4. FISHERY DATA UPDATE

In this document, fishery data, with the exception of some data on Atlantic sharks, are analyzed by gear type. While most HMS fishermen target particular species, the non-selective nature of most fishing gear promotes more effective analysis and management on a gear-by-gear basis. In addition, issues such as socio-economics, bycatch, and safety are more easily addressed by gear type.

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

Due to the nature of SCRS data collection, Table 4.1 depicts a summary of the U.S. portion of HMS catch and landings by species only rather than species and gear type. International catch levels as well as U.S. reported catches are taken from the 1999 SCRS Report which reflects catch data on a calendar year basis through 1998. The U.S. percentages of regional and total catch for HMS species have remained similar over the past five years and are not depicted here. Historical catch levels dating back to 1950 can be found in the SCRS Report and a discussion of typical species-specific U.S. catch levels can be found in the HMS FMP. International catch and landings tables are included for the longline and purse seine fisheries in Sections 4.1.3 and 4.2.3 of this report. At this point, data necessary to assess the U.S. regional and total percentage of international catch levels for Atlantic shark species are unavailable.

Table 4.1 1998 U.S. vs International Catch of HMS (mt ww). Source: SCRS, 1999

Species	Total International Reported Catch	Region of U.S. Involvement	Total Regional Catch	U.S. Catch	U.S. Percentage of Regional Catch	U.S. Percentage of Total Atlantic Catch
Atlantic Swordfish	31,119 (Atlantic and Mediterranean)	North Atlantic (N.Atl) and South Atlantic (S.Atl)	26,156 (12,175 N.Atl, 13,486 S.Atl)	3,656 (443 mt discards) (3,053 + 433 mt discards N.Atl, 160 +10 mt discards S.Atl)	13.98% (28.67% N.Atl, 1.26% S.Atl)	11.20% (includes Med catches)
Atlantic Bluefin Tuna	44,610	West Atlantic	2,643	1,302 (67 mt discards)	49.26%	2.92%
Atlantic Bigeye Tuna	94,786	Total Atlantic	94,786	928	0.98%	0.98%
Atlantic Yellowfin Tuna	147,434	West Atlantic	25,310	5,621	22.21%	3.81%
Atlantic Albacore Tuna	58,371	N.Atl	25,697	829	3.23%	1.42%
Atlantic Skipjack Tuna	133,181	West Atlantic	30,046	104	0.35%	0.08%
Atlantic Blue Marlin	3,198	N.Atl	1,243	99 (50 mt discards)	7.96%	3.10%
Atlantic White Marlin	1,118	N.Atl	480	34 (32 mt discards)	7.08%	3.04%
Atlantic Sailfish	1,713	West Atlantic	1,542	28 (27 mt discards)	1.82%	1.63%

One of the most important results of the 1999 ICCAT meeting was the acceptance of a 10-year rebuilding program for North Atlantic swordfish. The rebuilding measures primarily affect the pelagic longline fishery, responsible for approximately 98 percent of the U.S. catch. Under the 1999 ICCAT recommendation, there is a dead discard allowance. If the dead discard allowance were to be exceeded, NMFS would reduce the following year's landing quota by the overage. The swordfish rebuilding plan is designed to achieve B_{MSY} in 10 years with a greater than 50 percent probability. Over the next three years, the landings quota and subsequent U.S.

allocation will be progressively reduced. The United States receives 29 percent of the total landings quota and 80 percent of the dead discard allowance. U.S. fishermen are partially responsible for decreasing the amount of dead discards by 100 mt a year over the next three years (detailed in Table 4.2). In addition, the SCRS has been directed to report back in two years on possible measures to reduce the catch of undersize swordfish, including time-area closures and/or gear modifications.

Table 4.2 North Atlantic Swordfish Allocations: ICCAT, 1999.

Country	Share*	2000 allocation (mt)	2001 allocation (mt)	2002 allocation (mt)
European Community	49.85%	5073	5073	5073
United States	29%	2951	2951	2951
Canada	10%	1018	1018	1018
Japan	6.25%	636	636	636
Others	4.9%	498	498	498
Bermuda		24	24	24
Total Catch to be Retained		10,200	10,200	10,200
Dead Discard Allowance		400	300	200
TOTAL		**10,600**	**10,500**	**10,400**

*Share percentage is based on a total catch of 10,176 mt (10,200 - Bermuda's 24 mt allocation).

4.1 Fishery Data: PELAGIC LONGLINE

4.1.1 Overview of History and Current Management

U.S. pelagic longline fishermen began targeting highly migratory species in the Atlantic Ocean in the early 1960s. However, U.S. landings of swordfish did not exceed 1500 mt until the mid-1970s. Since that time, the gear deployed has evolved several times. The majority of fishermen use monofilament mainline that is rigged depending on whether the line is "targeting" tunas or "targeting" swordfish. The term "targeting" is used because there are differences in the location, timing, and gear configuration that are specific to the tuna or swordfish target. For example, tuna fishing tends to occur during the day while most swordfish fishing takes place at night. However, particularly during "swordfish" sets, this gear hooks many different pelagic species incidentally. The incidental catch includes species which are discarded for economic and regulatory reasons. A complete discussion of the pelagic longline fishery can be found in Section 2.5.1 of the HMS FMP.

Bycatch in this fishery is discussed in Section 5.1.6. Like fishermen using other fishing gears, pelagic longline fishermen are subject to minimum sizes for yellowfin, bigeye, and bluefin tuna, and swordfish in order to reduce the mortality of small fish. However, in some areas and at certain times of the year, much of the bycatch in this fishery is released dead. Therefore, NMFS is concerned about reducing bycatch as well as reducing bycatch mortality. Because it is difficult to avoid undersized fish, NMFS has proposed to subject pelagic longline fishermen to time/area closures in the Gulf of Mexico and along the east coast. The intention of these closures is to relocate some of the fishing effort into areas where bycatch is expected to be lower. There is currently in place a time/area closure for pelagic longline fishermen designed to reduce the incidental catch of bluefin tuna. In order to enforce time/area closures, NMFS will require all pelagic longline vessels to report hourly positions on an approved vessel monitoring system (VMS) beginning June 1, 2000. Time/area considerations and VMS are discussed below in Section 5.1.6.

In addition to regulations designed to reduce bycatch, pelagic longline fishermen are subject to quota management for swordfish and sharks, minimum sizes, and a prohibition on directed fishing for bluefin tuna. Quota monitoring requires seasonal regulations, closures, and target catch requirements. In order to document catch and effort, pelagic longline fishermen are subject to permitting and reporting requirements, including logbooks and observer coverage. In 1999, NMFS established a limited entry system for swordfish, shark, and tuna longline permits. Pelagic longline fishermen who target swordfish or BAYS tunas must have a swordfish limited access permit, a limited access shark permit, and a tuna longline permit. NMFS is re-evaluating the limited access program and may consider gear-specific permits in the future. Refer to Section 8 for a discussion of limited access options.

4.1.2 Most Recent Catch and Landings Data

Pelagic longline fishermen encounter as many as 40 different species in a trip. Table 4.1.1 indicates the 1995-1998 catches by U.S. pelagic longline fishermen in the Atlantic Ocean.

Table 4.1.1 **Estimated Pelagic Longline Catches: 1995-1998 (mt ww)***. Source: U.S. National Report (1997, 1998, 1999).

	1995	1996	1997	1998
Swordfish *landings*	3925.7	3627.8	3361.9	3212
Swordfish *dead discards***	525.7	563.7	455.2	432.7
Yellowfin Tuna	3581.6	3285	3773.6	2447.9
Bigeye Tuna	985.5	660.5	794.8	695.3
Bluefin Tuna *landings*	72.6	67.9	49.9	48.7
Bluefin Tuna *dead discards*	141.6	73.5	37.1	64
Albacore Tuna	336.8	109.4	189.1	180.1
Skipjack Tuna	0.8	0.3	3.5	1.3
Blue Marlin***	143.3	196.5	138.1	51.8
White Marlin***	99.7	67.6	70.8	32.1
Sailfish***	59.9	71.6	57.7	27.1

*Atlantic sharks are caught on pelagic longlines, however, the methods for reporting data on Atlantic sharks do not allow for their inclusion in this table.
** Post-release mortality of swordfish released alive is not estimated by NMFS at this time.
***Indicates longline *dead discards* of these species

4.1.3 U.S. vs. International Catch

Table 4.1.2 Estimated International Longline Landings in the Atlantic and Mediterranean: 1995-1998 (mt ww)*. Source: 1999 SCRS Report, U.S. National Report**.**

	1995	1996	1997	1998
Swordfish**	42,589	37,490	35,943	28,173
Yellowfin Tuna	23,199	24,421	21,113	22,993
Bigeye Tuna	74,000	73,660	66,619	58,835
Bluefin Tuna	12,203	14,881	10,250	8,671
Albacore Tuna	24,573	25,436	23,888	28,029
Skipjack Tuna***	37	26	61	77
Blue Marlin****	2,661	3,415	3,434	2,290
White Marlin****	1,395	1,068	814	840
Sailfish****	552	476	376	1,037
Total	**181,159**	**180,873**	**162,498**	**150,945**
US Total	**9,873**	**8,723**	**8,932**	**7,193**
US%	**5.45%**	**4.82%**	**5.50%**	**4.77%**

* landings include those classified by the SCRS as longline landings for all areas
**includes longline landings and *dead discards*
***includes longline and trawl catches for all countries
****includes U.S. longline *dead discards*

The U.S. longline fleet has historically accounted for a small percentage of total Atlantic landings. Even when including U.S. discards for swordfish, blue marlin, white marlin, and sailfish, the U.S. percentage still remains right around 5 percent of all longline landings reported to ICCAT. Swordfish discards have typically accounted for nearly 25 percent of the total swordfish catch (by number) of the U.S. pelagic longline fleet over the past four years (Cramer and Adams, 1999).

4.1.4 Economic Data

The HMS FMP contains baseline economic data for all HMS fisheries. Larkin et al. (1996) provide an overview of the economic aspects of the pelagic longline fishery. They stress that the characteristics of fishing trips vary widely and that distinct fleet sectors must be taken into account when managing this fishery. This is consistent with NMFS' view to manage fisheries holistically, not solely by species. NMFS collects economic and social data on a per trip basis

through submission of voluntary forms in the logbook, but may require this information in the future for selected vessels (64 FR 55900, October 15, 1999).

Pelagic Longline Fishery Economic Study

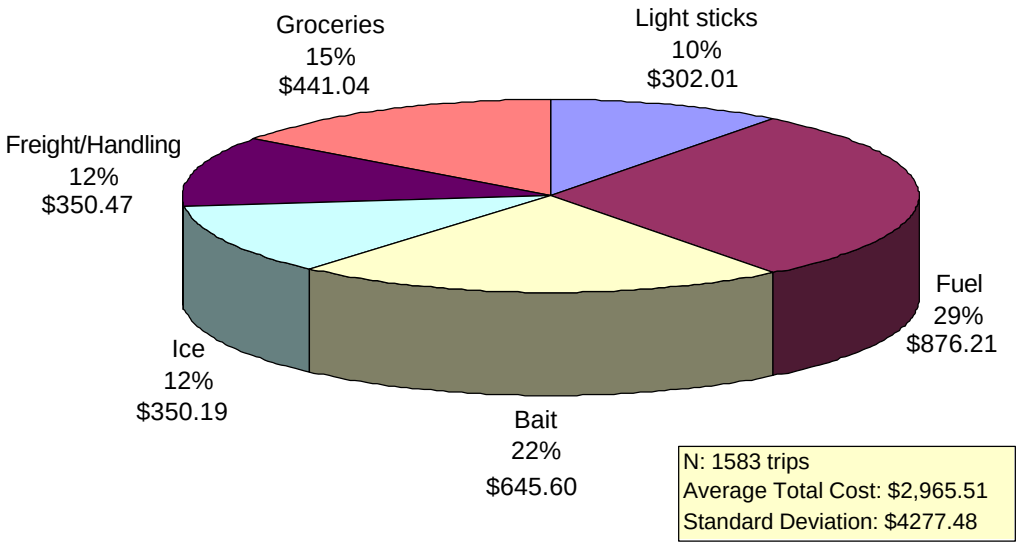
NMFS reported preliminary results from analysis of three years of data from the Atlantic pelagic longline logbook forms (data from set forms and trip summary forms including a voluntary cost component) and weigh-out data at the August 1999 American Fisheries Society meeting (Ward and Hanson, 1999). Table 4.1.3 displays the total number of observations contained in each of the three data sets. The total number of useful observations were reduced when errors and outliers were eliminated. The set and weigh-out forms are required on logbook reporting forms, but the cost portion of the trip summary form is a voluntary submission. All of the following data are reproduced from the Ward and Hanson presentation.

Table 4.1.3 Total Number of Logbook and Weigh-Out Observations. Source: Ward and Hanson, 1999.

