NOAA TECHNICAL MEMORANDUM NMFS-SEFSC-624

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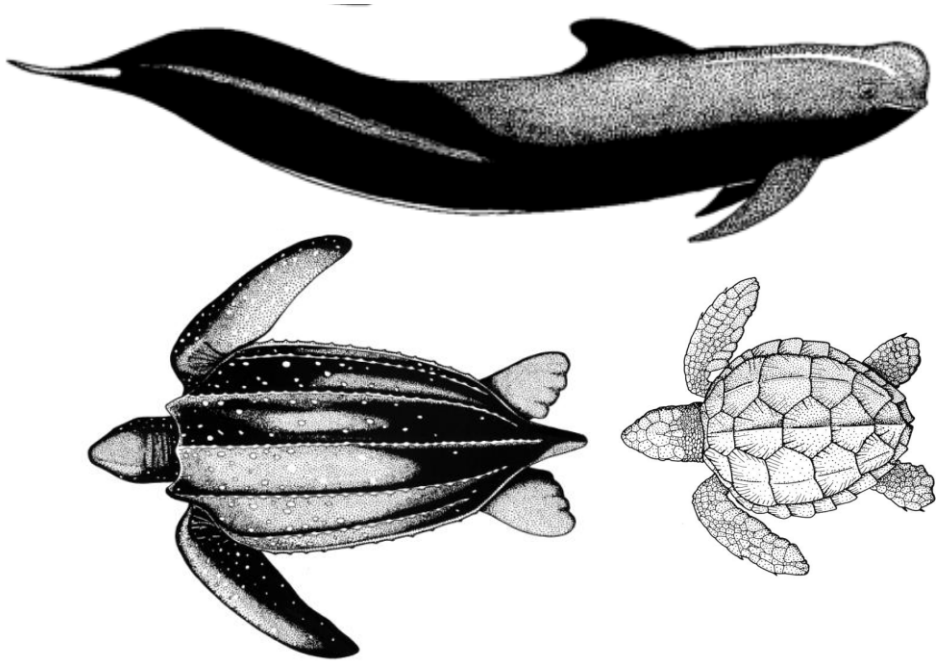

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National Oceanic and Atmospheric Administration
National Marine Fisheries Service
Southeast Fisheries Science Center
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Abstract

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 2010 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 2010, there were an estimated 170.9 (104.3 – 280.2 [95% CI]) interactions with leatherback turtles and 344.4 (236.6 - 501.3 [95% CI]) interactions with loggerhead turtles. The primary marine mammals interacting with this fishery were pilot whales (*Globicephala* sp.) with an estimated 149.9 (43.9 – 491.3 [95% CI]) interactions. 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) after August 2004. This mandate was 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 (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).

Pelagic longline fishing effort in the Gulf of Mexico during 2010 was affected by the Deepwater Horizon oil spill. Fishery closures of a large portion of the Gulf of Mexico were in place for much of the 3rd and 4th quarter. As a result, fishery effort was very low during this period compared to prior years. Some longline fishing vessels

participated in seafood safety sampling and other monitoring programs during this period. As these trips did not result in landed catch, they were not reported to the logbook program and are not included in the current analysis.

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).

In this report, marine mammal and marine turtle bycatch estimates are calculated for pelagic longline fishery effort during 2010. 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 2010, 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 and SAB areas. In addition, experimental fishing was conducted in the GOM and MAB regions testing the effectiveness of "weak" hooks as a potential bycatch mitigation tool. 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 159 sets (100,978 hooks) were observed in experimental fishing. The number of sets and hooks by area-quarter stratum cannot be reported due to confidentiality considerations.

Bycatch rates for quarter-area strata with reported longline fishery sets that had no corresponding observer coverage in 2010 were replaced with previously observed mean bycatch rates from 2005-2009.

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 either the reported effort data, the 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). 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:

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

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:

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

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

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

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·C* for the lower and upper confidence bounds respectively where:

$$(6) \qquad \mathrm{C} = \exp\left[\ \mathrm{z}_{\alpha} \sqrt{\mathrm{var}(\ln \mathrm{N})}\ \right],$$

and

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

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 2010. 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 likely to result in mortality (NOAA Fisheries 50 CFR 229.2, Angliss and DeMaster, 1998). A workshop of NOAA Fisheries and external experts was convened in 1997 to evaluate the types of injuries occurring in commercial fisheries and to develop guidelines for determining if a given marine mammal observed interacting with commercial fishing gear was seriously injured. For small cetaceans, including pilot whales and other delphinids, it was concluded that animals that ingested hooks, were released with significant amounts of trailing fishing gear, were swimming abnormally, or suffered some obvious severe external trauma, should be considered seriously injured (Angliss and DeMaster, 1998). Serious injury determinations are made on a case by case basis after reviewing the observations and comments of fishery observers. For this report, observer comments for all takes of marine mammals from 2010 (Appendix B) were reviewed and serious injury determinations were made based upon observer comments and photographs consistent with current NOAA fisheries 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 2010, four biopsy samples were collected from marine mammals and analyzed genetically. Sample information is provided in Appendix C.

Results and Discussion

Reported Fishing Effort and Observer Coverage

The total reported pelagic longline fishing effort included 5.7 million hooks during 2010 (Table 1A, Figure 2). The very low amount of fishing effort reported in the GOM during quarter 3 and 4 are associated with fishery closures following the Deepwater Horizon event. The reported fishery effort included 7,489 sets during 2010, 884 of which were observed by the POP program (Tables 1B and 2B, Figure 2). The overall percent coverage during regular fishing was 11.8% expressed as a proportion of reported hooks and 11.0% as a proportion of reported sets (Table 3). The relatively high annual rate reflects the 56.6% 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 2010 with more than 10 sets of reported fishing effort include the Northeast Coastal (NEC) during quarter 4, the Tuna North

(TUN) during quarters 1, 2 and 3 (Table 3), and the Tuna South (TUS) area in quarter 2. The TUS area had little to no reported fishing effort in recent years before 2010.

Observed Protected Species Interactions

There were 26 observed interactions with leatherback turtles and 41 with loggerhead turtles (Table 4, Figure 4) in 2010 in both regular and experimental fishing. There was also one interaction with one unidentified hardshell turtle. The greatest number of observed leatherback takes occurred in the GOM during the 2nd quarter and in the NED region during the 3rd quarter (Table 4A, Figure 4). Loggerhead takes were observed in the greatest numbers in the NEC during the 3rd quarter (Table 4B, Figure 4). These totals include 2 leatherback turtles taken during experimental fishing in the GOM (1 turtle), and MAB (1 turtle) fishing areas.

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 43 of the 67 turtles captured (Table 6). A total of 4 leatherbacks and 0 loggerheads were released either entangled or with the hook and line remaining that was > ½ the carapace length (Table 6).

There were 22 interactions observed with marine mammals (Table 7, Figure 5). This included three interactions with pilot whales in the MAB, one bottlenose dolphin in the GOM, and one pantropical spotted dolphin the GOM during experimental fishing. Twelve of the observed marine mammal interactions were categorized as serious injuries

including 8 pilot whales, 1 bottlenose dolphin, and 3 unidentified marine mammals (Table 8). Ten of the serious injuries were due to animals being hooked in the mouth, and in 8 of those cases they were released with gear likely to further entangle the animal. One pygmy sperm whale and one unidentified marine mammal were dead upon capture (Table 8).

Stratum estimates of total interactions for sea turtles are shown in Table 9. High leatherback estimated interactions occurred in the NEC (28.8 animals) and the NED (54.5 animals) in quarter 3 (Table 9). For loggerhead turtles, the estimated interactions were highest in the NEC in quarter 3 (89.6 animals) and the NED in quarter 3 (96.6 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 with an estimated 96.1 pilot whales in quarter 2 and 10.6 in quarter 3 (Table 10).

Estimated Interactions in Unobserved Areas with Fishing Effort

The average bycatch rates and estimated catches in strata that were not observed during 2010 are summarized in Table 11. There were observed sea turtle takes in prior years in TUN-Quarter 1 (Leatherbacks) and NEC-Quarter 4 (Leatherbacks and Loggerheads, Table 11a). For marine mammals, an additional 1.0 Risso's dolpin live releases were estimated from historical data in NEC-quarter 4 (Table 11b).

Total Estimated Bycatch

There were an estimated total of 166.2 (100.1 – 275.1 [95% CI]) interactions with leatherback turtles during 2010 in regular fishing and an additional 2 interactions in experimental fishing (Table 12). The highest number of interactions occurred in the NEC and NED. For loggerhead turtles, the estimated total number of interactions was 343.6 turtles (235.9 – 500.5 [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 149.9 (43.9 – 491.3 [95% CI]) interactions with pilot whales including 3 serious injuries during experimental fishing.

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 2010 estimated take of leatherback turtles continued a downward trend since 2007 and remained 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 2010 estimate is considerably lower than those in 2006 and 2007.

There appears to be a cyclic pattern in loggerhead bycatch rate occurring at 4-5 year intervals since 1996.

For pilot whales, the 2010 estimate was consistent with relatively low catch values that have occurred since 2006 (Figure 7). The bycatch estimate for Risso's dolphins has been on a downward trend since 2008 (Figure 7).

The total fishery effort was reduced in 2010 compared to recent years, and this is associated primarily with fishery closures in the Gulf of Mexico during the third and fourth quarters.

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. During 2010, the most notable gap in observer coverage occurred in the NEC region in quarter 4. The high bycatch rates observed in both the NED and NEC during

quarter 3 suggest that perhaps 2010 was an unusual year with a more northern distribution of turtles. In addition, the low coverage in the MAB during quarter 2 is potentially problematic for estimating pilot whale bycatch. The majority of the estimated bycatch for pilot whales was estimated based upon a very small number of observed sets.

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). 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

Alive, (C) Unknown status, and (D) All Interactions. NR 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 2010 by fishing area and quarter. NR indicates strata where effort cannot be reported due to confidentiality considerations.

Table 11. Bycatch rates for marine mammals in area-quarter strata with reported effort that were not observed in 2010. NR indicates strata where effort cannot be reported due to confidentiality considerations.

Table 12. Total estimated interactions (including live, dead, and unknown status) with A) Leatherback, B) Loggerhead turtles in the pelagic longline fishery during 2010 by fishing area.

Table 13. Total estimated interactions with marine mammals in the pelagic longline fishery during 2010. These estimates include extrapolated values for areas with no observer coverage during 2010 (see Table 11).

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 2010.

Figure 3. Locations of experimental sets during 2010.

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

Figure 5. Observed pelagic longline fishing effort and marine mammal takes during 2010.

