold an HMS angling, charter/headboat, shark and/or swordfish permits. Morehead City, North Carolina is home to a number of HMS angling, charter/headboat, and commercial tuna permit holders. Each of these towns is actively involved with more than one sector of the HMS fisheries and therefore be impacted be any changes to HMS regulations.

While the permit holders in Puerto Rico and the Virgin Islands are not as numerous as the permit holders on the U.S. mainland, HMS fisheries are active in these two areas and several of the communities benefit from those activities. Due to the number of HMS permit holders in these areas, future HMS actions should consider developing community profiles for Christiansted, St. Croix, as well as San Juan, Guaynabo, Aguadilla, Mayaguez, and/or Vega Baja, Puerto Rico. While NMFS may have community profiles describing these areas, an HMS-specific community profile should be developed for these towns to best determine the impact of changes to HMS-related regulations.

3.7 International Trade and Fish Processing

Several regional fishery management organizations (RFMOs) including ICCAT have taken steps to improve collection of international trade data to further international conservation policy for management of HMS. While RFMOs cannot re-create information about stock production based on trade data, this information can be used provisionally to estimate landings related to these fisheries, and to identify potential compliance problems with certain ICCAT management measures. United States participation in HMS related international trade programs, as well as a review of trade activity, is discussed in this section. This section also includes a review of the available information on the processing industry for Atlantic HMS species.

3.7.1 Overview of International Trade for Atlantic HMS

3.7.1.1 Trade Monitoring

The United States collects general trade monitoring data through the U.S. Bureau of Customs and Border Protection (CBP; imports) and the U.S. Bureau of the Census (Census Bureau; exports and imports). These programs collect data on the amount and value of imports and exports categorized under the Harmonized Tariff Schedule (HTS). Many HMS have distinct HTS codes, and some species are further subdivided by product (*e.g.* fresh or frozen, fillets, steaks, etc.). NMFS provides Census Bureau trade data for marine fish products online for the public at http://www.st.nmfs.gov/st1/trade/index.html. Some species, such as sharks, are grouped together, which can limit the value of these data for fisheries management when species specific information is needed. These data are further limited since the ocean area of origin for each product is not distinguished. For example, the HTS code for Atlantic, Pacific, and even Indian Ocean bigeye tuna is the same.

Trade data for Atlantic HMS are of more use as a conservation tool when they indicate the flag of the harvesting vessel, the ocean of origin, and the species for each transaction. Under the authority of ATCA and the Magnuson-Stevens Act, NMFS collects this information while monitoring international trade of bluefin tuna, swordfish, southern bluefin tuna, and frozen bigeye tuna. These programs implement ICCAT recommendations and support rebuilding efforts by collecting data necessary to identify nations and individuals that may be fishing in a manner that diminishes the effectiveness of ICCAT fishery conservation and management measures. Copies of all trade monitoring documents associated with these programs may be found on the NMFS HMS Management Division webpage at http://www.nmfs.noaa.gov/sfa/hms/. These and several other trade monitoring programs established by NMFS for HMS are described in further detail below.

3.7.1.2 Bluefin Tuna Statistical Document

The trade of bluefin tuna is tracked internationally as a result of the ICCAT recommendation to implement the Bluefin Statistical Document (BSD) program

(Recommendation 92-01). Japan's support for the program, as a major importer of bluefin tuna, is partially responsible for the success of this program. In the United States, each bluefin tuna is tagged when documented, and for all nations, the BSD travels with each shipment until the final point of destination. This document is used to track both imports and exports of bluefin tuna by ICCAT and other participating nations. If bluefin tuna are exported from, or imported to, the United States, the document is submitted to NMFS as part of the monitoring program. Since 1997, NMFS has also received CBP data (derived from Entry Form 7501) on imports of fresh and frozen bluefin tuna and swordfish on a monthly basis. Comparison of these data with BSD data allows NMFS to identify shipments without BSDs in order to obtain missing data and enforce dealer reporting requirements. In 2003, ICCAT updated the BSD program to include the collection of farming related information on the BSD. In 2005, NMFS added a re-export certificate to the program and expanded it to include southern bluefin tuna as well. Data collected under the BSD program are discussed in Sections 3.7.2 and 3.7.3 addressing U.S. exports and imports of HMS.

3.7.1.3 Swordfish Certificate of Eligibility and Statistical Document

The U.S. Swordfish Certificate of Eligibility (COE) has tracked U.S. imports of swordfish since it was implemented in 1999. In 2005, this program was replaced by a swordfish statistical document (SD) program similar to the BSD program described above. The swordfish SD program is based on a 2001 ICCAT recommendation (01-22), and incorporates all of the prior functions of the COE, including the following: ensuring that all imported swordfish are greater than the minimum size of 14.9 kg (33 lb) dw, identifying the flag of the harvesting vessel, and indicating ocean area of origin. Similar to the BSD program, CBP data on swordfish imports is also used to obtain missing data and identify dealers that are not following the required reporting procedures. With implementation of the swordfish SD program, the swordfish COE is longer in effect.

3.7.1.4 Bigeye Tuna Statistical Document

Like the two previous trade monitoring programs, the bigeye tuna SD program is used to track movement of internationally traded bigeye tuna to its final destination. ICCAT recommended the implementation of a bigeye tuna SD program in 2001 (01-21). The initial program was implemented in 2005 along with the swordfish SD, and applies only to frozen bigeye tuna. It may be expanded to cover fresh product in the future. Other RFMOs including the Inter-American Tropical Tuna Commission and the Indian Ocean Tuna Commission have also adopted frozen bigeye SD programs.

3.7.1.5 Yellowfin Tuna Form 370

Since the late 1970s, NOAA Form 370 has been used to document imports of yellowfin tuna and other species of tuna for the purpose of protecting dolphins in the Eastern Tropical Pacific Ocean. Form 370 is filed with other documents necessary for entry of yellowfin tuna into the United States. The form is *not* required for fresh tuna, animal food, or canned petfood made from tuna.

3.7.1.6 Billfish Certificate of Eligibility

The Billfish Certificate of Eligibility is used to ensure that any billfish being imported or sold in the United States (outside of the Pacific states) is not of Atlantic origin. In the Pacific states, billfish involved in trade are presumed to be of Pacific origin. Any statement that contains the specified information is sufficient to meet the certificate of eligibility documentation requirements; it is not necessary to use the form available from NMFS or to submit the form to NMFS upon final disposition of the billfish.

3.7.2 U.S. Exports of HMS

"Exports" may include merchandise of both domestic and foreign origin. The Census Bureau defines exports of "domestic" merchandise to include commodities which are grown, produced, or manufactured in the United States (*e.g.*, fish caught by U.S. fishermen). For statistical purposes, domestic exports also include commodities of foreign origin which have been altered in the United States from the form in which they were imported, or which have been enhanced in value by further manufacture in the United States. The value of an export is the f.a.s. (free alongside ship) value defined as the value at the port of export based on a transaction price including inland freight, insurance, and other charges incurred in placing the merchandise alongside the carrier. It excludes the cost of loading the merchandise, freight, insurance, and other charges or transportation costs beyond the port of exportation.

3.7.2.1 Atlantic and Pacific Bluefin Tuna Exports

As discussed in the previous section, NMFS collects detailed export data on Atlantic and Pacific bluefin tuna through the BSD program. Table 3.80 gives bluefin tuna export data for exports from the United States. Recent decreases in Atlantic BFT exports since 1999 could in part be a result of the growing U.S. market for high-quality fresh bluefin tuna meat. In 2003 – 2004, exports also could have been impacted by a reduction in U.S. landings. BFT re-exports are discussed separately in Section 3.7.3.1 and shown in Table 3.7.

Table 3.80 United States exports of Atlantic and Pacific bluefin tuna, 1999-2004. Sources: NMFS BSD Program, NERO, and Census Bureau.

Year	Atlantic Commercial Landings (NERO, MT)	Atlantic BFT Exports (BSD, MT)	Pacific BFT Exports (BSD, MT)	Total U.S. Exports (BSD, MT)	Total U.S. Exports (Census Bureau, MT)	Value of U.S. Exports (Census Bureau, $ million)
1999	876.0	735.6	95.7	831.3	1,183	9.37
2000	903.9	758.0	76.0	834.0	1,044	11.20
2001	987.0	812.3	67.0	879.0	1,020	10.70
2002	964.0	730.4	0.1	730.5	922	10.74
2003	756.9	572.2	2.1	574.3	998	11.36
2004	495.0	247.2	0.0	247.2	370	4.50

Note: most exports of Pacific BFT were in round (whole) form, although some exports were of dressed and gilled/gutted fish; Atlantic exports included whole, dressed, and product forms (dw); data are preliminary and subject to change.

3.7.2.2 Other Tuna Exports

Export data for other tunas is gathered by the Census Bureau, and includes trade data for albacore, yellowfin, bigeye, and skipjack tuna from all ocean areas of origin combined. Behind bluefin tuna, albacore tuna accounts for the next most valuable tuna export from the United States (Table 3.81). Comparing the last five years, the amount and value of exported albacore was greatest for the year 2004. In general, the amount and value of albacore exports appears to be on the rise. During the time period covered by this table, the annual amount and value of frozen exports exceeded fresh exports for every year.

Table 3.81 Amount and value of U.S. exports of albacore tuna from all ocean areas, 1999-2004 (Census Bureau data) and U.S. landings of North Atlantic albacore tuna (*2005 U.S. National Report to ICCAT*).

Year	**Atlantic Landings (mt ww)**	**U.S. Exports** (from all ocean areas)					
		Fresh		**Frozen**		**Total for all Exports**	
		MT	**US$ (million)**	**MT**	**US$ (million)**	**MT**	**US$ (million)**
1999	317	517	1.01	2,743	5.52	3,260	6.54
2000	407	263	0.78	2,747	6.04	3,010	6.83
2001	324	1,542	3.62	4,609	9.83	6,151	13.45
2002	488	680	1.50	4,483	8.28	5,163	9.78
2003	448	894	1.86	9,731	18.85	10,624	20.71
2004	636	1,360	3.28	10,737	24.11	12,097	27.38

Note: Landings may be calculated on a calendar or fishing year basis; exports may be in whole (ww) or product weight (dw); data are preliminary and subject to change.

Table 3.82 and Table 3.83 show U.S. Atlantic landings and U.S. exports from all ocean areas combined for yellowfin and skipjack tuna, respectively. Yellowfin exports were greater and more valuable than exports for skipjack or bigeye tuna (Table 3.84), although yellowfin tuna exports decreased markedly in 2004. Export of fresh yellowfin product exceeded the value of frozen yellowfin product for all years except 2001. Fresh product exports were highest in 2002 and 2003. The amount and value of exported fresh and frozen skipjack tuna has varied over the six year period covered in Table 3.83, without any discernable trends. Exports and landings of skipjack in 1999 far exceeded values for the following five years.

Table 3.82 Amount and value of U.S. exports of yellowfin tuna from all ocean areas, 1999-2004 (Census Bureau data) and U.S. landings of Atlantic yellowfin tuna (*2005 U.S. National Report to ICCAT).*

Year	**Atlantic Landings (mt ww)**	**U.S. Exports** (from all ocean areas)					
		Fresh		**Frozen**		**Total for all Exports**	
		MT	**US$ (million)**	**MT**	**US$ (million)**	**MT**	**US$ (million)**
1999	7569	947	2.09	390	.84	1337	2.93
2000	7051	412	1.12	406	.76	819	1.89
2001	6703	290	.71	834	1.45	1124	2.17
2002	5653	1612	2.37	420	.81	2033	3.19
2003	7701	1792	2.93	176	.68	1968	3.62
2004	6421	306	1.54	242	.31	549	1.86

Note: Landings may be calculated on a calendar or fishing year basis; exports may be in whole (ww) or product weight (dw); data are preliminary and subject to change.

Table 3.83 Amount and value of U.S. exports of skipjack tuna from all ocean areas, 1999-2004 (Census Bureau data) and U.S. landings of West Atlantic skipjack tuna (*2005 U.S. National Report to ICCAT)*.

Year	Atlantic Landings (mt ww)	**U.S. Exports** (from all ocean areas)					
		Fresh		**Frozen**		**Total for all Exports**	
		MT	**US$ (million)**	**MT**	**US$ (million)**	**MT**	**US$ (million)**
1999	152	88	.20	1092	.89	1,181	1.10
2000	44	7	.01	83	.05	91	.06
2001	69	82	.15	34	.04	117	.20
2002	66	66	.17	11	.01	77	.18
2003	77	81	.22	0	0	81	.22
2004	61	55	.30	140	.78	196	.48

Note: Landings data may have been ported on either a fishing year or calendar year basis; exports may be in whole (ww) or product weight (dw); data are preliminary and subject to change.

Bigeye tuna exports and Atlantic landings are given in Table 3.84. No data were available for bigeye tuna exports in 2001, and prior to 2001 bigeye exports were included in the category of unspecified tuna. Annually, bigeye tuna exports include more fresh than frozen product, and have increased gradually from 2002 to 2004.

Table 3.84 Amount and value of U.S. exports of bigeye tuna from all ocean areas, 1999-2004 (Census Bureau data) and U.S. landings of Atlantic bigeye tuna (*2005 U.S. National Report to ICCAT)*.

Year	**Atlantic Landings (mt ww)**	**U.S. Exports** (from all ocean areas)					
		Fresh		**Frozen**		**Total for all Exports**	
		MT	**US$ (million)**	**MT**	**US$ (million)**	**MT**	**US$ (million)**
2002	600	95	.22	8	.01	104	.24
2003	480	255	.47	40	.08	295	.56
2004	418	361	1.40	48	.10	410	1.51

NOTE: Landings data may have been reported on either a fishing year or calendar year basis; exports may be in whole (ww) or product weight (dw); data are preliminary and subject to change.

3.7.2.3 Shark Exports

Export data for sharks is gathered by the Census Bureau, and includes trade data for sharks from any ocean area of origin. Shark exports are not categorized down to the species level with the exception of dogfish, and are not identified by specific product code other than fresh or frozen meat and fins. Due to the popular trade in shark fins and their high relative value compared to shark meat, a specific HTS code was assigned to shark fins in 1998. It should be noted that there is no tracking of other shark products besides meat and fins. Therefore, NMFS cannot track trade in shark leather, oil, or shark cartilage products.

Table 3.85 indicates the magnitude and value of shark exports by the United States from 1999 – 2004. The reduction in shark fin exports from 2001 to 2002 and 2003 is of particular note, as is the increase in the unit value of shark fins during this time period. Decreases in shark fin trade are expected to be the result of the Shark Finning Prohibition Act, which was enacted in December of 2000 and implemented by final rule in February 2002.

Table 3.85 Amount and value of U.S. shark product exports from 1999-2004. Source: Census Bureau.

Yr	Shark Fins Dried			Non-specified Fresh Shark			Non-specified Frozen Shark			Total for all Exports	
	MT	US$ (million)	$/KG	MT	US$ (million)	$/KG	MT	US$ (million)	$/KG	MT	US$ (million)
1999	106	.91	8.54	270	.48	1.80	155	.46	2.97	532	1.86
2000	365	3.51	9.62	430	.78	1.82	345	.81	2.35	1140	5.10
2001	335	3.16	9.44	332	.54	1.64	634	2.34	3.69	1301	6.04
2002	123	3.46	28.00	968	1.47	1.52	982	2.34	2.38	2075	7.28
2003	45	4.03	87.79	837	1.31	1.57	592	1.34	2.28	1476	6.70
2004	63	3.02	47.53	536	1.18	2.21	472	.98	2.09	1071	5.18

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

3.7.2.4 Re-exports of Atlantic HMS

For purposes of international trade tracking of HMS, the term "re-export" refers to a product that has been entered for consumption into the United States and then exported to another country, with or without further processing in the United States (from 50 CFR Part 300, Subpart M, International trade documentation and tracking programs for HMS). For most HMS species, re-export activity is a small fraction of export activity and well below reference points of 1000 mt and/or one million dollars annually. Exceptions to this include fresh yellowfin tuna re-exports which were valued at $1.5 million in 2003 and fresh and frozen yellowfin valued at $1.1 million in 2002 (Census Bureau data). In 2004, dried shark fin re-exports reached a six year maximum value of $1.8 million (29 mt, down from 34 mt in 2003).

Bluefin tuna re-exports also reached a five year maximum in 2004 at 2,118 mt valued at $29.46 million (Census Bureau data), which exceeded the amount of bluefin exports for the year, for the first time in the history of the BSD program (K. Goldsmith, pers. com.). Further investigation into BSD program data found that the recent increases in bluefin re-exports reflects the growth of the Mexican farming/mariculture industry which exports product to the United States for re-export to Japan.

3.7.2.5 Summary of Atlantic HMS Exports

Nationally, the value of HMS exports (from all ocean areas combined) is dominated by bluefin tuna, albacore tuna, and shark products. In 2003, fresh and frozen products of these three species accounted for 14,873 mt dw or 1.3 percent of the 1,120,354 mt dw of fresh and frozen seafood products exported from the United States, as indicated in *Fisheries of the United States, 2004*. The value of these HMS products accounted for $40.77 million, out of a national total of $2.8 billion.

Data reflecting international trade of HMS species harvested from all ocean areas are of limited value for describing trade of HMS harvested from the Atlantic Ocean. For example, Atlantic landings of albacore tuna (commercial and recreational) for 2003 were reported in the *2004 U.S. National Report to ICCAT* as 448 mt (Table 3.81). National trade data show that over 10,000 mt of albacore were exported, which indicates that the majority of albacore exports were Pacific Ocean product. Trade tracking programs such as the bluefin tuna, swordfish, and bigeye tuna statistical document programs are much more useful for describing the international disposition of Atlantic HMS.

