

## 7. BYCATCH, INCIDENTAL CATCH, AND PROTECTED SPECIES

In 1998, NMFS developed a national bycatch plan, *Managing the Nation's Bycatch* (NMFS, 1998), which includes programs, activities, and recommendations for federally managed fisheries. The national goal of the Agency's bycatch plan activities is to implement conservation and management measures for living marine resources that will minimize, to the extent practicable, bycatch and the mortality of bycatch that cannot be avoided. Inherent in this goal is the need to avoid bycatch, rather than create new ways to utilize bycatch. The plan also established a definition of bycatch as fishery discards, retained incidental catch, and unobserved mortalities resulting from a direct encounter with fishing gear. Further discussion of fishery bycatch, incidental catch, and protected species, including standardized reporting of bycatch, bycatch reduction in HMS fisheries, and evaluation and monitoring of bycatch, is available in this chapter of the 2011 HMS SAFE Report. The bycatch in each HMS fishery is summarized and reported annually in the HMS SAFE Report. The effectiveness of bycatch reduction measures is evaluated based on this summary.

### 7.1 Bycatch Reduction and the Magnuson-Stevens Act

According to the Magnuson-Stevens Act, "The term 'bycatch' means fish which are harvested in a fishery, but which are not sold or kept for personal use, and includes economic discards and regulatory discards. Such term does not include fish released alive under a recreational catch and release fishery management program." Fish is defined as finfish, mollusks, crustaceans, and all other forms of marine animal and plant life other than marine mammals and birds. Birds and marine mammals are therefore not considered bycatch under the Magnuson-Stevens Act, but are examined as incidental catch.

NS 9 of the Magnuson-Stevens Act requires that fishery conservation and management measures shall, to the extent practicable, minimize bycatch and minimize the mortality of bycatch that cannot be avoided. In many fisheries, it is not practicable to eliminate all bycatch and bycatch mortality. Some relevant examples of fish caught in Atlantic HMS fisheries that are included as bycatch or incidental catch are marlin, undersized swordfish, and bluefin tuna caught by commercial fishing gear; undersized swordfish and tunas in recreational hook and line fisheries; species for which there is little or no market such as blue sharks; and species caught and released in excess of a bag limit.

### 7.2 Evaluation and Monitoring of Bycatch in HMS Fisheries

The identification of bycatch in Atlantic HMS fisheries is the first step in reducing bycatch and bycatch mortality. The Magnuson-Stevens Act requires the amount and type of bycatch to be summarized in the annual SAFE reports. Bycatch reporting methods are addressed in Section **Error! Reference source not found.** A summary of bycatch species, data collection methods, and management measures by fishery/gear type is found in Table 7.1.

Pelagic longline fishery dead discards of swordfish, bluefin tuna, billfish, large coastal sharks, and pelagic sharks are estimated using data from NMFS observer reports and logbook reports. Shark bottom longline and shark gillnet fishery discards can be estimated using logbook

data and observer reports as well. Shark gillnet discards have also been estimated using logbook data when observer coverage is equal to 100 percent.

NMFS has not estimated bycatch in the swordfish harpoon fishery. NMFS has limited historical observer data on harpooned swordfish from driftnet trips in which harpoons were sometimes used. Swordfish harpoon fishermen are required to submit pelagic logbooks and NMFS can examine those for their utility in estimating bycatch. NMFS has not estimated bycatch in the bluefin tuna harpoon fishery because these fishermen have not been selected to submit logbooks. NMFS has not estimated bycatch in the General category commercial rod and reel tuna fishery although anecdotal evidence indicates that some undersized bluefin tuna may be captured.

There is concern about the accuracy of discard estimates in the recreational rod and reel fishery for Atlantic HMS due to the low number of observations by the Large Pelagic Survey (LPS) and the Marine Recreational Information Program (MRIP). Recreational bycatch estimates (numbers of fish released alive and dead) are not currently available, except for bluefin tuna. For some species, encounters are considered rare events, which might result in bycatch estimates with considerable uncertainty. Due to improvements in survey methodology, increased numbers of intercepts (interviews with fishermen) have been collected since 2002. NMFS may develop bycatch estimates (live and dead discards) and estimates of uncertainty for the recreational fishery from the LPS. These data will be included in future HMS SAFE Reports. Bycatch estimates may also be examined for the recreational fishery with the use of tournament data.