	1996	**1997**	**1998**
Set Form	17,996	15,867	N/A
Weigh-Out Form	21,976	21,792	N/A
Trip Summary	1,310	624	383 (incomplete)

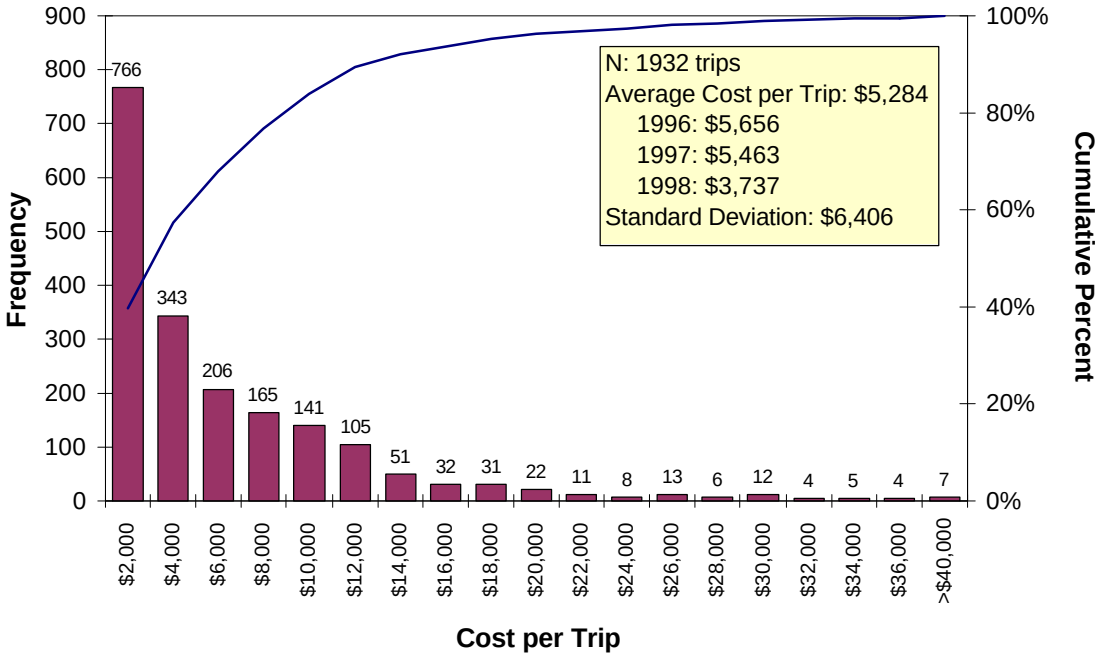
The trip summary form provides estimates of the cost and quantity of inputs used. For those trips where input data were recorded, the average percent and dollar value of total cost broken out by input was calculated. Approximately two-thirds of the calculated total cost of a trip was spent on fuel, bait, and ice (Figure 4.1.1).

Figure 4.1.1 Average Percent and Value of the Cost Components of Longline Fishing Trips: 1996-1997.



The vessel owners/captains were also asked to provide an estimated total cost of the trip on the trip summary form (Figure 4.1.2). In general, there was a difference between the vessel owner/captain reported total cost and the total cost based on inputs. The majority of the trips appeared to be on the lower end of the range of reported trip costs. Higher end trips correspond to distant water trips (destinations far offshore).

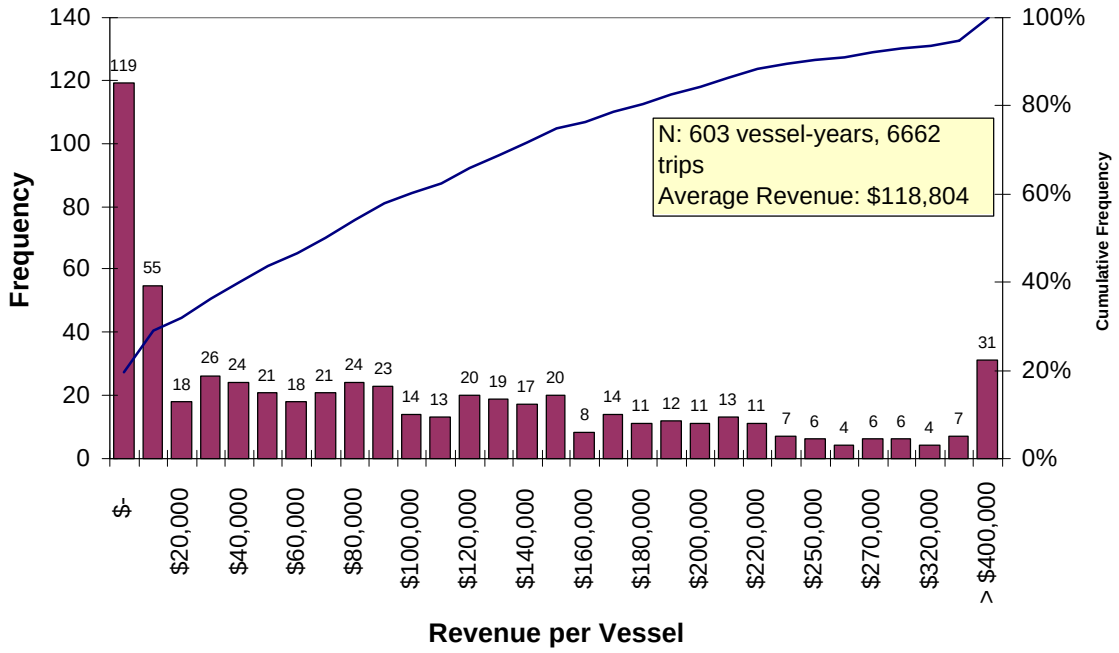
Figure 4.1.2 Cost per Pelagic Longline Trip: 1996-1998.



Swordfish and tunas typically account for approximately 85 percent by volume of the

landings by pelagic longline fishermen. Revenue was calculated by multiplying the average annual price for a species by the quantity of that species landed in a year by that vessel. The resulting distribution of revenue shown in Figure 4.1.3 indicates a large cluster of vessels at both the low and high ends of the revenue per vessel range. This suggests a heterogenous fleet with some vessels landing higher quality fish while others land lower valued fish.

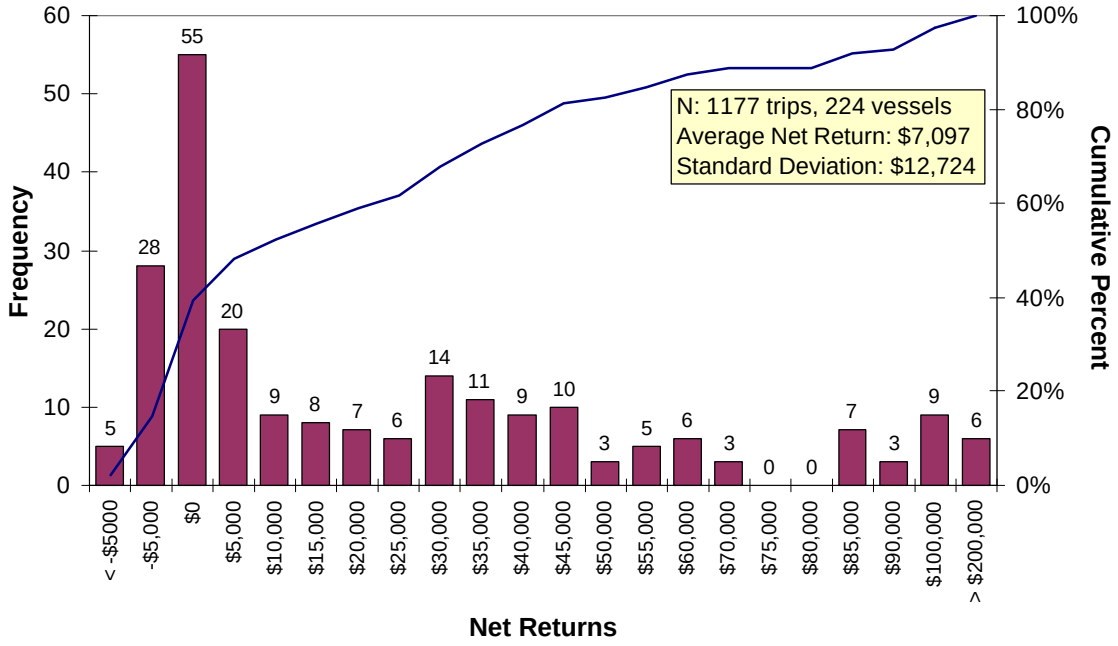
Figure 4.1.3 Total Revenue per Vessel: 1996-1997.



Revenue per vessel was calculated by multiplying the average annual price for a species by

the quantity of that species landed in a year by that vessel. The majority of vessels appear to have relatively low revenues, although many vessels earn considerable amounts. Total net returns can be calculated by subtracting the total cost from the total revenue. Ward and Hanson's results indicate that the majority of the fleet earns low to negative income (Figure 4.1.4). Fifty percent of the fleet are earning $10,000 or less and 20 percent of those are losing money (negative profit). This pattern is typical for fisheries operating within an open access management structure. The fishing businesses operating on the margin are typically the ones that are most likely affected by additional regulation and the first to exit the industry.

Figure 4.1.4 Total Net Returns by Vessel: 1996-1997.



4.1.5 Social Data

Western North Atlantic Longline Fishery: Sociological Survey

The following data are some of the highlights of a 1996 survey conducted at the Pelagic Longline Industry Bycatch Workshops (Hoey, 1996). Although the information presented here is not new, it is reviewed to highlight basic sociological data that may be useful when designing future surveys. Fifty-nine participants were surveyed of which 11 were vessel owners, 18 were

vessel owners/operators, 9 were hired captains, 12 crew members, 4 suppliers, and 5 were none of the above:

- In a comparison of current rankings of life as a commercial fisherman (on a scale of 0-10 where 0 is the worst possible life) versus rankings five years ago, 25 respondents indicated they were better off five years ago, 13 indicated they were better off now, and 10 indicated no change (48 respondents).

- In a comparison of current rankings of life as a commercial fisherman (on a scale of 0-10 where 0 is the worst possible life) versus predicted rankings five years from now, 25 indicated that conditions would get worse, 14 respondents indicated conditions would improve, and 9 indicated no change (48 respondents).

- Fifty-eight percent felt that their opinions had little or no impact on the current regulatory process (59 respondents).

- Eighty-two percent felt that federal regulations had an overall negative economic effect on the ability to fish commercially (57 respondents). Most responses cited income loss from requirements to discard dead fish and from quota closures.

- Seventy five percent felt that federal regulations had an overall negative effect on the quality of personal life (59 respondents). Most responses cited stress resulting from loss of income, longer trips, and longer periods of time away from home.

The survey results indicate that pelagic longline fishermen enjoy their work and their quality of life. Obviously, any regulatory framework dampens the independent nature of fishing and often dictates how, where, and when longlines can be set. Given the National Standard guidelines and the intent of the Magnuson-Stevens Act, there is no option but to set limits on fishing activities and the amount of fish caught. However, the survey data can be used to better predict the impacts of new regulations and assist in selecting those options that minimize negative effects on fishermen and their families.

Swordfish Permit Distribution

Limited access to the pelagic longline fishery for swordfish, sharks, and tunas is discussed in further detail in Section 8 of this report. However, when assessing the impacts of proposed regulations on pelagic longline fishermen, it is important to identify the communities in which they and their families reside. Since the distribution of limited access permits is relevant to the Atlantic pelagic longline fishery, a breakdown of those receiving directed or incidental swordfish permits is depicted here (Table 4.1.4). It is important to note that the addresses used in the permit distributions are the mailing addresses on file with NMFS, and not necessarily the home ports or communities in which the fishermen spend most of their time. The home port address for a given vessel may differ and may provide a varied indication of target areas for future socioeconomic studies. However, mailing address was selected here in order to identify concentrations of family

residences that may be impacted socially from additional management measures. Table 4.1.4 lists cities with eight or more permit holders qualifying for directed or incidental swordfish limited access permits as of December 30, 1999. Although a large fleet of longline vessels fish out of New England states, the towns with the greatest number of qualifying permit holders are found south of New York.

Table 4.1.4 **Swordfish Permit Distribution : Cities with Eight or More Permit Holders.** Based on the number of qualifying directed and incidental swordfish permit holders as of December 7, 1999 (449 total).

City	Number of Permits	State	Total Number of Permits in State	Percentage of State Permits in City
New Orleans	29	LA	51	56.9
Barnegat Light	27	NJ	77	35.1
Fort Pierce	14	FL	148	9.4
Cape May	10	NJ	77	13.0
Destin	10	FL	148	6.8
Pompano Beach	8	FL	148	5.4
St. Petersburg	8	FL	148	5.4
Harkers Island	8	NC	56	14.3
Wanchese	8	NC	56	14.3
Montauk	8	NY	46	17.4

4.1.6 Bycatch Issues and Data Associated with the Fishery

Fish are discarded from the pelagic longline fishery for a variety reasons. Swordfish, yellowfin tuna, and bigeye tuna may be discarded because they are undersized or unmarketable. Blue sharks, as well as some other finfish species, are discarded as a result of a limited market, rapid perishability, or low pricing levels. Large coastal sharks and swordfish are discarded from this gear when their respective quotas have been filled. Bluefin tuna may be discarded because the target catch requirements have not been met. All billfish and protected species including mammals, turtles, and birds are required to be discarded. Bycatch mortality of marlins, swordfish, and bluefin tuna may significantly reduce the ability of these populations to rebuild and remains an important management issue. NMFS is also concerned about serious injuries to turtles and marine mammals as a result of interactions with pelagic longline gear.

