3.0 DESCRIPTION OF THE AFFECTED ENVIRONMENT

United States HMS fishermen encounter many species of fish; some of those are marketable, others are discarded for economic or regulatory reasons. Species frequently encountered are swordfish, tunas, and sharks, as well as billfish, dolphin, wahoo, king mackerel, and other finfish species. On occasion, HMS fishermen also interact with sea turtles, marine mammals, and seabirds, known collectively as "protected" species. All of these species are federally managed, and NOAA Fisheries seeks to control anthropogenic sources of mortality. Detailed descriptions of those species are given in the Fishery Management Plan for Atlantic Tunas, Swordfish, and Sharks (NMFS, 1999), the 2003 and 2004 SAFE Reports (NOAA Fisheries, 2003a; NOAA Fisheries, 2004a) and are summarized and updated here. Management of declining fish populations requires decreasing fishing mortality from both directed and incidental fishing. The status of the stocks of concern is summarized below.

3.1 STATUS OF THE STOCKS

With the exception of Atlantic sharks, stock assessments for Atlantic HMS are conducted by ICCAT and its Standing Committee on Research and Statistics (SCRS). In 2002, the SCRS conducted stock assessments for Atlantic white marlin, North and South Atlantic swordfish, bigeye tuna, and bluefin tuna. Also in 2002, the United States conducted stock assessments for the Atlantic large and small coastal shark complexes. A stock assessment summary table is presented below (Table 3.1). As established in the HMS FMP, a stock is considered overfished when the biomass level (B) falls below the minimum stock size threshold (MSST), and overfishing occurs when the fishing mortality rate (F) exceeds the maximum fishing mortality threshold (MFMT).

Table 3.1 Stock Assessment Summary Table. Source: NOAA Fisheries, 2004b

Species	Current Relative Biomass Level	Minimum Stock Size Threshold	Current Fishing Mortality Rate	Maximum Fishing Mortality Threshold	Outlook
North Atlantic Swordfish	B_{02}/B_{MSY} = 0.94 (0.75-1.24)	$0.8B_{MSY}$	F_{01}/F_{MSY} = 0.75 (0.54-1.06)	F_{year}/F_{MSY} = 1.00	Overfished; overfishing is not occurring, stock is in recovery
South Atlantic Swordfish	*Not estimated*	$0.8B_{MSY}$	*Not estimated*	F_{year}/F_{MSY} = 1.00	Fully fished; Overfishing may be occurring.*

Species	Current Relative Biomass Level	Minimum Stock Size Threshold	Current 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)	$_{Fyear}/F_{MSY}$ = 1.00	Overfished; overfishing is occurring.
East Atlantic Bluefin Tuna	SSB_{00}/SSB_{70} = 0.80	*Not estimated*	F_{00}/F_{max} = 2.4	*Not estimated*	Overfished; overfishing is occurring.*
Atlantic Bigeye Tuna	B_{02}/B_{MSY} = 0.81-0.91	*$0.6B_{MSY}$ (age 2+)*	F_{01}/F_{MSY} = 1.15	$_{Fyear}/F_{MSY}$ = 1.00	May be overfished; overfishing is occurring.
Atlantic Yellowfin Tuna	B_{01}/B_{MSY} = 0.73 - 1.10	*$0.5B_{MSY}$ (age 2+)*	F_{01}/F_{MSY} = .87-1.46	$_{Fyear}/F_{MSY}$ = 1.00	Not overfished; overfishing may be occurring.
North Atlantic Albacore Tuna	B_{92}/B_{MSY} = 0.68 (0.52-0.86)	*$0.7B_{MSY}$*	F_{02}/F_{MSY} = 1.10 (0.99 - 1.30)	$_{Fyear}/F_{MSY}$ = 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*	$_{Fyear}/F_{MSY}$ = 1.00	Unknown
Atlantic 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)	$_{Fyear}/F_{MSY}$ = 1.00	Overfished; overfishing is occurring.
Atlantic 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)	$_{Fyear}/F_{MSY}$ = 1.00	Overfished; overfishing is occurring.

Species	Current Relative Biomass Level	Minimum Stock Size Threshold	Current Fishing Mortality Rate	Maximum Fishing Mortality Threshold	Outlook
West Atlantic Sailfish	*Not estimated*	$0.75B_{MSY}$	*Not estimated*	$F_{year}/F_{MSY} = 1.00$	Overfished; overfishing is occurring.
Large Coastal Sharks (SPM)	N_{01}/N_{MSY} = 0.46-1.18	$(1-M)B_{MSY}$ *or* $0.5B_{MSY}$	F_{01}/F_{MSY} = .89-4.48	$F_{year}/F_{MSY} = 1.00$	Overfished; overfishing is occurring
Sandbar Sharks (SPM)	N_{01}/N_{MSY} = 0.77 - 2.22	$(1-M)B_{MSY}$ *or* $0.5B_{MSY}$	F_{01}/F_{MSY} = 1.08-1.68	$F_{year}/F_{MSY} = 1.00$	Not overfished - still rebuilding; overfishing is occurring
Blacktip Sharks (SPM)	N_{01}/N_{MSY} = 1.20 - 1.45	$(1-M)B_{MSY}$ *or* $0.5B_{MSY}$	F_{01}/F_{MSY} = 0.42 - 0.82	$F_{year}/F_{MSY} = 1.00$	Not overfished; overfishing is not occurring
Pelagic Sharks	*Unknown*	*Unknown*	*Unknown*	*Unknown*	*Unknown*

* South Atlantic swordfish, South Atlantic albacore and East Atlantic bluefin tuna are not found in the U.S. EEZ and, therefore, are not managed under the Magnuson-Stevens Act.

3.1.1 Swordfish

Atlantic swordfish (*Xiphias gladius*) are large migratory predators that range from Canada to Argentina in the West Atlantic Ocean. The management units for assessment purposes are a separate Mediterranean group, and North and South Atlantic groups separated at 5°N (NOAA Fisheries, 2003a). Swordfish live to be more than 25 years old, and reach a maximum size of about 902 lb dressed weight (dw). Swordfish are characterized by having 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. Females mature between ages two and eight, with 50 percent mature at age five at a weight of about 113 lb dw. Males mature between ages two and six, with 50 percent mature at age three at a weight of about 53 lb dw (Arocha, 1997). Large swordfish are all females; males seldom exceed 150 lb dw. 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. Swordfish 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 (SAFMC, 1990).

In 2002, total estimated swordfish catch of U.S. vessels, including U.S. vessel landings and dead discards was 2,708.7 metric tons (MT) (NOAA Fisheries, 2003b). This underharvest represents a modest increase of 55.4 MT from 2001, but a 22.5 percent decrease from 2000. U.S. swordfish landings are monitored in-season from reports submitted by dealers, vessel owners and vessel operators, NOAA Fisheries port agents, and mandatory daily logbook reports submitted by U.S. vessels permitted to fish for swordfish. Starting in 1992, the fishery has been monitored using a scientific observer sampling program that strives to observe approximately five percent of the longline fleet-wide fishing effort. This serves as a mechanism to observe amounts of bycatch and to verify logbook data.

According to the latest stock assessment from the International Commission for the Conservation of Atlantic Tunas, North Atlantic swordfish is considered overfished, while overfishing is not considered to be occurring. The stock is in recovery, with the biomass at the beginning of 2002 estimated to be at 94% (range: 75 to 124%) 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) (SCRS, 2002).

3.1.2 Atlantic Billfish

Blue marlin (*Makaira nigricans*) and white marlin (*Tetrapturus albidus*) are found throughout tropical and temperate waters of the Atlantic ocean and adjacent seas. They 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. The average size of white marlin is 20 - 30 kg. 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. Although white marlin are generally considered to be a rare and solitary species, they are known to occur in small groups consisting of several individuals. Blue marlin are considered sexually mature by ages two to four, spawn in tropical and subtropical waters in the summer and fall, and are found in the colder temperate waters during the summer. Young blue marlin are one of the fastest, if not the fastest growing of all teleosts, reaching from 30 - 45 kg by age one. Female white and blue marlin grow faster and reach a much larger maximum size than males. Very little is known about the age and growth of white marlin, although they are considered to be very fast growing, as are all the Istiophoridae (NOAA Fisheries, 2003a).

Blue and white marlin feed on a wide variety of fish and squid. They are found predominately in the open ocean near the upper reaches of the water column and are caught most frequently as a bycatch in the offshore longline fisheries, which target tropical or temperate tunas using gear intended to fish near-surface waters. However, significant bycatch landings are also made by offshore longline fisheries that target swordfish and bigeye tuna using gear intended to fish deeper in the water column. White and blue marlin are both managed using the single Atlantic stock hypothesis. As discussed infra, marlins, in addition to sailfish and longbill spearfish, are caught as bycatch in the Atlantic pelagic longline and shark gillnet fisheries and they cannot be taken commercially.

Sailfish and spearfish have a pan-tropical distribution. Although sailfish have highest concentrations in coastal waters (more than any other Istiophorid), they are still found in oceanic waters. Spearfish are most abundant in offshore temperate waters. No trans-Atlantic movements have been recorded, suggesting a lack of mixing between east and west. Although sailfish and spearfish 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. Sailfish are the most common, and spearfish are generally the rarest, Atlantic Istiophorid (NOAA Fisheries, 2003a).

Sailfish and spearfish are generally considered piscivorous, but have also been known to consume squid. They are found predominantly in the upper reaches of the water column and are caught as bycatch in the offshore longline fisheries and as a directed catch in coastal fisheries. In coastal waters, artisanal fisheries use many types of shallow water gear to target sailfish (NOAA Fisheries, 2003a).

Sailfish spawn in tropical and subtropical waters in the spring and throughout the summer. Little is known about spearfish life history due to their relatively low abundance in offshore waters. Both sailfish and spearfish are considered to be fast growing species compared to other teleosts. Female sailfish grow faster and reach a larger maximum size than males (NOAA Fisheries, 2003a). The Billfish FMP Amendment provides more detailed background information regarding the life history strategies of Atlantic billfish, including age and growth, reproduction, movement pattern, influence of physical oceanographic features, essential fish habitat, and other information.

The preliminary estimates of 2002 U.S. recreational catches for these billfish species, combining the geographical areas of the Gulf of Mexico (Area 91), the northwestern Atlantic Ocean west of the 60^{o} W longitude (Area 92), and the Caribbean Sea (Area 93) are: 17.1 MT for blue marlin; 5.6 MT for white marlin; and 103 MT for sailfish. The estimates for 2001 were 16.4 MT, 3.1 MT, and 61.7 MT, respectively, for the three species. Estimates of the U.S. recreational catch (landings) do not include any estimates of mortality of released (or tagged and released) fish (NOAA Fisheries, 2003b).

According to the latest ICCAT stock assessment, Atlantic blue and white marlin and West Atlantic sailfish are all considered overfished, with overfishing believed to be occurring for all three species. The latest assessment for blue marlin is slightly more optimistic than the 1998 assessment, however productivity is lower than previously estimated. The total Atlantic stock is approximately 40% of B_{msy}, the current fishing mortality rate is approximately four times higher than F_{msy}, and overfishing has taken place in the last 10-15 years. Blue marlin landings declined in 1999 by 14% from the 1996 level. The 2000 assessment estimated that overfishing was still occurring and that productivity (MSY and stock's capacity to replenish) was lower than previously estimated (NOAA Fisheries, 2003a).

