5.0 DESCRIPTION OF THE AFFECTED ENVIRONMENT

Pelagic longline fishermen encounter many species of fish; some of those captured are marketable and thus are retained, 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. Sometimes pelagic longline fishermen also hook sea turtles, marine mammals, and sea birds, known collectively as "protected" species. All of these species are federally managed, and NMFS seeks to control the mortality that results from fishing effort. Detailed descriptions of the life histories and population status of those species are given in the HMS FMP and are not provided here. Management of declining fish populations requires reductions in fishing mortality from both directed and incidental fishing. The status of the stocks of concern is summarized below.

5.1 Swordfish

Atlantic swordfish (*Xiphias gladius*), also known as broadbill, are large migratory predators that range from Canada to Argentina in the West Atlantic Ocean. Swordfish live to be more than 25 years old, and reach a maximum size of about 902 lb dw. Females mature between ages 2 and 8 with 50 percent mature at age 5 at a weight of about 113 lb dw. Males mature between ages 2 and 6 with 50 percent mature at age 3 at a weight of about 53 lb dw (Arocha, 1997). Large swordfish are usually females; males seldom exceed 150 lb dw. 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. In U.S. waters, young swordfish predominate year-round in pelagic longline catches off Florida's "panhandle" (Apalachicola Bay) and off the south and east coasts of Florida.

In 1999, scientists of the International Commission for the Conservation of Atlantic Tunas (ICCAT) conducted a stock assessment on North Atlantic swordfish. The biomass of the North Atlantic stock is estimated to be 65 percent of the level needed to produce maximum sustainable yield (SCRS, 1999). It appears as though quota decreases and possibly minimum size restrictions, may have protected undersized swordfish over the last three years. In 1999, ICCAT nations agreed to a ten-year rebuilding program. Quotas must be strictly monitored, as overages can result in penalties, including quota reductions and trade sanctions, under ICCAT's compliance recommendations.

5.2 Atlantic Billfish

Blue marlin (*Makaira nigricans*), white marlin (*Tetrapturus albidus*) and sailfish (*Istiophorus platypterus*) are highly migratory billfish that are widely distributed over the Atlantic Ocean

(including the Caribbean Sea and Gulf of Mexico). They are opportunistic feeders, feeding primarily on fish and squid. Marlins, in addition to sailfish and longbill spearfish, are bycatch in the Atlantic pelagic longline fishery. Billfish FMP Amendment provides more detailed background regarding the life history strategies of Atlantic billfish, including, age and growth, reproduction, movement pattern, influences of physical oceanographic features, essential fish habitat and other information.

Results of the most recent stock assessment for Atlantic blue marlin and Atlantic white marlin (SCRS, 1996) indicate that Atlantic-wide biomass levels have been below the level necessary to produce maximum sustainable yield (B_{MSY}) for about three decades under both total Atlantic and north Atlantic stock hypotheses (SCRS, 1998). The Atlantic Billfish FMP amendment includes a 10-year rebuilding plan for blue and white marlin as a foundation for the negotiations at the 2000 ICCAT meetings.

5.3 Atlantic Tunas

Tunas are highly migratory fish found in many of the world's tropical, subtropical, and temperate ocean regions. Bluefin (*Thunnus thynnus*), bigeye (*Thunnus obesus*), and albacore (*Thunnus alalunga*) tunas are widely distributed throughout the Atlantic, while yellowfin tuna are considered to be a subtropical species. Bluefin tuna mature at approximately age 8 or later (60 inches CFL), while yellowfin, bigeye, and albacore tunas mature at a smaller size (40 inches CFL). Smaller yellowfin tuna form mixed schools with skipjack tuna and juvenile bigeye tuna and are mainly limited to surface waters, while larger yellowfin tuna are found in surface and sub-surface waters. Bigeye tuna inhabit waters deeper than those of any other tuna species and undertake extensive vertical movements. Albacore tuna tend to inhabit deeper waters, except when young. Many of these tunas are opportunistic feeders, eating mainly fish and squid (SCRS, 1999b). Commercial and recreational fishermen from numerous countries participate in fisheries for several species of Atlantic tuna.

5.4 Large Coastal and Pelagic Sharks

Large coastal sharks (LCS) are comprised of several species. Many of these species make extensive migrations along the U.S. Atlantic coast. Several LCS are caught by pelagic longline gear, including silky, dusky, sandbar, and hammerhead sharks. Pelagic sharks commonly taken in the pelagic longline fishery include shortfin mako, porbeagle, common thresher, and blue; longfin mako, sixgill, bigeye sixgill, and sevengill are occasionally or rarely taken. Trans-Atlantic migrations of these pelagic sharks are common; they are taken in several international fisheries outside the U.S. EEZ.

Compared to other finfish, sharks have low reproductive rates which make them especially vulnerable to overfishing. Because LCS are overfished and the status of pelagic sharks is unknown at this time (but in 1993 were found to be fully fished), NMFS seeks to minimize interactions between these species and pelagic longline gear.

5.5 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, traits that 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 U.S. southeastern Atlantic and Gulf of Mexico coasts. Dolphin was one of the top ten recreationally harvested species in 1998 (NMFS, 1999a).

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 are generally lower than those for dolphin.