**Table 7.1 Summary of Bycatch Species, Marine Mammal Protection Act Category, Endangered Species Act Requirements, Data Collection, and Management Measures (Year Implemented) for HMS Fisheries, by Fishery/Gear Type**

Fishery/Gear Type	Bycatch Species	MMPA Category	ESA Requirements	Bycatch Data Collection	Management Measures
Pelagic longline	Bluefin tuna Billfish Undersize target species Marine mammals Sea turtles Seabirds Non-target finfish Prohibited shark species Large coastal shark species after closure	Category I	Jeopardy findings in 2000 & 2004; Reasonable and Prudent Alternative implemented 2001-04; ITS, Terms & Conditions, RPMs	Permit requirement (1985); logbook requirement (SWO-1985; SHK - 1993); observer requirement (1992), EFPs (2001-present)	BFT target catch requirements (1981); quotas (SWO - 1985; SHK - 1993); prohibit possession of billfish (1988); minimum size (1995); gear marking (1999); line clippers, dipnets (2000); MAB closure (1999); limited access (1999); limit the length of mainline (1996-1997 only); move 1 nm after an interaction (1999); voluntary vessel operator workshops (1999); GOM closure (2000); FL, Charleston Bump, NED closures (2001); gangion length, corrodible hooks, de-hooking devices, handling & release guidelines (2001); NED experiment (2001-03); VMS (2003); circle hooks and bait requirements (2004); mandatory safe handling and release workshops (2006); sea turtle control device (2008); closed area research (2008-10); marine mammal handling and release placard, 20 nm mainline restriction in MAB, observer and research requirements in Cape Hatteras Spec. Research Area (CHSRA), increased observer coverage in Atl PLL fishery (2009), weak hook requirement in GOM (2011)
Shark bottom longline	Prohibited shark species Target species after closure Sea turtles Smalltooth sawfish Non-target finfish	Category III	ITS, Terms & Conditions, RPMs	Permit requirement (1993); logbook requirement (1993); observer coverage (1994)	Quotas (1993); trip limit (1994); gear marking (1999); handling & release guidelines (2001); line clippers, dipnets, corrodible hooks, de-hooking devices, move 1 nm after an interaction (2004); South Atlantic closure, VMS (2005); shark identification workshops for dealers (2007); sea turtle control device (2008); shark research fishery (2008)
Shark gillnet	Prohibited shark species Sea turtles Marine mammals	Category II	ITS, Terms & Conditions, RPMs	Permit requirement (1993); logbook requirement (1993); observer coverage	Quotas (1993); trip limit (1994); gear marking (1999); deployment restrictions (1999); 30-day closure for leatherbacks (2001); handling & release guidelines (2001); net checks (2002); whale sighting (2002); VMS

Fishery/Gear Type	Bycatch Species	MMPA Category	ESA Requirements	Bycatch Data Collection	Management Measures
	Non-target finfish Smalltooth sawfish			(1994)	(2004); closure for right whale mortality (2006); shark identification workshops for dealers (2007)
Bluefin tuna purse seine	Undersize target species Non-target finfish	Category III	ITS, Terms & Conditions	Permit requirement (1982); observer requirement (1996, 2001 only); EFPs (2002-03)	Quotas (1975); limited access, individual vessel quotas (1982); minimum size (1982)
Bluefin tuna & swordfish harpoon	Undersize target species	Category III	ITS, Terms & Conditions	Permit requirement (BFT - 1982; SWO - 1987); SWO logbook requirement (1987)	Quotas (BFT - 1982; SWO - 1985); minimum size (BFT - 1982; SWO - 1985)
Handgear - commercial	Undersize target species Non-target finfish	Category III	ITS, Terms & Conditions	Permit requirement (BFT - 1982; SWO 1987; SHK - 1993); logbook requirement (SWO - 1985; SHK - 1993)	Regulations vary by species, including quotas, minimum sizes, retention limits, landing form
Handgear - recreational	Undersize target species Non-target finfish	Category III	ITS, Terms & Conditions	Large Pelagic Survey (1992); MRFSS (1981)	Regulations vary by species, including minimum sizes, retention limits, landing form; BFT quotas

MMPA – Marine Mammal Protection Act; ESA – Endangered Species Act; ITS – Incidental take statement; MRFSS – Marine Recreational Fishing Statistics Survey; EFPs – Exempted fishing permits; BFT – Bluefin tuna; SWO – Swordfish; SHK – Shark; GOM – Gulf of Mexico; NED – North East Distant; MAB – Mid Atlantic Bight; PLL – Pelagic longline; VMS – Vessel monitoring system;

### 7.2.1 Bycatch Mortality

The reduction of bycatch mortality is an important component of NS 9. Physical injuries may not be apparent to the fisherman who is quickly releasing a fish because there may be injuries associated with the stress of being hooked or caught in a net. Little is known about the mortality rates of many of the species managed under this FMP, but there are some data for certain species. Information on bycatch mortality of these fish should continue to be collected, and in the future, could be used to estimate bycatch mortality in stock assessments.

