

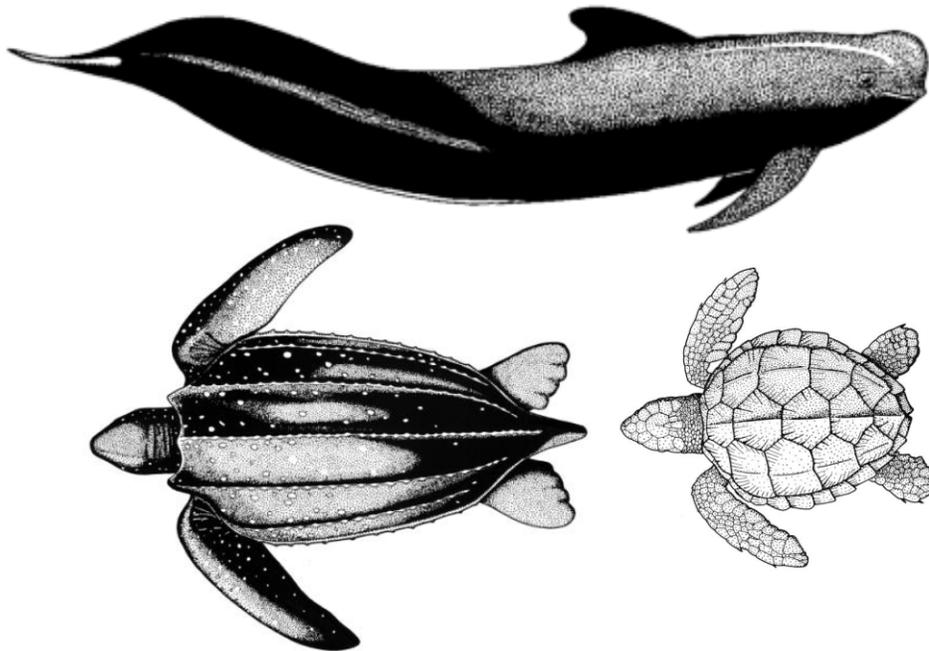


NOAA TECHNICAL MEMORANDUM NMFS-SEFSC-709

Estimated Bycatch of Marine Mammals and Sea Turtles in the U.S. Atlantic Pelagic Longline Fleet During 2015

By

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April 2017

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This report should be cited as follows:

Garrison, L.P and Stokes, L. 2017. Estimated Bycatch of Marine Mammals and Sea Turtles in the U.S. Atlantic Pelagic Longline Fleet During 2015. NOAA Technical Memorandum NOAA NMFS-SEFSC-709: 61 p.

Copies of this report can be obtained from:

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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 2015 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 2015, there were an estimated 300.0 (199.7 – 450.4 [95% CI]) interactions with leatherback turtles and 242.6 (161.9 – 363.6 [95% CI]) interactions with loggerhead turtles. In addition, there were an estimated 11.4 (2.2 – 58.1 [95% CI]) interactions with green turtles and 3.2 (0.6 – 16.4 [95% CI]) interactions with unidentified hardshell turtles (based upon one observed interaction each). 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 200.6 (126.1 – 319.0 [95% CI]) interactions resulting in serious injury and an additional 30.0 (13.8 – 65.5 [95% CI]) interactions in which the animal was released alive. 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).

In this report, marine mammal and marine turtle bycatch estimates are calculated for pelagic longline fishery effort during 2015. 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). Between 15 April and 15 June of 2015, 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. Similarly, in December of 2015, observer coverage was enhanced in regions of the Mid-Atlantic Bight (MAB) to evaluate bluefin tuna bycatch. Observer coverage in this region was therefore high (~19% of total hooks) during the fourth quarter corresponding to high coverage rates during December. The bycatch estimates developed for each species are stratified by fishing area and quarter to reflect the design of the observer program. In contrast to previous years, there was no experimental fishing in the pelagic longline fishery during 2015.

Bycatch rates for quarter-area strata with more than 10 reported longline fishery sets that had no corresponding observer coverage in 2015 were replaced with previously observed mean bycatch rates from 2010-2014. There were no marine mammals observed in these “missing” cells in prior years, but there were observed sea turtle interactions.

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). 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,

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

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

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

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

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

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

and

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

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

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

and

$$(7) \quad \text{var}(\ln N) = \ln [1 + \text{var}(N)/N^2],$$

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 2015. 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 2015 (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.

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 38-40°N latitude along the shelf break during warm months of the year. In the past decade, there have been very few interactions observed north of 38.5°N. 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 2015, there were two interactions with pilot whales in the NEC and several 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 22°C and latitudes south of 39°N, the probability of a sample coming from a short-finned pilot whale exceeds 80% (see Garrison and Rosel, 2016 for additional detail).

