Estimated Bycatch of Marine Mammals and Sea Turtles in the U.S. Atlantic Pelagic Longline Fleet During 2017

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Abstract

The U.S. Atlantic Pelagic Longline fleet operates throughout the western North 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 2017 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 2017, there were an estimated 292.9 (206.2 – 416.1 [95% CI]) interactions with leatherback turtles and 77.1 (39.8 – 149.3 [95% CI]) interactions with loggerhead turtles. The primary marine mammals interacting with this fishery were pilot whales (*Globicephala* sp.) in western North Atlantic waters. Interactions were apportioned between short-finned and long-finned pilot whales based upon location and environmental parameters. The majority of interactions were with short-finned pilot whales with an estimated 132.9 (76.1 – 232.1 [95% CI]) interactions resulting in serious injury. 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 western North 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, 2012a, 2012b, 2013, 2014, 2016, 2017, 2019).

In this report, marine mammal and marine turtle bycatch estimates are calculated for pelagic longline fishery effort during 2017. 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 11 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). During December-February, observer coverage was enhanced in portions of the Mid-Atlantic Bight (MAB) to evaluate bluefin tuna bycatch. Observer coverage in this region was therefore high during the first quarter (~51.3% of total hooks) quarter. The bycatch estimates developed for each

species are stratified by fishing area and quarter to reflect the design of the observer program. There was no experimental fishing in the pelagic longline fishery during 2017.

Bycatch rates for quarter-area strata with more than 10 reported longline fishery sets that had no corresponding observer coverage in 2017 were replaced with previously observed mean bycatch rates from 2012-2016. There were both marine mammal and sea turtle interactions observed in these "missing" cells in prior years.

The Magnuson-Stevens Fishery Conservation and Management Act places 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 prior 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, 2012a,

2012b, 2013, 2014, 2016, 2017, 2019). The mean and variance of catch rates for marine mammals and turtles observed in longline sets were calculated using a delta lognormal estimator (Pennington, 1983). 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:

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

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:

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

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

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

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 2017. 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 (Andersen 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). Observer comments for all takes of marine mammals from 2017 (Appendix B) were reviewed, and serious injury determinations were made on

a case by case basis based upon observer comments and photographs (when available) consistent with the 2012 guidelines.

Some observed interactions were scored as "Could Not Be Determined" (CBD) based upon the serious injury criteria. These include two types of cases. First, are those cases where the observer was unable to record sufficient information to allow a definitive determination. These include cases where the animal was involved with the gear in some way, but the observer recorded that it was "unknown if hooked or entangled." Second, are those cases where the animal was released from the gear; however, the duration of time it was involved in the gear or behavioral indicators (e.g., slow swimming, tail slaps, etc.) indicate the possibility that the animal was in distress. Details for each case and the associated score are noted in Appendix B. For observations where the determination was CBD, these cases were apportioned between serious and non-serious injury based upon the proportion of observed cases for that species since 2011 (the year the serious injury guidelines were revised) that were scored as serious injuries. These apportioned cases were therefore split between "serious injury" and "released alive" in the estimation of total bycatch based on past data.

Apportioning Pilot Whale Takes Between Species

Two species of pilot whales, short-finned and long-finned, occur within the MAB and NEC regions and are difficult to reliably identify at sea based upon visual observations. Therefore, nearly all of the observations of pilot whale interactions by observers have been assigned to "Unidentified Pilot Whales" (*Globicephala sp.*). The region of overlap between the two species is thought to occur between 38-40ºN latitude

along the shelf break during warm months of the year. In the past decade, there have been very few interactions observed north of 38.5ºN. Available data from studies directed at understanding the relative distribution of the two species based upon genetic and photo-identification data demonstrated that long-finned pilot whales did not occur this far south, and therefore all pilot whale takes were presumed to be from short-finned pilot whales. However, during 2017, there were several interactions in the northern part of the MAB where overlap between the species is possible, and therefore it was unclear whether or not these takes could be reliably assigned to short-finned vs. long-finned pilot whales.

There have been 542 biopsy skin samples collected from pilot whales in the MAB and NEC regions between 1989-2014 from both directed field studies and fisheries bycatch. This included 10 genetic identifications of samples collected from the pelagic longline fishery from 2009-2014. These samples have been analyzed genetically and identified to species. All of the samples collected from the pelagic longline fishery have to date been identified as short-finned pilot whales. A logistic regression model was used to estimate the probability that an observed pilot whale was a short-finned vs. long-finned pilot whale based upon the location and sea surface temperature at the time of the sample collection. The model used samples that were collected during May-November, as these were most representative of the period when pilot whale bycatch in the pelagic longline fishery is observed. The resulting model indicated that at water temperatures above 22ºC and latitudes south of 39ºN, the probability of a sample coming from a short-finned pilot whale exceeds 80% (see Garrison and Rosel, 2016 for additional detail).

Of the 31 observed pilot whale interactions during 2017, 27 had a greater than 95% probability of being from short-finned pilot whales, 2 had an approximately 92% probability of being from short-finned pilot whales, and 2 had an approximately 80% probability of being from short-finned pilot whales. For all observed unidentified pilot whales, the predicted probability of it being short-finned vs. long-finned was used to apportion the estimated bycatch between the two species. Due to the very low probability of the observed takes being from long-finned pilot whales, the estimated bycatch of this species was very low compared to that for short-finned pilot whales.

Results and Discussion

Reported Fishing Effort and Observer Coverage

The total reported pelagic longline fishing effort included 5.4 million hooks during 2017 (Table 1A, Figure 2). The reported fishery effort included 7,380 sets during 2017, 897 of which were observed by the POP program (Tables 1B and 2B, Figure 2). The overall percent coverage during regular fishing was 11.7% expressed as a proportion of reported hooks and 12.2% as a proportion of reported sets (Table 3). The relatively high annual rate reflects the high coverage of the fishery during the first and second quarter in the MAB. Observer coverage for other area-quarter strata is shown in Table 3.

Areas with no observer coverage during 2017 with more than 10 sets of reported fishing effort include the Northeast Coastal (NEC) during Quarter 4, CAR during Quarter 3 and 4, Northeast Distant Area during quarter 2 and 4, SAR during Quarter 4, and the Tuna North (TUN) during Quarter 2 and 3 (Table 3).

Observed Protected Species Interactions

There were 37 observed interactions with leatherback turtles, 10 with loggerhead turtles, and 3 unidentified hardshell turtles (Table 4, Figure 3) in 2017. The greatest number of observed leatherback takes occurred in the SAB during Quarter 1 and the MAB during Quarter 2 and 4 (Table 4A, Figure 3). Loggerhead takes were observed in the greatest numbers in the SAB during Quarter 1 and 2 (Table 4B, Figure 3).

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 had swallowed the hook (Table 5). All gear was removed before release from 18 of the 50 turtles captured (Table 6). A total of 8 leatherbacks were released either entangled or with the hook and line remaining that was > ½ the carapace length (Table 6).

There were 36 interactions observed with marine mammals (Table 7, Figure 4). This included 31 interactions with pilot whales, and none of these were sampled to allow direct identification to species (Table 8). Eleven of the observed marine mammal interactions were categorized as serious injuries including 10 pilot whales (Table 9). Ten of the serious injuries were due to animals being hooked in the mouth/head, and 1 case involved being released with gear likely to further entangle the animal (Table 9). There were 6 cases where a determination could not be made, and the interaction was therefore pro-rated based on historical serious injury rates. Observer comments used in serious injury determinations are summarized in Appendix B.

Stratum estimates of total interactions for sea turtles are shown in Table 10. High numbers of leatherback interactions occurred particularly in the SAB during Quarter 1 (39.0) and 2 (20.8), in the MAB in Quarter 2 (57.0) and Quarter 4 (70.0), and the GOM in Quarter 2 (21.5, Table 10). For loggerhead turtles, the estimated interactions were highest in the SAB in Quarter 2 (35.7, Table 10).

The quarter-area strata estimates for observed marine mammal mortality, serious injury, and live releases are presented in Table 11. The highest level of serious injuries occurred for short-finned Pilot whales in the MAB 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 2017 are summarized in Table 12. There were observed sea turtle takes in prior years in several areas during Quarter 4 for both leatherback and loggerhead turtles (Table 12). There also observed interactions with Risso's dolphins in prior years in NEC-Quarter 4.

Total Estimated Bycatch

There were an estimated total of 292.9 (206.2 – 416.1 [95% CI]) interactions with leatherback turtles during 2017 (Table 13). For loggerhead turtles, the estimated total number of interactions was 77.1 turtles (39.8 – 149.3 [95% CI], Table 13).

Annual estimates of marine mammal bycatch are shown in Table 14 with catch estimates separated among three large regions: Atlantic (FEC, SAB, MAB, and NEC), Gulf of Mexico (GOM), and Offshore (CAR, NED, SAR, and NCA). The Offshore

region corresponds to regions outside of the U.S. EEZ, while Gulf and Atlantic correspond to boundaries between western North Atlantic and Gulf of Mexico stocks of the affected species. The highest number of interactions and serious injuries were with Atlantic short-finned pilot whales with a total of 207.4 (CV = 0.28) animals released alive, and 132.9 (CV = 0.20) animals seriously injured (Table 14a).

Trends in Bycatch Estimates

The leatherback take estimate reached a historical high in 2004, and prior to that had increased sharply since 1998 (Figure 5A). 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 estimated take of leatherback turtles remained low and generally trended downward during 2007-2011, and then sharply increased in 2012 associated with an increase in reported fishing effort. The estimates have returned to a downward trend in recent years. Overall the total annual bycatch has been consistent since 2005.

Loggerhead turtle interactions since 2000 have been below the historical highs that occurred in the mid-1990's (Figure 5B). Following the implementation of regulations, the bycatch dropped in 2005, but rebounded to be similar to the pre-regulation period. There appears to be a cyclic pattern in loggerhead bycatch rate occurring at four-year intervals since 1996 with a generally increasing trend over a four-year period, followed by a sharp decline. This cycle continued during the 2010-2015 period. The 2014-2017 estimates remain relatively low and seem to be consistent with an

overall downward trend since the late 1990's. There has been a downward trend in loggerhead turtle takes since 2012.

For pilot whales (unspecified and short-finned pilot whales combined), the 2017 estimate of total catch was higher than that from recent years, but has remained relatively constant since 2011 (Figure 6) with no apparent trend. The bycatch estimate for Risso's dolphins was very low, consistent with that since 2013 (Figure 6).