NMFS submits annual data (Task II) to ICCAT on mortality estimates (dead discards). These data are included in the HMS SAFE reports and U.S. National Reports to ICCAT to evaluate bycatch trends in HMS fisheries.

#### *Pelagic Longline Fishery*

NMFS collects data on the disposition (released alive or dead) of bycatch species from logbooks submitted by fishermen in the PLL fishery. Observer reports also include disposition of the catch as well as information on hook location, trailing gear, and injury status of protected species interactions. These data are used to estimate post-release mortality of sea turtles and marine mammals based on guidelines for each (Angliss and DeMaster 1998, Ryder et al. 2006). See Section 4 for estimates of sea turtle and marine mammal bycatch.

#### *Purse Seine Fishery*

NMFS has limited observer data on the bluefin tuna purse seine fishery. There are no recorded instances of non-tuna finfish, other than minimal numbers of blue sharks, caught in tuna purse seines. Anecdotal evidence indicates that if fish are discarded, they are easily released out of the net with minimal bycatch mortality.

#### *Bottom Longline Fishery*

The shark BLL fishery has relatively low observed bycatch rates. Historically, finfish bycatch has averaged approximately five percent in the BLL fishery. Observed protected species bycatch (sea turtles) has typically been much lower, less than 0.01 percent of the total observed catch. Disposition of discards is recorded by observers and can be used to estimate discard mortality.

#### *Shark Gillnet Fishery*

Many shark gillnet fishermen have begun targeting finfish rather than sharks. A total of 402 gillnet sets were observed in 2011. The majority of species caught were finfish (93.7%) versus sharks (6.3%). Only one individual protected species was observed; a common loon was caught and discarded dead. Disposition of discards is recorded by observers and can be used to estimate discard mortality.

#### *Commercial Handgear Fishery*

Vessels targeting bluefin tuna with harpoon gear have not been selected for observer coverage since the deliberate fishing nature of the gear is such that bycatch is expected to be low.

Therefore, there are no recorded instances of non-target finfish caught with harpoons and NMFS cannot quantify the bycatch of undersized bluefin tuna in this fishery. Bycatch in the swordfish harpoon fishery is expected to be virtually, if not totally, non-existent. Since bycatch approaches zero in this fishery, it follows that bycatch mortality is near zero. Disposition of bycatch reported in logbooks is used to estimate mortality of bycatch in the hook and line handgear fisheries.

### *Recreational Handgear Fishery*

The LPS collects data on disposition of bycatch (released alive or dead) in recreational HMS fisheries. Rod and reel discard estimates from Virginia to Maine during June through October can be monitored through the expansion of survey data derived from the LPS (dockside and telephone surveys). However, the actual numbers of fish discarded for many species are low. Post-release mortality studies have been conducted on few HMS at this time. Summaries of those studies can be found in previous SAFE reports.

## 7.3 Protected Species Interactions in HMS Fisheries

This section examines the interaction between protected species and Atlantic HMS fisheries managed under the 2006 Consolidated HMS FMP. As a point of clarification, interactions are different than bycatch. Interactions take place between fishing gears and marine mammals and seabirds, while bycatch consists of the incidental take and discards of non-targeted finfish, shellfish, mollusks, crustaceans, sea turtles, and any other marine life other than marine mammals and seabirds. A more detailed review of the three acts (Marine Mammal Protection Act (MMPA), Endangered Species Act (ESA), and Migratory Bird Treaty Act (MBTA)) affecting protected species, along with a description of the Pelagic Longline Take Reduction Team (<http://www.nmfs.noaa.gov/pr/interactions/trt/pl-trt.htm>), Take Reduction Plan, and measures to address protected species concerns, is available in the 2011 HMS SAFE Report. The interaction of seabirds and longline fisheries are also considered under the the United States “National Plan of Action for Reducing the Incidental Catch of Seabirds in Longline Fisheries” (NPOA – Seabirds). Bycatch of HMS in other fisheries is also discussed in the 2011 HMS SAFE Report, and estimates of blacknose shark bycatch in the shrimp fisheries are available in the most recent stock assessment, SEDAR 21 (Cortes and Baremore, 2011).

### 7.3.1 Interactions and the Marine Mammal Protection Act

Under MMPA requirements, NMFS produces an annual List of Fisheries (LOF) that classifies domestic commercial fisheries, by gear type, relative to their rates of incidental mortality or serious injury of marine mammals. The LOF includes three classifications:

1. Category I fisheries are those with frequent serious injury or mortality to marine mammals;
2. Category II fisheries are those with occasional serious injury or mortality; and
3. Category III fisheries are those with remote likelihood of serious injury or mortality to marine mammals.