3.7.3 U.S. Imports of Atlantic HMS

All import shipments must be reported to the U.S. Bureau of Customs and Border Protection. “General” imports are reported when a commodity enters the country, and "consumption" imports consist of entries into the United States for immediate consumption combined with withdrawals from CBP bonded warehouses. “Consumption” import data reflect the actual entry of commodities originating outside the United States into U.S. channels of consumption. As discussed previously, CBP data for certain products are provided to NMFS for use in implementing statistical document programs. U.S. Census Bureau import data are used by NMFS as well.

3.7.3.1 Bluefin Tuna Imports

United States imports and re-exports of bluefin tuna for 1999 through 2004, as reported through both CBP and BSD program data, are shown in Table 3.86. The difference in import numbers between the CBP and BSD data may be explained by a lack of knowledge and compliance with the BSD program by importers, especially those on the Pacific coast.

The rise in popularity of sashimi in the United States has generated increased imports of bluefin tuna, and dealers are reporting an expanded domestic market for both locally-caught and imported raw tuna. As discussed previously, the large amount of re-exports in the last several years resulted from the increase in importation of farmed bluefin from Mexico and re-exportation to Japan.

Table 3.86 Imports of Atlantic and Pacific bluefin tuna into the United States: 1999-2004. Sources: NMFS BSD program and CBP data.

YEAR	NMFS BSD Program		U.S. CBP Data	
	Imports (MT)	Re-exports (MT)	Imports (MT)	VALUE (US$ million)
1999	411.9	16.6	558.6	3.02
2000	361.9	99.3	453.4	7.67
2001	512.9	7.0	532.3	8.21
2002	529.3	94.1	605.0	9.75
2003	649.9	691.0	780.3	11.67
2004	823.4	684.8	886.1	15.25

Note: Most imports of BFT were in dressed form, and some were round and gilled/gutted fish, fillets or belly meat (dw); data are preliminary and subject to change. Southern bluefin tuna trade was included in figures for Atlantic and Pacific bluefin tuna trade prior to 2002.

3.7.3.2 Other Tuna Imports

Since January 2001, CBP has been collecting species specific import information for bigeye tuna (grouped to include all ocean areas). Previously, bigeye tuna had been included under general tuna imports. The total amount and value of bigeye tuna imports have been gradually increasing over the last four years, as shown in Table 3.87.

Table 3.87 Imports of bigeye tuna into the United States from all ocean areas combined: 2001-2004. Source: Census Bureau data.

Year	Fresh		Frozen		Total for all Imports	
	MT	US$ (million)	MT	US$ (million)	MT	US$ (million)
2001	4684	25.70	135	.32	4,820	26.02
2002	6312	39.84	319	.70	6,632	40.55
2003	7312	51.01	560	1.48	7,872	52.49
2004	6752	49.10	1175	2.62	7928	51.73

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

Annual yellowfin tuna imports into the United States for all ocean areas combined are given in Table 3.88. As indicated by the data in this section, yellowfin tuna are imported in the greatest quantity of all fresh and frozen tuna products. The annual value of yellowfin imports has increased gradually from 1999 – 2004. The total annual amount of product imported has remained fairly consistent, with a slight dip in 2000.

Table 3.88 Imports of yellowfin tuna into the United States from all ocean areas combined: 1999-2004. Source: Census Bureau data.

Year	Fresh		Frozen		Total for all Imports	
	MT	US$ (million)	MT	US$ (million)	MT	US$ (million)
1999	11,756	63.04	9411	24.90	21,168	87.94
2000	13,153	70.27	3290	18.73	16,443	89.00
2001	15,563	85.50	3967	23.45	19,530	108.95
2002	15,966	95.22	4619	29.31	20,585	124.53
2003	15,299	94.03	5579	39.67	20,878	133.71
2004	15,624	99.41	5833	35.35	21,457	134.96

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

The amount of fresh albacore imports from all ocean areas have been fairly consistent since 2001 while imports of frozen product have decreased dramatically over the last six years, with the greatest reduction occurring between 2001 and 2002 (Table 3.89). In 1999, albacore imports were valued at $144 million while in 2004 the value dropped to approximately $15 million. (Products in airtight containers are not included in these data.)

Table 3.89 Imports of albacore tuna into the United States from all ocean areas combined: 1999-2004. Source: Census Bureau data.

Year	Fresh		Frozen		Total for all Imports	
	MT	US$ (million)	MT	US$ (million)	MT	US$ (million)
1999	1776	5.39	63,284	139.50	65,060	144.89
2000	1843	6.42	51,001	127.33	52,845	133.76
2001	1107	3.85	40,428	105.58	41,536	109.43
2002	1296	4.81	11,903	24.49	13,200	29.31
2003	1062	4.11	12,569	25.90	13,632	30.02
2004	1004	3.12	4943	11.67	5947	14.80

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

Skipjack tuna imports into the United States are comprised mainly of frozen product (Table 3.90). Like albacore tuna, the amount and value of skipjack imports have also decreased dramatically since 1999. The amount of product imported fell from over 8,000 mt dw in 1999 to 112 mt dw in 2004. Likewise, the value of these products during this time period fell from $6.3 million to $0.27 million.

Table 3.90 Imports of skipjack tuna from all ocean areas combined into the United States: 1999-2004. Source: U.S. Census Bureau data.

Year	Fresh		Frozen		Total for all Imports	
	MT	US$ (million)	MT	US$ (million)	MT	US$ (million)
1999	0	0	8,238	6.30	8,238	6.30
2000	0	0	904	2.75	904	2.75
2001	<1	<0.01	377	0.61	378	0.62
2002	<1	0.01	824	0.83	825	0.84
2003	0	0	224	0.43	224	0.43
2004	<1	<0.01	110	0.26	112	0.27

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

3.7.3.3 Swordfish Imports

Table 3.91 summarizes swordfish import data collected by NMFS' Swordfish Import Monitoring Program for the 2004 calendar year. According to these data, most swordfish imports were Pacific Ocean product. For Atlantic product, the most imports came from Brazil (48 percent), followed by Canada (22 percent) and Uruguay (16 percent). CBP data located at the bottom of the table reflect a larger amount of imports than reported by the import monitoring program, and may be used by NMFS staff to follow up with importers, collect statistical documents that have not been submitted, and enforce dealer reporting requirements.

Table 3.91 Swordfish import data for the 2004 calendar year collected under the NMFS Swordfish Import Monitoring Program.

Flag of Harvesting Vessel	Ocean Area of Origin				TOTAL (mt dw)
	Atlantic (mt dw)	Pacific (mt dw)	Indian (mt dw)	Not Provided (mt dw)	
Not Provided	0.00	9.12	0.00	11.10	20.22
Australia	0.00	111.94	6.59	0.00	118.53
Barbados	0.08	0.00	0.00	0.00	0.08
Belize	0.00	6.10	0.00	0.00	6.10
Bolivia	12.42	0.00	0.00	0.00	12.42
Brazil	721.11	0.00	0.00	0.00	721.11
Canada	328.26	0.00	0.00	0.00	328.26
Chile	0.00	442.38	0.00	0.00	442.38
China	0.00	0.00	58.91	0.00	58.91
Cook Islands	0.00	9.85	0.00	0.00	9.85
Costa Rica	0.00	242.92	0.00	0.00	242.92
Ecuador	0.00	133.65	0.00	0.00	133.65
El Salvador	0.00	1.80	0.00	0.00	1.80
Fiji Islands	0.00	33.62	0.00	0.00	33.62
Georgia	0.00	4.28	0.00	0.00	4.28
Grenada	33.48	0.00	0.00	0.00	33.48
Indonesia	0.00	0.00	16.54	0.00	16.54
Malaysia	0.00	17.49	73.19	0.00	90.68
Mexico	0.00	249.56	0.00	0.00	249.56
New Zealand	0.00	147.88	0.00	0.00	147.88
Nicaragua	0.00	0.25	0.00	0.00	0.25
Panama	0.00	649.75	0.00	0.00	649.75
Philippines	0.00	4.77	0.00	0.00	4.77
Singapore	0.00	0.00	33.58	0.00	33.58
South Africa	10.23	0.00	53.19	0.00	63.42
Taiwan	59.31	323.81	1,073.33	0.00	1,456.44
Tonga	0.00	7.81	0.00	0.00	7.81
Trinidad & Tobago	36.44	0.00	0.00	0.00	36.44
Uruguay	234.59	0.00	0.00	0.00	234.59
Venezuela	64.51	0.00	0.00	0.00	64.51
Vietnam	0.00	270.15	0.00	0.00	270.15
Total Imports Reported by COEs	1500.4	2667.1	1315.3	11.1	5494.0
Total Imports Reported by U.S. Customs & Border Patrol					11,265.00
Total Imports Not Reported by COEs					5771.03

COE Data as of 8/18/05

Table 3.92 indicates the amount and value of swordfish product imports by the United States from 1999 – 2004, as recorded by the U.S. Census Bureau, for all ocean areas combined. The amount of each product imported per year and annual totals for product and value were fairly consistent for the time period covered, although the data show a slight decrease in 2004.

Table 3.92 Imported swordfish products by year: 1999-2004. Source: Census Bureau data.

Year	Fresh (MT)		Frozen (MT)			Total for all Imports	
	Steaks	Other	Fillets	Steaks	Other	MT	US$ (million)
1999	81	8595	4377	401	386	13,842	71.70
2000	161	8626	4833	524	167	14,314	85.57
2001	71	8982	3814	710	119	13,697	81.89
2002	195	9726	4156	956	677	15,711	88.26
2003	147	8079	3929	433	560	13,150	75.62
2004	157	6568	3261	387	351	10,726	70.95

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

3.7.3.4 Shark Imports

Similar to tuna imports other than bluefin tuna and frozen bigeye tuna, NMFS does not require importers to collect and submit information regarding the ocean area of catch. Shark imports are also not categorized by species, and lack specific product information on imported shark meat such as the proportion of fillets, steaks, or loins. The condition of shark fin imports; *e.g.*, wet, dried, or further processed products such as canned shark fin soup, is also not collected. There is no longer a separate tariff code for shark leather, so its trade is not tracked by CBP or Census Bureau data.

The United States may be an important transshipment port for shark fins, which may be imported wet, processed and then exported dried. It is also probable that U.S.-caught shark fins are exported to Hong Kong or Singapore for processing, and then imported back into the United States for consumption by urban-dwelling Asian Americans (Rose, 1996).

Table 3.93 summarizes Census Bureau data on shark imports for 1999 through 2004. Imports of fresh shark products and shark fins have decreased significantly since 1999. The 2004 ICCAT recommendation addressing the practice of shark finning may result in a further reduction of imports in the near future. Over the last 5 years, the overall annual amount and value of shark imports decreased fairly consistently year after year to equal approximately half the 1999 amount and value in 2003, with a slight increase in each product category in 2004.

Table 3.93 U.S. imports of shark products from all ocean areas combined: 1999-2004. Source: Census Bureau data.

Year	Shark Fins Dried		Non-specified Fresh Shark		Non-specified Frozen Shark		Total For All Imports	
	MT	US$ (million)	MT	US$ (million)	MT	US$ (million)	MT	US$ (million)
1999	59	2.10	1,095	2.03	105	.62	1,260	4.76
2000	66	2.35	1,066	1.85	90	.57	1,222	4.79
2001	50	1.08	913	1.38	123	1.78	1,087	4.25
2002	39	1.02	797	1.24	91	1.09	928	3.35
2003	11	0.01	515	0.72	100	0.99	626	1.82
2004	14	0.34	650	1.00	156	2.35	821	3.70

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

3.7.3.5 Summary of U.S. Imports of Atlantic HMS

The import data in this section show that many HMS species are part of a valuable import market. As discussed previously regarding exports, most data documenting imports include products harvested from many ocean areas, not just the Atlantic Ocean. However, the statistical document programs for bluefin tuna, swordfish, and frozen bigeye tuna provide information specifically about product harvested from the Atlantic Ocean and imported into the United States.

In 2004, the U.S. domestic market for swordfish supported a domestic fishery of 2,896 mt round weight worth $14.64 million (Pritchard 2005) and an active import market of 10,726 mt dw valued at $70.95 million (Table 3.13). Despite recent increases in the U.S. quota of North Atlantic swordfish (consistent with ICCAT rebuilding programs), swordfish from the Pacific and Indian Oceans are expected to continue to supply the lucrative U.S. swordfish market during the near future.

3.7.4 The Use of Trade Data for Conservation Purposes

Trade data has been used in a number of ways to support international management of HMS. When appropriate, the SCRS uses trade data on bluefin tuna, swordfish, bigeye tuna, and yellowfin tuna that are submitted to ICCAT as an indication of landings trends. These data can then be used to augment estimates of fishing mortality rates (F) of these species, which improves scientific stock assessments. In addition, these data can be used to assist in assessing compliance with ICCAT recommendations and identify those countries whose fishing practices diminish the effectiveness of ICCAT conservation and management measures. On numerous occasions, ICCAT has adopted recommendations to address the lack of compliance with management programs for the bluefin tuna, bigeye tuna, and North and South Atlantic swordfish fisheries by ICCAT members. Penalties for non-compliance or fishing in a manner that diminishes the effectiveness of ICCAT conservation measures may include catch limit reductions and, if necessary, trade restrictive measures.

For example, an analysis of vessel sighting and Japanese BSD data led to the 1996 determination that fishing vessels from the countries of Panama, Honduras, and Belize were fishing in a manner that diminished the effectiveness of the bluefin tuna rebuilding program, and resulted in a 1996 ICCAT recommendation for sanctions against the import of bluefin tuna from these countries (Table 3.94). In 1999, ICCAT recommended this trade restriction on Panama be lifted as a result of the Government of Panama's efforts to substantially reduce fishing vessel activities deemed inconsistent with ICCAT measures. In 2001, Honduras became a member of ICCAT, and based on this change in status and Honduras' significant efforts to control its fleet and address ICCAT concerns, ICCAT recommended lifting trade sanctions for bluefin tuna. The bluefin sanction for Belize was lifted by ICCAT in 2002.

In another example, import data from 1997–1999 revealed significant Atlantic bluefin tuna exports from Equatorial Guinea despite the fact that a zero catch limit was in effect for that country. The government of Equatorial Guinea had not responded to ICCAT inquiries and had reported no bluefin tuna catch data to ICCAT, and as a result ICCAT recommended trade restrictions as a penalty for non-compliance. Based on information regarding improved compliance presented by Equatorial Guinea at the 2004 ICCAT meeting, specifically, that Equatorial Guinea had canceled licenses and flags of large-scale longline vessels previously participating in IUU tuna fishing in the Convention area and guaranteed compliance with ICCAT conservation and management measures, the trade sanction was lifted by ICCAT.

As indicated in Table 3.94, most of the trade sanctions recommended by ICCAT since 1996 have been lifted. In fact, only trade sanctions for Bolivia and Georgia remain in effect. Thus, the imposition of trade sanctions seems to be an effective measure for ensuring that countries involved in international trade operate in a manner consistent with ICCAT recommended conservation programs. As illustrated above, the data obtained by monitoring international trade in HMS is instrumental in the development of ICCAT trade restrictions. Current discussions at ICCAT include expanding the statistical document program to a catch documentation scheme, which may better assist in preventing IUU fishing.

Table 3.94 Summary and current status of ICCAT recommended trade sanctions for bluefin tuna, swordfish, and bigeye tuna implemented by the United States.

Country	Species	ICCAT Recommended Sanction	U.S. Sanction Implemented	ICCAT Sanction Lifted	U.S. Sanction Lifted
Panama	Bluefin	1996	1997	1999	2000
Honduras	Bluefin	1996	1997	2001	2004
	Bigeye	2000	2002	2002	2004
	Swordfish	1999	2000	2001	2004
Belize	Bluefin	1996	1997	2002	2004
	Swordfish	1999	2000	2002	2004
	Bigeye	2000	2002	2002	2004
Equatorial Guinea	Bluefin	1999	2000	2004	2005
	Bigeye	2000	2002	2004	2005
Cambodia	Bigeye	2000	2002	2004	2005
St. Vincent & the Grenadines	Bigeye	2000	2002	2002	2004
Bolivia	Bigeye	2002	2004	In effect	In effect
Sierra Leone	Bluefin	2002	2004	2004	2005
	Bigeye	2002	2004	2004	2005
	Swordfish	2002	2004	2004	2005
Georgia	Bigeye	2003	2004	In effect	In effect

3.7.5 Overview of the Processing Industry for Atlantic HMS

Understanding the harvesting and processing sectors is essential when analyzing world trade in highly migratory fish species. The processing related entities that depend on Atlantic HMS are as diverse as the species and products themselves. Processing techniques range from the simple dressing and icing of swordfish at sea, to elaborate grading and processing schemes for bluefin tuna, to processing shark fins. Like all other seafood, HMS are perishable and may pose health hazards if not handled properly. Products range from those having a long shelf-life, such as swordfish, to highly perishable species like yellowfin tuna. Improperly handled yellowfin tuna can produce histamine, swordfish and sharks may contain high levels of mercury, and shark meat requires careful handling due to the high concentrations of urea in the body of the shark. Processing companies are aware of these characteristics and their costs of doing business vary accordingly to protect consumers. The Food and Drug Administration (FDA) works closely with NOAA Office of Law Enforcement to monitor incoming shipments of seafood, including highly migratory species.