Sources of Bias and Uncertainty

The fishery logbook system 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, 2012a, 2012b, 2013, 2014, 2016, 2019). 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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Table 10. Estimated interactions with sea turtles in the pelagic longline fishery during 2017 by fishing area and quarter indicates strata where effort cannot be reported due to confidentiality considerations.

Table 11. Estimated A) Mortalities, B) Serious Injury, C) Released Alive, and D) Total Interactions with marine mammals in the pelagic longline fishery during 2017 by fishing area and quarter. NR indicates strata where effort cannot be reported due to confidentiality considerations.

Table 12. Bycatch rates for sea turtles in area-quarter strata with reported effort that were not observed in 2017.

Table 13. Total estimated interactions and experimental takes for A) Leatherback and B) Loggerhead turtles in the pelagic longline fishery during 2017 by fishing area. This includes estimates for strata that were not observed during 2017.

Table 14. Total estimated interactions with marine mammals in the pelagic longline fishery during 2017.

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 2017.

Figure 3. Observed pelagic longline fishing effort and sea turtle takes during 2017.

Figure 4. Observed pelagic longline fishing effort and marine mammal takes during 2017.

Figure 5. Historical trends in fishery effort and estimated marine turtle takes in the pelagic longline fishery between 1992 and 2017 for A) Leatherback Turtles, and B) Loggerhead Turtles. Errors bars represent 95% confidence intervals.

Figure 6. Historic trends in fishery effort and estimated marine mammal takes in the pelagic longline fishery from 1992 to 2017 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 2017 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	91.7	247.5	406.6	58.9	1.1	0.0	0.0	153.6	55.3	74.5	1089.1
2	126.5	88.2	314.5	201.9	1.4	16.6	21.4	667.4	2.5	26.3	1466.7
3	39.1	92.8	465.1	427.6	0.0	182.4	159.4	80.2	0.0	28.6	1475.2
4	37.7	110.8	368.3	654.7	0.0	11.4	33.7	82.4	40.2	8.6	1347.8
Total	294.9	539.4	1554.5	1343.1	2.5	210.4	214.5	983.6	97.9	138.0	5378.8

B. Number of Sets

Quarter	CAR	FEC	GOM	MAB	NCA	NEC	NED	SAB	SAR	TUN	Total
1	118	323	524	117	1	0	0	199	60	59	1401
2	142	155	443	346	1	20	20	718	3	23	1871
3	37	152	742	664	0	187	157	127	0	20	2086
4	38	175	546	1027	0	11	32	141	45	7	2022
Total	335	805	2255	2154	2	218	209	1185	108	109	7380

Table 2. Total amount of fishing effort observed during 2017 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	1.3	23.2	90.9	30.2	1.1	-	-	47.8	15.0	14.2	223.8
2	3.3	6.5	43.9	23.1	0	3.4	0	60.4	0.9	0	141.6
3	0	9.2	38.2	41.1	-	25.0	29.5	13.8	-	0	156.7
4	0	8.4	43.9	49.9	-	0	0	6.5	0	0	108.8
Total	4.7	47.3	216.9	144.4	1.1	28.4	29.5	128.5	15.9	14.2	630.7

B. Number of Sets

Quarter	CAR	FEC	GOM	MAB	NCA	NEC	NED	SAB	SAR	TUN	Total
1	2	27	117	68	1	-	-	62	15	11	303
2	5	23	56	44	0	4	0	74	1	0	207
3	0	16	59	63	-	24	25	22	-	0	209
4	0	14	62	91	-	0	0	11	0	0	178
Total	7	80	294	266	1	28	25	169	16	11	897

Table 3. Percentage of reported fishing effort observed during 2017 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.

A. Number of Hooks

Quarter	CAR	FEC	GOM	MAB	NCA	NEC	NED	SAB	SAR	TUN	Total
1	1.4	9.4	22.4	51.3	100.0	-	-	31.1	27.2	19.0	20.5
2	2.6	7.4	14.0	11.5	0.0	20.6	**0.0**	9.0	34.2	**0.0**	9.7
3	**0.0**	9.9	8.2	9.6	-	13.7	18.5	17.2	-	**0.0**	10.6
4	**0.0**	7.6	11.9	7.6	-	**0.0**	**0.0**	7.9	**0.0**	0.0	8.1
Total	1.6	8.8	14.0	10.7	44.0	13.5	13.7	13.1	16.2	10.3	11.7

B. Number of Sets

Quarter	CAR	FEC	GOM	MAB	NCA	NEC	NED	SAB	SAR	TUN	Total
1	1.7	8.4	22.3	58.1	100.0	-	-	31.2	25.0	18.6	21.6
2	3.5	14.8	12.6	12.7	0.0	20.0	**0.0**	10.3	33.3	**0.0**	11.1
3	**0.0**	10.5	8.0	9.5	-	12.8	15.9	17.3	-	**0.0**	10.0
4	**0.0**	8.0	11.4	8.9	-	**0.0**	**0.0**	7.8	**0.0**	0.0	8.8
Total	2.1	9.9	13.0	12.3	50.0	12.8	12.0	14.3	14.8	10.1	12.2

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 2017 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. *Three unidentified hardshell turtles were captured in the FEC during Quarter 1.

A. Leatherback Turtles

Quarter	CAR	FEC	GOM	MAB	NCA	NEC	NED	SAB	SAR	TUN	Total
1	0	0	2	0	0	X	X	13	1	0	16
2	0	0	2	5	-	1	-	2	0	-	10
3	-	0	1	0	X	0	1	1	X	-	3
4	-	0	2	6	X	-	-	0	-	-	8
Total	0	0	7	11	0	1	1	16	1	0	37

B. Loggerhead Turtles

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

C. All Turtles

Quarter	CAR	FEC	GOM	MAB	NCA	NEC	NED	SAB	SAR	TUN	Total
1	0	3*	3	2	0	X	X	15	1	0	25
2	0	0	2	5	-	1	-	5	0	-	13
3	-	0	2	0	X	0	1	1	X	-	4
4	-	0	2	6	X	-	-	0	-	-	8
Total	0	3*	9	13	0	1	1	21	1	0	50

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 2017. Hook location information is recorded on the sea turtle life history form (Appendix A) by the observer.

A. Capture condition

Species	Alive, Uninjured	Alive, Unknown	Alive, injured	Dead	Unknown	Total
Leatherback	6	10	20	1	0	37
Loggerhead	0	1	9	0	0	10
Unidentified	0	0	2	0	1	3
Total	**6**	**11**	**31**	**1**	**1**	**50**

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	10	2	0	0	4	15	37
Loggerhead	0	1	0	0	1	7	1	10
Unidentified	0	0	2	0	0	0	1	3
Total	**6**	**11**	**4**	**0**	**1**	**11**	**17**	**50**

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	5	1	1	0	0	1	4	12
Loggerhead	0	1	0	0	0	3	0	4
Unidentified	0	0	0	0	0	0	1	1
Total	**5**	**2**	**1**	**0**	**0**	**4**	**5**	**17**

Table 6. Release status and gear removal for sea turtles captured and released alive in the U.S. Atlantic Pelagic Longline Fishery during 2017. Condition columns refer to post-release mortality categories in Table 1 of SEFSC 2012.

Release Status	Leatherback	Loggerheads	Unidentified Turtles
Released entangled (Condition Column A)	8	0	0
Released with hook and line ≥ ½ carapace length (Condition Column B)	0	0	0
Released with hook and line < ½ carapace length (Condition Column C)	15	6	1
Released with all gear removed (Condition Column D)	13	4	1
Dead	1	0	0
Unknown	0	0	1

Table 7. Total number of marine mammals observed in interactions with the pelagic longline fishery during 2017 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	3	2	0	X	X	0	0	0	5
2	0	0	0	2	-	1	-	0	0	-	2
3	-	0	0	7	X	0	1	0	X	-	9
4	-	0	0	20	X	-	-	0	-	-	20
Total	0	0	3	31	0	1	1	0	0	0	36

Table 8. Marine mammal interactions with the pelagic longline fishery during 2017 by species, quarter, and fishing area. CBD indicates that the serious injury status could not be determined from available information. These observed interactions were prorated based on past observed serious injury rates.

Species	Quarter	Fishing Area	Serious Injuries	CBD	Released Alive	Total
Common Dolphin	3	NED	1	0	0	1
Risso's Dolphin	3	NEC	0	0	1	1
Unidentified Dolphin	1	GOM	0	0	1	1
Unidentified Marine Mammal	1	GOM	0	0	2	2
Pilot Whales	1	MAB	2	0	0	2
Pilot Whales	2	MAB	1	1	0	2
Pilot Whales	3	MAB	2	2	3	7
Pilot Whales	4	MAB	5	3	12	20
Total			**11**	**6**	**19**	**36**

Table 9. Summary of release condition and serious injury types for marine mammals observed in the pelagic longline fishery during 2017. Serious injury determinations were based upon written observer comments (Appendix B). Codes indicate table injury categories defined in the Small Cetacean Serious Injury Guidelines (NMFS, 2012a, b). CBD indicates that the serious injury status could not be determined from available information. These observed interactions were prorated based on past observed serious injury rates.

Species	Alive	CBD	Dead	Serious Injury Type			Serious Injury Total	Total
				Hooked in Head/Mouth (S5a)	Gear Attached Likely to Entangle (S6)	Freed After Entanglement (S7b)		
Common dolphin	1	0	0	1	0	0	1	1
Risso's dolphin	1	0	0	0	0	0	0	1
Unid. Dolphin	1	0	0	0	0	0	0	2
Unid. Marine Mammal	2	0	0	0	0	0	0	2
Pilot Whale	15	6	0	9	1	0	10	31
Total	**19**	**6**	**0**	**10**	**1**	**0**	**11**	**36**

Table 10. Estimated interactions with sea turtles in the pelagic longline fishery during 2017 by fishing area and quarter. NR indicates strata where effort cannot be reported due to confidentiality considerations.