In response to concerns about bycatch in the pelagic longline fishery, NMFS has proposed

time/area closures in the Gulf of Mexico and South Atlantic Bight (64 FR 69982, December 15, 1999). The proposed rule would complement the time/area closure previously established in the HMS FMP to address discards of bluefin tuna (50 CFR 635.21 (c) (2)). The objectives of the proposed measures are: (1) maximize the reduction in finfish bycatch, (2) minimize the reduction in the target catch of swordfish and other target species, (3) ensure that the catch of other species remains unchanged or is also reduced, and (4) optimize survival of bycatch and incidental catch species. The preferred alternative consists of an area approximately 99,810 nm^2 in the Southeast Atlantic to be closed year-round and a 96,560 nm^2 area in the Gulf to be closed from March through September. Assuming that fishermen will re-distribute longline effort in open areas, the proposed closures result in the following bycatch reductions: swordfish discards, 22 percent; bluefin tuna discards, 49 percent, and sailfish discards, 10 percent. Under this alternative, blue marlin and white marlin discards increase by 5 percent and 6 percent, respectively, and the incidental catch of sea turtles increases by 8 percent. The analysis assumes a random pattern of re-distribution. If boats direct their effort towards the Caribbean, billfish discards may increase. If they avoid fishing in the Caribbean due to safety concerns (e.g., smaller vessels), billfish discards could be expected to benefit from a subsequent decrease in discards. The preferred alternative was selected to maximize the effectiveness of NMFS' management strategy relative to the stated objectives, while minimizing, to the extent practicable, economic and social impacts to vessels and communities within the closed areas. The draft Supplemental Environmental Impact Statement (SEIS) details the analyses on the different individual areas proposed for time/area closure. The consideration of the full range of effects of implementing time/area closures, as well as an analysis of other alternatives considered to address bycatch, is also described in the draft SEIS, and will be further discussed at upcoming public hearings and the February 2000 HMS Advisory Panel meeting.

Vessel Monitoring System Update

The rationale for the mandatory use of a vessel monitoring system (VMS) on all Atlantic pelagic longline fishing vessels that hold HMS permits and the implementation of this program is described in Section 3.8.2 of the HMS FMP. VMS is essential to the effective implementation and enforcement of time/area closures and provides increased communication and safety benefits to longline fishermen. NMFS has delayed the effective date of the VMS requirement until June 1, 2000, in order to allow pelagic longline fishermen sufficient time to comply with the regulation. Compliance involves review of the list of approved units, purchase and installation of hardware, and establishing communication with NMFS.

Observer Program

Observers recorded effort from 287 pelagic longline sets in 1998, representing approximately 2.9 percent of the total number of sets. Table 4.1.4 compares observer coverage in past years for this fleet. As required by NMFS' Biological Opinion, 5 percent of the pelagic longline trips were selected for observer coverage. In addition, ICCAT requires 5 percent observer coverage for all trips targeting yellowfin tuna and/or bigeye tuna. Due to logistical problems, it was not possible to place observers on all selected trips.

Table 4.1.4 Observer Coverage of the Pelagic Longline Fishery

Year	Number of Sets Recorded	Percentage of Total Number of Sets
1992	329	2.5
1993	815	6.0
1994	649	5.2
1995	696	5.2
1996	361	2.5
1997	448	3.1
1998	287	2.9

Marine Mammals

Marine mammal catch is estimated based on observed takes only. Fishermen report takes of mammals to NMFS in a marine mammal logbook. The Atlantic pelagic longline fishery is considered a Category I fishery under the Marine Mammal Protection Act (MMPA). In 1998, there were six observed takes of marine mammals by pelagic longlines. This number has been extrapolated out to an estimated 205 mammals fleet-wide. NMFS has not released any recent data on marine mammal catch from pelagic longline vessels, but a report is being prepared on the estimate of mortalities and serious injuries. This report was presented to the Scientific Review Group (SRG) in November 1999. The SRG reviewed the report, and NMFS is now evaluating the pelagic longline fishery in terms of the take reduction plan under Potential Biological Removal levels (short term goal) and Zero Mortality Rate Goal (long term goal). In addition to mammals released *dead* from fishing gear, uncommon in the pelagic longline fishery, NMFS must consider post-release mortality of mammals released *alive*.

The Atlantic SRG recognized the need to immediately apply serious injury "guidelines" to the Atlantic pelagic longline fishery. At the April 1999 meeting, NMFS presented a preliminary analysis of the serious injuries in this fishery and gave a rough estimate of the number of injuries. Based on these levels of takes, the SRG recommended maintaining the Category I listing for the Atlantic pelagic longline fishery in the proposed List of Fisheries for 2000. NMFS will summarize the serious injury determinations for the pelagic longline fishery in the upcoming proposed List of Fisheries.

Sea Turtles

The Atlantic pelagic longline fishery exceeded the authorized level of takes of loggerhead

turtles in 1999. As a result, NMFS has re-initiated consultation under Section 7 of the Endangered Species Act. Once NMFS develops reasonable and prudent alternatives to manage this fishery, fishermen may be faced with a regulatory proposal for gear modification or time/area closures in order to minimize the number of turtle takes. The area of concern is the Northeast Distant area where turtles are sometimes taken in high numbers from July through September.

Sea birds

Gannetts, gulls, and storm petrels are occasionally hooked by Atlantic pelagic longlines. These species and all other sea birds are protected under the Migratory Bird Treaty Act; endangered sea birds receive further protection under the Endangered Species Act. Sea bird 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 NMFS observer data, from 1990-1997, 34 sea birds were hooked by pelagic longlines. Of those, 9 were released alive. The majority of longline interactions with sea birds occur as the gear is being set. The birds eat the bait and become hooked on the line; the line sinks and the birds are subsequently drowned.

The United States is developing a National Plan of Action in response to the FAO International Plan of Action to reduce incidental sea bird takes. Although pelagic longline interactions will be considered in the plan, NMFS has not identified a need to implement gear modifications aimed at reducing sea bird takes by Atlantic pelagic longlines. Takes of sea birds have been minimal in this fishery, most likely due to the setting of longlines at night and/or fishing in areas where birds are largely absent.

Finfish

Swordfish bycatch ranged from 7 percent to 45 percent of the total catch of swordfish per trip (by number) according to estimates based on reported observer and logbook data (Cramer and Adams, 1999). The most recent longline bycatch data are available from the 1999 U.S. National Report to ICCAT. Longline dead discards of swordfish in 1998 were estimated to be 442 mt ww or approximately 29,470 swordfish. Discard levels in 1998 mark a substantial reduction from those reported in 1997.

Longline bycatch of billfish in 1998 in many geographic areas declined from 1997 levels. Estimated billfish dead discards from commercial longlines were 52.4 mt for blue marlin, 32.8 mt for white marlin, and 27.0 mt for sailfish in 1998. In 1997, 138.1 mt blue marlin, 70.8 mt white marlin, and 57.7 mt sailfish were reported as dead discards.

Bluefin tuna dead discards from the pelagic longline fishery were 64 mt and 37.1 mt in 1998 and 1997 respectively. A June closure of an area off the New Jersey coast was implemented in 1999 to reduce dead discards of bluefin tuna in the pelagic longline fishery (54.8 mt in 1998 and 30.7 mt in 1997). This closure is expected to reduce dead discards by approximately 55 percent.

4.1.7 Safety Issues Associated with the Fishery

Like all offshore fisheries, pelagic longlining can be dangerous. Trips are extended, the work can be arduous, and the nature of setting and hauling the line may cause injuries due to hooking. Like all other HMS fisheries, longline fishermen are exposed to unpredictable weather. NMFS does not wish to exacerbate unsafe conditions through implementation of regulations. Therefore, NMFS 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. VMS is also likely to improve safety concerns not only because of the Emergency Position Indicating Radiobeacon (EPIRB) abilities of the system, but because regulations can now be adjusted given the enforcement backup of the vessel monitoring system. For example, fishermen may not be required to offload swordfish by the time of the closure but rather can adjust their transit time to maximize safety, provided they do not fish after the season is closed. NMFS seeks comments from fishermen on any safety concerns they may have. Fishermen have pointed out that due to decreasing profit margins, they may fish with less crew or may not have the time or money to complete necessary maintenance tasks. NMFS cannot influence the market to improve profits to fishermen, but rather encourages fishermen to be responsible in fishing and maintenance activities.

4.2 Fishery Data: PURSE SEINE

4.2.1 Overview of History and Current Management

Domestic aspects of the Atlantic tunas purse seine fisheries are described in Section 2.2.3 of the HMS FMP. Social and economic aspects of the fisheries are described in Section 2.2.4.

Vessels using purse seine nets have participated in the U.S. fishery for bluefin tuna continuously since the 1950s, although a number of purse seine vessels did target and land bluefin tuna off the coast of Gloucester, MA as early as the 1930s. The limited entry system with non-transferable individual vessel quotas (IVQs) for purse seining was established in 1982, effectively excluding any new entrants to this category. Equal quotas are assigned to individual vessels by regulation; the IVQ system is possible given the small pool of ownership in this sector of the fishery. Currently, only five vessels comprise the bluefin tuna Purse Seine fleet and the quotas were made transferable among the five vessels in 1996.

The FMP and its final implementing regulations established percentage quota shares for bluefin tuna for each of the domestic fishing categories. For the Purse Seine category, NMFS adopted a cap on the amount of quota the category could be allocated. The HMS Advisory Panel (AP) met in Silver Spring, MD on June 10 and June 11, 1999, and discussed, among other issues, the Purse Seine category cap. The AP provided information and advice to NMFS on the issue of fairness in the context of allocation to the Purse Seine category.

On August 18, 1999 (64 FR 44885), NMFS published a proposed rule to remove the 250 mt cap on the Purse Seine category bluefin tuna allocation. NMFS held two public hearings on the proposed rule and the comment period closed on September 27, 1999. Numerous comments were received, both in favor of the proposed rule and against it. On October 27, 1999, NMFS filed a final rule with the Federal Register (64 FR 58793, November 1, 1999) removing the cap on the Purse Seine category.

4.2.2 Most Recent Catch and Landings Data

Table 4.2.1 shows purse seine landings of Atlantic HMS from 1995 through 1998. Purse Seine landings make up about 20 percent of the total annual U.S. landings of bluefin tuna (about 25% of total commercial landings), but account for only a small percentage, if any, of the landings of other HMS. In the 1980's and early 1990's, however, purse seine landings of yellowfin tuna were often over several hundred metric tons. Over 4,000 mt of yellowfin were recorded landed in 1985.

Table 4.2.1 **Domestic Landings for the Purse Seine Fishery: 1995-1998 (mt ww)**. NW Atlantic Fishing Area. Sources: 1999 U.S. National Report; additional data from the Northeast Region mandatory dealer program

Species	1995	1996	1997	1998
Bluefin Tuna	249.0	245.0	249.7	248.6
Yellowfin Tuna	0	6.8	0	0
Skipjack Tuna	0	0.7	0	0

4.2.3 U.S. vs. International Catch

Table 4.1.2 **Estimated International Purse Seine Landings in the Atlantic and Mediterranean: 1995-1998 (mt ww)**. Source: 1999 SCRS Report, U.S. National Report**.**

Species	1995	1996	1997	1998
Bluefin Tuna	20,912	22,606	20,666	12,904
Yellowfin Tuna	94,622	104,847	93,448	95,273
Skipjack Tuna	107,786	77,102	74,587	70,820
Bigeye Tuna	24,786	26,446	17,037	14,657
Total	**248,106**	**231,001**	**205,738**	**193,654**
US Total	**249**	**252.5**	**249.7**	**248.6**
US%	**0.10%**	**0.11%**	**0.12%**	**0.13%**

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

At this year's ICCAT meeting, the Commission agreed to continue the prohibition on the use of Fish Aggregation Devices (FADs)in an area in the Gulf of Guinea. The closure (which became mandatory in 1999) was in response to concern over catches of juvenile and undersize tunas by purse seiners relying on FADs. While the closure is in place, data are being collected so that the SCRS can analyze the effects of "FAD-fishing" on the stocks.

4.2.4 Economic Data

There are no new economic studies or data available on the U.S. Atlantic tunas purse seine fishery. NMFS does not require logbooks and does not collect voluntary information from

this fishery.

4.2.5 Social Data

There are no new social studies or data available on the U.S. Atlantic tunas purse seine fishery. As a result of the limited entry system for purse seine vessels, NMFS can easily characterize the small number of participants (5 vessels and 3 owners) in the fishery.

4.2.6 Bycatch Issues and Data Associated with the Fishery

There is no new information on bycatch regarding the U.S. Atlantic tunas purse seine fishery. The Atlantic bluefin tuna Purse Seine category fishery is currently listed as a Category III fishery under the Marine Mammal Protection Act. This fishery was observed in 1996, with near-100 percent coverage. Six pilot whales, one humpback whale, and one minke whale were observed as encircled by the nets during the fishery. All were released alive or dove under the nets and escaped before being pursed. After a school of fish is located, a purse seine net is set by paying out the net in a circle around the school. This affords considerable control over what is encircled by the net and the net does not remain in the water for any considerable amount of time. Therefore, this gear-type is not likely to result in mortality or serious injury of marine mammals or sea turtles. As a result, it is NMFS' biological opinion that the continued operation of the purse seine fishery may adversely affect, but is not likely to jeopardize, the continued existence of any endangered or threatened species under NMFS jurisdiction.

4.2.7 Safety Issues Associated with the Fishery

There are no new safety issues associated with the U.S. Atlantic tunas purse seine fishery. Section 3.9 of the HMS FMP describes safety of human life at sea as it pertains to the fisheries for Atlantic HMS.

4.3 Fishery Data: COMMERCIAL HANDGEAR

Handgear are used for Atlantic HMS by fishermen on private vessels, charter vessels, and headboat vessels. Operations, frequency and duration of trips, and distance ventured offshore vary widely. An overview of the history of the HMS handgear fishery (commercial and recreational) can be found in Section 2.5.8 of the HMS FMP.