Figure 6. Historical trends in fishery effort and estimated marine turtle takes in the pelagic longline fishery between 1992 and 2010 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 between 1992 and 2010 for A) Pilot Whales, and B) Risso's Dolphins. Errors bars represent 95% confidence intervals.

Table 1. Total amount of fishing effort reported to the pelagic longline logbook program during 2010 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	TUS	Total
1	66.2	282.1	654.3	67.4	**NR**	0	0	198.8	71.3	48.6	**NR**	**1391.6**
2	11.5	296.9	235.0	114.4	**NR**	120.2	**NR**	591.8	9.4	70.6	**NR**	**1486.5**
3	0	268.7	23.6	594.8	0	505.0	209.4	43.3	0	47.7	0	**1692.6**
4	0	256.0	36.1	507.4	0	44.1	64.8	162.2	61.0	**NR**	0	**NR**
Total	**77.7**	**1103.8**	**949.1**	**1283.9**	**NR**	**669.2**	**NR**	**996.2**	**141.7**	**NR**	**NR**	**5743.2**

B. Number of Sets

Quarter	CAR	FEC	GOM	MAB	NCA	NEC	NED	SAB	SAR	TUN	TUS	Total
1	64	416	857	116	**NR**	0	0	264	80	54	**NR**	**1854**
2	11	476	378	187	**NR**	138	**NR**	690	10	82	**NR**	**2009**
3	0	444	53	719	0	547	200	94	0	57	0	**2114**
4	0	393	70	596	0	57	66	217	65	**NR**	0	**NR**
Total	**75**	**1729**	**1358**	**1618**	**NR**	**742**	**NR**	**1265**	**155**	**NR**	**NR**	**7489**

Table 2. Total amount of fishing effort observed during 2010 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	TUS	Total
1	11.7	19.3	115.9	**NR**	0	-	-	10.1	16.2	0	0	**NR**
2	**NR**	27.6	142.3	**NR**	0	**NR**	0	47.8	**NR**	0	0	**235.4**
3	-	14.0	**NR**	51.7	-	59.0	**NR**	**NR**	-	0	-	**147.9**
4	-	6.9	**NR**	56.0	-	0	**NR**	11.9	**NR**	**NR**	-	**117.8**
Total	**NR**	**67.8**	**261.0**	**117.4**	**0.0**	**NR**	**29.7**	**NR**	**39.5**	**NR**	**0.0**	**680.5**

B. Number of Sets

Quarter	CAR	FEC	GOM	MAB	NCA	NEC	NED	SAB	SAR	TUN	TUS	Total
1	14	25	151	**NR**	0	-	-	16	18	0	0	**236**
2	**NR**	44	214	**NR**	0	**NR**	0	52	**NR**	0	0	**329**
3	-	26	**NR**	52	-	66	**NR**	**NR**	-	0	-	**173**
4	-	10	**NR**	62	-	0	**NR**	19	**NR**	**NR**	-	**146**
Total	**NR**	**105**	**377**	**132**	**0**	**75**	**33**	**NR**	**41**	**NR**	**0**	**884**

Table 3. Percentage of reported fishing effort observed during 2010 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	TUS	Total
1	17.61	6.84	17.72	9.24	0.00	-	-	5.08	22.74	**0.00**	0.00	**12.89**
2	14.98	9.29	60.55	3.09	0.00	8.65	0.00	8.08	21.80	**0.00**	**0.00**	**15.83**
3	-	5.21	1.69	8.69	-	11.69	9.02	8.97	-	**0.00**	-	**8.74**
4	-	2.70	6.50	11.03	-	**0.00**	16.73	7.34	34.77	21.17	-	**10.05**
Total	**17.21**	**6.14**	**27.50**	**9.14**	**0.00**	**10.37**	**10.50**	**7.40**	**27.86**	**4.16**	**0.00**	**11.85**

B. Number of Sets

Quarter	CAR	FEC	GOM	MAB	NCA	NEC	NED	SAB	SAR	TUN	TUS	Total
1	21.88	6.01	17.62	10.34	0.00	-	-	6.06	22.50	**0.00**	0.00	**12.73**
2	18.18	9.24	56.61	3.21	0.00	6.52	0.00	7.54	20.00	**0.00**	**0.00**	**16.37**
3	-	5.86	3.77	7.23	-	12.07	9.50	8.51	-	**0.00**	-	**8.18**
4	-	2.54	14.29	10.40	-	**0.00**	21.21	8.76	32.31	20.83	-	**9.66**
Total	**21.33**	**6.07**	**27.76**	**8.16**	**0.00**	**10.11**	**11.91**	**7.51**	**26.45**	**4.15**	**0.00**	**11.80**

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 2010 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	TUS	Total
1	2	1	3	0	0	X	X	1	0	-	-	**7**
2	0	0	7	0	0	1	-	0	0	-	-	**8**
3	X	0	1	1	X	3	5	0	X	-	X	**10**
4	X	0	0	0	X	-	0	0	1	0	X	**1**
Total	**2**	**1**	**11**	**1**	**0**	**4**	**5**	**1**	**1**	**0**	**0**	**26**

B. Loggerhead Turtles

Quarter	CAR	FEC	GOM	MAB	NCA	NEC	NED	SAB	SAR	TUN	TUS	Total
1	2	1	0	0	0	X	X	0	2	-	-	**5**
2	0	0	1	0	0	1	-	3	0	-	-	**5**
3	X	1	0	5	X	12	9	0	X	-	X	**27**
4	X	0	0	1	X	-	0	0	2	0	X	**3**
Total	**2**	**2**	**1**	**6**	**0**	**13**	**9**	**3**	**4**	**0**	**0**	**40**

C. All Turtles

Quarter	CAR	FEC	GOM	MAB	NCA	NEC	NED	SAB	SAR	TUN	TUS	Total
1	4	2	3	0	0	X	X	1	2	-	-	**12**
2	0	0	8	0	0	2	-	3	0	-	-	**13**
3	X	1	0	5	X	15	14	0	X	-	X	**35**
4	X	0	0	1	X	-	-	0	4*	0	X	**5**
Total	**4**	**3**	**11**	**6**	**0**	**17**	**14**	**10**	**6***	**0**	**0**	**67***

***The count of total turtles during SAR-Quarter 4 includes one unidentified hardshell 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 2010. 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	6	0	20	0	0	26
Loggerhead	4	3	33	0	0	40
Unidentfied	0	1	0	0	0	1
Total	**10**	**4**	**53**	**0**	**0**	**67**

B. Hook Location in hooked animals

				Internal			External	
Species	**Not Hooked**	**Unknown if Hooked**	**Hooked, Location Unknown**	**Unknown Internal**	**Swallowed**	**Beak or Mouth**		**Total**
Leatherback	6	1	0	1	0	5	13	26
Loggerhead	4	3	0	0	11	20	2	40
Unidentified	0	1	0	0	0	0	0	1
Total	**10**	**5**	**0**	**1**	**11**	**25**	**15**	**67**

C. Animals with all gear removed, by hook location

				Internal			External	
Species	**Not Hooked**	**Unknown if Hooked**	**Hooked, Location Unknown**	**Unknown Internal**	**Swallowed**	**Beak or Mouth**		**Total**
Leatherback	6	0	0	0	0	2	6	14
Loggerhead	4	3	0	0	3	18	1	29
Unidentified	0	0	0	0	0	0	0	0
Total	**10**	**3**	**0**	**0**	**3**	**20**	**7**	**43**

Table 6. Release status and gear removal for sea turtles captured and released alive in the U.S. Atlantic Pelagic Longline Fishery during 2010. Counts include turtles captured during experimental fishing. The capture and release status of the unidentified hardshell turtle was unknown. Condition columns refer to post-release mortality categories in Table 1 of SEFSC 2011.

Release Status	Leatherback	Loggerheads
Released entangled (Condition Column A)	1 (+ 1 unknown)	0
Released with hook and line ≥ ½ carapace length (Condition Column B)	3	0
Released with hook and line < ½ carapace length (Condition Column C)	8	11
Released with all gear removed (Condition Column D)	14	29

Table 7. Total number of marine mammals observed in interactions with the pelagic longline fishery during 2010 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 animals captured during experimental fishing.

Quarter	CAR	FEC	GOM	MAB	NCA	NEC	NED	SAB	SAR	TUN	TUS	Total
1	0	1	2	0	0	X	X	1	0	-	-	**4**
2	0	0	4	3	0	0	-	1	0	-	-	**7**
3	X	0	1	3	X	2	0	0	X	-	X	**5**
4	X	0	0	4	X	-	0	0	0	0	X	**1**
Total	**0**	**1**	**7**	**10**	**0**	**2**	**0**	**2**	**0**	**0**	**0**	**22**

Table 8. Summary of release condition and serious injury types for marine mammals observed in the pelagic longline fishery during 2010. 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. Counts include animals captured during experimental fishing.

Species	Alive	Dead	Serious Injury Type				Total
			Mouth hooked	Entangled	Mouth Hooked & entangled	Serious injury total	
Bottlenose Dolphin	1	0	0	0	1	1	2
Minke Whale	1	0	0	0	0	0	1
Pantropical Spotted Dolphin	2	0	0	0	0	0	2
Pilot Whale	2	0	1	1	6	8	10
Pygmy Sperm Whale	0	1	0	0	0	0	1
Risso's Dolphin	1	0	0	0	0	0	1
Unidentified Dolphin	1	0	0	0	0	0	1
Unidentified Marine Mammal	0	1	1	1	1	3	4
Total	**8**	**2**	**2**	**2**	**8**	**12**	**22**

Table 9. Estimated interactions with sea turtles in the pelagic longline fishery during 2010 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	CAR	1	14	0.1483	1.0000	66.2	9.8
Leatherback	1	FEC	1	25	0.0702	1.0000	282.1	19.8
Leatherback	1	GOM	2	151	0.0237	0.7348	654.3	15.5
Leatherback	1	SAB	1	16	0.0671	1.0000	198.8	13.3
Leatherback	2	GOM	7	214	0.0450	0.3795	235.0	10.6
Leatherback	2	NEC	1	**NR**	0.0958	1.0000	120.2	11.5
Leatherback	3	NEC	3	66	0.0570	0.5732	505.0	28.8
Leatherback	3	NED	4	**NR**	0.2604	0.4811	209.4	54.5
Leatherback	4	SAR	1	21	0.0387	1.0000	61.0	2.4
Loggerhead	1	CAR	1	14	0.1841	1.0000	66.2	12.2
Loggerhead	1	FEC	1	25	0.0339	1.0000	282.1	9.6
Loggerhead	1	SAR	2	18	0.1097	0.6933	71.3	7.8
Loggerhead	2	GOM	1	214	0.0075	1.0000	235.0	1.8
Loggerhead	2	NEC	1	**NR**	0.0958	1.0000	120.2	11.5
Loggerhead	2	SAB	3	52	0.0652	0.5678	591.8	38.6
Loggerhead	3	FEC	1	26	0.0625	1.0000	268.7	16.8
Loggerhead	3	MAB	5	52	0.0811	0.4358	594.8	48.3
Loggerhead	3	NEC	10	66	0.1775	0.3012	505.0	89.6
Loggerhead	3	NED	5	**NR**	0.4611	0.4679	209.4	96.6
Loggerhead	4	MAB	1	62	0.0122	1.0000	507.4	6.2
Loggerhead	4	SAR	2	**NR**	0.0774	0.6892	61.0	4.7
Unid. Turtle	4	SAR	1	**NR**	0.0507	1.0000	61.0	3.1