Of the 38 observed pilot whale interactions during 2015, 36 had a greater than 95% probability of being from short-finned pilot whales. The remaining two included one taken at 39.4°N latitude and a temperature of 14.6° C (December, MAB, probability short-finned = 88%) and taken at 39.9°N latitude and a temperature of 19.8°C (October, MAB, probability short-finned = 81%). 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 5.9 million hooks during 2015 (Table 1A, Figure 2). The reported fishery effort included 8,195 sets during 2015, 1,127 of which were observed by the POP program (Tables 1B and 2B, Figure 2). The overall percent coverage during regular fishing was 12.6% expressed as a proportion of reported hooks and 13.8% as a proportion of reported sets (Table 3). The relatively high annual rate reflects the 58.2% coverage of the fishery during the second quarter in the GOM and the 19.4% coverage of the MAB during Quarter 4. Note that the number of observed sets exceeded the number of reported sets during Quarter 4 in the CAR. Observer coverage for other area-quarter strata is shown in Table 3.

Areas with no observer coverage during 2015 with more than 10 sets of reported fishing effort include the North-Central Atlantic (NCA) during Quarter 1, Northeast Distant (NED) during Quarter 4, Northeast Coastal (NEC) during Quarter 2, and the Tuna North (TUN) during Quarter 4 (Table 3).

Observed Protected Species Interactions

There were 43 observed interactions with leatherback turtles, 30 with loggerhead turtles, 1 with a green turtle, and 1 unidentified turtle (Table 4, Figure 3) in 2015. The greatest number of observed leatherback takes occurred in the GOM during the Quarters 2 and 3 (Table 4A, Figure 3). Loggerhead takes were observed in the greatest numbers in the FEC during Quarters 1 and 2 and the MAB during Quarters 3 and 4 (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 24 of the 75 turtles captured (Table 6). A total of 16 leatherbacks and 3 loggerheads were released either entangled or with the hook and line remaining that was $> \frac{1}{2}$ the carapace length (Table 6).

There were 49 interactions observed with marine mammals (Table 7, Figure 4). This included 38 interactions with pilot whales, and none of these were sampled to allow direct identification to species. Additional interactions of note included 1 beaked whale and 1 sperm whale (Table 8). Thirty-eight of the observed marine mammal interactions were categorized as serious injuries including 32 pilot whales (Table 9). Twenty-nine of the serious injuries were due to animals being hooked in the mouth/head, 6 cases involved being released with gear likely to further entangle the animal, and two were cases where the gear was removed but other factors indicated likely serious injury (Table 9). The sperm whale was categorized as entangled with limited information to determine the extent of the entanglement. This resulted in the use of a proration of this interaction (Table 9). 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 GOM during Quarter 3 (67.7), in the NEC in Quarter 3 (38.8) and the NED in and Quarter 3 (24.5, Table 10).

For loggerhead turtles, the estimated interactions were highest in the NEC, MAB, and FEC (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 2015 are summarized in Table 12. There were observed sea turtle takes in prior years in NEC-Quarter 2 for both leatherback and loggerhead turtles (Table 12). There were no observed interactions with marine mammals in unobserved strata during prior years.

Total Estimated Bycatch

There were an estimated total of 300.0 (199.7 – 450.5 [95% CI]) interactions with leatherback turtles during 2015 (Table 13). For loggerhead turtles, the estimated total number of interactions was 242.6 turtles (161.9 – 363.6 [95% CI], Table 13). In addition, there were an estimated 11.4 (2.2 – 58.1 [95% CI]) interactions with green turtles and 3.2 (0.6 – 16.4 [95% CI]) interactions with unidentified hardshell turtles (Table 10c).

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). There were no interactions observed in Offshore strata, which correspond 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 30.0 (CV = 0.41) animals released alive and 200.6 (CV = 0.242) animals seriously injured (Table 14a). While two interactions were observed with pilot whales in the NEC where long-finned pilot whales occur, there was a high probability that these animals were short-finned pilot whales based upon environmental conditions and the location of the interactions. The low likelihood that these were long-finned pilot whales is reflected by the small estimate of interactions for this species. The only interaction occurring in the Gulf of Mexico was with a sperm whale. There was evidence of entanglement, and this interaction was therefore prorated between serious injury and released alive with an expected 75% likelihood that it was seriously injured. The expansion this injury resulted in an estimate of 0.9 serious injuries to sperm whales in the Gulf (Table 14b). The observed seriously injured beaked whale occurred in the “Offshore” region.

Trends in Bycatch Estimates

The leatherback take estimate reached a historical high in 2004, and prior to that had increased sharply since 1998 (Figure 5). 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.