The proportion of domestic HMS landings harvested with handgear varies by species, with Atlantic tunas comprising the majority of commercial landings. Commercial handgear landings of all Atlantic HMS (other than sharks) in the United States are shown in Table 4.3.1. The fishery is most active during the summer and fall, although in the South Atlantic and Gulf of Mexico fishing occurs during the winter months. For bluefin tuna, commercial handgear landings accounted for approximately 60 percent of total U.S. bluefin tuna landings, and over 71% of commercial bluefin landings. The commercial handgear fishery for bluefin tuna occurs mainly in New England, with vessels targeting large medium and giant bluefin using rod and reel, handline, harpoon, and bandit gear. Beyond these general patterns, the availability of bluefin tuna at a specific location and time is highly dependent on environmental variables that fluctuate from year to year. Fishing usually takes place between 8 and 200 km from shore using bait including mackerel, whiting, mullet, ballyhoo, and squid.

The majority of U.S. commercial handgear (handline and bandit gear) fishing activities for BAYS tunas take place in the northwest Atlantic. Rod and reel gear use for these species is predominantly by recreational fishermen and is addressed in Section 4.4. In 1998, 4.3 percent of the total yellowfin catch, or 9.0 percent% of the commercial yellowfin catch, was attributable to commercial handgear. The majority of these landings occurred in the northwest Atlantic Ocean. Commercial handgear landings of skipjack tuna accounted for less than one percent of total skipjack landings, or about 2.1 percent of commercial skipjack landings. The percentages of albacore are similar to those for skipjack, and handgear landings of bigeye tuna accounted for less than one percent of total and commercial bigeye landings.

Swordfish are landed using harpoons and/or handlines. While commercial handgear is periodically used by New England fishermen, fishermen in the southeast may increase their handgear landings as the swordfish stock increases. Handgear landings of swordfish are shown in Table 4.3.1 and account for a very small percentage of total U.S. swordfish catch (less than 0.1%).

The HMS FMP established a limited access program for the commercial swordfish and shark fisheries (all gears), as well as for tunas (longline only). Fishermen who submitted an application by December 1, 1999, with documentation of a swordfish permit for use with harpoon gear or landings of swordfish with handgear as evidenced by logbook records, verifiable sales slips or receipts from registered dealers, or state landings records were eligible for a swordfish handgear permit. NMFS also issued handgear permits to those applicants who met the earned income requirement, i.e., those who had derived more than 50 percent of their earned income from commercial fishing through the harvest and first sale of fish or from charter/headboat fishing,

or those who had gross sales of fish greater than $20,000 harvested from their vessel, during one of the three calendar years preceding the application. Chapter 4 of the HMS FMP includes a complete description of the handgear permit for swordfish under the limited access system. As of January 18, 2000, 115 limited access swordfish handgear permits had been issued.

There are a significant number of sharks landed by fishermen using commercial handgear. However, the nature of the data collected and assessed for Atlantic sharks does not readily allow a breakdown into various commercial gear types. Anecdotal evidence suggests that many charter and headboat captains target sharks as an alternative when other species are unavailable. The Sutton and Ditton study on the Gulf charter/party boat industry (discussed further in Section 4.3.5) indicate that 65 percent of party boat operators targeted sharks at least once during the study period. Further information on Atlantic sharks catch and landings data is found in Section 4.5.

4.3.1 Overview of History and Current Management

A thorough description of the commercial handgear fisheries for Atlantic tunas can be found in Section 2.2.3 of the HMS FMP. Social and economic aspects of the domestic handgear fisheries are described in section 2.2.4 of the HMS FMP. For bluefin tuna, information regarding Prices and Markets, Costs and Expenses in the Commercial Fishery, Exports and Imports, Processing and Trade, Charter/Headboat Fishing, and Recreational Fishing can be found in Section 2.2.4.1. Section 2.2.4.2 details Commercial Fishing, Charter/Headboat Fishing, and Recreational Fishing for BAYS tunas.

The domestic swordfish fisheries are discussed in Section 2.3.3 of the HMS FMP. Social and economic aspects of the domestic handgear fisheries are described in Section 2.3.4.

The domestic shark fisheries are discussed in Section 2.4.3 of the HMS FMP. Directed fisheries for Atlantic sharks are conducted by vessels using bottom longline, gillnet, and rod and reel gear and discussed in Section 4.5 of this report. Social and economic aspects of the domestic handgear fisheries are described in Section 2.4.4 of the HMS FMP.

4.3.2 Most Recent Catch and Landings Data

Updated tables of landings for the commercial handgear fisheries by gear and by area for 1995-1998 are presented in Tables 4.3.1 and 4.3.2. As commercial shark landings are not recorded/disaggregated by gear type, no commercial handgear data is provided in this section. A complete discussion of Atlantic sharks is found in Section 4.5. In the HMS FMP, domestic landings of Atlantic bluefin tuna (1983 through 1997) and BAYS tunas (1995 through 1997) are presented in Section 2.2.3, and domestic catches (landings and discards) are presented in Section 2.3.3. As the majority of U.S. landings of yellowfin tuna are by rod and reel, a summary of the recently published total domestic recreational and commercial yellowfin landings (1981-1998) is presented in this section.

Table 4.3.1 Domestic Landings for the Commercial Handgear Fishery:1995-1998 (mt ww). Sources: National Report of the United States, 1999; Northeast Region Mandatory Dealer Program Data.

Species	Gear	1995	1996	1997	1998
Bluefin Tuna	Rod and Reel*	441.7	478.2	617.8	590.0
	Handline	65.5	32.5	17.4	29.2
	Harpoon	76.8	95.7	97.5	133.1
	TOTAL	**584.0**	**898.9**	**732.7**	**752.3**
Bigeye Tuna	Troll	16.5	4.1	3.9	4.0
	Handline	3.7	17.3	2.7	0.1
	TOTAL	**20.2**	**21.4**	**6.6**	**4.1**
Albacore Tuna	Troll	1.9	2.7	5.2	5.8
	Handline	2.6	3.8	4.8	0
	TOTAL	**4.5**	**6.5**	**10.0**	**5.8**
Yellowfin Tuna	Troll	355.7	371.0	237.6	177.5
	Handline	146.9	84.2	90.6	64.7
	TOTAL	**502.6**	**455.2**	**328.2**	**242.2**
Skipjack Tuna	Troll	2.3	0.9	7.9	0.4
	Handline	0.6	0.4	0.1	0
	Harpoon	**	0	0	0
	TOTAL	**2.9**	**1.3**	**8.0**	**0.4**
Swordfish	Troll	0	7.3	0.4	0.7
	Handline	0	0.1	1.3	0
	Harpoon	1.0	0.5	0.7	1.5
	TOTAL	**1.0**	**7.9**	**2.4**	**2.2**

* Rod and Reel catches and landings represent estimates of landings and dead discards based on statistical surveys of the U.S. commercial and recreational harvesting sectors.
** $\leq$ 0.05 mt

Table 4.3.2 **Domestic Landings for the Commercial Handgear Fishery: 1995-1998 (mt ww)**. Sources: National Report of the United States, 1999; Northeast Region Mandatory Dealer Program Data.

Species	Region	1995	1996	1997	1998
Bluefin Tuna	NW Atl	584.0	898.9	747.3	755.0
Bigeye Tuna	NW Atl	19.8	20.5	6.6	4.0
	GOM	0.4	0.9	0	0.1
Albacore Tuna	NW Atl	4.3	6.4	6.4	5.8
	GOM	0.1	0.1	0	0
	Carib	0.1	0	3.6	0
Yellowfin Tuna	NW Atl	473.3	408.2	252.3	177.5
	GOM	29.1	47.0	55.6	60.8
	Carib	0.2	0	20.3	3.9
Skipjack Tuna	NW Atl	0.4	1.2	0.7	0.4
	GOM	0.4	0.1	0	0
	Carib	2.1	0	7.3	0
Swordfish	NW Atl	1.0	7.9	2.4	2.2

Yellowfin Tuna Landings

In October 1999, NMFS published revised statistics on the level of U.S. recreational and commercial landings of Atlantic yellowfin tuna since 1981 (64 FR 58035, October 28, 1999). Preliminary statistics were published in March 1996 (61 FR 10319, March 13, 1996), and NMFS received considerable public comment. NMFS published these final statistics to inform the public of updated data on landings trends in the yellowfin tuna recreational and commercial fisheries. The preliminary data and related data collection issues have been discussed at meetings of the ICCAT Advisory Committee (IAC) in recent years. Comments received from both the general public and from the IAC resulted in extensive reexamination of the data by NMFS scientists to ensure the best available data on commercial and recreational yellowfin tuna landings for publication and subsequent revisions to the preliminary statistics. At the November 1998 IAC meeting, a copy of a draft report to be used as the basis for submitting revised estimates of yellowfin tuna landings to ICCAT was circulated to the IAC (Brown, 1998). After further refining the information, NMFS provided a draft scientific paper detailing yellowfin tuna data revisions to the IAC at its March 1999 meeting (Brown, 1999a).

The source of the yellowfin tuna data and revisions made to the historical database are described in a final paper that was submitted to the SCRS in 1999 (Brown, 1999b). A variety of

commercial landings databases were examined for the purpose of evaluating the possible need for revising U.S. landings of Atlantic bigeye, albacore, yellowfin, and skipjack tuna as reported to ICCAT. This SCRS paper updates, with appropriate revision and additions, a previous review of U.S. commercial landings of Atlantic yellowfin as presented in an earlier SCRS paper. In addition, various sources of recreational landing tallies and estimates are examined and landings values are presented.

In presenting these revised data to the SCRS, the United States formally revised historical landings statistics. These revised statistics have been submitted through the ICCAT reporting process, after incorporating the review comments received from both the IAC and the SCRS, and will be published in future reports of the SCRS. Because this review and revision of yellowfin tuna statistics included extensive research of all sources of yellowfin tuna data and a variety of estimation techniques, NMFS considers these historical data as the best data available at this time. NMFS, therefore, does not intend to consider further revisions to these data unless new, verifiable data become available.

NMFS is exploring new measures designed to improve the quality of yellowfin tuna commercial and recreational landings data. The HMS FMP established new permitting and reporting requirements for recreational vessels, including logbooks for Highly Migratory Species charter/headboats, if selected. Through efforts implemented under the Atlantic Coast Cooperative Statistics Program, NMFS is working with states and other fishery management authorities to ensure uniform, non-redundant, and consistent data collection systems. These and other efforts should contribute to improved quality of yellowfin tuna landings data in coming years.

Table 4.3.3 Yellowfin Tuna Commercial and Recreational Landings: 1981-1998 (mt ww).

Year	Commercial Landings	Recreational Landings
1981	1886	1274
1982	819	912
1983	358	2196
1984	1775	405
1985	6342	3394
1986	5102	4836
1987	5710	3952
1988	9166	1899
1989	6530	1930
1990	5121	545
1991	5495	1418
1992	5982	957
1993	4386	1898
1994	3775	4522
1995	4395	4157
1996	3788	4498
1997	4105	3569
1998	2693	2927

Handgear Trip Estimates

Table 4.3.4 displays the estimated number of rod and reel and handline trips targeting large pelagic species in 1998. The trips include commercial and recreational trips, and are not specific to any particular species. One can assume that most trips in MA, NH, and ME were targeting bluefin tuna, and that most of these trips were commercial, as approximately 90 percent of Atlantic tunas vessel permit holders in these states have commercial General category tuna permits. For the other states, the majority of the trips are recreational (in that fish are not sold), with the predominant targeted species consisting of yellowfin tuna and sharks.

Table 4.3.4 Estimated Total Trips Using Rod and Reel or Handgear Targeting Large Pelagic Species from June 1 Through November 1, 1998. Source: LPS telephone and dockside interviews. Estimates are preliminary.

State/Area	Private Vessel Trips	Charter Trips	Total
VA	3,372	658	4,030
MD/DE	7,879	2,994	10,873
NJ	13,720	2,485	16,205
NY	9,501	2,994	12,495
CT/RI	3,946	1,077	5,023
MA	12,456	661	13,117
NH/ME	7,859	500	8,359
Total	**58,733**	**11,369**	**70,102**

4.3.3 U.S. vs. International Catch

SCRS data do not lend themselves to organize international landings into a commercial handgear category. While some countries report rod and reel landings, these numbers may include both commercial and recreational landings. Reported 1998 international catches of all Atlantic HMS can be found in Table 4.1.

4.3.4 Economic Data

Information on the economics of the handgear fisheries for Atlantic HMS that has become available since the publication of the HMS FMP is described below. Additional description of the economics of the Atlantic HMS fisheries, including those using handgear, are presented in Section 2.2.4 of the HMS FMP. Export and import data, including those for tuna caught with commercial handgear, are updated in Section 6 of this report. Since bluefin tuna are primarily targeted with commercial handgear, economic studies involving bluefin tuna are discussed here.