Table 10. Estimated A) Mortalities, B) Serious Injury, C) Released Alive, and D) Total Interactions with marine mammals in the pelagic longline fishery during 2010 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
Pygmy Sperm Whale	2	GOM	1	214	0.0052	1.0000	235.0	1.2
Unid. Marine Mammal	1	GOM	1	151	0.0084	1.0000	654.3	5.5

B. Serious Injury

Species	Quarter	Area	# Positive Sets	# Observed Sets	Mean CPUE	CV CPUE	# Hooks Reported (x1000)	Estimated Catch
Pilot Whale	1	FEC	1	25	0.0702	1.0000	282.1	19.8
Pilot Whale	2	MAB	1	**NR**	0.8403	1.0000	114.4	96.1
Pilot Whale	3	MAB	1	52	0.0178	1.0000	594.8	10.6
Unid. Marine Mammal	2	GOM	1	214	0.0052	1.0000	235.0	1.2
Unid. Marine Mammal	3	MAB	1	52	0.0178	1.0000	594.8	10.6
Unid. Marine Mammal	3	NEC	1	66	0.0200	1.0000	505.0	10.1

Table 10 cont.

C. Released Alive

Species	Quarter	Area	# Positive Sets	# Observed Sets	Mean CPUE	CV CPUE	# Hooks Reported (x1000)	Estimated Catch
Bottlenose Dolphin	2	SAB	1	52	0.0269	1.0000	591.8	15.9
Minke Whale	1	SAB	1	16	0.1225	1.0000	198.8	24.4
Pantropical Spotted Dolphin	1	GOM	1	151	0.0078	1.0000	654.3	5.1
Pilot Whale	3	MAB	1	52	0.0219	1.0000	594.8	13.0
Pilot Whale	3	NEC	1	66	0.0148	1.0000	505.0	7.5
Risso's Dolphin	4	MAB	1	62	0.0175	1.0000	507.4	8.9
Unid. Dolphin	2	GOM	1	214	0.0065	1.0000	235.0	1.5

Table 10 cont.

D. Total Interactions

Species	Quarter	Area	# Positive Sets	# Observed Sets	Mean CPUE	CV CPUE	# Hooks Reported (x1000)	Estimated Catch
Bottlenose Dolphin	2	SAB	1	52	0.0269	1.0000	591.8	15.9
Minke Whale	1	SAB	1	16	0.1225	1.0000	198.8	24.4
Pantropical Spotted Dolphin	1	GOM	1	151	0.0078	1.0000	654.3	5.1
Pilot Whale	1	FEC	1	25	0.0702	1.0000	282.1	19.8
Pilot Whale	2	MAB	1	**NR**	0.8403	1.0000	114.4	96.1
Pilot Whale	3	MAB	2	52	0.0397	0.7039	594.8	23.6
Pilot Whale	3	NEC	1	66	0.0148	1.0000	505.0	7.5
Pygmy Sperm Whale	2	GOM	1	214	0.0052	1.0000	235.0	1.2
Risso's Dolphin	4	MAB	1	62	0.0175	1.0000	507.4	8.9
Unid. Dolphin	2	GOM	1	214	0.0065	1.0000	235.0	1.5
Unid. Marine Mammal	1	GOM	1	151	0.0084	1.0000	654.3	5.5
Unid. Marine Mammal	2	GOM	1	214	0.0052	1.0000	235.0	1.2
Unid. Marine Mammal	3	MAB	1	52	0.0178	1.0000	594.8	10.6
Unid. Marine Mammal	3	NEC	1	66	0.0200	1.0000	505.0	10.1

Table 11. Bycatch rates for a) sea turtles and b) marine mammals in area-quarter strata with reported effort that were not observed in 2010.

A) Sea Turtles

Bycatch Rate Source	Species	Interaction Type	Quarter	Area	# Positive Sets	#Observed Sets	Mean CPUE	CV CPUE	# Hooks Reported (X1000) 20010	Estimated Catch 2010
Quarterly 05-09	Leatherback	Alive	1	TUN	1	20	0.0476	1.0000	48.6	2.3
Quarterly 05-09	Leatherback	Alive	4	NEC	2	44	0.0549	0.6989	44.1	2.4
Quarterly 05-09	Loggerhead	Alive	1	NEC	1	44	0.0183	1.0000	44.1	0.8

B) Marine Mammals

Bycatch Rate Source	Species	Interaction Type	Quarter	Area	# Positive Sets	#Observed Sets	Mean CPUE	CV CPUE	# Hooks Reported (X1000) 20010	Estimated Catch 2010
Quarterly 05-09	Risso's Dolphin	Released Alive	4	NEC	1	44	0.0238	1.0000	44.1	1.0

Table 12. Total estimated interactions and experimental takes for A) Leatherback and B) Loggerhead turtles in the pelagic longline fishery during 2010 by fishing area.

A. Leatherbacks

Area	Total	Total CV	Total 95% Confidence Interval	Experimental Takes
CAR	9.8	1.000	1.9 - 50.2	-
FEC	19.8	1.000	3.9 - 101.2	0
GOM	26.1	0.463	11.0 - 61.9	1
MAB	0.0	-	-	1
NCA	0.0	-	-	-
NEC	42.7	0.472	17.7 - 102.9	-
NED	54.5	0.481	22.3 - 133.3	-
SAB	13.3	1.000	2.6 - 68.2	0
SAR	2.4	1.000	0.5 - 12.1	-
TUN	2.3	1.000	0.5 – 11.8	-
TUS	0.0	-	-	-
Total	**170.9**	**0.256**	**104.3 – 280.2**	**2**

B. Loggerheads

Area	Total	Total CV	Total 95% Confidence Interval	Experimental Takes
CAR	12.2	1.000	2.4 - 62.3	-
FEC	26.4	0.733	7.3 - 95.4	0
GOM	1.8	1.000	0.3 - 9	0
MAB	54.5	0.403	25.5 - 116.4	0
NCA	0.0			-
NEC	102.0	0.287	58.6 – 177.3	-
NED	96.6	0.468	40.4 - 231	-
SAB	38.6	0.568	13.7 - 108.8	0
SAR	12.5	0.504	4.9 - 31.9	-
TUN	0.0			-
TUS	0.0			-
Total	**344.4**	**0.193**	**236.6-501.3**	**0**

Table 13. Total estimated interactions with marine mammals in the pelagic longline fishery during 2010. These estimates include extrapolated values for areas with no observer coverage during 2010 (see Table 11).

Species	Estimated Alive	CV Alive	Estimated Serious Injury	CV Serious Injury	Estimated Dead	CV Dead	Experimental Takes	Estimated Total	CV Total	95% Confidence Interval
Bottlenose Dolphin	15.9	1.000	0	-	0	-	1*	16.9	1.000	3.1 – 81.3
Minke Whale	24.4	1.000	0	-	0	-	0	24.4	1.000	4.8 – 124.5
Pantropical Spotted Dolphin	5.1	1.000	0	-	0	-	1	6.1	1.000	1.0 – 26.3
Pilot Whale	20.5	0.733	126.5	0.780	0	-	3*	149.9	0.679	43.9 – 491.3
Pygmy Sperm Whale	0	-	0	-	1.2	1.000	0	1.2	1.000	0.2 – 6.2
Risso's Dolphin	9.9	0.900	0	-	0	-	0	9.9	0.900	2.2 – 44.8
Unid. Dolphin	1.5	1.000			0	-	0	1.5	1.000	0.3 – 7.8
Unid. Marine Mammal	0	-	21.9	0.670	5.5	1.000	0	27.5	0.572	9.7 – 77.9

* These animals taken during experimental fishing were considered seriously injured.

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).