The final 2012 MMPA LOF was published on November 29, 2011 (76 FR 73319). The Atlantic Ocean, Caribbean, and Gulf of Mexico large PLL 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). A summary of the observed and estimated marine mammal interactions with the PLL fishery is presented in Table 4.6. The following Atlantic HMS fisheries are classified as Category III (remote likelihood or no known serious injuries or mortalities): Atlantic tuna purse seine; Gulf of Maine and Mid-Atlantic tuna, shark and swordfish, hook-and-line/harpoon; southeastern Mid-Atlantic and Gulf of Mexico shark BLL; and Mid-Atlantic, southeastern Atlantic, and Gulf of Mexico pelagic hook-and-line/harpoon fisheries. Commercial passenger fishing vessel (charter/headboat) fisheries are subject to Section 118 and are listed as a Category III fishery. Recreational vessels are not categorized since they are not considered commercial fishing vessels.

Fishermen participating in Category I or II fisheries are required to register under the MMPA and to accommodate an observer aboard their vessels if requested. Vessel owners or operators, or fishermen, in Category I, II, or III fisheries must report all incidental mortalities and serious injuries of marine mammals during the course of commercial fishing operations to NMFS. There are currently no regulations requiring recreational fishermen to report takes, nor are they authorized to have incidental takes (i.e., they are illegal).

### 7.3.2 Interactions and the Endangered Species Act (ESA)

#### *Sea Turtles*

NMFS has taken numerous steps in the past few years to reduce sea turtle bycatch and bycatch mortality in domestic longline fisheries. A summary of those steps can be found in Chapter 4 and previous SAFE reports. As noted in Chapter 4, sea turtle interactions have decreased since these steps have been taken.

#### *Smalltooth Sawfish*

NMFS designated critical habitat for smalltooth sawfish in September 2009 (74 FR 45353). NMFS believes that smalltooth sawfish takes in the shark gillnet fishery are rare given the low reported number of takes and high rate of observer coverage. The fact that there were no smalltooth sawfish caught during 2001, when 100 percent of the fishing effort was observed, indicates that smalltooth sawfish takes (observed or total) most likely do not occur on an annual basis. Based on this information, the 2003 Biological Opinion estimated that one incidental capture of a sawfish (released alive) over five years would occur as a result of the use of gillnets in this fishery (NMFS, 2003a). No smalltooth sawfish were observed in shark gillnet fisheries for 2011.

#### *Interactions with Seabirds*

The NPOA-Seabirds was released in February 2001, and calls for detailed assessments of longline fisheries, and, if a problem is found to exist within a longline fishery, for measures to reduce seabird bycatch within two years. Because interactions appear to be relatively low in Atlantic HMS fisheries, the adoption of immediate measures is unlikely.

Gannets, gulls, greater shearwaters, and storm petrels are occasionally hooked by Atlantic PLLs. These species and all other seabirds are protected under the MBTA. 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.

Bycatch of seabirds in the shark BLL fishery has been virtually non-existent. A single pelican has been observed killed from 1994 through 2011. No expanded estimates of seabird bycatch or catch rates for the BLL fishery have been made due to the rarity of seabird takes.

#### 7.4 Bycatch of HMS in Other Fisheries

The following section summarizes the bycatch of HMS in any federal or state-managed fishery which captures them. More detailed information, including a description of HMS bycatch in the menhaden purse seine fishery, was presented in the 2011 HMS SAFE Report. NMFS continues to solicit bycatch data on HMS from all state, interjurisdictional, and Federal data collection programs.

##### 7.4.1 Squid Mid-Water Trawl

U.S. squid trawl fishermen, using mid-water gear, landed 22.4 mt ww of yellowfin tuna, skipjack tuna, albacore tuna, bigeye tuna, and swordfish in 2011 incidental to the squid, mackerel, and butterfish trawl fishery (Table 7.2). Bycatch of HMS in other trawl fisheries may be included as a portion of the overall reported trawl landings in Table 7.2. Landings increased from 2010 for bigeye tuna and albacore. Swordfish landings remain low relative to the directed fishery landings but have increased in 2009-2011. A retention limit of 30 swordfish per trip allows squid trawl fishermen to land some of the swordfish that are encountered, although regulatory discards may still occur.