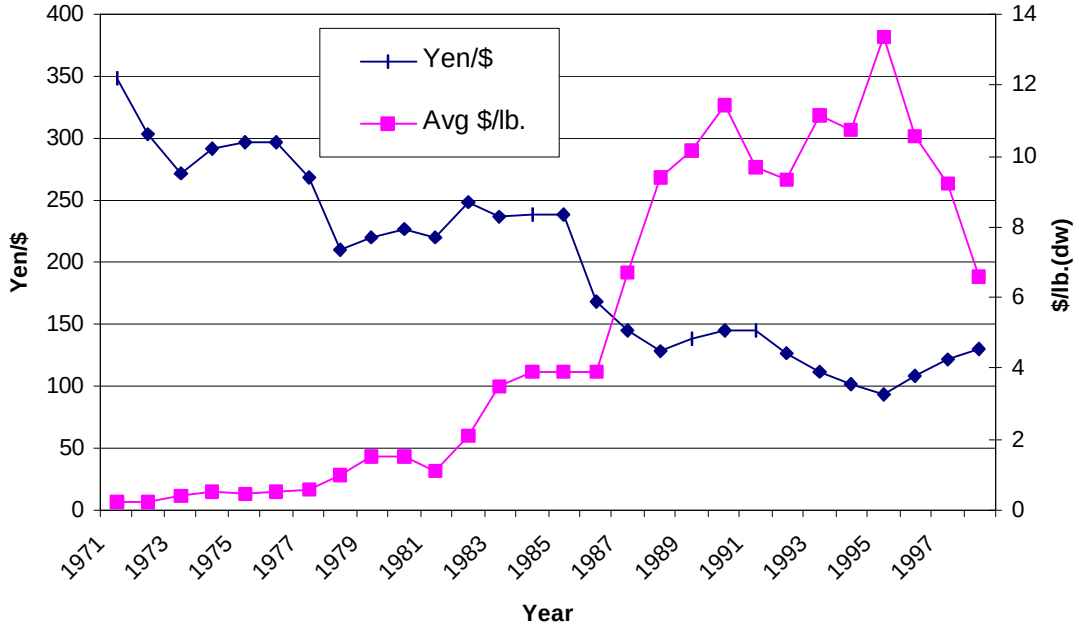
In 1999, researchers at the University of Rhode Island issued a final report on a project entitled, "Assessment of Atlantic Bluefin Tuna Markets: The Economic Implications for Management Plans" (Carroll *et al*, 1999). The objectives of the project were: 1) to evaluate the influence of factors such as quantity supplied, time of harvest, and quality characteristics on the price of U.S. Atlantic bluefin tuna sold on the Japanese wholesale market; 2) to determine the relationship between prices in Japan and ex-vessel prices received by U.S. fishermen, and 3) to determine how different fishery management options influence gross revenues received by U.S. fishermen. The final report concluded that regulations should be implemented so as to avoid

capture seasons that are condensed into sporadic intervals. The researchers recommend that consumer preferences should be considered for the efficient exploitation and trade of bluefin tuna in order to help increase revenues for the industry and to eliminate economic inefficiencies generated by public management. Specifically, the report suggests a more dispersed allocation of harvest planned in conjunction with periods of the year when fish seem to possess consumer-favored characteristics, such as high fat content.

In the Spring of 1999, NMFS contracted with researchers at the University of Massachusetts to perform a study on the use of spotter aircraft in the Atlantic bluefin tuna fishery. The main goals of the study were as follows: Quantify the extent of spotter plane use in the bluefin tuna fishery and collect information about the pilots, plane owners, and vessel operators involved; gather economic data related to the use of spotter planes in the bluefin tuna fishery; investigate the effect spotter planes have on catch rates and season length in the bluefin tuna fishery, and; investigate the safety issues related to the use of spotter planes in the bluefin tuna fishery. Copies of the final report can be obtained from the HMS Management Division at the Northeast Regional Office of NMFS in Gloucester, MA.

Recent price and market information is included in section 2.2.4 of the HMS FMP. The predominant commercial fishery for bluefin tuna in the United States is the handgear fishery in New England, and prices for bluefin tuna can be greatly influenced by many factors, including the Japanese Yen/U.S. Dollar (¥/$) exchange rate. Figure 4.3.1 shows the average ¥/$ exchange rate, plotted with average ex-vessel bluefin tuna prices, from 1971 to 1998. The average monthly ¥/$ exchange rate for January through October 1999 was approximately 116, down from 131 in 1998. Ex-vessel prices have not yet been compiled for 1998, but reports from fishermen and dealers indicate that ex-vessel prices were higher than in 1998 mostly due to the devaluation of the dollar in relation to the yen. The pace of landings in the General category in 1999 was slower than in recent years (with the exception of October), which may have also contributed to better ex-vessel prices, as market gluts from too many U.S. fish being sold at once did not occur or were more infrequent. Reports from fishery participants indicate that the lower catch rates may have been attributable to warmer than average water temperatures in the New England area.

Figure 4.3.1 Average Annual Yen/$ Exchange Rate and Average U.S. Bluefin Tuna Ex-vessel $/lb (dw): 1971-1998.



4.3.5 Social Data

A recent study (Sutton and Ditton, 1999) details key social and economic characteristics of the for-hire fishery in the offshore waters of Alabama, Mississippi, Louisiana, and Texas. The charter and party boat industry has been historically difficult to classify within a fishery management framework. They are essentially commercial fishermen, earning their livelihood from fishing activity, yet they must comply with recreational limits. Sutton and Ditton's study results apply primarily to fishermen governed under the Gulf of Mexico Fishery Management Council, but there is interaction with several stocks classified as Highly Migratory Species. In addition, general conclusions about the charter and party boat fisheries apply to HMS management, notably the importance of industry participation in any further fishery management in the Gulf. There has been some difficulty in assessing the socio-economic dynamics of the for-hire fisheries in the past since they tend to operate on a multi-species basis.

Sutton and Ditton provide a wide range of social and economic indicators to assess the status of the fishery and contrast the results with a similar study conducted in 1989 (Ditton *et al.*) for longitudinal perspective. Key indices that apply to Atlantic tunas, swordfish, sharks, and billfish are:

Species Dependence

- Fifty-five percent of charter boat operators targeted tuna at least once between March 1, 1997 and February 28, 1998.
- Five percent of total charter boat effort during that time period was directed towards tuna.
- Sixty-five percent of party boat operators targeted shark and 55 percent targeted tuna at least once between March 1, 1997 and February 28, 1998.
- Five percent of total party boat effort during that time period was directed towards sharks.
- Only 35 percent of charter and 10 percent of party boats targeted billfish at least once between March 1, 1997 and February 28, 1998.

Financial Operations and Economic Impact

- Estimated average annual gross revenue for charter boats was $68,934 (most operations do not appear to be highly profitable).
- Estimated income and employment generated by the charter boat industry was: Alabama - $5.6 million (270 jobs); Mississippi - $2.1 million (211 jobs); Louisiana - $1.8 million (118 jobs); and Texas - $6.1 million (385 jobs).
- Estimated average annual gross revenue for party boats was $137,308.
- Estimated income and employment generated by the party boat industry was: Alabama - $348,979 (16 jobs); and Texas - $1.7 million (77 jobs).

Opinions on Fisheries Management

- Eighty-five percent of charter and 100 percent of party boat operators cited “fishing regulations” as an important problem facing the industry (red snapper regulations were the most contentious).

Major Changes Since 1987

- The number of charter boats in the study area increased from 210 in 1987 to 430 in 1997.
- The number of party boats in the study area decreased from 26 in 1987 to 23 in 1997.
- The number of passenger-trips taken on both charter and party boats has increased three-fold since 1987 (436,706 total estimated trips).
- There has been an observed trend of increased boat length, horsepower, maximum capacity, and reliance on offshore species since 1987.

Since publication of the HMS FMP, NMFS has received comment from the families of General category bluefin fishermen that restricted-fishing days allow for the scheduling of family activities during the bluefin season, and that waiving restricted fishing days is disruptive as fishermen feel compelled to fish on every open fishing day. NMFS will consider these comments and other information from fishery participants when planning future General category effort control schedules and will discuss these issues with the HMS AP.

4.3.6 Bycatch Issues and Data Associated with the Fishery

As compared with other commercial gear types, commercial handgear produces relatively lower levels of bycatch. However, bycatch in the yellowfin tuna commercial handgear fishery is unmonitored in those areas where commercial activities occur after the Large Pelagic Survey

(LPS) sampling season. Rod and reel discards of HMS as assessed from LPS data are discussed in the Recreational Section (4.4.6) as are new efforts in documenting catch and release survival rates. At this time, however, there is little information regarding important interactions and new data relating to commercial handgear bycatch. Anecdotal reports suggest that there may be an issue of small yellowfin tuna and bigeye tuna discards, but there is no supporting documentation at this point. Some regulatory discards occur because fishermen must comply with minimum size restrictions.

4.3.7 Safety Issues Associated with the Fishery

Section 3.9 of the HMS FMP describes safety of human life at sea as it pertains to the fisheries for Atlantic HMS. Additional safety information regarding the commercial handgear fisheries for Atlantic HMS is presented below.

In September 1999, three vessels participating in the Atlantic bluefin tuna General category capsized off Chatham, Massachusetts. Two of the vessels capsized due to weight while attempting to boat commercial-sized bluefin tuna (measuring 73 inches or greater and weighing several hundred pounds). The third vessel capsized while under tow by another vessel. Although the United States Coast Guard (USCG) conducts routine vessel safety inspections at sea on a variety of vessels throughout the year, the USCG concentrated patrol activities on bluefin boats and followed the fleet south of Cape Cod during the busy fall season. Boarding officers indicate that although the majority of General category vessels have the necessary safety equipment, many part-time fishermen operating smaller vessels do not.

Currently, NMFS does not require proof of proper safety equipment as a condition to obtain an Atlantic tunas permit. Instead, NMFS informs permit applicants that commercial vessels are subject to the Fishing Vessel Safety Act of 1988 and advises them to contact their local USCG office for further information. The USCG District Boston office reports receiving 50 to 75 calls a week during the peak fishing season; officers speak with callers to answer all vessel questions including those pertaining to equipment.

Since NMFS regulations do not require USCG inspection or safety equipment in order to obtain a General category permit, NMFS cannot be certain that all participants in the commercial bluefin fishery are adequately prepared for the conditions they may encounter. NMFS is concerned about the safety of all vessels participating in the General category and is working with the USCG to improve communication of vessel safety requirements to General category vessel operators.

It is unlawful for Atlantic tunas vessels to engage in fishing unless the vessel travels to and from the area where it will be fishing under its own power and the person operating that vessel brings any bluefin tuna under control (secured to the catching vessel or on board) with no assistance from another vessel, except when shown by the operator that the safety of the vessel or its crew was jeopardized or other circumstances existed that were beyond the control of the operator. NMFS Enforcement and USCG boarding officers have recently encountered vessels

participating in the bluefin tuna fishery that are unable to transit to and from the fishing grounds due to their limited fuel capacity. Occasionally these smaller vessels will work in cooperation with a larger documented vessel to catch a bluefin; others have been observed to leave lifesaving equipment at the dock to make room for extra fuel, bait, and staples. NMFS is concerned that use of such inadequately-equipped vessels jeopardizes crew in that the vessel may not be able to safely return to shore without assistance of the larger vessel due to insufficient fuel or to adverse weather conditions.

If a vessel is boarded at sea and found to be lacking major survival equipment, the USCG may terminate the trips and escort the vessels back to the dock. In 1999, the USCG focused boardings on small vessels, especially those owned by "part-time" commercial bluefin fishermen, and terminated about ten trips due to the lack of safety equipment on board.

NMFS has received comments from some General category participants that effort controls, particularly restricted-fishing days (RFDs), allow fishermen to rest and to make needed vessel repairs, and therefore improve safety. On the other hand, there is a perception by many General category participants that every open day must be fished. The issue of effort controls alleviating fatigue problems was discussed in the FMP, but vessel repairs were not. NMFS also continues to receive comments, as discussed in the FMP, that indicate that RFDs may encourage fishermen to fish in conditions which they generally would avoid on open days, and that a season without RFDs would allow fishermen to choose their own schedule of fishing days, thus alleviating derby conditions and safety concerns.

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

4.4 Fishery Data: RECREATIONAL HANDGEAR

The HMS Handgear (rod and reel, handline, and harpoon) fishery includes both commercial and recreational fishermen and is described in Section 2.5.8 of the HMS FMP. This section will describe the recreational portion of the handgear fishery, primarily rod and reel fishing. Commercial handgear fisheries for HMS are discussed separately in Section 4.3 of this report.

4.4.1 Overview of History and Current Management

Atlantic tunas, swordfish, and sharks are managed under the HMS FMP, while Atlantic billfish are managed separately under the Billfish Amendment. The history of Atlantic billfish management is reviewed in Section 1.1.1 of the Billfish Amendment. Summaries of the domestic aspects of the Atlantic tuna fishery, the Atlantic swordfish fishery, and the Atlantic shark fishery are found in Sections 2.2.3, 2.3.3, and 2.4.3, respectively, of the HMS FMP.

Atlantic tunas, sharks, and billfish are all targeted by recreational fishermen using rod and reel gear. Atlantic swordfish are also targeted and, although this fishery had declined dramatically over the past twenty years, recent anecdotal reports suggest that a recreational swordfish fishery may be growing in the Mid-Atlantic Bight and off the East Coast of Florida. Recreational fishing for Atlantic HMS is managed primarily through the use of minimum sizes and bag limits. Recreational tuna fishing regulations are the most complex and include a combination of minimum sizes, bag limits, limited seasons based quota allotment for bluefin tuna, and reporting requirements depending on the particular species and vessel type. Atlantic tunas are the only HMS species group that require a permit for recreational fishing at this time. Bluefin tuna are the only HMS species managed under a recreational quota for which the fishing season closes after the quota has been met. While Atlantic marlin have associated landing caps (a maximum amount of fish that can be landed), the overall strategy for management of recreational billfish fisheries is based on size limits. The recreational fishery for swordfish is also managed through a minimum size requirement. The recreational shark fishery is managed through bag limits in conjunction with minimum size requirements. Additionally, the possession of several species of sharks is prohibited.