5.6 Status of the Stocks

A summary of the status of the major highly migratory species stocks caught on pelagic longlines is provided in Table 5.1. SCRS conducted a stock assessment for North and South Atlantic swordfish in 1999 based on international catch and catch per unit effort data through 1998. Tuna and billfish assessments took place in 1997, using data through 1996. These SCRS assessments are based on international catch and effort data that are submitted to ICCAT. Shark status is evaluated through a group of scientists convened by NMFS using U.S. catch and effort data only (in 1998, estimates of Mexican landings of blacktip sharks were provided). The group of pelagic sharks is comprised of less than 10 species and currently the status of this group is unknown. In 1993, this species group was identified as fully fished. Available information on catch, landings, and catch rates is insufficient to accurately determine the status of this species grouping, although there is concern particularly regarding porbeagle sharks, and the level of blue shark discards from pelagic longline fisheries. NMFS has listed north Atlantic swordfish, bluefin tuna, bigeye tuna, northern albacore, blue and white marlin, sailfish, and large coastal sharks as overfished, because the fishing mortality rate is higher than that required to keep a population at maximum sustainable yield (MSY) or because biomass is below the level that would support MSY (or both). Further details about stock status, minimum biomass thresholds, and maximum fishing mortality levels can be found in the HMS FMP and the Billfish FMP amendment.

Table 5.1. Status of Highly Migratory Species Stocks in the Atlantic Ocean. Source: SCRS,1999; NMFS 1999b, c.

Species	Current Relative Biomass Level	Minimum Stock Size Threshold	Current Fishing Mortality Rate (Threshold is F_{MSY})	Outlook
N. Atlantic Swordfish	B_{1999}/B_{MSY}= 0.65 (0.5 to 1.05)	$0.8B_{MSY}$	F_{1998}/F_{MSY}= 1.34 (0.84 to 2.05)	Overfished; rebuilding plan in place
S. Atlantic Swordfish	B_{1999}/B_{MSY}= 0.1.10 (0.84to 1.40)	$0.8B_{MSY}$	F_{1998}/F_{MSY}= 1.34 (0.81 to 2.54)	Overfishing may be occurring

Species	Current Relative Biomass Level	Minimum Stock Size Threshold	Current Fishing Mortality Rate (Threshold is F_{MSY})	Outlook
W. Atlantic Bluefin Tuna	SSB_{1997}/SSB_{MSY} (two line)=0.48 SSB_{1997}/SSB_{MSY} (Beverton-Holt) =0.071 SSB_{1997}/SSB_{75} =0.14-0.17	$0.86B_{MSY}$	F_{1997}/F_{MSY} (two-line) = 1.73 F_{1997}/F_{MSY} (Beverton-Holt) = 4.10	Overfished; rebuilding plan in place
Atlantic Bigeye Tuna	SSB_{1998}/B_{MSY}= 0.57 to 0.63	$0.6B_{MSY}$ (age 2+)	F_{1998}/F_{MSY}= 1.5 to 1.82	Borderline overfished; Overfishing is occurring
Atlantic Yellowfin Tuna	B_{1997}/B_{MSY}= 0.92 to 1.35	$0.5B_{MSY}$ (age 2+)	F_{1997}/F_{MSY}= variable > 1.0	Stock not overfished; Fishing mortality is probably greater than what would produce MSY
N. Atlantic Albacore Tuna	B_{1997}/B_{MSY}= 0.47 (0.34 to 0.63) B_{90-94}/B_{75-80}= 0.72	$0.7B_{MSY}$	F_{1997}/F_{MSY}= 1.39 (uncertain) F_{1997}/F_{MAX}= 0.91 $F_{1997}/F_{0.1}$= 1.60	Overfished; Overfishing is occurring; SCRS notes stock stock is at or above full exploitation
W. Atlantic Skipjack Tuna	unknown	unknown	unknown	unknown
Atlantic Blue Marlin	B_{1996}/B_{MSY}= 0.236	$0.9B_{MSY}$	F_{1995}/F_{MSY}= 2.87 (1.45 to 3.41)	Overfished; overfishing is occurring
Atlantic White Marlin	B_{1996}/B_{MSY}= 0.226	$0.85B_{MSY}$	F_{1995}/F_{MSY}= 1.96 (1.33 to 2.91)	Overfished; overfishing is occurring
West Atlantic Sailfish	$B_{1992-96}/B_{MSY}$= 0.62	$0.75B_{MSY}$	F_{91-95}/F_{MSY}= 1.4	Overfished; overfishing is occurring
Large Coastal Sharks (all species)	N_{1998}/N_{MSY}= 0.30 (baseline) N_{1998}/N_{MSY}= 0.36 (alternative)	$0.9B_{MSY}$	F_{1997}/F_{MSY}= 6.34 (baseline) F_{1997}/F_{MSY}= 6.03 (alternative)	Overfished; overfishing is occurring
Small Coastal Sharks	B_{1991}/B_{MSY}= 1.12	$0.9B_{MSY}$	F_{86-91}/F_{MSY}= 0.89	Fully fished; Overfishing is not occuring
Pelagic Sharks	unknown	unknown	unknown	unknown

5.7 Marine Mammals

Pelagic longline fishermen have been observed over the period from 1993 through 1997 to encounter short and long-finned pilot whales, spotted and bottlenose dolphins, Risso's dolphin, a Clymene dolphin, and a killer whale. The most recent annual estimate indicates that the U.S. Atlantic pelagic longline fleet caught 39 marine mammals in 1997; all were released alive. Most of the marine mammals were encountered in the U.S. EEZ between South Carolina and Cape Cod.