**Table 7.2 Atlantic HMS Landed (mt ww) Incidental to Trawl Fisheries (2002-2011)**

Species	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011
Yellowfin tuna	0.3	2.20	1.6	0.20	0.7	2.40	0.00	0.0	1.4	1.3
Skipjack tuna	<0.05	0.50	0.2	0.07	0.7	<0.01	<0.01	0.0	0.0	0.0
Bigeye tuna	0.5	0.03	0.9	0.60	0.0	0.40	0.00	0.0	0.7	1.2
Albacore tuna	0.3	0.02	2.7	1.70	1.1	0.30	0.01	0.08	0.2	2.0
Swordfish	3.9	5.60	8.3	8.20	3.5	6.50	7.60	22.7	21.2	17.9
Total	5.0	8.35	13.7	10.77	6.0	9.61	7.61	22.8	22.5	22.4

Source: NMFS, 2012.

##### 7.4.2 Shrimp Trawl Fishery

For a summary of shark bycatch in the shrimp trawl fishery, please see the 2011 HMS SAFE Report. More recent estimates of blacknose shark bycatch in the shrimp fisheries can be found in the most recent stock assessment, SEDAR 21 (Cortes, E. and I. Baremore, 2011).

#### 7.5 Effectiveness of Existing Pelagic Longline Time/Area Closures and Gear Restrictions in Reducing Bycatch

Since 2000, NMFS has implemented a number of time/area closures and gear restrictions in the Atlantic Ocean and Gulf of Mexico for the PLL fishery to reduce discards and bycatch of a

number of species (juvenile swordfish, bluefin tuna, billfish, sharks, sea turtles, etc.). Circle hooks are required for the entire PLL fishery since July 2004. In May 2011, NMFS implemented a requirement that only "weak" circle hooks be used in the Gulf of Mexico PLL fishery in order to reduce the bycatch of bluefin tuna. Weak hooks are made with thinner wire (no larger than 3.65 mm in diameter) than standard hooks, which allows them to bend more easily and release large bluefin tuna quickly, thus allowing them to escape. Preliminary analyses of the effectiveness of the closures and combined closures and circle hook requirement are summarized here. Preliminary analysis of the effectiveness of weak hooks is being conducted. A brief summary of the prohibition of live bait in the Gulf of Mexico PLL fishery is available in the 2011 HMS SAFE Report.

The combined effects of the individual area closures and gear restrictions were examined by comparing the reported catch and discards from 2005-2011 to the averages for 1997-1999 throughout the U.S. Atlantic fishery. Previous analyses attempted to examine the effectiveness of the time/area closures only by comparing the 2001-2003 reported catch and discards to the base period (1997-1999) chosen and are included here for reference. The percent changes in the reported numbers of fish caught and discarded were compared to the predicted changes from the analyses in Regulatory Amendment 1 to the 1999 FMP (NMFS, 2000). Overall effort, expressed as the number of hooks reported set, declined by 28 percent during 2005-2011 from 1997-1999 (Table 7.3). Declines were noted for both the numbers of kept and discards of almost all species examined including swordfish, tunas, sharks, billfish, and sea turtles. The only positive changes from the base period were the numbers of bluefin tuna and dolphin kept. The reported number of bluefin tuna kept increased by 62.9 percent for 2005-2011 compared to 1997-1999 (Table 7.3). The number of reported discards of bluefin tuna increased by almost 30 percent between the same time periods, which is almost triple the predicted 11 percent increase from the analyses in Regulatory Amendment 1, while the number of dolphin kept increased by 2.7 percent (Table 7.3). Billfish (blue marlin, white marlin, and sailfish) discards reportedly decreased by 60 - 67 percent from 1997-1999 to 2005-2011 (Table 7.4). The reported discards of spearfish declined by only 1.6 percent, although the absolute number of discards was also low (less than 200 fish in most years). The reported number of turtle interactions decreased by 67.5 percent from 1997-1999 to 2005-2011.

The reported declines in swordfish kept and discarded, large coastal sharks kept, and dolphin kept decreased more than the predicted values developed for Regulatory Amendment 1. Reported discards of pelagic sharks, all billfish (with the exception of spearfish for which no predicted change was developed in Regulatory Amendment 1), and total BAYS tunas kept also declined more than the predicted values. The number of large coastal shark discards remained almost unchanged from 1997-1999 to 2005-2011, while the number of bluefin tuna discards and dolphin kept increased more than predicted.

The reported distribution of effort over the same time periods was also examined for changes in fishing behavior (Table 7.5). Declines in the number of hooks set were noted for all areas with the exception of the Sargasso (SAR) area, where reported effort has increased eight-fold from the 1997-1999 period. However, this effort represents only 3.5 percent of the overall effort reported in this fishery. Overall, reported effort decreased by 28 percent from 1997-1999 to 2005-2011. Reported effort declined by only 4.3 percent in the MAB area, 4.6 percent in the South Atlantic Bight (SAB), and 8.1 percent in the Florida East Coast (FEC). Reported effort

declined by 45 percent or more in all other areas with the exception of the SAR and the Gulf of Mexico. As a result of the Deepwater Horizon/BP oil spill in the Gulf of Mexico and the subsequent closures, reported effort for 2010 was dramatically reduced, less than one third of the reported effort of the previous year (2009). Reported effort in 2011 increased slightly from 2010, but was still below the pre-spill effort. Although reported effort declined by 77.5 percent in the SAT area (Tuna North and Tuna South combined), this represents less than one percent of total reported effort.