FDA's Seafood Hazard Analysis Critical Control Point (HACCP) program implemented regulations that require processors of fish and fishery products to operate preventive control systems to ensure human food safety. Among other things, processors must effectively maintain the safety of their products, systematically monitor the operation of critical control points to ensure that they are working as they should, and keep records of the results of that monitoring. Processors must also develop written HACCP plans that describe the details and operation of their HACCP systems. Each processor may tailor its HACCP system to meet its own circumstances. The best way for FDA to determine whether a processor is effectively operating a HACCP system is by inspecting the processor. Federal review of monitoring and other records generated by the HACCP system is a critical component of an inspection because it allows the inspector to match records against the practices and conditions being observed in the plant and it discourages fraud. NMFS works closely with the FDA, in support of the HACCP program.

Just as HACCP plans vary between processors, transportation of the seafood to market also varies widely from the direct domestic sale of some shark or swordfish meat by a fisherman to a restaurant (carried by truck) to the quick, and sometimes complicated, export of bluefin tuna from fisherman to dealer to broker to the Japanese auction (carried by a commercial airline carrier). Frozen swordfish and tunas are often brought to the United States by overseas shipping companies and sharks and other products may be exported from the United States, processed overseas, and imported in a final product form.

It is unknown how many U.S. companies depend on HMS fisheries, other than the registered dealers who buy fish directly from U.S. fishermen and/or who import bluefin tuna or swordfish. The proportion of those companies that depend solely on Atlantic HMS versus those that handle other seafood and/or products is also unknown. This section provides a summary of the most recent trade data that NMFS has analyzed, as well as a brief description of the processing and trade industries employed in transitioning Atlantic HMS from the ocean to the plate.

3.7.5.1 Processing and Wholesale Sectors

NMFS has limited quantitative information on the processing sector, including the amount of HMS products sold in processed forms. In addition, knowledge regarding the utilization of Atlantic HMS is largely limited to the major or most valuable product forms, such as export quality bluefin tuna.

Much of the processing of export-quality Atlantic bluefin tuna occurs onboard the vessel harvesting the fish, which serves to maximize fish quality. Bluefin are gutted and bled, and protected from the heat and sunlight by immersion in ice or an icy brine. Upon landing, bluefin are immediately graded and prepared for export to Japan's fresh fish market. The fish are either refrigerated or exported immediately in insulated crates or "coffins" filled with ice or icepacks.

Other Atlantic tunas, especially bigeye tuna, are frequently shipped fresh to Japan in dressed form. Swordfish are sold fresh and frozen in dressed form and as processed products (*e.g.*, steaks and fillets). The utilization of sharks is also not well known since trade statistics frequently do not indicate product forms such as skins and leather, jaws, fishmeal and fertilizer, liver oil, and cartilage (Rose, 1996). Domestically-landed sandbar and blacktip shark meat may be sold to supermarkets and processors of frozen fish products. NMFS continues to work with industry to collect information specific to U.S. and foreign processing of Atlantic HMS to better track markets, conserve stocks, and manage sustainable fisheries.

The U.S. processing and wholesale sectors are dependent upon both U.S. and international HMS fisheries. Individuals involved in these businesses buy the seafood, cut it into pieces that transform it into a consumer product, and then sell it to restaurants or retail outlets. Employment varies widely among processing firms. Often employment is seasonal unless the firms also process imported seafood or a wide range of domestic seafood. The majority of firms handles other types of seafood and is not solely dependent on HMS. Other participants in the commercial trade sector include brokers, freight forwarders, and carriers (primarily commercial airlines, trucking, and shipping companies). Swordfish, tunas, and sharks are important commodities on world markets, generating significant amounts in export earnings in recent years.

NMFS has recently observed that many seafood dealers that buy and sell highly migratory species and other seafood products have expanded their operations into internet-powered trading platforms specifically designed to meet the needs of other seafood professionals. Through these platforms, interested parties can conduct very detailed negotiations with many trading partners simultaneously. Buyers and sellers can bargain over all relevant elements of a market transaction (not just price) and can specify the product needed to buy or sell in detail, using seafood-specific terminology. The platforms are purportedly very easy to use because they mimic the pattern of traditional negotiations in the seafood industry. NMFS expects that the use of the internet will continue to change the way HMS trade occurs in the future.

3.8 Bycatch, Incidental Catch, and Protected Species

Bycatch in commercial and recreational fisheries has become an important issue for the fishing industry, resource managers, scientists, and the public. Bycatch can result in death or injury to the discarded fish, and it is essential that this component of total fishing-related mortality be incorporated into fish stock assessments and evaluation of management measures. Bycatch precludes other more productive uses of fishery resources and decreases the efficiency of fishing operations. Although not all discarded fish die, bycatch can become a large source of mortality, which can slow the rebuilding of overfished stocks. Bycatch imposes direct and indirect costs on fishing operations by increasing sorting time and decreasing the amount of gear available to catch target species. Incidental catch concerns also apply to populations of marine mammals, sea turtles, seabirds, and other components of ecosystems which may be protected under other applicable laws and for which there are no commercial or recreational uses but for which existence values may be high.

In 1998, NMFS developed a national bycatch plan, *Managing the Nation's Bycatch* (NMFS, 1998), which includes programs, activities, and recommendations for Federally managed fisheries. The national goal of the Agency's bycatch plan activities is to implement conservation and management measures for living marine resources that will minimize, to the extent practicable, bycatch and the mortality of bycatch that cannot be avoided. Inherent in this goal is the need to avoid bycatch, rather than create new ways to utilize bycatch. The plan also established a definition of bycatch as fishery discards, retained incidental catch, and unobserved mortalities resulting from a direct encounter with fishing gear.

3.8.1 Bycatch Reduction and the Magnuson-Stevens Act

The Magnuson-Stevens Act defines bycatch as fish which are harvested in a fishery, but which are not sold or kept for personal use, and includes economic and regulatory discards. Fish is defined as finfish, mollusks, crustaceans, and all other forms of marine animal and plant life other than marine mammals and birds. Seabirds and marine mammals are therefore not considered bycatch under the MSA but are examined as incidental catch. Bycatch does not include fish released alive under a recreational catch-and-release fishery management program.

National Standard 9 of the Magnuson-Stevens Act requires that fishery conservation and management measures shall, to the extent practicable, minimize bycatch and minimize the mortality of bycatch that cannot be avoided. In many fisheries, it is not practicable to eliminate all bycatch and bycatch mortality. Some relevant examples of fish caught in Atlantic HMS fisheries that are included as bycatch or incidental catch are marlin, undersized swordfish and bluefin tuna caught and released by commercial fishing gear; undersized swordfish and tunas in recreational hook and line fisheries; species for which there is little or no market such as blue sharks; and species caught and released in excess of a bag limit.

There are benefits associated with the reduction of bycatch, including the reduction of uncertainty concerning total fishing-related mortality, which improves the ability to assess the status of stocks, to determine the appropriate relevant controls, and to ensure that overfishing levels are not exceeded. It is also important to consider the bycatch of HMS in fisheries that target other species as a source of mortality for HMS and to work with fishery constituents and resource manager partners on an effective bycatch strategy to maintain sustainable fisheries. This strategy may include a combination of management measures in the domestic fishery, and if appropriate, multi-lateral measures recommended by international bodies such as ICCAT or coordination with Regional Fishery Management Councils or States. The bycatch in each fishery is summarized annually in the SAFE report for Atlantic HMS fisheries. The effectiveness of the bycatch reduction measures is evaluated based on this summary.

A number of options are currently employed (*) or available for bycatch reduction in Atlantic HMS fisheries. These include but are not limited to:

Commercial

1. *Gear Modifications (including hook and bait types)
2. *Circle Hooks
3. *Time/Area Closures
4. Performance Standards
5. *Education/Outreach
6. *Effort Reductions (*i.e.*, Limited Access)
7. Full Retention of Catch
8. *Use of De-hooking Devices (mortality reduction only)

Recreational

1. Use of Circle Hooks (mortality reduction only)
2. Use of De-hooking Devices (mortality reduction only)
3. Full Retention of Catch
4. *Formal Voluntary or Mandatory Catch-and-Release Program for all Fish or Certain Species
5. Time/Area Closures

There are probably no fisheries in which there is zero bycatch because none of the currently legal fishing gears are perfectly selective for the target of each fishing operation (with the possible exception of the swordfish/tuna harpoon fishery and proposed speargun fishery). Therefore, to totally eliminate bycatch of all non-target species in Atlantic HMS fisheries would be impractical. The goal then is to minimize the amount of bycatch to the extent practicable and minimize the mortality of species caught as bycatch.

3.8.2 Standardized Reporting of Bycatch

Section 303(a)(11) of the Magnuson-Stevens Act requires that a fishery management plan establish a standardized reporting methodology to assess the amount and type of bycatch occurring in the fishery. In 2004, NMFS published a report entitled *"Evaluating Bycatch: A National Approach to Standardized Bycatch Monitoring Programs,"* which described the current status of and guidelines for bycatch monitoring programs (NMFS, 2004a). The data collection and analyses that are used to estimate bycatch in a fishery constitute the "standardized bycatch reporting methodology" (SBRM) for that fishery (NMFS, 2004a). Appendix 5 of the report specifies the protocols for SBRMs established by NMFS throughout the country.

As part of the Agency's National Bycatch Strategy, NMFS established a National Working Group on Bycatch (NWGB) to develop a national approach to standardized bycatch reporting methodologies and monitoring programs. This work is to be the basis for regional teams, established in the National Bycatch Strategy, to make fishery-specific recommendations.

The NWGB reviewed regional issues related to fisheries and bycatch and discussed advantages and disadvantages of various methods for estimating bycatch including: (1) fishery-independent surveys; (2) self-reporting through logbooks, trip reports, dealer reports, port sampling, and recreational surveys; (3) at-sea observation, including observers, digital video cameras, digital observers, and alternative platform and remote monitoring; and (4) stranding networks. All of the methods may contribute to useful bycatch estimation programs, but at-sea observation (observers or electronic monitoring) provides the best mechanism to obtain reliable and accurate bycatch estimates for many fisheries. Often, observer programs also will be the most cost-effective of these alternatives. However, observers are not always the most cost-effective or practicable method for assessing bycatch (NMFS, 2004a).

The effectiveness of any SBRM depends on its ability to generate estimates of the type and quantity of bycatch that are both precise and accurate enough to meet the conservation and management needs of a fishery. The National Bycatch Report (NMFS, 2004a) contains an in-depth examination of the issues of precision and accuracy in estimating bycatch. Accuracy refers to the closeness between the estimated value and the (unknown) true value that the statistic was intended to measure. Precision refers to how closely multiple measurements of the same statistic cluster to one another when obtained under the same protocol. The more precise an estimate is the tighter the cluster. The precision of an estimate is often expressed in terms of the coefficient of variation (CV) defined as the standard error of the estimator divided by the estimate. The lower the CV, the more precise the estimate is considered to be. A precise estimate is not necessarily an accurate estimate. The National Bycatch Report (NMFS, 2004a) contains an extensive discussion of how precision relates to sampling and to assessments.

The other important aspect of obtaining bycatch estimates that are useful for management purposes is accuracy. Accuracy is the difference in the mean of the sample and the true value of that property in the sampled universe (NMFS, 2004a). In other words, accuracy refers to how correct the estimate is. Efficient allocation of sampling effort within a stratified survey design improves the precision of the estimate of overall discard rates (Rago *et al.*, 2005). Accuracy of sample estimates can be evaluated by comparing performance measures (e.g., landings, trip duration) between vessels with and without observers present. While there are differences between the terms accuracy and bias they have been used interchangeably. A "biased" estimate is inaccurate while an "accurate" estimate is unbiased (Rago *et al.*, 2005).

The NWGB recommended that at-sea sampling designs should be formulated to achieve precision goals for the least amount of observation effort, while also striving to increase accuracy (NMFS, 2004a). This can be accomplished through random sample selection, developing appropriate sampling strata and sampling allocation procedures, and by implementing appropriate tests for bias. Sampling programs will be driven by the precision and accuracy required by managers to address management needs for estimating management quantities such as allowable catches through a stock assessment, for evaluating bycatch relative to a management standard such as allowable take, and for developing mitigation mechanisms.

The recommended precision goals for estimates of bycatch are defined in terms of the coefficient of variation (CV) of each estimate. For marine mammals and other protected species, including seabirds and sea turtles, the recommended precision goal is a 20 to 30 percent CV for estimates of interactions for each species/stock taken by a fishery. For fishery resources, excluding protected species, caught as bycatch in a fishery, the recommended precision goal is a 20 to 30 percent CV for estimates of total discards (aggregated over all species) for the fishery; or if total catch cannot be divided into discards and retained catch, then the goal is a 20 to 30 percent CV for estimates of total catch (NMFS, 2004a). The report also states that attainment of these goals may not be possible or practical in all fisheries and should be evaluated on a case-by-case basis.

The CV of an estimate can be reduced and the precision increased by increasing sample size. In the case of observer programs, this would entail increasing the number of trips or gear deployments observed. Increasing the number of trips observed increases both the cost in terms of funding, but also the logistical complexities and safety concerns. However, the improvements in precision will decline at a decreasing rate as sample size is increased to a point where it will not be cost-effective to increase sample size any further. This concept is illustrated in Figure 1 of the National Bycatch Report (NMFS, 2004a). As a result of this statistical relationship, fishery managers select observer coverage levels that should achieve the desired or required balance between precision of bycatch estimates and cost.

While the relationship between precision and sample size is relatively well known (NMFS, 2004), the relationship between sample size and accuracy is not reliable. Observer programs strive to achieve samples that are representative of both fishing effort and catches. Representativeness of the sample is critical not only for obtaining accurate (*i.e.*, unbiased) estimates of bycatch, but also for collecting information about factors that may be important for mitigating bycatch. Bias may be introduced at several levels: when vessels are selected for coverage, when hauls are selected for sampling, or when only a portion of the haul can be sampled (NMFS, 2004a).

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

(2003), but additional analyses would need to be conducted to determine the applicability to HMS fisheries.

A simplistic approach in trying to get more accurate bycatch estimates is to increase observer coverage. A report by Babcock *et al.* (2003) suggests that relatively high percentages of observer coverage are necessary to adequately address potential bias in bycatch estimates from observer programs. However, the examples cited by Babcock *et al.* (2003) as successful in reducing bias through high observer coverage levels are fisheries comprised of relatively few vessels compared to many other fisheries, including the Atlantic HMS fisheries. Their examples are not representative of the issues facing most observer programs and fishery managers, who must work with limited resources to cover large and diverse fisheries. It is also incorrect to assume that simply increasing observer coverage ensures accuracy of the estimates (Rago *et al.*, 2005). Bias due to unrepresentative sampling may not be reduced by increasing sample size due to logistical constraints, such as if certain classes of vessels cannot accommodate observers. Increasing sample size may only result in a larger, but still biased, sample.

Although the precision goals for estimating bycatch are important factors in determining observer coverage levels, other factors are also considered when determining actual coverage levels. These may result in lower or higher levels of coverage than that required to achieve the precision goals for bycatch estimates. Factors that may justify lower coverage levels include lack of adequate funding; incremental coverage costs that are disproportionately high compared to benefits; and logistical consideration such as lack of adequate accommodations on a vessel, unsafe conditions, and lack of cooperation by fishermen (NMFS, 2004a).

Factors that may justify higher coverage levels include incremental coverage benefits that are disproportionately high compared to costs and other management focused objectives for observer programs. The latter include total catch monitoring, in-season management of total catch or bycatch, monitoring bycatch by species, monitoring compliance with fishing regulations, monitoring requirements associated with the granting of Experimental Fishery Permits, or monitoring the effectiveness of gear modifications or fishing strategies to reduce bycatch. In some cases, management may require one or even two observers to be deployed on every fishing trip. Increased levels of coverage may also be desirable to minimize bias associated with monitoring "rare" events with particularly significant consequences (such as takes of protected species), or to encourage the introduction of new "standard operating procedures" for the industry that decrease bycatch or increase the ease with which bias can be monitored (NMFS, 2004a).

NMFS utilizes self-reported logbook data (Fisheries Logbook System or FLS, and the supplemental discard report form in the reef fish/snapper-grouper/king and Spanish mackerel/shark logbook program), at-sea observer data, and survey data (recreational fishery dockside intercept and telephone surveys) to produce bycatch estimates in HMS fisheries. These data are collected with respect to fishing gear type (see Section 3.8.2). The number and location of discarded fish are recorded, as is the disposition of the fish (*i.e.*, released alive vs. released dead). Post-release mortality of HMS can be accounted for in stock assessments to the extent that the data allow.

The fishery logbook systems in place are mandatory programs, and it is expected that the reporting rates are generally high (Garrison, 2005). Due to the management focus on HMS fisheries, there has been close monitoring of reporting rates, and observed trips can be directly linked to reported effort. In general, the gear characteristics and amount of observed effort is consistent with reported effort. However, under-reporting is possible, which can lead to a negative bias in bycatch estimates. Cramer (2000) compared dead discards of undersized swordfish, sailfish, white and blue marlin, and pelagic sharks from HMS logbook and POP data in the U.S. Atlantic pelagic longline fishery. Cramer (2000) provided the ratio of catch estimated from the POP data divided by the reported catch in the HMS logbooks. The ratio indicated the amount of underreporting for each species in a given area. However, the data analyzed by Cramer (2000), was based on J-hook data from 1997 – 1999 and that gear is illegal now. In some instances, logbooks are used to provide effort information against which bycatch rates obtained from observers is multiplied to estimate bycatch. In other sectors/fisheries, self-reporting provides the primary method of reporting bycatch because of limited funding, priorities, etc.

The following section provides a review of the bycatch reporting methodologies for all HMS fisheries currently in place. Future adjustments may be implemented based on evaluation of the results of studies developed as part of the HMS Bycatch Reduction Implementation Plan, or as needed due to changing conditions in the fisheries. In addition, NMFS is in the process of developing a National Bycatch Report which may provide additional insight and guidance on areas to be addressed for each fishery. Further analyses of bycatch in the various HMS fisheries may be conducted as time, resources and priorities allow.