The estimate for 2015 is consistent with that for 2014 despite a sharp decrease in reported fishery effort. The estimate for 2015 is consistent with those during the period from 2004-2011.

Loggerhead turtle interactions since 2000 have been below the historical highs that occurred in the mid-1990's (Figure 5). 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 4 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 and 2015 estimates remain relatively low and seem to be consistent with an overall downward trend since the late 1990's. Notably, the estimate for 2015 was consistent with that from 2014 despite a sharp decline in fishing effort.

For pilot whales (unspecified and short-finned pilot whales combined), the 2015 estimate was consistent with that for 2014, and has remained relatively constant since 2011 (Figure 6). 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). 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 1. Total amount of fishing effort reported to the pelagic longline logbook program during 2015 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	25.4	482.2	440.9	11.2	NR	NR	0.0	123.2	152.5	43.4	NR	1292.1
2	0.0	182.8	208.5	183.9	NR	75.4	NR	746.8	0.0	34.4	0.0	1435.5
3	0.0	141.6	535.9	565.7	0.0	364.7	164.3	87.6	NR	NR	0.0	1876.8
4	NR	121.5	280.2	445.6	0.0	78.5	60.1	88.0	124.5	NR	0.0	1251.5
Total	NR	928.2	1465.5	1206.4	13.3	519.3	225.0	1045.7	277.5	142.2	NR	5856.0

B. Number of Sets

Quarter	CAR	FEC	GOM	MAB	NCA	NEC	NED	SAB	SAR	TUN	TUS	Total
1	29	658	593	22	NR	NR	0	163	163	55	NR	1698
2	0	289	342	295	NR	87	NR	804	0	41	0	1862
3	0	243	781	934	0	410	170	154	NR	NR	0	2716
4	NR	188	433	783	0	92	83	140	141	NR	0	1919
Total	NR	1378	2149	2034	15	590	254	1261	305	172	NR	8195

Table 2. Total amount of fishing effort observed during 2015 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	NR	23.7	78.7	NR	0.0	0.0	-	17.9	NR	NR	NR	151.1
2	-	24.2	106.2	6.2	0.0	0.0	0.0	78.8	-	NR	-	220.6
3	-	14.5	26.5	34.9	-	42.9	NR	5.8	0.0	NR	-	179.0
4	NR	7.8	30.4	85.1	-	18.7	0.0	11.5	30.0	0.0	-	188.5
Total	9.4	70.3	241.8	NR	0.0	61.6	NR	114.0	NR	28.2	NR	739.1

B. Number of Sets

Quarter	CAR	FEC	GOM	MAB	NCA	NEC	NED	SAB	SAR	TUN	TUS	Total
1	NR	39	112	NR	0.0	0.0	-	27	13	NR	NR	208
2	-	50	199	12	0.0	0.0	0.0	90	-	NR	-	357
3	-	31	48	64	-	45	NR	12	0.0	NR	-	258
4	NR	11	58	152	-	23	0	18	33	0	-	304
Total	14	131	417	NR	0	68	NR	147	46	29	NR	1127

Table 3. Percentage of reported fishing effort observed during 2015 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	TUS	Total
1	17.4	4.9	17.9	4.1	0.0	0.0	-	14.5	7.8	29.2	53.8	11.7
2	-	13.2	50.9	3.4	0.0	0.0	0.0	10.6	-	14.9	-	15.4
3	-	10.2	4.9	6.2	-	11.8	26.8	6.6	0.0	63.4	-	9.5
4	97.8	6.4	10.9	19.1	-	23.8	0.0	13.0	24.1	0.0	-	15.1
Total	30.8	7.6	16.5	10.5	0.0	11.9	19.5	10.9	15.1	19.8	53.8	12.6

B. Number of Sets

Quarter	CAR	FEC	GOM	MAB	NCA	NEC	NED	SAB	SAR	TUN	TUS	Total
1	17.2	5.9	18.9	4.5	0.0	0.0	-	16.6	8.0	18.2	50.0	12.2
2	-	17.3	58.2	4.1	0.0	0.0	0.0	11.2	-	14.6	-	19.2
3	-	12.8	6.1	6.9	-	11.0	26.5	7.8	0.0	56.5	-	9.5
4	150.0	5.9	13.4	19.4	-	25.0	0.0	12.9	23.4	0.0	-	15.8
Total	40.0	9.5	19.4	11.3	0.0	11.5	17.7	11.7	15.1	16.9	50.0	13.8

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 2015 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. *One green turtle was captured in the SAB in Quarter 2, **1 unidentified turtles was captured in the NED in Quarter 3.