The previous two white marlin assessments, made in 1996 and 2000, indicated that the biomass of white marlin has been below B_{msy} for more than two decades. Thus, white marlin has been overfished for many years. The 2002 assessment results suggest that the total Atlantic stock in 2000 remains overfished, and overfishing is continuing to occur. 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. Results from the 2002 assessment indicate a MSY of 964 mt (849-1070 mt), a relative biomass (B_{2001}/B_{msy}) of 0.12 (0.06 - 0.25), and a relative fishing mortality rate (F_{2000}/F_{msy}) of 8.28 (4.5 - 15.8) (NOAA Fisheries, 2003a) .

Longbill spearfish and sailfish landings have historically been reported together in annual ICCAT landings 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 the list of abundance indices and by separating the catch of sailfish from that of spearfish in the offshore longline fleets.

Considerable progress was made on obtaining new, more reliable abundance indices. The new separation of sailfish/spearfish allowed assessments to be attempted on sailfish "only" data. Results from the 2001 sailfish "only" assessment indicate a recent yield (2000) of 506 mt and a 2000 replacement yield of ~ 600 mt. However, considerable uncertainties remain relating to both catches and catch rates that can only be addressed by a substantial research investment in historical data validation and in investigations of the habitat requirements of sailfish (NOAA Fisheries, 2003a).

For the western Atlantic stock, recent catch levels for sailfish/spearfish, combined, seem sustainable, as both CPUE and catch have remained relatively constant over the last two decades. For the combined sailfish/spearfish western Atlantic stock, it is not known whether the current catch level is below or at maximum sustainable yield. For this same stock, tentative catches of sailfish "only" have averaged about 700 MT over the past two decades, and the abundance indices have remained relatively stable for the same period. New analyses do not provide any information on the MSY or other stock benchmarks for the western Atlantic composite or sailfish "only" stock (NOAA Fisheries, 2003a).

3.1.3 Atlantic Tunas

Tunas are members of the family Scombridae in the suborder Scombroidei, which they share with swordfish (family Xiphiidae) and billfishes (family Istiophoridae). Atlantic tunas are wide-ranging in size; skipjack tuna is less than one meter (18 kg) as an adult, and the giant bluefin tuna can grow to more than three meters in length (675 kg or 1485 lbs). The Atlantic tunas include some of the largest and fastest predators in the oceans, and their physiological adaptations reflect that role in the ocean's ecosystems. Tuna have among the highest metabolic rates, fastest digestion rates, and the most extreme specializations for sustained levels of rapid locomotion of any fish (Helfman *et al*,1997).

Many of these characteristics are common among HMS. The tunas' body shape, round or slightly compressed in cross section, minimizes drag as they move through the water. Their lunate tails are deeply forked. These adaptations for speed are further enhanced by depressions on the body surface which are shaped to hold the fins in a streamlined position. Small dorsal and ventral finlets minimize turbulence and allow the tail to propel the fish forward more efficiently. Tunas utilize a respiratory mode known as ram gill ventilation, which differs from the more common mechanism whereby water is actively pumped across the gills. Ram gill ventilation requires that the fish swim continuously with its mouth open to maintain water flow across the gill surfaces. It is believed that this system helps conserve energy for voracious fishes like the tunas (Helfman *et al*., 1997).

Tunas are endothermic, with a physiological mechanism to control their body temperature. These fishes maintain an elevated body temperature by conserving the heat generated by active swimming muscles. This enables tunas to dive into colder and deeper water, giving them an edge in overtaking their prey. Heat conservation is accomplished through an adaptation of the circulatory system. The internal temperatures of these fishes remains fairly stable even as they move from surface waters to colder deep water. Bluefin tuna keep muscle temperatures between 28˚ and 33˚C while swimming through waters ranging from 7˚ to 30˚C, while yellowfin and skipjack tunas maintain muscle temperatures at about 3˚C or 4˚ to 7˚C above ambient water temperatures, respectively.

Tunas move thousands of kilometers annually throughout the world's tropical, subtropical, and temperate oceans and adjacent seas, primarily in the upper 100 to 200 meters of open ocean. As adults and juveniles, they feed on a variety of fishes, cephalopods, and crustaceans, depending on seasonal prey availability. The foraging and movement patterns of tunas reflect the distribution and scarcity of appropriate prey in the open seas; these fishes must cover vast expanses of the ocean in search of sufficient food resources. Consequently, aggregations of tunas are often correlated with areas where higher densities of prey are found, such as current boundaries, convergence zones, and upwelling areas (Helfman *et al*., 1997).

3.1.3.1 Atlantic Bluefin Tuna

In west Atlantic waters, bluefin tuna (*Thunnus thynnus*) reach maturity at about 196 cm (77 inches) straight fork length, and 145 kg (320 lbs). Bluefin tuna of this size are believed to be about eight years old. Stock assessments assume that the spawning population consists of all bluefin tuna eight years and older. Although each spawning Atlantic bluefin tuna produces approximately 30 million eggs, natural mortality on juvenile bluefin tuna is high (National Research Council, 1994). Bluefin tuna have a relatively long life span (20 years or more), which means that the stock consists of several age classes, a condition that serves as a buffer against adverse environmental conditions and that confers some degree of stability on the stock. As opportunistic feeders that can migrate long distances in search of prey, bluefin tuna may also be quite resilient to fluctuations in prey concentrations, although changes in prey availability may greatly influence fishing patterns.

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. Bluefin tuna spend a large part of the year feeding in temperate waters, returning to the warm waters of the Gulf of Mexico to spawn (Helfman *et al*., 1997). Trans-Atlantic migrations are well-documented, although migration patterns and their significance to species life history are not well known.

The two management units for Atlantic bluefin tuna are separated at 45˚ W above 10˚ N and at 25˚ W below the equator, with an eastward shift in the boundary between those parallels. A new stock assessment was conducted for both Atlantic bluefin tuna management units (East and West) in 2002. The West Atlantic stock assessment included projections for two scenarios about future recruitment. One scenario assumed that future recruitment will approximate the average estimated recruitment since 1976, unless spawning stock size declines to low levels. The second scenario anticipated an increase in recruitment corresponding to an increase in spawning stock size up to a maximum level no greater than the average recruitment for 1970 - 1974. These scenarios were referred to as the low recruitment and high recruitment scenarios, respectively.

The results of projections based on the low recruitment scenario for the Atlantic stock indicated that a constant catch of 2,500 mt per year has a 97 percent probability of allowing rebuilding to the associated B_{MSY} level by 2018. A constant catch of 2,500 mt per year has about a 35 percent probability of allowing rebuilding to the 1975 stock size (SSB75) by 2018. The SCRS notes that, arguably SSB75 is appropriate as a target level for interpreting the implications of projections based on the high recruitment scenario. Under the high recruitment scenario, a constant catch of about 2,500 mt has about a 60 percent probability of allowing rebuilding to the 1975 stock size; a catch of 2,700 has about a 52 percent chance of reaching this stock size. The SCRS cautioned that these conclusions do not capture the full degree of uncertainty in the assessments and projections. The immediate rapid projected increases in stock size are strongly dependent on estimates of high levels of recent recruitment, which are the most uncertain part of the assessment. The implications of stock mixing between the east and West Atlantic add to the uncertainty. For more information see Section 2.2.2 of the 2003 SAFE Report (NOAA Fisheries 2003a).

3.1.3.2 Atlantic Bigeye Tuna

Atlantic bigeye tuna (*Thunnus obesus*) are widely distributed in tropical and temperate waters between 45 degrees N and 45 degrees S latitudes. Young bigeye tuna form schools near the sea surface, mixing with other tuna such as yellowfin and skipjack tunas. Bigeye tuna reach sexual maturity at about four years of age, at which point they are approximately 100 cm long (40 inches). They spawn throughout the year in tropical waters from 15 degrees N to 15 degrees S. Catch information from the surface fisheries indicates that the Gulf of Guinea is a major nursery ground for the species. ICCAT recognizes a single Atlantic stock for management purposes, although the possibility of other scenarios, such as north and south Atlantic stocks, should not be disregarded (SCRS, 1997).

Catch of undersized fish remains a major problem in the Atlantic bigeye tuna fishery. The share of bigeye tuna less than the ICCAT minimum size (3.2 kg) is estimated at up to 59 percent by number of all bigeye tuna harvested. At its 2000 meeting, ICCAT adopted a recommendation that established the first-ever catch limits for bigeye tuna, which went into effect in 2001. These measures were continued for 2002 and 2003. While these measures will not be sufficient to rebuild the stock, bigeye tuna catches in 2000 (100,413 mt) and 2001 (96,482 mt) were down significantly from the 1999 level of 120,883 mt - first steps toward rebuilding (NOAA Fisheries 2003a).

ICCAT currently manages Atlantic bigeye tuna based on an Atlantic-wide single stock hypothesis. However, the possibility of other scenarios, including north and south stocks, does exist, and should not be disregarded (SCRS 2002). The latest stock assessment of Atlantic bigeye tuna was conducted in October 2002. The assessment was hampered by a paucity of information about illegal, unregulated, or unreported (IUU) catches, limited Ghanian fishery statistics, and the lack of a reliable index of abundance for small bigeye tuna. An estimate of natural mortality for juvenile fish was computed, which will help reduce uncertainty in future assessments.

Various production models were used which estimated that the total catch was larger than the upper limit of MSY estimates for the years between 1993 and 1999, causing the stock to decline considerably (SCRS 2002). This period was followed by a leveling off of biomass in recent years as total catches decreased. These results indicate that the current biomass is about 10-20% below the biomass corresponding to MSY and that current fishing mortality is about 15% higher than the rate that would achieve MSY. In addition to the estimates from production models, yield-per-recruit (YPR) analyses and other models support the production model results indicating that the stock is being over-fished. Further YPR analysis indicates that YPR can be increased with a reduction of fishing effort in small-fish fisheries. Increases in biomass are expected with catches below 95,000 mt, and further biomass declines are expected with catches of 105,000 mt or greater.

3.1.3.3 Atlantic Yellowfin Tuna

Yellowfin tuna (*Thunnus albacores*) are fast-growing, reaching sexual maturity at a size of about 25 kg (55 lbs) and 110 cm (44 inches), corresponding to an age of about three years (SCRS, 1997). The maximum size of yellowfin tuna is over 200 cm fork length. In the Atlantic, the greatest concentrations are found within 15 degrees north or south of the equator. Yellowfin tuna may be found seasonally as far north and south as the northeastern United States and Uruguay, with substantial concentrations occurring in the Gulf of Mexico during spring and summer months. Their distribution is determined by water temperature and the availability of prey species such as pelagic fishes and squids. Yellowfin tuna is a schooling species, with juveniles found in schools at the surface mixing with skipjack and bigeye tuna. Larger fish are found in deeper water and also extend their ranges into higher latitudes than smaller individuals. The main spawning ground in the Atlantic Ocean is the Gulf of Guinea near the equator, with spawning occurring from January to April (SCRS, 1998). Individual fish may spawn repeatedly during a single spawning season. All individuals in the Atlantic probably comprise a single population, but movement patterns are not well known (SCRS, 1997).