3.8.2.1 U.S. Atlantic Pelagic Longline Fishery

NMFS utilizes both self-reported data (mandatory logbooks for all vessels) and observer data to monitor bycatch in the pelagic longline fishery. The observer program has been in place since 1992 to document finfish bycatch, characterize fishery behavior, and quantify interactions with protected species (Beerkircher *et al.*, 2002). The program is mandatory for those vessels selected and all vessels with directed and indirect swordfish permits are selected. The program had a target coverage level of five percent of the U.S. fleet within the North Atlantic (waters north of 5^{o} N. latitude), as was agreed to by the United States at ICCAT. Actual coverage levels achieved from 1992 – 2003 ranged from two to nine percent depending on quarter and year. Observer coverage was 100 percent for vessels participating in the NED experimental fishery during 2001 – 2003. Overall observer coverage in 2003 was 11.5 percent of the total sets made, including the NED experiment. The program began requiring an eight percent coverage rate due to the requirements of the 2004 Biological Opinion for Atlantic Pelagic Longline Fishery for HMS. Observer coverage in 2004 ranged from 6.2 – 9.0 percent per quarter. Since 1992, data collection priorities have been to collect catch and effort data of the U.S. Atlantic pelagic longline fleet on highly migratory fish species, although information is also collected on bycatch of protected species.

Fishery observer effort is allocated among eleven large geographic areas and calendar quarter based upon the historical fishing range of the fleet (Walsh and Garrison, 2006). The target annual coverage is eight percent of the total reported sets, and observer coverage is randomly allocated based upon reported fishing effort during the previous fishing year/quarter/statistical reporting area (Beerkircher *et al.*, 2002). Bycatch rates of protected species (catch per 1,000 hooks) are quantified based upon observer data by year, fishing area, and quarter (Garrison, 2005). The estimated bycatch rate is then multiplied by the fishing effort (number of hooks) in each area and quarter reported to the FLS program to obtain estimates of total interactions for each species of marine mammal and sea turtle (Garrison, 2005).

3.8.2.2 Purse Seine Fishery

Vessels operating in the bluefin tuna purse seine fishery submit either Vessel Trip Reports (NERO) or HMS logbooks (Southeast) based on the type of Federal permits they hold in addition to their HMS permit. Observers were placed on purse seine vessels operating in this fishery in 1996 and 2001 in order to monitor groundfish bycatch in closed areas in the Northwest Atlantic (B. McHale, pers. comm., 2005). The purse seine fishery was observed to have very little bycatch of groundfish or other species of fish and no protected species interactions. As a result, observer coverage has not been used recently to document bycatch or validate logbook reports.

3.8.2.3 Shark Bottom Longline Fishery

Vessels participating in the bottom longline fishery for sharks are required to submit snapper/grouper/reef fish/shark logbooks to report their catch and effort, including bycatch species. All vessels having Shark Limited Access Permits are required to report. The Commercial Shark Fishery Observer Program (CSFOP) has monitored the shark bottom longline fishery since 1994. The program has been mandatory for vessels selected to carry observers beginning in 2002. Prior to that, it was a voluntary program relying on cooperating vessels/captains to take observers. From 2002 – 2005, the objective of the vessel selection was to achieve a representative five percent level of coverage of the total fishing effort in each fishing area (North Atlantic, South Atlantic, and Gulf of Mexico) and during each fishing season of that year (Smith *et al*., 2006). Beginning in 2006, target coverage level will be 3.9 percent of the total fishing effort. This level is estimated to attain a sample size needed to provide estimates of sea turtle, smalltooth sawfish, or marine mammal interactions with an expected CV of 0.3 (Carlson, unpubl., as cited in Smith *et al*., 2006)

Effective August 1, 2001, selected Federal permit holders that report on the Gulf of Mexico reef fish, South Atlantic snapper-grouper, king and Spanish mackerel, and shark fisheries logbook must report all species and quantities of discarded (alive and dead) sea turtles, marine mammals, birds, and finfish on a supplemental discard form. A randomly selected sample of 20 percent of the vessels with active permits in the above fisheries is selected each year. The selection process is stratified across geographic area (Gulf of Mexico and South Atlantic), gear (handline, longline, troll, gillnet, and trap), and number of fishing trips (ten or less trips and more than 11 trips). Of the 3,359 vessels with Federal permits in these fisheries in 2003, a total of 452 vessels were selected to report. Of the 3,517 vessels with Federal permits in the fisheries in 2004, 428 were selected to report. Shark fishermen can use the pelagic longline logbook or the northeast vessel trip reports depending on the permits held by the vessel. If they use either the PLL logbook or VTR, they need to report all of the catch and effort, as well as all the bycatch or incidental catch.

3.8.2.4 Shark Gillnet Fishery

Vessels participating in the gillnet fishery for sharks are required to submit logbooks to report their catch and effort, including bycatch species. An observer program for the directed shark gillnet fishery has been in place from 1993 – 1995 and from 1998 to the present. The objectives of this program are to obtain estimates of catch and bycatch and bycatch mortality rates of protected species, juvenile sharks, and other fish species. Catch and bycatch estimates are produced to meet the mandates of the Atlantic Large Whale Take Reduction Plan and the October 2003 Biological Opinion.

During right whale calving season (15 November to 31 March), 100 percent observer coverage is required for shark gillnet vessels operating from West Palm Beach, FL, to Sebastian Inlet, FL. Outside right whale calving season, observer coverage is equal to that which would obtain a sample size needed to provide estimates of sea turtle or marine mammal interactions with an expected CV of 0.3 (in 2003, this was 33.8 percent of the total trips) (Carlson and Baremore, 2002). On June 21, 2005, NMFS proposed modifying the time and areas where 100 percent observer coverage is required during right whale calving season (70 FR 35894). NMFS has proposed that, from November 15 to April 15, 100 percent observer coverage would be required for gillnet vessels fishing between the SC/GA border and 29^{o} 00 N. Gillnet vessels fishing between 29^{o} 00 N and 26^{o} 46.5 N would be required to have 100 percent observer coverage from December 1 to March 31.

Starting in 2005, a pilot observer program was begun to include all vessels that have an active directed shark permit and fish with sink gillnet gear (Carlson and Bethea, 2006). These vessels were not subject to observer coverage because they were either targeting non-highly migratory species or were not fishing gillnets in a drift or strike fashion. These vessels were selected for observer coverage in an effort to determine their impact on finetooth shark landings and their overall impact on shark resources when not targeting sharks. One of the alternatives to reduce mortality of finetooth sharks in this document would thereby increase observer coverage to these vessels with directed shark permits that report landing sharks with gillnet.

3.8.2.5 Commercial Handgear Fishery

The commercial handgear fishery includes vessels using handline, harpoon, rod and reel, or bandit gear to fish for HMS. NMFS has the authority to use observers to collect bycatch information from commercial vessels fishing for tunas. Many of these vessels are already required to complete Federal and/or state logbooks (*e.g.*, the NMFS Northeast Region Vessel Trip Report (VTR) Program), in which they are required to report all fishing information, including that for HMS and bycatch. NMFS is currently evaluating various alternatives to increase fishery data collection of vessels fishing for HMS with handgear, such as selecting additional HMS permitted vessels to report in logbooks or to be selected for observer coverage, and is investigating alternatives for electronic reporting. Therefore, no estimates of bycatch are available at this time. Bycatch and bycatch mortality are considered to be low due to the nature of the gear but this should be validated in the future.

3.8.2.6 Recreational Handgear Fishery

NMFS collects recreational catch-and-release data from dockside surveys (the Large Pelagics Survey and the Marine Recreational Fishery Statistics Survey) for the rod and reel fishery and uses these data to estimate total landings and discards of bycatch or incidental catch. Statistical problems associated with small sample size remain an obstacle to estimating bycatch reliably in the rod and reel fishery. CVs can be high for many HMS (rare event species in the MRFSS) and the LPS does not cover all times/geographic areas for non-bluefin tuna species. New survey methodologies are being developed, however, especially for the Charter/Headboat sector of the rod and reel fishery, which should help to address some of the problems in estimating bycatch for this fishery. In addition, selecting recreational vessels for voluntary logbook reporting may be an option for collecting bycatch information for this sector of the HMS fishery.

NMFS has the authority to use observers to voluntarily collect bycatch information from vessels with HMS Charter/Headboat or Angling category permits. Many of the charter/headboat vessels are required to complete Federal and/or state logbooks (*e.g.*, the NMFS Northeast Region Vessel Trip Report (VTR) Program), in which they are required to report all fishing information, including that for HMS and bycatch. NMFS is currently evaluating various alternatives to increase logbook coverage of vessels fishing for HMS, such as selecting additional HMS vessels to report in logbooks or be selected for observer coverage, and is investigating alternatives for electronic reporting.

The National Academy of Sciences assembled a committee to review current marine recreational fishing surveys at the request of NMFS (NAS, 2006). The committee was tasked with developing recommendations for improvements to current surveys and to recommend the implementation of possible alternative approaches. The committee's final report was published in April 2006, and NMFS is in the process of evaluating the recommendations. At the present time, no other alternative approach is available.

3.8.3 Bycatch Reduction in HMS Fisheries

The NMFS HMS bycatch reduction program includes an evaluation of current data collection programs, implementation of bycatch reduction measures such as gear modifications and time/area closures, and continued support of data collection and research relating to bycatch (Table 3.107). Additional details on bycatch and bycatch reduction measures can be found in Section 3.5 of the Fishery Management Plan for Atlantic Tunas, Swordfish and Sharks (NMFS, 1999), in Regulatory Amendment 1 to the 1999 FMP (NMFS, 2000), in Regulatory Adjustment 2 to the 1999 FMP (NMFS, 2002), and in Amendment 1 to the 1999 FMP (NMFS, 2003a). In addition, an HMS Bycatch Reduction Implementation Plan was developed in late 2003 which identify priority issues to be addressed in the following areas: 1) monitoring, 2) research, 3) management, and 4) education/outreach. Individual activities in each of these areas were identified and new activities may be added or removed as they are addressed or identified.

3.9 HMS Permits and Tournaments

This section provides updates for the number of permits that were issued in conjunction with HMS fishing activities as of February 2006. Furthermore, Section 3.9.6, Atlantic HMS Tournaments, provides a comprehensive synthesis of recreational fishing tournaments and their role in the context of HMS management.

NMFS' HMS Management Division continues to monitor capacity in HMS fisheries. Updated permit numbers for HMS fisheries as of April 2005, are included in Table 3.95 through Table 3.101. These tables have been updated since the Draft Consolidated HMS FMP, which listed numbers of permits as of April 2005. The overall number of limited access permits for Atlantic swordfish, tunas, and sharks increased from 1,128 to 1,131 (Table 3.95) between October 2005 and February 2006, however, these numbers are subject to change based upon on-going permit renewal or expiration. The overall number of tuna permits increased in all categories between October 2005 and February 2006 (Table 3.96). The HMS Angling Permit category went into effect on March 1, 2003 (67 FR 77434, December 18, 2003), and there has been a significant increase in Angling category permits over the past few years (Table 3.96). The number of tuna dealer permits increased from 364 (April 20, 2005) to 416 (February 1, 2006) (Table 3.99).

Table 3.95 Distribution of Shark, Swordfish, and Tuna longline Limited Access Permits Between 2001 and 2006. Data for 2001-2005 are as of October 1 for each year.

State	# Directed Swordfish	# Incidental Swordfish	# Swordfish Handgear	# Directed Shark	# Incidental Shark	# Tuna Longline	# Permit Holders/# Permits
ME	2	-	4	2	3	1	9/12
NH	-	-	-	-	1	-	1/1
MA	13	1	21	4	13	8	37/60
RI	2	4	19	-	10	1	24/36
CT	1	-	1	-	1	1	2/4
NY	12	2	9	7	8	12	24/50
NJ	22	13	9	22	21	30	48/117
DE	4	-	-	3	1	3	4/11
MD	6	-	-	3	6	6	9/24
VA	-	3	-	3	3	3	6/12
NC	9	10	2	21	16	15	37/73
SC	2	1	-	7	14	4	20/28
GA	1	-	-	2	2	-	4/5
FL	66	32	22	144	137	76	299/477
AL	-	1	-	2	1	1	3/5
MS	-	2	-	1	7	1	8/11
LA	37	7	-	7	43	44	49/138
TX	1	5	-	2	10	6	12/24
CA	-	-	-	-	-	1	1/1
PA	2	2	-	2	4	1	6/11
VI	1	-	-	-	1	1	1/3
No Vessel ID	10	3	1	8	10	-	-
Totals 2006**	**191**	**86**	**88**	**240**	**312**	**214**	**604/1131**
2005	**190**	**91**	**92**	**235**	**320**	**200**	**639/1128**

State	# Directed Swordfish	# Incidental Swordfish	# Swordfish Handgear	# Directed Shark	# Incidental Shark	# Tuna Longline	# Permit Holders/# Permits
2004	**195**	**99**	**96**	**241**	**348**	**222**	**657/1201**
2003	**206**	**99**	**95**	**251**	**359**	**235**	**696/1245**
2002	**205**	**110**	**94**	**251**	**376**	**226**	**713/1262**
2001	**208**	**112**	**100**	**252**	**390**	**213**	**752/1275**

* Number of permit holders in each category, and state, is subject to change as permits are renewed or expire.
** Totals for 2006 are as of February 1, 2006

3.9.1 Upgrading and Safety Issues

When the limited access program was implemented, NMFS included upgrading restrictions that were the same as those implemented by the New England Fishery Management Council (NEFMC) and Mid-Atlantic Fishery Management Council (MAFMC) in order to help minimize the number of regulations for fishermen in those areas. These regulations restrict vessels from any increase over ten percent length overall (LOA), ten percent gross or net tonnage, and 20 percent horsepower. NMFS continues to receive comments that these vessel upgrading restrictions are not appropriate for longline fisheries, may inhibit full utilization of the domestic swordfish quota, are not the preferred vessel characteristics to limit overcapitalization, and have caused safety at sea concerns. In developing the current upgrading restrictions, hold capacity was identified by constituents as a vessel characteristic that would not impact safety at sea and would meet the objective of addressing overcapitalization in HMS commercial fisheries. NMFS did not implement hold capacity as a measure to limit vessel upgrading in 1999 due to the lack of standard measurements of vessel hold capacity as well as the lack of consistent collection of this information for HMS commercial vessels as part of existing vessel registration systems. NMFS has considered other possible options including: eliminating upgrading restrictions; limiting hold capacity instead of, or in addition to, the current restrictions; allowing a greater percentage increase; and creating vessel categories. NMFS heard similar comments as those listed above from the Advisory Panel (AP) in February of 2004. NMFS is considering these options, and, as with any potential changes in the permitting system, will allow for adequate public comment during the rulemaking process before making any changes to the regulations.

3.9.2 Atlantic Tunas Permits

The number of Atlantic Tunas permit holders by category is listed in Table 3.96. The number of permits in the Longline, General, and Charter/Headboat (CHB) categories increased between 2004 and April 2005. In previous years, CHB vessels fishing for HMS only needed a CHB permit if they were fishing for Atlantic tunas.

Table 3.96 The number of Atlantic tuna permit holders in each category as of October 2001 through 2005. Permit numbers for 2006 are as of February 1, 2006. The actual number of 2006 permit holders in each category is subject to change as individuals renew or allow their permits to expire.

Category	2001	2002	2003**	2004	2005	2006
Longline	213	226	235	222	200	214
Angling *	12,685	13,263	18,804	20,245	24,127	25,238
Harpoon	53	56	47	49	40	40
Trap	1	6	2	2	7	7
General	6,072	6,431	5,526	5,057	4,494	4,824
Purse Seine	5	5	5	5	5	5
CHB**	3,260	3,659	4,167	3,881	3,963	4,173
Total	**22,289**	**23,646**	**28,789**	**29,461**	**32,836**	**34,501**

* HMS Angling permit became effective March 1, 2003 (67 FR 77434, December 18, 2003) and includes all HMS, not just tunas.
****** No longer a tuna-only permit, became a HMS CHB permit on March 1, 2003

In December 2002, NMFS published a final rule (67 FR 77434, December 18, 2002) that required the owner of each vessel used to fish recreationally for Atlantic HMS or on which Atlantic HMS are retained or possessed, to obtain an HMS Angling permit. Effective March 1, 2003, this permit replaced the Atlantic Tunas Angling category permit. It is discussed in greater detail in the HMS Angling Permit section.

3.9.3 HMS CHB Permits

In 2002, NMFS published a final rule (67 FR 77434, Dec. 18, 2002) expanding the HMS recreational permit from tuna only to include all HMS and define CHB operations. This established a requirement that owners of charterboats or headboats that are used to fish for, take, retain, or possess Atlantic tunas, sharks, swordfish, or billfish must obtain a HMS CHB permit. This permit replaced the Atlantic Tunas CHB permit. A vessel issued a HMS CHB permit for a fishing year will not be issued an HMS Angling permit or any Atlantic Tunas permit in any category for that same fishing year, regardless of a change in the vessel's ownership. The total number of CHB increased between April 2005 and February 2006.

Table 3.97 CHB Permits by State as of February 1, 2006.

