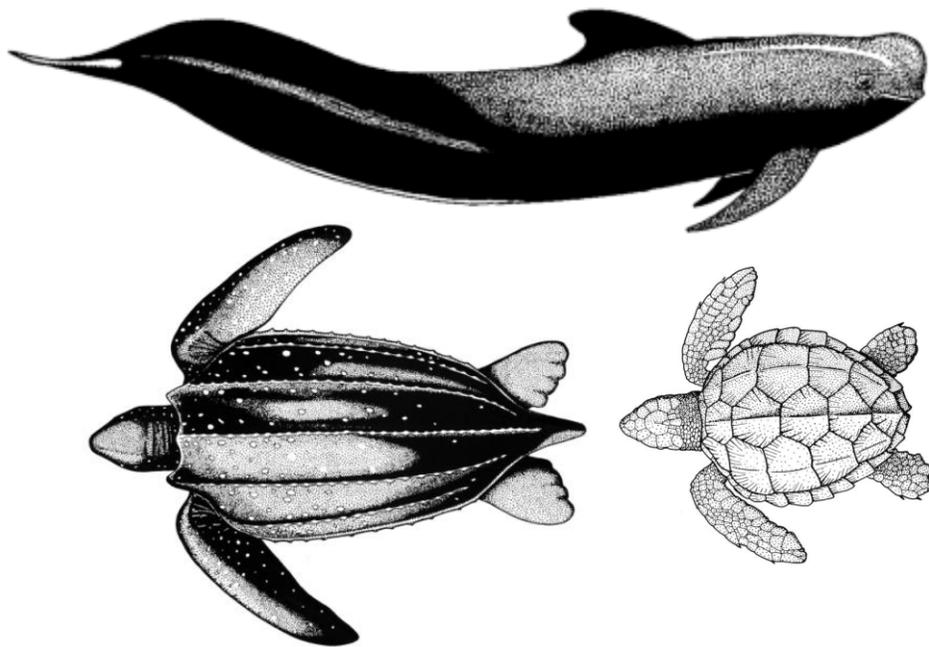




NOAA TECHNICAL MEMORANDUM NMFS-SEFSC-632

Estimated Bycatch of Marine Mammals and Sea Turtles in the U.S. Atlantic Pelagic Longline Fleet During 2011

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Abstract

The U.S. Atlantic Pelagic Longline fleet operates throughout the northwestern Atlantic Ocean, including along the U.S. coast from the Gulf of Mexico to New England, the waters of the Caribbean, and in international waters of the North Atlantic Ocean. The Atlantic longline fleet is defined as a Category I fishery under the Marine Mammal Protection Act, and it is also the subject of management under the Endangered Species Act due to interactions with leatherback (*Dermochelys coriacea*) and loggerhead (*Caretta caretta*) turtles. Total bycatch of marine mammals and turtles in the longline fishery was estimated for 2011 using data from the pelagic longline fishery observer program and a mandatory fishery logbook reporting program. We applied a delta-lognormal approach to estimate region specific and total annual interactions with protected species in the fishery. During 2011, there were an estimated 238.5 (156.8 – 362.8 [95% CI]) interactions with leatherback turtles and 437.6 (309.1 – 619.5 [95% CI]) interactions with loggerhead turtles. The primary marine mammals interacting with this fishery were pilot whales (*Globicephala* sp.) with an estimated 291.7 (179.5 – 474.0 [95% CI]) interactions with unspecified pilot whales and an additional 58.3 (20.0 – 169.3 [95% CI]) interactions with genetically identified short-finned pilot whales. Potential sources of bias and uncertainty in these bycatch estimates are discussed.

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Introduction

Pelagic longline fisheries operate throughout the world's oceans targeting large pelagic fish including swordfish, tunas, and sharks. The U.S. Atlantic Pelagic Longline fleet operates throughout the northwestern Atlantic Ocean, along the U.S. coast from the Gulf of Mexico to New England, the waters of the Caribbean, and in international waters of the North Atlantic Ocean (Figure 1). The Atlantic longline fleet is defined as a Category I fishery under the Marine Mammal Protection Act (50 CFR Part 229, Federal Register Vol. 69, No. 135, 15 July 2003) due to frequently documented interactions with marine mammals.

The fishery is also the subject of management under the Endangered Species Act (ESA) due to frequent interactions with marine turtles including leatherback (*Dermochelys coriacea*) and loggerhead sea turtles (*Caretta caretta*). In June 2004, a Biological Opinion was issued by the National Marine Fisheries Service, Southeast Regional Office, finding that the U.S. Pelagic Longline Fleet posed a jeopardy to leatherback turtles in the Atlantic Ocean as defined under the ESA. To allow continued operation of the fishery, the Biological Opinion mandated increased reporting of bycatch, required education and outreach programs to train fishers in careful handling and release of turtles, and instituted large-scale changes in fishing gear. Most notably, the fishery was required to exclusively use "circle" hooks (size 16/0 or greater) and to adopt safe handling and release practices for sea turtles after August 2004. These mandates were based upon expected reductions in bycatch rate due to hook shape and size demonstrated by experimental studies conducted in the Northeast Distant Water (NED) fishing area and

an expected reduction in post-release mortality by using the handling and release protocols (Watson *et al.*, 2005).

In addition, several time-area closures were introduced into the fishery in 2000 and 2001 due to concerns over both finfish and protected species bycatch (NMFS 2003, 50 CFR Part 635). These include year-round closures near the De Soto Canyon in the Gulf of Mexico after 1 November 2000 (Figure 1, Label A) and in waters off the Atlantic coast of Florida after 1 March 2001 (Figure 1, Label B). Seasonal closures are in effect in the Charleston Bump region between 1 February and 30 April (Figure 1, Label C) and in a bluefin tuna area off the New Jersey coast between 1 June and 30 June (Figure 1, Label D). The NED area was closed to non-experimental longline fishing from 2001 to 2004 in response to high turtle bycatch. However, with the implementation of gear changes, it was reopened to fishing in June 2004.

In late 2009, regulations were implemented in the fishery to reduce the serious injury and mortality of pilot whales and Risso's dolphins in the mid-Atlantic bight region. The Pelagic Longline Take Reduction Plan (PLTRP) was developed based upon consensus recommendations of a team of scientists, managers, and commercial fisheries organizations per the Take Reduction Team process under the MMPA. Regulations were effective on 18 June, 2009 and include restriction of mainline lengths to less than 20 nautical miles in the mid-Atlantic Bight area and mandatory reporting requirements for fishermen operating in waters offshore of Cape Hatteras, North Carolina (50 CFR Part 229, Federal Register Vol. 74, No. 95, 18 May 2009).

The pelagic longline fishery has had a fishery observer program (Pelagic Observer Program, POP) in place since 1992 to document finfish bycatch, characterize

fishery behavior, and quantify the interactions with protected species (Beerkircher *et al.*, 2004). In addition, a mandatory fishery logbook system (FLS) has been in place since 1992 requiring vessel captains to report fishing effort, gear characteristics, and commercial catch. These data have been used to generate annual estimates of marine mammal and turtle bycatch (Johnson *et al.*, 1999; Yeung, 1999a; Yeung 1999b; Yeung, 2001; Garrison 2003; Garrison and Richards, 2004; Garrison 2005; Fairfield-Walsh and Garrison, 2006, 2007, 2008; Garrison, Stokes, and Fairfield 2009; Garrison and Stokes, 2010, 2012).

In this report, marine mammal and marine turtle bycatch estimates are calculated for pelagic longline fishery effort during 2011. Bycatch rates (catch per 1000 hooks) are quantified based upon observer data by fishing area and quarter. The estimated bycatch rate is then multiplied by the total fishing effort (number of hooks) reported to the FLS program to obtain estimates of total interactions for each species of marine mammal and turtle.

Methodology

Geographic Stratification

Fishery observer effort is currently allocated among 10 large geographic areas and calendar quarter based upon the historical fishing range of the fleet (Figure 1). The target annual coverage is 8% of the total reported hooks, and observer effort is allocated randomly based upon reported fishing effort during the previous calendar year in each quarter/fishing area stratum (Beerkircher *et al.*, 2004). Between 15 April and 15 June of 2011, observer coverage in the Gulf of Mexico (GOM) fishing area was greatly enhanced to collect more robust information on the interactions between pelagic longline vessels

and spawning bluefin tuna. As a result, the observer coverage for this time and area is dramatically higher than is typical for other strata or previous years. The bycatch estimates developed for each species are stratified by fishing area and quarter to reflect the design of the observer program.

In addition to observation of regular fishing, the POP program participated in a cooperative research program with NOVA Southeastern University that included longline fishing inside and outside of areas normally closed to fishing in the FEC, SAB, and MAB areas. There was 100% observer coverage of all experimental sets, and the experimental fishing is not included in extrapolated bycatch estimates because they are not representative of the normal fishing effort. A total of 15 sets (10,233 hooks) were observed in experimental fishing.

Bycatch rates for quarter-area strata with reported longline fishery sets that had no corresponding observer coverage in 2011 were replaced with previously observed mean bycatch rates from 2006-2010.

Recent changes to the Magnuson-Stevens Fishery Conservation and Management Act have changed the restrictions on reporting fishery information including that collected by observers. NMFS rules therefore restrict the reporting of business information within temporal or spatial strata including fewer than 3 vessels. Business information includes information on the fishing gear or level of effort. As such, the number of sets and hooks cannot be reported in some quarter-area strata in reported effort data, observer data, or both. In cases where by simple calculation one could derive the level of effort in such cells, we have not reported sufficient information to make those

calculations. Quarter-area strata where the level of reporting is limited by confidentiality concerns are noted in the appropriate tables.

Delta Lognormal Estimator

Sets in which a portion of the longline broke away, and therefore had multiple recorded haul times, were combined into single sets. This is consistent with the approach of the most recent mortality estimates (Garrison, 2003; Garrison and Richards, 2004; Garrison, 2005; Fairfield-Walsh and Garrison, 2006; Fairfield-Walsh and Garrison, 2007; Fairfield and Garrison, 2008 Garrison, Stokes, and Fairfield 2009; Garrison and Stokes, 2010, 2012). The mean and variance of catch rates for marine mammals and turtles observed in longline sets were calculated using a delta lognormal estimator (Pennington, 1993). The delta estimator is more appropriate than the simple mean because catch rates are generally log-normally distributed and bycatch events (i.e., positive sets) are rare. The unit of effort in this analysis is the number of hooks, consistent with methods used to estimate total catch and bycatch of finfish and previous analyses of protected resource interactions (Johnson *et al.*, 1999). The mean bycatch rate for each analytical stratum, t , is calculated as:

$$(1) \quad C_t = \frac{m_t}{n_t} e^{L_t} G\left(s_{L_t}^2 / 2\right),$$

where:

m_t is the number of sets with observed bycatch,

n_t is the total number of observed sets,

L_t is the mean of the log-transformed number of animals taken per 1000 hooks when bycatch occurred,

s_L^2 is the observed sample variance of the log transformed bycatch rate, and G is the cumulative probability function from the Poisson distribution given as:

$$(2) \quad G(s_L^2/2) = 1 + \frac{m_t - 1}{m_t} (s_L^2/2) + \sum_{j=2}^{\infty} \frac{(m_t - 1)^{2j-1}}{m_t^j (m_t + 1)(m_t + 3) \dots (m_t + 2j - 3)} \times \frac{(s_L^2/2)^j}{j!}.$$

The series was computed numerically over j terms until meeting a convergence criterion of a change in the function value of < 0.0001 with additional terms (j). Convergence was generally achieved with < 10 terms. The variance of the delta estimator is:

$$(3) \quad \text{var}(C_t) = \frac{m_t}{n_t} (e^{2L_t}) \left[\frac{m_t}{n_t} G^2(s_L^2/2) - \left(\frac{m_t - 1}{n_t - 1} \right) G\left(\frac{m - 2}{m - 1} s_L^2 \right) \right].$$

When m_t is equal to 1, the mean bycatch rate reduces to the simple mean rate where

$$(4) \quad C_t = \frac{\exp(L_t)}{n_t},$$

and

$$(5) \quad \text{var}(C_t) = \left(\frac{\exp(L_t)}{n_t} \right)^2.$$

The C_t calculated above gives the mean number of animals caught per 1000 hooks in the observed trips. To estimate total interactions, N , these rates are multiplied by the total number of hooks reported to the FLS database for each analytical stratum. The stratified estimates and associated variances were summed to provide annual estimates for each species. Approximate 95% confidence intervals (95% CI) were calculated assuming log-normal distribution of total mortality as N/C and $N \cdot C$ for the lower and upper confidence bounds respectively where:

$$(6) \quad C = \exp [z_{\alpha} \sqrt{\text{var}(\ln N)}],$$

and

$$(7) \text{var}(\ln N) = \ln \left[1 + \frac{\text{var}(N)}{N^2} \right],$$

where z_α is 1.96, the z score for $\alpha = 0.05$.

Sea Turtle Life History Form

Detailed information on the characteristics of longline interactions with sea turtles was recorded by the fisheries observers during 2011. These data include detailed descriptions of the type of interaction, the extent of entanglement, the location of any hook attached to the animal or swallowed, and other data (Appendix A). Detailed information on entanglement, hooked animals, and the location of hooks are shown in Appendix B.

Marine Mammal Serious Injury Determination

The Marine Mammal Protection Act (MMPA) requires that mortality and serious injury of marine mammals incidental to commercial fishing operations be reduced to a level approaching a zero mortality rate. “Serious injury” has been defined as an injury more likely than not to result in mortality (NOAA Fisheries 50 CFR 229.2, Angliss and DeMaster, 1998). In prior annual reports, serious injury determinations were based upon criteria developed during a workshop of NOAA Fisheries and external experts convened in 1997 (Angliss and DeMaster, 1998). These guidelines were reviewed at a workshop conducted during 2007, and a proposed revision of the criteria for serious injuries in pinnipeds, large whales, and small cetaceans was developed (Anderson et al. 2008). This

proposal was reviewed and evaluated by NMFS, and a policy for determining serious vs. non-serious injury in marine mammals with associated criteria was established in 2012 (NMFS 2012a, NMFS 2012b). Serious injury determinations were made on a case by case basis after reviewing the observations and comments of fishery observers. Observer comments for all takes of marine mammals from 2011 (Appendix B) were reviewed, and serious injury determinations were made based upon observer comments and photographs (when available) consistent with the 2012 guidelines.