A. Leatherback

Status	Area	Quarter	# Positive Sets	# Observed Sets	Mean CPUE	CV	Hooks Reported (x1000)	Estimated Catch
Dead	SAB	1	1	62	0.0175	1.0000	153.6	2.7
Alive	GOM	1	2	117	0.0257	0.7143	406.6	10.5
Alive	SAB	1	9	62	0.2538	0.3183	153.6	39.0
Alive	SAR	1	1	15	0.0675	1.0000	55.3	3.7
Alive	GOM	2	2	56	0.0683	0.7368	314.5	21.5
Alive	MAB	2	5	44	0.2823	0.5028	201.9	57.0
Alive	NEC	2	1	4	0.2924	1.0000	16.6	4.8
Alive	SAB	2	2	74	0.0311	0.7102	667.4	20.8
Alive	GOM	3	1	59	0.0174	1.0000	465.1	8.1
Alive	NED	3	1	25	0.0309	1.0000	159.4	4.9
Alive	SAB	3	1	22	0.0638	1.0000	80.2	5.1
Alive	GOM	4	2	62	0.0467	0.7072	368.3	17.2
Alive	MAB	4	6	91	0.1069	0.4024	654.7	70.0

Table 10 – Continued

B. Loggerheads

Status	Area	Quarter	# Positive Sets	# Observed Sets	Mean CPUE	CV	Hooks Reported (x1000)	Estimated Catch
Alive	GOM	1	1	117	0.0089	1.0000	406.6	3.6
Alive	MAB	1	2	68	0.0600	0.7020	58.9	3.5
Alive	SAB	1	2	62	0.0325	0.7014	153.6	5.0
Alive	TUN	1	1	11	0.0708	1.0000	74.5	5.3
Alive	SAB	2	3	74	0.0535	0.5699	667.4	35.7
Alive	GOM	3	1	59	0.0319	1.0000	465.1	14.8

C. **Unidentified Turtles**

Status	Area	Quarter	# Positive Sets	# Observed Sets	Mean CPUE	CV	Hooks Reported (x1000)	Estimated Catch
Unknown	FEC	1	1	27	0.0355	1.0000	247.5	8.8
Alive	FEC	1	2	27	0.0617	0.6934	247.5	15.3

Table 11. Estimated A) Serious Injury and B) Released Alive marine mammals in the pelagic longline fishery during 2017 by fishing area and quarter. NR indicates strata where effort cannot be reported due to confidentiality considerations. Long-finned and short-finned pilot whale estimates reflect the apportioning of observed unidentified pilot whale takes by species based upon location and environmental conditions. Interactions where serious injury status could not be determined were prorated based on past observed serious injury rates.

A. Serious Injury

Species	Area	Quarter	# Positive Sets	# Observed Sets	Mean CPUE	CV CPUE	# Hooks Reported (x1000)	Estimated Catch
Common Dolphin	NED	3	1	25	0.0309	1.0000	159.4	4.9
Risso's Dolphin	NEC	4	1	84	0.0165	1.0000	11.4	0.2
Long-finned Pilot Whale	MAB	4	1	91	0.0050	1.0000	654.7	3.3
Short-finned Pilot Whale	MAB	1	2	68	0.0800	0.7541	58.9	4.7
Short-finned Pilot Whale	MAB	2	2	44	0.0469	0.7052	201.9	9.5
Short-finned Pilot Whale	MAB	3	3	63	0.0717	0.6291	427.6	30.7
Short-finned Pilot Whale	MAB	4	7	91	0.1329	0.3738	654.7	87.0

Table 11 cont.

B. Alive

Species	Area	Quarter	# Positive Sets	# Observed Sets	Mean CPUE	CV CPUE	# Hooks Reported (x1000)	Estimated Catch
Risso's Dolphin	NEC	3	1	24	0.0420	1.0000	182.4	7.7
Unid. Dolphin	GOM	1	1	117	0.0130	1.0000	406.6	5.3
Unid. Marine Mammal	GOM	1	2	117	0.0288	0.7275	406.6	11.7
Long-finned Pilot Whale	MAB	3	1	63	0.0019	1.0000	427.6	0.8
Long-finned Pilot Whale	MAB	4	3	91	0.0175	0.6686	654.7	11.4
Short-finned Pilot Whale	MAB	2	1	44	0.0080	1.0000	201.9	1.6
Short-finned Pilot Whale	MAB	3	5	63	0.0799	0.5172	427.6	34.2
Short-finned Pilot Whale	MAB	4	12	91	0.2618	0.3230	654.7	171.4

Table 12. Bycatch rates for sea turtles and marine mammals in area-quarter strata that were not observed in 2017. NR indicates strata where effort cannot be reported for 2017 due to confidentiality restrictions.

A. Sea Turtles

Status	Species	Area	Quarter	# Positive Sets	#Observed Sets	Mean CPUE	CV CPUE	# Hooks Reported (X1000) 2017	Estimated Catch 2017
Alive	Leatherback	TUN	2	1	34	0.0242	1.0000	26.3	0.6
Alive	Leatherback	TUN	3	1	46	0.0279	1.0000	28.6	0.8
Alive	Leatherback	NEC	4	11	84	0.2528	0.3320	11.4	2.9
Alive	Leatherback	NED	4	3	11	0.6585	0.5917	33.7	22.2
Alive	Leatherback	SAR	4	4	144	0.0291	0.4993	40.2	1.2
Alive	Olive Ridley	TUN	4	1	31	0.0501	1.0000	8.6	0.4
Alive	Loggerhead	CAR	4	2	23	0.0971	0.6920	37.7	3.7
Alive	Loggerhead	NEC	4	4	84	0.0597	0.5069	11.4	0.7
Alive	Loggerhead	NED	4	1	11	0.1160	1.0000	33.7	3.9
Alive	Loggerhead	SAR	4	3	144	0.0210	0.5790	40.2	0.8

Table 12 cont.

B. Marine Mammals

Injury Type	Species	Area	Quarter	# Positive Sets	#Observed Sets	Mean CPUE	CV CPUE	# Hooks Reported (X1000) 2017	Estimated Catch 2017
Serious Injury	Long-finned Pilot Whale	NEC	4	6	84	0.0049	0.4181	11.4	0.1
Serious Injury	Short-finned Pilot Whale	NEC	4	6	84	0.0910	0.4184	11.4	1.0
Alive	Bottlenose Dolphin	NEC	4	1	84	0.0165	1.0000	11.4	0.2
Alive	Unid. Marine Mammal	NEC	4	1	84	0.0165	1.0000	11.4	0.2
Alive	Long-finned Pilot Whale	NEC	4	2	84	0.0008	0.7946	11.4	0.0

Table 13. Total estimated interactions for A) Leatherback, B) Loggerhead in the pelagic longline fishery during 2017 by fishing area. This includes estimates for strata that were not observed during 2017.

A. Leatherbacks

Area	Alive	Alive CV	Dead	Dead CV	Total	Total CV	Total 95% Confidence Interval
CAR	0	-	0	-	0	-	-
FEC	0	-	0	-	0	-	-
GOM	57.3	0.398	0	-	57.3	0.398	27-121.5
MAB	127.0	0.316	0	-	127.0	0.316	69.3-232.7
NCA	0	-	0	-	0	-	-
NEC	7.7	0.640	0	-	7.7	0.640	2.5-24.3
NED	27.1	0.517	0	-	27.1	0.517	10.4-70.4
SAB	64.9	0.307	2.7	1.000	67.4	0.306	37.5-121.2
SAR	4.9	0.770	0	-	4.9	0.770	1.3-18.7
TUN	1.4	0.712	0	-	1.4	0.712	0.4-5
Total	**290.3**	**0.18**	**2.7**	**1.000**	**292.9**	**0.181**	**206.2-416.1**

B. Loggerheads

Area	Alive	Alive CV	Dead	Dead CV	Total	Total CV	Total 95% Confidence Interval
CAR	3.7	0.692	0	-	3.7	0.692	1.1-12.5
FEC	0	-	0	-	0	-	-
GOM	18.4	0.827	0	-	18.4	0.827	4.5-75.9
MAB	3.5	0.702	0	-	3.5	0.702	1.0-12.2
NCA	0	-	0	-	0	-	-
NEC	0.7	0.507	0	-	0.7	0.507	0.3-1.7
NED	3.9	1.000	0	-	3.9	1.000	0.8-20.0
SAB	40.7	0.507	0	-	40.7	0.507	15.9-104.0
SAR	0.8	0.579	0	-	0.8	0.579	0.3-2.4
TUN	5.3	1.000	0	-	5.3	1.000	1.0-27.0
Total	**77.1**	**0.347**	**0**	**-**	**77.1**	**0.347**	**39.8-149.3**

Table 13 cont.

C. Other Hardshell Turtles

Species	Area	Alive	Alive CV	Unknown	Unknown CV	Total	Total CV	Total 95% Confidence Interval
Unidentified Turtles	FEC	15.3	0.693	8.8	1.000	24.1	0.556	8.7-66.5
Olive Ridley	TUN	0.4	1.000	0	0	0.4	1.000	0.1-2.2

Table 14. Total estimated interactions with marine mammals in the pelagic longline fishery during 2017.

A. Atlantic

Species	Estimated Alive	CV Alive	95% CI Alive	Estimated Serious Injury	CV Serious Injury	95% CI Serious Injury
Risso's Dolphin	7.7	1.000	1.5-39.1	0.2	1.000	0-1
Long-finned Pilot whale	12.3	0.627	4.0-37.9	3.3	0.983	0.7-16.8
Short-finned pilot whale	207.4	0.280	121.0-355.6	132.9	0.290	76.1-232.1
Bottlenose Dolphin	0.2	1.000	0.0-1.0	0	-	-
Unidentified marine mammal	0.2	1.000	0.0-1.0	0	-	-

B. Gulf of Mexico

Species	Estimated Alive	CV Alive	95% CI Alive	Estimated Serious Injury	CV Serious Injury	95% CI Serious Injury
Unidentified Dolphins	5.3	1.000	1-26.9	0	-	-
Unidentified marine mammal	11.7	0.727	3.3-42	0	-	-

C. Offshore

Species	Estimated Alive	CV Alive	95% CI Alive	Estimated Serious Injury	CV Serious Injury	95% CI Serious Injury
Common Dolphin	0	-	-	4.9	1.000	1.0-25.2

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).