Based on movement patterns, as well as other information (e.g., time-area size frequency distributions and locations of fishing grounds), ICCAT manages Atlantic yellowfin tuna based on an Atlantic-wide single stock hypothesis. A full assessment was conducted for yellowfin tuna in 2003 (SCRS 2003) applying various age-structured and production models to the available catch data through 2001. At the time of the assessment meeting, only 19 percent of the 2002 catch had been reported (calculated relative to the catch reports available at the time of the SCRS Plenary). The results from all models were considered in the formulation of the Committee's advice. Both equilibrium and non-equilibrium production models were examined in 2003. The effective effort used for the production models was calculated by first creating a combined index from the available abundance indices by fleet and gear, and weighting each index by the catch of that fishery. One of the non-equilibrium models applied estimated the annual effective fishing effort internally, allowing the fishing power trends by fleet to vary.

The estimate of maximum sustainable yield (MSY) based upon the equilibrium models ranged from 151,300 to 161,300 metric ton (mt); the estimates of F_{2001}/F_{MSY} ranged from 0.87 to 1.29. The point estimate 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 Committee was unable to estimate the level of uncertainty associated with these point estimates (NOAA Fisheries 2004a).

3.1.3.3 Atlantic Albacore Tuna

Albacore tuna (*Thunnus alalunga*) are widely distributed throughout temperate waters of the Atlantic Ocean and the Mediterranean Sea, ranging from 50 degrees N to 40 degrees S latitudes. Aggregations are composed of similarly sized individuals, with those groups made up of the largest individuals making the longest journeys. Groups may include other tuna species, such as skipjack, yellowfin, and bluefin. They reach maximum sizes of about 125 cm (50 inches) and maximum weights of about 40 kg (88 lbs). Atlantic albacore tuna are considered mature at the age of five years, corresponding to approximately 90 cm (35 inches) (SCRS, 1998). Albacore tuna spawn in the spring and summer in tropical waters of the Atlantic (ICCAT, 1997).

On the basis of the available biological information, the existence of three stocks of albacore tuna is assumed for assessment and management purposes; northern and southern Atlantic stocks (separated at 5˚ N) and a Mediterranean stock. U.S. fishermen caught relatively small amounts of albacore from the North Atlantic stock/management unit (322 mt in 2001), and had minor catches of South Atlantic albacore (2 mt in 2001).

In 2003, an age-structured production model (ASPM), using the same specifications as in 2000, was used to provide a Base Case assessment for South Atlantic albacore. Results were similar to those obtained in 2000, but the confidence intervals were substantially narrower. 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 2003 and 2000, 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. A statistical (Bayesian) age structured production model was used for the first time in 2003. The results from this model were qualitatively similar to those from the ASPM. Projections were carried out using this alternate model (NOAA Fisheries 2003a).

3.1.3.4 Atlantic Skipjack Tuna

Skipjack tuna (*Katsuwonus pelamis*) are found throughout tropical and warm-temperate seas. The skipjack tuna is a schooling species, forming aggregations associated with hydrographic fronts. These tuna spawn opportunistically throughout the year in vast areas of the Atlantic Ocean. The size at first maturity is about 45 cm (18 inches), slightly smaller for females, which corresponds to about one to one and a half years of age (SCRS, 1997).

The stock structure of Atlantic skipjack tuna is not well known, and two management units (east and west) have been established due to the development of fisheries on both sides of the Atlantic and the lack of transatlantic recoveries of tagged skipjack tuna. U.S. vessels fish on the West Atlantic stock/management unit.

The characteristics of Atlantic skipjack tuna stocks and fisheries make it extremely difficult to conduct stock assessments using current models. Continuous recruitment occurring throughout the year, but heterogeneous in time and area, makes it impossible to identify and monitor individual cohorts. Apparent variable growth between areas makes it difficult to interpret size distributions and their conversion to ages. For these reasons, the SCRS has not conducted a stock assessment for Atlantic (West or East) skipjack tuna since 1999, and few definitive conclusions on the status of the stocks can be made. Standardized abundance indices from the Brazilian baitboat fishery and Venezuelan purse seine fishery both indicated a stable status for the western stock. The SCRS did not propose any management recommendations (NOAA Fisheries 2003a).

The estimated U.S. vessel landings and dead discards of tuna species in commercial and recreational HMS fisheries for 2002 can be seen in Table 3.2.

Table 3.2 Estimated U.S. Vessel Landings in Metric Tons of Tuna Species in Commercial and Recreational HMS Fisheries in 2002 (MT). Source: NOAA Fisheries, 2003b.

Gear	Albacore	Bigeye	Bluefin	Skipjack	Yellowfin
Handline	6.1	13.7	4.5	12.4	227
Harpoon	--	--	55.5	--	--
Gillnet	2.5	--	--	~0.6	~5.0
Pelagic Longline	147.1	510.7	49.9	~2.3	2542
Purse Seine	--	--	207.7	--	--
Trawl	0.3	0.3	--	0	0.3
Trap	0.6	--	--	~0.6	0.5
Troll	--	--	--	--	--
Rod and Reel	342	50.9	1557.3	73.5	3067.3
Pound	--	--	--	--	--
Unclassified	*	--	--	--	3.2
Total	**498.6**	**572**	**1,874.9**	**89.6**	**5845**

* < or = 0.5 MT

3.1.4 Atlantic Sharks

Atlantic sharks are managed in several species groups. Many shark species make extensive migrations along the U.S. Atlantic coast. Compared to other fishes, sharks have low reproductive rates which make them particularly vulnerable to overfishing. Because LCS are overfished, SCS are fully fished, and the status of pelagic sharks is unknown at this time, NOAA Fisheries seeks to minimize bycatch in any fishery which encounters them. Additional information on Atlantic sharks can be found in the HMS FMP (NOAA Fisheries, 1999), the 2003 and 2004 Stock Assessment and Fishery Evaluation Reports (NOAA Fisheries, 2003a; NOAA Fisheries, 2004a), and Amendment 1 to the HMS FMP (NOAA Fisheries, 2003c).

Large Coastal Sharks

Species in the large coastal sharks (LCS) group are the main commercial species and are targeted with bottom longline gear. Sandbar and blacktip sharks make up approximately 60 to 75 percent of the bottom longline catch and approximately 75 to 95 percent of the bottom longline landings (GSAFDF, 1996). The remainder of the bottom longline catch is comprised mostly of bull, bignose, tiger, sand tiger, lemon, spinner, scalloped hammerhead and great hammerhead sharks, with catch composition varying by region. These species are less marketable and are often released, so they are reflected in the overall catch but not the landings. Several LCS can also be caught by pelagic longline gear: silky, dusky, sandbar, and hammerhead sharks. The shark gillnet fishery catches several large coastal species including blacktip (targeted and retained), and scalloped hammerhead (discarded). To a lesser extent, sandbar, bull, spinner, tiger, lemon, and silky sharks are caught and retained in the shark gillnet fishery (NOAA Fisheries, 2002).

The latest Shark Evaluation Workshop (SEW) was held in June 2002. Discussions 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 SEW and incorporated new catch and effort estimates for the years 1998-2001 as well as over 20 catch- per-unit-effort (CPUE) series for LCS, sandbar, and blacktip sharks. 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 the results illustrate improvements in the LCS complex since 1998, all of the models and catch scenarios, 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. Overall, the stock assessment found that the LCS complex as a whole is overfished and overfishing is occurring (Cortes *et al.*, 2002).

Pelagic Sharks

Pelagic sharks including shortfin mako, porbeagle, common thresher, and blue sharks are commonly taken in the pelagic longline fishery. Pelagic sharks are also sometimes encountered incidentally in the shark gillnet fishery (e.g., thresher sharks, mostly discarded) and bottom longline fishery. Trans-Atlantic migrations of these sharks are common; they are taken in several international fisheries outside the U.S. EEZ (NOAA Fisheries, 2002).

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 Subcommittee on Bycatch has recommended that ICCAT take the lead in conducting stock assessments for pelagic sharks. Recently, the SCRS decided to conduct an assessment of Atlantic pelagic sharks beginning in 2004. Emphasis will be placed on blue, shortfin mako, and porbeagle sharks.

Prohibited Shark Species

In 1999, NOAA Fisheries prohibited possession of 19 species of sharks. These species were identified as highly susceptible to overexploitation and the prohibition on possession was a precautionary measure to ensure that directed fisheries did not develop. Three species on the prohibited list (i.e., dusky, night, and sand tiger) are also on the Candidate Species List under the ESA (NOAA Fisheries, 2003c).

To date there is little information available regarding the status of individual prohibited species. For the most part, many species that were LCS before 1999 continue to be considered as part of the LCS complex in the latest LCS stock assessment. In 2001, NOAA Fisheries contracted

Virginia Institute of Marine Science (VIMS) to conduct a status review under ESA of the dusky shark (Romine *et al.*, 2002). Additionally, VIMS continues to conduct a fisheries independent longline study off Virginia, which provides valuable information regarding the status of dusky shark. Specifically, relative abundance data (1974-2000) indicates increasing trends in abundance from 1997-2000, despite declines from 1980-1992 (Romine *et al.*, 2002). Catch data, which suggests increasing catch rates from 1994 to 1999, provides evidence that greater numbers of small dusky sharks are being caught. This finding is important considering that hooking mortality increases as shark size decreases. Romine *et al.* (2002) noted that mortality for dusky sharks less than 100 cm fork length was 79 percent, as compared with 37 percent in sexually mature animals (Romine et al., 2002). These data, when combined with other life history information and analyzed by a demographic model, suggest that dusky shark populations will continue to decline so long as fishery-induced mortality is incurred (Romine *et al.*, 2002). NOAA Fisheries will be conducting status reviews for night and sand tiger sharks in the future (NOAA Fisheries, 2003c).

3.1.5 Other Finfish

Dolphin (*Coryphaena hippurus*) are fast-swimming, pelagic, migratory, and predatory fish found in tropical and subtropical waters throughout the world. They are short-lived and fast growing. These traits allow the stock to support high fishing mortality rates. Also referred to as mahi-mahi, these fish are sold by commercial fishermen (driftnet and pelagic longline) and are targeted by recreational fishermen along the Atlantic and Gulf Coasts (NOAA Fisheries, 2002). Wahoo (*Acanthocybium solanderia*) are large pelagic fish found throughout the tropical and subtropical waters of the Atlantic Ocean. The life history of wahoo is largely unknown, although they are a fast-growing species similar to dolphin. These fish are also landed both recreationally and commercially, although encounter rates seem to be lower than those for dolphin (NOAA Fisheries, 2002).

The South Atlantic Fishery Management Council recently received notice that the Fishery Management Plan for Dolphin and Wahoo in the Atlantic Region has been approved by the U.S. Secretary of Commerce. The management plan, developed by the South Atlantic Council in conjunction with the Mid-Atlantic and New England Councils, will set limits on catches of dolphin and wahoo for commercial and recreational fishermen in federal waters along the entire Atlantic coast. The precautionary management plan also establishes a framework for long-term management of both fish species. Management measures included in the plan and approved by the secretary of commerce include requirements for permits, size limits for dolphin, recreational bag limits for both species, commercial trip limits for wahoo and commercial longline closures in conjunction with current closures in the Atlantic for Highly Migratory Species. The plan also will prohibit the sale of recreationally caught dolphin or wahoo, with the exception of for-hire vessels that possess the appropriate state and Federal commercial permits; those vessels will be allowed to sell dolphin harvested under the bag limit. The FMP establishes a non-binding cap of 1.5 million pounds, or 13 percent of the total landings for the commercial dolphin fishery.