Through restrictions on the recreational fishery, the United States intends to achieve at least a 25 percent reduction in billfish landings by the end of the 1999 fishing year as required by ICCAT. U.S. landings of white marlin were reduced 20 percent from 1996 levels (63 FR 14030, March 23, 1998) through an increase in the minimum size to 168 cm (66 inches) for the 1998 fishing season. Blue marlin minimum size requirements were increased as well to a limit of 244 cm (96 inches). However, 1998 reported landings of blue marlin exceed those reported in 1997. On September 29, 1998 (63 FR 51859), the minimum size for blue marlin was increased once again to 251 cm (99 inches). The Billfish Amendment maintained these size requirements.

4.4.2 Most Recent Catch and Landings Data

The recreational landings databases for HMS consist of data obtained through surveys including the Marine Recreational Fishery Statistics Survey (MRFSS), Large Pelagic Survey (LPS), Southeast Headboat survey (HBS), Texas Headboat survey, and the Recreational Billfish Survey tournament data (RBS). Descriptions of these surveys, the geographic areas they include, and their limitations, are discussed in both the HMS FMP and the Billfish Amendment in Sections 2.6.2 and 2.3.2, respectively.

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

Table 4.4.1 Updated Domestic Landings for the Atlantic Tunas, Swordfish and Billfish Recreational Rod and Reel Fishery: 1995-1998 (mt ww)*. Sources: 1999 National Report, Large Pelagic Survey, SEFSC Recreational Billfish Survey.

Species	Region	1995	1996	1997	1998
Bluefin tuna**	NW Atlantic	402	362	299	184
Bigeye tuna	NW Atlantic	11.8	108.2	333.5	228.0
	GOM	0	0	0	0
Albacore	NW Atlantic	19.1	277.8	269.5	601.1
	GOM	0	61.7	65.2	0
	Total	19.1	339.5	334.7	601.1
Yellowfin tuna	NW Atlantic	4125.4	4484.8	3560.9	2845.7
	GOM	31.7	13.2	7.7	80.9
	Total	4157.1	4498	3569	2927
Skipjack tuna	NW Atlantic	20.5	48.1	42.0	49.5
	GOM	0	36.4	21.7	37.0
	Total	20.5	84.5	63.7	86.5
Blue marlin***	NW Atlantic	23.0	17.0	25.0	34.1
	GOM	14.0	8.3	11.5	4.5
	Caribbean	6.0	9.6	8.6	10.6
	Total	43.0	34.9	45.1	49.2
White marlin***	NW Atlantic	8.0	2.7	0.9	2.4
	GOM	1.0	0.6	0.9	0.2
	Caribbean	0.0	0.0	0.0	0.02
	Total	9.0	3.3	1.8	2.6
Sailfish***	NW Atlantic	9.0	0.2	0	0.1
	GOM	1.0	0.8	0.4	1.0
	Caribbean	0.0	0.2	0.2	0.05
	Total	10.0	1.2	0.6	1.15

* Rod and reel catches and landings for Atlantic tunas represent estimates of landings and dead discards based on statistical surveys of the U.S. recreational harvesting sector.

**Rod and Reel catch estimates for bluefin tuna in the U.S. National Report to ICCAT include both recreational and commercial landings. Rod and reel catch of bluefin less than 73" curved fork length (CFL) are recreational, and rod and reel catch of bluefin 73 inches CFL or greater are commercial. Rod and reel catch of bluefin > 73" CFL also includes a few metric tons of "trophy" bluefin (recreational bluefin 73").
***Blue marlin, white marlin, and sailfish landings are estimated based on the SEFSC Recreational Billfish Survey and the Large Pelagic Survey.

Table 4.4.2 **Final Estimates of Total Recreational Harvest of Large Coastal Sharks: 1995-1998 (numbers of fish in thousands)**. Source: Modified from 1998 Report of the Shark Evaluation Workshop (changes from previously reported estimates are noted)*

Species Group	1995	1996	1997	1998
LCS	176.3 (-7.1)	188.5 (4)	165.1 (3.2)	160.4
Pelagic	32.8	20.8	8.4	11.6
SCS	135.1	112.7	97.0	77.9

*For an explanation of the derivation of these estimates, see the 1999 Shark Evaluation Annual Update.

Table 4.4.3 1998 Recreational Landings of Atlantic Sharks by Number.

Large Coastal Sharks	Recreational Landings
Bignose	none reported
Blacktip	76,522
Bull	802
Dusky	4,277
Hammerhead	384
Hammerhead, Great	441
Hammerhead, Scalloped	1,101
Hammerhead, Smooth	370
Lemon	1,992
Night	none reported
Nurse	2,690
Reef	none reported
Sand Tiger	none reported
Sandbar	33,245
Silky	5,039
Spinner	7,119
Tiger	1,302
Large Coastal	16,505
Unclassified	none reported
Unclassified Fins	none reported
Total:	151,791

Pelagic Sharks	Recreational Landings
Bigeye thresher	none reported
Blue	6,003
Shortfin Mako	5,581
Longfin Mako	none reported
Mako	none reported
Oceanic Whitetip	none reported
Porbeagle	none reported
Thresher	36
Pelagic	none reported
Unclassified	none reported
Total:	11,620

Small coastal sharks	Recreational Landings
Atlantic Angel	107
Atlantic Sharpnose	42,048
Blacknose	9,578
Bonnethead	26,191
Finetooth	none reported
Unclassified	none reported
Total:	77,924

Rod and Reel Billfish Landings

Two papers submitted to the SCRS in October of 1999 report on trends in billfish landings in the United States. A preliminary evaluation of U.S. billfish landings in 1998 relative to 1996 was performed by the SEFSC to compare respective U.S. rod and reel catches and fishing success. This evaluation compares results from the Recreational Billfish Survey (RBS) for 1998 with the 1996 survey results. It appears that the minimum sizes implemented in 1998 may have contributed to decreases in numbers of blue marlin and white marlin boated, percentage of fish boated, and the abundance adjusted boating rates. The reductions in numbers of fish boated and in boated rates were in the order of 17-25 percent for blue marlin and at least 25 percent for white marlin when comparing all events between years or matched events in both years.

The other paper addressing U.S. billfish landings explores the possible integration of the U.S. Marine Recreational Fisheries Statistical Survey (MRFSS) catch estimates and the U.S. RBS. The resulting model attempts to estimate total U.S. recreational marlin landings by adjusting for the bias in the relatively precise annual RBS estimates. The bias correction was based on regressions of relatively unbiased, but highly imprecise, MRFFS estimates on the RBS estimates. The resulting models were used to predict the U.S. recreational landings of Atlantic blue marlin and white marlin for 1981-1997. These preliminary estimates will continue to be evaluated and presented at the Data Preparatory Session of the ICCAT Billfish Workshop scheduled for the summer of 2000. Additional research will be conducted and reported to the ICCAT Billfish Workshop during the summer of 2000.

4.4.3 U.S. vs. International Catch

Important fisheries including directed recreational fisheries of the United States, Venezuela, Bahamas, Brazil, and many other countries and entities in the Caribbean Sea and off of the west coast of Africa are responsible for significant HMS landings. Directed recreational fisheries for sailfish occur in the west Atlantic from the United States, Venezuela, Bahamas, Brazil, Dominican Republic, Mexico, and other countries in the Caribbean Sea. However, of these countries, the United States is the only country that reports recreational landings to ICCAT. Therefore, a comparison of the percentage of U.S. landings relative to recreational fisheries in other countries is not feasible. In addition, total landings data are incomplete for 1997 and 1998 because many countries that reported landings in 1996 failed to report their 1997 and 1998 landings. However, new landings data are becoming available for historically traditional fisheries, as well as some artisanal fisheries.

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

At the 1999 ICCAT meeting in Rio, the Commission adopted a resolution to improve the quantity and quality of recreational data collection. Recreational fisheries are to be discussed and assessed in each country's National Report beginning in the year 2000. In addition, the SCRS was called upon to examine the impact of recreational fishing on tuna and tuna-like species.

4.4.4 Economic Data

A summary of the social and economic aspects of the recreational Atlantic tunas, swordfish, and shark fisheries is provided in Sections 2.2.4, 2.3.4, and 2.4.4 of the HMS FMP. A

description of available economic data on the billfish recreational fishery is in Section 2.1.4.1 of the Billfish Amendment.

A team of NMFS economists conducted a survey in 1994 of anglers in New England and the Mid-Atlantic. The data collected were used to estimate expenditures and economic value of the various groups of recreational fisheries in this area. One category of fishing, called "Big Game" consisted primarily of HMS, including sharks, billfish, and tunas. Non-HMS species in the category included wahoo, dolphin, tarpon, and cobia. The results of the study were recently published in a series of NOAA Technical Memoranda (Hicks *et al*, 1999; Thunberg *et al*, 1999; and Steinback *et al*, 1999). Although these regions are not an exhaustive picture of the entire HMS recreational fishery, the results provide considerable insight into the absolute and relative values of the recreational fisheries for HMS.

Using historic catch rate data in combination with actual choices made by recreational anglers (where and how to fish), a site choice model was estimated for recreational demand for saltwater angling. This model can be used to predict how anglers might react to changes in expected catch rates as well as various regulations.

Overall average willingness to pay (WTP) for a one-day fishing trip ranged from a low of less than a dollar in New Hampshire to a high of $42 in Virginia. Aggregate WTP (average WTP times the number of trips) ranged from $18 million in New Hampshire to nearly $1 billion in Virginia. Using model results, it was possible to estimate the WTP for a one fish increase in the expected catch rate across all sites in the choice set. The highest average value was attributed to big game fish, ranging from $5 to $7 per trip (about $5.40 on average), in addition to the value of the trip. The marginal value of an increase in catch per trip was highest for big game fish, and lowest for bottom fish.

Survey results indicated that boat fees were responsible for the greatest percentage of expenditures. Roughly 70 percent and 53 percent of total expenditures went for private/rental boats and charter/party boats, respectively. Travel expenses were the smallest portion of expenditures, although travel costs for those fishing on party/charter vessels were about twice as high as those for anglers on private/rental boats ($28 vs. $16).

While these results are useful in considering the economic value of HMS recreational fisheries, specific surveys focusing on HMS are preferable in order to consider the particular nature of these fisheries. NMFS will continue to pursue options for funding economic surveys of the recreational HMS fisheries..

4.4.5 Social Data

The NOAA Technical Memoranda cited above (Hicks *et al*, 1999; Thunberg *et al*, 1999; and Steinback *et al*, 1999) included an analysis of survey questions on "Big Game" recreational anglers' attitudes towards fishery regulations. The results appear to indicate that anglers in the northeast are conservation-minded, as most support four basic types of recreational measures:

minimum sizes, bag limits, seasons and area closures. Minimum sizes were deemed most popular (over 90 percent of anglers approved), while area restrictions were the least popular management alternative (two-thirds of anglers approved).

In August 1999, a thesis was submitted to the College of Agriculture and Life Sciences of Texas A&M University that analyzed the management preferences of members of The Billfish Foundation (TBF) who responded to a mail survey (Gillis, 1999). The survey was sent to a random sample of 435 TBF members (approximately 11 percent of membership residing in the United States). A total of 229 surveys were completed and returned at a 57 percent response rate (excluding 24 surveys that were undeliverable). The study focused on billfish angler preferences for potential management measures necessary to achieve a 25 percent reduction in landings of Atlantic blue and white marlin. The management measures were those considered by NMFS in the Draft Amendment One to the Billfish FMP. Respondents evaluated sixteen potential management regimes defined by two levels of the six different management measures NMFS was considering as options.

Respondents' evaluation choices were most influenced by the management measures concerning "Tournaments" and "Hook Restrictions", which accounted for an average of 39 percent and 21 percent, respectively, of TBF member evaluation choices. TBF members were found to prefer "mandatory no-kill tournaments" over "no new tournament specific regulations" and "limiting rigs and lures to a single hook only" over "no restrictions on the number of hooks used". In general, TBF members appeared to prefer the most restrictive management regime that could be constructed from the different levels of the six management measures.

The results of this study concern the preferences of TBF members only and therefore it can not be concluded that the results are indicative of the preferences of billfish anglers overall. As active members of one or more conservation groups, it would be expected that their preferences for management measures would differ from other billfish anglers who may not be involved in related conservation efforts. However, the study concludes that survey analysis can be a useful tool to define management regimes that achieve biological objectives while maximizing constituent satisfaction.

An additional report, "A Cross-sectional Study and Longitudinal Perspective on the Social and Economic Characteristics of the Charter and Party Boat Fishing Industry of Alabama Mississippi Louisiana, and Texas", prepared for NMFS through a research contract with the Texas A&M University Research Foundation was submitted in August of 1999. The purpose of the study was to provide fisheries managers with both a current and historical perspective on the for-hire fishery in offshore waters in Alabama, Mississippi, Louisiana, and Texas by replicating a previous study of charter and party boat operators in the central and western Gulf of Mexico (Ditton et al., 1989). The charter headboat fishery is a commercial sector and is discussed in more detail in Section 4.3. Additional new social information is also discussed in Section 5.2.