Marine Mammal Biopsy Sampling and Species Identification

POP observers are equipped with long-handled poles that include a tip designed to collect a small sample of skin (“biopsy sample”) from turtles and marine mammals. When the opportunity arises to collect a sample from a marine mammal safely, the observers attempt to use the biopsy pole to scrape a small amount of skin and tissue from the dorsal surface of the animal. These samples are stored for later genetic analyses. DNA from biopsy samples are extracted and sequenced, and these sequences are compared to a database of genetic information for cetacean species to determine or verify species identifications by the NMFS Southeast Marine Mammal Molecular Genetics laboratory. The sex of the animal sampled is also determined genetically. During 2011, eight biopsy samples were collected from marine mammals and analyzed genetically. Sample information and identifications are provided in Appendix C.

Results and Discussion

Reported Fishing Effort and Observer Coverage

The total reported pelagic longline fishing effort included 6.0 million hooks during 2011 (Table 1A, Figure 2). The reported fishery effort included 8,044 sets during 2011, 879 of which were observed by the POP program (Tables 1B and 2B, Figure 2). The overall percent coverage during regular fishing was 10.9% expressed as a proportion of reported hooks and 10.1% as a proportion of reported sets (Table 3). The relatively high annual rate reflects the 77.3% coverage of the fishery during the second quarter in the GOM. Observer coverage for other area-quarter strata is shown in Table 3. The location of experimental fishing sets is shown in Figure 3.

Areas with no observer coverage during 2011 with more than 10 sets of reported fishing effort include the Caribbean (CAR) during quarter 1 and 2, Northeast Distant (NED) during quarter 4, the South Atlantic Bight (SAB) during quarter 4, the Sargasso Sea (SAR) during quarter 2, and the Tuna North (TUN) during quarters 2 and 4 (Table 3).

Observed Protected Species Interactions

There were 24 observed interactions with leatherback turtles and 47 with loggerhead turtles (Table 4, Figure 4) in 2011 in regular and experimental fishing combined. There was also one interaction with an olive ridley turtle in the TUN area. The greatest number of observed leatherback takes occurred in the GOM during the 2nd quarter and in the MAB region during the 4th quarter (Table 4A, Figure 4). Loggerhead takes were observed in the greatest numbers in the NED and NEC during the 3rd quarter

(Table 4B, Figure 4). These totals include 1 leatherback turtle taken during experimental fishing in the SAB fishing area.

The vast majority of the turtles were characterized as being released alive and injured (i.e., most had been hooked) based upon recorded information on the sea turtle life history form (Table 5). Leatherback turtles were most typically hooked externally, while loggerhead turtles were primarily hooked in the mouth or beak or swallowed the hook (Table 5). All gear was removed before release from 44 of the 72 turtles captured (Table 6). A total of 3 leatherbacks and 4 loggerheads were released either entangled or with the hook and line remaining that was $> \frac{1}{2}$ the carapace length (Table 6).

There were 37 interactions observed with marine mammals (Table 7, Figure 5). This included twenty-three interactions with pilot whales (18 unidentified pilot whales, 5 short-finned pilot whales) in the MAB, seven Risso's dolphins (2 in the GOM and 5 in the NEC) and three bottlenose dolphins (1 in the MAB, 2 in the GOM). One animal was initially identified as a pilot whale, but it was genetically identified as a false killer whale. This is the first record of this type in Atlantic waters, though a false killer whale take was documented in the Tuna north (TUN) area in 2008. Twenty-four of the observed marine mammal interactions were categorized as serious injuries including 18 pilot whales (14 unid. Pilot whales, 4 short-finned pilot whales), 3 Risso's dolphins, and 1 bottlenose dolphin, 1 pygmy/dwarf sperm whale, and 1 unidentified dolphin (Table 8). Fifteen of the serious injuries were due to animals being hooked in the mouth or ingesting gear, and an additional seven cases involved being released with gear likely to further entangle the animal. Two animals were deemed seriously injured after they were released from gear based upon characterizations that they were exhausted or had altered

swimming behavior following the release. One pilot whale was dead upon observation (Table 8).

Stratum estimates of total interactions for sea turtles are shown in Table 9. High leatherback estimated interactions occurred in the MAB during quarter 4 (126.3 animals) and the GOM during quarter 4 (23.7 animals, Table 9). For loggerhead turtles, the estimated interactions were highest in the MAB (68.0 animals), NEC (74.2 animals), and NED (96.8) in quarter 3 (89.6 animals). The FEC area in quarter 4 also had high numbers of interactions (62.8 animals, Table 9).

The quarter-area strata estimates for observed marine mammal mortality, serious injury, and live releases are presented in Table 10. All observed pilot whale serious injuries occurred in the MAB region during quarters 3 and 4.

Estimated Interactions in Unobserved Areas with Fishing Effort

The average bycatch rates and estimated catches in strata that were not observed during 2011 are summarized in Table 11. There were observed sea turtle takes in prior years in CAR-Quarter 1, CAR-Quarter 2, NED-Quarter 4, SAB-Quarter 4, and TUN-Quarter 4 for Leatherbacks. Loggerhead interactions occurred in CAR-Quarter 1 and NED-Quarter 4 in prior years (Table 11a). One olive ridley take was observed in CAR-Quarter 2 in prior years. For marine mammals, no takes had been observed in these strata in previous years (Table 11b).

Total Estimated Bycatch

There were an estimated total of 238.5 (156.8 – 362.8 [95% CI]) interactions with leatherback turtles during 2011 in regular fishing and an additional 1 interaction in experimental fishing (Table 12). The highest number of interactions occurred in the MAB area. For loggerhead turtles, the estimated total number of interactions was 437.6 turtles (309.1 – 619.5 [95% CI], Table 12). The areas with the highest estimated interactions included the NED, NEC and the MAB. Annual estimates of marine mammal bycatch are shown in Table 13 with a total of 291.7 (179.5 – 474.0 [95% CI]) interactions with unspecified pilot whales and 58.3 (20.0 – 169.3 [95% CI]) with short-finned pilot whales.

Trends in Bycatch Estimates

The leatherback take estimate reached a historical high in 2004, and prior to that had increased sharply since 1998 (Figure 6). A significant decrease in the leatherback bycatch rate and the annual estimated number of interactions with leatherback turtles occurred beginning in 2005 after the implementation of regulations in August 2004. The 2011 estimated take of leatherback turtles is slightly higher than that from 2010, and remains well below the average prior to implementation of the gear regulations.

Loggerhead turtle interactions since 2000 have been well below the historical highs that occurred in the mid-1990's (Figure 6). Following the implementation of regulations, the bycatch dropped in 2005, but rebounded to be slightly lower than the pre-regulation period. The 2011 estimate is considerably lower than those in 2006 and 2007,

but higher than that compared to 2010. There appears to be a cyclic pattern in loggerhead bycatch rate occurring at 4-5 year intervals since 1996.

For pilot whales (unspecified and short-finned pilot whales combined), the 2011 estimate was considerably higher than those from the prior four years and approached historic highs seen in 1999 and 1995 (Figure 7). The bycatch estimate for Risso's dolphins was higher than that for 2010 but remained relatively low (Figure 7).

The total fishery effort was slightly higher than that in 2010 and continued to be low relative to historic highs in the mid-1990s.

Sources of Bias and Uncertainty

The fishery logbook data is a mandatory reporting program, and thus it is expected that reporting rates are generally high. Due to the intense management focus on the longline fishery, there has been close monitoring of reporting rates, and observed trips can be directly linked to reported effort. In general, the gear characteristics and amount of observed effort is consistent with the reported effort. However, reporting errors are possible in this fishery that would result in a bias in bycatch estimates.

Observer coverage in the pelagic longline fishery is generally high, particularly in comparison to that of other commercial fisheries. The sampling level is sufficient to provide reasonably precise estimates of interactions with protected species. The observed coefficients of variation for annual estimates of both loggerhead and leatherback turtles are below the 30% benchmark established by guidelines for precision set by NOAA Fisheries.

The delta estimator was applied to calculate bycatch rates primarily to maintain consistency with previous estimates for this fishery (Johnson *et al.*, 1999; Yeung, 1999a; Yeung, 1999b; Yeung, 2001; Garrison, 2003; Garrison and Richards, 2004; Garrison, 2005; Fairfield-Walsh and Garrison, 2006, 2007, 2008; Garrison, Stokes, and Fairfield 2009; Garrison and Stokes, 2010, 2012). This approach assumes that: 1) catch rates (animals per hook) are log-normally distributed, and 2) the number of hooks is an appropriate unit of effort. The first assumption was critically examined for sea turtles in Johnson *et al.* (1999); however, it is difficult to verify for marine mammals given the generally low rate of these interactions. The delta estimator is sensitive to the assumption of log-normality, and violations of this assumption may result in biased (positive or negative) estimates of catch rate and associated variances. The second assumption has not been examined critically in previous analyses. The current approach assumes that total bycatch is linearly related to the total number of hooks fished. If this assumption is not correct, for example if there are saturation effects resulting in a non-linear relationship between the number of hooks and total catch, then there is potentially a bias, of unknown direction and magnitude, in the estimate of total bycatch.

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List of Tables and Figures

Table 1. Total amount of fishing effort reported to the pelagic longline logbook program during 2011 by quarter and fishing area. Fishing effort is reported as A) Number of hooks (thousands) and B) Number of sets. NR indicates strata where effort cannot be reported due to confidentiality considerations.

Table 2. Total amount of fishing effort observed during 2011 by quarter and fishing area. Fishing effort is reported as A) Number of hooks (thousands) and B) Number of sets. Dashes indicate cells where no fishery effort was reported. NR indicates strata where effort cannot be reported due to confidentiality considerations.

Table 3. Percentage of reported fishing effort observed during 2011 by quarter and fishing area by A) Number of hooks and B) Number of sets. Dashes indicate no reported fishing effort. Cells in which >10 longline sets were reported with no observer coverage are indicated in bold. Totals indicate overall percentage coverage by area and quarter. NR indicates strata where effort cannot be reported due to confidentiality considerations.

Table 4. Total number of observed interactions with A) Leatherback turtles, B) Loggerhead turtles, and C) All sea turtles in the pelagic longline fishery during 2011 by quarter and fishing area. Dashes indicate areas where there was no observed fishing effort, and an X indicates an area where no effort was reported. Counts include turtles taken during experimental fishing.

Table 5. Summary of A) Release condition, B) Hook location in hooked animals, and C) Animals with all gear removed, by hook location for sea turtles observed in the pelagic longline fishery during 2011. Hook location information is recorded on the sea turtle life history form (Appendix A) by the observer.

Table 6. Release status and gear removal for sea turtles captured and released alive in the U.S. Atlantic Pelagic Longline Fishery during 2011. Counts include turtles captured during experimental fishing. Condition columns refer to post-release mortality categories in Table 1 of SEFSC (2012). Three additional loggerheads were released with an unknown amount of line attached.

Table 7. Total number of marine mammals observed in interactions with the pelagic longline fishery during 2011 by quarter and fishing area. Dashes indicate areas where there was no observed fishing effort, and an X indicates an area where no effort was reported.

Table 8. Summary of release condition and serious injury types for marine mammals observed in the pelagic longline fishery during 2011. Serious injury determinations were based upon written observer comments (Appendix B). “Entangled” indicates that the animal was released with line remaining attached that is likely to further entangle the animal. Codes indicate table injury categories defined in the Small Cetacean Serious Injury Guidelines (NMFS, 2012).

Table 9. Estimated interactions with sea turtles in the pelagic longline fishery during 2011 by fishing area and quarter indicates strata where effort cannot be reported due to confidentiality considerations.

Table 10. Estimated A) Mortalities, B) Serious Injury, C) Released Alive, and D) Total Interactions with marine mammals in the pelagic longline fishery during 2011 by fishing area and quarter. NR indicates strata where effort cannot be reported due to confidentiality considerations.

Table 11. Bycatch rates for sea turtles in area-quarter strata with reported effort that were not observed in 2011. There were no observed marine mammal takes in the prior five years in the unobserved strata.

Table 12. Total estimated interactions and experimental takes for A) Leatherback and B) Loggerhead turtles and C) Olive ridley turtles in the pelagic longline fishery during 2011 by fishing area. This includes estimates for strata that were not observed during 2011.

Table 13. Total estimated interactions with marine mammals in the pelagic longline fishery during 2011.

Figure 1. Pelagic longline fishing areas in the North Atlantic Ocean: CAR = Caribbean, GOM = Gulf of Mexico, FEC = Florida East Coast, SAB = South Atlantic Bight, SAR = Sargasso Sea, MAB = Mid-Atlantic Bight, NEC = Northeast Coastal, NED = Northeast Distant, NCA = North Central Atlantic, TUN = Tuna North. Year-round closed areas in the DeSoto Canyon (A) and the Florida East Coast (B) are indicated along with seasonal closures in the Charleston Bump (C) and in the Mid-Atlantic (D).

Figure 2. Observed and reported pelagic longline fishing effort during 2011.

Figure 3. Locations of experimental sets during 2011.

Figure 4. Observed pelagic longline fishing effort and sea turtle takes during 2010\1.

Figure 5. Observed pelagic longline fishing effort and marine mammal takes during 2011.

Figure 6. Historical trends in fishery effort and estimated marine turtle takes in the pelagic longline fishery between 1992 and 2011 for A) Leatherback Turtles, and B) Loggerhead Turtles. Errors bars represent 95% confidence intervals.