3.2 FISHERY PARTICIPANTS AND GEAR TYPES

The HMS FMP provides a thorough description of the U.S. fisheries for Atlantic HMS, including sectors of the pelagic longline fishery. Below is specific information regarding the U.S. pelagic longline fishery for Atlantic HMS. For more detailed information on the fishery, please refer to the HMS FMP (NMFS, 1999), and the 2000 - 2004 HMS SAFE Reports.

3.2.1 Pelagic Longline Gear

The U.S. pelagic longline fishery for Atlantic HMS primarily targets swordfish, yellowfin tuna, or 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 (i.e., 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. Longline gear sometimes attracts and hooks non-target finfish with 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 3.1[1]). The primary fishing line, or mainline of the longline system, can vary

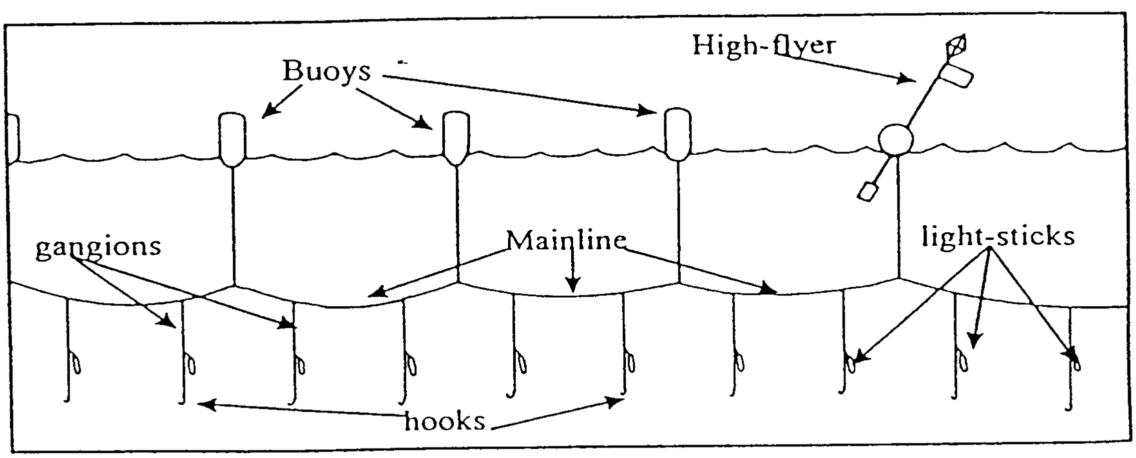

Figure 3.1 **Typical U.S. Pelagic Longline Gear.** Source: Arocha, 1996.

[1] 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

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 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 bait fish which may, in turn, attract pelagic predators.

When targeting swordfish, the lines generally are deployed at sunset and hauled at sunrise to take advantage of swordfish nocturnal near-surface feeding habits (Berkeley *et al*., 1981). 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 catch (Table 3.3).

Table 3.3 **Average Number of Hooks per Pelagic Longline Set, 1995-2002.** Source: Data reported in pelagic longline logbook.

Target Species	1995	1996	1997	1998	1999	2000	2001	2002
Swordfish	539	529	550	563	521	550	625	695
Bigeye Tuna	752	764	729	688	768	454	671	755
Yellowfin Tuna	721	679	647	685	741	772	731	715
Mix of tuna species	NA	NA	NA	NA	NA	638	719	767
Shark	654	531	540	706	613	621	571	640
Dolphin	NA	NA	NA	NA	NA	943	447	542
Other species	231	79	460	492	781	504	318	300
Mix of species	658	695	713	726	738	694	754	756

Figure 3.2 illustrates the difference 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

hooks are on board.

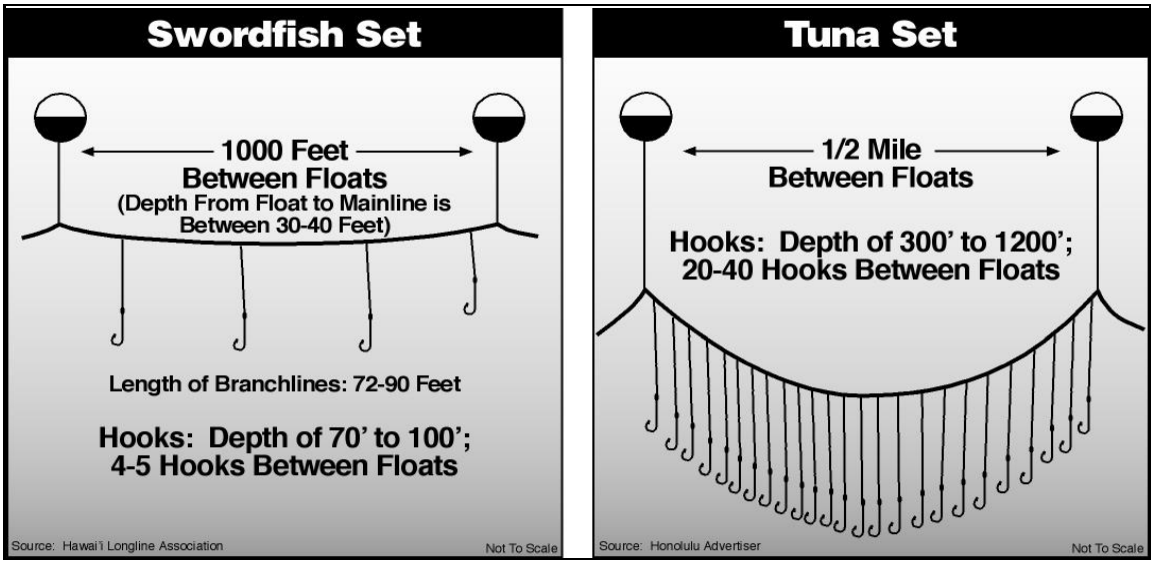

Figure 3.2 **Different Longline Gear Deployment Techniques.** Source: Hawaii Longline Association and Honolulu Advertiser.

believed that because of the difference in fishing depth, tuna sets hook fewer turtles than the swordfish sets. The hook types are also different for each target species. Swordfish sets generally use "J" hooks and tuna sets use "tuna" hooks, which are more curved than "J" hooks. 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 targeting tuna typically are smaller and fish different grounds.

3.2.2 U.S. Pelagic Longline Catch and Discard Patterns

The U.S. pelagic longline fishery sector is 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, segments differ by percentage of various target and non-target species, gear characteristics, bait, and deployment techniques. Some vessels fish in more than one fishery segment during the course of the year. 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 3.4

Table 3.4 **Reported Catch of Species Caught by U.S. Atlantic Pelagic Longlines, in Number of Fish 1995-2002.** Reported in pelagic longline logbook.

Species	1995	1996	1997	1998	1999	2000	2001	2002
Swordfish Kept	72,788	73,111	68,274	68,345	64,370	60,101	49,220	49,360
Swordfish Discarded	29,789	23,831	20,613	22,579	20,066	16,711	14,448	13,039
Blue Marlin Discarded	3,091	3,310	2,614	1,291	1,248	338	164	401
White Marlin Discarded	3,432	2,924	2,812	1,490	1,971	504	295	709
Sailfish Discarded	1,195	1,443	1,766	827	1,404	517	61	158
Spearfish Discarded	445	553	390	105	156	79	29	51
Bluefin Tuna Kept	239	209	180	206	239	232	183	178
Bluefin Tuna Discarded	2,852	1,709	688	1,304	601	737	348	593
Bigeye, Albacore, Yellowfin, Skipjack Tunas Kept	120,548	85,964	102,798	75,268	99,957	94,677	82,973	80,104
Pelagic Sharks Kept	5,885	5,270	5,134	3,624	2,705	2,932	3,511	2,997
Pelagic Sharks Discarded	90,173	84,330	82,220	44,000	28,910	26,281	23,953	22,844
Large Coastal Sharks Kept	57,676	36,022	21,382	8,742	1,025	7,752	6,510	4,077
Large Coastal Sharks Discarded	11,013	10,403	8,243	5,908	5,774	6,800	4,891	3,815
Dolphin Kept	72,463	35,888	62,811	21,864	29,902	28,095	27,913	30,452
Wahoo Kept	4,976	3,635	4,570	4,303	4,112	3,887	3,084	4,212
Turtles Discarded	1,142	498	267	885	627	270	421	465
Number of Hooks (X 1,000)	*11,064*	*10,657*	*9,861*	*7,676*	*7,488*	*7,570*	*7,740*	*7,151*

3.2.2.1 Regional U.S. Pelagic Longline Fisheries Description

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, FL; Panama City, FL; Dulac, LA; and Venice, LA.

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 2 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, NOAA Fisheries recently banned the use of live bait in an effort to decrease bycatch and bycatch mortality of billfish (August 1, 2000, 65 FR 47214). Bait used includes frozen squid, Japanese mackerel, and local finfish. "J" hooks are most commonly used.

Yellowfin tuna inhabit tropical and subtropical waters of the Atlantic, prefer the upper 100 meters of the water column, and eat fishes, cephalopods, and crustaceans, with a preference for squid. This species is extensively fished in the Intertropical Atlantic (45° N - 40° S) by many nations using purse seine, longline, handline, and baitboat.

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

South Atlantic pelagic longline vessels previously targeted swordfish year-round, although yellowfin tuna and dolphin fish were other important marketable components of the catch. In 2001 (August 1, 2000, 65 FR 47214), the Florida East Coast closed area (year-round closure) and the Charleston Bump closed area (February through April closure) became effective. NOAA Fisheries plans to analyze logbook data to determine the effectiveness of these closed areas and to determine what adjustments have been made by the vessels that used to fish there.

Prior to these closures, smaller vessels used to fish shorter 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, SC; Charleston, SC; Fort Pierce, FL; Pompano Beach, FL; and Key West, FL. This sector of the fishery consists of small to mid-size vessels which typically sell fresh swordfish to local high-quality markets. "J" hooks are most commonly used in this fishery sector.

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. Fishing trips in this fishery sector average 12 sets over 18 days. During the season, vessels primarily offload in the ports of New Bedford, MA; Barnegat Light, NJ; Ocean City, MD; and Wanchese, NC.

Bigeye tuna inhabit tropical and subtropical waters (50°N lat. and 45°S lat.) and range in surface waters to depths of 250 meters, this species tends to swim the deepest of the tunas. Bigeye tuna feed day and night on a variety of fish species, as well as cephalopods and crustaceans. This species is mostly caught on deep-water longlines for the fresh fish market, but is also caught by baitboat and purse seine as a secondary species by other nations. Bait used is typically frozen squid.

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 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 player 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 to travel 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, PR through Portland, ME, and include New Bedford, MA, and Barnegat Light, NJ. Bait used includes frozen squid and Boston mackerel. "J" hooks are most commonly used in this fishery sector. This segment of the fleet was directly affected by the L-shaped closure in 2000 and the NED closure in 2001.

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 set 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. Bait used includes frozen squid.