State	CHB permits	State	CHB Permits
AL	76	NH	47
CT	91	NJ	643
DE	129	NV	--
FL	673	OH	2
GA	31	PA	11
LA	93	PR	27
MA	557	RI	163
MD	198	SC	141
ME	64	TN	--
MI	2	TX	166
MS	32	VA	142
NC	465	VI	18
NY	373	Other	23
Total			**4,173**

3.9.6 HMS Angling Permit

Effective March 2003 (67 FR 77434, Dec. 18, 2002), the HMS Angling category permit allows all recreational anglers aboard permitted vessels to fish for HMS and is required to fish for, retain, or possess, including catch and release fishing, any federally regulated HMS. These species include: sharks, swordfish, white and blue marlin, sailfish, spearfish, and federally regulated Atlantic tunas (bluefin, yellowfin, bigeye, skipjack, and albacore). Atlantic HMS caught, retained, possessed, or landed by persons on board vessels with an HMS Angling permit may not be sold or transferred to any person for a commercial purpose. By definition, recreational landings of Atlantic HMS are those that cannot be marketed through commercial channels, therefore it is not possible to monitor anglers' catches through ex-vessel transactions as in the commercial fishery. Instead, NMFS conducts statistical sampling surveys of the recreational fisheries. These survey programs have been used for over a decade and include the Marine Recreational Fisheries Statistics Survey (MRFSS) and the Large Pelagic Survey (LPS). A vessel issued an HMS Angling permit for a fishing year shall not be issued an HMS Charter/ Headboat permit or an Atlantic Tunas permit in any category for that same fishing year, regardless of a change in the vessel's ownership.

3.9.4 Dealer Permits

Dealer permits are required for commercial receipt of Atlantic tuna, swordfish, and sharks, and are described in further detail in the 1999 Tunas, Swordfish, and Sharks FMP. Dealer permits are not limited access. Fishermen caught selling HMS to unpermitted dealers and persons without a dealer permit buying HMS from fishermen could be subject to enforcement action. Similarly, persons caught buying HMS from non-commercial fishermen could also be subject to enforcement action. All dealer permit holders are required to submit reports detailing the nature of their business. For swordfish and shark permit holders (including those who *only* import swordfish), dealers must submit bi-weekly dealer reports on all HMS they purchase. Tuna dealers must submit, within 24 hours of the receipt of a bluefin tuna, a landing report for each bluefin purchased from U.S. fishermen. Dealers must also submit bi-weekly reports that include additional information on tunas that they purchase. To facilitate quota monitoring "negative reports" for shark and swordfish are also required from dealers when no purchases are made (*i.e.*, NMFS can determine who has not purchased fish versus who has neglected to report). NMFS continues to automate and improve its permitting and dealer reporting systems and plans to make additional permit applications and renewals available online in the near future.

Starting July 1, 2005, dealers who import and/or export certain HMS species are required to obtain the NMFS HMS International Trade Permit (ITP) (69 FR 67268, November 17, 2004) (Table 3.100). The permit has been established to coordinate U.S. implementation of ICCAT and IATTC trade tracking recommendations. The HMS ITP is required for trade of bluefin tuna, southern bluefin tuna, swordfish, and frozen bigeye tuna. Reporting associated with the HMS ITP will include biweekly reports and submission of swordfish, bluefin tuna, southern bluefin tuna and bigeye tuna statistical documents. Atlantic tunas and swordfish dealer permits will no longer be required for international trade of these species, and will be necessary only for domestic transactions. Additionally, the Pacific Ocean bluefin tuna dealer permit will no longer be in effect.

Table 3.98 Number of shark and swordfish dealer permits issued in each state or country as of October 2001-2005. Permits for 2006 are as of February 1, 2006. The actual number of permits per may change as permit holders move or sell their businesses.

State/Country	Atlantic swordfish	Atlantic sharks	# of permits
AL	2	5	7
CA	29	29	58
FL	94	119	213
GA	1	1	2
HI	7	7	14
LA	12	13	25
MA	31	31	62
MD	6	6	12
ME	3	3	6
MO	--	1	1
MS	--	1	1
NC	14	20	34
NJ	14	14	28
NY	18	18	36
OH	--	--	--
PA	2	2	4

State/Country	Atlantic swordfish	Atlantic sharks	# of permits
PR	1	1	2
RI	10	10	20
SC	11	20	31
TX	8	11	19
VA	4	6	10
VI	1	1	2
WA	8	8	16
Canada	8	8	16
Chile	1	1	2
New Zealand	--	--	--
Ecuador	--	--	--
Totals 2006	**285**	**336**	**621**
2005	**294**	**228**	**522**
2004	**321**	**230**	**559**
2003	**319**	**254**	**573**
2002	**321**	**267**	**588**
2001	**302**	**249**	**551**

Table 3.99 Number of Atlantic tuna dealer permits by state issued in the 2005 calendar year. Dealers may obtain a permit to sell and purchase only bluefin tuna, only BAYS tunas, or both bluefin and BAYS tunas.

State	Bluefin Only *	BAYS Only	Bluefin and BAYS	Total Atlantic Tunas Dealer Permits
AL	--	--	1	1
CA	8	--	5	13
CT	--	--	2	2
DE	--	--	3	3
FL	1	1	16	18
GA	--	--	2	2
IL	1	--	--	1
HI	--	--	2	2
LA	1	--	11	12
MA	14	5	77	96
MD	--	1	9	10
ME	10	--	13	23
NC	6	7	25	38
NH	--	--	5	5

State	Bluefin Only *	BAYS Only	Bluefin and BAYS	Total Atlantic Tunas Dealer Permits
NJ	1	9	32	42
NY	3	14	49	66
PA	--	--	3	3
PR	--	4	2	6
RI	--	5	30	35
SC	--	4	8	12
TX	--	1	2	3
VA	1	6	14	21
VI	--	3	1	4
WA	--	--	1	1
Total	**43**	**60**	**313**	**416**

- Does not include Pacific bluefin tuna dealer permits which were eliminated July 1, 2005.

Table 3.100 Number of International Trade Permits (ITP) by state (province) as of February 1, 2006.

State/Province	Number of ITPs
CA	13
FL	22
GA	1
HI	2
LA	3
MA	23
ME	4
NC	4
NJ	7
NY	13
RI	3
VA	2
WA	1
Nova Scotia, Canada	2
Total	**100**

3.9.5 Exempted Fishing Permits (EFPs), Display Permits, Chartering Permits, and Scientific Research Permits (SRPs)

EFPs, display permits, and SRPs are requested and issued under the authority of the Magnuson-Stevens Act (16 U.S.C. 1801 et seq.) and/or the ATCA (16 U.S.C. 971 et seq.). EFPs are issued to individuals interested in being exempted from regulations for the purpose of conducting research or other fishing activities using private (non-NOAA) vessels, whereas an SRP would be issued to agency scientists who are using NOAA vessels as their research platform. Display permits are issued to individuals who are fishing for, catching, and then transporting HMS to certified aquariums for public display. Regulations at 50 CFR 600.745 and 50 CFR 635.32 govern scientific research activity, exempted fishing, and exempted educational activity with respect to Atlantic HMS. Amendment 1 to the Atlantic Tunas, Swordfish, and Sharks FMP implemented and created a separate display permitting system, which operates apart from the exempted fishing activities that are focusing on scientific research. However, the application process for display permits is similar to that required for EFPs and SRPs. The quota is 60 mt ww for all sharks collected under exempted fishing permits.

Issuance of EFPs, display permits, and SRPs may be necessary because possession of certain shark and billfish species are prohibited, possession of billfishes on board commercial fishing vessels is prohibited, the commercial fisheries for bluefin tuna, swordfish and large coastal sharks may be closed for extended periods during which collection of live animals and/or biological samples would otherwise be prohibited, or for other reasons. These EFPs, SRPs, and display permits would authorize collections of tunas, swordfish, billfishes, and sharks from Federal waters in the Atlantic Ocean and Gulf of Mexico for the purposes of scientific data collection and public display. In addition, NMFS regulations at 50 CFR 635.32 regarding implantation or attachment of archival tags in Atlantic HMS require prior authorization and a report on implantation activities.

In order to implement the chartering recommendations of ICCAT, NMFS recently published a rule on December 6, 2004 (69 FR 70396), requiring U.S. vessel owners with HMS permits to apply for and obtain a chartering permit before fishing under a chartering arrangement outside U.S. waters. These permits are issued in a similar manner as other EFPs. Under this final rule and consistent with the ICCAT recommendations, vessels issued a chartering permit are not authorized to use the quota or entitlement of the United States until the chartering permit expires or is terminated. This is because of the fact that under a chartering arrangement it is assumed that vessels have attained temporary authorization to harvest another ICCAT Contracting Parties' quota. Having a chartering permit does not obviate the need to obtain a fishing license, permits, or other authorizations issued by the chartering nation in order to fish in foreign waters, or obtain other authorizations such as a High Seas Fishing Compliance Act Permit, 50 CFR 300.10 et seq. Additionally, incidental takes of, or interactions with, protected resources are included against the Incidental Take Statement specified in any relevant Biological Opinions. A U.S. vessel shall not be authorized to fish under more than one chartering arrangement at the same time. NMFS will issue chartering permits only if it determines that the chartering arrangement is in conformance with ICCAT's conservation and management programs.

The number of EFPs, display permits, and SRPs issued from 2002 – 2006 by category and species are listed in Table 3.101. Year-end reports for permits issued for 2004 are required, and are expected to be submitted to NMFS in early 2005.

Table 3.101 Number of Exempted Fishing Permits (EFPs), Display Permits, and Scientific Research Permits (SRPs) issued between 2002 and 2006.

Permit type		2002	2003	2004	2005	2006*
Exempted Fishing Permit	Sharks for display	7	8	8	6	3
	HMS for display	1	1	1	1	--
	Tunas for display	0	0	1	0	--
	Shark research on a non-scientific vessel	5	9	6	5	--
	Tuna research on a non-scientific vessel	4	5	11	7	1
	HMS research on a non-scientific vessel	5	18	5	3	3
	Billfish research on a non-scientific vessel	0	0	1	2	1
	Shark Fishing	1	1	0	0	--
	HMS Chartering	0	0	1	0	--
	Tuna Fishing	6	7	2	0	
	TOTAL	**29**	**49**	**36**	**24**	**8**
Scientific Research Permit	Shark research	2	1	3	4	--
	Tuna research	1	0	0	0	--
	Billfish research	0	0	0	0	--
	HMS (multi-species) research	1	1	1	4	3
	TOTAL	**4**	**2**	**4**	**8**	**3**
Letters of Acknowledgement	Shark research	3	3	2	4	1
	TOTAL	**3**	**3**	**2**	**4**	**1**

***** Permit numbers for 2006 are as of February 1, 2006.

3.9.6 Atlantic HMS Tournaments

Fishing tournaments are an important component of HMS recreational fisheries. A tournament is defined in the HMS regulations as any fishing competition involving Atlantic HMS in which participants must register or otherwise enter or in which a prize or award is offered for catching or landing such fish. Since 1999, Federal regulations have required that each HMS tournament operator register their tournament with NMFS at least four weeks prior to the commencement of tournament fishing activities. Tournament operators may be selected for reporting and must submit tournament results to NMFS within seven days of the conclusion of the tournament.

Tournament registration and reporting is necessary because it provides an important source of information used to assess HMS fish stocks and to estimate the annual catch of Atlantic HMS. The information may be used by NMFS to plan for the assignment of tournament observers to assist in catch/effort data compilation and to obtain biological data and samples from landed fish (length/weight, stomach contents, injuries, parasites, hard and soft tissue samples for age determination, genetic and microconstituent analysis, spawning condition, fecundity, etc.). Additionally, with an accurate tournament database, NMFS may better assess the practicality of using tournaments for angler educational outreach efforts including distribution of written informational materials, notification of public hearings, and explanation of HMS regulations. HMS tournament registration and reporting information further allows NMFS, in the course of developing fishery management plans, to evaluate the social and economic impact of tournament angling in relation to other types of angling (*e.g*., commercial, non-tournament recreational) and the relative effect of tournament angling on populations of various regulated HMS. Finally, the information is essential for the U.S. to meet its reporting obligations to ICCAT.

When registering an HMS tournament, the following information is required to be submitted to the HMS Management Division in St. Petersburg, FL: (1) Tournament name; (2) tournament location; (3) name, address, phone number, fax number, and e-mail address of tournament operator; (4) fishing dates; and (5) HMS species for which points or prizes are awarded. If selected for reporting, operators must submit the following information to the SEFSC: (1) Tournament name; (2) tournament dates; (3) tournament location; (4) number of boats fishing; (5) hours fished; (6) recorder's name, phone number, and e-mail address; (7) the number of each species kept; (8) the number of each species lost; (9) the number of each species tagged and released; (10) the number of each species released without a tag; (11) the number of each species released dead; and, (12) the weight and length of all fish boated. This information is routinely collected during tournament operations to award prizes. Generally, 100 percent of all billfish tournaments are selected for reporting, as this information is critical to determining billfish landings. Tournament registration forms are available at: http://www.nmfs.noaa.gov/sfa/hms/linkpages/reporting_forms.htm.

The reasons for participation in fishing tournaments include, but are not limited to, competition, camaraderie, and the opportunity to win valuable prizes. A search on the Internet for fishing tournaments (December, 2004) indicated that many saltwater tournaments target HMS. It has been estimated that approximately 300 – 400 HMS fishing tournaments occur annually along the U.S. Atlantic coast, including the Gulf of Mexico and Caribbean (NMFS, 1999). These tournaments may range from smaller, club member-only events with as few as ten participating boats (40 – 60 anglers) to larger, statewide tournaments with 250 or more participating vessels (1,000 – 1,500 anglers). For the larger tournaments, corporate sponsorship from tackle manufactures, marinas, boat dealers, beverage distributors, resorts, publications, chambers of commerce, restaurants, and others are often involved.

Many HMS fishing tournaments, particularly those that target billfish, promote strict conservation principles in their rules. For example, significant numbers of blue marlin, white marlin, and sailfish tournaments are "release-only," utilizing observers, angler affidavits, polygraph tests, photographs, or video cameras to document the live release of marlins.

Minimum sizes for fish that are landed are often larger than state and Federal requirements. Also, some tournaments prohibit treble hooks and may require circle hooks on certain baits. Because tournament participants are often well-respected anglers (*i.e*. highliners), these conservation trends and ethics likely influence the general angling population in a positive manner.

For anglers in HMS tournaments, winning the prize money may not be the only motive for participation. Many HMS fishing tournaments support charitable organizations; an internet search revealed that some of the charities who have benefited from fishing tournaments include: the Cystic Fibrosis Foundation, Make-A-Wish Foundation, Sloan-Kettering Skin Cancer Center, Boy Scouts of America, Ducks Unlimited, The Boys and Girls Club, The Broadstreet Clinic, Core Sound Waterfowl Museum, Hope Mission Christian Ministries, Sertoma by the Bay (breast cancer research), Take A Kid Fishing, Capt. Bob Lewis Scholarship Fund, South Nassau Communities Hospital, South Texas Children's, T. H. Rogers School for Impaired Children's Home, The Billfish Foundation, and Kids In Distress.

Table 3.102 presents the number of registered HMS tournaments, by state, between 2001 and 2005. This table indicates that, in 2005, HMS fishing tournaments were conducted most frequently in Florida, Louisiana, Puerto Rico, North Carolina, Texas, New Jersey, Maryland, Georgia, New York, Virgin Islands, and South Carolina. By far, the largest number of registered HMS tournaments has consistently occurred in the state of Florida.

Table 3.102 Number of Registered HMS Tournaments by State between 2001 and 2005. Source: NMFS Atlantic HMS Tournament Registration Database

STATE	2001	2002	2003	2004	2005
ME	2	3	3	5	3
NH	0	0	0	0	0
MA	7	1	7	10	4
RI	2	2	3	3	2
CT	1	0	0	0	1
NY	5	4	14	14	10
NJ	11	5	18	17	16
DE	2	0	0	1	0
MD	4	2	14	14	14
VA	5	1	5	4	5
NC	11	5	15	16	18
SC	6	3	13	9	9
GA	6	1	12	3	13
FL	46	26	66	57	74
AL	7	7	9	8	7
MS	3	2	7	2	2
LA	19	0	20	22	26
TX	14	1	17	10	17
MI	1	0	0	0	0
PR	16	4	13	17	22

STATE	2001	2002	2003	2004	2005
USVI	9	0	6	1	10
Bahamas[1]	3	2	1	2	2
Bermuda[1]	0	0	0	0	1
Mexico[1]	1	0	0	0	0
Turks/Caicos[1]	0	0	1	0	0
TOTAL	**181**	**68**	**244**	**215**	**256**

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

Table 3.103 shows the number and percentage of HMS tournaments awarding points or awards for a particular HMS, based upon 2005 tournament registrations. Blue marlin, white marlin, sailfish, and yellowfin tuna are the predominant target species in HMS fishing tournaments.

Table 3.103 Number and Percent of All 2005 HMS Tournaments Awarding Points or Prizes for an HMS.
Source: NMFS Atlantic HMS Tournament Registration Database

Species	Number of Tournaments	Percent of tournaments
Blue Marlin	174	67.9%
White Marlin	164	64.1%
Sailfish	162	63.3%
Yellowfin Tuna	161	62.9%
Bluefin Tuna	83	32.4%
Swordfish	71	27.7%
Bigeye Tuna	53	20.1%
Pelagic Sharks	48	18.8%
Albacore Tuna	13	5.1%
Skipjack Tuna	9	3.5%
Small Coastal Sharks	5	2.0%
Ridgeback Sharks	5	2.0%
Non-Ridgeback Sharks	5	2.0%

Table 3.106 indicate the percentage and number of 2005 HMS registered tournaments, by state (or country), for blue marlin, white marlin and sailfish, respectively. These tables indicate that Florida is the leading state in terms of numbers of registered billfish tournaments, especially for sailfish.

Table 3.104 Registered Blue Marlin Tournaments, 2005. Source: NMFS Atlantic HMS Tournament Registration Database.