Concern over the status of bluefin tuna and the effects of the PLL fishery on bluefin tuna led to a re-examination of a previous analysis which compared the reported catch and discards of select species or species groups from the MAB and NEC to that reported from the rest of the fishing areas (Table 7.6). The number of bluefin tuna discards reported from the MAB/NEC had increased over the last few years but decreased in 2011. The discards from the other areas have remained relatively constant. The increase in bluefin tuna discards in the MAB/NEC does not appear to be effort-related as the reported number of hooks set has also been relatively stable (MAB) or in decline (NEC).

**Table 7.3 Total Number of Swordfish, Bluefin Tuna, Yellowfin Tuna, Bigeye Tuna, and Total BAYS (Bigeye, Albacore, Yellowfin and Skipjack Tuna) Reported Landed or Discarded in the U.S. Atlantic Pelagic Longline Fishery (1997 – 2011) and Percent Changes Since 1997-99**

Year	Number of Hooks Set (x1000)	Swordfish Kept	Swordfish Discards	Bluefin Tuna Kept	Bluefin Tuna Discards	Yellowfin Tuna Kept	Yellowfin Tuna Discards	Bigeye Tuna Kept	Bigeye Tuna Discards	Total BAYS Kept	Total BAYS Discards
1997-99	8,533.1	69,131	21,519	238	877	72,342	2,489	21,308	1,133	101,477	4,224
(A) 2001-03	7,364.1	50,838	13,240	212	607	55,166	1,827	13,524	395	76,116	3,069
2004	7,325.9	46,950	10,704	476	1,031	64,128	1,736	8,266	486	77,989	3,452
2005	5,922.6	41,239	11,158	376	766	43,833	1,316	8,383	369	57,237	2,545
2006	5,662.0	38,241	8,900	261	833	55,821	1,426	12,491	257	73,058	2,865
2007	6,290.6	45,933	11,823	357	1,345	56,062	1,452	8,913	249	70,390	3,031
2008	6,498.1	48,000	11,194	343	1,417	33,774	1,717	11,254	356	50,108	3,427
2009	6,978.9	45,378	7,484	629	1,290	40,912	1,701	10,379	397	57,461	3,555
2010	5,729.1	33,813	6,107	392	1,488	32,567	748	12,561	476	51,786	1,590
2011	5,914.5	38,012	8,510	355	764	40,993	728	16,338	453	68,401	2,830
(B) 2005-11	6,142.3	41,517	9,311	388	1,129	43,423	1,298	11,474	365	61,206	2,835
% dif (A)	-13.7	-26.5	-38.5	-10.9	-30.7	-23.7	-26.6	-36.5	-65.2	-25.0	-27.3
% dif (B)	-28.0	-40.0	-56.7	62.9	28.7	-40.0	-47.8	-46.2	-67.8	-39.7	-32.9
Pred <sup>1</sup>		-24.6	-41.5		-1.0					-5.2	
Pred <sup>2</sup>		-13.0	-31.4		10.7					10.0	

Predicted values from Regulatory Amendment 1, where Pred <sup>1</sup> = without redistribution of effort, Pred <sup>2</sup> = with redistribution of effort.

Source: HMS Logbook data.

**Table 7.4 Total Number of Pelagic Sharks, Large Coastal Sharks, Dolphin (Mahi mahi), and Wahoo Reported Landed or Discarded and Number of Billfish (Blue and White Marlin, Sailfish, and Spearfish) and Sea Turtles Reported Caught and Discarded in the U.S. Atlantic Pelagic Longline Fishery (1997 – 2011) and Percent Changes Since 1997-99**