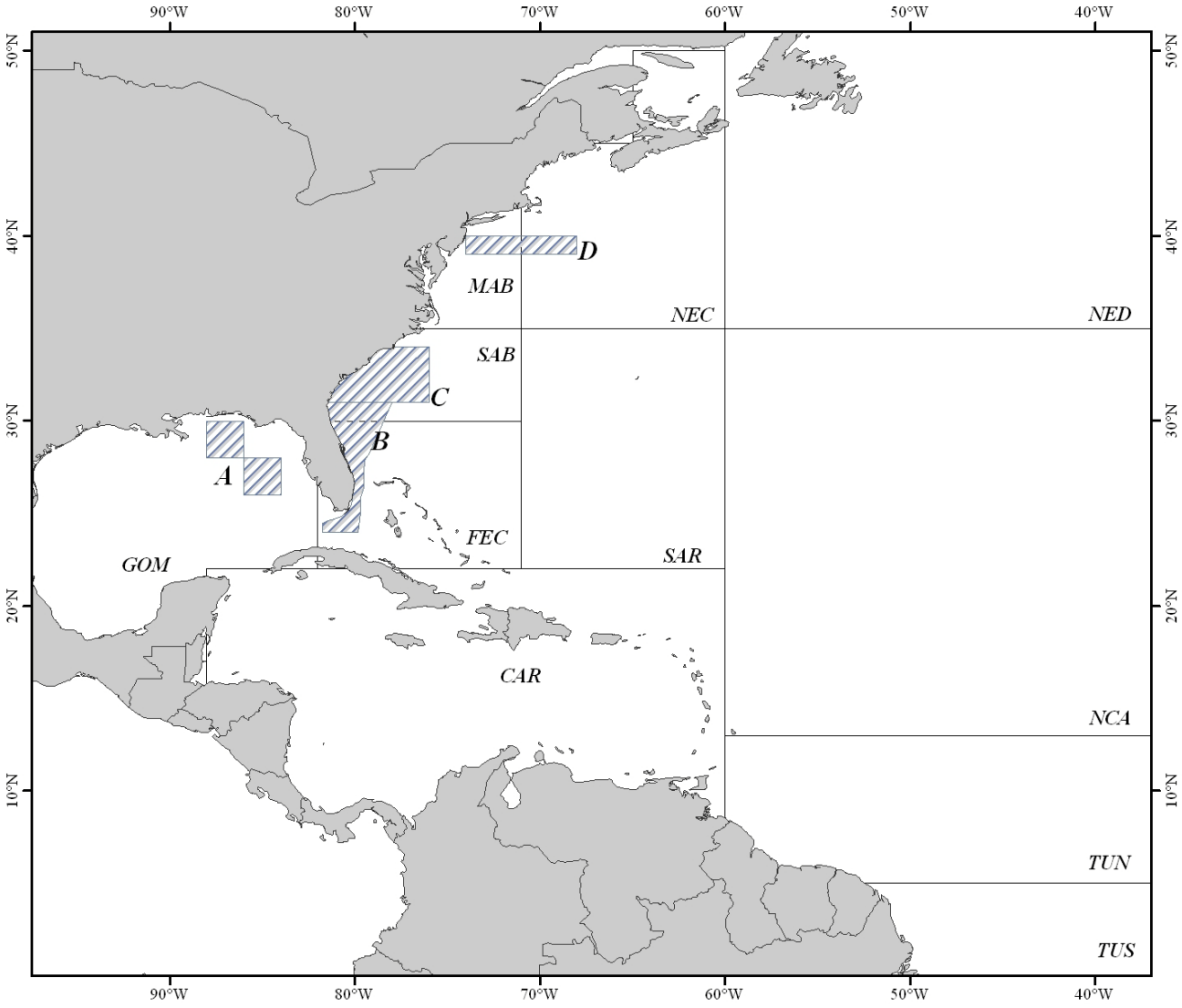


Figure 2. Observed (gray circles) and reported (black circles) pelagic longline fishing effort during 2010.

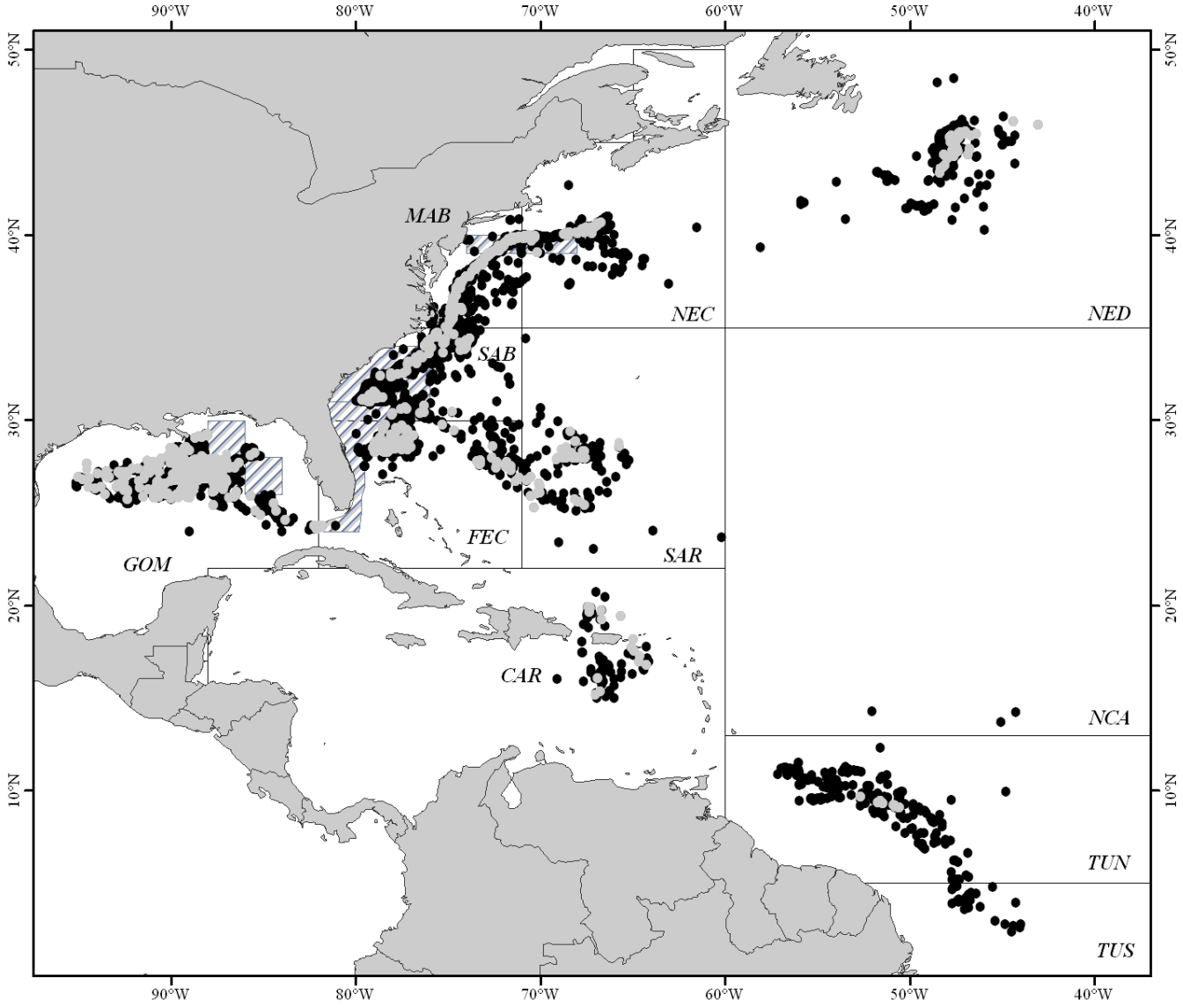


Figure 3. Locations of experimental sets during 2010.

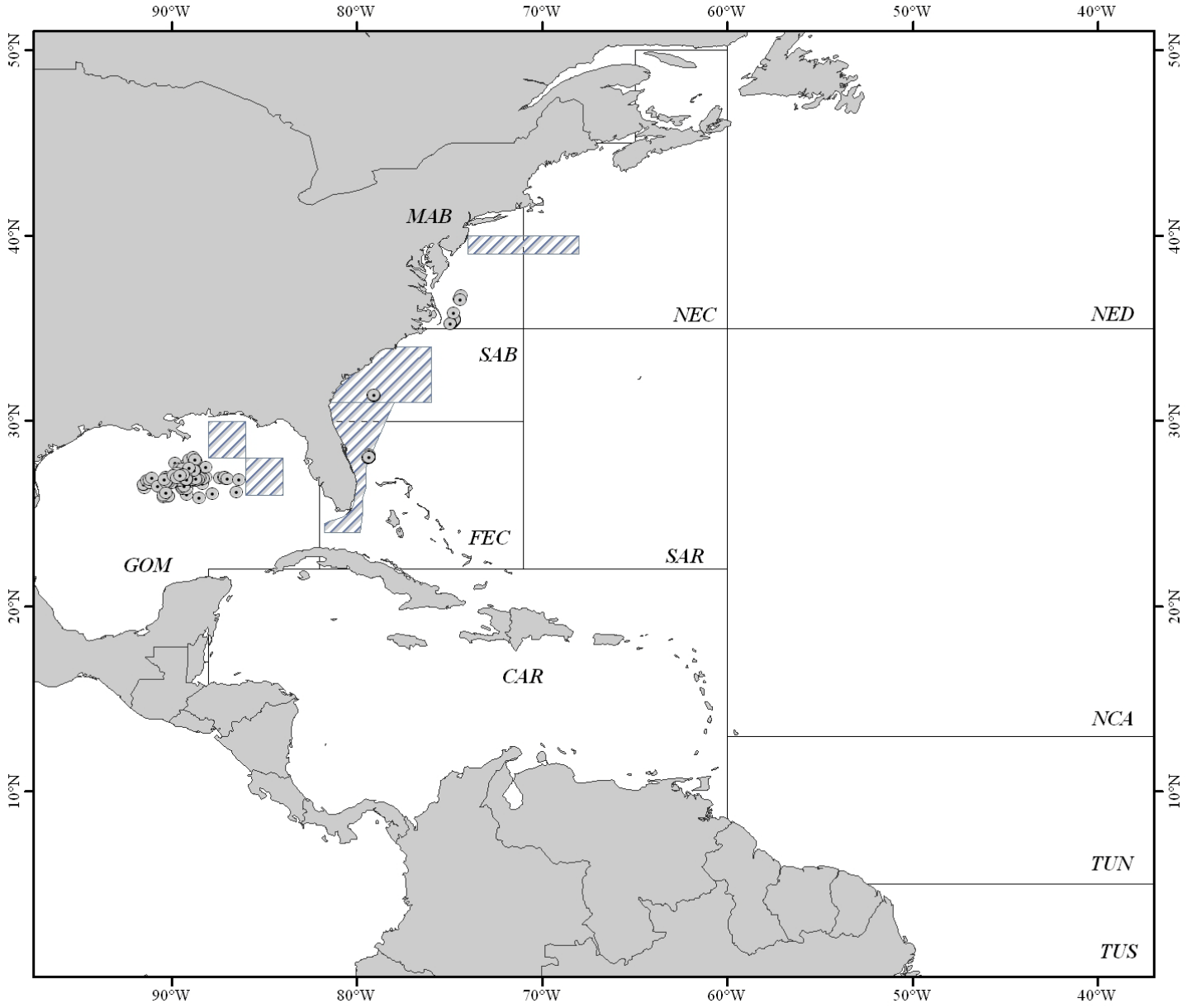


Figure 4. Observed pelagic longline fishing effort and sea turtle interactions during 2010.