NMFS is most concerned about the impact of pelagic longline fishing on the pilot whales that prey on longline-hooked tunas. Two species of pilot whales (*Globicephala melas* and *G.*

macrorhynchus) are distributed principally along the continental shelf edge in the winter and spring off the northeast U.S. coast. In late spring, pilot whales move onto Georges Bank and into the Gulf of Maine and more northern waters. They remain there through the autumn. In general, pilot whales tend to occupy habitats with complex bottom structure. The stock structure of the North Atlantic population is currently unknown, however several genetic studies are underway. Sightings of these animals in U.S. waters occur primarily within the Gulf Stream, and primarily along the continental shelf and slope in the northern Gulf of Mexico.

5.8 Sea Turtles

Loggerhead and leatherback turtles are the species predominantly caught in the Atlantic pelagic longline fishery. Turtles are caught throughout the range of the fishery (Gulf of Mexico, Caribbean, Florida to Maine) but the sets with the most turtles occur in the Northeast Distant area (see Figure 6.2). Many sea turtle populations are especially slow to recover from increased fishing mortality because their reproductive potential is low (late sexual maturation, low juvenile survival). General information about the biology and status of sea turtles can be found in the Recovery Plans for each species (available through the Office of Protected Resources, NMFS); the status of sea turtle populations is provided in Table 5.2. Most turtles are released alive from pelagic longline entanglements. However, NMFS is concerned about serious injury and mortality of turtles once they are released.

Table 5.2. Status of Atlantic sea turtle populations: Species taken in the pelagic longline fishery 1992-1997. Source: NMFS, 1999d.

Species/Stock	Status: trend in U.S. nesting population
Loggerhead: Northern Sub-population	Threatened: declining through mid-1980s, no trend detected since that time
Leatherback	Endangered: loss of some nesting populations, otherwise stable
Green	Endangered: increasing
Kemp's Ridley	Endangered: thought to be increasing
Hawksbill	Endangered: unknown if there is a recent trend

5.8.1 Background Information for Biological Opinion for the Atlantic Pelagic Longline Fishery

The Office of Sustainable Fisheries (OSF) requested a re-initiation of consultation under section 7 of the ESA of 1973, as amended (16 U.S.C. 1531 *et seq.*), on November 19, 1999, based on preliminary reports that observed incidental take of loggerhead sea turtles by the Atlantic pelagic longline fishery during 1999 had exceeded levels anticipated in the April 23, 1999, Biological Opinion (BO) for the pelagic longline component of HMS fisheries. Specifically, the Incidental Take Statement (ITS) of the April 23, 1999, BO allowed the following levels of incidental take:

(a) 690 leatherback sea turtles (*Dermochelys coriacea*), entangled or hooked (annual estimated number) of which no more than 11 are observed hooked by ingestion or moribund when released.

(b) 1541 loggerhead sea turtles (*Caretta caretta*) entangled or hooked (annual estimated number); of which no more than 23 may be hooked by ingestion or observed moribund when released.

A draft BO was provided to OSF in early June 2000; a final BO is scheduled to be completed by late June 2000. It is not anticipated that the final BO will differ significantly from the draft BO in regard to the Reasonable and Prudent Alternatives (RPAs), Reasonable and Prudent Measures (RPMs), and Terms and Conditions (TCs) of the draft BO. The draft BO also addressed the shark drift gillnet fishery and HMS purse seine fisheries; however, the following discussion addresses only issues in the BO that apply specifically to the pelagic longline fishery.

In recent years, NMFS has undertaken several ESA section 7 consultations to address the effects of vessel operations and gear associated with Federally-permitted fisheries on threatened and endangered species in the action area. Each of those consultations sought to develop ways of reducing the probability of adverse effects of the action on large whales and sea turtles. Similarly, NMFS has undertaken recovery actions under both MMPA and ESA to address the problem of take of whales in the fishing and shipping industries. Incidental take levels anticipated under the ITSs associated with these existing BOs, not including those for the pelagic longline fishery, are summarized in Table 5.3 below, followed by a brief discussion of each action on which there is consultation.

Table 5.3. **Summary of incidental take levels anticipated under the incidental take statements associated with NMFS existing BOs in the US Atlantic and Gulf of Mexico.** Note: This table does not including the anticipated takes for the Atlantic pelagic longline fishery. Source: NMFS, 2000b.

Federal Action	Anticipated Incidental Take Level (lethal or non)				
	Loggerhead	Leatherback	Green	Kemp's	Hawksbill
Coast Guard Vessel Operation	1[1]	1[1]	1[1]	1[1]	1[1]
Navy – SE Ops Area	84	12	12[1]	12[1]	0
Shipshock – Seawolf	50	6	4[1]	4[1]	4[1]
COE Dredging – S. Atlantic	35	0	7	7	2
COE Dredging - N & W Gulf of Mexico	30	0	8	14	2
COE Dredging - E Gulf of Mexico	2 + 8[2]	0 + 5[2]	1 + 5[2]	1 + 5[2]	1 + 5[2]
COE Rig Removal, Gulf of Mexico	1[1]	1[1]	1[1]	1[1]	1[1]
MMS Rig Removal, Gulf of Mexico	10[3]	5[3]	5[3]	5[3]	5[3]
NE Multispecies Sink Gillnet Fishery	100[4]	10[4]	10[4]	10[4]	10[4]
ASMFC Lobster Plan	0[5]	0[5]	0[5]	0[5]	0[5]
Monkfish Fishery	6	1	1	1	0
Dogfish Fishery	6	1	1	1	0
Summer Flounder, Scup & Black Sea Bass	15	3[1]	3[1]	3[1]	3[1]