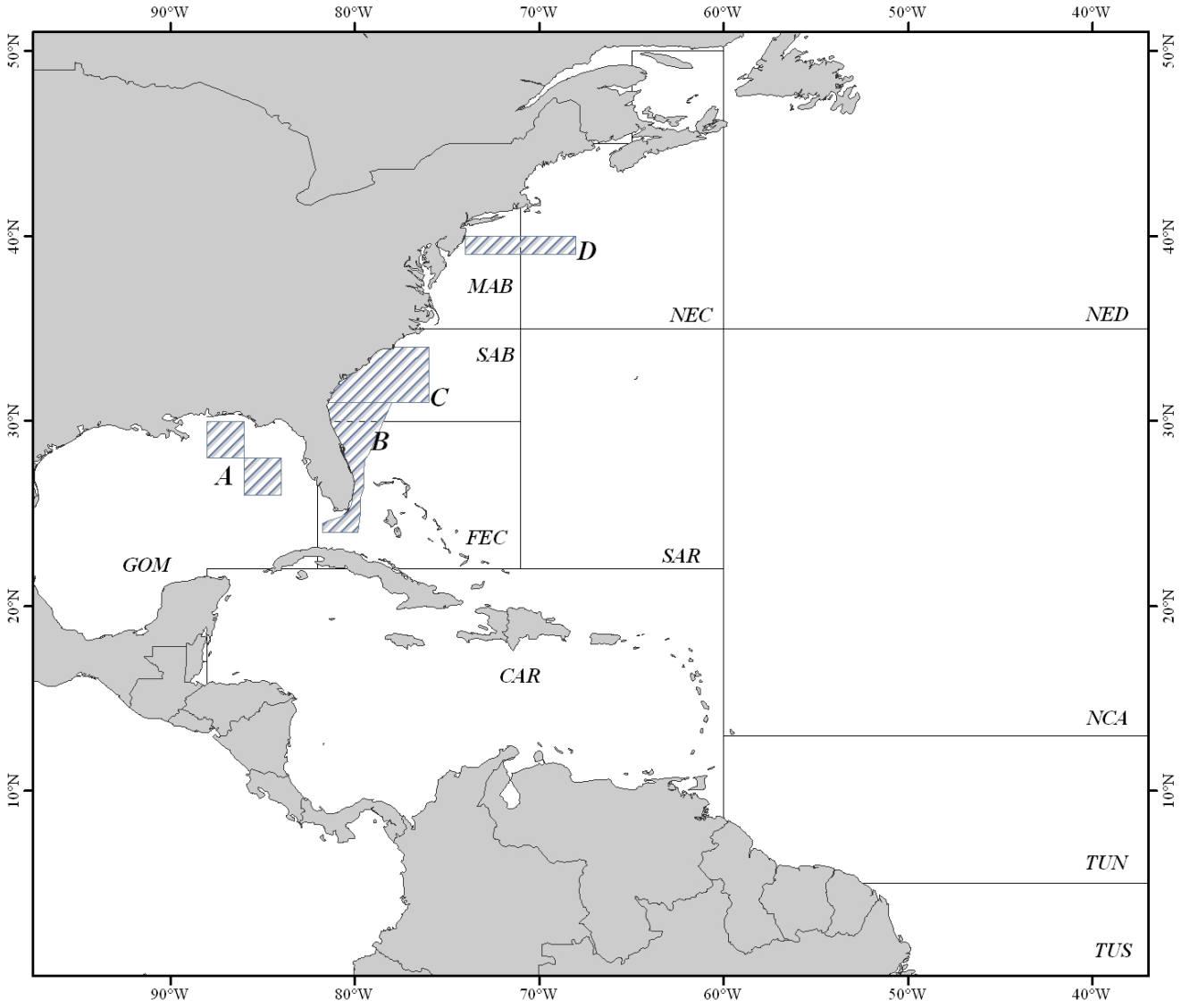


Figure 2. Observed (gray circles) and reported (black circles) pelagic longline fishing effort during 2017.

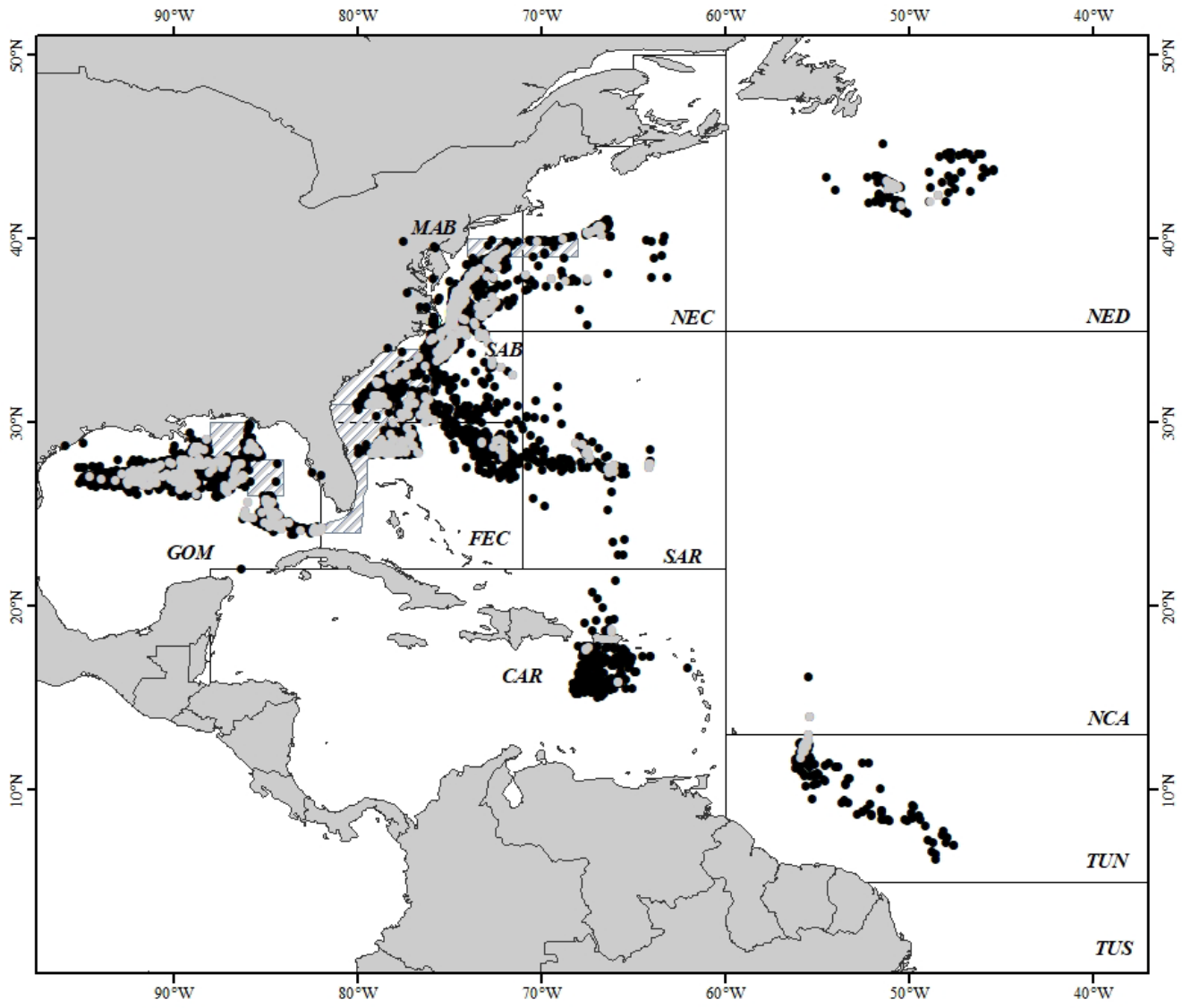


Figure 3. Observed pelagic longline fishing effort and sea turtle interactions during 2017

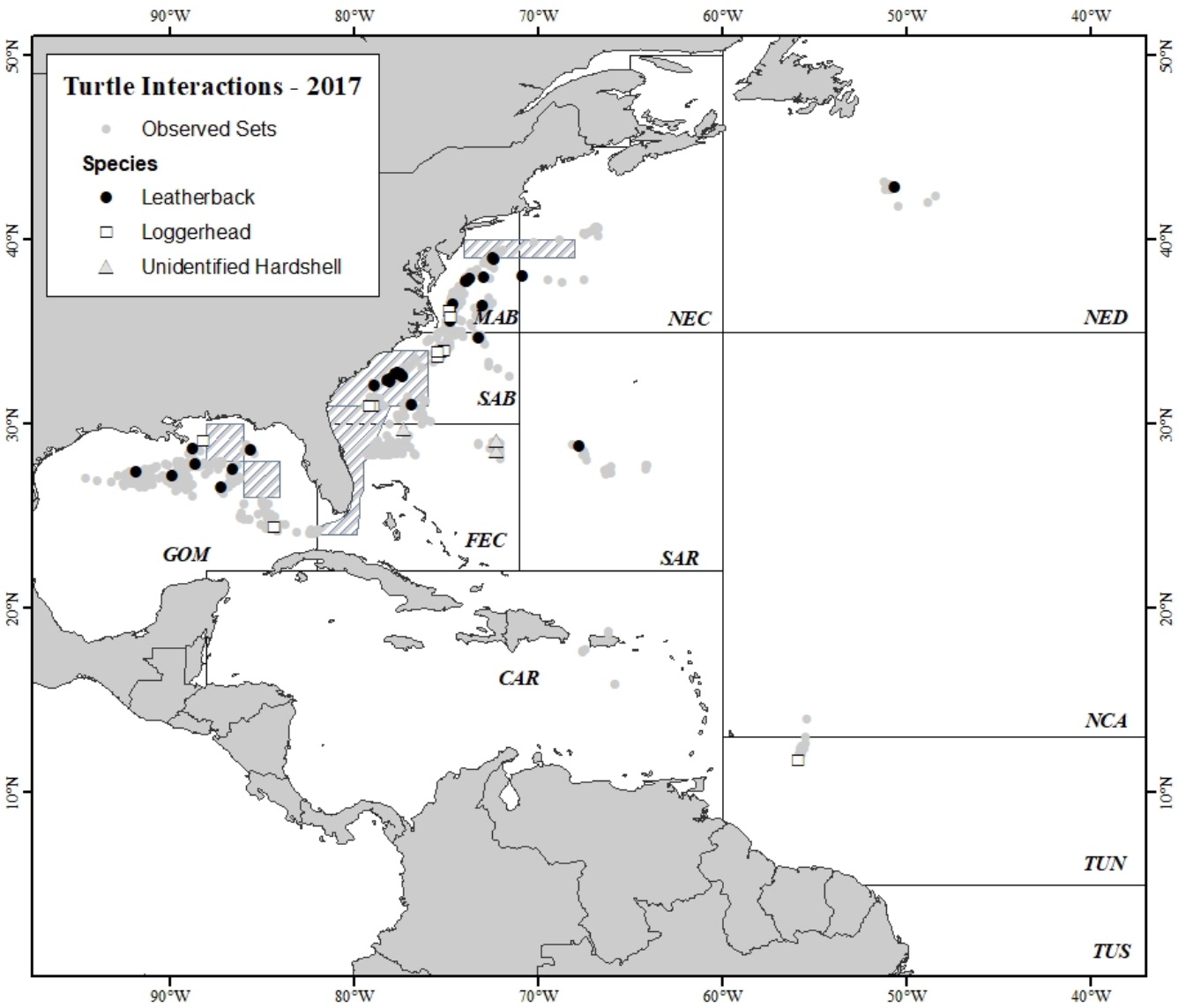


Figure 4. Observed pelagic longline fishing effort and marine mammal takes during 2017.