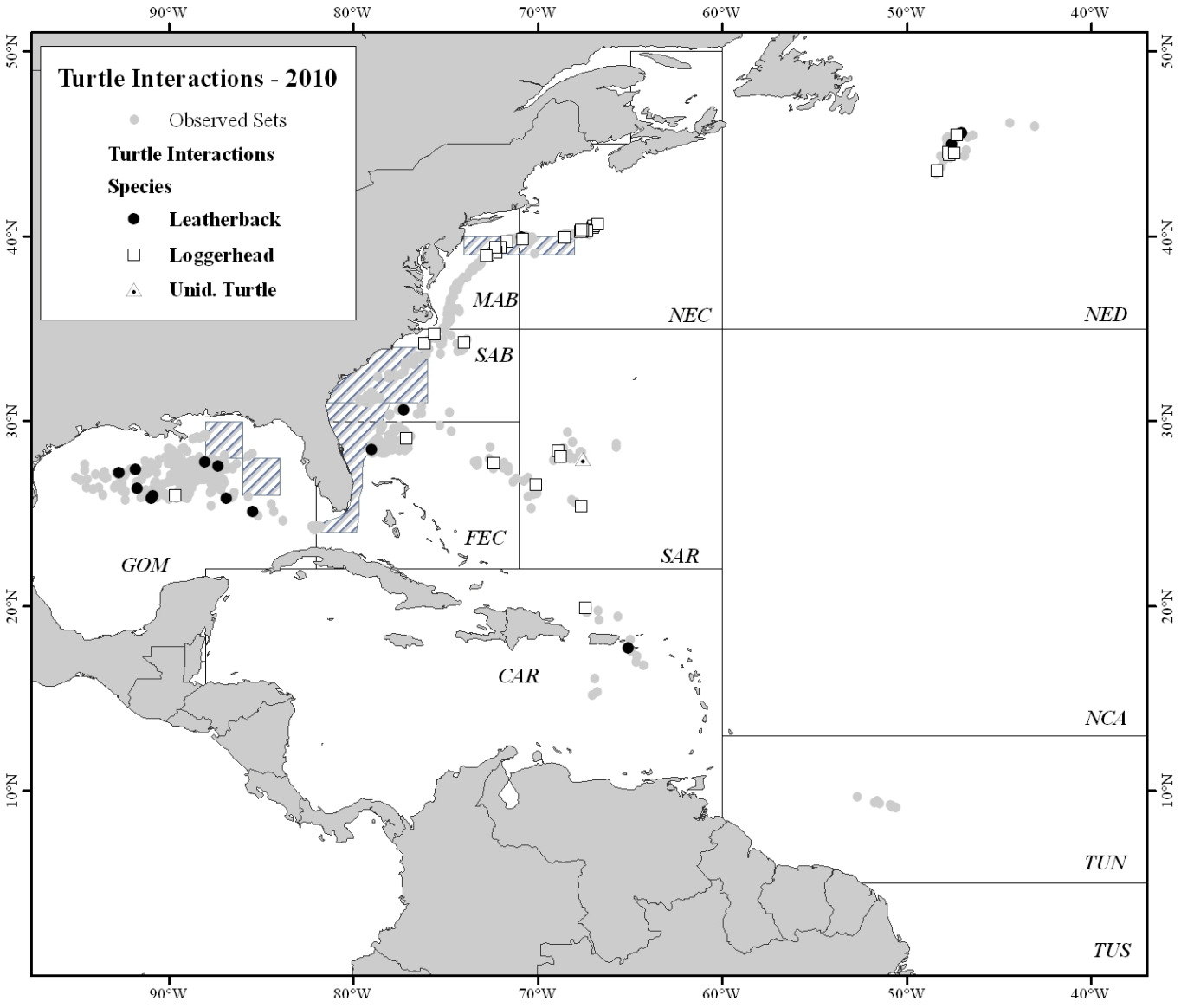


Figure 5. Observed pelagic longline fishing effort and marine mammal takes during 2010.

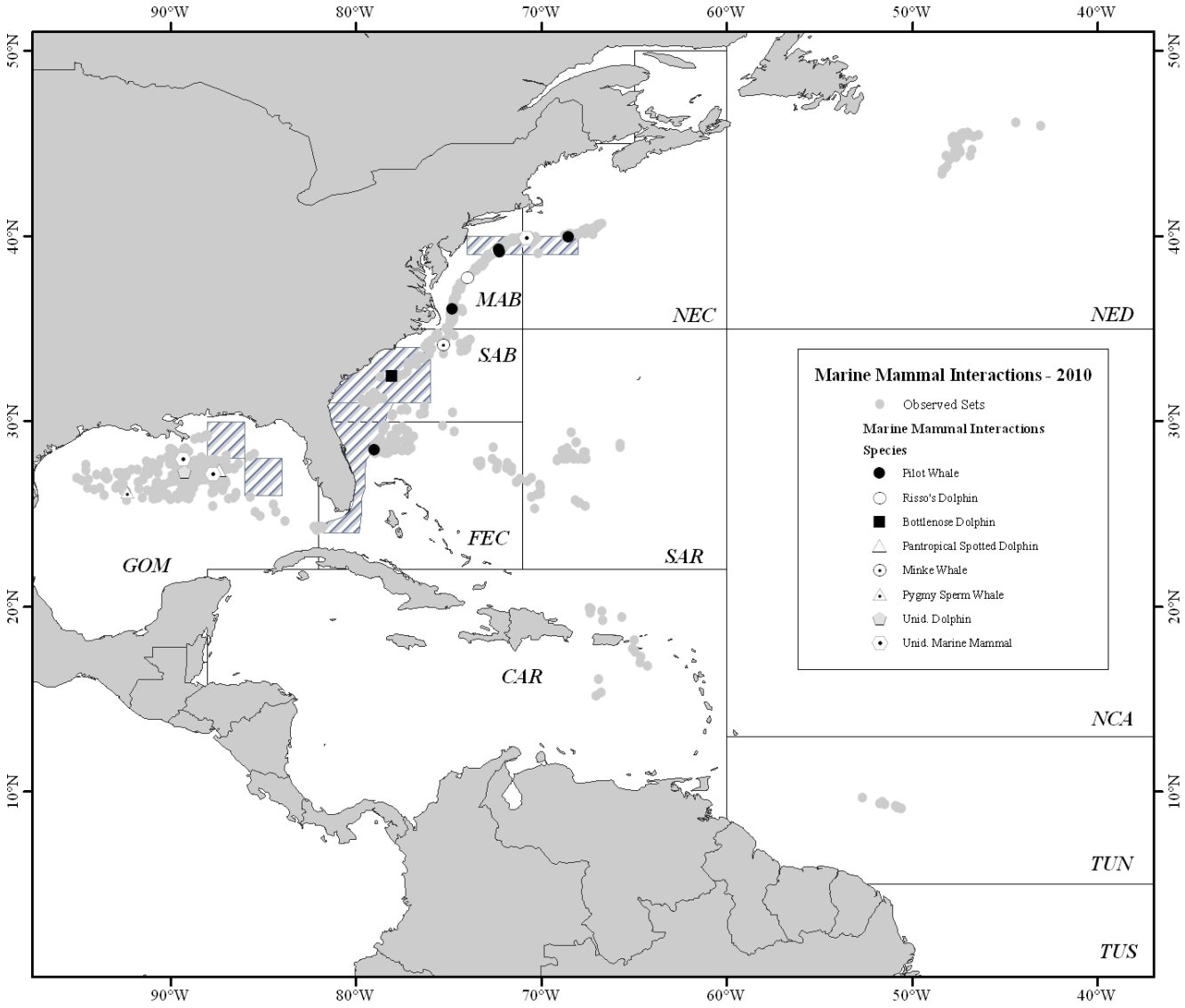
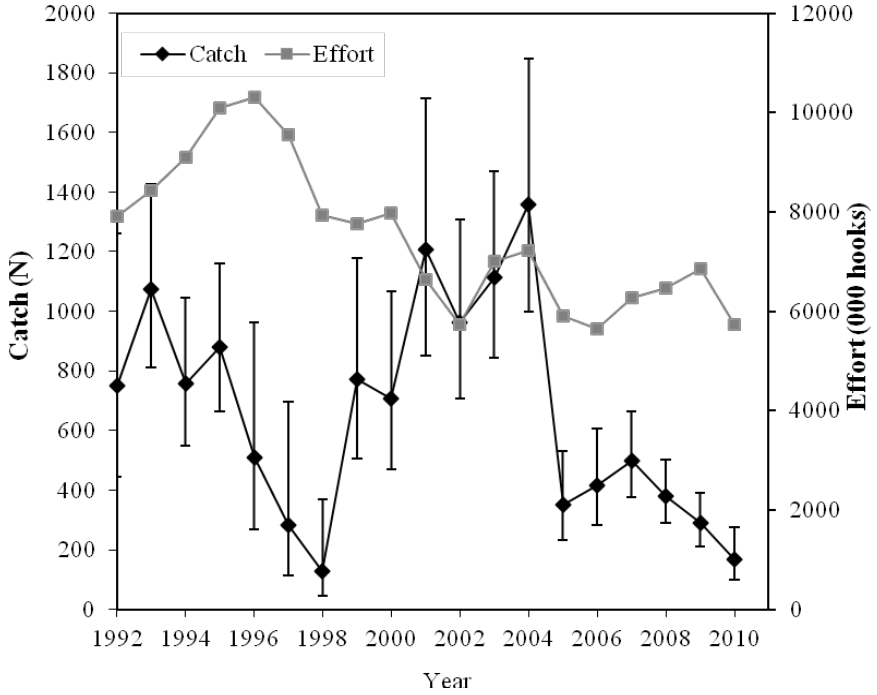


Figure 6. Historical trends in fishery effort and estimated marine turtle takes in the pelagic longline fishery from 1992 to 2010 for A) Leatherback Turtles, and B) Loggerhead Turtles. Errors bars represent 95% confidence intervals.