Figure 7. Historic trends in fishery effort and estimated marine mammal takes in the pelagic longline fishery from 1992 to 2011 for A) Pilot Whales and B) Risso's Dolphins. Errors bars represent 95% confidence intervals. For 2011, the total includes both unidentified pilot whales and short-finned pilot whales.

Table 1. Total amount of fishing effort reported to the pelagic longline logbook program during 2011 by quarter and fishing area. Fishing effort is reported as A) Number of hooks (thousands) and B) Number of sets. NR indicates strata where effort cannot be reported due to confidentiality considerations.

A. Number of Hooks (thousands)

Quarter	CAR	FEC	GOM	MAB	NCA	NEC	NED	SAB	SAR	TUN	Total
1	NR	406.1	129.0	46.1	NR	0.0	0.0	207.9	89.5	28.3	924.8
2	NR	302.0	165.4	171.3	NR	181.0	NR	591.7	NR	NR	1477.0
3	0.0	225.9	447.9	530.7	0.0	415.7	183.5	93.5	0.0	NR	1932.7
4	0.0	202.8	505.7	575.0	NR	71.2	NR	86.0	108.7	NR	1621.3
Total	29.6	1136.8	1247.9	1323.1	NR	667.9	218.2	979.1	NR	NR	5955.8

B. Number of Sets

Quarter	CAR	FEC	GOM	MAB	NCA	NEC	NED	SAB	SAR	TUN	Total
1	NR	584	235	71	NR	0	0	267	105	35	1311
2	NR	514	295	244	NR	216	NR	678	NR	NR	2025
3	0	381	646	658	0	479	209	146	0	NR	2564
4	0	333	698	687	NR	82	NR	140	113	NR	2144
Total	24	1812	1874	1660	12	777	248	1231	NR	NR	8044

Table 2. Total amount of fishing effort observed during 2011 by quarter and fishing area. Fishing effort is reported as A) Number of hooks (thousands) and B) Number of sets. Dashes indicate cells where no fishery effort was reported. NR indicates strata where effort cannot be reported due to confidentiality considerations.

A. Number of Hooks (thousands)

Quarter	CAR	FEC	GOM	MAB	NCA	NEC	NED	SAB	SAR	TUN	Total
1	0.0	21.1	NR	4.5	0.0	0.0	0.0	25.8	NR	NR	75.2
2	0.0	22.0	117.3	11.1	0.0	25.2	0.0	53.7	0.0	0.0	229.2
3	0.0	16.6	30.7	39.3	0.0	42.7	NR	NR	0.0	NR	166.1
4	0.0	18.9	35.8	34.4	0.0	NR	0.0	0.0	NR	0.0	128.9
Total	0.0	78.6	NR	89.3	0.0	NR	NR	NR	37.0	NR	599.3

B. Number of Sets

Quarter	CAR	FEC	GOM	MAB	NCA	NEC	NED	SAB	SAR	TUN	Total
1	0	30	NR	7	0	0	0	34	NR	NR	103
2	0	42	228	20	0	32	0	68	0	0	390
3	0	29	45	43	0	50	NR	NR	0	NR	218
4	0	32	54	41	0	NR	0	0	NR	0	168
Total	0	133	NR	111	0	NR	NR	NR	41	NR	879

Table 3. Percentage of reported fishing effort observed during 2011 by quarter and fishing area by A) Number of hooks and B) Number of sets. Dashes indicate no reported fishing effort. Cells in which >10 longline sets were reported with no observer coverage are indicated in bold. Totals indicate overall percentage coverage by area and quarter and exclude experimental fishing.

A. Number of Hooks

Quarter	CAR	FEC	GOM	MAB	NCA	NEC	NED	SAB	SAR	TUN	Total
1	0.0	5.2	0.7	9.9	0.0	-	-	12.4	15.6	31.0	8.1
2	0.0	7.3	70.9	6.5	0.0	13.9	0.0	9.1	0.0	0.0	15.5
3	-	7.3	6.8	7.4	-	10.3	14.3	6.1	-	13.7	8.6
4	-	9.3	7.1	6.0	0.0	23.6	0.0	0.0	21.1	0.0	7.9
Total	0.0	6.9	14.8	6.7	0.0	12.7	12.0	8.7	17.9	10.1	10.9

B. Number of Sets

Quarter	CAR	FEC	GOM	MAB	NCA	NEC	NED	SAB	SAR	TUN	Total
1	0.0	5.1	0.9	9.9	0.0	-	-	12.7	18.1	31.4	7.9
2	0.0	8.2	77.3	8.2	0.0	14.8	0.0	10.0	0.0	0.0	19.3
3	-	7.6	7.0	6.5	-	10.4	15.3	8.9	-	13.3	8.5
4	-	9.6	7.7	6.0	0.0	23.2	0.0	0.0	19.5	0.0	7.8
Total	0.0	7.3	17.6	6.7	0.0	18.0	9.6	13.0	12.9	9.3	10.1

Table 4. Total number of observed interactions with A) Leatherback turtles, B) Loggerhead turtles, and C) All sea turtles in the pelagic longline fishery during 2011 by quarter and fishing area. Dashes indicate areas where there was no observed fishing effort, and an X indicates an area where no effort was reported. Counts include turtles taken during experimental fishing.

A. Leatherback Turtles

Quarter	CAR	FEC	GOM	MAB	NCA	NEC	NED	SAB	SAR	TUN	Total
1	-	0	0	0	-	X	X	1	0	0	1
2	-	1	6	0	-	2	-	1	-	-	10
3	X	0	0	1	X	1	0	0	X	0	2
4	X	0	2	8	-	1	-	-	0	-	11
Total	-	1	8	9	-	4	0	2	0	0	24

B. Loggerhead Turtles

Quarter	CAR	FEC	GOM	MAB	NCA	NEC	NED	SAB	SAR	TUN	Total
1	-	1	0	0	-	X	X	0	5	0	6
2	-	0	0	0	-	4	-	1	-	-	5
3	X	0	0	5	X	8	13	0	X	0	26
4	X	6	0	1	-	1	-	-	2	-	10
Total	-	7	0	6	-	13	13	1	7	0	47

C. All Turtles

Quarter	CAR	FEC	GOM	MAB	NCA	NEC	NED	SAB	SAR	TUN	Total
1	-	1	0	0	-	X	X	1	5	1*	8
2	-	1	6	0	-	6	-	2	-	-	15
3	X	0	0	6	X	9	13	0	X	0	28
4	X	6	2	9	-	2	-	-	2	-	21
Total	-	8	8	15	-	17	13	3	7	1	72

*TUN quarter 1 includes one Olive Ridley turtle.

Table 5. Summary of A) Release condition, B) Hook location in hooked animals, and C) Animals with all gear removed, by hook location for sea turtles observed in the pelagic longline fishery during 2011. Hook location information is recorded on the sea turtle life history form (Appendix A) by the observer. Counts include turtles taken during experimental fishing.

A. Capture condition

Species	Alive, Uninjured	Alive, unknown	Alive, injured	Dead/ Unresponsive	Unknown	Total
Leatherback	4	2	18	0	0	24
Loggerhead	3	0	44	0	0	47
Olive Ridley	0	0	1	0	0	1
Total	7	2	63	0	0	72

B. Hook Location in hooked animals

Species	Not Hooked	Unknown if Hooked	Hooked, Location Unknown	Internal			External	Total
				Unknown Internal	Swallowed	Beak or Mouth		
Leatherback	4	2	1	1	0	3	13	24
Loggerhead	3	0	1	0	15	25	3	47
Olive Ridley	0	0	0	0	0	1	0	1
Total	7	2	2	1	15	29	16	72

C. Animals with all gear removed, by hook location

Species	Not Hooked	Unknown if Hooked	Hooked, Location Unknown	Internal			External	Total
				Unknown Internal	Swallowed	Beak or Mouth		
Leatherback	4	2	0	0	0	2	8	16
Loggerhead	3	0	0	0	2	21	1	27
Olive Ridley	0	0	0	0	0	1	0	1
Total	7	2	0	0	2	24	9	44

Table 6. Release status and gear removal for sea turtles captured and released alive in the U.S. Atlantic Pelagic Longline Fishery during 2011. Counts include turtles captured during experimental fishing. Condition columns refer to post-release mortality categories in Table 1 of SEFSC 2012. Three additional loggerheads were released with an unknown amount of line attached.

Release Status	Leatherback	Loggerheads*	Olive Ridley
Released entangled (Condition Column A)	0	2	0
Released with hook and line \geq ½ carapace length (Condition Column B)	3	2	0
Released with hook and line $<$ ½ carapace length (Condition Column C)	5	16	0
Released with all gear removed (Condition Column D)	16	24	1

* These totals do not include three loggerhead turtles released with an unknown amount of line attached.

Table 7. Total number of marine mammals observed in interactions with the pelagic longline fishery during 2011 by quarter and fishing area. Dashes indicate areas where there was no observed fishing effort, and an X indicates an area where no effort was reported.

Quarter	CAR	FEC	GOM	MAB	NCA	NEC	NED	SAB	SAR	TUN	Total
1	-	0	0	0	-	X	X	0	0	0	0
2	-	0	4	1	-	2	-	0	-	-	7
3	X	0	0	14	X	2	0	0	X	0	16
4	X	0	1	11	-	2	-	-	0	-	14
Total	-	0	5	26	-	6	0	0	0	0	37

Table 8. Summary of release condition and serious injury types for marine mammals observed in the pelagic longline fishery during 2011. Serious injury determinations were based upon written observer comments (Appendix B). “Entangled” indicates that the animal was released with line remaining attached that is likely to further entangle the animal. Codes indicate table injury categories defined in the Small Cetacean Serious Injury Guidelines (NMFS, 2012).

Species	Alive	Dead	Serious Injuries				Serious Injury Total	Total
			Ingested Gear (S2)	Hooked in Head/Mouth (S5a)	Gear Attached Likely to Entangle (S6)	Freed After Entanglement (S7b)		
Atlantic spotted dolphin	1	0	0	0	0	0	0	1
Bottlenose dolphin	2	0	0	0	0	1	1	3
Risso’s dolphin	4	0	0	0	3	0	3	7
Pilot whale	3	1	2	9	3	0	14	18
Short-finned pilot whale	1	0	0	2	1	1	4	5
False killer whale	1	0	0	0	0	0	0	1
Pygmy/Dwarf sperm whale	0	0	0	1	0	0	1	1
Unid. dolphin	0	0	0	1	0	0	1	1
Total	12	1	2	13	7	2	24	37

Table 9. Estimated interactions with sea turtles in the pelagic longline fishery during 2011 by fishing area and quarter. NR indicates strata where effort cannot be reported due to confidentiality considerations.

Species	Quarter	Area	# Positive Sets	# Observed Sets	Mean CPUE	CV	Hooks Reported (x1000)	Estimated Catch
Leatherback	1	SAB	1	34	0.033	1.000	207.9	6.8
Leatherback	2	FEC	1	42	0.055	1.000	302.0	16.5
Leatherback	2	GOM	6	228	0.054	0.423	165.4	8.9
Leatherback	2	NEC	2	32	0.081	0.696	181.0	14.7
Leatherback	3	MAB	1	43	0.025	1.000	530.7	13.4
Leatherback	3	NEC	1	50	0.018	1.000	415.7	7.6
Leatherback	4	GOM	2	54	0.047	0.701	505.7	23.7
Leatherback	4	MAB	8	41	0.220	0.324	575.0	126.3
Leatherback	4	NEC	1	NR	0.052	1.000	71.2	3.7
Olive ridley	1	TUN	1	11	0.108	1.000	28.3	3.1
Loggerhead	1	FEC	1	30	0.072	1.000	406.1	29.2
Loggerhead	1	SAR	5	NR	0.381	0.406	89.5	34.1
Loggerhead	2	NEC	3	32	0.143	0.586	181.0	25.8
Loggerhead	2	SAB	1	68	0.015	1.000	591.7	9.0
Loggerhead	3	MAB	4	43	0.128	0.499	530.7	68.0
Loggerhead	3	NEC	7	50	0.178	0.364	415.7	74.2
Loggerhead	3	NED	6	32	0.527	0.417	183.5	96.8
Loggerhead	4	FEC	4	32	0.310	0.510	202.8	62.8
Loggerhead	4	MAB	1	41	0.023	1.000	575.0	13.0
Loggerhead	4	NEC	1	NR	0.047	1.000	71.2	3.3
Loggerhead	4	SAR	2	22	0.089	0.692	108.7	9.7

Table 10. Estimated A) Mortalities, B) Serious Injury, C) Released Alive, and D) Total Interactions with marine mammals in the pelagic longline fishery during 2011 by fishing area and quarter. NR indicates strata where effort cannot be reported due to confidentiality considerations.

A. Mortality

Species	Quarter	Area	# Positive Sets	# Observed Sets	Mean CPUE	CV CPUE	# Hooks Reported (x1000)	Estimated Catch
Pilot whale	4	MAB	1	41	0.033	1.000	574.99	18.7

B. Serious Injury

Species	Quarter	Area	# Positive Sets	# Observed Sets	Mean CPUE	CV CPUE	# Hooks Reported (x1000)	Estimated Catch
Bottlenose dolphin	4	GOM	1	54	0.024	1.000	505.68	12.2
Pilot whale	3	MAB	6	43	0.167	0.392	530.69	88.7
Pilot whale	4	MAB	6	41	0.252	0.418	574.99	145.1
Pygmy/Dwarf sperm whale	4	MAB	1	41	0.030	1.000	574.99	17.0
Risso's dolphin	2	GOM	1	228	0.009	1.000	165.40	1.5
Risso's dolphin	2	NEC	2	32	0.065	0.699	180.97	11.8
Short-finned pilot whale	3	MAB	2	43	0.063	0.731	530.69	33.5
Short-finned pilot whale	4	MAB	1	41	0.023	1.000	574.99	13.0
Unid. Dolphin	2	GOM	1	228	0.007	1.000	165.40	1.1

Table 10 cont.