A. Leatherback Turtles

Quarter	CAR	FEC	GOM	MAB	NCA	NEC	NED	SAB	SAR	TUN	TUS	Total
1	0	1	1	0	-	-	X	0	0	1	0	3
2	X	0	6	1	-	-	-	1	-	0	-	8
3	X	0	5	0	X	5	7	0	X	1	-	18
4	0	1	2	4	X	4	-	0	3	-	-	14
Total	0	2	14	5	-	9	7	1	0	0	0	43

B. Loggerhead Turtles

Quarter	CAR	FEC	GOM	MAB	NCA	NEC	NED	SAB	SAR	TUN	TUS	Total
1	0	2	0	0	-	-	X	0	0	0	0	2
2	X	4	1	0	-	-	-	1	-	0	-	6
3	X	1	0	2	X	4	2	1	X	0	-	10
4	1	1	0	9	X	0	-	0	1	-	-	12
Total	1	8	1	11	-	4	2	2	1	0	0	30

C. All Turtles

Quarter	CAR	FEC	GOM	MAB	NCA	NEC	NED	SAB	SAR	TUN	TUS	Total
1	0	3	1	0	-	-	X	0	0	1	0	5
2	X	4	7	1	-	-	-	3*	-	0	-	15
3	X	1	5	2	X	9	10*	1	X	1	-	29
4	1	2	2	13	X	4	-	0	4	0	-	26
Total	1	10	15	16	-	13	10**	4*	4	2	0	75

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 2015. 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	Unknown	Total
Leatherback	6	5	31	1	43
Loggerhead	2	0	28	0	30
Other Species	0	0	2	0	2
Total	8	5	61	1	75

B. Hook Location in hooked animals

Species	Not Hooked	Unknown if Hooked	Hooked, Location Unknown	Internal			External	Total
				Unknown Internal	Swallowed	Beak or Mouth		
Leatherback	9	5	2	0	0	3	24	43
Loggerhead	2	0	0	0	7	20	1	30
Other Species	0	0	2	0	0	0	0	2
Total	11	5	4	0	7	23	25	75

C. Animals with all gear removed, by hook location

Species	Not Hooked	Unknown if Hooked	Hooked, Location Unknown	Internal			External	Total
				Unknown Internal	Swallowed	Beak or Mouth		
Leatherback	6	0	0	0	0	1	3	10
Loggerhead	2	0	0	0	0	12	0	14
Other Species	0	0	0	0	0	0	0	0
Total	8	0	0	0	0	13	3	24

Table 6. Release status and gear removal for sea turtles captured and released alive in the U.S. Atlantic Pelagic Longline Fishery during 2015. Condition columns refer to post-release mortality categories in Table 1 of SEFSC 2012. Other species include one green turtle and one unidentified turtle.

Release Status	Leatherback	Loggerheads	Other Species
Released entangled (Condition Column A)	5	0	0
Released with hook and line \geq $\frac{1}{2}$ carapace length (Condition Column B)	11	3	2
Released with hook and line $<$ $\frac{1}{2}$ carapace length (Condition Column C)	15	13	0
Released with all gear removed (Condition Column D)	10	14	0
Unknown	2	0	0

Table 7. Total number of marine mammals observed in interactions with the pelagic longline fishery during 2015 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	TUS	Total
1	0	1	0	0	-	-	X	0	0	-	0	1
2	X	0	1	0	-	-	-	1	-	0	-	2
3	X	0	0	1	X	0	1	0	X	0	-	2
4	0	0	0	39	X	5	-	0	0	-	-	44
Total	0	1	1	40	-	5	1	1	0	0	0	49

Table 8. Marine mammal interactions with the pelagic longline fishery during 2015 by species, quarter, and fishing area.

Species	Quarter	Fishing Area	Serious Injuries	Released Alive	Total
Unidentified dolphin	4	MAB	0	2	2
Bottlenose dolphin	4	NEC	0	1	1
Common dolphin	4	MAB	1	1	2
Risso's dolphin	4	MAB	1	0	1
Risso's dolphin	4	NEC	1	0	1
Unidentified marine mammal	4	MAB	1	0	1
Unidentified marine mammal	4	NEC	0	1	1
Pilot whale	1	FEC	1	0	1
Pilot whale	2	SAB	1	0	1
Pilot whale	3	MAB	1	0	1
Pilot whale	4	MAB	27	6	33
Pilot whale	4	NEC	2	0	2
Beaked whale	3	NED	1	0	1
Sperm whale	2	GOM	1	0	1
Totals			38	11	49

Table 9. Summary of release condition and serious injury types for marine mammals observed in the pelagic longline fishery during 2015. 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).