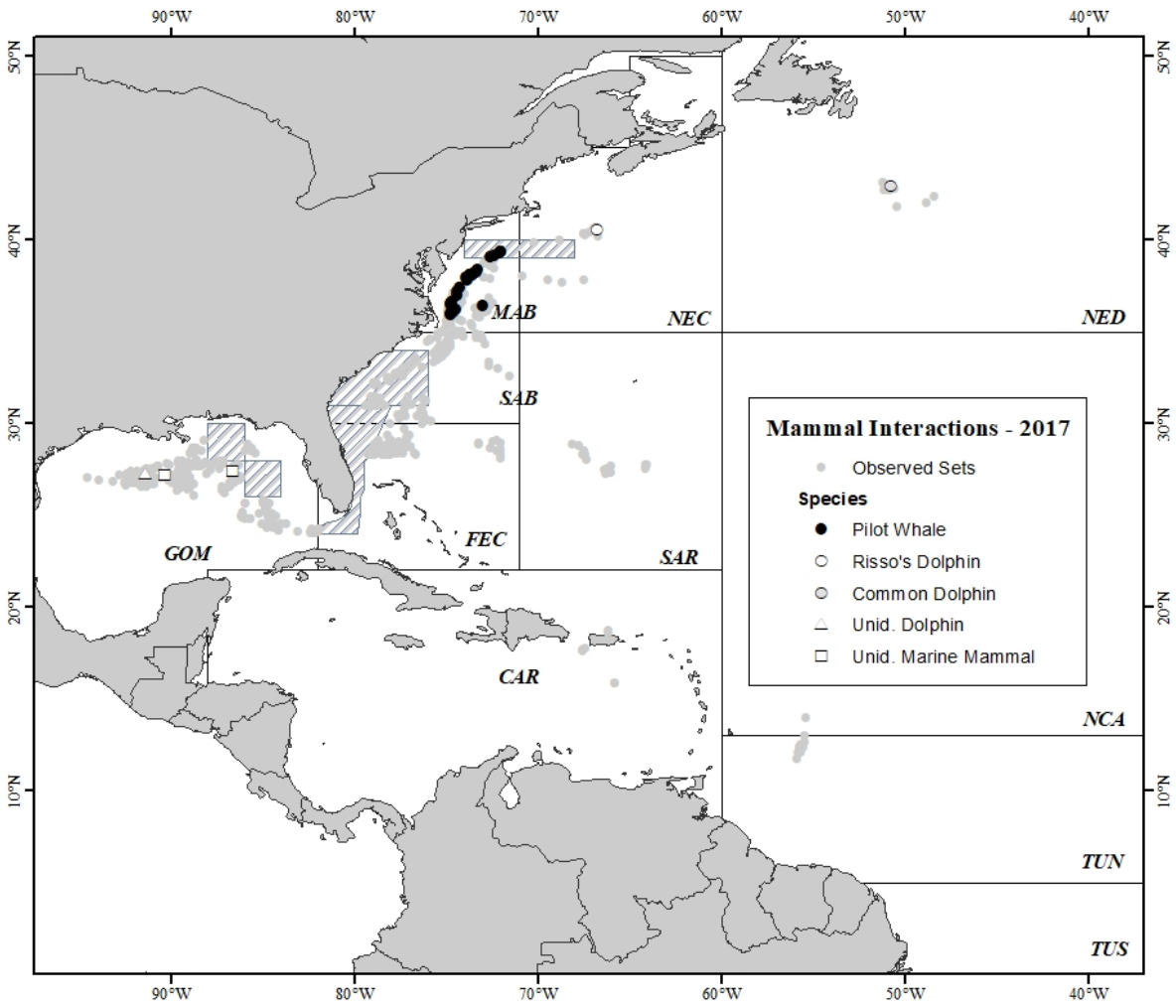
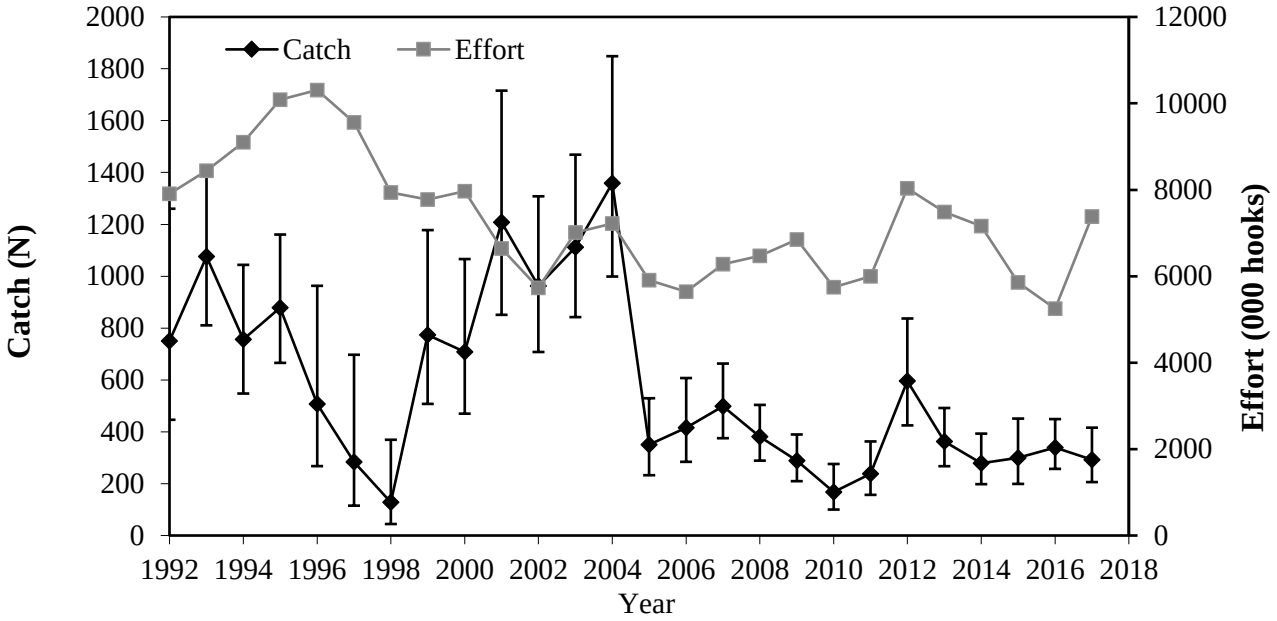


Figure 5. Historical trends in fishery effort and estimated marine turtle takes in the pelagic longline fishery from 1992 to 2017 for A) Leatherback Turtles, and B) Loggerhead Turtles. Errors bars represent 95% confidence intervals.