4.4.6 Bycatch Issues and Data Associated with the Fishery

Bycatch in the recreational rod and reel fishery is difficult to quantify because many fishermen value the experience of fishing and may not be targeting a particular pelagic species. Based on results from a March 1997 to February 1998 NMFS-conducted socioeconomic survey of recreational fisherman from North Carolina through Louisiana, 60 percent of fishermen did not have a target species when they fished (see Section 5.2 for more information on this study). Recreational "marlin" or "tuna" trips may yield dolphin, tunas, wahoo, and other species, both undersized and legally sized. Bluefin trips may yield undersized bluefin or a seasonal closure may prevent landing of a bluefin tuna above the minimum size. In some cases, therefore, rod and reel catch may be discarded. 1998 bluefin tuna rod and reel discards were estimated at less than 3 mt (49 fish), a decrease from the 15 mt of dead discards reported in 1997.

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

Bycatch can result in death or injury to discarded fish and bycatch mortality should be incorporated into fish stock assessments and evaluation of management measures. Rod and reel estimates from Virginia to Maine during June through October can be monitored through expanding survey data derived from the LPS (dockside and telephone surveys). Actual numbers of fish discarded for many species are so low that presenting these data by area may be misleading, particularly if estimates are expanded for unreported effort in the future. The HMS FMP presented the "raw" data for bycatch species in the rod and reel fishery from the 1997 LPS database in summary format (for all areas) in Table 3.38. This table is updated below to include preliminary 1998 data.

Table 4.4.4 **Reported Discards* of HMS in the Rod and Reel Fishery.** Source: Large Pelagic Survey (LPS) Preliminary Data, 1997 data from 3538 total dockside intercepts, 1998 data from 3095 total dockside intercepts.

Species	Number of Fish Kept		Number of Fish Discarded Alive		Number of Fish Discarded Dead	
	1997	1998	1997	1998	1997	1998
White Marlin**	7	11	203	465	0	0
Blue Marlin**	2	3	30	27	0	0
Sailfish**	0	1	2	2	0	0
Swordfish	5	1	6	5	0	0
Bluefin Tuna	749	653	1,181	1,105	12	11
Bigeye Tuna	17	17	6	9	6	18
Yellowfin Tuna	1,632	2646	224	645	8	3
Skipjack Tuna	285	261	468	267	60	4
Albacore Tuna	189	558	43	92	2	1
Thresher Shark	3	7	2	2	0	0
Mako Shark	51	78	86	92	3	1
Sandbar Shark	5	2	30	56	1	0
Dusky Shark	16	6	50	54	0	0
Tiger Shark	0	2	5	5	0	1
Blue Shark	68	26	1,897	780	5	8
Hammerhead Shark	1	1	4	4	0	0
Wahoo	6	71	1	2	0	0
Dolphin	920	7263	61	194	0	2
King Mackerel	174	198	1	10	6	0
Atlantic Bonito	336	328	203	300	1	11
Little Tunny	587	1231	1,015	1507	17	5
Amberjack	3	6	18	40	0	0

*NMFS typically expands these “raw” data to report discards of bluefin tuna by the rod and reel fishery to ICCAT. If sample sizes are large enough to make reasonable discard estimates for other species, NMFS may estimate discard estimates of other bycatch species in future SAFE reports.

**The Billfish Amendment established billfish released in the recreational fishery as a “catch and release” program, thereby exempting these fish from bycatch considerations

Outreach programs were included as final actions in the HMS FMP and the Billfish Amendment as part of the management measures to address bycatch. These programs have not yet been implemented, but preparation of program designs are currently in progress. One of the key elements of the outreach program will be to provide information that leads to an improvement in post-release survival from both commercial and recreational gear.
Section 3.5.2.2 in the Billfish Amendment includes a review of available information on post-release mortality. Table 3.5.3 of the Billfish Amendment and Table 3.40 of the HMS FMP list the existing studies, their methods, and conclusions. Approximately 90 percent of blue marlin taken by U.S. recreational fishermen are released after capture, therefore, studies on post-release mortality are critical.

Since publication of the HMS FMP and the Billfish Amendment, several new studies have been initiated and/or completed which may improve bycatch information, as well as provide useful information to present in future outreach programs. A recent paper acknowledges that recent technological advances in tags, including those that release from the fish at a preprogrammed time and then transmit data to satellites, offer the potential for developing better estimates of release mortality (Goodyear, 1999a). This paper uses simulation techniques to examine factors leading to robust estimates of release mortality and contends that initial studies should focus on proving the technology. Each fishing mode is likely to have a different release mortality rate and each experiment will only estimate the release mortality rate for the species, gear, and fishing method employed in the fishery. Therefore, the number of tags required to estimate the total number of deaths of released fish of all species could be in the tens of thousands. However, the paper also notes that a well-researched experimental design might reduce the required number of tags significantly.

In another study, an evaluation of pop-up satellite tag technology to estimate post-release survival of blue marlin was recently conducted by the Virginia Institute of Marine Science (VIMS), Bermuda Division of Fisheries in the Department of Agriculture and Fisheries, and NMFS' Southeast Fisheries Science Center (SEFSC). Results of previous acoustic tracking studies in which blue marlin were followed up to several days suggest that mortality, when it occurs, usually happens within 48 hours of release. Pop-up satellite tags, which have been used to study the movements of bluefin tuna and marlin over time periods of one to several months, provide a potential tool to study post-release survival of billfish over shorter time periods. Nine pop-up satellite tags were deployed on blue marlin caught on recreational gear off the southwest coast of Bermuda. Fish ranged from 150 to 400 pounds, and were captured on rod and reel with trolled lures or skirted dead baits. Fight times ranged from fifteen to forty-five minutes and some individuals required resuscitation before release. Eight of the nine tags reported after five days at liberty. Data demonstrated that at least eight of the nine tagged fish were alive for the five days following their capture and release. The study also concluded that pop-up satellite tag technology is appropriate for estimating post-release survival of this species.

Summary results of the South Carolina Marine Game Fish Tagging program were presented at the August 1999 meeting of the American Fisheries Society (Davy, 1999). The Tagging Program has been in operation since 1974 through the South Carolina Department of

Natural Resources and relies on cooperating anglers to tag fish. Since its inception, over 800 blue marlin, 331 white marlin, 1218 sailfish, and 6,491 sharks have been tagged off the South Carolina coast. Recovery rates have been low, as is typical for HMS, and hover around the 1 percent mark. The study noted the dramatic increases in release of billfish species (98.5 percent in 1999 versus 26.9 percent in 1987) as well as the effects of minimum size limits. Nearly two-thirds of the sailfish and white marlin caught in 1999 were undersized, as were 85 percent of the blue marlin. Although the numbers of fish recovered from the tagging program are too low to establish general conclusions, results seem to indicate that billfish travel extensively and do survive after being released. Several cases were reported where specific fish had been boated in poor condition and went on to make full recoveries (as indicated by weight and general health at recovery).

In addition to the need for post-release mortality studies, the HMS FMP noted that scientific studies are also needed to determine the impact of various fishing practices on bycatch and bycatch mortality of billfish. Since publication of the HMS FMP, Dr. Eric Prince of the SEFSC has conducted an evaluation of the performance of circle and comparable size "J" hooks, primarily on Atlantic and Pacific sailfish. Hook types were assessed in terms of catch and hooking rates, hook location, hook damage, and amount of bleeding. Two basic types of recreational billfishing techniques were involved: trolling with dead natural bait and drifting or kite fishing with live natural bait. The portion of the study that involved trolling with dead bait took place off Iztaba, Guatemala during the months of March and April, 1999. A total of over 200 sailfish were caught on circle hooks and about 160 were caught on "J" hooks. Catch and hooking rates for Pacific sailfish were also compared between circle and "J" hooks using much larger sample sizes at the resort in previous years. In addition, numerous sailfish were caught using live bait in the south Florida sailfish fishery. This portion of the study provided some insight to possible differences in hook performance between circle hooks with and without an offset point. Some information on the use of circle hooks was also obtained for Pacific and Atlantic blue marlin. In general, circle hooks have an equal or slightly higher catch rate compared to equivalent size "J" hooks fished in a similar manner, although hooking techniques between hooks types are different. Circle hooks also minimize deep hooking and foul hooking, thus promoting the live release of these species.

A similar study by the Massachusetts Division of Marine Fisheries was recently conducted comparing circle and straight hooks relative to hooking location, damage, and success while catch and release angling for bluefin tuna. The objectives of the study were to statistically compare the performance of circle hooks to standard straight shank hooks relative to hooking rate, location, damage, and hook effectiveness in typical bluefin tuna 'chunk' fisheries as practiced along the East Coast. During the summers of 1997 and 1998, ten offshore fishing trips were made off the coasts of Virginia and Massachusetts to catch bluefin tuna using standard drifting and baiting techniques with circle hooks and straight shank hooks ranging in size 10/0-12/0 and 5/0-8/0, respectively. A total of 129 bluefin hooking events were recorded during the study, 69 on circle hooks and 60 on standard straight hooks. Of the hooked bluefin, 77 were successfully landed and dissected to assess damage. Statistically significant differences were found between the two hook types relative to hook location. Of the landed bluefin tuna, 91 percent of the 43 circle-hooked bluefin

tuna were hooked in the hinge of the jaw in contrast to 56 percent of the 34 straight-hooked bluefin tuna. The results of this study provide evidence that the use of circle hooks can reduce physical trauma associated with the catch and release of bluefin tuna. Additional sampling is planned for future seasons.

4.4.7 Safety Issues Associated with the Fishery

The USCG does not maintain statistics on boating accidents, rescue, or casualty data specifically pertaining to recreational fishing as it does for the commercial industry. As a result, the HMS FMP and the Billfish Amendment contain only minimal safety information regarding this fishery. However, the USCG does compile statistics on recreational boating accidents and casualties, independent of the activity in which they are engaged. Coast Guard Safety Officer and Recreational Boats Safety Specialist, Lieutenant Keirsten Current cited two common situations that place recreational boaters in potential danger. Individuals in small vessels often venture out farther than the vessels are designed without the proper navigational equipment and may encounter rougher water than their boats can handle. Since fishermen targeting HMS species, particularly marlin, often travel at least 75 to 100 miles offshore, having a properly equipped vessel of adequate size is very important for the safety of recreational HMS constituents. The other situation that the Lieutenant noted as a frequent safety concern of the Coast Guard is when someone is up in the flybridge. Both of these situations can lead to people falling overboard. In 1997, approximately 70 percent of all boating casualties were due to drowning and in approximately 90 percent of all the drowning deaths, the victim was not wearing a personal floatation device (PFD).

Table 4.4.5 1997 Reported Boating Casualties. Source: USCG Lt. Current, personal communication.

Age Groups	# of Drowning Fatalities (victim was wearing a PFD)	# of Drowning Fatalities (victim was not wearing a PFD)	Total Number of Drowning Fatalities	# of Fatalities not due to Drowning
0-12	0	14	14	11
13-19	4	36	40	15

20-29	15	91	106	36
30-39	13	98	111	58
40-49	12	97	109	41
50-59	7	76	83	19
60-69	9	40	49	14
70-79	4	24	28	5
≥80	1	5	6	7
Total	**65**	**521**	**586**	**233**

4.5 Fishery Data: ATLANTIC SHARKS

4.5.1 Overview of History and Current Management

Atlantic sharks are targeted primarily through bottom longline, drift gillnet, and rod and reel gear types. Although discussions on other fisheries have been broken down by gear type, the nature of the shark catch and the method of data collection lend themselves to a stock-based analysis. As a result, some of the information overlaps with that found in other sections of the report.

The HMS FMP contained numerous new management measures for Atlantic sharks, including rebuilding programs for ridgeback and non-ridgeback large coastal sharks (LCS) and precautionary measures for pelagic and small coastal sharks (SCS). Specifically, the HMS FMP:

- Reduced the annual commercial quota for LCS to 816 mt dw, apportioned between ridgeback (620 mt) and non-ridgeback (196 mt) LCS.*
- Reduced the annual commercial quota for SCS to 359 mt dw.*
- Reduced the annual commercial quota for pelagic sharks to 488 mt dw and established a separate annual commercial quota of 92 mt dw for the porbeagle and an annual dead discard quota for blue sharks of 273 mt dw.*
- Established a minimum size of 137 cm fork length for ridgeback LCS in commercial fisheries.*
- Reduced the recreational retention limit to 1 shark per vessel per trip, with a minimum size of 137 cm fork length for all sharks, and an additional 1 Atlantic sharpnose shark per person per trip (no minimum size for Atlantic sharpnose sharks).
- Prohibited possession of 19 species of sharks (Atlantic angel, basking, bigeye sand tiger, bigeye sixgill, bigeye thresher, bignose, Caribbean reef, Caribbean sharpnose, dusky, Galapagos, longfin mako, narrowtooth, night, sand tiger, sevengill, sixgill, smalltail, whale and white).*
- Established a public display quota of 60 mt ww for all sharks.
- Established season-specific quotas and adjustments for the commercial fisheries.
- Accounted for all sources of mortality in establishing quota levels, including counting dead discards and landings in state waters after federal closures against federal quotas.*
- Scheduled fishery openings for specified periods in advance of fishery openings.

- Established 100 percent observer coverage in the shark drift gillnet fishery.**

- Created a new management subgroup of deepwater sharks and extended the prohibition on finning to this subgroup.

*Certain measures contained in the HMS FMP have been enjoined until further order of the Middle District Court, Tampa, FL.
**Due to funding constraints, NMFS has issued waivers to all known participants in the directed shark drift gillnet fishery.

As part of the implementation of the HMS FMP, NMFS announced on June 1, 1999 (64 FR 30248), that the ridgeback LCS fishery would open July 1, 1999, and close August 4, 1999, and that the non-ridgeback LCS fishery would open July 1, 1999, and close July 12, 1999.