Federal Action	Anticipated Incidental Take Level (lethal or non)				
	Loggerhead	Leatherback	Green	Kemp's	Hawksbill
Shrimp Fishery	3550[1]	650	3550[1]	3550[1]	3550[1]
NRC – St. Lucie, FL	5	1	10	1	1
NRC – Brunswick, NC	50[1] (6)	50[1] (0)	50[1] (3)	50[1] (2)	50[1] (0)
NRC – Crystal River, FL	55[1] (1)	55[1] (1)	55[1] (1)	55[1] (1)	55[1] (1)
Total (maximum anticipated[6])	**4008**	**801**	**3724**	**3721**	**3690**

[1]Up to this amount for these species, in combination. In most cases, it is expected that takes of turtle species other than loggerheads will be minimal. Parentheses indicate expected mortalities, where provided in the BO. Other numbers represent "takes", including non-lethal captures.
[2]Up to 8 turtles total, of which, no more than 5 may be leatherbacks, greens, Kemp's or hawksbill, in combination.
[3]Not to exceed 25 turtles, in total.
[4]As part of the 1989 BO on the Issuance of Exemptions for Commercial Fishing Operations under MMPA Section 114.
[5]Included in totals noted above.
[6]Maximum values given for non-loggerhead hardshell turtles are extreme, due to lumping of anticipated takes across species under ITSs.

Sea turtle bycatch estimates based on observations of takes in the pelagic longline component of the swordfish/tuna/shark fishery number in the thousands. The incidental take estimates anticipated in Scott and Brown (1997), used in the April 23, 1999, BO, were revised and updated by estimates provided in Johnson *et al.* (1999) and Yeung (1999). The estimated numbers for all species of sea turtles caught on pelagic longline gear are provided in Table 5.4. below. These estimates are similar to those used in developing the April 23, 1999, BO, and are provided as background in understanding the magnitude of take occurring in the fishery. However, subsequent to the analyses noted above, the Southeast Fisheries Science Center (SEFSC) developed an improved method (Brown *et al.*, 2000) for estimating swordfish catch which pooled across quarters, years and areas rather than the previously used method (also followed for protected species bycatch estimation) that assumed zero catch in areas not sampled. The SEFSC then followed with revised estimates of protected species bycatch (Yeung and Epperly, in prep.) following the Brown *et al.* (2000) method but with pooling priorities selected as appropriate for these species. Although peer review and refinement of the manuscript is not yet complete, NMFS believes this methodology is more accurate and appropriate than that used in previous analyses of these data, as the failure to account effort in unobserved areas would result in negative bias in the estimates. The Yeung and Epperly (in prep.) data, although preliminary, are reported below (see Table 5.5).

Table 5.4. Estimated Sea Turtle Takes Recorded in the U.S. Atlantic and Gulf of Mexico Pelagic Longline Fishery for Swordfish, Tuna and Sharks, 1992 - 1998. Source: Johnson *et al.*, 1999, Yeung, 1999b, NMFS, 2000b.

Species	Loggerhead		Leatherback		Green		Hawksbill		Kemp's		Sum Total**
Year	Total	Dead*	Total	Dead*	Total	Dead*	Total	Dead*	Total	Dead*	
1992	247	18	871	87	129	18	30	0	0	0	1295
1993	374	9	889	12	25	0	0	0	0	0	1315

1994	1279	12	700	12	24	0	0	0	15	0	2047
1995	2169	0	925	0	31	0	0	0	0	0	3290
1996	410	0	674	0	0	0	0	0	0	0	1084
1997	329	0	357	0	0	0	13	0	23	0	765
1998	472	0	169	0	0	0	77	0	0	0	718

* Does not account for death that may occur after release, which several studies have shown to be 29-33 percent
**Totals include unidentified turtles not listed in the table.

The previous estimated take for all species combined (pooled within areas) was 728 (337-1824, 95 percent CI) in 1998, with a high of 3,136 (2,325-4,260, 95 percent CI) in 1995. Of these, the estimated number in the bycatch that were released dead ranged from 0 in 1995-1997 to 60 (11-307, 95 percent CI) in 1992 (note: this does not account for death that may occur after the release). These totals include unidentified turtles not listed in the table. Most marine turtles were caught from the Grand Banks (NED) fishing area, outside of the US EEZ. These estimates include the loggerhead, leatherback, Kemp's ridley, hawksbill and green sea turtles (see Appendix III). However, the records of the Kemp's ridley and green captures may have been misidentifications and should be re-evaluated (see Hoey, 1998; Witzell 1999).

For 1998, Yeung (1999) provided estimates for the number of sea turtles "seriously injured" *(i.e.*, those not expected to survive). Pooling across species but stratified by area, an estimated total of 730 sea turtles were taken. Of these, Yeung (1999) estimates that all but 10 were seriously injured. This is a much greater predicted mortality rate than that reported by Aguilar *et al.* (1992). Yeung's (1999) criteria for determining serious injury were based on criteria developed for marine mammals (Angliss and DeMaster,1998) and may be overly conservative for sea turtles. These values still use the "old" methods of estimation (*i.e.,* data were not pooled across quarters, years or areas).