A. Leatherback Turtles



B. Loggerhead Turtles

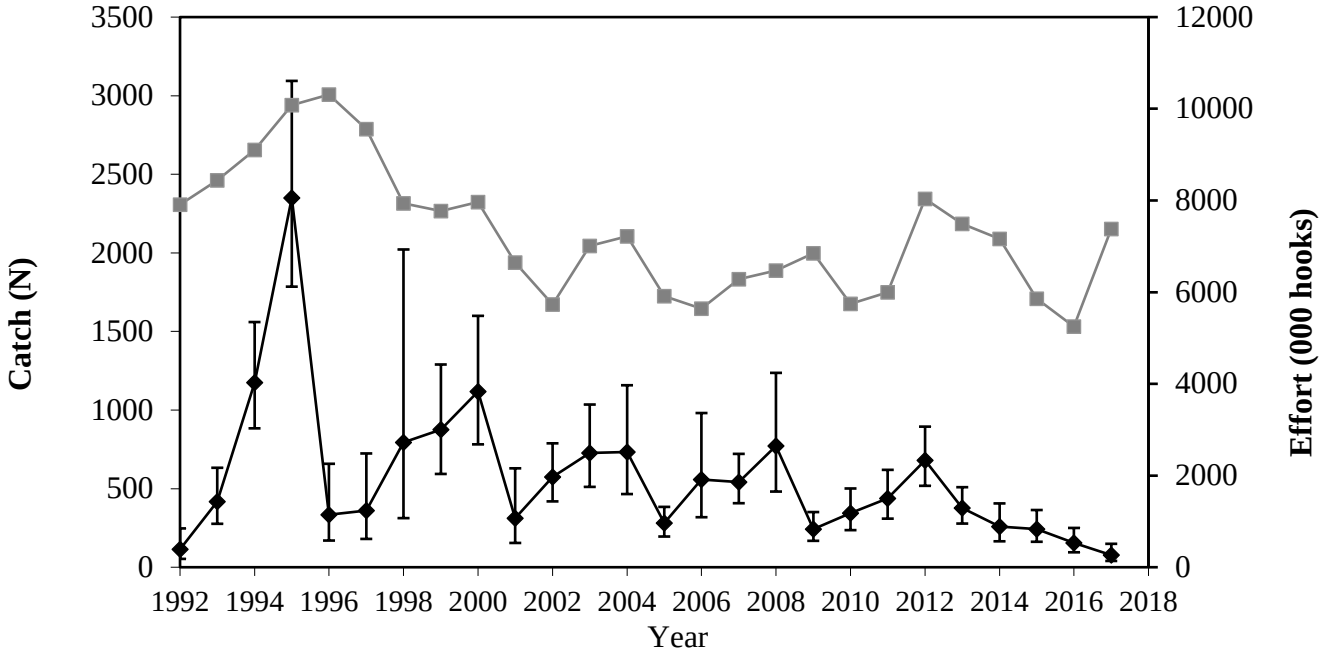
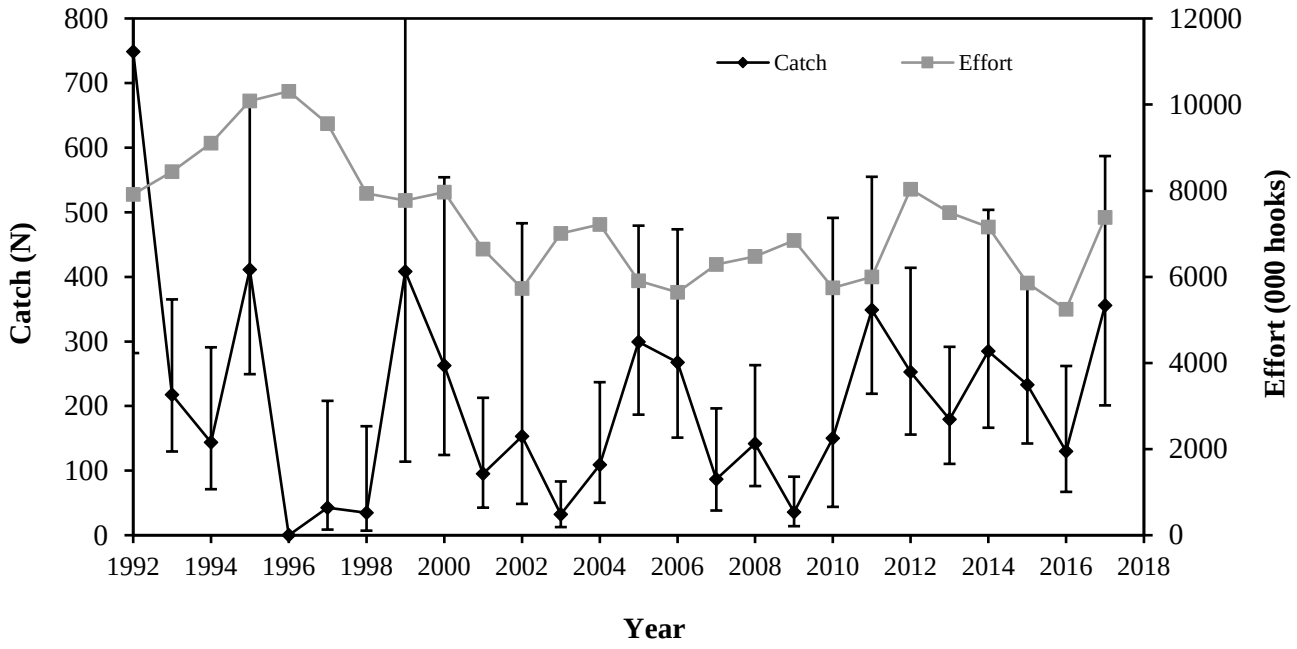
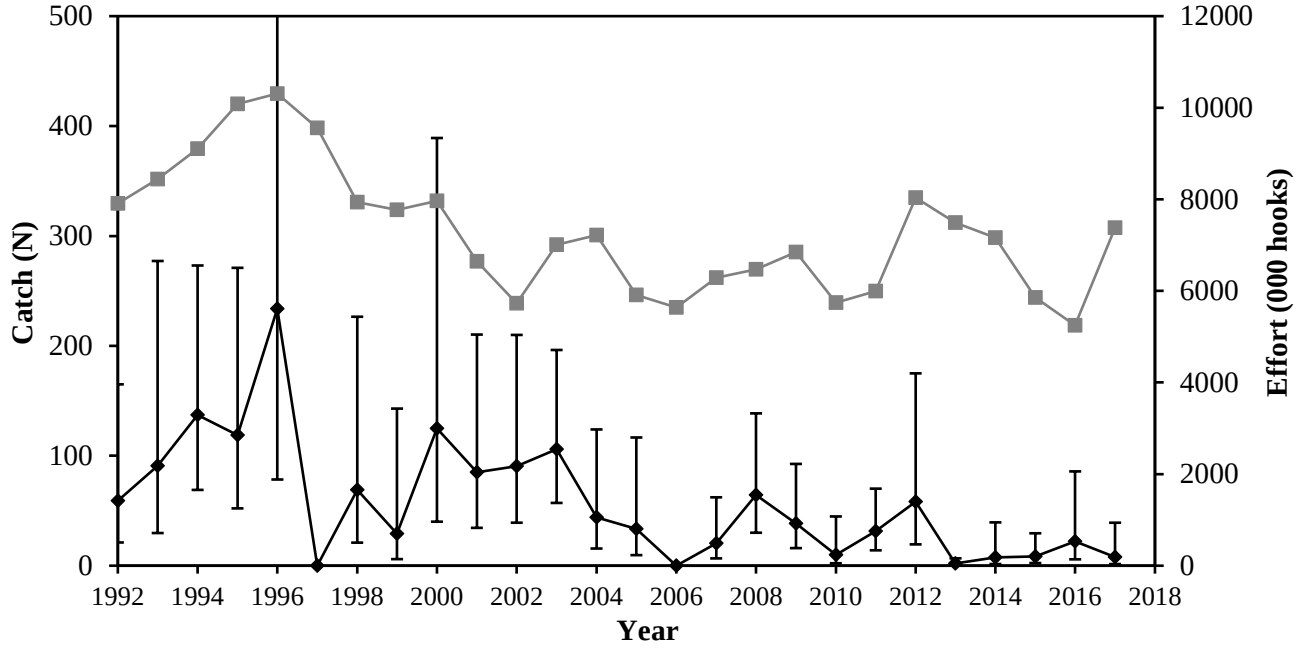


Figure 6. Historic trends in fishery effort and estimated marine mammal takes in the pelagic longline fishery from 1992 to 2017 for A) Pilot Whales and B) Risso's Dolphins in Western North Atlantic waters. Errors bars represent 95% confidence intervals. For pilot whales, all takes are most likely of short-finned pilot whales.

A. Pilot Whales



B. Risso's Dolphins



Appendix A. Sea Turtle Life History Form

SEA TURTLE LIFE HISTORY FORM

02/2012

CAPTURE INFORMATION

TRIP ☐☐☐☐☐☐ YEAR 20☐☐ MONTH☐☐ DAY☐☐

SET/HAUL/TOW ☐☐☐ SPECIMEN NUMBER BY TRIP ☐☐☐ EXPERIMENTAL Y / N? (if Y, note project name in comments)

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

TARGET CATCH: _____ 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; complete condition evaluation on p. 2 for any not coded "alive")

☐Previously dead ☐Fresh dead/comatose/unresponsive 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 / Not Applicable If No, number of gangions to next light stick ☐☐
Light stick type (circle) : Chemical / LED
Light stick color (circle)? White, Pink, Blue, Green, Black, Red, Yellow, Purple, Other, Unknown
Number of gangions to next float ☐☐

HOOK LOCATION (See Appendix in manual for descriptive figures)
(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 ☐Holding bait/hook

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 recovered 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)

Appendix A. Sea Turtle Life History Form (cont.)

BIOLOGICAL INFORMATION

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

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 ☐☐☐☐☐☐☐☐☐☐☐☐☐☐☐ Position (Flipper) ☐☐ ☐ Scanned? Y / N

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

(Put PIT tag label here) If you have the option of Decimal or Hexidecimal sequence, choose DECIMAL

BIOPSY SAMPLES TAKEN? Y (itemize below) / N / Unsuccessful

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 Dead/Comatose/Unresponsive Carcass Marked? Y / N

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

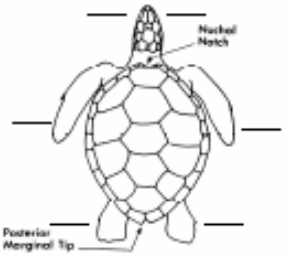
ADDITIONAL COMMENTS (list all biological samples collected; describe/sketch anomalies):

_____

_____

_____

_____



IDENTIFICATION CRITERIA

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

CONDITION EVALUATION FOR TURTLES NOT CODED "ALIVE"

Mark each line on diagram above with a 'Y' to indicate positive reflex/response, and 'N' for no response.

Rigor Mortis	Y / N / U
Rotting Flesh	Y / N / U
Foul Smell	Y / N / U

Dorsal Coloration ☐ Black ☐ Orange/Red-Brown ☐ Brown ☐ Gray-Green ☐ Other_____

Appendix B. Details of Sea Turtle and Marine Mammal Interactions

Table B1. Gear types and hooking locations based upon observed comments and the sea turtle life history form for each A) Leatherback, B) Loggerhead, and C) Other species turtles observed during 2017. 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). "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?	Injury Cat. Row	Release Cond. Col	Line Left (ft)	CL Est. (ft)	CCL (cm)	N-N (cm)
1	SAB	1	C-16/0	0	Squid or Mackerel	153 or 239	Alive unknown	Released alive	Not known if hooked	Unknown	Yes	No	IV	C	0.0	6.0		
2	SAB	1	C-16/0	0	Squid or Mackerel	153 or 239	Alive unknown	Released alive	Not known if hooked	Unknown	Yes	No	IV	C	0.0	6.0		
3	SAB	1	C-16/0	0	Squid or Mackerel	158 or 248	Alive unknown	Released alive	Not known if hooked	Unknown	Yes	No	IV	C	0.0	6.0		
4	SAB	1	C-16/0	0	Squid or Mackerel	158 or 248	Unknown	Dead	Not known if hooked	Unknown	Yes	No	IV	Dead	0.0	6.0		
5	SAB	1	C-16/0	0	Squid or Mackerel	158 or 248	Alive injured	Released alive	Shoulder	Yes	Yes	No	I	D	0.0	6.0		
6	SAB	1	C-16/0	0	Squid	180	Alive injured	Released alive	Shoulder	Yes	No	No	I	D	0.0	3.5		
7	SAB	1	C-16/0	0	Squid or Mackerel	171 or 140	Alive uninjured	Released alive	Not hooked	N/A	Yes	No	V	D	0.0	3.5		
8	SAB	1	C-16/0	0	Squid	158	Alive injured	Released alive	Mouth side other	No	No	No	II	C	0.1	4.0		
9	SAB	1	C-16/0	0	Squid	167	Alive injured	Released alive	Mouth side other	No	No	No	II	C	0.2	4.0		
10	SAB	1	C-16/0	0	Squid	167	Alive injured	Released alive	Armpit	Yes	No	No	I	D	0.0	4.0		
11	SAB	1	C-16/0	0	Squid	149	Alive injured	Released alive	Shoulder	No	Yes	No	I	C	1.0	5.0		