C. Released Alive

Species	Quarter	Area	# Positive Sets	# Observed Sets	Mean CPUE	CV CPUE	# Hooks Reported (x1000)	Estimated Catch
Atlantic spotted dolphin	2	GOM	1	228	0.005	1.000	165.40	0.8
Bottlenose dolphin	2	MAB	1	20	0.089	1.000	171.31	15.3
Bottlenose dolphin	4	MAB	1	41	0.023	1.000	574.99	13.0
False killer whale	3	NEC	1	50	0.026	1.000	415.70	11.0
Pilot whale	3	MAB	3	43	0.074	0.577	530.69	39.5
Risso's dolphin	2	GOM	1	228	0.011	1.000	165.40	1.9
Risso's dolphin	3	NEC	1	50	0.022	1.000	415.70	9.0
Risso's dolphin	4	NEC	2	NR	0.100	0.702	71.24	7.1
Short-finned pilot whale	3	MAB	1	43	0.022	1.000	530.69	11.8

Table 10 cont.

D. Total Interactions

Species	Quarter	Area	# Positive Sets	# Observed Sets	Mean CPUE	CV CPUE	# Hooks Reported (x1000)	Estimated Catch
Atlantic spotted dolphin	2	GOM	1	228	0.005	1.000	165.4	0.8
Bottlenose dolphin	2	MAB	1	20	0.089	1.000	171.3	15.3
Bottlenose dolphin	4	GOM	1	54	0.024	1.000	505.7	12.2
Bottlenose dolphin	4	MAB	1	41	0.023	1.000	575.0	13.0
False killer whale	3	NEC	1	50	0.026	1.000	415.7	11.0
Pilot whale	3	MAB	9	43	0.242	0.308	530.7	128.2
Pilot whale	4	MAB	7	41	0.284	0.378	575.0	163.5
Pygmy/Dwarf sperm whale	4	MAB	1	41	0.030	1.000	575.0	17.0
Risso's dolphin	2	GOM	2	228	0.020	0.710	165.4	3.3
Risso's dolphin	2	NEC	2	32	0.065	0.699	181.0	11.8
Risso's dolphin	3	NEC	1	50	0.022	1.000	415.7	9.0
Risso's dolphin	4	NEC	2	NR	0.100	0.702	71.2	7.1
Short-finned pilot whale	3	MAB	2	43	0.085	0.699	530.7	45.3
Short-finned pilot whale	4	MAB	1	41	0.023	1.000	575.0	13.0
Unid. Dolpihin	2	GOM	1	228	0.007	1.000	165.4	1.1

Table 11. Bycatch rates for sea turtles in area-quarter strata with reported effort that were not observed in 2011. There were no observed marine mammal takes in the prior five years in the unobserved strata.

Bycatch Rate Source	Species	Quarter	Area	# Positive Sets	#Observed Sets	Mean CPUE	CV CPUE	# Hooks Reported (X1000) 2011	Estimated Catch 2011
Quarterly 06-10	Leatherback	1	CAR	1	17	0.122	1.000	16.4	2.0
Quarterly 06-10	Leatherback	2	CAR	1	18	0.070	1.000	13.2	0.9
Quarterly 06-10	Leatherback	4	NED	12	70	0.226	0.270	33.8	7.6
Quarterly 06-10	Leatherback	4	SAB	2	64	0.061	0.718	86.0	5.3
Quarterly 06-10	Leatherback	4	TUN	1	21	0.031	1.000	34.4	1.1
Quarterly 06-10	Olive ridley	2	CAR	1	18	0.067	1.000	13.2	0.9
Quarterly 06-10	Loggerhead	1	CAR	2	17	0.221	0.736	16.4	3.6
Quarterly 06-10	Loggerhead	4	NED	12	70	0.239	0.278	33.8	8.1

Table 12. Total estimated interactions and experimental takes for A) Leatherback and B) Loggerhead turtles and C) Olive ridley turtles in the pelagic longline fishery during 2011 by fishing area. This includes estimates for strata that were not observed during 2011.

A. Leatherbacks

Area	Total	Total CV	Total 95% Confidence Interval	Experimental Takes
CAR	2.9	0.753	0.8 - 10.9	-
FEC	16.5	1.000	3.2 - 84.5	0
GOM	32.6	0.522	12.4 - 85.2	-
MAB	139.7	0.308	77.4 - 252.2	0
NCA	0.0	-	-	-
NEC	26.0	0.510	10.1 - 66.6	-
NED	7.6	0.270	4.5 - 12.9	-
SAB	12.1	0.645	3.8 - 38.4	1
SAR	0	-	-	-
TUN	1.1	1.000	0.2 - 5.5	-
Total	238.5	0.216	156.8 – 362.8	1

B. Loggerheads

Area	Total	Total CV	Total 95% Confidence Interval	Experimental Takes
CAR	3.6	0.736	1 - 13.2	-
FEC	92.0	0.471	38.3 - 221.1	0
GOM	0.0	-	-	-
MAB	81.0	0.449	35 - 187.5	0
NCA	0.0	-	-	-
NEC	103.3	0.301	58 - 184.2	-
NED	104.9	0.385	50.6 - 217.4	-
SAB	9.0	1.000	1.8 - 46.1	0
SAR	43.8	0.351	22.5 - 85.5	-
TUN	0.0	-	-	-
Total	437.6	0.179	309.1 – 619.5	0

C. Olive ridley

Area	Total	Total CV	Total 95% Confidence Interval	Experimental Takes
CAR	0.9	1.000	0.2 - 4.5	-
TUN	3.1	1.000	0.6 - 15.7	-
Total	4.0	0.807	1.0 – 15.9	0

Table 13. Total estimated interactions with marine mammals in the pelagic longline fishery during 2011.

Species	Estimated Alive	CV Alive	Estimated Serious Injury	CV Serious Injury	Estimated Dead	CV Dead	Estimated Total	CV Total	95% Confidence Interval
Atlantic spotted dolphin	0.8	1.000	0	-	0	-	0.8	1.000	0.2 – 4.3
Bottlenose dolphin	28.3	0.709	12.2	1.000	0	-	40.5	0.580	14.1 – 116.3
False killer whale	11.0	1.000	0	-	0	-	11.0	1.000	2.2 – 56.2
Pilot whale	39.5	0.577	233.7	0.299	18.7	1.000	291.7	0.251	179.5 – 474.0
Pygmy/Dwarf sperm whale	0	-	17.0	1.000	0	-	17.0	1.000	3.3 – 86.9
Risso's dolphin	18.0	0.583	13.3	0.631	0	-	31.3	0.429	14.0 – 70.1
Short-finned pilot whale	11.8	1.000	46.5	15.8-137.0	0	-	58.3	0.587	20.0 – 169.3
Unid. dolphin	0	-	1.1	1.000	0	-	1.1	1.000	0.2 – 5.6

Figure 1. Pelagic longline fishing areas in the North Atlantic Ocean: CAR = Caribbean, GOM = Gulf of Mexico, FEC = Florida East Coast, SAB = South Atlantic Bight, SAR = Sargasso Sea, MAB = Mid-Atlantic Bight, NEC = Northeast Coastal, NED = Northeast Distant, NCA = North Central Atlantic, TUN = Tuna North, TUS = Tuna South. Year-round closed areas in the De Soto Canyon (A) and the Florida East Coast (B) are indicated along with seasonal closures in the Charleston Bump (C) and in the Mid-Atlantic (D).

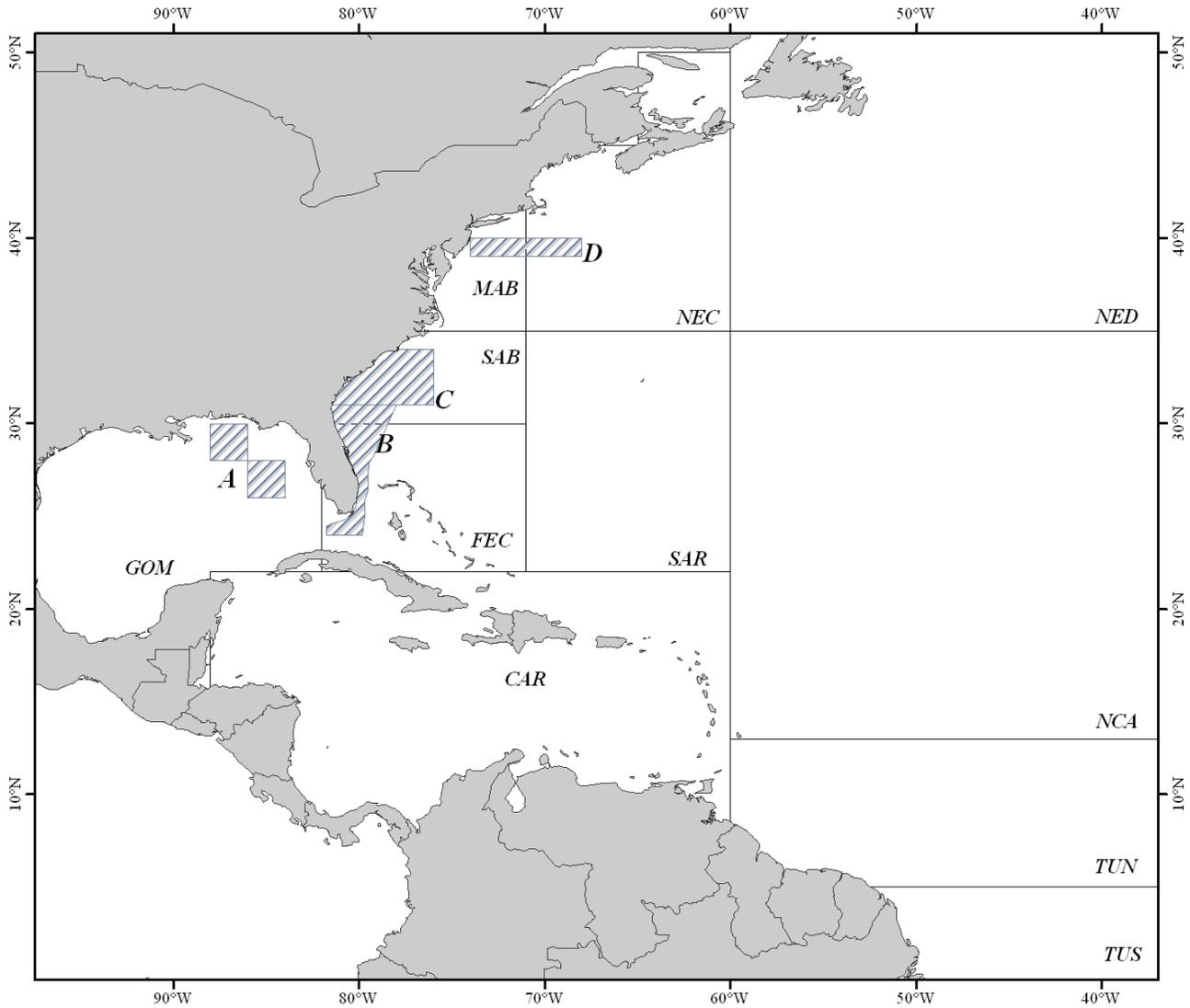


Figure 2. Observed (gray circles) and reported (black circles) pelagic longline fishing effort during 2011