State	Number of 2005 Tournaments Awarding Points or Prizes for Blue Marlin	Percent of Total 2005 Tournaments Awarding Points or Prizes for Blue Marlin
Florida	36	20.7%
Louisiana	25	14.4%
Puerto Rico	17	9.8%
Texas	17	9.8%
North Carolina	15	8.6%
Georgia	11	6.3%
Maryland	11	6.3%
New Jersey	9	5.2%
U.S. Virgin Islands	9	5.2%
South Carolina	8	4.6%
Alabama	5	2.9%
Virginia	3	1.7%
Massachusetts	2	1.1%
Bahamas[1]	2	1.1%
Mississippi	1	0.6%
New York	1	0.6%
Rhode Island	1	0.6%
Bermuda[1]	1	0.6%
TOTAL	**174**	**100%**

Table 3.105 Registered White Marlin Tournaments, 2005. Source: NMFS Atlantic HMS Tournament Registration Database.

State	Number of 2005 Tournaments Awarding Points or Prizes for White Marlin	% of Total 2005 Tournaments Awarding Points or Prizes for White Marlin
Florida	36	22.0%
Louisiana	25	15.2%
North Carolina	15	9.1%
Texas	15	9.1%
Georgia	11	6.7%
Maryland	11	6.7%
New Jersey	9	5.5%
Puerto Rico	9	5.5%
South Carolina	8	4.9%
U.S. Virgin Islands	8	4.9%

State	Number of 2005 Tournaments Awarding Points or Prizes for White Marlin	% of Total 2005 Tournaments Awarding Points or Prizes for White Marlin
Alabama	6	3.6%
Virginia	3	1.8%
Massachusetts	2	1.2%
Bahamas[1]	2	1.2%
Rhode Island	1	0.6%
Mississippi	1	0.6%
New York	1	0.6%
Bermuda[1]	1	0.6%
TOTAL	**164**	**100%**

Table 3.106 Registered Sailfish Tournaments, 2005. Source: NMFS Atlantic HMS Tournament Registration Database.

State	Number of 2005 Tournaments Awarding Points or Prizes for Sailfish	% of Total 2005 Tournaments Awarding Points or Prizes for Sailfish
Florida	58	35.8%
Louisiana	25	15.4%
Texas	16	9.9%
North Carolina	15	9.2%
Georgia	11	6.8%
Puerto Rico	10	6.2%
South Carolina	7	4.3%
Alabama	6	3.7%
Maryland	3	1.8%
U.S. Virgin Islands	3	1.8%
Virginia	3	1.8%
Bahamas[1]	2	1.2%
Massachusetts	1	0.6%
Mississippi	1	0.6%
Bermuda[1]	1	0.6%
TOTAL	**162**	**100%**

Table 3.107 Summary of bycatch species in HMS fisheries, Marine Mammal Protection Act (MMPA) category, endangered Species Act (ESA) requirements, data collection, and management measures by fishery/gear type. (Excerpted from HMS Bycatch Priorities and Implementation Plan and updated through May 2006)

Fishery/Gear Type	Bycatch Species	MMPA Category	ESA Requirements	Bycatch Data Collection	Management Measures
Pelagic Longline	Bluefin tuna Billfish Undersize target species Marine mammals Sea turtles Seabirds Non-target finfish Prohibited shark species Large Coastal Shark species after closure	Category I	Jeopardy findings in 2000 & 2004, Reasonable and Prudent Alternative implemented 2001-04	Permit requirement (1985); logbook requirement (SWO- 1985; SHK - 1993); observer requirement (1992), EFPs (2001-03)	BFT target catch requirements (1981); quotas (SWO - 1985; SHK - 1993); prohibit possession of billfish (1988); minimum size (1995); gear marking (1999); line clippers, dipnets (2000); MAB closure (1999); limited access (1999); limit the length of mainline (1996-1997 only); move 1 nm after an interaction (1999); voluntary vessel operator workshops (1999); GOM closure (2000); FL, Charleston Bump, NED closures (2001); gangion length, corrodible hooks, de-hooking devices, handling & release guidelines (2001); NED experiment (2001); VMS (2003); circle hooks and bait requirements (2004)
Shark Bottom Longline	Prohibited shark species Target species after closure Sea turtles Smalltooth sawfish Non-target finfish	Category III	ITS, Terms & Conditions, RPMs	Permit requirement (1993); logbook requirement (1993); observer coverage (1994)	Quotas (1993); trip limit (1994); gear marking (1999); handling & release guidelines (2001); line clippers, dipnets, corrodible hooks, de-hooking devices, move 1 nm after an interaction (2004); South Atlantic closure, VMS (2005)
Shark Gillnet	Prohibited shark species Sea turtles Marine mammals Non-target finfish Smalltooth sawfish	Category II	ITS, Terms & Conditions, RPMs	Permit requirement (1993); logbook requirement (1993); observer coverage (1994)	Quotas (1993); trip limit (1994); gear marking (1999); deployment restrictions (1999); 30-day closure for leatherbacks (2001); handling & release guidelines (2001); net checks (2002); whale sighting (2002); VMS (2004); closure for right whale mortality (2006)
BFT Purse Seine	Undersize target species Non-target finfish	Category III	ITS, Terms & Conditions	Permit requirement (1982); observer requirement (1996, 2001 only); EFPs (2002-05)	Quotas (1975); limited access, individual vessel quotas (1982); minimum size (1982)

Fishery/Gear Type	Bycatch Species	MMPA Category	ESA Requirements	Bycatch Data Collection	Management Measures
BFT & SWO Harpoon	Undersize target species	Category III	ITS, Terms & Conditions	Permit requirement (BFT - 1982; SWO - 1987); SWO logbook requirement (1987)	Quotas (BFT - 1982; SW0 - 1985); minimum size (BFT - 1982; SWO - 1985)
Handgear - Commercial	Undersize target species Non-target finfish	Category III	ITS, Terms & Conditions	Permit requirement (BFT - 1982; SWO 1987; SHK - 1993); logbook requirement (SWO - 1985; SHK - 1993)	Regulations vary by species, including quotas, minimum sizes, retention limits, landing form
Handgear - Recreational	Undersize target species Non-target finfish	Category III	ITS, Terms & Conditions	Large Pelagic Survey (1992); MRFSS (1981)	Regulations vary by species, including minimum sizes, retention limits, landing form; BFT quotas

3.9.7 Evaluation and Monitoring of Bycatch

The identification of bycatch in Atlantic HMS fisheries is the first step in reducing bycatch and bycatch mortality. The Magnuson-Stevens Act requires the amount and type of bycatch to be summarized in the annual SAFE reports. Bycatch reporting is addressed in Section 3.8.3. Additional species and fishery specific data have already been presented in Section 3.2.

Pelagic longline dead discards of swordfish, billfish, large coastal sharks and pelagic sharks are estimated using data from NMFS observer reports and pelagic logbook reports. Shark bottom longline and shark gillnet discards can be estimated using logbook data and observer reports as well. Shark gillnet discards have also been estimated using logbook data when observer coverage is equal to 100 percent.

NMFS has not estimated bycatch in the swordfish harpoon fishery. NMFS has limited historical observer data on harpooned swordfish from driftnet trips in which harpoons were sometimes used. Swordfish harpoon fishermen are required to submit pelagic logbooks and NMFS can examine those for their utility in estimating bycatch. NMFS has not estimated bycatch in the bluefin tuna harpoon fishery because these fishermen have not been selected to submit logbooks. NMFS has not estimated bycatch in the General category commercial rod and reel tuna fishery although anecdotal evidence indicates that some undersized bluefin tuna may be captured. Studies of post-release mortality are ongoing.

There is concern about the accuracy of discard estimates in the recreational rod and reel fishery for HMS due to the low number of observations by the LPS and the MRFSS. Recreational bycatch estimates (numbers of fish released alive and dead) are not currently available, except for bluefin tuna. For some species, encounters are considered rare events, which might result in bycatch estimates with considerable uncertainty. Due to improvements in survey methodology, increased numbers of intercepts (interviews with fishermen) have been collected since 2002. NMFS intends to develop bycatch estimates (live and dead discards) and estimates of uncertainty from the recreational fishery from the LPS. These data will be included in future SAFE reports. Bycatch estimates may also be examined by using tournament data for the recreational fishery.

3.9.8 Bycatch Mortality

3.9.8.1 Introduction

The reduction of bycatch mortality is an important component of National Standard 9. Physical injuries may not be apparent to the fisherman who is quickly releasing a fish because there may be injuries associated with the stress of being hooked or caught in a net. Little is known about the mortality rates of many of the species managed under this FMP but there are some data for certain species. Information on bycatch mortality of these fish should continue to be collected, and in the future, could be used to estimate bycatch mortality in stock assessments.

NMFS submits annual data (Task I) to ICCAT on mortality estimates (dead discards). These data are included in the SAFE reports and National Reports to ICCAT to evaluate bycatch trends in HMS fisheries.

3.9.8.2 Mortality by Fishery

Pelagic Longline Fishery

NMFS collects data on the disposition (released alive or dead) of bycatch species from logbooks submitted by fishermen in the pelagic longline fishery. Observer reports also include disposition of the catch as well as information on hook location, trailing gear and injury status of protected species interactions. These data are used to estimate post-release mortality of sea turtles and marine mammals based on guidelines for each (Angliss and DeMaster 1998, Ryder *et al*. 2006). See Section 3.4.1 for estimates of sea turtle and marine mammal bycatch estimates.

Purse Seine Fishery

NMFS has limited observer data on the bluefin tuna purse seine fishery. There are no recorded instances of non-tuna finfish, other than minimal numbers of blue sharks, caught in tuna purse seines. Anecdotal evidence indicates that if fish are discarded, they are easily released out of the net with minimal bycatch mortality.

Bottom Longline Fishery

The shark bottom longline fishery has relatively low observed bycatch rates. Historically, finfish bycatch has averaged approximately five percent in the bottom longline fishery. Observed protected species bycatch (sea turtles) has typically been much lower, less than 0.01 percent of the total observed catch. See Section 3.4.5.1 for more information. Disposition of discards is recorded by observers and can be used to estimate discard mortality.

Shark Gillnet Fishery

The shark gillnet fishery has relatively low observed bycatch rates. Finfish bycatch during the 2003 fishery ranged from 3.3 to 20.7 percent of the total catch. Observed protected species bycatch (sea turtles and marine mammals) was very low, less than 0.1 percent. See Section 3.4.5 for more information. Disposition of discards is recorded by observers and can be used to estimate discard mortality.

Commercial Handgear Fishery

Vessels targeting bluefin tuna with harpoon gear have not been selected for observer coverage since the deliberate fishing nature of the gear is such that bycatch is expected to be low. Therefore, there are no recorded instances of non-target finfish caught with harpoons and NMFS cannot quantify the bycatch of undersized bluefin tuna in this fishery. Bycatch in the swordfish harpoon fishery is virtually if not totally, non-existent. Since bycatch approaches zero in this fishery, it follows that bycatch mortality is near zero. Disposition of bycatch reported in logbooks is used to estimate mortality of bycatch in the hook and line handgear fisheries.

Recreational Handgear Fishery

The LPS collects data on disposition of bycatch (released alive or dead) in recreational HMS fisheries. Rod and reel discard estimates from Virginia to Maine during June through October can be monitored through the expansion of survey data derived from the LPS (dockside and telephone surveys). However, the actual numbers of fish discarded for many species are low. See Section 3.4.4 for more information.

Post-release mortality studies have been conducted on few HMS at this time. Immediate mortality in recreational hook and line-caught juvenile bluefin tuna can be high (29.2 percent) due to injuries or predation (Belle, 1997). This is thought to be a conservative estimate because scientific personnel in the study were professionally trained and had extensive experience in fish handling techniques designed to reduce mortality. Mortality often occurs ten minutes or longer after the fish is released under normal circumstances. Injuries may not be readily apparent to the angler and seemingly minor capture injuries may be related to substantial internal injuries. Forty percent of sampled tuna that died during that study did not have injuries that would be apparent to the angler in the boat. Skomal and Chase (1996) provided evidence that the stress of rod and reel angling did not cause immediate post-release mortality in larger bluefin tuna (50 to 150 kg). However, they did document metabolic and pH disturbances in bluefin tuna sampled off Cape Hatteras, NC. The physiological consequences of angling stress are poorly understood for several species of large pelagic fishes (Skomal and Chase, 1996).

A study by Graves *et al.* (2002), investigated short-term (five days) post-release mortality of Atlantic blue marlin using pop-up satellite tag technology. A total of nine recreationally-caught blue marlin were tagged and released during July and August of 1999. All hooks employed in the study were “J” hooks. The attached tags were programmed to detach from the fish after five days and to record direct temperature and inclination of the buoyant tag to determine if the fish were actively swimming after being released. After detachment, the tags floated to the surface and began transmitting recorded position, temperature and inclination data to satellites of the Argos™ system. Three different lines of evidence provided by the tags (movement, water temperature, and tag inclination) suggested that at least eight of the nine blue marlin survived for five days after being tagged and released. One of the tags did not transmit any data which precluded the derivation of a conclusion regarding the tagged marlin’s survival.

The study was continued in 2003 to evaluate post release survival and habitat use of white marlin using pop-up satellite archival tags (PSATs) caught and released from four locations in the western North Atlantic recreational fishery (Horodysky and Graves, 2005). Forty-one tags were attached to white marlin caught using dead baits rigged on straight shank (“J”) hooks ($n = 21$) or circle hooks ($n = 20$) offshore of the U.S. Mid-Atlantic, the Dominican Republic, Mexico, and Venezuela. Survival was significantly higher ($p<0.01$) for white marlin caught on circle hooks (100 percent) relative to those caught on straight-shank (“J”) hooks (65 percent). These results, along with previous studies on circle hook performance, suggest that a change in hook type can significantly increase the survival of white marlin released from recreational fishing gear. Data from these short term deployments also suggest that white marlin strongly associate with warm, near surface waters. However, based on the frequency, persistence, and patterns of vertical movements, white marlin appear to direct a considerable proportion of foraging effort well below surface waters, a behavior that may account for relatively high catch rates of white marlin on some pelagic longline sets. NMFS continues to support studies on recreational post-release mortality and intends to account for this source of mortality when additional information becomes available.

3.9.8.3 Code of Angling Ethics

NMFS developed a Code of Angling Ethics as part of implementing Executive Order 12962 – Recreational Fisheries. NMFS implemented a national plan to support, develop, and implement programs that were designed to enhance public awareness and understanding of marine conservation issues relevant to the wellbeing of fishery resources in the context of marine recreational fishing. This code is consistent with National Standard 9, minimizing bycatch and bycatch mortality, and is therefore reproduced below. These guidelines are discretionary, not mandatory, and are intended to inform the angling public of NMFS views regarding what constitutes ethical angling behavior. Part of the code covers catch-and-release fishing and is directed towards minimizing bycatch mortality.

Code of Angling Ethics

- Promotes, through education and practice, ethical behavior in the use of aquatic resources.
- Values and respects the aquatic environment and all living things in it.
- Avoids spilling, and never dumps any pollutants, such as gasoline and oil, into the aquatic environment.
- Disposes of all trash, including worn-out lines, leaders, and hooks, in appropriate containers, and helps to keep fishing sites litter-free.
- Takes all precautionary measures necessary to prevent the spread of exotic plants and animals, including live baitfish, into non-native habitats.
- Learns and obeys angling and boating regulations, and treats other anglers, boaters, and property owners with courtesy and respect.
- Respects property rights, and never trespasses on private lands or waters.
- Keeps no more fish than needed for consumption, and never wastefully discards fish that are retained.
- Practices conservation by carefully handling and releasing alive all fish that are unwanted or prohibited by regulation, as well as other animals that may become hooked or entangled accidentally.
- Uses tackle and techniques, which minimize harm to fish when engaging in "catch-and-release" angling.

3.9.9 Interactions of HMS Fishing Gears with Protected Species

This section examines the interaction between protected species and Atlantic HMS fisheries under consideration in this FMP. As a point of clarification, interactions are different than bycatch. Interactions take place between fishing gears and marine mammals, sea turtles, and seabirds while bycatch consists of discards of fish. Following a brief review of the three acts (Marine Mammal Protection Act, Endangered Species Act, and Migratory Bird Treaty Act) affecting protected species, the interactions between HMS gears and each species is examined. Additionally, the interaction of seabirds and longline fisheries are considered under the auspices of the United States "National Plan of Action for Reducing the Incidental Catch of Seabirds in Longline Fisheries" (NPOA – Seabirds).

3.9.9.1 Interactions and the Marine Mammal Protection Act

The Marine Mammal Protection Act of 1972 as amended (MMPA) is one of the principal Federal statutes that guide marine mammal species protection and conservation policy. In the 1994 amendments, section 118 established the goal that the incidental mortality or serious injury of marine mammals occurring during the course of commercial fishing operations be reduced to insignificant levels approaching a zero mortality rate goal (ZMRG) and serious injury rate within seven years of enactment (*i.e*,. April 30, 2001). In addition, the amendments established a three-part strategy to govern interactions between marine mammals and commercial fishing operations. These include the preparation of marine mammal stock assessment reports, a registration and marine mammal mortality monitoring program for certain commercial fisheries (Category I and II), and the preparation and implementation of take reduction plans (TRP).

NMFS relies on both fishery-dependent and fishery-independent data to produce stock assessments for marine mammals in the Atlantic Ocean, Gulf of Mexico, and Caribbean Sea. Draft stock assessment reports are typically published around January and final reports are typically published in the Fall. Final 2005 stock assessment reports are available and can be obtained on the web at:
http://www.nmfs.noaa.gov/prot_res/PR2/Stock_Assessment_Program/sars.html

The following marine mammal species occur off the Atlantic and Gulf Coasts that are or could be of concern with respect to potential interactions with HMS fisheries.