Table 5.5. **Comparison of the estimates of total bycatch by species and year among the pooling treatment of zero observer effort strata using two different pooling orders.** Note: qyn and yqn stand for q=quarter, y=year, n= NAREA (the order from left to right represents the pooling priority) and two different minimums for observed sets: 5 and 30 (qyn5 is used in the Yeung and Epperly (in prep.) as it requires less pooling from more distantly related samples). Estimates using the omission treatment (omit, *i.e.*, estimate assigns zero values to areas not sampled) used in Johnson *et al.* (1999) Table 10 and in Yeung (1999) Table 5 are also listed. Source: NMFS, 2000b.

Species	Year	qyn5	qyn30	yqn5	yqn30	Omit
Unid. turtle	92	30	30	37	34	
	93	27	30	27	27	28
	94	33	20	33	21	19
	95	135	79	135	80	
	96	7	25	7	26	
	97	41	58	41	62	19
	98	4	23	2	30	
	Total	**277**	**265**	**282**	**280**	

Species	Year	qyn5	qyn30	yqn5	yqn30	Omit
Green	92	90	67	78	56	37
	93	29	38	29	48	32
	94	29	36	27	51	25
	95	35	8	34	23	
	96	19	27	27	35	
	97	4	10	1	5	
	98	14	23	12	18	
	Total	**220**	**209**	**208**	**236**	**94**
Hawksbill	92	26	23	20	20	15
	93					
	94				3	
	95		2		1	
	96	3	8	1	3	
	97	13	4	13	5	13
	98	13	4	13	7	13
	Total	**55**	**41**	**47**	**39**	**41**
Kemp's ridley	92	1	4	1	4	
	93					
	94	23	24	23	24	19
	95		3			
	96	3	6	1	6	
	97	18	20	18	18	17
	98	1	3		2	
	Total	**46**	**60**	**43**	**54**	**36**
Leatherback	92	941	811	764	925	350
	93	992	945	993	880	876
	94	763	755	774	693	477
	95	874	953	877	959	880
	96	726	747	782	815	36
	97	313	405	319	453	51
	98	394	532	435	609	181
	Total	**5003**	**5148**	**4944**	**5334**	**2851**
Loggerhead	92	215	790	188	932	88
	93	392	635	389	483	388
	94	1299	1460	1274	1296	346
	95	2233	2124	2231	2005	1418
	96	957	933	986	965	118
	97	461	534	417	500	201
	98	987	902	1018	954	516
	Total	**6544**	**7378**	**6503**	**7135**	**3075**

Preliminary information from observer data for 1999 indicates that 45 leatherbacks, 64 loggerheads and 3 unidentified turtles were observed taken; 1 of the loggerheads was dead when boated (NMFS, unpublished data). The location of the hook was not always recorded (N=60) and thus it is assumed that all animals for which this information was not recorded were seriously injured. Thus, 19 of 45 (42 percent) leatherbacks, 50 of 64 (78 percent) loggerheads and 1 of 3 (33 percent) unidentified turtles were assumed to have ingested the hook and were seriously injured or dead. In addition, many animals were released with line still attached, which may also contribute to subsequent mortality.

Observed take levels documented in 1999 indicate that, of all the turtles taken, up to 50 loggerheads and 19 leatherbacks were observed "hooked by ingestion" or moribund upon release (Table 5.6). However, only about 3 percent observer coverage was obtained (G. Scott, pers.

comm.). The anticipated take levels were based on 5 percent observer coverage. Thus, the observed levels of take would have been considerably higher had the required 5 percent coverage level been achieved (as represented by the higher numbers). If the 5 percent observer coverage had been acheived, NMFS preliminarily expects that up to 83 loggerheads and 32 leatherbacks would have been observed "hooked by ingestion" or moribund in 1999.

Table 5.6. Observed Levels of Loggerhead and Leatherback Sea Turtles Taken Incidental to Commercial Pelagic Longlining for Swordfish and Tuna in the U.S. Atlantic Fleet in 1999. Source: NMFS, 2000b.

Species	Total Observed Takes	Anticipated Take by Hook or Ingestion	Actual no. Observed Dead or Taken by Hook or Ingestion[1]	No. taken if Scaled[2] to 5% Effort Level	Estimated[3] no. Taken by Hook or Ingestion, Extrapolated[2] to 5% Coverage Level	Amount ITS Exceeded Actual and (Estimated)
Loggerhead	64	23	50	83	32	60 (9)
Leatherback	45	11	19	32	22	13 (11)

[1]Observer logs in most cases were not detailed enough to determine whether or not a mouth hooked animal was "hooked by ingestion"; thus to be conservative, cases which were unclear were considered as "hooked by ingestion."
[2]Number observed * 5 percent level desired/3 percent achieved.
[3]Based on 29 percent of Total Observed Takes (per post-release mortality estimates provided by Aguilar *et al.*, 1992)

While a determination of whether an animal meets the criteria of "hooked by ingestion or moribund when released" is in some cases somewhat subjective due to the limited detail regarding entanglements provided on observer forms, in most cases the animal's status is very clear (e.g. comments indicating "hooked in gullet") or would be clear if a higher level of detail is provided by the observer. Additionally, where enough detail is not provided, NMFS takes the risk averse approach and assumes the injury may be serious enough to eventually incur death.

For the loggerhead turtle and for all sea turtle species, juvenile survivorship to maturity and adult longevity are critical to population growth. For the loggerhead turtle with an especially long pelagic stage, a reduction in mortality over the 7-12 years of the pelagic stage, during which it is vulnerable to incidental take by this fishery, is especially critical (Heppell *et al.*, in prep).