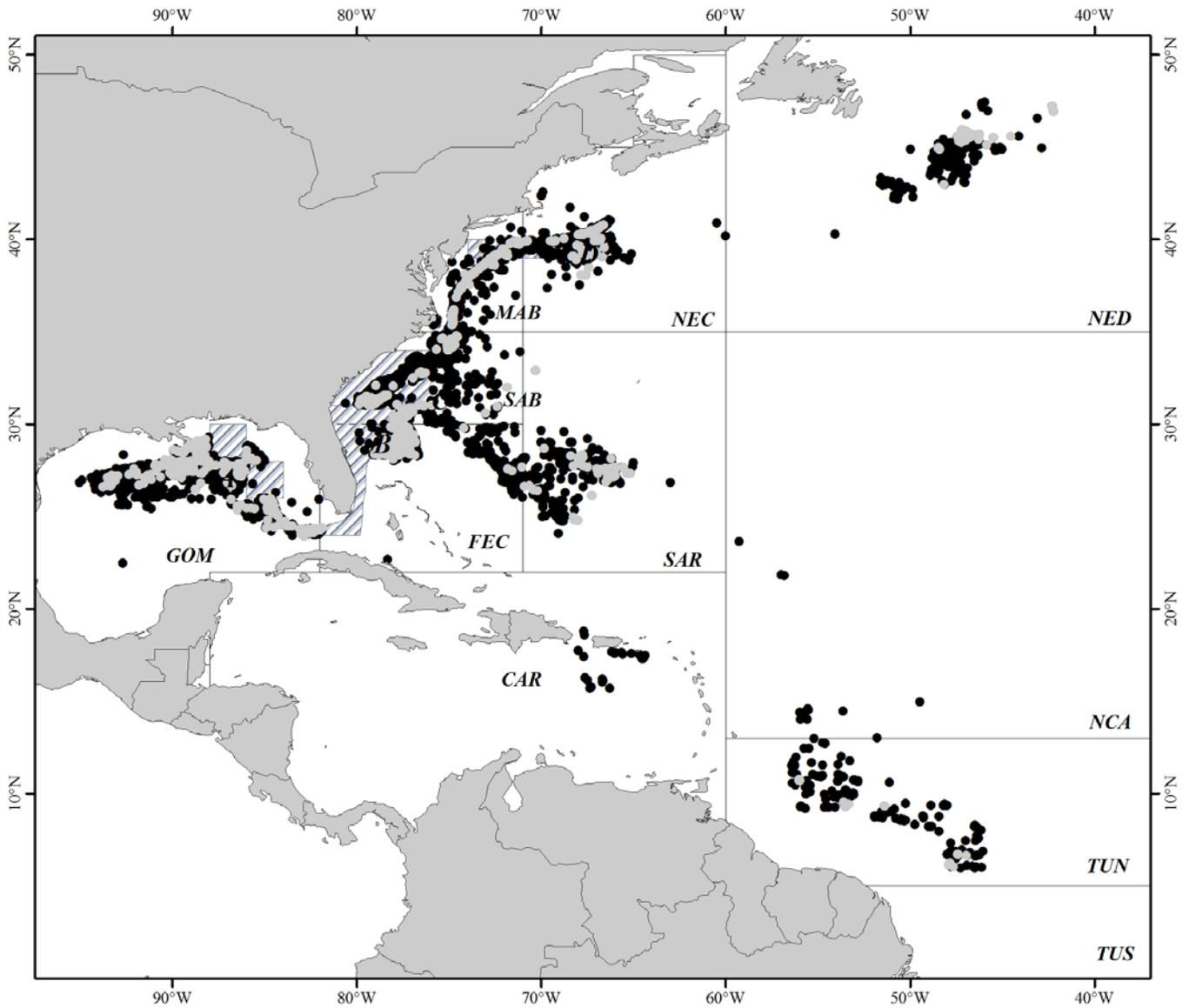


Figure 3. Locations of experimental sets during 2011

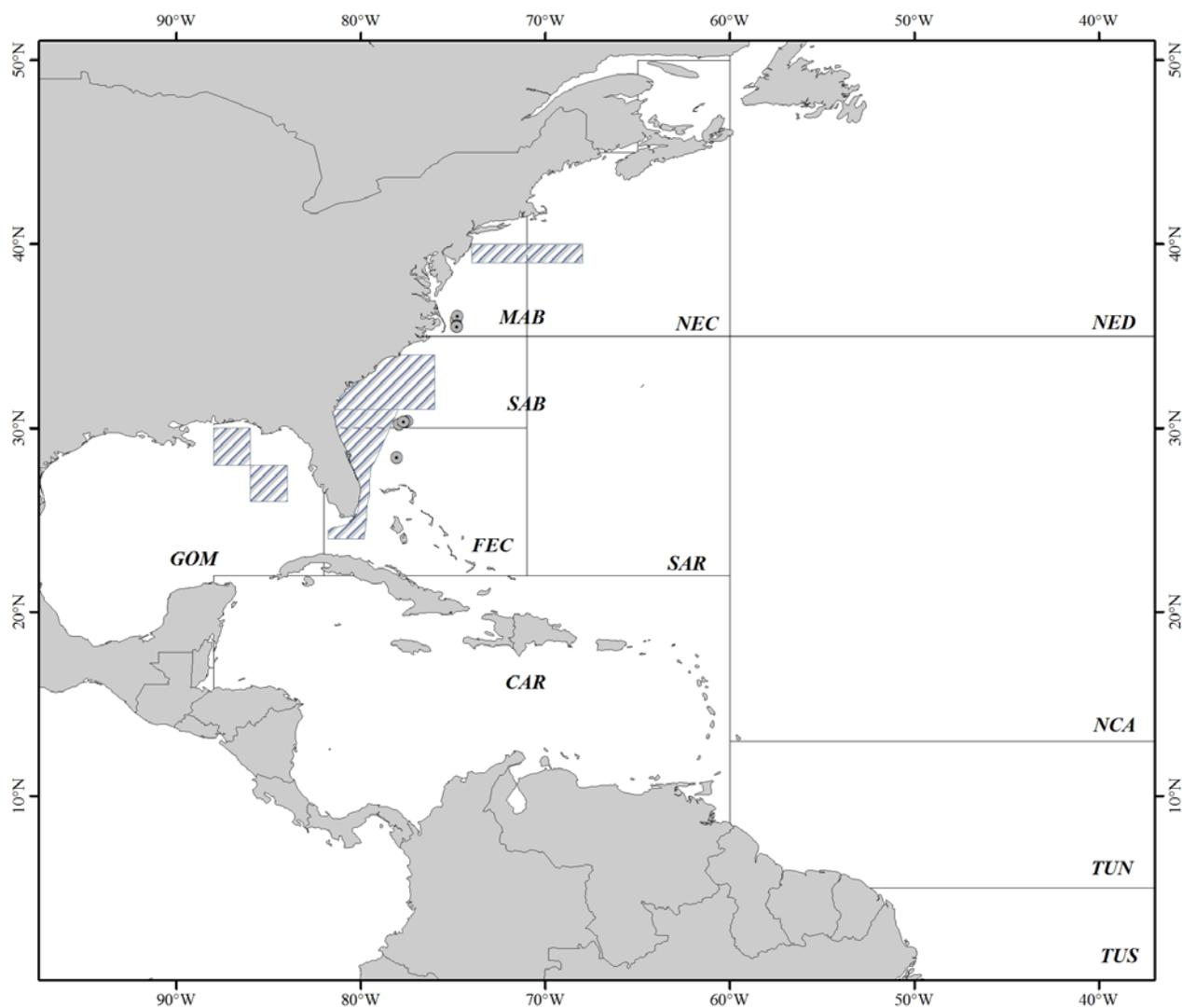


Figure 4. Observed pelagic longline fishing effort and sea turtle interactions during 2011

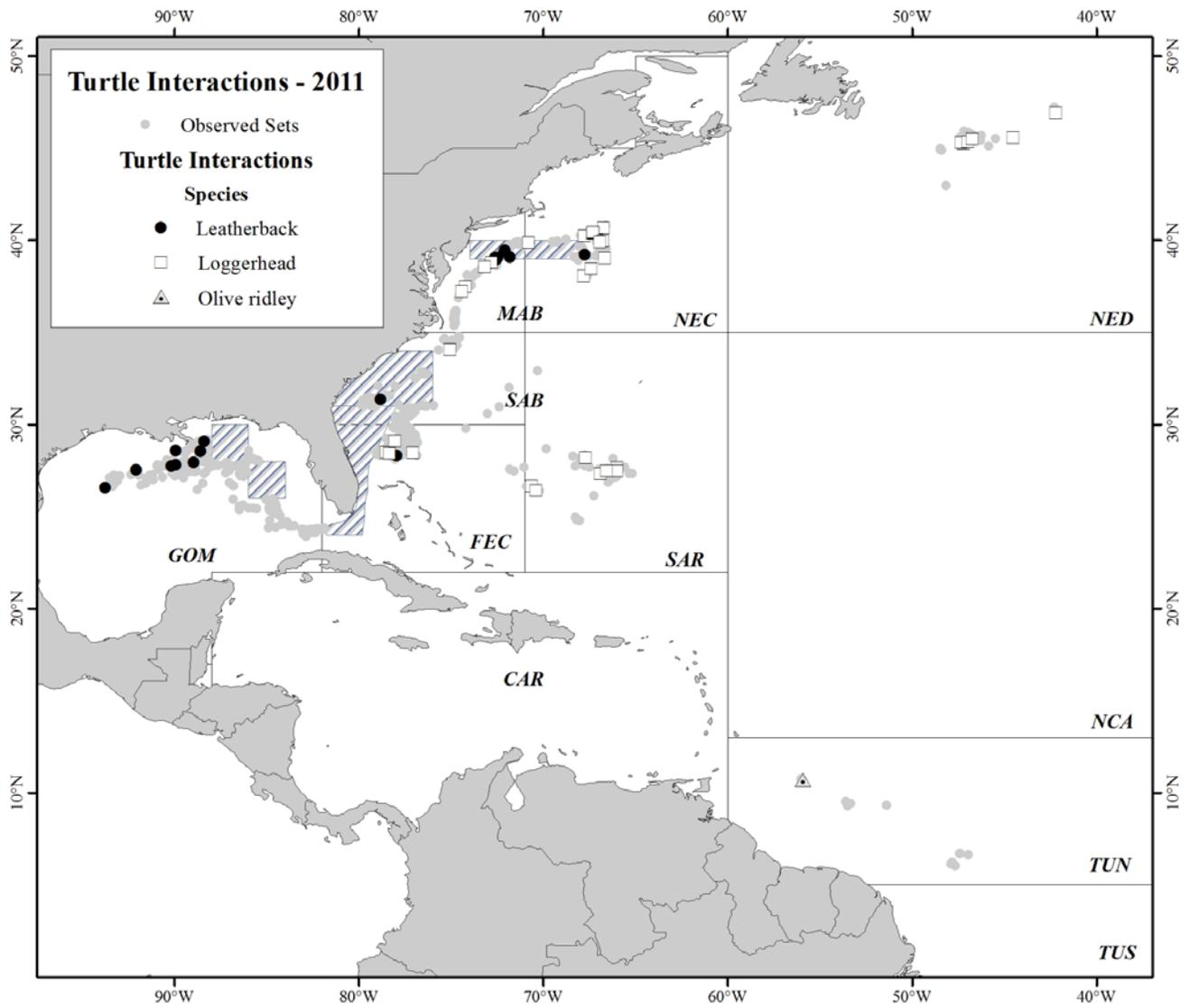


Figure 5. Observed pelagic longline fishing effort and marine mammal takes during 2011

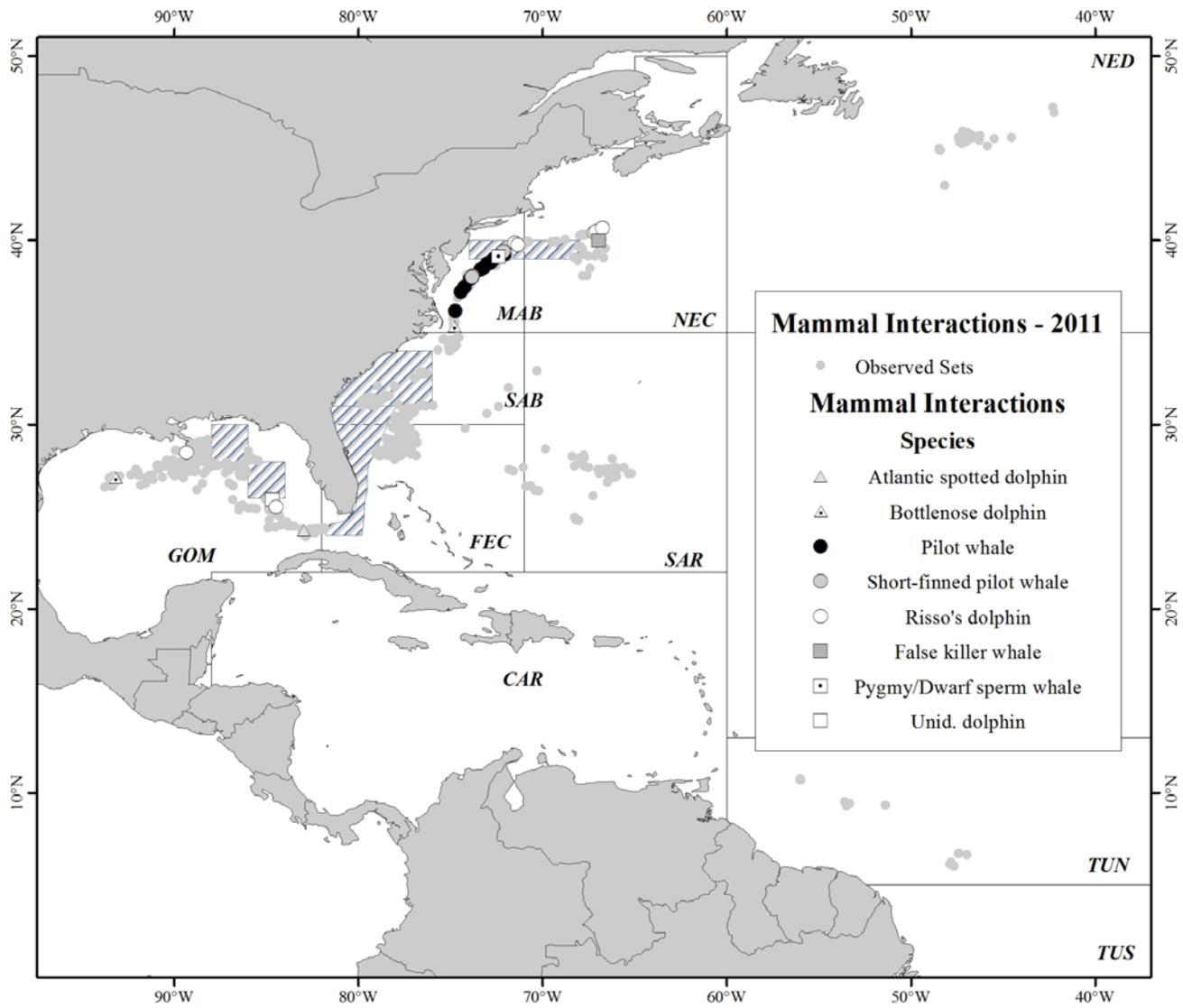
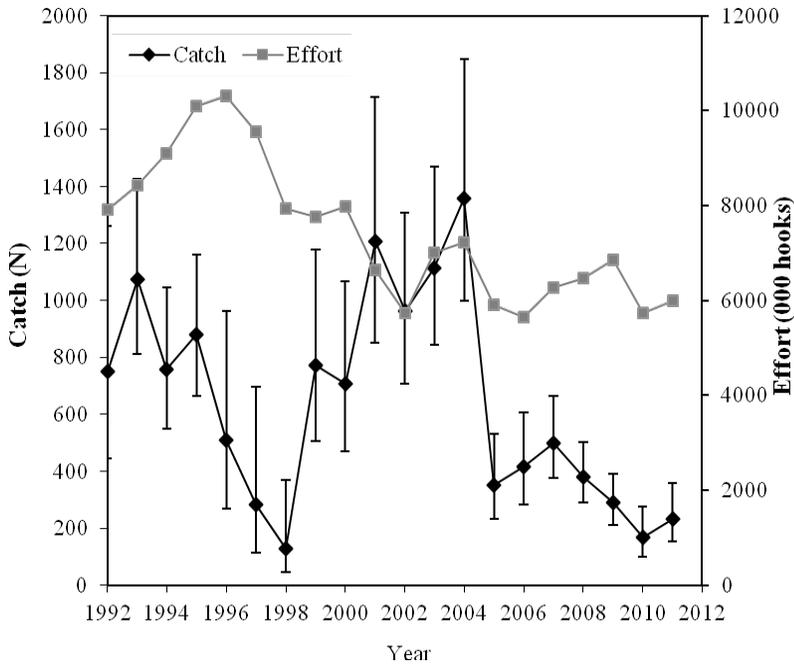


Figure 6. Historical trends in fishery effort and estimated marine turtle takes in the pelagic longline fishery from 1992 to 2011 for A) Leatherback Turtles, and B) Loggerhead Turtles. Errors bars represent 95% confidence intervals.