Year	Pelagic Sharks Kept	Pelagic Shark Discards	Large Coastal Sharks Kept	Large Coastal Shark Discards	Dolphin Kept	Dolphin Discards	Wahoo Kept	Wahoo Discards	Blue Marlin Discards	White Marlin Discards	Sailfish Discards	Spearfish Discards	Sea Turtles
1997-99	3,898	52,093	8,860	6,308	39,711	608	5,172	175	1,621	1,973	1,342	213	596
(A) 2001-03	3,237	23,017	5,306	4,581	29,361	322	3,776	74	815	1,045	341	139	429
2004	3,460	25,414	2,304	5,144	39,561	295	4,674	35	713	1,060	425	172	370
2005	3,150	21,560	3,365	5,881	25,709	556	3,360	280	569	990	367	155	154
2006	2,098	24,113	1,768	5,326	25,658	1,041	3,608	100	439	557	277	142	128
2007	3,504	27,478	546	7,133	68,124	467	3,073	52	611	744	321	147	300
2008	3,500	28,786	115	6,732	43,511	404	2,571	82	686	669	505	196	476
2009	3,060	33,721	403	6,672	62,701	433	2,648	81	1,013	1,064	774	335	137
2010	3,872	45,511	434	6,726	30,454	174	749	26	504	605	312	212	94
2011	3,694	43,778	130	6,085	29,442	335	1,848	50	539	921	556	281	66
(B) 2005-11	3,268	32,135	966	6,365	40,800	487	2,551	96	623	793	445	210	194
% dif (A)	-17.0	-55.8	-40.1	-27.4	-26.1	-47.0	-27.0	-57.8	-49.7	-47.0	-74.6	-34.6	-28.1
% dif (B)	-16.2	-38.3	-89.1	0.9	2.7	-19.9	-50.7	-45.2	-61.6	-59.8	-66.9	-1.6	-67.5
Pred <sup>1</sup>	-9.5	-2.0	-32.1	-42.5	-29.3				-12.0	-6.4	-29.6		-1.9
Pred <sup>2</sup>	4.1	8.4	-18.5	-33.3	-17.8				6.5	10.8	-14.0		7.1

Predicted values from Regulatory Amendment 1 where Pred <sup>1</sup> = without redistribution of effort, Pred <sup>2</sup> = with redistribution of effort.

Source: HMS logbook data.

**Table 7.5**      **Reported Distribution of Hooks Set by Area (1997-2011) and Percent Change Since 1997-99**

Year	CAR	GOM	FEC	SAB	MAB	NEC	NED	SAR	NCA	SAT	Total
1997-99	328,110	3,346,298	722,580	813,111	1,267,409	901,593	511,431	14,312	191,478	436,826	8,533,148
(A) 2001-03	175,195	3,682,536	488,838	569,965	944,929	624,497	452,430	76,130	222,070	127,497	7,364,086
2004	298,129	4,118,468	264,524	672,973	856,521	462,171	455,862	128,582	20,990	47,730	7,325,950
2005	180,885	3,037,968	323,551	467,680	835,091	356,696	462,490	110,107	55,716	92,382	5,922,566
2006	73,774	2,577,231	281,239	544,647	1,085,640	406,199	339,586	135,575	64,500	153,620	5,662,011
2007	32,650	2,914,475	345,486	737,873	1,319,056	326,532	285,827	100,336	11,409	207,598	6,281,242
2008	87,190	2,368,381	642,846	846,984	1,423,136	579,244	224,635	147,969	16,148	152,763	6,489,246
2009	34,783	3,037,197	830,348	847,525	1,199,657	481,110	262,003	107,172	0	179,152	6,978,947
2010	77,710	1,005,764	1,097,929	1,002,748	1,295,242	657,892	211,465	141,713	3,096	235,553	5,729,112
2011	29,600	1,247,892	1,129,555	984,858	1,330,542	665,706	173,038	206,923	11,270	135,069	5,914,453
(B) 2005-11	73,799	2,312,701	664,422	776,045	1,212,623	496,197	279,863	135,685	23,163	165,162	6,139,654
% dif (A)	-46.6	10.0	-32.3	-29.9	-25.4	-30.7	-11.5	431.9	16.0	-70.8	-13.7
% dif (B)	-77.5	-30.9	-8.1	-4.6	-4.3	-45.0	-45.3	848.1	-87.9	-62.2	-28.1

CAR – Caribbean; GOM - Gulf of Mexico; FEC - Florida East Coast; SAB - South Atlantic Bight; MAB - Mid-Atlantic Bight; NEC - Northeast Coastal; NED - Northeast Distant; SAR - Sargasso; NCA - North Central Atlantic; SAT - Tuna North & Tuna South.

Source: HMS logbook data.