Witzell (1999) summarized turtle catch from logbook data (1992 - 1995) for sets targeting swordfish and tuna, or both. The Northeast Distant Area accounted for 70 percent of the loggerhead and 47 percent of the leatherback captures that were reported north of the mid-Atlantic Bight. June through November were the peak months for reported captures. A review of observer reports for sets targeting all species between 1990 - 1996 yielded similar results (Hoey, 1998). The Northeast Distant accounted for 75 percent of the loggerhead and 40 percent of the leatherback captures for all sampling areas. The Northeast Distant Area also was the only area where interactions of four or more turtles occurred on a single set. July through November were the predominant months for turtle captures (Hoey, 1998).

It has been suggested that the use of lightsticks is associated with the incidental take of sea turtles in pelagic longline fisheries (Witzell and Cramer, 1995; Price, 1995). Examination of logbook data indicated that CPUE for leatherbacks and loggerheads doubled with the use of lightsticks

(Witzell and Cramer, 1995). However, Hoey's 1998 analysis of Atlantic pelagic longline observer data from 1990 - 1996 indicated that lightstick use had little bearing on levels of sea turtle bycatch. For the Hawaii longline fishery, Skillman and Kleiber (1998) were unable to predict turtle capture based on lightstick use. The use of lightsticks was associated with a number of other more significant predictor variables (e.g. latitude and fishing for swordfish) (Skillman and Kleiber, 1998). Preliminary results of a study on the response of post-hatchling loggerheads to lightsticks indicate that the turtles were strongly attracted to glowing green lightsticks and were weakly attracted to glowing yellow Coghlan lightsticks; methodology developed for testing these animals needs to be applied to older animals (Wang *et al.*, 2000).

NMFS held a workshop in Miami on August 31- September 1, 1999, to discuss monitoring the number of turtles taken and killed in the pelagic longline fisheries and to discuss steps that could be taken to reduce the takes. The report (Kleiber *et al.*, in prep.) lists recommendations for data collection. The Atlantic recommendations were: 1) the color of the lightsticks should be recorded; 2) the position of takes in relation to floats and lightsticks must be recorded; and 3) an estimate of the length of line remaining on the turtle when released should be made. To date only the third recommendation has been implemented in the Atlantic pelagic longline fishery. The report further recommends prioritized avenues of research to both reduce turtle takes in the longline fisheries and improve the survival of turtles taken. Recommendations to reduce takes included targeted closures to selectively achieve a reduction in effort where takes were particularly high, setting hooks deeper in the water column, restrictions on time of day that the lines soaked and were fished, experiments/analyses to determine takes relative to floats or lightsticks and to determine vulnerability relative to time of day, some hook testing, and research on turtle deterrents (*e.g.*, dyed bait). Recommendations to improve survival included changes in the hooks used (circle vs. J and highly corrodible), increase in gangion line length, removal of all line from turtle before release, shortened soak times, and improved handling guidelines.

There are few sources of information on the level of mortality caused by pelagic longlines. In the Spanish pelagic longline fishery, the minimum mortality due to ingestion/internal hooking (84 percent of the loggerheads captured had ingested the hook) was estimated to be 29 percent (Aguilar *et al.*, 1992) in addition to the mortality associated with drowning while hooked (4 of 1098 animals). Post-hooking mortality studies in both the Atlantic and Pacific, based on satellite-tag transmissions of deeply (ingested) and lightly (mouth or foul hooked) hooked turtles of all species (mostly loggerheads), indicate that 29 percent (11 of 38) died (Balazs, pers. comm.; Polovina *et al.*, in press; Bjorndal *et al.*, 1999); 11 of 25 (44 percent) deeply hooked animals failed to transmit signals from their satellite transmitters after being released; the assumption is that they died and remained submerged. The deeply hooked animals tracked by Balaz had all lines removed and were dehooked where possible prior to released; thus 44 percent is likely an underestimate of mortality for deeply hooked animals. The transmissions of the remaining 14 were no different from the transmissions of 13 lightly hooked (in mouth, beak, or flipper) and thus it is assumed that all lived. Sea turtle mortality reported due to drowning in the Mexican tuna longline fishery in the Gulf of Mexico was 33 percent (Ulloa Ramirez and Gonzáles Ania, in press) and there is no estimate of post-hooking mortality in that fishery. Therefore, based on the total estimated catch and a 29 percent mortality rate, 593 and 954 turtles may have died in 1994

and 1995, respectively in the pelagic longline fishery. This is likely a low estimate.

The numbers under the "actual number observed dead or hooked by ingestion" column in Table 5.6 above, minus the one mortality (*i.e.* the deeply hooked animals) represent 62.5 percent of the total observed takes. Multiplying this by the 44 percent mortality estimate observed by Balaz (pers. comm.) for deeply hooked animals yields an overall estimate of 27.5 percent mortality for this fishery, thus reinforcing the 29 percent figure reported by Aguilar *et al.* (1992) as a solid, conservative estimate of minimum mortality.