3.2.2.2 Bycatch and Incidental Catch

Marine Mammals

Of the marine mammals that are hooked by pelagic longline fishermen, many are released alive, although some animals suffer serious injuries and may die after being released. Mammals are caught primarily from June through December in the Mid-Atlantic Bight and Northeast Coastal areas (see Figure 3.3). In the past, the incidental catch rate was highest, on average, in the third quarter (July - September) in the Mid-Atlantic Bight. 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 whale, 19 whale, 29 pygmy sperm whale) (Yeung, 2001). Incidental catch of pilot whales on pelagic longlines is thought to result from pilot whales preying on tuna that have been caught on the gear. In 2001 and 2002, there were 16 and 24 observed takes of marine mammals, respectively. The majority of these interactions were observed in the Mid-Atlantic Bight, followed by the experimental NED fishery. In 2001, a total of 84 Risso's dolphin and 93 pilot

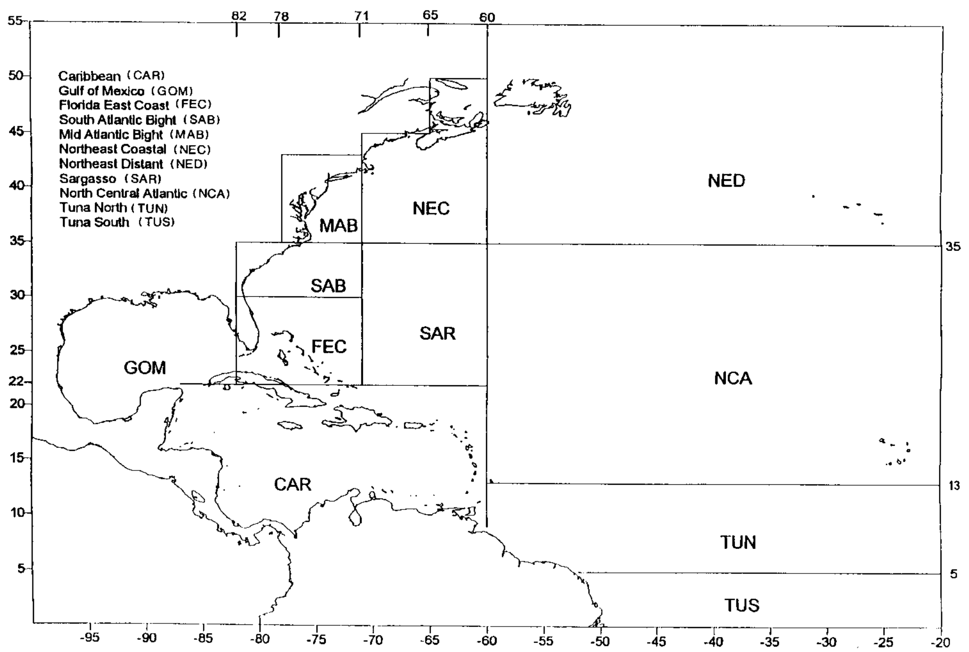

Figure 3.3 Geographic Areas Used in Summaries of Pelagic Logbook Data.
Source: Cramer and Adams, 2000.

whales are estimated to have been interacted with in the pelagic longline fishery. In 2002, the pelagic longline fishery is estimated to have interacted with 87 Risso's dolphin and 114 pilot whales. In the experimental NED fishery, 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).

Sea Turtles

Currently, many sea turtles are taken in the Gulf of Mexico and Northeast Coastal areas (Figure 3.3) 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). The June 14, 2001, BiOP found that the actions of the pelagic longline fishery jeopardized the continued existence of loggerhead and leatherback sea turtles, based upon projections that the fishery was expected to interact with 991 loggerhead and 1012 leatherback sea turtles per year, for many years into the future. The estimated take levels for 2000 are 1256 loggerhead and 769 leatherback sea turtles (Yeung, 2001). As discussed in Section 1.1 of this document, in 2001 and 2002, NOAA Fisheries closed the NED area and implemented other measures consistent with the BiOp. The estimated take levels outside of the NED closed area are 312 loggerhead and 1208 leatherback sea turtles for 2001 and 575 loggerhead and 962 leatherback sea turtles for 2002 (Garrison, 2003). NOAA Fisheries is currently working to identify the root cause of these increases. As a result of these increased sea turtle interactions, NOAA Fisheries reinitiated consultation for this fishery and completed a new BiOp on June 1, 2004. See Section 4.3 for information on the 2004 BiOp.

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). According to NOAA Fisheries observer data from 2002, seven gulls, seven unidentified seabirds, four greater shearwaters, two shearwaters, and one northern gannet were hooked between June and November. 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 FAO International Plan of Action to reduce the incidental take of seabirds (www.nmfs.gov.gov/NPOA-S.html). Although Atlantic pelagic longline interactions will be considered in the plan, NOAA Fisheries 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. Observed seabird bycatch in the Atlantic pelagic longline fishery from 1992 - 2002 can be seen in Table 3.11 in Section 3.4.

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. U.S. pelagic longline reported catch for 1995 - 2002 (including reported bycatch, incidental catch, and target catch) is summarized in Table 3.4. The 2002 pelagic longline landings and average weight per fish can be seen in Tables 6.4 and 6.6, respectively. U.S. landings and discard data are also available in the 2003 U.S. National Report to ICCAT (NOAA Fisheries, 2003b)

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 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 pelagic longline fishery, NOAA Fisheries implemented regulations to close areas to longline fishing (Figure 3.4) and has banned the use of live bait by longline vessels in the Gulf of Mexico.

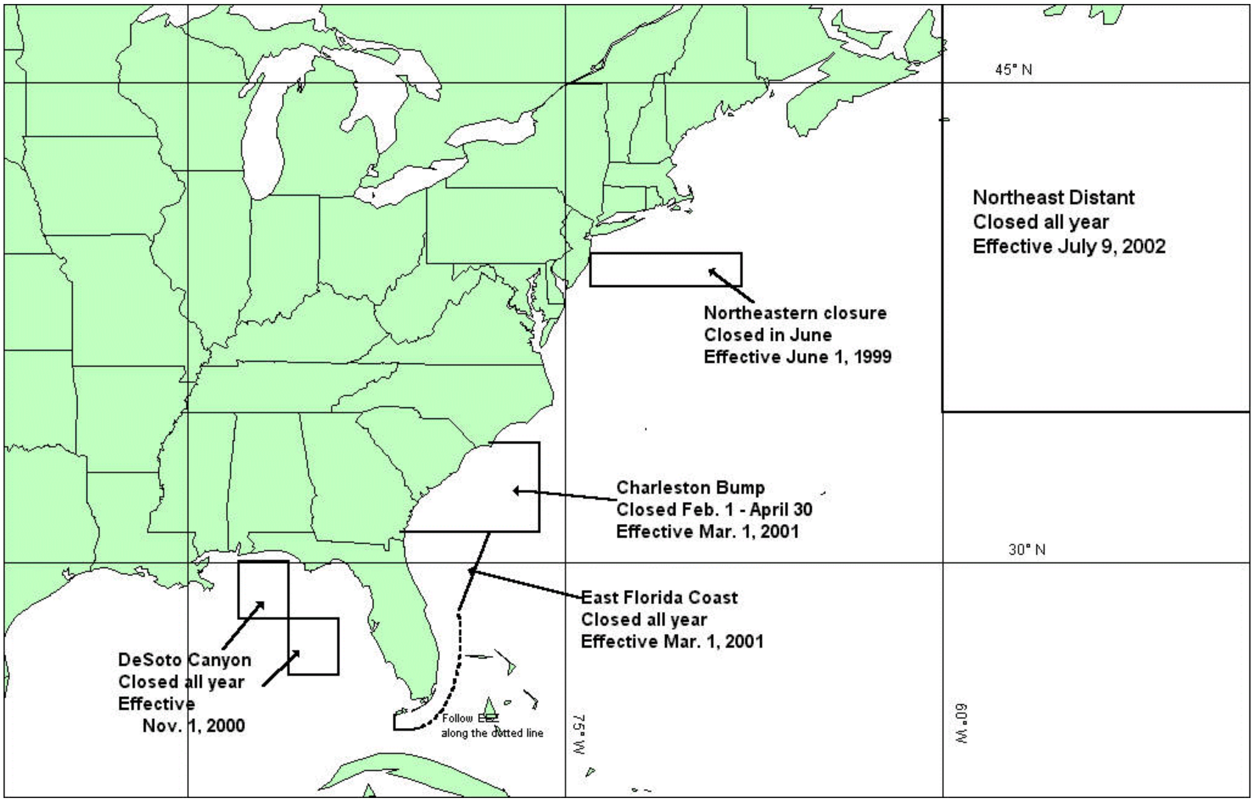

Figure 3.4 Areas Closed to Pelagic Longline Fishing by U.S.- Flagged Vessels.

3.2.3 U.S. Catch in Relation to International Catch of Atlantic Highly Migratory Species

The U.S. fleet is a small part of the international fleet that competes on the high seas for catches of tunas and swordfish (Table 3.5). Although the U.S. fleet landed as much as 35 percent of the swordfish from the north Atlantic, north of 5° N. latitude in 1990, this proportion decreased to 25 percent by 1997. For tunas, the U.S. proportion of landings was 23 percent in 1990, decreasing to 16 percent by 1997. In recent years, the proportion of U.S. pelagic longline landings of HMS has remained relatively stable in proportion to international landings (Table 3.5). The U.S. fleet accounts for none, or virtually none, 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 (NOAA Fisheries, 2001b).

The U.S. pelagic longline fleet targeting HMS captures sea turtles at a rate estimated to average 912 loggerheads and 846 leatherbacks per year, based on observed takes and total reported effort from 1992 to 2002 (Table 3.10). Estimates for 2000, based on observed take and reported effort, are 1256 loggerhead and 769 leatherback sea turtles (Yeung, 2001). The estimated take levels for 2001 and 2002 are 312 loggerhead and 1208 leatherback sea turtles, and 575 loggerhead and 962 leatherback sea turtles, respectively (Garrison, 2003). Most of these takes occur on the high seas, rather than within the U.S. EEZ. 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 (NOAA Fisheries, 2001b). See Section 3.4.1 for recent catch estimates. If the sea turtle catch rates of foreign fleets, per hook, or even per pound of swordfish landed, are similar to the catch rates of the American fleet, then the American fleet may represent less than one-tenth, and certainly no more than one-third, of the total catch and mortality of sea turtles in north Atlantic pelagic longline fisheries.

Table 3.5 Estimated International Longline Landings of HMS, Other than Sharks, for All Countries in the Atlantic: 1998-2002 (mt ww)*. Source: SCRS, 2003

	1998	1999	2000	2001	2002
Swordfish (N.Atl + S. Atl)	24,432	25,201	24,990	21,773	21,770
Yellowfin Tuna (W. Atl)**	8,795	11,596	11,465	12,535	12,141
Bigeye Tuna	71,825	76,513	70,902	54,842	43,773
Bluefin Tuna (W. Atl.)**	764	914	859	610	727
Albacore Tuna (N. Atl + S. Atl)	23,574	27,209	28,881	28,959	27,491
Skipjack Tuna (N. Atl + S. Atl)	99	51	60	70	88
Blue Marlin (N. Atl. + S. Atl.)***	2,519	2,359	2,187	1,638	1,247
White Marlin (N. Atl. + S. Atl.)***	918	981	893	592	705
Sailfish (W. Atl.)***	1,058	524	811	812	1,050
Total	**133,984**	**145,348**	**141,048**	**121,831**	**108,992**
U.S. Longline Landings (from U.S. Natl. Report, 2003)#	**7,139.9**	**8,356.0**	**7,319.7**	**6,012.0**	**5893.2**
U.S. Longline Landings as a Percent of Total Longline Landings	**5.3**	**5.7**	**5.2**	**4.9**	**5.4**

* Landings include those classified by the SCRS as longline landings for all areas
** 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 tuna fishery since 1982.
***Includes U.S. *dead discards.*
Includes swordfish longline discards and bluefin tuna discards.