Common Name	Scientific Name
Atlantic spotted dolphin	*Stenella frontalis*
Blue whale	*Balaenoptera musculus*
Bottlenose dolphin	*Tursiops truncatus*
Common dolphin	*Delphinis delphis*
Fin whale	*Balaenoptera physalus*
Harbor porpoise	*Phocoena phocoena*
Humpback whale	*Megaptera novaeangliae*
Killer whale	*Orcinus orca*
Long-finned pilot whale	*Globicephela melas*
Minke whale	*Balaenoptera acutorostrata*
Northern bottlenose whale	*Hyperoodon ampullatus*
Northern right whale	*Eubalaena glacialis*
Pantropical spotted dolphin	*Stenella attenuata*
Pygmy sperm whale	*Kogia breviceps*
Risso's dolphin	*Grampus griseus*
Sei whale	*Balaenoptera borealis*

Short-beaked spinner dolphin	*Stenella clymene*
Short-finned pilot whale	*Globicephela macrorhynchus*
Sperm whale	*Physeter macrocephalus*
Spinner dolphin	*Stenella longirostris*
Striped dolphin	*Stenella coeruleoalba*
White-sided dolphin	*Lagenorhynchus acutus*

Under MMPA requirements, NMFS produces an annual list of Fisheries (LOF) that classifies domestic commercial fisheries, by gear type, relative to their rates of incidental mortality or serious injury of marine mammals. The LOF includes three classifications:

1. Category I fisheries are those with frequent serious injury or mortality to marine mammals;
2. Category II fisheries are those with occasional serious injury or mortality; and
3. Category III fisheries are those with remote likelihood of serious injury or mortality to marine mammals.

The final 2005 MMPA LOF was published on January 4, 2004 (71 FR 247) and the draft 2006 MMPA LOF was published on April 24, 2006 (71 FR 20941). The Atlantic Ocean, Caribbean, and Gulf of Mexico large pelagic longline fishery is classified as Category I (frequent serious injuries and mortalities incidental to commercial fishing) and the southeastern Atlantic shark gillnet fishery is classified as Category II (occasional serious injuries and mortalities). The following Atlantic HMS fisheries are classified as Category III (remote likelihood or no known serious injuries or mortalities): Atlantic tuna purse seine; Gulf of Maine and Mid-Atlantic tuna, shark and swordfish, hook-and-line/harpoon; southeastern Mid-Atlantic and Gulf of Mexico shark bottom longline; and Mid-Atlantic, southeastern Atlantic, and Gulf of Mexico pelagic hook-and-line/harpoon fisheries. Commercial passenger fishing vessel (charter/headboat) fisheries are subject to Section 118 and are listed as a Category III fishery. Recreational vessels are not categorized since they are not considered commercial fishing vessels. For additional information on the fisheries categories and how fisheries are classified, see http://www.nmfs.noaa.gov/pr/interactions/lof/.

Fishermen participating in Category I or II fisheries are required to register under the MMPA and to accommodate an observer aboard their vessels if requested. Vessel owners or operators, or fishermen, in Category I, II, or III fisheries must report all incidental mortalities and serious injuries of marine mammals during the course of commercial fishing operations to NMFS. There are currently no regulations requiring recreational fishermen to report takes, nor are they authorized to have incidental takes (*i.e.*, they are illegal).

NMFS continues to investigate serious injuries to marine mammals as they are released from fishing gear. In April 1999, NMFS held a joint meeting of the three regional scientific review groups to further discuss the issue. NMFS is continuing to develop marine mammal serious injury guidelines and until these are published, NMFS will apply the criteria listed by the review groups to make determinations for specific fisheries. The current Biological Opinions for Atlantic HMS fisheries have resulted in a conclusion of no jeopardy for marine mammals.

However, a Pelagic Longline Take Reduction Team (PLTRT) was recently formed and first met on June 29-30, 2005. The PLTRT replaces the disbanded Atlantic Offshore Cetacean Take Reduction Team (AOCTRT). The PLTRT must develop a Take Reduction Plan (TRP) for pilot whales within 11 months. The Draft TRP has been transmitted to NMFS and will be published shortly. The 1999 HMS FMP implemented several of the recommendations of the AOCTRT including: 1) a requirement that vessels fishing for HMS move one nautical mile (nm) after an entanglement with protected species; 2) limiting the length of the mainline to 24 nm in the MAB from August 1, 1999 through November 30, 2000; 3) voluntary vessel operator education workshops for HMS pelagic longline vessels; 4) handling and release guidelines; and 5) limited access for swordfish, shark and tuna longline permits. A summary of the observed and estimated marine mammal interactions with the pelagic longline fishery is presented in Table 3.26 and Table 3.27 of Section 3.4.1.

3.9.9.2 Interactions and the ESA

The Endangered Species Act of 1973 as amended (16 U.S.C. 1531 et seq.) provides for the conservation and recovery of endangered and threatened species of fish, wildlife, and plants. The listing of a species is based on the status of the species throughout its range or in a specific portion of its range in some instances. Threatened species are those likely to become endangered in the foreseeable future [16 U.S.C. §1532(20)] if no action is taken to stop the decline of the species. Endangered species are those in danger of becoming extinct throughout all or a significant portion of their range [16 U.S.C. §1532(20)]. Species can be listed as endangered without first being listed as threatened. The Secretary of Commerce, acting through NMFS, is authorized to list marine and anadromous fish species, marine mammals (except for walrus and sea otter), marine reptiles (such as sea turtles), and marine plants. The Secretary of the Interior, acting through the USFWS, is authorized to list walrus and sea otter, seabirds, terrestrial plants and wildlife, and freshwater fish and plant species.

In addition to listing species under the ESA, the service agency (NMFS or USFWS) generally must designate critical habitat for listed species concurrently with the listing decision to the "maximum extent prudent and determinable" [16 U.S.C. §1533(a)(3)]. The ESA defines critical habitat as those specific areas that are occupied by the species at the time it is listed that are essential to the conservation of a listed species and that may be in need of special consideration, as well as those specific areas that are not occupied by the species that are essential to their conservation. Federal agencies are prohibited from undertaking actions that are likely to destroy or adversely modify designated critical habitat.

Marine Mammals	**Status**
Blue whale *(Balaenoptera musculus)*	Endangered
Fin whale *(Balaenoptera physalus)*	Endangered
Humpback whale *(Megaptera novaeangliae)*	Endangered
Northern right whale *(Eubalaena glacialis)*	Endangered
Sei whale *(Balaenoptera borealis)*	Endangered
Sperm whale *(Physeter macrocephalus)*	Endangered

Sea Turtles	
Green turtle *(Chelonia mydas)*	*Endangered/Threatened
Hawksbill sea turtle *(Eretmochelys imbricata)*	Endangered
Kemp's ridley sea turtle *(Lepidochelys kempii)*	Endangered
Leatherback sea turtle *(Dermochelys coriacea)*	Endangered
Loggerhead sea turtle *(Caretta caretta)*	Threatened
Olive ridley sea turtle *(Lepidochelys olivacea)*	Threatened
Critical Habitat	
Northern right whale	Endangered
Finfish	
Smalltooth sawfish *(Pristis pectinata)*	Endangered

*Green sea turtles in U.S. waters are listed as threatened except for the Florida breeding population, which is listed as endangered. Due to the inability to distinguish between the populations away from the nesting beaches, green sea turtles are considered endangered wherever they occur in U.S. waters.

Sea Turtles

NMFS has taken several steps in the past few years to reduce sea turtle bycatch and bycatch mortality in domestic longline fisheries. On March 30, 2001, NMFS implemented via interim final rule requirements for U.S. flagged vessels with pelagic longline gear on board to have line clippers and dipnets to remove gear on incidentally captured sea turtles (66 FR 17370). Specific handling and release guidelines designed to minimize injury to sea turtles were also implemented. NMFS published a final report which provides the detailed guidelines and protocols (Epperly *et al*., 2004) and a copy can be found at http://www.nmfs.noaa.gov/sfa/hms/Protected%20Resources/TM_524.pdf

A Biological Opinion completed on June 14, 2001, found that the actions of the pelagic longline fishery jeopardized the continued existence of loggerhead and leatherback sea turtles. This document reported that the pelagic longline fishery interacted with an estimated 991 loggerhead and 1,012 leatherback sea turtles in 1999. The estimated take levels for 2000 were 1,256 loggerhead and 769 leatherback sea turtles (Yeung 2001).

On July 13, 2001 (66 FR 36711), NMFS published an emergency rule that closed the Northeast Distant (NED) area to pelagic longline fishing (effective July 15, 2001), modified how pelagic longline gear may be deployed effective August 1, 2001, and required that all longline vessels (pelagic and bottom) post safe handling guidelines for sea turtles in the wheelhouse. On December 13, 2001 (66 FR 64378), NMFS extended the emergency rule for 180 days through July 8, 2002. On July 9, 2002, NMFS published a final rule (67 FR 45393) that closed the NED to pelagic longline fishing. As part of the Reasonable and Prudent Alternative, the BiOp required NMFS to conduct an experiment with commercial fishing vessels to test fishery-specific gear modifications to reduce sea turtle bycatch and mortality. This rule also required the length of any gangions to be 10 percent longer than the length of any floatline on vessels where the length of both is less than 100 meters; prohibited stainless steel hooks; and required gillnet vessel operators and observers to report any whale sightings and required gillnets to be checked every 0.5 to 2 hours.

The experimental program required in the BiOp was initiated in the NED area in 2001 in cooperation with the U.S. pelagic longline fleet that historically fished on the Grand Banks fishing grounds. The goal of the experiment was to test and develop gear modifications that might prove useful in reducing the incidental catch and post-release mortality of sea turtles captured by pelagic longline gear while striving to minimize the loss of target catch. The experimental fishery had a three-year duration and utilized 100 percent observer coverage to assess the effectiveness of the measures. The gear modifications tested in 2001 included blue-dyed squid and moving gangions away from floatlines. In 2002, the NED experimental fishery examined the effectiveness of whole mackerel bait, squid bait, circle and "J" hooks, and reduced daylight soak time in reducing the capture of sea turtles. The experiment tested various hook and bait type combinations in 2003 to verify the results of the 2002 experiment.

On November 28, 2003, based on the conclusion of the three-year NED experiment, and preliminary data that indicated that the Atlantic pelagic longline fishery may have exceeded the Incidental Take Statement in the June 14, 2001, BiOp, NMFS published a Notice of Intent to prepare an SEIS to assess the potential effects on the human environment of proposed alternatives and actions under a proposed rule to reduce sea turtle bycatch (68 FR 66783). A new BiOp for the Atlantic pelagic longline fishery was completed on June 1, 2004. The BiOp concluded that long-term continued operation of the Atlantic pelagic longline fishery, authorized under the 1999 FMP, was not likely to jeopardize the continued existence of loggerhead, green, hawksbill, Kemp's ridley, or olive ridley sea turtles; and was likely to jeopardize the continued existence of leatherback sea turtles.

On July 6, 2004, NMFS implemented additional regulations for the Atlantic pelagic longline fishery to further reduce the mortality of incidentally caught sea turtles (69 FR 40734). These measures include requirements on hook type, hook size, bait type, dipnets, lineclippers, and safe handling guidelines for the release of incidentally caught sea turtles. These requirements were developed based on the results of the 2001 – 2003 NED experiment (Watson *et al*., 2003; Watson *et al*., 2004a; Shah *et al*., 2004). These requirements are predicted to decrease the number of total interactions, as well as the number of mortalities, of both leatherback and loggerhead sea turtles (NMFS, 2004c). Post-release mortality rates are expected to decline due to a decrease in the number of turtles that swallow hooks which engage in the gut or throat, a decrease in the number of turtles that are foul-hooked and improved handling and gear removal protocols. NMFS is working to export this new technology to pelagic longline fleets of other nations to reduce global sea turtle bycatch and bycatch mortality. U.S gear experts have presented this bycatch reduction technology and data from research activities at approximately 15 international events that included fishing communities and resource managers between 2002 and mid-2005 (NMFS, 2005).

Internationally, the United States is pursuing sea turtle conservation through international, regional, and bilateral organizations such as ICCAT, the Asia Pacific Fisheries Commission, and FAO Committee on Fisheries (COFI). The United States intends to provide a summary report to FAO for distribution to its members on bycatch of sea turtles in U.S. longline fisheries and the research findings as well as recommendations to address the issue. At the 24th session of COFI held in 2001, the United States distributed a concept paper for an international technical experts meeting to evaluate existing information on turtle bycatch, to facilitate and standardize collection of data, to exchange information on research, and to identify and consider solutions to reduce turtle bycatch. COFI agreed that an international technical meeting could be useful despite the lack of agreement on the specific scope of that meeting. The United States has developed a prospectus for a technical workshop to address sea turtle bycatch in longline fisheries as a first step. Other gear-specific international workshops may be considered in the future.

Smalltooth sawfish

On April 1, 2003, NMFS listed smalltooth sawfish as an endangered species (68 FR 15674) under the Endangered Species Act (ESA). After reviewing the best scientific and commercial information, the status review team determined that the U.S. DPS (Distinct Population Segment) of smalltooth sawfish is in danger of extinction throughout all or a significant portion of its range from a combination of the following four listing factors: the present or threatened destruction, modification, or curtailment of habitat or range; over utilization for commercial, recreational, scientific, or educational purposes; inadequacy of existing regulatory mechanisms; and other natural or manmade factors affecting its continued existence. NMFS is working on designating critical habitat for smalltooth sawfish.

NMFS believes that smalltooth sawfish takes in the shark gillnet fishery are rare given the high rate of observer coverage. The fact that there were no smalltooth sawfish caught during 2001, when 100 percent of the fishing effort was observed, indicates that smalltooth sawfish takes (observed or total) most likely do not occur on an annual basis. Based on this information, the 2003 BiOp estimates that one incidental capture of a sawfish (released alive) over the next five years, will occur as a result of the use of gillnets in this fishery (NMFS, 2003a).

Smalltooth sawfish have been observed caught (eight known interactions, seven released alive, one released in unknown condition) in shark bottom longline fisheries from 1994 through 2004 (A. Morgan pers. comm., 2003). Based on these observations, expanded sawfish take estimates for 1994 – 2002 were developed for the shark bottom longline fishery (NMFS, 2003a). A total of 466 sawfish were estimated to have been taken in this fishery during 1994 – 2002, resulting in an average of 52 per year. It is important to note that all of the sawfish takes observed, except for one, were released alive.

3.9.9.3 Interactions with Seabirds

Observer data from 1992 through 2005 indicate that seabird bycatch is relatively low in the U.S. Atlantic pelagic longline fishery (Table 3.29). Since 1992, a total of 129 seabird interactions have been observed, with 95 observed killed (73.6 percent). In 2005, there were 110 active U.S. pelagic longline vessels fishing for swordfish in the Atlantic Ocean, Gulf of Mexico, and Caribbean Sea that reportedly set approximately 5.9 million hooks. A total of four seabirds were observed taken.

The National Plan of Action (NPOA) for Reducing the Incidental Catch of Seabirds in Longline Fisheries was released in February 2001. The NPOA for Seabirds calls for detailed assessments of longline fisheries, and, if a problem is found to exist within a longline fishery, for measures to reduce seabird bycatch within two years. NMFS, in collaboration with the appropriate Councils and in consultation with the U.S. Fish and Wildlife Service, will prepare an annual report on the status of seabird mortality for each longline fishery. The United States is committed to pursuing international cooperation, through the Department of State, NMFS, and U.S. Fish and Wildlife Service, to advocate the development of National Plans of Action within relevant international fora. NMFS intends to meet with longline fishery participants and other members of the public in the future to discuss possibilities for complying with the intent of the plan of action. Because interactions appear to be relatively low in Atlantic HMS fisheries, the adoption of immediate measures is unlikely.

Bycatch of seabirds in the shark bottom longline fishery has been virtually non-existent. A single pelican has been observed killed from 1994 through 2005. No expanded estimates of seabird bycatch or catch rates for the bottom longline fishery have been made due to the rarity of seabird takes.

3.9.10 Measures to Address Protected Species Concerns

NMFS has taken a number of actions designed to reduce interactions with protected species over the last few years. Bycatch reduction measures have been implemented through the Fishery Management Plan for Atlantic Tunas, Swordfish and Sharks (NMFS, 1999), in Regulatory Amendment 1 to the 1999 FMP (NMFS, 2000), in Regulatory Adjustment 2 to the 1999 FMP (NMFS, 2002), in Amendment 1 to the 1999 FMP (NMFS, 2003a), and in the June 2004 Final Rule for Reduction of Sea Turtle Bycatch and Bycatch Mortality in the Atlantic Pelagic Longline Fishery (69 FR 40734). NMFS closed the Southeast U.S. Restricted Area to gillnet fisheries from February 15, 2006, to March 31, 2006, as a result of an entanglement and subsequent mortality of a right whale with gillnet gear (71 FR 8223). NMFS continues to monitor observed interactions with marine mammals and sea turtles on a quarterly basis and reviews data for appropriate action, if any, as necessary.

3.9.11 Bycatch of HMS in Other Fisheries

NMFS is concerned about bycatch mortality of Atlantic HMS in any Federal or state-managed fishery which captures them. NMFS plans to address bycatch of these species in the appropriate FMPs through coordination with the responsible management body. For example, capture of swordfish and tunas incidental to squid trawl operations is addressed in the Squid, Mackerel, and Butterfish FMP. Capture rates of tunas in coastal gillnet fisheries are being explored through issuance of exempted fishing permits and reporting requirements. NMFS continues to solicit bycatch data on HMS from all state, interjurisdictional, and Federal data collection programs. NMFS supports development of an interstate management plan for coastal sharks by the ASMFC to protect sharks caught incidentally in state-managed fisheries. NMFS has requested assistance from the ASMFC, GSMFC, and Atlantic and Gulf Regional Fishery Management Councils in identifying potential sources of bycatch of finetooth sharks in state waters fisheries or other fisheries outside the jurisdiction of this FMP.