A. Leatherback Turtles



B. Loggerhead Turtles

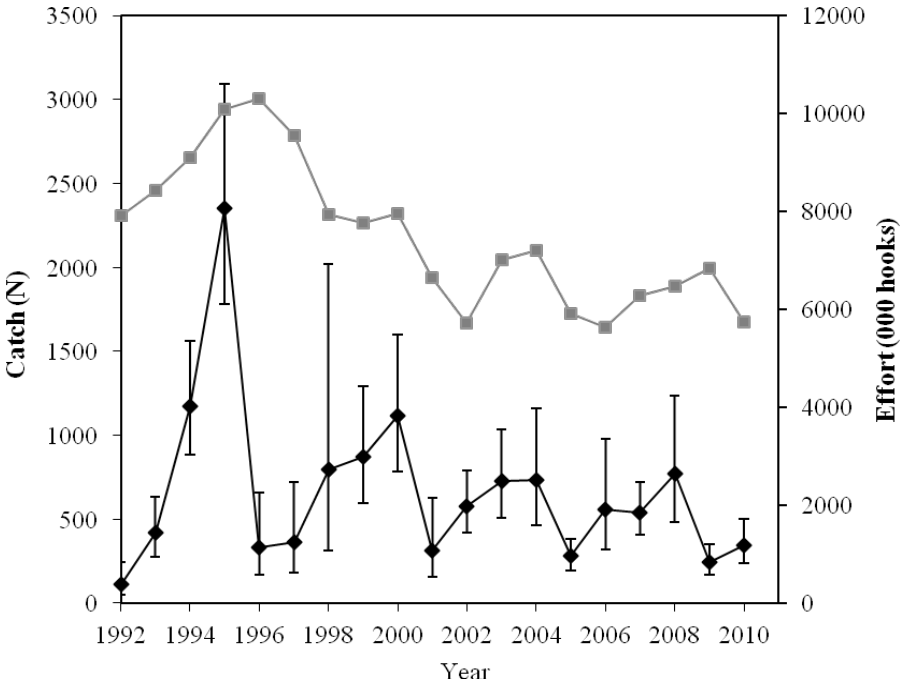
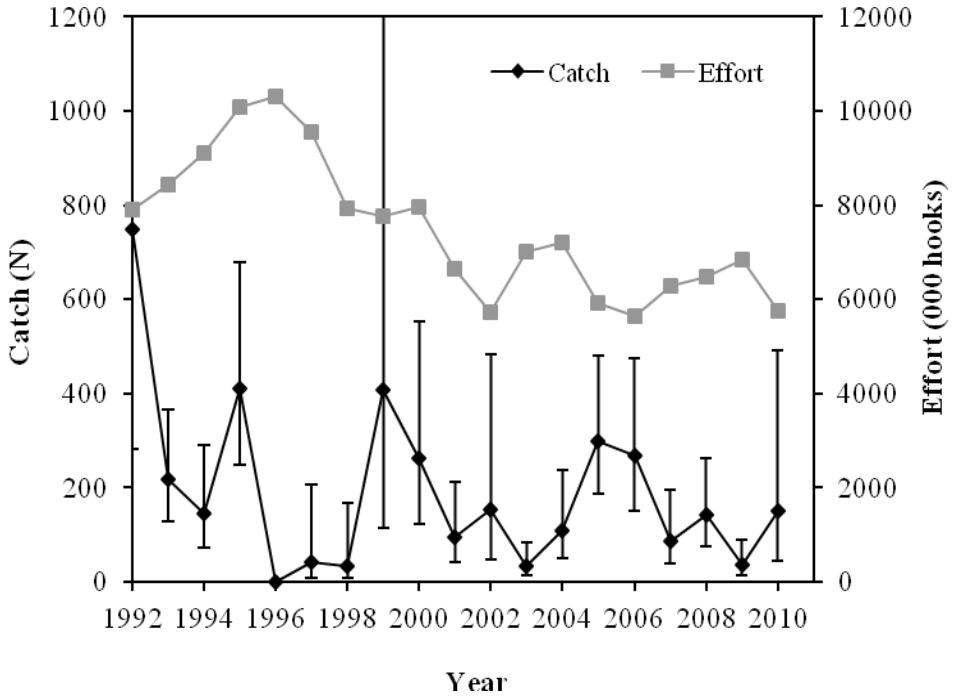
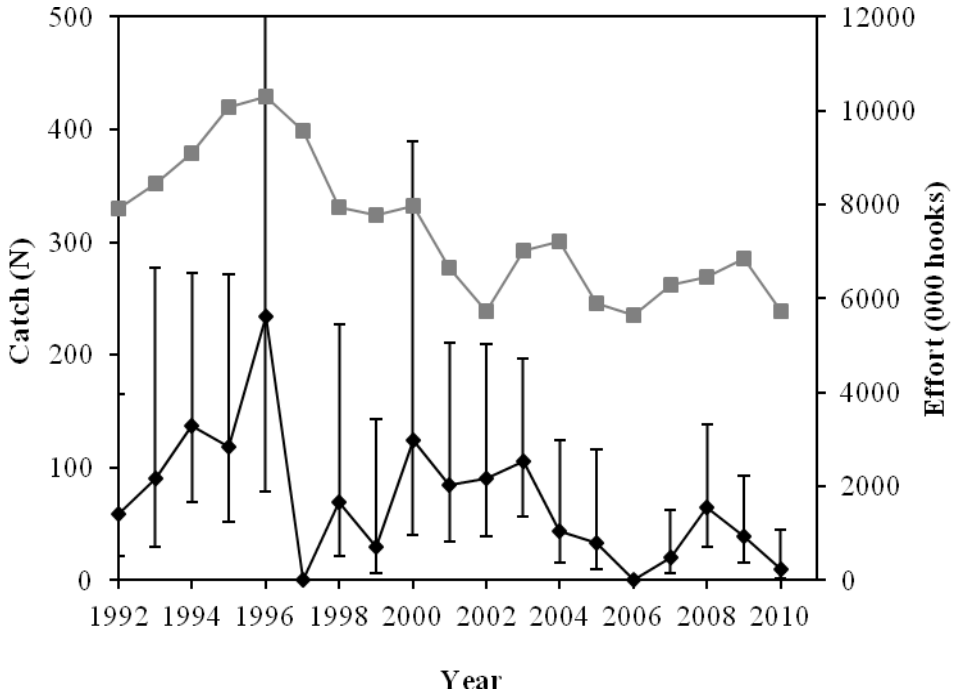


Figure 7. Historic trends in fishery effort and estimated marine mammal takes in the pelagic longline fishery from 1992 to 2010 for A) Pilot Whales and B) Risso's Dolphins. Errors bars represent 95% confidence intervals.

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, Pin**k, B**lue, **G**reen, Bl**a**ck, **R**ed, **Y**ellow, **P**urple, **A**qua, **O**ther, **U**nknown
If No, number of gangions to next light stick☐☐
Light Stick Color (circle)? **W**hite, Pin**k, B**lue, **G**reen, Bl**a**ck, **R**ed, **Y**ellow, **P**urple, **A**qua, **O**ther, **U**nknown
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: ☐ **t**ongue ☐ gl**o**ttis ☐ roof of **m**outh ☐ **j**aw 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 A. Sea Turtle Life History Form (cont.)

BIOLOGICAL INFORMATION

DIMENSIONS (cm)	**Curved (measuring tape) Standard Measurements**	**Straight Line (calipers) Standard Measurements**	**Straight Line (calipers)**
Carapace Length	☐☐☐.☐ **notch-to-tip**	☐☐☐.☐ **notch-to-tip**	☐☐☐.☐ **notch-to-notch**
Carapace Width	☐☐☐.☐	☐☐☐.☐	

TAGS (identify address on each tag in the comments section)

Flipper Tag Number	**Metal (1) or Plastic(2)**	**Position (Flipper) LF, RF, LR, RR**	**Already Present (1) or Applied By Observer (2)**	**Were Tags Removed?**
☐☐☐☐☐☐	☐	☐☐	☐	**Y / N**
☐☐☐☐☐☐	☐	☐☐	☐	**Y / N**
☐☐☐☐☐☐	☐	☐☐	☐	**Y / N**
☐☐☐☐☐☐	☐	☐☐	☐	**Y / N**

PIT Tag

☐☐☐☐☐☐☐☐☐☐ ☐☐ ☐ **Scanned? Y / N**

Living Tag (describe)_____ Other Tags (describe) _____

(Put PIT tag label here)

BIOPSY SAMPLES TAKEN? Y (itemize below) **/ N** / **U**nsuccessful (If yes, USFWS 3-177 form may be needed)

RELEASE INFORMATION

LATITUDE ☐☐**deg**☐☐.☐**min N / S LONGITUDE** ☐☐☐**deg**☐☐.☐**min E / W**

TIME (24 hr) ☐☐☐☐ **WATER TEMP (°F)** ☐☐.☐

DATE, if different from capture: YEAR 20☐☐ **MONTH**☐☐ **DAY**☐☐

FINAL DISPOSITION

☐**Discarded Marked Dead/Unresponsive Carcass** ☐**Discarded Unmarked Dead/UnresponsiveCarcass**

☐**Salvaged Carcass/Parts (explain)** ☐**Released Alive** ☐**Taken to Holding Facility** ☐**Unknown (explain)**

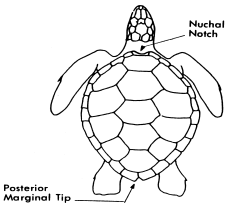
ADDITIONAL COMMENTS (list all biological samples collected; describe or sketch any anomalies):

_____

_____

_____

_____



IDENTIFICATION CRITERIA

Number of:

Left Lateral Scutes	☐	**Overlapping Scutes?**	**Y / N / U**	**Does Nuchal Scute**
Right Lateral Scutes	☐	**Inframarginal Pores?**	**Y / N / U**	**Touch 1st Lateral Scute?**
Vertebral Scutes	☐	**1 Pair Prefrontal Scales?**	**Y / N / U**	**Y / N / U**
L. Inframarginal Scutes	☐	**Lacks Bony Shell?**	**Y / N**	
R. Inframarginal Scutes	☐			

Dorsal Coloration ☐**Black** ☐ **Orange/Red-Brown** ☐**Brown**
☐**Gray-Green** ☐ **Other**_____

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 2010. 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 2011.

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?	Injury Cat. Row	Release Cond. Col.	Line Left (ft)	CL Est. (ft)	CCL (cm)	N-N (cm)
1	GOM	1	C-16/0	0	Squid	207	Alive, injured	Released alive	Shoulder	No	No	No	I	C	1.0	5.5		
2	GOM	1	C-16/0	0	Squid	207	Alive, injured	Released alive	Unknown external	No	No	No	I	C	1.0	5.5		
3	CAR	1	C-18/0	10	Squid or Mackerel	207 or 302/410	Alive, uninjured	Released alive	Not hooked	N/a	Yes	No	V	D	0.0	4.5		
4	CAR	1	C-18/0	10	Squid or Mackerel	207 or 302/410	Alive, uninjured	Released alive	Not hooked	N/a	Yes	No	V	D	0.0	5.5		
5	FEC	1	C-16/0	0	Squid	221	Alive, injured	Released alive	Armpit	No	No	No	I	C	0.5	4.0		
6	SAB	1	C-18/0	10	Squid or Mackerel	248 or 261	Alive, injured	Released alive	Shoulder	No	No	No	I	B	6.0	5.0		
7	GOM	1	C-16/0	0	Squid	140	Alive, injured	Released alive	mouth, side, other	No	No	No	II	C	0.1	4.0		
8	GOM	2	C-16/0	0	Unk	Unknown	Alive, uninjured	Released alive	not hooked	N/a	Yes	No	V	D	0.0	6.0		
9	GOM	2	C-16/0	0	Squid	149	Alive, injured	Released alive	unknown internal	No	Yes	Unk	IV	A	10.0	5.0		
10	GOM	2	C-16/0	0	Squid	149	Alive, injured	Released alive	not known if hooked	Unk	Yes	Yes	IV	A	25.0	4.0		
11	GOM	2	C-16/0	0	Mackerel	189	Alive, injured	Released alive	mouth, lower jaw, unknown	Yes	No	No	III	D	0.0	3.5		