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 to be 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 U.S. 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. However, NOAA Fisheries is not aware of the implementation of sea turtle conservation measures by foreign fleets, and in the absence of a domestic fishing fleet subject to sea turtle conservation measures, foreign vessels would likely increase their fishing effort and sea turtle mortality would likely increase. Further, NOAA Fisheries continues to advance turtle conservation through participation in both domestic and international workshops.

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 U.S. 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.

Additionally, the Inter-American Convention for the Protection and Conservation of Sea Turtles ("Inter-American Convention") was concluded on September 5, 1996, in Salvador, Brazil, and entered into force in May 2001. This is the first international agreement devoted solely to the protection of sea turtles. The Inter-American Convention calls for the Parties to establish national sea turtle conservation programs. Each party will agree to implement broad measures for the conservation of sea turtles, including the use of turtle excluder devices in commercial shrimp trawl vessels and the mitigation of impacts on sea turtles from other fisheries.

3.2.4 Research Experiment

Consistent with the conservation recommendation of the June 14, 2001, BiOp, NOAA Fisheries 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 display 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, NOAA Fisheries 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, NOAA Fisheries 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. Preliminary 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 unidentified dolphin, and five Risso's dolphin resulting in one mortality (S. Epperly, pers. comm., 2003).

Since publication of the DSEIS, the reduction rates calculated for various experimental treatments (hook and bait combinations) have been standardized to control for several variables including sea surface temperature, daylight soak time, total soak time, vessel effect, and pairing effect in case of matched paired hook types per set. This FSEIS incorporates the NED research experiment data standardized for these variables.

3.2.5 Management of the 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 requirements. Current billfish regulations prohibit the retention of billfish by commercial vessels, or the sale of billfish from the Atlantic Ocean. As a result, all billfish hooked on longlines must be discarded, and are considered bycatch. This is a heavily managed gear type and, as such, is strictly monitored to avoid over harvest of the swordfish quota. Because it is difficult for pelagic longline fishermen to avoid undersized fish in some areas, NOAA Fisheries has closed areas in the Gulf of Mexico and along the east coast. The intent of these closures is to relocate some of the fishing effort into areas where bycatch is expected to be lower. 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, NOAA Fisheries requires all pelagic longline vessels to report positions on an approved vessel monitoring system (VMS).

Pelagic longline fishermen and the dealers who purchase HMS from them are also subject to reporting requirements. NOAA Fisheries has extended dealer permitting and 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.

As of November 2003, approximately 235 tuna longline limited access permits had been issued. In addition, approximately 203 directed swordfish limited access permits, 100 incidental swordfish limited access permits, 249 directed shark limited access permits, and 357 incidental shark limited access permits had been issued.

Dealer permits are required for commercial receipt of Atlantic tunas, swordfish, and sharks, and are detailed in the HMS FMP. As of October 2002, approximately 479 Atlantic tunas, 321 Atlantic swordfish, and 267 Atlantic shark dealer permits had been issued. Dealer and limited access permits are discussed further in Chapter 6.

3.2.6 Observer Program

Eight hundred fifty-six pelagic longline sets were observed and recorded by NOAA Fisheries observers in 2002 (8.9% overall coverage - 100% coverage in the northeast distant statistical sampling area (NED); and 3.7% coverage in remaining areas). Table 3.6 compares the amount of observer coverage in past years for this fleet. The June 14, 2001, BiOp requires that five percent of the pelagic longline trips be selected for observer coverage. In addition, ICCAT requires five percent observer coverage for vessels targeting yellowfin tuna and/or bigeye tuna. Unfortunately, due to logistical problems, it has not been possible to place observers on all selected trips. NOAA Fisheries 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 3.6 Observer Coverage of the Pelagic Longline Fishery. Source: Yeung, 2001 & Garrison, 2003

Year	Number of Sets Observed			Percentage of Total Number of Sets		
1995	696			5.2		
1996	361			2.5		
1997	448			3.1		
1998	287			2.9		
1999	420			3.8		
2000	464			4.2		
2001*	Total	Non-NED	NED	Total	Non-NED	NED
	403	217	186	3.7	2.0	100.0
2002*	856	353	503	8.9	3.7	100.0

*In 2001 and 2002, 100 percent observer coverage was required in the NED research experiment.

3.2.7 Safety Issues Associated with the Fishery

Like all offshore fisheries, pelagic longlining can be dangerous. Trips are often long, the work is arduous, and the nature of setting and hauling the longline may cause injuries due to hooking. Like all other HMS fisheries, longline fishermen are exposed to unpredictable weather. NOAA Fisheries does not wish to exacerbate unsafe conditions through the implementation of regulations. Therefore, NOAA Fisheries considers safety factors when implementing management measures on pelagic longline fishermen. 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. NOAA Fisheries seeks comments from fishermen on any safety concerns they 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. NOAA Fisheries encourages fishermen to be responsible in fishing and maintenance activities.

3.2.8 Economic Aspects of the U.S. Pelagic Longline Fishery

3.2.8.1 Costs and Revenues

The amount of economic data available for this gear type is increasing, although additional up to date information is needed. Since 1996, NOAA Fisheries has been collecting economic information on a per trip basis through submission of voluntary forms in the pelagic logbook maintained in the Southeast Fisheries Science Center. Compared to the number of logbook reports, few economic data have been collected, because submission was voluntary. In 2003, NOAA Fisheries initiated mandatory cost earnings reporting for selected vessels in order to improve the economic data available for all HMS fisheries. Mandatory submission of this economic data is needed for NOAA Fisheries to accurately assess the economic impacts of proposed fishery management regulations on fishermen and their communities as required by Federal laws, such as the National Environmental Policy Act (NEPA), Executive Order 12866, the Regulatory Flexibility Act (RFA), and National Standards 7 and 8 of the Magnuson-Stevens Act. Specifically, this information will be used to conduct cost-benefit analyses and develop regulatory impact analyses of proposed regulations in an effort to help NOAA Fisheries develop and improve fishery management strategies.

Larkin *et al.* (2000) examined 1996 logbooks and the 1996 voluntary forms and found that net returns to a vessel owner varied substantially depending on the vessel size and the fishing behavior (i.e. sets per trip, fishing location, season, target species). This study noted that of 3,255 pelagic longline trips which reported, 642 provided the voluntary economic information. From all trips, four species (swordfish, yellowfin tuna, dolphin fish, and sandbar sharks) comprised 77 percent of all species landed and accounted for 84 percent of the total gross revenues for the fleet. Generally, vessels that were between 46 and 64 feet in length, had between 10 and 21 sets per trip, fished in the second quarter, fished in the Caribbean, or had more than 75 percent of their gross revenues from swordfish had the highest net return to the owner (ranging from $3,187 to $13,097 per trip). Vessels that were less than 45 feet in length, had between one and three sets per trip, fished in the first quarter, fished between North Carolina and Miami, FL, or had between 25 and 50 percent of their gross revenues from swordfish had the lowest net return to the owner (ranging from $642 to $1,885 per trip).

Larkin *et al*. (in press) used the above data in a cost function model to determine if and how captains decide on levels of effort in order to minimize variable costs per trip. They found that, on average, increasing the price of bait increased the demand for light sticks (i.e. these inputs are complements); changing the price of fuel did not affect any purchase decisions; and for every additional 10 feet in vessel length, operators demanded an additional 149 light sticks, 319 pounds of bait, and 540 gallons of fuel per trip. They also found that on average increasing swordfish landings required additional light sticks, bait and fuel. Increasing tuna landings reduced the demand for light sticks while increasing the demand for bait and fuel. Additionally, some inputs (i.e. light sticks, bait demand, and fuel demand) varied significantly with region, quarter, number of sets, and target species. They also found that if the price of light sticks or bait increases, the quantity demanded falls, particularly for light sticks (i.e. own-price elasticities are negative). However, elasticities could also change depending on region, target species, or number of trips but did not change between seasons.

Porter *et al*. (2001) conducted a survey of 147 vessels along the Atlantic and Gulf of Mexico (110 surveys were completed) in 1998 regarding 1997 operations. The survey consisted of 55 questions divided into five categories (vessel characteristics, fishing and targeting strategies, demographics, comments about regulations, and economic information of variable and fixed costs). The vessels interviewed were diverse in vessel size and target species (swordfish, tuna, mixed). Information was also used from trip tickets and logbooks. They found that on average, the average vessel received approximately $250,000 annual gross revenues, annual variable costs were approximately $190,000, and annual fixed costs were approximately $50,000. Thus, vessels were left with approximately $8,000 to cover depreciation on the vessel and the vessel owner lost approximately $3,500 per year. On a per trip level, gross revenues averaged $22,000 and trip expenses, including labor, were $16,000. Labor cost the owner the most (43 percent) followed by gear. Generally trip returns were divided so the vessel owner received 43 percent and the captain and crew 57 percent. Based on 2002 data, NOAA Fisheries estimates annual gross revenues of approximately $187,074.00 in 2002. Along with other studies, Porter *et al*. (2001) noted differences between region, vessel size, and target species. Porter *et al*. (2001) also noted that 1997 was probably a financially poor year due to a reduction in swordfish quota and a subsequent closure of the fishery. In all, these studies are consistent with Larkin *et al*. (1998) and Ward and Hanson (1999) in that characteristics of fishing trips can influence the success of the trip and that pelagic longline fishermen do not have large profits. Gross revenues, net revenues, and variable costs are discussed further in Chapter 6.

Many consumers consider swordfish to be a premier seafood product. Swordfish that bring $3.00 per pound to the vessel may sell in some restaurants at prices of over $20.00 for a six-ounce steak. Swordfish prices are affected by a number of demand and supply factors, including the method of harvest, either by distant-water or inshore vessels, and by gear type (harpoon vs. pelagic longline). Generally, prices for fresh swordfish can be expected to vary during the month due to the heavier fishing effort around the full moon. Swordfish prices also vary by size and quality, with prices first increasing with size, up to about 250 pounds dressed weight (lbs dw), then decreasing due to higher handling costs for larger fish. “Marker” swordfish weighing 100 to 275 lbs dw are preferred by restaurants because uniform-sized dinner portions can be cut with a minimum of waste. “Pups” weighing 50 to 99 lbs dw are less expensive than markers but the yield of uniformly sized portions is smaller. “Rats” (33 to 49 lbs dw) are the least expensive but are generally not used by food service or retail buyers who require large portions of uniform size. Larger tunas are also more desirable than smaller ones with prices for tunas ranging from $1.00 - 1.50 for 0 - 29 pound yellowfin tuna to $1.50 - 3.00 for 50+ pound yellowfin tuna (Strand and Mistiean, 1999). Size of fish harvested can be a substantial factor in management because regulations might have the effect of reducing catch but might raise the average size per fish caught and therefore, raise the price. Current ex-vessel and wholesale prices for Atlantic HMS are summarized in the 2004 HMS SAFE Report.