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

#	Area	Q	Hook Type	Offset (deg)	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	SAB	1	C-18/0 or C-16/0	10 or 0	Squid	149	Alive injured	Released alive	Front flipper	No	No	No	I	C	1.0	6.0		
13	SAB	1	C-16/0	0	Squid	149	Alive uninjured	Released alive	Not hooked	N/A	Yes	No	V	D	0.0	5.0		
14	SAR	1	C-16/0	10	Squid	189	Alive uninjured	Released alive	Shoulder	Yes	Yes	No	I	D	0.0	5.0		
15	GOM	1	C-16/0	0	Squid	144	Alive injured	Released alive	Shoulder	No	Yes	Yes	I	A	5.0	6.0		
16	GOM	1	C-16/0	0	sardine	198	Alive uninjured	Released alive	Not hooked	N/A	Yes	No	V	D	0.0	4.0		
17	SAB	2	C-16/0	0	Squid	198	Alive injured	Released alive	Head	No	No	No	I	C	2.0	6.0		
18	MAB	2	C-16/0	0	Squid	180	Alive injured	Released alive	Front flipper/shoulder/armpit	No	Unknown	Unknown	I	A	4.0	4.0		
19	MAB	2	C-16/0	0	Mackerel	207	Alive uninjured	Released alive	Not hooked	N/A	Yes	No	V	D	0.0	4.0		
20	SAB	2	C-16/0	0	Squid or Mackerel	257 or 149	Alive injured	Released alive	Unknown location	No	Unknown	Unknown	IV	A	50.0	5.0		
21	MAB	2	C-16/0	0	Squid	140	Alive injured	Released alive	Front flipper	No	No	No	I	C	1.0	4.0		
22	GOM	2	C-16/0	0	Sardine	68	Alive injured	Released alive	Front flipper	No	No	No	I	C	0.5	3.5		
23	MAB	2	C-18/0	10	Squid or Mackerel	212	Alive unknown	Released alive	Not known if hooked	No	Yes	Unknown	IV	A	UNK	7.0		
24	GOM	2	C-16/0	0	Squid	99	Alive unknown	Released alive	Not known if hooked	No	Yes	No	IV	C	0.0	5.2		

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

#	Area	Q	Hook Type	Offset (deg)	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)
25	MAB	2	C-18/0 or C-16/0	10 or 0	Squid or Mackerel	207 or 216	Alive unknown	Released alive	Not known if hooked	Unknown	Yes	Unknown	IV	A	UNK	UNK		
26	NEC	2	C-18/0	10	Squid	212	Alive injured	Released alive	Armpit	No	Yes	Yes	I	A	20.0	6.0		
27	SAB	3	C-16/0	0	Squid	248	Alive uninjured	Released alive	Not hooked	N/A	Yes	No	V	D	0.0	4.5		
28	GOM	3	C-16/0	0	Squid	171	Alive unknown	Released alive	Not known if hooked	No	Yes	Yes	IV	A	25.0	6.0		
29	NED	3	C-18/0	10	Mackerel	459	Alive unknown	Released alive	Not hooked	N/A	Yes	No	V	D	0.0	3.5		
30	MAB	4	C-16/0	0	Squid	158	Alive injured	Released alive	Mouth side other	Yes	Yes	No	II	D	0.0	6.0		
31	MAB	4	C-16/0	0	Squid	140	Alive unknown	Released alive	Not known if hooked	Yes	Unknown	No	III	D	0.0	6.0		
32	MAB	4	C-18/0	10	Squid	153	Alive injured	Released alive	Armpit	No	No	No	I	C	0.2	6.0		
33	GOM	4	C-16/0	0	Pacific saury	99	Alive unknown	Released alive	Not known if hooked	No	Yes	Yes	IV	A	15.0	3.5		
34	MAB	4	C-18/0	10	Squid	149	Alive injured	Released alive	Front flipper/shoulder/armpit	No	No	No	I	C	1.0	6.0		
35	MAB	4	C-16/0	0	Squid	225	Alive injured	Released alive	Mouth side other	No	No	No	II	C	1.0	6.0		
36	MAB	4	C-16/0	0	Squid	225	Alive injured	Released alive	Armpit	No	No	No	I	C	1.0	6.0		

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

#	Area	Q	Hook Type	Offset (deg)	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)
37	GOM	4	C-16/0	0	Sardine	90	Alive injured	Released alive	Unknown location	Yes	No	No	IV	D	0.0	7.0		

Appendix B, Table B1, B. Loggerhead Turtles

#	Area	Q	Hook Type	Offset (deg)	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	SAB	1	C-18/0 or C-16/0	10 or 0	Squid or Mackerel	135 or 401	Alive injured	Released alive	Swallowed hook not visible	No	No	No	IV	C	0.0		60.0	53.5
2	MAB	1	C-16/0	0	Squid	135	Alive injured	Released alive	Beak (internal), lower jaw	Yes	No	No	I	D	0.0	2.5		
3	MAB	1	C-18/0	10	Menhaden	383	alive unknown	Released alive	Not known if hooked	Yes	Unknown	No	III	D	0.0	2.0		
4	GOM	1	C-16/0	0	Squid or Mackerel	149 or 189	Alive injured	Released alive	Beak (internal), upper jaw	No	No	No	I	C	0.0	2.0		
5	SAB	1	C-16/0	0	Squid	90	Alive injured	Released alive	Tongue	Yes	No	No	III	D	0.0		68.0	
6	TUN	1	C-16/0	0	Sardine or Pacific saury	81 or 99	Alive injured	Released alive	Mouth lower jaw, unknown	No	No	No	III	C	0.5	2.5		
7	SAB	2	C-16/0	0	Squid or Mackerel	257 or 149	Alive injured	Released alive	Mouth side unknown	Yes	No	No	III	D	0.0	3.0		
8	SAB	2	C-16/0	0	Squid or Mackerel	180	Alive injured	Released alive	Front flipper	No	No	No	I	C	0.0	1.3		
9	SAB	2	C-16/0	0	Squid	270	Alive injured	Released alive	Mouth side unknown	No (partial hook)	No	No	III	C	0.0	2.0		
10	GOM	3	C-16/0	0	Sardine	90	Alive injured	Released alive	Beak (internal), upper jaw	No	No	No	I	C	1.0	3.0		

Appendix B, Table B1, C. Unidentified 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	FEC	1	C-18/0 or C-16/0	10 or 0	Squid	113	Unknown	Unknown	Unknown location	No	No	No	IV	UNK	96.0	2.5		
2	FEC	1	C-16/0	0	Squid	180	Alive injured	Released alive	Armpit	Yes	No	No	I	D	0.0	3.0		
3	FEC	1	C-16/0	0	Squid	180	Alive injured	Released alive	Unknown location	No	No	No	IV	C	1.0	3.0		

Appendix B cont.

Table B2: 2017 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.

	Species	Length (cm)	Release Condition	Interaction Type	Observer Comments
1	Pilot Whale	300	Serious Injury	S5a - Hook in head, S6 - Gear attached to free-swimming animal with potential to be ingested or entangle	[Hooked, drawing indicates in mouth. Line cut near the hook leaving 3 feet trailing.] Used line cutter and cut at the weighted swivel. 3 daubs into second bundle on second section, two bundles left in the section. Was just swimming normally next to boat, when live was cut swam away normal.
2	Unid. Marine Mammal	300	Released Alive	S7b - Entangled before being freed without gear attached	[Not hooked, entangled around flukes in mainline and gangion, gear removed] Line wrapped around tail was removed completely using a long-handled line cutter. Swam away behind the boat. It surfaced several times soon after release to take several breaths. The animal seemed healthy and was swimming strongly. It was soon out of view because it was still dark outside.
3	Pilot Whale	600	Serious Injury	S5a - Hook in head, S6 - Gear attached to free-swimming animal with potential to be ingested or entangle	[Hooked in mouth, hook not visible, not entangled, line unintentionally cut with 50 ft remaining] Whale pulled mainline into the propeller as crew attempted to untangle the leader the whale was hooked on. The leader then snapped leaving approximately 50ft of mono attached to the hook. Whale dove after it snapped the leader it was on and did not reappear.
4	Unid. Dolphin	210	Released Alive	S7b - Entangled before being freed without gear attached **Hook bent/broke and released animal**	[Unknown if hooked or entangled. Released with no gear remaining] Crew thought was shark, no visual, pulling leader to cut off past swivel. Dolphin head came out of the water, but not long enough to tell what species. Bent hook flew back at boat, hitting crew member in ear, not hooking. Dolphin freed itself from gear. Swam off normally
5	Unid. Marine Mammal	240	Released Alive	S7b - Entangled before being freed without gear attached	[Not hooked, entangled around flukes in gangion. Gear removed] Used long handled cutter to remove the gangion/leader from around the tail. Swam away normally.
6	Pilot Whale		CBD	Possibly S5a –CBD because Unknown if actually hooked, but indication of line leading to mouth	[Unknown if hooked, line appeared to lead to mouth. Unknown if entangled. Line broke leaving 1 feet trailing] Animal broke free of its own accord, the line broke somewhere near where the hook would be judging by the amount of gangion recovered and the location the line returned from. Animal surfaced partially revealing the top of the head briefly and immediately dove, breaking the line as it did. The hook could not be seen, but appeared to lead to the mouth region.

Appendix B, Table B2 (cont.)

Animal #	Species	Length (cm)	Release Condition	Interaction Type	Observer Comments
7	Pilot Whale	300	Serious Injury	S6 - Gear attached to free-swimming animal with potential to be ingested or entangle	[Unknown if hooked. Entangled in dropline around flukes. Wraps not cut, released with 120ft of line attached] No effort was used to remove any entanglement from the animal. Animal was released quickly from mainline with gangion, leader, and dropline wrapped two or three times around the tail stock. Animal seemed to swim away strongly. Dove and surfaced several times right after release with good blows.
8	Risso's Dolphin	360	Released Alive	S7b - Entangled before being freed without gear attached	[Not hooked. Entangled in dropline around flukes. Line cut and gear removed.] Whale was hand lined to the boat and the leader that was wrapped around its tail was cut with the long-handled line cutter. Whale on surface attempting to swim, pulling gangion and a daub when line was cut whale swam away strongly.
9	Common Dolphin	270	Serious Injury	S5a - Hook in head	[Hooked in mouth, hook not visible. Not entangled. Line cut leaving 1 foot of trailing line.] The mammal was hand lined in to the boat, a crew member was able to reach out of the tuna door and cut the gangion right near the mouth. The hook/bait had been entirely eaten. It swam away several strokes, took a breath and darted away. Alive and active at capture, it was seen swimming several geangions before we got to it.
10	Pilot Whale	240	Released Alive	S7b - Entangled before being freed without gear attached **Hook bent/broke and released animal**	[Unknown if hooked. Indicated in tail. Hook recovered. Unknown if entangled] MPW not known if entangled or hooked around tail. When the gangion snap was coming up to the block the MPW dove towards the stern and popped the gangion loose. The entire gangion and hook was recovered. Swam away quickly and normally.
11	Pilot Whale	180	CBD	S7b - Entangled before being freed without gear attached, CBD due to length of interaction and small animal	[Not hooked, entangled around tail in mainline, gangion, dropline, and float. Gear removed] Multiple wraps of mainline, gangion, floatline around tail, buoy on surface very close to MPW. Crew held mainline while multiple wraps cut with line cutter. Juvenile MPW, 6 feet and relatively slim, multiple wraps around tail. Large 10 ft. MPW standing by, Mother? Both disappeared after smaller MPW was freed. Both animals dove out of view.
12	Pilot Whale	270	Released Alive	S7b - Entangled before being freed without gear attached **Hook bent/broke and released animal**	[Hooked in tail. Hook removed with 0 feet remaining. Not entangled.] MPW was shagged by hook in tail, unable to get it close to boat. MPW flipped tail and hook straightened out and recovered. Disappeared immediately.
13	Pilot Whale	210	Serious Injury	S5a - Hook in head	[Hooked, line going to mouth but not clearly observed. Hook not removed, 3 feet of line remaining. Not entangled] Line seems to be going to mouth not tangled, crew pulled MPW as close as possible then line cut with very long line cutter. When line cut MPW disappeared. MPWS seen in great numbers all day but none seen at this time. Last 2 set outs bait covered in garlic salt.