A. Leatherback Turtles



B. Loggerhead Turtles

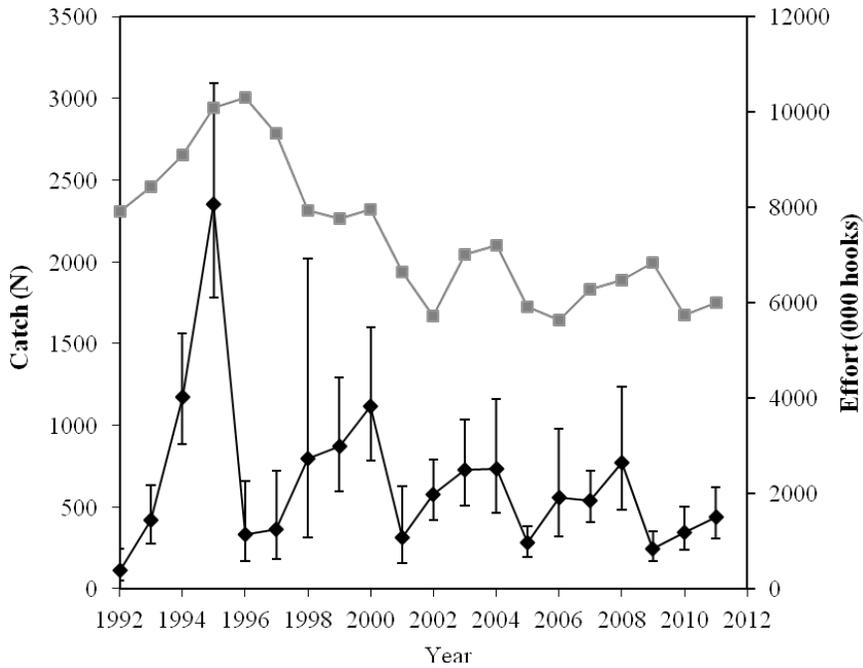
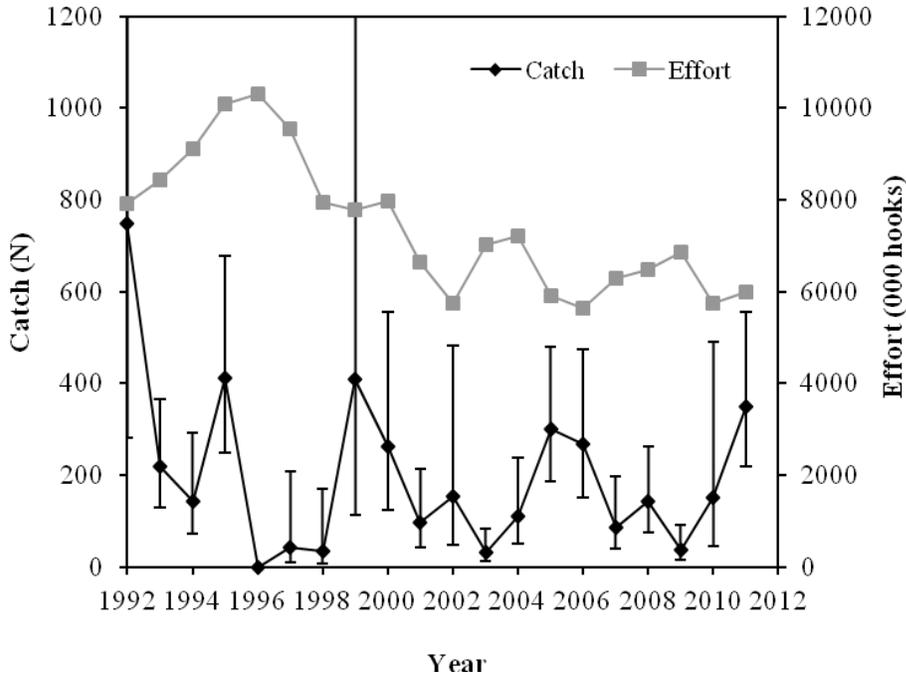
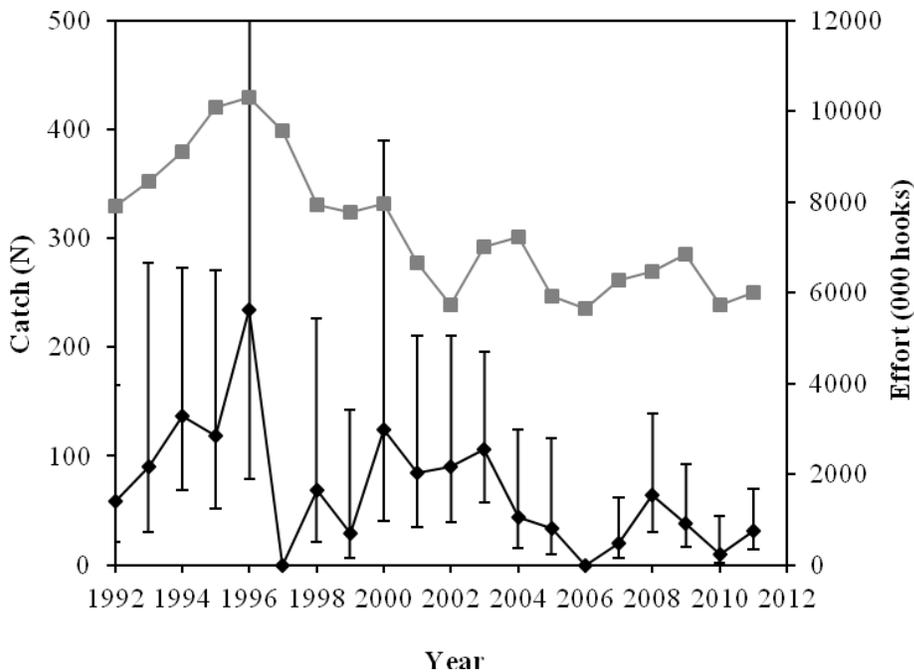


Figure 7. Historic trends in fishery effort and estimated marine mammal takes in the pelagic longline fishery from 1992 to 2011 for A) Pilot Whales and B) Risso’s Dolphins. Errors bars represent 95% confidence intervals. For 2011, the total includes both unidentified pilot whales and short-finned pilot whales.

A. Pilot Whales



B. Risso’s Dolphins



Appendix A. Sea Turtle Life History Form (dated 12/04)

CAPTURE INFORMATION

TRIP YEAR 20 MONTH DAY
 SET/HAUL/TOW SPECIMEN NUMBER BY TRIP

GEAR TYPE: Longline Gill Net Trawl (note time in comments)
 GEAR DEPTH: Surface Midwater Bottom Other

TIME (24 hr) WATER TEMP (°F)

LATITUDE deg min N/S LONGITUDE deg min E /W

Did turtle slide out/escape from gear? Y / N Was turtle brought on board? Y / N

IDENTIFICATION (see back) Number of Photos Taken?

SPECIES: Leatherback Loggerhead Kemp's ridley Green Hawksbill Olive ridley
 Unidentified Hardshell Unknown

CONDITION OF TURTLE AT CAPTURE Injured Uninjured Unknown

(Please check injury status above as well as condition below)

Previously dead Fresh dead Comatose Attempted resuscitation? Y / N
 Alive Unknown (describe) Other (describe)

IF GEAR IS A FORM OF HOOK AND LINE, COMPLETE THIS SECTION, AS APPLICABLE:

HOOK TYPE "J" Circle Other (describe) SIZE /0

MANUFACTURER/STYLE NO. DEGREE OFFSET °

BAIT Squid Mackerel Sardine Unknown Other (describe) SIZE

Caught on hook timer? Y / N If yes, fill in time elapsed

Was light stick on hook? Y/N/U Circle: White, Pink, Blue, Green, Black, Red, Yellow, Purple, Aqua, Other, Unknown

If No, number of gangions to next light stick

Light Stick Color (circle)? White, Pink, Blue, Green, Black, Red, Yellow, Purple, Aqua, Other, Unknown

Number of gangions to next float

HOOK LOCATION

(circle specific location; check box if specifics are not known; annotate drawing on reverse to indicate location as needed):

Not Hooked Not Known if Hooked Hooked, but location totally Unknown

Internal: Unknown, internal

Swallowed (Esophagus) Hook visible? Visible to insertion point / Partial hook / Not visible

Beak/ Mouth (Circle one) Jaw Location (Check one) upper lower side (mouth only)

Check one for mouth: tongue glottis roof of mouth jaw joint other (describe)

External: Unknown, external Beak/Head/Neck Carapace/Plastron

Front Flipper/Shoulder/Armpit Rear Flipper/Groin/Tail

Was hook removed from this animal? Y / N / Unknown / Not Applicable

Was animal entangled in gear? At capture? Y / N / Unknown At Release? Y / N / Unknown

How much gear (linear feet) was left on turtle when released? . ft. (estimated/measured)

Estimated carapace length (notch-to-tip straight line): . ft (needed only if turtle is not boated & measured)

Appendix B

Table B1. Gear types and hooking locations based upon observed comments and the sea turtle life history form for each A) Leatherback and B) Loggerhead turtles observed during 2011. These data are summarized in Tables 5 and 6. Q indicates calendar quarter, “CL Est.” indicates an estimated carapace length in feet, “CCL” indicates a measured curved carapace length in cm, and “N-N” indicates a straight line measurement of the turtle carapace from notch to notch (see Appendix A). Areas denoted with “Exp” indicate takes in experimental fishing. “Injury Cat. Row” and “Release Cond. Col.” refer to rows and columns, respectively, for post-release mortality assignments in SEFSC 2012.

A. Leatherback Turtles

#	Area	Q	Hook Type	Offset (degrees)	Bait	Bait Size (g)	Capture Condition	Final Disposition	Hook Location	Hook Removed?	Entangled Capture?	Entangled Release?	Line Left (ft)	Injury Cat. Row	Release Cond. Col.	CL Est. (ft)	CCL (cm)	N-N (cm)
1	GOM	2	C-18/0	10	Mackerel	302	Alive, unknown	Released alive	Not known if hooked	Yes	Unknown	No	0.0	IV	D	4.0		
2	GOM	2	C-16/0	0	Mackerel	189	Alive, injured	Released alive	Armpit	No	No	No	1.0	I	C	4.5		
3	NEC	3	C-18/0	10	Squid or mackerel	184 or 284	Alive, injured	Released alive	unknown location	No	No	No	12.0	IV	B	6.0		
4	FEC	2	C-16/0	0	Squid	252	Alive, injured	Released alive	Armpit	Yes	No	No	0.0	I	D	5.0		
5	GOM	4	C-16/0	0	Squid	126	Alive, injured	Released alive	armpit	Yes	No	No	0	I	D	5.0		
6	GOM	4	C-16/0	0	Squid	131	Alive, uninjured	Released alive	not hooked	N/A	Yes	No	0	V	D	5.0		
7	MAB	4	C-16/0	0	Squid	198	Alive, injured	Released alive	armpit	Yes	No	No	0	I	D	3.5		
8	MAB	4	C-16/0	0	Squid	212	Alive, injured	Released alive	shoulder	Yes	No	No	0	I	D	3.5		
9	MAB	4	C-18/0	10	Squid	167	Alive, injured	Released alive	armpit	Yes	No	No	0	I	D	4.5		
10	MAB	4	C-16/0	0	Squid	189	Alive, injured	Released alive	shoulder	No	No	No	0	I	C	5.0		
11	SAB	1	C-18/0	10	Mackerel	234	Alive, injured	Released alive	Mouth, side, other	No	No	No	0.50	II	C	4.00		

Appendix B, Table B1, A. Leatherback Turtles cont.