3.2.8.2 Imports

The United States monitors the trade of swordfish, but only as it relates to the sale of Atlantic swordfish in U.S. markets. Monitoring U.S. imports of swordfish is facilitated by the use of U.S. Customs data, the Certificate of Eligibility (COE), and importer activity reports. The U.S. COE program was established to implement an ICCAT recommendation that allows countries to ban the sale of swordfish less than the minimize size. The United States is successfully monitoring swordfish imports through this program and is providing useful information on Atlantic swordfishing activities to ICCAT. If swordfish shipments enter the United States under the swordfish tariff codes required by U.S Customs and Border Protection (formerly U.S. Customs Service) regulations, the shipments can be cross-checked with a COE that indicates the flag of the harvesting vessel and the ocean of origin. Furthermore, the COE validates that the imported swordfish is not less than the U.S. minimum size of 33 lb dressed weight. Japan implemented a swordfish monitoring program in 2000 that is similar to the U.S. COE program in order to implement a 1999 ICCAT recommendation to prohibit the import of swordfish harvested by Belize and Honduras. At its 2001 meeting, ICCAT adopted recommendations for the establishment of swordfish and bigeye tuna statistical documentation programs. NOAA Fisheries is currently developing a proposed rule to implement these recommendations.

Since the United States represents a significant market for swordfish and demand for swordfish may provide incentive for nations to export Atlantic swordfish to the United States, NOAA Fisheries reports imports of swordfish to ICCAT every year in November as part of the U.S. National Report. Data are collected from Customs entry forms, certificates of eligibility, and U.S. importer activity reports. This program has been in place since June 1999. Table 3.7 summarizes the bi-weekly dealer report and the COE data for the 2002 calendar year. Table 3.8 indicates the magnitude of swordfish product imports by the United States from 1997 - 2002.

Table 3.7 Swordfish Import Data Collected Under the Swordfish Import Monitoring Program (mt dw) for the 2002 Calendar Year. Source: NOAA Fisheries, 2004a

	Ocean of Origin				
Flag of Harvesting Vessel	**Atlantic**	**Pacific**	**Indian**	**Not Provided**	**Total***
Not Provided	2.7	0.0	0.0	2.8	5.5
Australia	0.0	217.4	41.1	7.2	265.7
Barbados	0.5	0.0	0.0	0.0	0.5
Brazil	1,075.2	0.0	0.0	0.0	1,075.2
Canada	324.9	0.0	0.0	0.0	324.9
Chile	0.0	963.3	0.0	0.0	963.3
Columbia	0.0	0.0	0.0	0.0	0.0
Costa Rica	0.3	406.6	0.0	0.0	406.9
Ecuador	0.5	458.7	0.0	0.0	459.2
El Salvador	0.0	30.3	0.0	0.0	30.3

Flag of Harvesting Vessel	Ocean of Origin: Atlantic	Pacific	Indian	Not Provided	Total*
Fiji Islands	0.0	36.0	0.0	0.0	36.0
Grenada	19.8	0.0	0.0	0.0	19.8
Indonesia	0.0	0.0	17.2	0.0	17.2
Japan	0.0	16.6	0.0	0.0	16.6
Malaysia	0.5	29.8	0.0	0.0	30.2
Mexico	0.0	78.1	0.0	2.8	80.8
Namibia	87.0	0.0	0.0	1.4	88.4
New Zealand	0.0	257.9	0.0	0.0	257.9
Panama	0.0	755.5	0.0	0.0	755.5
Philippines	0.0	34.0	0.0	1.0	35.0
R.S.A	0.0	0.0	86.9	0.0	86.9
Samoa	0.0	14.3	0.0	0.0	14.3
Seychelles	0.0	0.0	0.1	0.0	0.1
Singapore	0.0	139.7	3,062.1	0.0	3,201.8
South Africa	146.0	0.7	309.2	0.0	455.9
Taiwan	37.3	0.0	99.8	0.0	137.2
Tonga	0.0	3.8	0.0	0.7	4.5
Trinidad & Tobago	15.4	0.0	0.0	0.2	15.6
Uruguay	245.2	2.3	0.0	0.0	247.5
Venezuela	50.9	4.7	0.0	1.3	56.9
Vietnam	0.0	14.7	0.0	0.0	14.7
TOTAL	2,006.1	3,464.2	3,616.5	17.4	9,104.2
% of total swordfish imports	22.0	38.0	39.7	0.2	100.0

* COE Data as of 2/23/03

Table 3.8 Swordfish Products Imported: 1997-2002. Bureau of the Census data.

Year	Frozen (kg)			Fresh (kg)		Total for all products (kg)	
	Fillets	Steaks	Other	Steaks	Other	kg	$
1997	6,872,850	129,935	117,983	282,106	8,195,182	15,598,056	95,423,460
1998	7,224,329	207,816	259,675	92,560	8,497,451	16,281,831	82,577,668
1999	4,377,159	401,870	386,865	81,233	8,595,843	13,842,970	71,700,000
2000	4,833,867	524,148	167,441	161,763	8,626,856	14,314,075	85,579,449
2001	3,814,454	710,003	119,211	71,323	8,982,601	13,697,592	81,899,112
2002	4,156,755	956,459	677,351	195,211	9,726,199	15,711,975	88,266,887

note: Prior to 1997, Customs codes specific to products beyond the frozen and fresh designations, did not exist.

3.3 HABITAT

This section and Chapter 10 address essential fish habitat (EFH) for Atlantic HMS, in accordance with the MSA.

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 that FMPs describe and identify 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 CFR 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."

3.3.2 Description and Identification of EFH

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 and tables 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. Available information should be evaluated through a hierarchical analysis based on: distribution data for some or all portions of the geographic range of a species (Level 1); habitat-related densities or relative abundances (Level 2); growth, reproduction, or survival rate comparisons between habitats (Level 3); and habitat-dependent production rates (Level 4). This information should be interpreted with a risk-averse approach to ensure that adequate areas are protected as EFH for the managed species. Habitats that satisfy the criteria in the Magnuson-Stevens Act and HMS EFH regulations have been identified and described as EFH. Required identifications and descriptions of EFH were included in the 1999 HMS FMP, and are incorporated in this Supplemental Environmental Impact Statement by reference.

3.3.3 Fishing Activities That May Adversely Affect EFH

The EFH regulations and the Magnuson-Stevens Act require the fishery management councils (Councils) and NOAA Fisheries, on behalf of the Secretary of Commerce, to minimize adverse effects on EFH from fishing activities to the extent practicable. Adverse effects from fishing may include physical, chemical, or biological alterations of the substrate, and loss of, or injury to, benthic organisms, prey species and their habitat, and other components of the ecosystem. Based on an assessment of the potential adverse effects of all fishing equipment types used within an area identified as EFH, the Council should act if there is evidence that a fishing practice is having an identifiable adverse effect on the EFH.

An assessment was made of the gears and practices in order to determine whether HMS fishing activities cause adverse impacts on EFH in the 1999 HMS FMP. Impacts of HMS and non-HMS fishing gears and practices were analyzed by examining published literature and anecdotal evidence of potential impacts or comparable impacts from other fisheries. Based on this assessment, NOAA Fisheries considers that the fishing gears and methods of the HMS fisheries do not appear to have adverse impacts on EFH. Even if there were any adverse impacts, such impacts are not expected to be "more than minimal and not temporary in nature" (50 CFR 600.815(a)(2)(ii)). There is the possibility that other (non-HMS) fisheries may adversely impact HMS EFH, and some HMS gear may impact other EFH; however, the degree of that impact is difficult to ascertain from the data currently available. NOAA Fisheries is aware that other actions may be required in the future as a greater understanding of the impacts of fishing gear on fish habitat is gained. Future management measures could include fishing gear or practice restrictions, additional time/area closures, or harvest limits on the take of species that provide structural habitat or of prey species. Any areas that may be closed to fishing should be used as experimental control areas to research the effects of fishing gears on habitat.

3.3.4 Non-Fishing Activities That May Adversely Affect EFH and Respective Fishing Measures

Section 600.815 (a)(4) of the EFH regulations requires that FMPs identify non-fishing related activities that may adversely affect EFH of managed species, either quantitatively or qualitatively, or both. In addition, Section 600.815 (a)(6) requires that FMPs recommend conservation measures describing options to avoid, minimize, or compensate for the adverse effects identified.

Broad categories of activities that may adversely affect HMS EFH include, but are not limited to: (1) actions that physically alter structural components or substrate, e.g., dredging, filling, excavations, water diversions, impoundments and other hydrologic modifications; and (2) actions that result in changes in habitat quality, e.g., point source discharges, activities that contribute to non-point-source pollution and increased sedimentation, introduction of potentially hazardous materials, or activities that diminish or disrupt the functions of EFH. If these actions are persistent or intense enough they can result in major changes in habitat quantity as well as quality, conversion of habitats, or in complete abandonment of habitats by some species.

3.4 PROTECTED SPECIES

The unintended capture of species listed under the ESA, MMPA, and the Migratory Bird Treaty Act (collectively known as "protected" species) is known to occur as a result of HMS longline fishery activities**.** A description of the impacted species as well as known data accounting for the frequency of such bycatch interactions is outlined below and updates the 1999 HMS FMP.

3.4.1 Sea Turtles

The following summary of the information available regarding sea turtle populations and interactions with HMS longline fisheries represents an update to the HMS FMP. Other NOAA Fisheries documents containing detailed information on sea turtle population trends and/or longline interactions include the June 1, 2004, BiOp for the fishery, the September 15, 2003, the December 2002, BiOp for the S.E. shrimp trawl fishery, and the June 14, 2001, HMS BiOp. The June 1, 2004, BiOp is discussed further in Section 4.3.

The HMS longline fisheries have the potential to interact with any of the five species of sea turtles in the Atlantic (including the Gulf of Mexico), but the vast majority of the interactions occur with loggerhead and leatherback sea turtles. The status of the five sea turtles can be found in Table 3.9.

Table 3.9 Status of Atlantic Sea Turtle Populations. Source: NOAA Fisheries, 2001b.

Species/Stock	**Status: trend in U.S. nesting population**
Loggerhead	Threatened: overall the species is thought to be stable or slightly increasing. The northern nesting assemblage is thought to be stable or slightly declining
Leatherback	Endangered: loss of some nesting populations; possible increases in some nesting populations; overall thought to be stable at best
Green	Endangered: increasing
Kemp's Ridley	Endangered: thought to be increasing
Hawksbill	Endangered: unknown if there is a recent trend

Loggerhead sea turtles

The loggerhead sea turtle was listed as a threatened species in 1978. This species inhabits the continental shelves and estuarine environments along the margins of the Atlantic, Pacific, and Indian Oceans. Within the continental U.S. loggerheads nest from Louisiana to Virginia. The major nesting areas include coastal islands of Georgia, South Carolina, and North Carolina, and the Atlantic and Gulf coasts of Florida, with the bulk of the nesting occurring on the Atlantic coast of Florida. Developmental habitat for small juveniles includes the pelagic waters of the North Atlantic and the Mediterranean Sea.

The loggerhead sea turtles in the action area (west Atlantic Ocean, Caribbean Sea, and Gulf of Mexico) represent differing proportions of five western north Atlantic subpopulations, as well as unidentified subpopulations from the eastern Atlantic. The five nesting assemblages are the Northern subpopulation, occurring from North Carolina to northeast Florida; the South Florida subpopulation, occurring from 29˚ N. latitude on the east coast to Sarasota on the west coast; the Florida Panhandle subpopulation; the Yucatán subpopulation from the eastern Yucatán Peninsula, Mexico; and the Dry Tortugas subpopulation from the Dry Tortugas (located west of the Florida Keys), Florida. The June 14, 2001, BiOp considered these subpopulations for the analysis, with particular emphasis on the northern subpopulation of loggerhead sea turtles because unlike the population as a whole, this nesting subpopulation is thought to be declining, or at best, stable. Loggerheads reported captured in the pelagic longline fishery in the open ocean are mostly pelagic juveniles. It is assumed that overall interaction of loggerhead sea turtles with the pelagic longline fishery is in proportion with the overall stock sizes of each nesting aggregation (NOAA Fisheries, 2004c).