Requiring fishermen to move after an interaction with not only a marine mammal, as recommended by the AOCTRT, but following an interaction with a sea turtle as well (as now required in the HMS FMP), is intended to mitigate against the contagious distribution of marine mammal and sea turtle takes noted in the observer data set. If fishermen comply with this provision, according to industry representatives familiar with the observer data set, there could be up to a 40 percent reduction in levels of serious injury and mortality of strategic stocks of marine mammals. Hoey (1998) noted that for the Northeast Distant fishing area, 68.1 percent of all loggerheads observed entangled in pelagic longline gear were caught on sets with other loggerheads. For leatherbacks, 31.7 percent were caught on sets with other leatherbacks. Thus, HMS' adoption of this measure in the April 1999 HMS FMP could substantially decrease incidental take levels of both marine mammals and sea turtles. However, as OSF notes in the HMS FMP, this measure is extremely difficult, if not impossible to enforce. Given this difficultly, NMFS is hopeful that, provided with education, fishermen will comply. NMFS also hopes that with the continued promotion of protected species conservation affected via the educational outreach/workshop efforts discussed below, an increased level of compliance with this requirement may be achieved. However, without having an observer onboard there is no way to fully ascertain that fishermen will comply with this provision.

5.8.2 Conclusion of Biological Opinion

After reviewing the current status of the northern right whale, the humpback, fin and sperm whales, and leatherback, loggerhead, green, hawksbill, and Kemp's ridley sea turtles, the environmental baseline for the action area, the effects of implementation of the proposed Amendment to the Atlantic HMS FMP, the record of compliance with requirements of previous BOs on HMS fisheries, and probable cumulative effects, it is NMFS' BO that continued operation of the Atlantic pelagic longline fishery is likely to jeopardize the continued existence of loggerhead sea turtles. It is possible, pending additional analysis, that the final BO will also include a jeopardy finding for the pelagic longline fishery for leatherback sea turtles. If this happens, NMFS expects that similar RPAs would be required.

5.8.3 Reasonable and Prudent Alternatives (RPAs)

Regulations (50 CFR §402.02) implementing section 7 of the ESA define RPAs as alternative actions, identified during formal consultation, that: 1) can be implemented in a manner consistent with the intended purpose of the action; 2) can be implemented consistent with the scope of the

action agency's legal authority and jurisdiction; 3) are economically and technologically feasible; and 4) would, NMFS believes, avoid the likelihood of jeopardizing the continued existence of listed species or resulting in the destruction or adverse modification of critical habitat.

The draft BO concluded that the Atlantic pelagic longline fisheries for swordfish, tunas, and sharks are likely to jeopardize the continued existence of loggerhead sea turtles. The clause "jeopardize the continued existence of" means "to engage in an action that reasonably would be expected, directly or indirectly, to reduce appreciably the likelihood of both the survival and recovery of a listed species in the wild by reducing the reproduction, numbers, or distribution of that species" (CFR §402.02).

Federal fisheries threaten loggerhead sea turtles primarily by capturing them in differing types of gear, injuring turtles caught in fishing gear, harming turtles that manage to escape by leaving gear trailing from their mouths or body parts, drowning turtles that are caught in gear, or some combination of these effects. According to the draft BO, to avoid the likelihood of jeopardizing the continued existence of loggerhead sea turtles, OSF must implement fishery management measures to reduce the number of loggerhead sea turtles that are incidentally captured, injured, killed by gear associated federally-managed fisheries by at least 75 percent from current (that is, a reduction in the number of loggerhead sea turtles captured, injured, or killed compared with a running average of the number captured, injured, or killed during the period 1993 to 1999) levels.

The draft BO requires OSF to lessen the impact of the pelagic longline fishery upon loggerhead and leatherback sea turtles, and ensure takes decrease in future years because:

(1) of the current status of the loggerhead population;
(2) the levels of incidental take of the April 28, 1999, BO were exceeded for this species;
(3) the SEFSC's revised estimates of incidental take levels for sea turtles indicates that takes in this fishery over the years have actually been much higher than previously believed;
(4) the time/area closures included in the final actions this document could increase incidental take levels for sea turtles; and,
(5) the largely unquantifiable nature of most of these potential changes.

As more information becomes available regarding the status of these populations, it may be necessary to implement additional restrictions to further reduce incidental takes.

Under the terms of the draft BO, the reduction in the number of loggerhead sea turtles that are incidentally captured, injured, or killed in gear can be accomplished directly by gear modifications or it can be accomplished indirectly by changing the method by which gear is deployed. Indirect modifications can include:

(a) Managing fisheries that use harmful gear over time and space to eliminate the likelihood of interactions between loggerhead sea turtles and gear (proportional to the threat posed by specific gear);

(b) Managing fisheries to eliminate the likelihood that loggerhead sea turtles captured by gear would drown before they can be released (such as keeping soak times to less than 30 to 45 minutes);
(c) Excluding gear from areas that, based on available data, appear to be important for loggerhead sea turtles; or,
(d) Any combination of these changes that reduce the number of loggerhead sea turtles that are incidentally captured, injured, and killed by gear associated with federally-managed fisheries by at least 75 percent from current levels.

According to the draft BO, if OSF cannot develop and implement management measures that reduce the number of loggerhead sea turtles that are incidentally captured, injured, and killed by gear associated federally-managed fisheries by at least 75 percent from current levels, OSF must implement the following RPAs, which has three elements:

(1a) Modifications in Fishing Method (e.g. limiting fishing activity to certain temperatures and time regimes); **or,**
(1b) Gear Modifications (e.g. allowing the use of only corrodible hooks);
(2) Exclusion Zones (e.g. temporally and spatially restricting pelagic longline effort in the Grand Banks area); and,
(3) Enhanced Monitoring.

If the final BO includes a jeopardy finding for leatherback sea turtles, similar or the same RPAs could also apply to this species.