#	Area	Q	Hook Type	Offset (degrees)	Bait	Bait Size (g)	Capture Condition	Final Disposition	Hook Location	Hook Removed?	Entangled Capture?	Entangled Release?	Line Left (ft)	Injury Cat. Row	Release Cond. Col.	CL Est. (ft)	CCL (cm)	N-N (cm)
12	MAB	4	C-16/0	0	Squid	135	Alive, injured	Released alive	armpit	Yes	No	No	0	I	D	4.5		
13	MAB	4	C-16/0	0	Squid	140	Alive, injured	Released alive	front flipper	No	No	No	22	I	B	8.0		
14	MAB	4	C-16/0	0	Squid	162	Alive, injured	Released alive	armpit	No	No	No	1	I	C	6.0		
15	MAB	4	C-16/0	0	Squid	162	Alive, injured	Released alive	armpit	Yes	No	No	0	I	D	4.0		
16	GOM	2	C-16/0	0	Sardine	72	Alive, injured	Released alive	Roof of mouth	Yes	No	No	0.0	III	D	4.4		
17	GOM	2	C-16/0	0	Sardine	108	Alive, uninjured	Released alive	Not hooked	N/a	Yes	No	0.0	V	D	5.5		
18	GOM	2	C-16/0	0	Squid	149	Alive, uninjured	Released alive	Not hooked	N/a	Yes	No	0.0	V	D	4.0		
19	NEC	2	C-18/0	10	Mackerel or squid	225 or 140	Alive, unknown	Released alive	Not known if hooked	Yes	Unknown	No	0.0	IV	D	6.0		
20	NEC	4	C-18/0	10	Squid	117	Alive, injured	Released alive	mouth, side, jaw joint	Yes	No	No	0	III	D	6.0		
21	GOM	2	C-16/0	0	Sardine	63	Alive, injured	Released alive	Front flipper	Yes	No	No	0.0	I	D	5.0		
22	NEC	2	C-18/0 or C-16/0	10 or 0	Mackerel or squid	338 or 180	Alive, injured	Released alive	Armpit	No	No	No	0.1	I	C	5.0		
23	MAB	3	C-18/0 or C-16/0	10 or 0	Squid	189	Alive, uninjured	Released alive	not hooked	N/A	Yes	No	0.0	V	D	5.0		
24	SAB – Exp.	2	C-18/0	0	Squid	225	Alive, injured	Released alive	Unknown, internal	No	No	No	5.0	IV	B	5.0		

B. Loggerhead Turtles

#	Area	Q	Hook Type	Offset (degrees)	Bait	Bait Size (g)	Capture Condition	Final Disposition	Hook Location	Hook Removed?	Entangled Capture?	Entangled Release?	Line Left (ft)	Injury Cat. Row	Release Cond. Col.	CL Est. (ft)	CCL (cm)	N-N (cm)
1	NED	3	C-18/0	10	Squid	207	Alive, uninjured	Released alive	holding bait/hook	Yes	No	No	0.0	N/A	N/A	Unk		
2	NED	3	C-18/0	10	Squid	207	Alive, injured	Released alive	swallowed, hook not visible	No	No	No	0.2	IV	C		66	56
3	NED	3	C-18/0	10	Squid	207	Alive, uninjured	Released alive	holding bait/hook	Yes	No	No		N/A	N/A	Unk		
4	NED	3	C-18/0	10	Squid	207	Alive, injured	Released alive	side jaw joint	Yes	No	No	0.0	III	D		53	47.5
5	NED	3	C-18/0	10	Squid	207	Alive, injured	Released alive	tongue	Yes	No	No	0.0	III	D		60.5	56.5
6	NED	3	C-18/0	10	Squid	212	Alive, injured	Released alive	side jaw joint	Yes	No	No	0.0	III	D		72	64
7	NED	3	C-18/0	10	Squid	212	Alive, injured	Released alive	front flipper/shoulder/arm pit	Yes	No	No	0.0	I	D		53	44.5
8	NED	3	C-18/0	10	Squid	212	Alive, injured	Released alive	swallowed, hook partially visible	No	No	No	0.0	III	C		62	54.5
9	NED	3	C-18/0	10	Squid	207	Alive, injured	Released alive	swallowed, hook partially visible	No	No	No	0.0	III	C		68	62
10	NED	3	C-18/0	10	Squid	207	Alive, injured	Released alive	mouth, lower jaw, other	Yes	No	No	0.0	II	D		62	56
11	NED	3	C-18/0	10	Squid	207	Alive, injured	Released alive	tongue	Yes	No	No	0.0	III	D		76	69.5
12	NED	3	C-18/0	10	Squid	207	Alive, uninjured	Released alive	holding bait/hook	Yes	No	No	0.0	N/A	N/A	Unk		
13	NED	3	C-18/0	10	Squid	207	Alive, injured	Released alive	tongue	Yes	No	No	0.0	III	D		61	54.5
14	FEC	4	C-16/0	0	Squid or herring	266 or 180	Alive, injured	Released alive	mouth lower jaw other	No	No	No	0	II	C	2.0		

Appendix B, Table B1, B. Loggerhead Turtles cont.

#	Area	Q	Hook Type	Offset (degrees)	Bait	Bait Size (g)	Capture Condition	Final Disposition	Hook Location	Hook Removed?	Entangled Capture?	Entangled Release?	Line Left (ft)	Injury Cat. Row	Release Cond. Col.	CL Est. (ft)	CCL (cm)	N-N (cm)
15	SAR	4	C-18/0	10	Squid	230	Alive, injured	Released alive	mouth lower jaw other	Yes	No	No	0	II	D		63.0	59.5
16	SAR	1	C-18/0	10	Squid or mackerel	230 or 423	Alive, injured	Released alive	Swallowed, hook partially visible	No	No	No	0.10	III	C		70.3	63.3
17	SAR	1	C-18/0	10	Squid or mackerel	230 or 423	Alive, injured	Released alive	Swallowed, hook partially visible	No	No	No	0.10	III	C		65.8	57.8
18	SAR	1	C-18/0	10	Squid or mackerel	230 or 423	Alive, injured	Released alive	Mouth, lower, other	Yes	No	No	0.00	II	D		73.9	68.7
19	MAB	3	C-18/0	10	Squid	126	Alive, injured	Released alive	mouth, lower jaw, other	Yes	No	No	0.0	II	D		71.4	66.1
20	NEC	3	C-18/0	10	Squid	194	Alive, injured	Released alive	mouth, lower jaw, other	No	No	No	1.2	II	C	2.7		
21	NEC	3	C-18/0	10	Squid	194	Alive, injured	Released alive	swallowed, hook not visible	No	No	No	12.0	IV	B	2.3		
22	NEC	3	C-18/0	10	Squid	194	Alive, injured	Released alive	tongue	No	No	No	0.8	III	C	2.5		
23	NEC	3	C-18/0	10	Squid	194	Alive, injured	Released alive	unknown location	No	No	No	2.0	IV	B	2.7		
24	SAR	4	C-18/0	10	Squid or mackerel	216 or 437	Alive, injured	Released alive	swallowed hook not visible	No	No	No	0.1	IV	C		69.8	62.8
25	FEC	4	C-16/0	0	Squid	230	Alive, injured	Released alive	swallowed hook not visible	No	No	No	1	IV	C	2.7		
26	FEC	1	C-16/0	0	Squid	320	Alive, injured	Released alive	Front flipper	No	No	Unknown	6.00	I	A	3.50		
27	NEC	3	C-18/0	10	Squid, mackerel or herring	162, 243, or 243	Alive, injured	Released alive	mouth, side, other	Yes	No	No	0.0	II	D		69	67

Appendix B, Table B1, B. Loggerhead Turtles cont.

#	Area	Q	Hook Type	Offset (degrees)	Bait	Bait Size (g)	Capture Condition	Final Disposition	Hook Location	Hook Removed?	Entangled Capture?	Entangled Release?	Line Left (ft)	Injury Cat. Row	Release Cond. Col.	CL Est. (ft)	CCL (cm)	N-N (cm)
28	NEC	3	C-18/0	10	Squid or mackerel	261 or 126	Alive, injured	Released alive	tongue	Yes	No	No	0.0	III	D		63	59
29	NEC	3	C-18/0	10	Squid	230	Alive, injured	Released alive	beak internal, lower jaw	Yes	No	No	0.0	I	D		71.5	68
30	NEC	3	C-18/0	10	Squid	221	Alive, injured	Released alive	beak internal, lower jaw	Yes	No	No	0.0	I	D		65.5	62
31	MAB	4	C-16/0	0	Squid or mackerel	311 or 324	Alive, injured	released alive	tongue	Yes	No	No	0	III	D		66.0	62.0
32	SAR	1	C-18/0	10	Squid or mackerel	176 or 225	Alive, injured	Released alive	Beak internal, lower jaw	Yes	No	No	0.00	I	D		69.2	63.8
33	SAR	1	C-18/0	10	Squid or mackerel	176 or 234	Alive, injured	Released alive	Mouth, lower, other	Yes	No	No	0.00	II	D		73.2	66.8
34	SAB	2	C-18/0	10	Mackerel or squid	230 or 248	Alive, injured	Released alive	Swallowed, hook partially visible	Yes	No	No	0.0	III	D		67.8	60.4
35	FEC	4	C-16/0	0	Squid	243	Alive, injured	released alive	swallowed hook not visible	No	No	No	0.5	IV	C	3.0		
36	MAB	3	C-16/0	0	Squid	198	Alive, injured	Released alive	mouth, side, unknown	No	No	No	0.5	III	C	4.5		
37	MAB	3	C-16/0	0	Squid	198	Alive, injured	Released alive	front flipper	No	No	No	0.5	I	C	4.0		
38	MAB	3	C-16/0	0	Squid	198	Alive, injured	Released alive	swallowed, hook not visible	No	No	No	0.5	IV	C	3.5		
39	NEC	4	C-18/0	0	Squid	180	Alive, injured	Released alive	mouth side other	Yes	No	No	0	II	D		75.0	
40	NEC	2	C-18/0 or C-16/0	10 or 0	Mackerel or squid	388 or 180	Alive, injured	Released alive	Swallowed, hook not visible	No	No	No	0.1	IV	C		67.8	59.0
41	NEC	2	C-16/0	0	Mackerel or squid	388 or 180	Alive, injured	Released alive	Beak internal, lower jaw	Yes	No	No	0.0	III	D		70.4	63.4
42	NEC	2	C-16/0	0	Mackerel or squid	388 or 189	Alive, injured	Released alive	Swallowed, hook partially visible	Yes	No	No	0.0	III	D		60.8	54.8

Appendix B, Table B1, B. Loggerhead Turtles cont.

#	Area	Q	Hook Type	Offset (degrees)	Bait	Bait Size (g)	Capture Condition	Final Disposition	Hook Location	Hook Removed?	Entangled Capture?	Entangled Release?	Line Left (ft)	Injury Cat. Row	Release Cond. Col.	CL Est. (ft)	CCL (cm)	N-N (cm)
43	NEC	2	C-16/0	0	Mackerel or squid	388 or 189	Alive, injured	Released alive	mouth, lower jaw, other	Yes	No	No	0.0	II	D		70.2	62.0
44	MA B	3	C-18/0	10	Squid	180	Alive, injured	Released alive	tongue	Yes	No	No	0.0	III	D		72.2	65.2
45	FEC	4	C-16/0	0	Squid	189	Alive, injured	Released alive	swallowed hook not visible	Yes	Yes	Yes	0	IV	A		78.0	71.4
46	FEC	4	C-16/0	0	Squid	189	Alive, injured	Released alive	swallowed hook partially visible	No	No	No	0.1	III	C		66.4	62.6
47	FEC	4	C-16/0	0	Squid	189	Alive, injured	Released alive	tongue	Yes	No	No	0	III	D		68.8	66.0

C. Olive ridley turtle

#	Area	Q	Hook Type	Offset (degrees)	Bait	Bait Size (g)	Capture Condition	Final Disposition	Hook Location	Hook Removed?	Entangled Capture?	Entangled Release?	Line Left (ft)	Injury Cat. Row	Release Cond. Col.	CL Est. (ft)	CCL (cm)	N-N (cm)
1	TUN	1	C-16/0	0	Squid or mackerel	180 or 113	Alive, injured	Released alive	Tongue	Yes	No	No	0.00	III	D		61.4	56.7

Appendix B cont.

Table B2: 2011 observer comments and serious injury codes for marine mammals are presented. Lengths (cm) are estimated visually by the observer. Interaction type categories are based on NMFS Serious Injury determination policy.

Animal #	Species	Length (cm)	Release Condition	Interaction Type	Observer Comments
1	Atlantic spotted dolphin	210	Released Alive	S7b – Entangled before being freed without gear attached	[Check boxes indicate animal was wrapped around flukes and tail in mainline. All gear removed and no wraps] As the dolphin came up it immediately swam underneath the bow, then emerged behind the stern seconds later. Two of the crew had a hold of the mainline and the other crewmember had grabbed the long handled line cutter. The dolphin was cut loose from mainline within five seconds from emerging from the stern. The dolphin swam away at the surface then dove down about 100 feet from the boat. Dolphin was cut from mainline and swam off the port side of the boat. It swam up on the surface directly away from the boat then submerged underwater where it was not seen again.
2	Risso's dolphin	270	Serious Injury	S6 – Gear attached to free-swimming animal with potential to be ingested or entangle	[Check boxes indicate that the animal may have been involved with the hook and gangion line. Animal was released with 50 feet of trailing gear. Location of hook (if hooked) was unknown] It is not known if this animal is hooked or entangled. The gangion was cut before it could be brought to the boat. This animal did not appear panicked or stressed and calmly swam away when the gangion was cut.
3	Risso's dolphin	240	Released Alive	S7b – Entangled before being freed without gear attached	[Check boxes indicate that animal was entangled in mainline around head and front flipper. All gear removed] Dolphin was pulled to port side of boat by captain and crewmember. Other crew grabbed the long handled line cutter and cut one side of mainline. The mainline was then pulled from the uncut side of the mainline, freeing the animal. Dolphin then swam away from boat then dove down. No mainline remained on the animal. The dolphin swam directly from the port side of the boat for about 5 feet at the surface before diving not to be seen again.
4	Unid. dolphin	210	Serious Injury	S5a – Hook in head	[Check boxes indicate hooked, but not visible. Noted line coming from mouth/head region. Animal not entangled, released with hook and 3 ft of line remaining] 2 crew members had a hold of the gangion trying to pull it to the surface as the MAM jumped out of the water at the stern of the boat. The dolphin then surfaced a couple seconds later for nearly two seconds then swam down popping the line. Dove down out of sight immediately.
5	Bottlenose dolphin	180	Released Alive	S7b – Entangled before being freed without gear attached	[Check boxes indicate animal was entangled in mainline around flipper, head, mouth. Gear was removed from animal before release] Dolphin was lightly tangled around left front flipper and beak, they used gaff to pull slack in the line and dolphin rolled out of tangle. Gear was easily removed with no gear remaining. It stayed at the surface for a moment then quickly dove away.
6	Risso's dolphin	300	Serious Injury	S6 – Gear attached to free-swimming animal with potential to be ingested or entangle	[Check boxes indicate animal was hooked, but location unknown since animal was beneath surface. Released with 36 feet trailing line.] Animal was attempted to be pulled in but was too strong and line was cut at snap. Line appeared to be leading to front of animal. After release it came up for air and swam away.