In examining the nesting trend for the northern subpopulation, the turtle expert working group (TEWG) concluded that it is stable or declining (1998, 2000). The analysis described in the NOAA Fisheries 2001 stock assessment report summarized the trend analyses for the number of nests sampled from beaches for the northern subpopulation and the south Florida subpopulation and concluded that from 1978-1990, the northern subpopulation has been stable at best and possibly declining (less than 5 percent per year). From 1990 to the present, the number of nests in the northern subpopulation has been increasing at 2.8 - 2.9 percent annually; however, there are confidence intervals about these estimates that include no growth (0 percent). Over the same time frame, the south Florida population has been increasing at 5.3 - 5.4 percent per year from 1978-1990, and increasing at 3.9 - 4.2 percent since 1990. This figure was derived from the most optimistic, and perhaps the least reliable, analysis. NOAA Fisheries (2001) cautioned that "it is an unweighted analysis and does not consider the beaches' relative contribution to the total nesting activity of the subpopulation and must be interpreted with some caution." In fact, more recent analysis, including nesting data through 2003, indicate that there is no discernable trend over the past 15 years in the south Florida subpopulation (NOAA Fisheries, 2004c). All other data and analysis indicated that the number of loggerhead sea turtle nests in the northern subpopulation were remaining the same or declining.

Loggerhead sea turtles are primarily exposed to pelagic longline gear in the pelagic juvenile stage. According to observer records, an estimated 10,034 loggerhead sea turtles were caught by the U.S. Atlantic tuna and swordfish longline fisheries between 1992 - 2002, of which 81 were estimated to be brought to the vessel already dead (Table 3.10). This figure does not account for post-release mortalities. However, the U.S. fleet accounts for a small proportion (5 - 8 percent) of the total hooks fished in the Atlantic Ocean compared to other nations, including Taipei, Brazil, Trinidad, Morocco, Cyprus, Venezuela, Korea, Mexico, Cuba, U.K., Bermuda, People's Republic of China, Grenada, Canada, Belize, France, and Ireland (Carocci and Majkowski, 1998). Reports of incidental takes of turtles are incomplete for many of these nations (see NOAA Fisheries, 2001b for a description of take records). An analysis of the international pelagic longline fisheries' impacts on loggerhead sea turtles throughout the Atlantic and Mediterranean estimated that the annual take ranged from 210,000 - 280,000 incidences (Lewison *et al.,* 2004).

Leatherback sea turtles

The leatherback sea turtle was listed as endangered on June 2, 1970. Leatherbacks are widely distributed throughout the oceans of the world, and are found in waters of the Atlantic, Pacific, and Indian Oceans; the Caribbean Sea; and the Gulf of Mexico (Ernst and Barbour, 1972). Adult leatherbacks forage in temperate and subpolar regions from 71˚N to 47˚S latitude in all oceans and undergo extensive migrations between 90˚N and 20˚S, to and from the tropical nesting beaches. In the Atlantic Ocean, leatherbacks have been recorded as far north as Newfoundland, Canada, and Norway, and as far south as Uruguay, Argentina, and South Africa (NOAA Fisheries, 2001b). Female leatherbacks nest from the southeastern United States to southern Brazil in the western Atlantic and from Mauritania to Angola in the eastern Atlantic. The most significant nesting beaches in the Atlantic, and perhaps in the world, are in French Guiana and Suriname (NOAA Fisheries, 2001b).

The conflicting information regarding the status of Atlantic leatherback sea turtles makes it difficult to conclude whether or not the population is currently in decline. Numbers at some nesting sites are up, while numbers at others are down. Data collected in southeast Florida clearly indicate increasing numbers of nests for the past twenty years (9.1 - 11.5 percent increase), although it is critical to note that there was also an increase in the survey area in Florida over time (NOAA Fisheries, 2001b). The largest leatherback rookery in the western north Atlantic remains along the northern coast of South America in French Guiana and Suriname. While Spotila *et al.* (1996) indicated that turtles may have been shifting their nesting from French Guiana to Suriname due to beach erosion, analyses show that the overall area trend in number of nests has been negative since 1987, declining at a rate of 15.0 - 17.3 percent per year (NOAA Fisheries, 2001b). If turtles are not nesting elsewhere, it appears that the Western Atlantic portion of the population is being subjected to high anthropogenic mortality rates, resulting in a continued decline in numbers of nesting females.

Leatherback sea turtles are exposed to pelagic fisheries throughout their life cycle. According to observer records, an estimated 9,302 leatherback sea turtles were caught by the U.S. Atlantic tuna and swordfish longline fisheries between 1992 - 2002, of which 121 were brought to the vessel already dead (Table 3.10). This figure does not account for post-release mortalities. Leatherback sea turtles make up a significant portion of takes in the Gulf of Mexico and south Atlantic areas, but are more often released alive. The U.S. fleet accounts for five to eight percent of the hooks fished in the Atlantic Ocean. Other nations, including Taipei, Brazil, Trinidad, Morocco, Cyprus, Venezuela, Korea, Mexico, Cuba, U.K., Bermuda, People's Republic of China, Grenada, Canada, Belize, France, and Ireland also fish in these waters (Carocci and Majkowski, 1998). Reports of incidental takes of turtles are incomplete for many of these nations (see NOAA Fisheries, 2001b, for a description of take records). Throughout the Atlantic basin, including the Mediterranean Sea, a total of 30,250 - 70,000 leatherback sea turtles are estimated to be captured by pelagic longline fisheries each year (Lewison *et al.*, 2004).

Table 3.10 **Annual Estimates of Total Marine Turtle Bycatch and the Subset that Were Dead When Released in the U.S. Pelagic Longline Fishery.** Source: NOAA Fisheries, 2001b (1992-1999 data); Yeung. 2001 (2000 data); Garrison, 2003 (2001-2002 data).

Species	Loggerhead		Leatherback		Green		Hawksbill		Kemp's Ridley		Unidentified		Sum Total
Year	Total	Dead*	Total	Dead*	Total	Dead*	Total	Dead*	Total	Dead*	Total	Dead*	
1992	293	0	914	88	87	30	20	0	1	0	26	0	1,341
1993	417	9	1,054	0	31	0					31	0	1,533
1994	1,344	31	837	0	33	0			26	0	34	0	2,274
1995	2,439	0	934	0	40	0					171	0	3,584
1996	917	2	904	0	16	2					2	0	1,839
1997	384	0	308	0			16	0	22	0	47	0	777
1998	1,106	1	400	0	14	1	17	0			1	0	1,538
1999	991	23	1,012	0							66	0	2,069
2000	1,256	0	769	0							128	0	2,153
2001	312	13	1,208	0							0	0	1,520
2002	575	2	962	33							50	0	1,587
Total	10,034	81	9,302	121	221	33	53	0	49	0	556	0	20,215

* Does not account for fishing related mortality that may occur after release.

3.4.2 Marine Mammals

NOAA Fisheries published the final 2003 Marine Mammal Protection Act (MMPA) List of Fisheries on July 15, 2003 (68 FR 41725). The Atlantic Ocean, Caribbean, and Gulf of Mexico 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 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, swordfish, and shark 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. Data are collected for the fisheries indicating whether the animal was removed dead or alive. In addition to mammals released dead from fishing gear, which is uncommon in the pelagic longline fishery, NOAA Fisheries must consider post-release mortality of mammals released alive when determining fishery impacts. Further details on the number of takes in the pelagic longline fisheries in the Atlantic were presented previously in Section 3.2.

3.4.3 Seabirds

Seabirds are protected under the Migratory Bird Treaty Act; endangered seabirds are further protected under the Endangered Species Act; and all migratory birds are protected under E.O. 13186. The United States has developed a National Plan of Action in response to the Food and Agriculture Organization International Plan of Action to Reduce Incidental Seabird Takes in Longline Fisheries. Many seabird populations are especially slow to recover from mortality because their reproductive potential is low (one egg per year and late sexual maturation). They forage on the surface, but some can also pursue prey fish swimming at shallow depths which makes seabirds somewhat susceptible to driftnets, shallow set longlines, and longline gear being deployed. They are possibly at the highest risk during the process of setting and hauling the gear. Observer data for the Atlantic pelagic longline fishery from 1992 through 2002 indicate that bycatch is relatively low (Table 3.11). Since 1992, a total of 113 seabird interactions have been observed, with 78 seabirds observed killed in the Atlantic pelagic longline fishery. No expanded estimates of seabird bycatch or catch rates are available for the pelagic longline fishery. 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 2002.

Table 3.11 Seabird Bycatch in the Atlantic Pelagic Longline Fishery from 1992 to 2002. MAB - Mid Atlantic Bight, SAB - South Atlantic Bight, NEC - Northeast Coastal, GOM - Gulf of Mexico. Source: NOAA Fisheries Observer Program. (NOAA Fisheries, U.S. National Report 2003)

Year	Month	Area	Type of Bird	Number observed	Status
1992	October	MAB	Gull	4	Dead
	October	MAB	Shearwater, Greater	2	Dead
1993	February	SAB	Gannet, Northern	2	Alive
	February	MAB	Gannet, Northern	2	Alive
	February	MAB	Gull, Black Backed	1	Alive
	February	MAB	Gull, Black Backed	3	Dead
	November	MAB	Gull	1	Alive
1994	June	MAB	Shearwater, Greater	3	Dead
	August	MAB	Shearwater, Greater	1	Dead
	November	MAB	Gull	4	Dead
	December	MAB	Gull, Herring	7	Dead
1995	July	MAB	Seabird	5	Dead
	August	GOM	Seabird	1	Dead
	October	MAB	Storm Petrel	1	Dead
	November	NEC	Gannet, Northern	2	Alive
	November	NEC	Gull	1	Alive
1997	June	SAB	Seabird	11	Dead
	July	MAB	Seabird	1	Dead

Year	Month	Area	Type of Bird	Number observed	Status
	July	NEC	Seabird	15	Alive
	July	NEC	Seabird	6	Dead
1998	February	MAB	Seabird	7	Dead
	July	NEC	Seabird	1	Dead
1999	June	SAB	Seabird	1	Dead
2000	June	SAB	Gull, Laughing	1	Alive
	November	NEC	Gannet, Northern	1	Dead
2001	June	NEC	Shearwater, Greater	7	Dead
	July	NEC	Shearwater, Greater	1	Dead
2002	July	NEC	Seabird	1	Dead
	August	NED	Shearwater, Greater	1	Dead
	August	NED	Seabird	1	Dead
	September	NED	Shearwater, Greater	3	Dead
	September	NED	Seabird	3	Alive
	September	NED	Shearwater SPP	1	Dead
	October	NED	Gannet, Northern	1	Alive
	October	NED	Shearwater SPP	1	Dead
	October	NED	Seabird	2	Dead
	October	MAB	Gull	3	Alive
	October	MAB	Gull	1	Dead
	November	MAB	Gull	3	Alive

At this time, NOAA Fisheries has not identified a need to implement gear modifications to reduce takes of seabirds in Atlantic HMS longline fisheries. Takes of seabirds are minimal in these fisheries in the Atlantic, probably due to night setting of the longlines or fishing in areas where there are not significant numbers of birds. Interested readers can refer to Alexander et al., 1997, for additional possibilities of mitigating measures for seabird mortality in longline fisheries.

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