Appendix B, Table B2 (cont.)

Animal #	Species	Length (cm)	Release Condition	Interaction Type	Observer Comments
14	Pilot Whale	270	Serious Injury	S5a - Hook in head	[Hooked, line going to mouth, exact location not seen. Hook not removed, 3 feet of line remaining. Not entangled] Line seen going into mouth, not tangled, crew pulled MPW as close as possible the leader cut with line cutter. Disappeared immediately when line cut, MPWs seen in large numbers all day but none at time MAM04 seen. Last two sets bait covered with garlic salt.
15	Pilot Whale	210	Released Alive	S7b - Entangled before being freed without gear attached	[Not hooked. Entangled in mainline, gangion around flukes. Gear cut and removed] Crew pulled longline from both sides until MPW under hauling station, several cuts made with line cutter, all line cut or spun off, MPW left with no line attached. Disappeared immediately when freed. Saw many MPWs all day, but non at this time except this one. Bait covered in garlic salt.
16	Pilot Whale	270	CBD	S5d – Hook in appendage or body. CBD due to length of interaction and possible trailing gear	[Hooked in tail. Not entangled. Line broke w 5 feet trailing] MPW very powerful and unhappy, crew tried to get MPW close to boat but no luck, line snapped leaving 5 feet of leader. MPW disappeared when line broke. Garlic salt all over bait.
17	Pilot Whale	150	CBD	S7b - Entangled before being freed without gear attached, CBD due to duration of interaction and small animal	[Hooked in tail, Not entangled. Line cut near hook] Animal was brought to side of the boat and the line was cut less than 1 inch away from the hook. Whale was on surface, appeared calm and tired. Crew controlled pilot whale by handlining then reached down with hand clippers to remove gear. Whale was calm throughout. Animal swam away normally and joined mate who was swimming nearby.
18	Pilot Whale	330	Released Alive	S7b - Entangled before being freed without gear attached	[Not hooked. Entangled in mainline around tail/flukes. All gear removed) Mainline was wrapped around tail flipper, and cut completely off. No gear remaining on animal. Handlines mam close to the boat and used box hooks to control line while cutting line with mono-cutters. Normal behavior, after release swam away and dove down.
19	Pilot Whale	360	Released Alive	S7b - Entangled before being freed without gear attached	[Not hooked. Entangled in mainline around body, mouth, head, flippers, and tail. Gear removed.] Gear was unwrapped from front flipper and tail and the cut along the body and head removed from the mouth. All gear removed. Crew used monocutters to cut line from MAM02. Animals surfaced after gear was removed to breathe and then dove down and swam away.
20	Pilot Whale	210	Released Alive	S5d – Hook in appendage or body.	[Hooked in tail. Not entangled. Line cut with 1 ft remaining.] Animal was brought to side of boat and the line was cut approx. 1 foot from the hook. The animal swam away normally.. PW was on surface, crew managed to handline PW to the boat and use hand clippers to remove gear. Animal swam away normally.

Appendix B, Table B2 (cont.)

Animal #	Species	Length (cm)	Release Condition	Interaction Type	Observer Comments
21	Pilot Whale	210	Serious Injury	S5a - Hook in head	[Hooked in side of mouth. Not entangled. Line cut with 2 feet of trailing gear] Animal was brought to the side of the boat and the line was cut approx. 2 ft from the hook. MAM03 was very calm upon approach but became more agitated as encounter continued. Handlined whale fairly close to vessel before using hand cutters to remove gear. Animal swam away and joined a mate swimming nearby.
22	Pilot Whale	240	Serious Injury	S5a - Hook in head	[Hooked in side of mouth. Not entangled. Line cut with 2 ft or less remaining] Animal was hand lined near to the boat, a biopsy was attempted but failed. Leader was cut with knife as close to hook as possible. 2' or less. The animal was active and healthy throughout the interaction. Upon release, it swam away normally.
23	Pilot Whale	240	Released Alive	S7b - Entangled before being freed without gear attached **Hook bent/broke and released animal**	[Hooked externally in dorsal fin. Line wrapped around top of fin. All gear removed.] Line was single loop on top of dorsal. Hook point only, not barb was stuck in dorsal. Line and hook came free when crew was pulling whale close to vessel to remove gear. Swam away fairly quickly breathing and swimming normally.
24	Pilot Whale	330	Released Alive	S7b - Entangled before being freed without gear attached	[Not hooked. Entangled in mainline and gangion around front flippers. All gear removed.] Crew pulled whale alongside and used long handled line cutter to cut wraps and pull off of animal. Animal swam away normally when released. Did not swim away as fast as previous whale encountered but appeared uninjured.
25	Pilot Whale	360	Released Alive	S7b - Entangled before being freed without gear attached	[Not hooked. Entangled in mainline and gangion around flukes. All gear removed] Mainline and some leader wrapped around tail flukes and caudal peduncle. Crew pulled whale alongside and used long handle line cutter to cut wraps and pull line off whale's tail and flukes. Some fell away after cutting. Whale left quickly when gear was removed, swimming and breathing normally.
26	Pilot Whale	240	CBD	S7b - Entangled before being freed without gear attached, CBD due to length of interaction and unknown amount of trailing gear	[Not hooked. Entangled in mainline around tail/flukes. Wraps cut, but unknown if all gear was removed] Whale was pulled alongside of boat by crew. Long handle line cutter was used to cut wraps and pull line off caudal peduncle and flukes. Most of wraps cut but could not tell if all had fallen away before lost sight of whale. Animal dove and quickly swam away on release. Saw it surface and blow once after release. Could not say if any gear was left trailing.
27	Pilot Whale	300	CBD	S7b - Entangled before being freed without gear attached, CBD due to length of interaction	[Not hooked. Entangled in mainline around tail/flukes. All gear removed.] Crew pulled whale along side of vessel and used long handle line cutter to cut and remove wraps from whale's tail flukes and caudal peduncle. Whale was pretty docile for size and crew removed gear. Whale swam away normally unharmed when gear was removed.
28	Pilot Whale	300	Serious Injury	S5a - Hook in head	[Hooked in side of mouth. Not entangled. Line broke and unknown amount of gear left on animal] Crew began to pull in whale to release/remove hook, but whale made a run. Began pulling in whale again, again it ran, this time breaking the leader. I did not see how much line fro trailing from hook. Whale broke leader and dove/swam quickly away. Did not see again.

Appendix B, Table B2 (cont.)

Animal #	Species	Length (cm)	Release Condition	Interaction Type	Observer Comments
29	Pilot Whale	210	Serious Injury	S5a - Hook in head	[Hooked in side of mouth. Entangled in mainline and gangion around flukes. Entangling gear removed, line cut near hook with 2 feet trailing] About 3 wraps of mainline was present around the tail. Long handled line cutters were used by the crew to first cut the gangion 2 ft from the hook and then cut away the wraps from the atil The hook and 2 ft of monofilament remained at the side of the mouth. MPW surfaced for a breath after release and then swam off normally.
30	Pilot Whale	270	Released Alive	S7b - Entangled before being freed without gear attached	[Not hooked. Entangled in mainline and gangion around flippers and flukes. All gear removed.] Whale pulled in alongside of vessel. Long handle line cutter was used to cut loops and pull gear from whale. Gear was tight on whale's pectoral and tail but I did not see any breaks in skin. Once all gear was removed the whale swam away slowly but normally. Trip was cut short due to number of whale interactions. Going back out in a couple of days to new area further south.
31	Pilot Whale	180	Released Alive	S7b - Entangled before being freed without gear attached **Hook removed by crew**	[Hooked in side of mouth. Not entangled. Hook removed with dehooker.] The animal was slowly pulled to the side of the boat. The animal seemed agitated and was trying to swim away. One of the mates quickly de-hooked the animal using a long-handled dehooker. The animal swam straight down and seemed to be behaving normally.
32	Pilot Whale	420	Serious Injury	S5a - Hook in head	[Hooked in mouth, unknown location. Not entangled. Line broke with 5 feet remaining with the animal] Before the gangion snap was removed from the mainline the MPW broke the leader with 5 ft of line remaining attached to hook. When vessel approached, the MPW dove and broke the gangion and swam away afterwards.
33	Pilot Whale	450	CBD	S7b - Entangled before being freed without gear attached, CBD due to length of interaction and unclear if gear remained wrapped	[Not hooked. Entangled in mainline around flukes. Unknown if gear was removed.] MPW was hand lined to the boat, crew attempted to cut mainline wrapped around MPW's tail but whale dove under the boat. MPW handlined back to the rail and crew used long handled line cutter to removed 2 wraps from tail. At this point, the MPW dove and either released itself from a final tail wrap or took 30 ft of gear with it. When the MPW either released itself or broke the line, it was still connected to, it swam strongly away and dove.
34	Pilot Whale	330	Released Alive	S7b - Entangled before being freed without gear attached	[Not hooked. Entangled in mainline around flukes. All gear removed.] Whale was handlined to the boat (mainline) and the wrap around its tail was cut using long handled line cutter leaving no mono. Swam away strongly.
35	Pilot Whale	360	Released Alive	S7b - Entangled before being freed without gear attached	[Not hooked. Entangled in mainline around flukes. All gear removed.] Whale was handlined to boat, wrap around tail was cut w long handled line cutter. MAM03 dove immediately upon release.
36	Pilot Whale	330	Released Alive	S7b - Entangled before being freed without gear attached	[Uknown if hooked, unknown if entangled. Involved with gangion. All gear removed.] Whale surfaced with a gangion/leader connected to it (hook was not visible) as the crew attempted to pull it towards the boat to dehook/cut mono, the whale released itself form the fishing hear. The hook was retrieved on the leader the whale was involved with. Whale immediately dove after it was free of the fishing gear.