On June 25, 1999, a coalition of shark fishermen and dealers sued NMFS on several of the new management measures regarding sharks. On June 30, 1999, NMFS received a Court Order from Judge Steven D. Merryday relative to the May, 1997, lawsuit challenging commercial harvest quotas for Atlantic sharks. This court order enjoined many of the new shark management measures that were to go into effect July 1, 1999, *except for* limited access (including incidental catch limits), trip limits (4,000 lb large coastal sharks), shark gillnet observer coverage, and all recreational shark measures. Therefore, the LCS commercial quota reverted to the 1997 level of 1,285 mt dw (all species of LCS included), with no minimum size on ridgeback LCS, and the pelagic and small coastal shark quotas also reverted to the 1997 levels. In addition, commercial shark fishermen are subject to the 1997 prohibited species list (white, basking, whale, sand tiger, and bigeye sand tiger) while the 1999 prohibited species list now applies to recreational fishermen only. On July 9, 1999 (64 FR 37883), NMFS changed the closure of the LCS fisheries to comply with the court order. Due to the injunction against ridgeback and non-ridgeback quotas, NMFS reevaluated the available quota and changed the closure for all LCS to July 28, 1999. On December 6, 1999, a motion to dissolve the injunction and for expedited consideration was filed.

On August 26, 1999 (64 FR 47713), NMFS announced that the LCS quota had not been reached and reopened the LCS fishery for the month of September. On September 30, 1999 (64 FR 53949), NMFS extended the fishery closure until October 15, 1999, due to preliminary estimates indicating that the LCS quota would not be reached by the end of September. As of November 16, 1999, dealer reports and state landing reports indicate that approximately 1,379.5 mt dw of LCS were landed in 1999 (approximately 694 mt dw from January - March, approximately 278.5 mt dw from July 1- July 28, and 407 mt dw from September 1 - October 15), which exceeded the annual quota, per court order, of 1,285 mt dw by approximately 94.5 mt dw, or 7.5 percent of the annual LCS quota. The impact of this quota overharvest on the LCS rebuilding program is unknown at this time.

On November 24, 1999 (64 FR 66114), NMFS announced the length of the commercial fisheries for the first semi-annual period of 2000; all commercial shark fisheries will open January

1, 2000, LCS will close March 31, 2000, and pelagic sharks and SCS will remain open until further notice. NMFS may close these fisheries earlier if harvest data indicate that the quotas will be reached earlier than projected.

4.5.2 Most Recent Catch and Landings Data

The 1999 Shark Evaluation Annual Report indicates that estimates of 1997 landings of large coastal, pelagic, and small coastal sharks (which were preliminary at the time the HMS FMP was prepared) have been finalized, and provides preliminary estimates of 1998 landings (see below). Notable revisions indicate that LCS landings in 1997 were approximately 400 mt dw higher than previously reported, and that landings in 1998 were approximately 249 mt dw higher than the final 1997 estimates. The 1999 Shark Evaluation Annual Report states that:

> Updated catches in numbers for 1997 are estimated to be higher than previously reported because complete landings statistics were not available at the time the original estimates were derived. Catches in numbers for 1998 are estimated to be about 14% higher than 1997 catches. Catch levels higher than the established quota in 1997 and 1998 are attributable to state landings after season closures, and Louisiana is the state with the highest landings.

The impact of these revised landings statistics on the LCS rebuilding program is unknown at this time. On the other hand, 1997 final estimates of pelagic and SCS landings were approximately 189 and 6 mt dw respectively, lower than previously reported and 1998 preliminary estimates are lower still.

Table 4.5.1 **Final Estimates of Total Landings and Dead Discards for Large Coastal Sharks: 1981-1998 (numbers of fish in thousands)***. Modified from 1998 Report of the Shark Evaluation Workshop. Changes from previously reported estimates are noted.

Year	Commercial Landings	Longline Discards	Recreational Catches	Unreported	Coastal Discards	Menhaden Fishery bycatch	Total
1981	16.2	0.9	265.0	N/A	N/A	N/A	282.1
1982	16.2	0.9	413.9	N/A	N/A	N/A	431.0
1983	17.5	0.9	746.6	N/A	N/A	N/A	765.0
1984	23.9	1.3	254.6	N/A	N/A	N/A	279.8
1985	22.2	1.2	365.6	N/A	N/A	N/A	389.0
1986	54.0	2.9	426.1	24.9	N/A	N/A	508.0
1987	104.7	9.7	314.4	70.3	N/A	N/A	499.0
1988	274.6	11.4	300.6	113.3	N/A	N/A	699.9
1989	351.0	10.5	221.1	96.3	N/A	N/A	678.8
1990	267.5	8.0	213.2	52.1	N/A	N/A	540.8
1991	200.2	7.5	293.4	11.3	N/A	N/A	512.4
1992	215.2	20.9	304.9	N/A	N/A	N/A	541.1
1993	169.4	7.3	249.0	N/A	17.6	N/A	443.3
1994	228.0	8.8	160.9	N/A	22.8	26.2 (26.2)	446.7 (26.2)
1995	222.4	6.1	176.3 (-7.1)	N/A	22.2	24.0 (24)	451.0 (16.9)
1996	170.5 (6)	5.7	188.5 (4)	N/A	17.0 (0.6)	25.1 (25.1)	406.8 (35.7)
1997	131.9 (33.5)	5.9 (0.3)	165.1 (3.2)	N/A	13.2 (3.4)	25.1 (25.1)	341.2 (65.5)
1998*	150.0	5.9	160.4	N/A	9.6	25.1	351.0

*For an explanation of the derivation of these estimates, see the 1999 Shark Evaluation Annual Update. 1998 estimates are preliminary.

Table 4.5.2 Preliminary vs Final 1997 Landings Estimates for Large Coastal Sharks.

Species	1997 Preliminary Estimates	1997 Final Estimates	Difference

Bigeye Sixgill	*29*	0	-29
Bignose	*2,132*	2,132	0
Blacktip	*1,503,356*	1,506,182	2,826
Bull	*40,247*	40,247	0
Dusky	*73,250*	80,930	7,680
Hammerhead	*62,955*	79,685	16,730
Lemon	*20,595*	20,595	0
Night	*57*	33	-24
Nurse	*8,864*	8,864	0
Reef	*3,548*	3,548	0
Sand Tiger	*7,920*	8,425	505
Sandbar	*863,574*	890,881	27,307
Silky	*13,920*	13,920	0
Spinner	*6,039*	6,039	0
Tiger	*5,312*	6,603	1,291
Unclassified	*359,148*	1,078,813	719,665
Unclassified Fins	*151,364*	140,638	-10,726
Whale	*3,598*	0	-3,598
White	*1,315*	1,315	0
Large Coastal	*0*	98,726	98,726
TOTAL	3,127,223	3,987,576	860,353
	(1,418 mt)	(1,809 mt)	391 mt

Table 4.5.3 1998 Landings of Large Coastal Sharks*.

	Commercial (lbs dw)	Recreational (number)
Bignose	50	none reported
Blacktip	1,893,805	76,522
Bull	27,389	802
Dusky	81,124	4,277
Hammerhead	59,802	384
Hammerhead, Great	none reported	441
Hammerhead, Scalloped	none reported	1,101
Hammerhead, Smooth	none reported	370
Lemon	23,232	1,992
Night	3,289	none reported
Nurse	2,846	2,690
Reef	100	none reported
Sand Tiger	38,791	none reported
Sandbar	1,077,161	33,245
Silky	13,615	5,039
Spinner	16,900	7,119
Tiger	12,174	1,302
Large Coastal	172,038	16,505
Unclassified	1,038,530	none reported
Unclassified fins	76,588	none reported
TOTAL	4,537,434	151,791
	(2,058 mt)	

*1998 estimates are preliminary.

Table 4.5.4 Preliminary vs Final 1997 Landings Estimates for Pelagic Sharks.

Species	1997 Preliminary Estimates	1997 Final Estimates	Difference
Bigeye Thresher	*5,308*	5,308	0
Blue	*967*	904	-63
Bonito (SF Mako)	*261,825*	224,362	-37,463
Cow	*81*	0	-81
Longfin Mako	*2,112*	7,867	5,755
Oceanic Whitetip	*3,656*	2,764	-892
Porbeagle	*3,690*	4,222	532
Thresher	*109,030*	145,253	36,223
Unclassified	*568,644*	74,849	-493,795
Mako	*0*	71,371	71,371
Pelagic	*0*	694	694
TOTAL	955,313	537,594	-417,719
	(433 mt)	(244 mt)	-189 mt

Table 4.5.5 1998 Landings of Pelagic Sharks*.

	Commercial (lbs dw)	Recreational (number)
Bigeye Thresher	1,403	none reported
Blue	706	6,003
Shortfin Mako	222,920	5,581
Longfin Mako	4,410	none reported
Mako	79,773	none reported
Oceanic Whitetip	22,049	none reported
Porbeagle	19,795	none reported
Thresher	102,530	36
Pelagic	111	none reported
Unclassified	49,502	none reported
TOTAL	503,199	11,620
	(228 mt)	

*1998 estimates are preliminary.

Table 4.5.6 Preliminary vs Final 1997 Landings Estimates for Small Coastal Sharks.

Species	1997 Preliminary Estimates	1997 Final Estimates	Difference
Atlantic Sharpnose	*256,632*	256,562	-70
Blacknose	*202,781*	202,781	0
Bonnethead	*75,787*	75,787	0
Finetooth	*184,141*	169,733	-14,408
Unclassified	*0*	51	51
TOTAL	719,341	704,914	-14,427
	(326 mt)	(320 mt)	-6 mt

Table 4.5.7 1998 Landings of Small Coastal Sharks*.

	Commercial (lbs dw)	Recreational (number)
Atlantic Angel	none reported	107
Atlantic Sharpnose	230,920	42,048
Blacknose	119,689	9,578
Bonnethead	13,949	26,191
Finetooth	267,224	none reported
Unclassified	82	none reported
TOTAL	631,864	77,924
	(287 mt)	

*1998 estimates are preliminary.

4.5.3 U.S. vs. International Breakdown of Landings

As previously stated, there is no comprehensive international reporting system for Atlantic shark catches and landings. While there are some international data, not all countries report and those that do use varying reporting methods. At this year's ICCAT meeting, the U.S. Delegation proposed that countries participate in collecting shark catch and bycatch data and assist the Food and Agriculture Organization of the United Nations (FAO) in their biological assessments. As mentioned in Section 2.5 the SCRS Subcommittee on Bycatch also requested that countries report shark catch and effort data. In addition, the United States advocated measures to prohibit shark finning and ensure the protection of juvenile sharks and their nursery areas.

4.5.4 Bycatch Issues and Data Associated with the Fishery

Shark Drift Gillnet Fishery

Updated information on catch and bycatch in the shark drift gillnet fishery off east Florida during the 1999 critical right whale season (November 15 - March 31) indicate that a total of 20 sets on 20 known vessels trips caught an estimated 2,923 animals. The catch consisted of 12 species of sharks, 21 species of teleosts and rays, and one species of marine mammal. Two species of sharks, blacktip and finetooth, made up 90 percent by number and 73 percent by weight of the observed shark catch (see below). Bycatch was dominated by crevalle jack, Spanish mackerel, tarpon, cobia, king mackerel, spotted eagle ray, and menhaden. Observers recorded 4

incidental takes of bottlenose dolphin in 2 different sets, all of which were released dead (Carlson and Lee, 1999).

Table 4.5.8 **Total Shark Catch in NMFS Observed Sets During 1999 Critical Right Whale Season**: Based on observations from January 8, 1999 - March 31, 1999.

Species	Total Number Caught	Percentage Kept	Discarded Alive (%)	Discarded Dead (%)
Blacktip	1,068	99.8	0	0.2
Finetooth	839	99.8	0	0.2
Bonnethead	393	45.8	0.2	54
Atlantic Sharpnose	238	98.7	0.4	0.9
Blacknose	28	100	0	0
Sandbar	19	94.7	0	5.3
Spinner	7	100	0	0
Bull	6	100	0	0
Hammerhead, Scalloped	5	20	0	80
Hammerhead, Great	2	100	0	0
Tiger	2	100	0	0
Lemon	1	100	0	0

Table 4.5.9 **Total Bycatch in NMFS Observed Sets During 1999 Critical Right Whale Season:** Based on observations from January 8, 1999 - March 31, 1999.

Species	Total Number Caught	Percentage Kept	Discarded Alive (%)	Discarded Dead (%)
Crevalle Jack	75	17.3	0	82.7
Spanish Mackerel	62	95.1	0	4.9
Tarpon	47	0	8.5	91.5
Cobia	30	100	0	0
King Mackerel	23	47.8	4.4	47.8
Spotted Eagle Ray	18	0	72.2	27.8
Menhaden	14	0	0	100
Cownose Ray	6	0	100	0
Gag Grouper	6	100	0	0
Tripletail	6	100	0	0
Sailfish	6	0	33.3	66.7
Barracuda	5	100	0	0
Pompano	4	100	0	0
Manta Ray	3	0	0	100
Atlantic Moonfish	2	0	50	50
Harvestfish	2	0	0	100
Butterfish	2	0	0	100
Black Margate	2	100	0	0
Lookdown	1	100	0	0
Atlantic Bonito	1	0	0	100
Little tunny	1	0	0	100
Weakfish	1	0	0	100
Bottlenose Dolphin	4	0	0	100

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