Species	Alive	Dead	Serious Injury Type			Serious Injury Total	Total
			Hooked in Head/Mouth (S5a)	Gear Attached Likely to Entangle (S6)	Freed After Entanglement (S7b)		
Unidentified dolphin	2	0	0	0	0	0	2
Bottlenose dolphin	1	0	0	0	0	0	1
Common dolphin	1	0	1	0	0	1	2
Risso's dolphin	0	0	1	0	1	2	2
Unidentified marine mammal	1	0	1	0	0	1	2
Pilot whale	6	0	25	6	1	32	38
Beaked whale	0	0	1	0	0	1	1
Sperm whale	0	0	0	0	0	1*	1
Total	11	0	29	6	2	38	49

*This interaction was coded as “L10 – Evidence of entanglement.” This category requires pro-rating this interaction using a ratio of 0.75 (NMFS 2012a).

Table 10. Estimated interactions with sea turtles in the pelagic longline fishery during 2015 by fishing area and quarter. NR indicates strata where effort cannot be reported due to confidentiality considerations.

A. Leatherback

Species	Area	Quarter	# Positive Sets	# Observed Sets	Mean CPUE	CV	Hooks Reported (x1000)	Estimated Catch
Leatherback	FEC	1	1	39	0.036	1.000	482.2	17.2
Leatherback	GOM	1	1	112	0.011	1.000	440.9	4.9
Leatherback	TUN	1	1	NR	0.078	1.000	NR	3.4
Leatherback	GOM	2	6	199	0.041	0.411	208.5	8.6
Leatherback	MAB	2	1	12	0.201	1.000	183.9	36.9
Leatherback	SAB	2	1	90	0.011	1.000	746.8	8.0
Leatherback	GOM	3	4	48	0.126	0.508	535.9	67.7
Leatherback	NEC	3	5	45	0.106	0.428	364.7	38.8
Leatherback	NED	3	6	45	0.149	0.397	164.3	24.5
Leatherback	TUN	3	1	NR	0.099	1.000	NR	1.6
Leatherback	FEC	4	1	11	0.105	1.000	121.5	12.8
Leatherback	GOM	4	2	58	0.065	0.703	280.2	18.1
Leatherback	MAB	4	4	152	0.053	0.507	445.6	23.8
Leatherback	NEC	4	3	23	0.220	0.608	78.5	17.3
Leatherback	SAR	4	3	33	0.096	0.566	124.5	11.9

Table 10 – Continued
 B. Loggerheads

Species	Area	Quarter	# Positive Sets	# Observed Sets	Mean CPUE	CV	Hooks Reported (x1000)	Estimated Catch
Loggerhead	FEC	1	2	39	0.069	0.698	482.2	33.3
Loggerhead	FEC	2	4	50	0.139	0.507	182.8	25.4
Loggerhead	GOM	2	1	199	0.006	1.000	208.5	1.2
Loggerhead	SAB	2	1	90	0.008	1.000	746.8	6.0
Loggerhead	FEC	3	1	31	0.063	1.000	141.6	9.0
Loggerhead	MAB	3	2	64	0.049	0.706	565.7	27.6
Loggerhead	NEC	3	4	45	0.114	0.515	364.7	41.7
Loggerhead	NED	3	2	45	0.041	0.699	164.3	6.8
Loggerhead	SAB	3	1	12	0.133	1.000	87.6	11.6
Loggerhead	CAR	4	1	NR	0.117	1.000	NR	0.6
Loggerhead	FEC	4	1	11	0.186	1.000	121.5	22.5
Loggerhead	MAB	4	9	152	0.095	0.331	445.6	42.2
Loggerhead	SAR	4	1	33	0.035	1.000	124.5	4.4

C. Other Species

Species	Area	Quarter	# Positive Sets	# Observed Sets	Mean CPUE	CV	Hooks Reported (x1000)	Estimated Catch
Green Turtle	SAB	2	1	90	0.015	1.000	746.8	11.4
Unid Turtle	NED	3	1	45	0.020	1.000	164.3	3.2

Table 11. Estimated A) Serious Injury and B) Released Alive marine mammals in the pelagic longline fishery during 2015 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. The sperm whale interaction was prorated as 0.75 serious injury, 0.25 released alive.