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?	Injury Cat. Row	Release Cond. Col.	Line Left (ft)	CL Est. (ft)	CCL (cm)	N-N (cm)
12	GOM	2	C-16/0	0	Sardine	45	Alive, injured	Released alive	armpit	Yes	No	No	I	D	0.0	3.8		
13	GOM	2	C-16/0	0	Sardine	81	Alive, injured	Released alive	roof of mouth	No	No	No	III	C	1.0	5.0		
14	GOM	2	C-16/0	0	Sardine	72	Alive, uninjured	Released alive	not hooked	N/a	Yes	No	V	D	0.0	5.0		
15	NEC	2	C-18/0	10	Mackerel	257	Alive, injured	Released alive	shoulder	Yes	No	No	I	D	0.0	6.0		
16	MAB Exp	3	C-16/0	0	Squid	131	Alive, uninjured	Released alive	not hooked	N/a	Yes	No	V	D	0.0	5.0		
17	GOM Exp	3	C-16/0	0	Sardine	81	Alive, injured	Released alive	mouth, upper jaw, other	No	No	No	III	C	2.0	5.0		
18	NEC	3	C-18/0	10	Squid or Mackerel	185 or 293	Alive, injured	Released alive	mouth, side, other	Yes	No	No	II	D	0.0	5.0		
19	NEC	3	C-18/0	10	Squid	185	Alive, injured	Released alive	armpit	No	No	No	I	B	8.0	5.5		
20	NEC	3	C-18/0	10	Squid	203	Alive, injured	Released alive	shoulder	No	No	No	I	C	1.0	4.5		
21	NED	3	C-18/0	10	Squid or Mackerel	243 or 216	Alive, injured	Released alive	shoulder	Yes	Yes	No	I	D	0.0		129	
22	NED	3	C-18/0	10	Squid	216	Alive, injured	Released alive	armpit	Yes	No	No	I	D	0.0	6.0		
23	NED	3	C-18/0	10	Mackerel	216	Alive, injured	Released alive	armpit	No	No	No	I	C	0.0	6.0		
24	NED	3	C-18/0	10	Squid or Mackerel	243 or 216	Alive, injured	Released alive	shoulder	Yes	No	No	I	D	0.0	6.0		
25	NED	3	C-18/0	10	Squid or Mackerel	243 or 216	Alive, injured	Released alive	shoulder	Yes	No	No	I	D	0.0	6.0		
26	SAR	4	C-18/0 or C-16/0	10 or 0	Squid or mackerel	216 or 293	Alive, uninjured	Released alive	not hooked	N/a	Yes	No	V	D	0.0	4.5		

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?	Injury Cat. Row	Release Cond. Col.	Line Left (ft)	CL Est. (ft)	CCL (cm)	N-N (cm)
1	SAR	1	C-18/0	10	Squid or Mackerel	207 or 410	Alive, injured	Released alive	shoulder	Yes	No	No	I	D	0.0		68.8	64.9
2	FEC	1	C-18/0	10	Squid	207	Alive, injured	Released alive	swallowed, hook not visible	No	No	No	IV	C	0.1		61.5	54.4
3	CAR	1	C-18/0	10	Mackerel	360	Alive, unknown	Released alive	Not known if hooked	Yes	Unk.	No	III	D	0.0	2.0		
4	SAR	1	C-16/0 or C-18/0	0 or 10	Squid	189	Alive, injured	Released alive	swallowed, hook not visible	No	No	No	IV	C	0.0		69.8	62.7
5	CAR	1	C-18/0	10	Mackerel	360	Alive, injured	Released alive	glottis	No	No	No	III	C	0.1		64	57.5
6	SAB	2	C-18/0	10	Unknown	Unknown	Alive, injured	Released alive	mouth, side, jaw joint	Yes	No	No	III	D	0.0			67.2
7	GOM	2	C-16/0	0	Sardine	90	Alive, injured	Released alive	swallowed, hook not visible	Yes	No	No	IV	D	0.0	2.7		
8	SAB	2	C-16/0	0	Mackerel	113	Alive, injured	Released alive	shoulder	No	No	No	I	C	0.1	3.0		
9	SAB	2	C-16/0	0	Mackerel	113	Alive, injured	Released alive	mouth, lower jaw, unknown	Yes	No	No	III	D	0.0		66.0	60.8
10	NEC	2	C-18/0	10	squid	194	Alive, injured	Released alive	swallowed, hook partially visible	Yes	No	No	III	D	0.0		65.5	57.9
11	NEC	3	C-18/0	10	Squid	162	Alive, injured	Released alive	mouth, lower jaw, other	Yes	No	No	II	D	0.0		78	68
12	NEC	3	C-18/0	10	Squid or Mackerel	144 or 288	Alive, uninjured	Released alive	not hooked, holding bait/hook	N/a	No	No	V	D	0.0	2.3		
13	NEC	3	C-18/0	10	Squid or Mackerel	144 or 288	Alive, injured	Released alive	tongue	Yes	No	No	III	D	0.0		55.5	49
14	NEC	3	C-18/0	10	Squid or Mackerel	144 or 288	Alive, injured	Released alive	swallowed, hook partially visible	No	No	No	III	C	0.1		69	60.8

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?	Injury Cat. Row	Release Cond. Col.	Line Left (ft)	CL Est. (ft)	CCL (cm)	N-N (cm)
15	MAB	3	C-18/0	10	Squid	144	Alive, injured	Released alive	tongue	Yes	No	No	III	D	0.0		84.3	77.7
16	MAB	3	C-18/0	10	Squid	144	Alive, injured	Released alive	tongue	Yes	No	No	III	D	0.0		78.2	
17	NEC	3	C-18/0	10	Mackerel	288	Alive, injured	Released alive	side jaw joint	Yes	No	No	III	D	0.0		81	73
18	NEC	3	C-18/0	10	Squid	185	Alive, injured	Released alive	glottis	Yes	No	No	III	D	0.0		70.2	63.2
19	NEC	3	C-18/0	10	Squid	185	Alive, injured	Released alive	swallowed, hook visible to insertion pt	Yes	No	No	III	D	0.0		72.6	64.8
20	NEC	3	C-18/0	10	Squid	185	alive, unknown	Released alive	not known if hooked	Yes	No	No	III	D	0.0	2.3		
21	NEC	3	C-18/0	10	Squid	162	Alive, injured	Released alive	side jaw joint	Yes	No	No	III	D	0.0		80.4	75.8
22	MAB	3	C-16/0	0	Squid	153	Alive, injured	Released alive	tongue	Yes	No	No	III	D	0.0	2.5		
23	NEC	3	C-18/0	10	Squid or Mackerel	189 or 162	Alive, injured	Released alive	tongue	No	No	No	III	C	0.0	3.0		
24	NEC	3	C-18/0	10	Squid or Mackerel	239 or 126	Alive, injured	Released alive	beak internal, lower jaw	Yes	No	No	I	D	0.0		70.2	60
25	NEC	3	C-18/0	10	Squid or Mackerel	131 or 243	Alive, uninjured	Released alive	not hooked	N/a	Yes	No	V	D	0.0		65	60
26	MAB	3	C-16/0	10	Squid	198	Alive, injured	Released alive	mouth, side, other	Yes	No	No	II	D	0.0		79.6	68.5
27	MAB	3	C-16/0	0	Squid	198	Alive, uninjured	Released alive	not hooked	N/a	Yes	No	V	D	0.0	2.7		

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?	Injury Cat.	Release Cat.	Line Left (ft)	CL Est. (ft)	CCL (cm)	N-N (cm)
28	NED	3	C-18/0	10	Mackerel	216	Alive, injured	Released alive	mouth, side, other	Yes	No	No	II	D	0.0		66	59.5
29	FEC	3	C-16/0	10	Squid	189	Alive, injured	Released alive	swallowed, hook not visible	No	No	No	IV	C	0.2		65	59.6
30	NED	3	C-18/0	10	Squid or Mackerel	243 or 216	Alive, injured	Released alive	swallowed, hook partially visible	No	No	No	III	C	0.0		81.5	73
31	NED	3	C-18/0	10	Squid or Mackerel	243 or 216	Alive, injured	Released alive	swallowed, hook not visible	No	No	No	IV	C	0.1		66	59
32	NED	3	C-18/0	10	Mackerel	216	Alive, injured	Released alive	mouth, lower jaw, other	Yes	No	No	II	D	0.0		62	56
33	NED	3	C-18/0	10	Mackerel	216	Alive, injured	Released alive	beak internal, upper jaw	Yes	No	No	I	D	0.0		68	60.5
34	NED	3	C-18/0	10	Mackerel	216	alive, unknown	Released alive	not known if hooked	Yes	No	No	III	D	0.0		67.5	59
35	NED	3	C-18/0	10	Mackerel	216	Alive, injured	Released alive	mouth, lower jaw, other	Yes	No	No	II	D	0.0		62	54.5
36	NED	3	C-18/0	10	Mackerel	216	Alive, injured	Released alive	swallowed, hook not visible	No	Yes	No	IV	C	0.5		66	59.5
37	NED	3	C-18/0	10	Squid or Mackerel	243 or 216	Alive, injured	Released alive	tongue	Yes	No	No	III	D	0.0		60	55.5
38	MAB	4	C-18/0	10	Squid or Mackerel	225 or 360	Alive, uninjured	Released alive	not hooked	N/a	Yes	No	V	D	0.0	2.0		
39	SAR	4	C-16/0	0	Squid or Mackerel	216 or 293	Alive, injured	Released alive	mouth, lower, other	Yes	No	No	II	D	0.0		68.8	60.2
40	SAR	4	C-16/0	0	Squid or Mackerel	216 or 293	Alive, injured	Released alive	swallowed, hook partially visible	no	No	No	III	C	0.1		66	59.7

C. Unidentified Hardshell Turtle

#	Area	Q	Hook Type	Offset (degrees)	Bait	Bait Size (g)	Capture Condition	Final Disposition	Hook Location	Hook Removed?	Entangled Capture?	Entangled Release?	Injury Cat.	Release Cat.	Line Left (ft)	CL Est. (ft)	CCL (cm)	N-N (cm)
1	SAR	4	C-18/0	10	Squid or Mackerel	225 or 306	Alive, unknown	Released alive	not known if hooked	no	Unk	Unk	IV	A	Unk	2.0		

Appendix B cont.

Table B2: 2010 observer comments and serious injury codes for marine mammals are presented. Lengths (cm) are estimated visually by the observer.