Appendix B, Table B2 (cont.)

Animal #	Species	Length (cm)	Release Condition	Interaction Type	Observer Comments
7	Risso's dolphin	240	Serious Injury	S6 – Gear attached to free-swimming animal with potential to be ingested or entangle	[Check boxes indicate hooked in unknown location, entangled in mainline and gangion around tail and flukes. Animal released with 5 feet of gear, but wraps cut. Unknown if hook was in the animal or not] Animal pulled to boat mainline wraps unentangled, biopsy attempted with small amount of tissue collected. Then gangion line was cut; however actual placement of hook unknown (whether was in animal or not) Potentially some gangion wraps left on caudal fin. Last piece of gline (gangion), cut while animal was beneath surface and was actively swimming away.
8	Pilot whale	270	Released Alive	S7b – Entangled before being freed without gear attached	[Check boxes indicated hooked in fluke, not entangled]. Hook was in fluke. MPW tried to keep swimming away from boat. I was ready for biopsy, but MPW did not get close enough to boat before hook came out. No gear left on animal. MPW swam away quickly when released.
9	Pilot whale	210	Serious Injury	S5a – Hook in head	[Check boxes indicate hooked in side of mouth. Line cut leaving 0 ft. remaining on animal] Hook was in corner of mouth. Leader broke at crimp when crew was wiring [sic] MPW to boat for biopsy. MPW quickly swam away on release. I saw nothing abnormal in it's behavior.
10	Pilot whale	270	Serious Injury	S5a – Hook in head	[Check boxes indicate hooked in side of mouth. Line was cut leaving 36 feet with the animal] Crew was wiring MPW to boat for quite awhile. He could not get MPW close to boat for biopsy or hook removal. Finally Capt said cut the line and they did. Crew used a knife instead of long pole line cutter. MPW swam away normally when released.
11	Pilot whale	360	Serious Injury	S5a – Hook in head	[Check boxes indicate animal hooked in side of mouth. Hook was not removed, but line was cut leaving 2 feet with the animal] After I got a picture and a biopsy, crew cut leader while MPW was next to boat. MPW swam away normally when released.
12	Shortfin pilot whale	210	Serious Injury	S5a – Hook in head	[Check boxes indicate hooked in side of mouth. Line broke leaving 0 feet with animal.] Crew was trying to get MPW to boat when leader broke at crimp. MPW quickly swam away normally. NOTE: Genetic id was SF pilot whale.

Appendix B, Table B2 (cont.)

Animal #	Species	Length (cm)	Release Condition	Interaction Type	Observer Comments
13	Short-finned pilot whale	210	Released Alive	S7b – Entangled before being freed without gear attached	[Check boxes indicate animal was not hooked, but was entangled in mainline, gangion, and dropline. With wraps around tail/flukes. Wraps were cut with no line left on animal when released]. Wraps were cut with a knife until all gear was removed. NOTE: Genetic id was SF pilot whale, incorrectly coded in database and on datasheet.
14	Pilot Whale	210	Released Alive	S7b – Entangled before being freed without gear attached	[Check boxes indicate animals was not hooked but wrapped in mainline through the mouth. All gear removed from animal] Once they got the animal alongside the boat and untwisted the mainline, the mainline came out of its mouth easily. The line was caught between its teeth. The MPW swam away quickly.
15	Short-finned pilot whale	270	Serious Injury	S7b – Entangled before being freed without gear attached <i>Indication of tired animal and milling post-release support SI determination.</i>	[Check boxes indicate animal was not hooked. Wrapped in mainline, gangion, and float line around front flippers. Wraps were cut and animal was released with no entangling gear.] MPW was entangled around both front flippers. The lines were cut with a knife until all line was removed. MPW was tired. When released milled around surface for 10 seconds or so then sawm away slowly. NOTE: Genetic id was SF pilot whale. Database coding is incorrect and noted incorrectly on data sheet.
16	Short-finned pilot whale	210	Serious Injury	S5a – Hook in head	[Check boxes indicate animal was hooked somewhere near mouth/head area, hook not visible. Hook was not removed and line was cut with 4 feet remaining with the animal] Leader was cut with a knife when MPW got close to boat. I did not get a good look into the animal's mouth to see the hook. MPW milled at surface after being released. It didn't swim away. NOTE: Animal genetically ID'd as SF Pilot whale. Database coding is incorrect and incorrectly noted on data sheet.
17	Pilot Whale	390	Serious Injury	S2 – Ingested gear	[Check boxes indicate animal was hooked in the mouth and that the hook was swallowed. Line was cut leaving 4 feet of line with the animal] MPW had entangled mainline but was not itself entangled. 2 people pulled mainline tangle up enough so that when mpw circled from underneath boat able to use long handled line cutter to cut gangion close to mouth. Took alot of manpower to maneuver MPW close enough to guet a shot w/long handled dehooker. Dangerous bc crew had tangle in hands. Once gangion cut, MPW took one breath and dove.
18	False Killer Whale	240	Released Alive	S7b – Entangled before being freed without gear attached	[Check boxes indicate animal was hooked in tail. Hook was not removed, but line was cut with 2 feet remaining with the animal. Animal was also entangled in mainline, gangion, and floatline around tail. Wraps were cut before release.] Gear tangled mostly w/mainline, a few gangion/float snaps pulled together. Animal pulled alongside vessel, daub removed easily, cangion cut close to hook. Animal slid out easily. Trying to swim away. Remained on surface during involvement. Swam away rapidly after freed. NOTE: Genetic id to False Killer Whale

Appendix B, Table B2 (cont.)

Animal #	Species	Length (cm)	Release Condition	Interaction Type	Observer Comments
19	Pilot whale	360	Serious Injury	S2 – Ingested gear	[Check boxes indicate animal was hooked in mouth and hook was swallowed. Hook not removed and line cut with 20 feet remaining with the animal.] Long handled line cutter used, approx 20 ft. leader left on animal. Animal swam off vigorously.
20	Pilot whale	360	Serious Injury	S6 - Gear attached to free-swimming animal with potential to be ingested or entangle	[Check boxes indicate animal was hooked, but hook location unknown. Leader broke leaving 20 feet of line with animal] Leader broke while bringing animal to boat. About 20 ft leader left on animal, hook location unknown, no appearance of entanglement. Swam away vigorously.
21	Pilot whale	390	Serious Injury	S5a – Hook in head	[Check boxes indicate animal was hooked in side of mouth. Hook was not removed and line cut with 6 feet remaining with animal.] Crew cut leader with knife. MPW dove and swam away quickly.
22	Risso’s dolphin	240	Released Alive	S7b – Entangled before being freed without gear attached	[Check boxes indicate animal was not hooked but entangled in mainline around tail/flukes. Gear removed and wraps cut] Hauled to MAM - Able to get other side of mainline with grapple hook. Used long handle line cutter to cut mainline near flukes of mam. Wraps of mainline pulled off MAM's tail stock. Dove immediately upon release.
23	Pilot whale	180	Released Alive	S7b – Entangled before being freed without gear attached	[Check boxes indicate animal was not hooked but entangled in mainline through mouth and around flukes. Wraps were cut and gear was removed from animal.] Baby whale ~6 ft. Multiple wraps around tail and flukes, 1 wrap (all mainline) going from tail to mouth and back to tail binding whale to one side, low freeboard. Crew used lafource line cutter to cut wrap near mouth, used knives to cut wraps around tail. Whale made lots of pathetic noises, swam away lively free of all mainline. Swam away lively, momentarily hung up as last of mainline came off tail.
24	Pilot whale	210	Serious Injury	S5a – Hook in head	[Check boxes indicate animal was hooked near head/mouth but no clear view of the hook. Line was cut leaving 30 feet of leader with the animal] Leader cut 5 fathoms from animal. Swam off vigorously.

Appendix B, Table B2 (cont.)

Animal #	Species	Length (cm)	Release Condition	Interaction Type	Observer Comments
25	Pygmy/Dwarf sperm whale	240	Serious Injury	S5a – Hook in head	[Check boxes indicate animal was hooked near the front of head/mouth but no clear view of hook location. Line was cut leaving 24 feet remaining with the animal.] Leader cut with 4 fathoms remaining with animal. Swam off vigorously, sounded almost immediately.
26	Pilot whale	240	Serious Injury	S6 - Gear attached to free-swimming animal with potential to be ingested or entangle	[Check boxes indicate animal was entangled in mainline around body and tail/flukes. Part of gear was removed, but 15 feet of line remained on animal with only partially cut wraps]. Wraps cut with long handle cutter. Swam off strongly, sounded quickly.
27	Pilot whale	270	Serious Injury	S5a – Hook in head	[Check boxes indicate animal was hooked near mouth/head but no clear view of hook. Line was cut with 24 feet remaining with the animal] Line cut 4 fathoms from animal. Swam strongly, sounded.
28	Risso's dolphin	240	Released Alive	S7b – Entangled before being freed without gear attached	[Check boxes indicate animal was not hooked but entangled in mainline around tail/flukes. Wraps were cut and all gear removed] They pulled the tail which was wrapped in mainline to tuna door and used short and long handled line cutters to free wraps. All gear removed. It was trying to swim away while being released and quickly swam away as soon as line was removed.
29	Risso's dolphin	180	Released Alive	S7b – Entangled before being freed without gear attached	[Check boxes indicate animal was not hooked but entangled in mainline around tail/flukes. Gear removed from animal and released with no remaining gear] Animal was tail wrapped by mainline, very close to drop, pulled alongside boat and cut free (all took place as I was applying my biopsy punch to the aluminum pole). At capture: trying to swim away, breaching surface at regular intervals for air. Once cut: swam away from boat and dived.
30	Pilot whale	300	Serious Injury	S5a – Hook in head	[Check boxes indicate animal was hooked around head or mouth, but hook location could not be observed. Line was cut leaving 12 feet with the animal.] Gangion cut at leader 2 fathoms from animal. Sounded, did not surface.
31	Bottlenose dolphin	210	Released Alive	S7b – Entangled before being freed without gear attached	[Check boxes indicate animal was not hooked but entangled in gangion/leader around tail/flukes. Line cut and all gear removed before release.] Tail wrapped in leader, pulled next to boat and wraps cut w/line cutter. Was thrashing wildly, once cut, swam away quickly. Note: Genetic id to bottlenose dolphin

Appendix B, Table B2 (cont.)

Animal #	Species	Length (cm)	Release Condition	Interaction Type	Observer Comments
32	Short-finned pilot whale	300	Serious Injury	S6 - Gear attached to free-swimming animal with potential to be ingested or entangle	[Check boxes indicate animal was entangled, not hooked. Wrapped in gangion around tail/flukes. Gear was partially removed from animal and wraps partially cut. 5 feet of line remaining on animal.] Tail wrapped in leader close to mainline. Wraps partially cut before release.
33	Pilot whale	270	Serious Injury	S5a – Hook in head	[Check boxes indicate animal was hooked in mouth exact location unknown. Line cut and animal released with hook and 18 feet of trailing line.] Crew started pulling whale towards boat but seas were rough so leader was immediately cut at swivel before biopsy could be taken. Just kept swimming.
34	Pilot whale	120	Dead	Entanglement	[Check boxes indicate unknown if hooked and hook location. Entangled in mainline around flukes/tail.] Animal pulled up and wraps cut - I never saw anterior portion of animal in darkness. Whale appeared dead with rigor. It sank immediately upon wraps being cut.
35	Bottlenose dolphin	270	Serious Injury	S7b – Entangled before being freed without gear attached <i>Indication of exhaustion, dead weight support SI determination</i>	[Check boxes indicate animal was hooked in tail stock near fluke. Line cut with 1 ft. remaining on release] Hooked in keel just above tail, not entangled. MBD exhausted dead weight but breathing exhaust seen from blow hole, kept head mostly underwater. 3 photos of tail, biopsy flank 1/3 distance from tail. Line cut with 1 ft. left. Dove and disappeared when line cut.
36	Pilot whale	240	Serious Injury	S5a – Hook in head	[Check boxes indicate animal was hooked in side of mouth. Hook left in animal and released with 5 feet of trailing line] The pilot whale first surfaced just 30 feet in front of fish door after about 1 minute of fighting with crew. 3 other pilot whales surfaced just after that and once the hooked whale surfaced again I could tell that it was hooked in the right corner of the mouth. 1 photo was taken then the whale swam straight down busting the line. The whale swam out of sight with the hook and 5 ft. of line remaining. As soon as the animal swam away from the boat and downward the whale was not seen again.
37	Pilot whale	135	Serious Injury	S6 - Gear attached to free-swimming animal with potential to be ingested or entangle	[Check boxes indicate whale was entangled, not hooked, with mainline and gangion wrapped around tail/flukes. Gear not removed from animal and wraps not cut. Unknown amount of gear remained with animal on release.] I saw the whale hanked to boat and went for my biopsy pole. The captain yelled, line parted, and upon returning to the rail the whale was gone. Due to line part I did not see the release but can assume it sank to the bottom with a considerable load of gear. NOTE: Since animal was not directly observed and observer indicates assumed mortality, changed determination from dead to SI based upon entangling gear remaining on the animal.

Appendix C. Marine Mammal Biopsy Samples and Identification

Sample #	Quarter	Area	Initial Species ID	Genetic Species ID	Sex (Genetically Determined)
1	2	MAB	Risso's dolphin	Risso's dolphin	U
2	3	MAB	Pilot whale	Short-finned pilot whale	M
3	3	MAB	Pilot whale	Short-finned pilot whale	M
4	3	MAB	Pilot whale	Short-finned pilot whale	M
5	3	MAB	Pilot whale	Short-finned pilot whale	M
6	3	MAB	Pilot Whale	False killer whale	M
7	4	MAB	Unid. dolphin	Bottlenose dolphin	F
8	4	MAB	Pilot whale	Short-finned pilot whale	M