A. Serious Injury

Species	Area	Quarter	# Positive Sets	# Observed Sets	Mean CPUE	CV CPUE	# Hooks Reported (x1000)	Estimated Catch
Short-finned Pilot whale	FEC	1	1	39	0.036	1.000	482.2	17.2
Sperm whale	GOM	2	1	199	0.005	1.000	208.5	1.0
Long-finned Pilot whale	MAB	3	1	64	0.001	1.000	565.7	0.6
Short-finned Pilot whale	MAB	3	1	64	0.058	1.000	565.7	32.9
Common dolphin	MAB	4	1	152	0.020	1.000	445.6	9.0
Risso's dolphin	MAB	4	1	152	0.008	1.000	445.6	3.7
Unid. Marine Mammal	MAB	4	1	152	0.013	1.000	445.6	5.8
Long-finned Pilot whale	MAB	4	4	152	0.003	0.695	445.6	1.2
Short-finned Pilot whale	MAB	4	22	152	0.291	0.213	445.6	129.6
Risso's dolphin	NEC	4	1	23	0.060	1.000	78.5	4.7
Long-finned Pilot whale	NEC	4	2	23	0.005	0.691	78.5	0.4
Short-finned Pilot whale	NEC	4	2	23	0.116	0.691	78.5	9.1
Beaked whale	NED	3	1	45	0.024	1.000	164.3	4.0
Short-finned Pilot whale	SAB	2	1	90	0.016	1.000	746.8	11.9

Table 11 cont.**B. Released Alive**

Species	Area	Quarter	# Positive Sets	# Observed Sets	Mean CPUE	CV CPUE	# Hooks Reported (x1000)	Estimated Catch
Sperm whale	GOM	2	1	199	0.002	1.000	208.5	0.3
Unid. dolphin	MAB	4	2	152	0.019	0.717	445.6	8.5
Common dolphin	MAB	4	1	152	0.012	1.000	445.6	5.4
Long-finned pilot whale	MAB	4	2	152	0.002	0.778	445.6	0.7
Short-finned pilot whale	MAB	4	6	152	0.067	0.414	445.6	30.0
Bottlenose dolphin	NEC	4	1	23	0.060	1.000	78.5	4.7
Unid. Marine mammal	NEC	4	1	23	0.060	1.000	78.5	4.7

Table 12. Bycatch rates for sea turtles in area-quarter strata that were not observed in 2015. NR indicates strata where effort cannot be reported for 2015 due to confidentiality restrictions. There were no marine mammals observed taken during 2010-2014 for these area-quarter strata.

Bycatch Rate Source	Species	Area	Quarter	# Positive Sets	#Observed Sets	Mean CPUE	CV CPUE	# Hooks Reported (X1000) 2015	Estimated Catch 2015
Quarterly 10-14	Olive Ridley	TUN	4	1	21	0.074	1.000	NR	3.6
Quarterly 10-14	Leatherback	NEC	2	3	61	0.057	0.579	75.4	4.3
Quarterly 10-14	Loggerhead	NEC	2	7	61	0.135	0.377	75.4	10.2

Table 13. Total estimated interactions and experimental takes for A) Leatherback, B) Loggerhead in the pelagic longline fishery during 2015 by fishing area. This includes estimates for strata that were not observed during 2015.

A. Leatherbacks

Area	Alive	Alive CV	Dead	Dead CV	Total	Total CV	Total 95% Confidence Interval
CAR	0	-	0	-	0	-	-
FEC	30.0	0.7147	0	-	30.0	0.7147	8.5 - 105.5
GOM	99.4	0.3738	0	-	99.4	0.3738	48.9 - 202
MAB	60.7	0.6397	0	-	60.7	0.6397	19.3 - 191.4
NCA	0	-	0	-	0	-	-
NEC	60.4	0.3279	0	-	60.4	0.3279	32.3 - 113
NED	24.5	0.3970	0	-	24.5	0.3970	11.6 - 51.8
SAB	8.0	1.0000	0	-	8.0	1.0000	1.6 - 41.1
SAR	11.9	0.5664	0	-	11.9	0.5664	4.2 - 33.5
TUN	5.0	0.7505	0	-	5.0	0.7505	1.4 - 18.5
TUS	0	-	-	-	0	-	-
Total	300.0	0.2909	0	-	300.0	0.2909	199.7 – 450.5

B. Loggerheads

Area	Alive	Alive CV	Dead	Dead CV	Total	Total CV	Total 95% Confidence Interval
CAR	0.6	1.0000	0	-	0.6	1.0000	0.1 - 3
FEC	90.3	0.3989	0	-	90.3	0.3989	42.5 - 191.7
GOM	1.2	1.0000	0	-	1.2	1.0000	0.2 - 6.1
MAB	69.8	0.3434	0	-	69.8	0.3434	36.3 - 134.4
NCA	0	-	0	-	0	-	-
NEC	51.9	0.4208	0	-	51.9	0.4208	23.5 - 114.5
NED	6.8	0.6992	0	-	6.8	0.6992	2 - 23.4
SAB	17.6	0.7423	0	-	17.6	0.7423	4.8 - 64.6
SAR	4.4	1.0000	0	-	4.4	1.0000	0.9 - 22.4
TUN	0	-	0	-	0	-	-
TUS	0	-	-	-	0	-	-
Total	242.6	0.2087	0	-	242.6	0.2087	161.9 – 363.6

Table 14. Total estimated interactions with marine mammals in the pelagic longline fishery during 2015.