Animal #	Species	Length (cm)	Release Condition	Interaction Type	Observer Comments
1	Minke Whale	240	Released Alive	Entangled, Gear removed	[Check boxes and drawing indicate wrapped in mainline around tail stock]. Tail was wrapped by more than one gangion. May or may not have been hooked. Was next to floatline by not entangled in the floatline. Hard to see which gangion was the primary snag. Line cut as close to animal as possible. Still some line wrapped, may have loosened up. [Record indicates 4' mono remaining after release]. Tried to swim away as it was pulled alongside the boat. Swam away w/o any problems after line was cut. [Biopsy collected - species id genetically confirmed]
2	Unid. Marine Mammal		Dead	Entangled, Mouth Hooked	[Check boxes and drawing indicate hooked in mouth, perhaps entangled]. Only saw head of animal. Crewmember cut the line immediately and head sank immediately. Sank backward as line was cut. Line was cut too quick for biopsy or pictures to be taken. [Comments indicate crewmember cut line as soon as animal's head was seen - Possible PW or Risso's - brown coloration, no beak, large eye]
3	Pantropical Spotted Dolphin	120	Released Alive	Entangled, Gear removed	[Check boxes indicate animal was entangled around body in drop line]. They used a gaff to remove dropline. It was only wrapped around dolphin one time and easily removed by gaffing bullet and removing it from drop. It was very lively and quickly swam away with no visible scarring or bleeding. Biopsy taken from dorsal near dorsal fin. when hit by biopsy pole he did react a little but was still wrapped up so didn't move around that much.
4	Pilot Whale	480	Serious Injry	Mouth Hooked, Released with potentially entangling line	[Check boxes indicate that gangion line lead to the mouth, but could not confirm if hooked or not. Line was intentionally cut and animal released with 30' of mono trailing.] Pilot whale porpoised once, then started diving. Very large male and heavy so line was cut quickly. It appeared, in my brief view of the whale that it was probably hooked in the mouth or had a fish in its mouth. Robustly and normally dived away. Large adult male.
5	Pygmy Sperm Whale	141	Dead	Hooked in flukes	[Animal was hooked in the flukes - hauled on board dead] Hook fell out when animal was hauled on deck. Discarded unmarked carcass at sea. [Tissue samples collected including lower jaw - species id through genetics].
6	Unid. Dolphin	150	Released Alive	Entangled, Gear removed	[Animal was entangled in gangion around tail stock] The leader was wrapped around the tail once and back onto the hook. Once the leader was cut, the hook fell free. I only got a quick glimpse of the dolphin before the line was cut free. Swam away normally without hesitation once it was freed. [Described as small dolphin - possibly Pantrop spotted]

Appendix B, Table B2 (cont.)

Animal #	Species	Length (cm)	Release Condition	Interaction Type	Observer Comments
7	Unid. Marine Mammal	300	Serious Injury	Mouth Hooked, Released with potentially entangling line	[Check boxes indicate hooked in mouth, released with 20 feet of line]. Crew cut gangion with scissors immediately after realizing it was a marine mammal. Dove right away after line was cut, never saw it again.
8	Bottlenose Dolphin	90	Serious Injury	Mouth Hooked, Released with potentially entangling line	[Check boxes indicate animal hooked in lower portion of mouth with hook eye visible - line cut with 2 ft trailing]. Small dolphin ~3ft was brought boat side with little effort. The captain leaned over the rail and cut the line with the mammal still in the water. Then it swam away slowly making chirping noises. Entire interaction lasted less than one min. Sea conditions and attitude of animal could have allowed for proper de-hooking. The eye of the hook was still visible. It swam away, but slowly and not far under the surface. Most likely tired because I did not notice any other wounds.
9	Bottlenose Dolphin	180	Released Alive	Entangled, Gear removed	[Check boxes indicate animal wrapped in mainline, gangion, dropline around tail and flukes] Secured MAM to vessel using both ends of mainline. Used laforce line cutter and mono snips to cut wraps until animals' tail was sufficiently loose to pull other wraps off. Animal swam away strong took immediate breath then swam away from vessel. Saw take 3 breaths before lost sight.
10	Pilot Whale	420	Serious Injury	Mouth Hooked, Released with potentially entangling line	[Check boxes indicate hooked, but hook not visible connected to head/mouth - line cut with 15 ft. remaining]. All gear was pulled in as much as possible before the line was cut. A great effort was made by fishermen to leave as little mono attached to hook considering such a powerful animal. Animal behaved normally - coming up for air at intervals while line was pulled in. At release it dived and disappeared.
11	Pilot Whale	300	Serious Injury	Mouth Hooked, Released with potentially entangling line	[Check boxes indicate hooked, but hook not visible connected to head/mouth - line cut with 20 ft. remaining]. There was a large mess of tangled mainline which was pulled onboard and the leader was pulled tight and cut. The whale only surfaced once during the interaction. Did not see whale swim away, it was underwater when the line was cut.
12	Pilot Whale	300	Serious Injury	Mouth Hooked, Released with potentially entangling line	[Check boxes indicate hooked, but hook not visible connected to head/mouth - line snapped with unknown amount remaining - up to 30 feet]. A tangled mess of gear was pulled on board and as the gangion tightened the large male whale surfaced and the leader broke sending the lead weight into the vessel. The whale submerged and swam away.

Appendix B, Table B2 (cont.)

Animal #	Species	Length (cm)	Release Condition	Interaction Type	Observer Comments
13	Unid. Marine Mammal	270	Serious Injury	Entangled, Released with potentially entangling line	[Check boxes indicate not hooked, but wrapped in mainline, gangion/leader, and dropline/floatline around flukes. Gear partially removed with 15 feet remaining wrapped on release] Whale was trying to swim away. Appeared it was semi-tail-wrapped in mainline in addition to gangions. Mainline pulled free, gangions cut off. Wrap remained around tail. Trying to swim away, taking breaths before each big stroke. Swam straight away after line was cut.
14	Unid. Marine Mammal	210	Serious Injury	Mouth Hooked	[Check boxes indicate entangled but line removed, hooked in mouth - hook position unknown- with gangion line cut 3 feet away from hook] Line cut 3 ft from mouth, 1 wrap of tail w/o snagging, line cut, exact position of hook not seen. Small pilot whale, did not make mess of gear, one wrap around tail cut, leader going into mouth cut about 3 foot from mouth. Whale came up easily and quickly, observer not aware of pilot whale until next to boat, incident quickly over, partner seen earlier but not when animal next to boat. [NOTE: Coded as Unid Mammal in database, but PW on data sheet due to limited observer confidence in ID]
15	Pantropical Spotted Dolphin	150	Released Alive	Mouth Hooked, Hook removed	[Check boxes indicate hooked in upper side of mouth. Hook removed. No entanglement] This was a large dolphin hooked in the tip of the lower beak and not tangled in gear. They were able to gaff the circle hook and when they cut the leader. They removed the hook by holding and spinning the gaff. When they removed the hook the dolphin went down in the water then started swimming away normally. I watch it for over 2 min.
16	Pilot Whale	210	Serious Injury	Mouth Hooked	[Check boxes indicate hooked in mouth, not entangled. Hook left in mouth with line cut approx. 3 feet from hook] MPW did not make mess of gear, offered very little resistance as crew member pulled leader as close as possible to stern and cut leader ~3 feet from mouth. Animal did not make a mess of gear, offered little resistance, Observer thought just another fish or shark until head popped up over stern, line cut, another pilot whale close by. Interaction over quickly.
17	Pilot Whale	210	Released Alive	Entangled, Gear removed	[Check boxes indicate entangled around tail, not hooked. Gangion and leader involved, all gear removed before release] leader wrapped around tail, Capt. Able to pull tail to haul station and cut leader. No line left. Capt. Able to pull small pilot whale to haul station fairly easily, cut line, abrasions where line was but otherwise animal ok. Incident over very quickly, saw head for instant then tail for a second, 1 photo maybe, then animal gone.
18	Pilot Whale	270	Released Alive	Entangled, Gear removed	[Check boxes indicate entangled around body in mainline, not hooked. All gear removed by cutting wraps] Whale was pulled to boat and loose wrap was cut/pulled away. All gear slid off whale. The whale resisted capture during retrieval of mainline and swam away normally once freed.

Appendix B, Table B2 (cont.)

Animal #	Species	Length (cm)	Release Condition	Interaction Type	Observer Comments
19	Pilot Whale	150	Serious Injury	Mouth Hooked, Released with potentially entangling Line	[Check boxes indicate animal hooked near mouth, hook position not directly observed. Animal released with hook and 4 ft of mono] Attempted to get near animal and control it. Between 3 guys they could not control it. Last attempt made to get as much monofilament retrieved and then the line was cut. Animal was extremely active/agitated. Animal broke surface several times and sped away.
20	Pilot Whale	180	Serious Injury	Mouth Hooked, Released with potentially entangling Line	[Check boxes indicate animal was hooked near moth and partially entangled with gangion/leader line around body. Hook not removed and line parted with 18 ft. trailing.] Tried to get near animal by maneuvering slowly and trying to reach the mainline. Animal bolted away leaving behind 1 snap ith missing hook and tdr associated with hook. After it broke free, the one wrap seemed to unravel itself and MPS was no longer entangled. Swam away very quickly.
21	Pilot Whale	180	Serious Injury	Hooked in flukes, Released with potentially entangling line	[Check boxes indicate animal hooked in tail. Line cut with 8 feet remaining with the animal] Brought marine mammal near boat. Because it was hooked on tail it was very agitated and attempting to stay at the surface while line was being held. Brought to rear of boat and cut close to hook. Swam away very quickly and normally. [LPG Note: Body length 6 feet, released with 8 feet of gear trailing and hook in tail. Therefore coded 10 - gear likely to further entangle]
22	Risso's Dolphin	240	Released Alive	Entangled, Gear removed	[Check boxes indicate animal wrapped around tail and mouth in mainline. All gear removed] Animal tail wrapped w/ mainline and also in mouth (only mainline visible), pulled in close to boat, as much line was untangled by hand as possible then mainline cut and remainder of gear untangled itself. Animal swam away free of all (visible) gear. Maybe a pectoral fin was wrapped in addition? Took a breath and swam directly away, subsurface. Didn't struggle much during incident.

Appendix C. Marine Mammal Biopsy Samples and Identification

Sample #	Quarter	Area	Initial Species ID	Genetic Species ID	Sex (Genetically Determined)
1	1	SAB	Unid. Marine Mammal	Minke Whale	M
2	1	GOM	Pantropical spotted dolphin	Pantropical spotted dolphin	M
3	2	GOM	Dwarf sperm whale	Pygmy sperm whale	M
4	4	MAB	Risso's dolphin	Risso's dolphin	M