**Table 7.6** Number of Bluefin Tuna, Swordfish, Pelagic and Large Coastal Sharks, Billfish, and Sea Turtles Reported Kept and/or Discarded in the Mid-Atlantic Bight and Northeast Coastal Areas Combined (1997-2011)

Year	Hooks Set (x1000)	BFT Kept	BFT Discards	SWO Kept	SWO Discards	PEL Shark Kept	PEL Shark Discards	LCS Kept	LCS Discards	Billfish Discards	Sea Turtle Interactions
1997	2,441.1	96	583	6,330	3,663	3,062	40,515	6,670	958	803	52
1998	2,207.4	94	1,157	9,684	4,923	2,143	28,579	1,781	890	401	57
1999	1,858.5	70	335	8,213	4,331	1,680	12,479	1,966	736	818	174
2000	1,645.4	26	356	8,748	2,846	2,099	13,083	4,744	1,407	240	30
2001	1,975.3	45	200	10,661	4,000	2,537	9,013	4,383	997	310	69
2002	1,582.3	18	389	10,986	4,219	2,378	7,308	2,331	1,207	311	41
2003	1,150.7	67	471	10,888	3,022	2,222	6,929	2,787	1,429	172	42
2004	1,318.7	128	709	8,486	2,463	2,323	7,594	923	1,488	219	54
2005	1,191.8	96	575	9,184	2,420	1,912	7,026	2,512	2,433	473	44
2006	1,491.8	124	737	10,278	2,564	1,428	7,547	1,279	2,180	266	28
2007	1,645.6	137	1,148	14,102	3,082	2,313	8,169	431	2,861	407	55
2008	2,002.5	143	1,133	13,208	3,199	2,695	9,541	63	1,781	320	100
2009	1,608.8	137	952	12,657	1,896	2,256	14,113	206	2,210	299	16
2010	1,953.1	155	1,301	9,090	1,546	3,326	17,033	408	2,293	376	32
2011	1,996.3	168	583	9,995	2,474	2,793	19,867	90	1,809	497	28

BFT - Bluefin tuna; SWO – Swordfish; PEL - Pelagic; LCS - Large coastal sharks; MAB - Mid-Atlantic Bight; NEC - Northeast coastal.

Source: HMS logbook Data.

**Table 7.7** Number of Bluefin Tuna, Swordfish, Pelagic and Large Coastal Sharks, Billfish, and Sea Turtles Reported Kept and/or Discarded in All Areas Other than the Mid-Atlantic Bight and Northeast Coastal (1997-2011)

Year	Hooks Set (x1000)	BFT		SWO		PEL Shark		LCS		Billfish Discards	Turtle Interactions
		BFT Kept	Discards	SWO Kept	Discards	Kept	Discards	Kept	Discards		
1997	7,233.5	111	123	62,892	16,892	2,048	41,507	7,076	6,911	6,091	215
1998	5,823.9	143	164	60,943	18,422	1,588	16,682	4,677	4,687	3,364	833
1999	6,035.1	200	269	59,331	16,325	1,172	16,516	4,409	4,741	3,968	458
2000	6,376.5	210	382	54,787	13,860	969	14,965	3,014	5,320	3,394	241
2001	5,767.0	138	148	38,575	10,448	974	14,941	2,127	3,895	1,723	352
2002	5,647.3	160	204	39,453	8,963	693	15,160	1,746	2,761	2,866	426
2003	5,969.7	208	410	41,950	9,067	907	14,842	2,565	3,453	1,641	357
2004	6,007.3	348	322	38,464	8,241	1,137	17,820	1,381	3,656	2,151	316
2005	4,730.8	280	191	32,055	8,738	1,238	14,534	853	3,448	1,608	110
2006	4,170.2	137	96	27,963	6,336	670	16,566	489	3,146	1,149	100
2007	4,645.1	200	197	31,831	8,741	1,191	19,309	115	4,272	1,416	245
2008	4,495.7	200	284	29,592	7,995	805	19,245	52	4,951	1,736	376
2009	5,298.2	492	338	32,721	5,588	804	16,608	197	4,462	2,887	121
2010	3,775.9	237	187	24,723	4,561	546	28,478	26	4,433	1,257	62
2011	3,918.2	187	181	28,017	6,036	901	23,911	40	4,276	1,800	38

BFT - Bluefin tuna; SWO – Swordfish; PEL - Pelagic; LCS - Large coastal sharks; MAB - Mid-Atlantic Bight; NEC - Northeast coastal.

Source: HMS logbook Data.

### 7.5.1 Conclusion

The time/area closures and live bait prohibition in the Gulf of Mexico have been successful at reducing bycatch in the HMS PLL fishery. Reported discards of all species of billfish have declined. The reported number of turtles caught, swordfish discarded, and pelagic and large coastal shark discards have also declined.

### 7.6 Evaluation of Other Bycatch Reduction Measures

NMFS continues to monitor and evaluate bycatch in HMS fisheries through direct enumeration (pelagic and BLL observer programs, shark gillnet observer program), evaluation of management measures (closed areas, trip limits, gear modifications, etc.), and VMS.

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