A. Atlantic

Species	Estimated Alive	CV Alive	95% CI Alive	Estimated Serious Injury	CV Serious Injury	95% CI Serious Injury
Unidentified dolphin	8.5	0.7165	2.4 – 29.9	0	-	-
Bottlenose dolphin	4.7	1.000	0.9 – 24.2	0	-	-
Common dolphin	5.4	1.000	0.1 – 27.5	9.0	1.000	1.8 – 46.3
Risso’s dolphin	0	-	-	8.4	0.7129	2.4 – 29.5
Long-finned pilot whale	0.7	0.7778	0.2 – 2.6	2.2	0.4862	0.9 – 5.5
Short-finned pilot whale	30.0	0.4142	13.8 – 65.5	200.6	0.2402	126.1 – 319.0
Unid. Marine mammal	4.7	1.000	0.9 – 24.2	5.8	1.000	1.1 – 29.7

B. Gulf of Mexico

Species	Estimated Alive	CV Alive	95% CI Alive	Estimated Serious Injury	CV Serious Injury	95% CI Serious Injury
Sperm Whale	0.3	1.000	0.1 – 1.6	0.9	1.000	0.2 – 4.8

C. Offshore

Species	Estimated Alive	CV Alive	95% CI Alive	Estimated Serious Injury	CV Serious Injury	95% CI Serious Injury
Beaked Whale	0	-	-	4.0	1.000	0.8 – 20.2

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).