3.9.11.1 Squid Mid-Water Trawl

U.S. squid trawl fishermen, using mid-water gear, landed 8.6 mt ww of yellowfin tuna, skipjack tuna, albacore tuna, bigeye tuna, and swordfish in 2003 incidental to the squid, mackerel, and butterfish trawl fishery (Table 3.108). Bycatch of HMS in other trawl fisheries may be included as a portion of the overall reported trawl landings in Table 3.108. Landings decreased from 2002 for bigeye and albacore tuna, and increased slightly for yellowfin and skipjack tuna. Swordfish landings increased by 50 percent but remain at a low level relative to the directed fishery landings. A retention limit of five swordfish per trip allows squid trawl fishermen with swordfish limited access permits to land some of the swordfish that are encountered, although regulatory discards still occur.

Table 3.108 Atlantic HMS Landed (mt ww) Incidental to Trawl Fisheries, 1998-2004. Source: NMFS, 2003, NMFS, 2005.

Species	1998	1999	2000	2001	2002	2003	2004
Yellowfin tuna	0.7	4.1	1.76	2.7	0.3	2	1
Skipjack Tuna	0.2	1.0	<0.05	0.2	<0.05	0.5	0.2
Bigeye Tuna	0.5	1.2	1.7	0.4	0.5	<0.05	0.3
Albacore	2.4	0.4	<0.05	0.0	0.3	<0.05	2.6
Swordfish	5.9	7.5	10.9	2.5	3.9	6.0	7.6
Total	9.7	14.2	14.43	5.8	4.8	8.6	11.7

3.9.11.2 Menhaden Purse Seine Fishery

In the menhaden purse seine fishery, sharks were caught incidentally in approximately 30 percent of the purse seine sets observed (deSilva *et al.*, 2001). Ten species of sharks were identified with blacktip sharks being the most common species. Approximately 20 percent of the sharks were not identified to species. An estimated 30,000 sharks were taken in this fishery annually in 1994 and 1995. At the time of release, 75 percent of sharks were dead, 12 percent were disoriented, and eight percent were healthy. The odds of observing shark bycatch was highest in April and May. Stomach analyses of sharks suggest that their occurrence in the fishery is probably the result of sharks preying on gulf menhaden (deSilva *et al.*, 2001). No new data are available at this time.

Industry workers in this fishery employ a fish excluder device to reduce the retention of sharks and other large species (Rester and Condrey, 1999). In addition, a recently introduced hose cage modification may prove to be effective in reducing shark bycatch. These devices vary in effectiveness and no standards exist for such bycatch reduction measures in this fishery. In addition, there are currently no reporting requirements for takes of sharks in the menhaden purse seine fishery. Recent estimates of large coastal sharks discarded in this fishery range from 24,000 – 26,200 individuals (Cortés, 2005).

3.9.11.3 Shrimp Trawl Fishery

Shark bycatch in the shrimp trawl fishery consists mainly of sharks too small to be highly valued in the commercial market. As a result, few sharks are retained. Bycatch estimates of LCS in this fishery have been generated and were reviewed in the most recent LCS assessment (Cortés *et al*. 2002). Cortés (2002) estimated bycatch in the south Atlantic shrimp trawl fishery (North Carolina, South Carolina, Georgia, and Florida) for Atlantic sharpnose, bonnethead, and finetooth sharks based on expansion by fishing effort. Annual estimates of bycatch ranged from zero to almost six million sharks from 1992 to 1997 (Table 3.109) (Cortés, 2002). The 2002 SCS assessment included estimates of SCS bycatch because they were likely to exceed the actual landings for those species (Cortés, 2002). However, requirements for turtle excluder devices in this fishery have probably resulted in less bycatch because sharks are physically excluded from entering the gear.

Table 3.109 Expanded estimates of bycatch (number of fish) of bonnethead, Atlantic sharpnose, and finetooth sharks in the U.S. south Atlantic shrimp trawl fishery based on within stratum expansion by effort as trips by fishing year. Source: Cortés, 2002.

Year	Estimated number of trips	Bonnethead	Atlantic sharpnose	Finetooth
1992-93	20,181	53,674	1,753,829	0
1993-94	20,445	0	5,873,333	447,495
1995-96	23,333	34,378	0	0
1996-97	19,320	38,517	358,457	0

Bycatch of the SCS complex in the Gulf of Mexico shrimp trawl fishery consists mainly of Atlantic sharpnose and bonnethead sharks (Cortés, 2002). Estimates of the bycatch of SCS in this fishery ranged from 3.2 to 1.3 million sharks per year from 1972 - 2000 (Table 3.110). Finetooth sharks were added as a select species for the shrimp trawl observer program in 2005 to help determine if this fishery has bycatch of finetooth sharks. Prior to this, data on finetooth shark bycatch was not recorded.

Table 3.110 Estimates (in thousands of individuals and pounds dressed weight) of the bycatch of small coastal sharks (as a complex and by species) in the shrimp trawl fishery operating in the Gulf of Mexico. Source: S. Nichols, NMFS Pascagoula Lab., pers. comm. as cited in Cortés, 2002.

Year	All SCS (numbers)	All SCS (lb dw)	Atlantic sharpnose (numbers)	Atlantic sharpnose (lb dw)	Bonnethead (numbers)	Bonnethead (lb dw)
1972	1,575	1,500	1,051	1,010	468	371
1973	1,579	1,580	831	842	620	525
1974	1,903	1,899	1,508	1,407	420	400
1975	2,055	1,997	1,587	1,473	347	313
1976	2,193	2,209	1,706	1,632	456	436
1977	2,187	2,142	1,507	1,457	520	427
1978	2,223	2,156	1,799	1,625	367	370
1979	2,829	2,754	2,384	2,254	388	341
1980	2,591	2,436	2,148	1,933	368	330

Year	All SCS (numbers)	All SCS (lb dw)	Atlantic sharpnose (numbers)	Atlantic sharpnose (lb dw)	Bonnethead (numbers)	Bonnethead (lb dw)
1981	2,081	2,007	1,830	1,649	242	252
1982	2,281	2,203	1,850	1,661	302	310
1983	2,138	2,193	1,856	1,821	255	250
1984	1,551	1,509	1,277	1,191	232	230
1985	1,767	1,796	1,451	1,442	260	249
1986	2,222	2,234	1,464	1,519	624	506
1987	3,216	3,123	2,636	2,392	516	519
1988	2,535	2,272	1,959	1,664	421	404
1989	2,116	2,216	1,632	1,713	336	286
1990	1,981	2,069	1,503	1,507	489	431
1991	2,350	2,322	1,784	1,756	365	323
1992	2,759	2,879	1,968	1,997	494	459
1993	2,226	2,213	1,710	1,626	416	400
1994	2,197	2,243	1,586	1,591	395	347
1995	2,401	2,362	1,806	1,636	311	299
1996	2,923	2,457	2,069	1,644	519	428
1997	2,883	2,926	1,732	1,681	486	439
1998	2,657	2,410	1,662	1,494	376	329
1999	1,282	1,257	906	848	218	198
2000	1,282	1,257	906	848	218	198

3.9.11.4 Southeast Gillnet Fishery

Gillnet fisheries operating in the south Atlantic, particularly off Florida, have been shown to incidentally take various species of sharks (see Section 4.2.2 for full description). These fisheries are primarily targeting Spanish mackerel and whiting (kingfish). Vessels participating in these fisheries either have a mackerel permit and a commercial shark permit which allows retention and landing of sharks, or may be operating in an unmanaged fishery (whiting) that requires no permit at this time. Vessels operating in these fisheries and holding a Federal permit are required to file trip reports (Coastal Fisheries Logbook). Preliminary data from observed gillnet trips not targeting sharks indicate that Atlantic sharpnose, bonnethead, blacktip, finetooth, scalloped hammerhead, blacknose, spinner and tiger sharks were caught (Carlson and Bethea, 2006). Expanding observer coverage in South Atlantic gillnet fisheries that are landing sharks could provide additional data on the extent of the bycatch of HMS species in these fisheries and thereby improving the stock assessments for these species. NMFS will attempt to continue expanded observer coverage in these fisheries as resources allow.

3.9.12 Effectiveness of Existing Time/Area Closures in Reducing Bycatch

During the past several years, NMFS has implemented several time/area closures in the Atlantic Ocean and Gulf of Mexico for the PLL fishery to reduce discards and bycatch of a number of species (juvenile swordfish, bluefin tuna, billfish, sea turtles, etc.). Analyses of the effectiveness of these closures are included in Section 4.1.2 and summarized here.

The combined effects of the individual area closures were examined by comparing the 2001 – 2003 catch and discards to the averages for 1997 – 1999 throughout the entire U.S. Atlantic fishery. Changes in the numbers of fish caught and discarded were compared to the predicted values from Regulatory Amendment 1 to the 1999 FMP (NMFS, 2000). Overall effort, expressed as the number of hooks set, declined by 15 percent between the two time periods. Declines were noted for both the numbers of kept and discards of all species examined including swordfish, tunas, sharks, billfish, and sea turtles. The number of reported discards of swordfish, bluefin and bigeye tuna, pelagic sharks, dolphin, wahoo, blue and white marlin, sailfish, and spearfish all declined by more than 30 percent. The reported discards of blue and white marlin declined by about 50 percent and sailfish discards declined by almost 75 percent. The reported number of sea turtles caught and released declined by almost 28 percent.

The reported declines in swordfish kept and discarded, large coastal sharks kept and discarded, and dolphin kept were similar to the predicted values developed for Regulatory Amendment 1. Reported discards of bluefin tuna, pelagic sharks, all billfish (with the exception of spearfish for which no predicted change was developed in Regulatory Amendment 1), and total BAYS tunas kept all declined more than the predicted values.

3.9.12.1 Prohibition of Live Bait in the Gulf of Mexico

Regulatory Amendment 1 to the 1999 FMP also prohibited the use of live bait on pelagic longline gear in the Gulf of Mexico due to concerns over the incidental bycatch of billfish. Based on logbook data, the number of hooks reported set with live bait or a combination of live and dead bait in the Gulf of Mexico decreased from 22.7 percent in 2000, to less than 0.1 percent in 2003 (Table 3.111). However, the number of hooks reported set with no bait type specified increased from zero in 1999 – 2001 to 3.7 percent in 2003, but declined to less than one percent in 2004. Also, the reported number of hooks set in the Gulf of Mexico has increased in recent years. The reported effort in 2004 represents an increase of 21.8 percent from 2000. NMFS will continue to analyze the effectiveness of the live bait prohibition in the Gulf of Mexico pelagic longline fishery.

Table 3.111 Comparison of the number of hooks reported set in the Gulf of Mexico with dead or live bait, or a combination of both baits, 1999-2004 (numbers in parentheses are percent of the total number of hooks set in the Gulf of Mexico). Source: PLL Logbook data.

	Year					
Bait Type	**1999**	**2000**	**2001**	**2002**	**2003**	**2004**
Dead	2,335,845 (70.9)	2,598,083 (77.3)	3,176,493 (98.3)	3,494,577 (97.6)	3,668,687 (96.3)	4,089,018 (99.8)
Live	372,162 (11.3)	259,256 (7.7)	5,500 (0.2)	750 (>0.1)	1,514 (>0.1)	0 (0)
Both	584,473 (17.8)	505,582 (15.0)	49,250 (1.5)	13,115 (0.4)	1,000 (>0.1)	0 (0)
Unknown	0 (0)	0 (0)	0 (0)	71,011 (2.0)	139,569 (3.6)	8,000 (0.2)
Total hooks	3,292,480	3,362,921	3,231,243	3,579,453	3,810,770	4,097,018

3.9.12.2 Conclusions

The time/area closures and live bait prohibition in the Gulf of Mexico have been relatively successful at reducing bycatch in the HMS pelagic longline fishery. Reported discards of all species of billfish have declined (Table 4.8). The reported number of turtles caught, swordfish discarded, bluefin tuna discarded, and pelagic and large coastal shark discards have also declined. However, the reported number of target species kept, such as swordfish and BAYS tuna, have decreased more than was predicted. This is contrary to the other objective of the time/area closures, which was to minimize the reduction in target catch. NMFS will continue to analyze these measures as additional data become available and examine the effects of ongoing regulatory change over time.

3.9.13 Evaluation of Other Bycatch Reduction Measures

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

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

- Atlantic Large Whale Take Reduction Plan (ALWTRP) regulations

Observers were placed on shark gillnet vessels during the 2005 season and covered 33 strikenet and 31 driftnet sets during and outside of right whale calving season (Carlson and Bethea, 2006). In addition, observers were placed on vessels fishing with sink gillnets as part of a pilot program and observed 88 sets. Protected species interactions occurred with all three types of gear. One leatherback and four loggerhead sea turtles were observed with all but one loggerhead released alive. One loggerhead was observed taken by strikenet and one with sink net. Both were released alive. No marine mammals or smalltooth sawfish were observed taken. NMFS has published a proposed rule to modify the right whale areas and the time periods when 100 percent observer coverage would be required (70 FR 35894; 21 June 2005).

- Atlantic Bottlenose Dolphin Take Reduction Team

Due to the observed takes of Atlantic bottlenose dolphin in the shark drift gillnet fishery, representatives of the fishery have been included in the Atlantic Bottlenose Dolphin Take Reduction Team. The Team held seven meetings during 2001 – 2003 and developed a set of recommendations which formed the basis for a TRP. NMFS published a proposed rule on November 10, 2004, to implement the TRP (69 FR 65127), and a final rule was published on April 26, 2006 (71 FR 24776). Included in the final rule are: 1) effort reduction measures; 2) gear proximity rules; 3) gear or gear deployment modifications; 4) fishermen training; and 5) outreach and education measures to reduce dolphin bycatch below the stock's potential biological removal level. The final rule also includes time/area closures and size restrictions on large mesh fisheries to reduce incidental takes of endangered and threatened sea turtles as well as to reduce dolphin bycatch.

- MMPA List of Fisheries Update/Stock Assessment

NMFS continues to update the MMPA List of Fisheries and the 2005 final list is available at http://www.nmfs.noaa.gov/pr/pdfs/fr/fr71-247.pdf. The proposed 2006 List of Fisheries published on April 24, 2006 (71 FR 20941). Final 2005 marine mammal stock assessment reports and draft 2006 reports are also available. See Section 3.9.9.1 for information on obtaining these reports.

- Atlantic Offshore Cetacean Take Reduction Team (AOCTRT)

NMFS has disbanded the AOCTRT due to the fact that two of the three fisheries addressed by the AOCTRT were closed by fishery management actions, leaving only the pelagic longline fishery in operation. This fishery has been the subject of recent fishery management actions and increased observer coverage related to bycatch. As discussed below, a take reduction team specific to the pelagic longline fishery has been formed.

- Pelagic Longline Take Reduction Team (PLTRT)

NMFS appointed a PLTRT in June 2005, to address marine mammal interactions in the longline fishery, specifically pilot whales. As required by the MMPA, the PLTRT must develop a TRP within eleven months. The PLTRT has met four times since and a draft TRP should be available shortly. NMFS intends to continue reviewing the fishery and any marine mammal interactions to determine if additional take reduction measures are necessary.

- Observer coverage of shark drift gillnet fleet

On March 30, 2001, NMFS reduced the level of observer coverage required in the shark drift gillnet fishery from 100 percent year-round to 100 percent during right whale calving season and to a statistically significant level during the rest of the year. Recent scientific analyses indicate that a 33.8 percent level of coverage is statistically significant and adequate to provide reasonable estimates of sea turtle and marine mammal takes outside of the right whale calving season. The level of observer coverage necessary will be re-evaluated annually and adjusted accordingly. During the 2005 season, 33 strikenet and 31 driftnet sets were observed (Carlson and Bethea, 2006). No interactions with marine mammals were observed in either drift gillnet or strikenet sets. Four loggerhead sea turtles were observed caught in drift gillnet sets (three released alive, one released injured and assumed to be dead). One leatherback sea turtle was caught in drift gillnet gear and released alive. NMFS began placing observers on vessels with directed shark permits that were targeting species other than sharks in 2005. Management options to address issues in the shark drift gillnet fishery, particularly overfishing of finetooth sharks, are considered in this document.

- Vessel monitoring systems in the pelagic longline fishery

NMFS adopted fleet-wide VMS requirements in the Atlantic pelagic longline fishery in May 1999, but was subsequently sued by an industry group. By order dated September 25, 2000, the U.S. District Court for the District of Columbia prevented any immediate implementation of VMS in the Atlantic pelagic longline fishery, and instructed to "undertake further consideration of the scope of the [VMS] requirements in light of any attendant relevant conservation benefits." On October 15, 2002, the court issued a final order that denied plaintiff's objections to the VMS regulations. Based on this ruling, NMFS implemented the VMS requirement in September 2003.

- Vessel monitoring systems in other HMS fisheries

Starting in 2004, gillnet vessels with a directed shark permit and gillnet gear onboard were required to install and operate a VMS unit during the Right Whale Calving Season (November 15 – March 31). In an attempt to better quantify bycatch, NMFS will require all vessels with Limited Access Shark Permits to participate in the Directed Shark Gillnet Observer program. Directed shark bottom longline vessels located between 33^{o} N and 36^{o} 30' N need to install and operate a VMS unit from January through July.

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