5.8.4 Incidental Take Statement

Section 9 of ESA and Federal regulation pursuant to section 4(d) of ESA prohibit the take of endangered and threatened species, respectively, without special exemption. Take is defined as to harass, harm, pursue, hunt, shoot, wound, kill, trap, capture or collect, or attempt to engage in any such conduct. Incidental take is defined as take that is incidental to, and not the purpose of, the carrying out of an otherwise lawful activity. Under the terms of section 7(b)(4) and section 7(o)(2), taking that is incidental to and not intended as part of the agency action is not a prohibited taking under ESA, provided that such taking is in compliance with the RPMs and TCs of the ITS.

Section 7(b)(4)(c) of the ESA specifies that in order to provide an ITS for an endangered or threatened species of marine mammal, the taking must be authorized under section 101(a)(5) of the Marine Mammal Protection Act of 1972 (MMPA). Since no incidental take has been authorized under section 101(a)(5) of the MMPA, no statement on incidental take of endangered whales is provided and no take is authorized. Nevertheless, OSF must immediately (within 24 hours) notify the nearest NMFS Office of Protected Resources should a take occur.

Regarding anticipated incidental take for the pelagic longline fishery for swordfish, tunas, and sharks, it is hoped that the final actions to reduce bycatch in the pelagic longline fishery, which may slightly increase take levels of sea turtles, will be more than offset by additional

requirements to reduce take and that estimates of incidental takes of sea turtles in this fishery, which are approximately double previously available estimates, will be substantially minimized by the RPAs and RPMs required under the draft BO.

5.8.5 Reasonable and Prudent Measures

Section 7(b)(4) of the ESA requires that when an agency action is found to comply with section 7(a)(2) of the ESA and the proposed action may incidentally take individuals of listed species, NMFS will issue a statement specifying the impact of any incidental taking. It also states that RPMs necessary to minimize impacts, and TCs to implement those measures must be provided and followed to minimize those impacts. Only incidental taking by the Federal agency that complies with the specified TCs is authorized.

The RPMs and TCs are specified as required by 50 CFR § 402.14 (i)(1)(ii) and (iv) to document the incidental take by HMS fisheries and to minimize the impact of that take on sea turtles. These measures and TCs are non-discretionary, and must be implemented by OSF, in order for the protection of section 7(o)(2) to apply. OSF has a continuing duty to regulate the activity covered by this ITS. If the agency fails to require OSF to adhere to the TCs of the ITS through enforceable terms, and/or fails to retain oversight to ensure compliance with these TCs, the protective coverage of section 7(o)(2) may lapse. In order to monitor the impact of the incidental take, OSF must report the progress of the action and its impact on the species to NMFS as specified in the ITS [50 CFR 402.14(i)(3)].

The draft BO states that the RPMs that are necessary and appropriate to minimize take of listed species include an effective monitoring and reporting system to document take, educating fishermen to reduce the potential for serious injury or mortality of hooked turtles, and assessments of current data to look for trends that may indicate management measures to reduce the number of protected species interactions.

Terms and Conditions

In order to be exempt from the take prohibitions of section 9 of ESA, the early June 2000 draft BO requires OSF to comply with the following TCs, which implement the RPMs described above and outline required reporting/monitoring requirements. These TCs would be non-discretionary:

1) Observer coverage;
2) Record information on the condition of sea turtles and marine mammals when released;
3) Require the presence and use of dipnets and cutting devices on all longline vessels;
4) Review the Azore's study when it is completed and review other related studies;
5) Provide financial support to genetic research with the ultimate goal of quantifying the various segments of the sea turtle populations;
6) Determine and report on the level of reduction that lightsticks could achieve while

allowing the fishery to continue;

7) As an alternative to the observed experimental fishery to modify gear and fishing techniques to reduce sea turtle takes, investigate use of these options via other means (*e.g.* providing support to various studies, performing data analyses, conducting follow-up activities on various information, etc.); and,

8) Analyze the effects on marine mammal and sea turtle bycatch of limiting the length of pelagic longline gear in the Mid-Atlantic Bight area to 24 nm.

5.9. Sea Birds

Sea bird species hooked by Atlantic pelagic longlines include gannets, gulls, and storm petrels. Sea birds are protected under the Migratory Bird Treaty Act; endangered sea birds are further protected under the Endangered Species Act. The United States is developing a National Plan of Action in response to the FAO Plan of Action to reduce incidental seabird takes. 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 also pursue prey fish at shallow depths making them somewhat susceptible to driftnet and pelagic longline gear. They are possibly at the highest risk during the process of setting and hauling while the gear is at or near the surface.

Incidental take data for seabirds observed entangled in pelagic longlines are summarized in Appendix B. In 1990-1997, 34 seabirds were hooked by pelagic longlines; 9 were released alive. Seabirds are more often hooked on pelagic longlines as the gear is being set. The birds eat the bait and then become hooked on the line. The line sinks and the birds are subsequently drowned. Anecdotal information suggests that other fisherman also encounter sea birds while fishing for Atlantic HMS.

NMFS has not identified a need to implement gear modifications to reduce takes of sea birds in the pelagic longline fisheries; takes of sea birds are minimal in this fishery in the Atlantic, probably due to night setting of the longlines or fishing in areas where there are not significant numbers of birds. Alexander *et al.* (1997) provides a for additional possibilities of mitigating measures for sea bird mortality in longline fisheries.