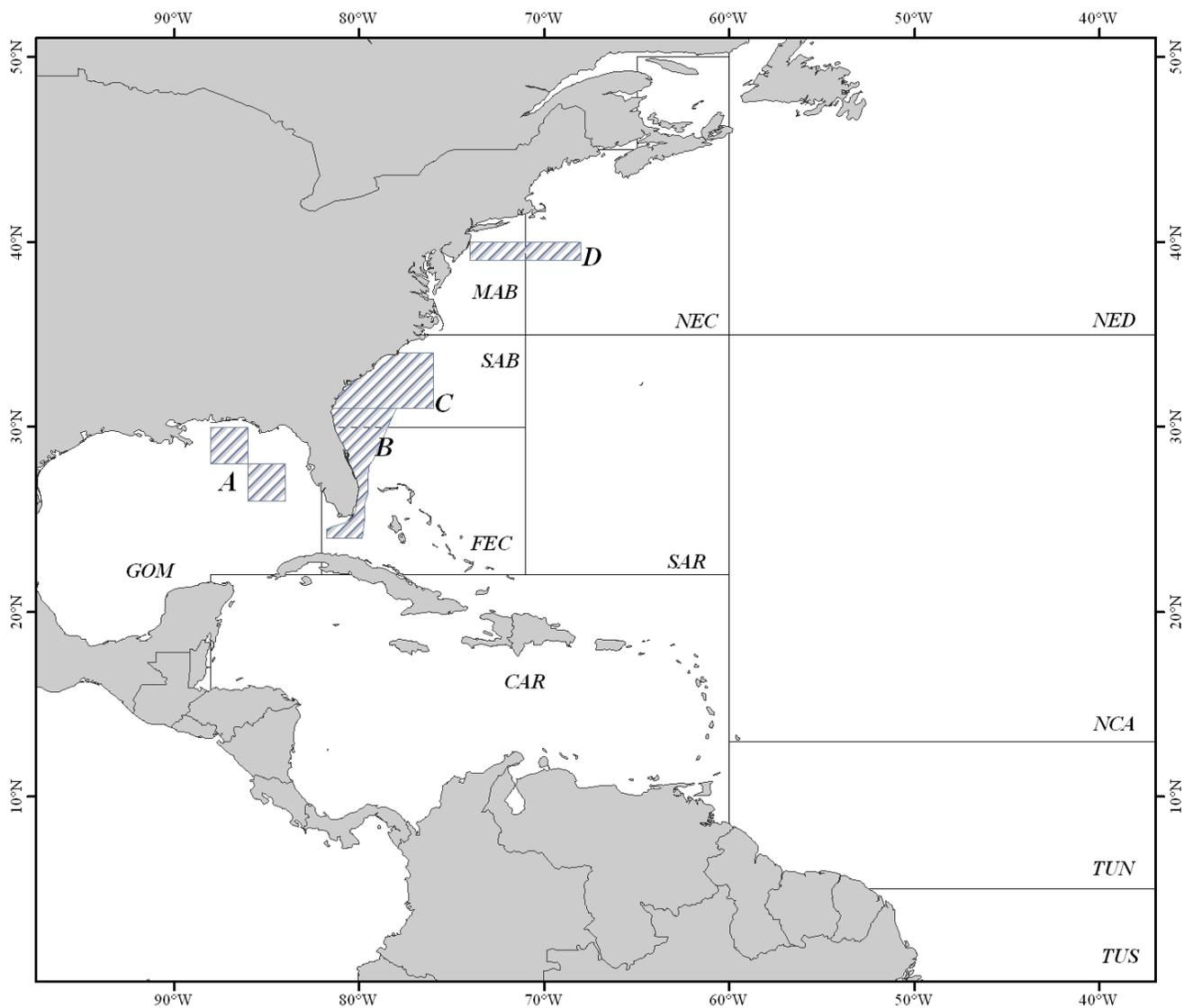


Figure 2. Observed (gray circles) and reported (black circles) pelagic longline fishing effort during 2015

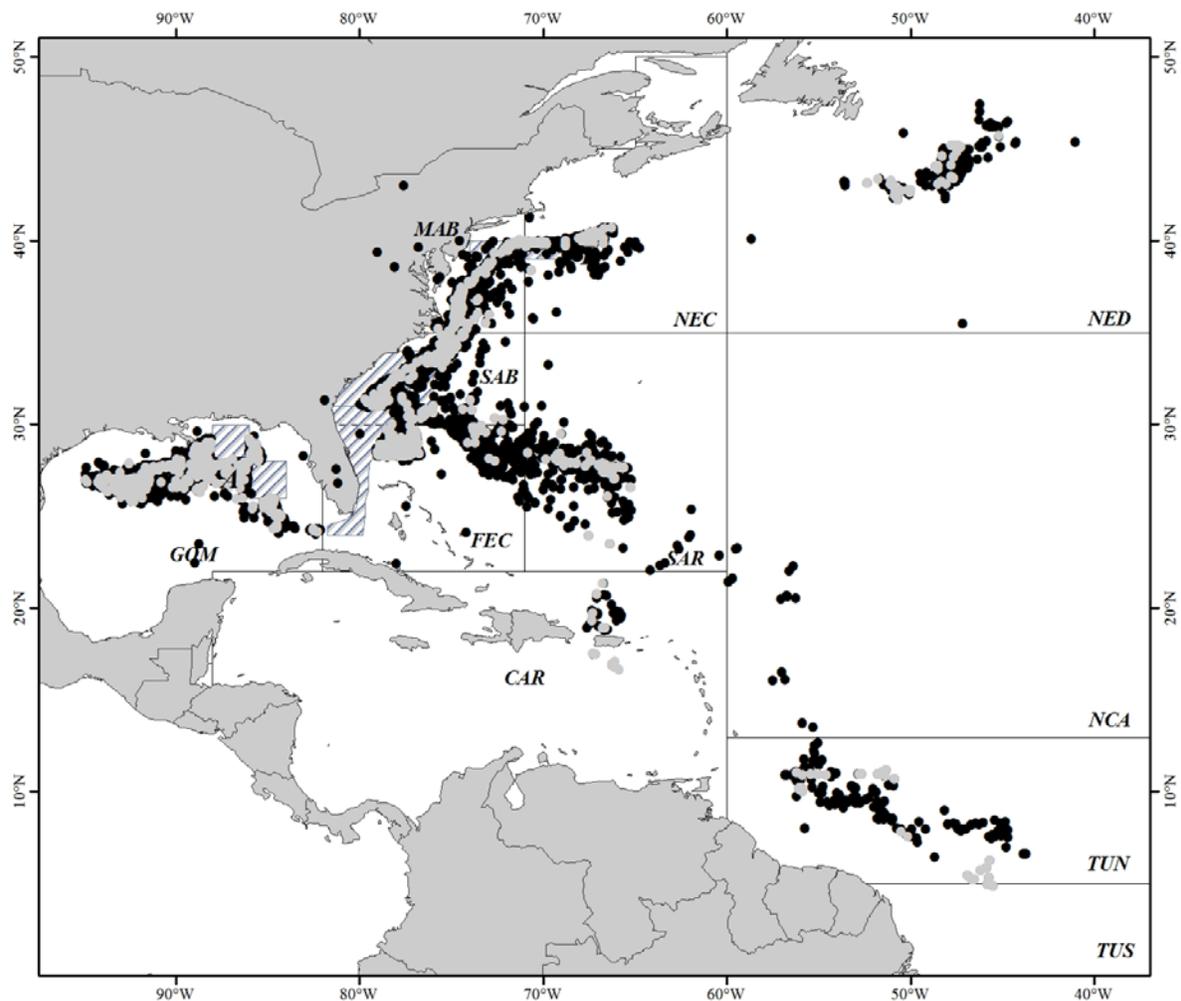


Figure 3. Observed pelagic longline fishing effort and sea turtle interactions during 2015

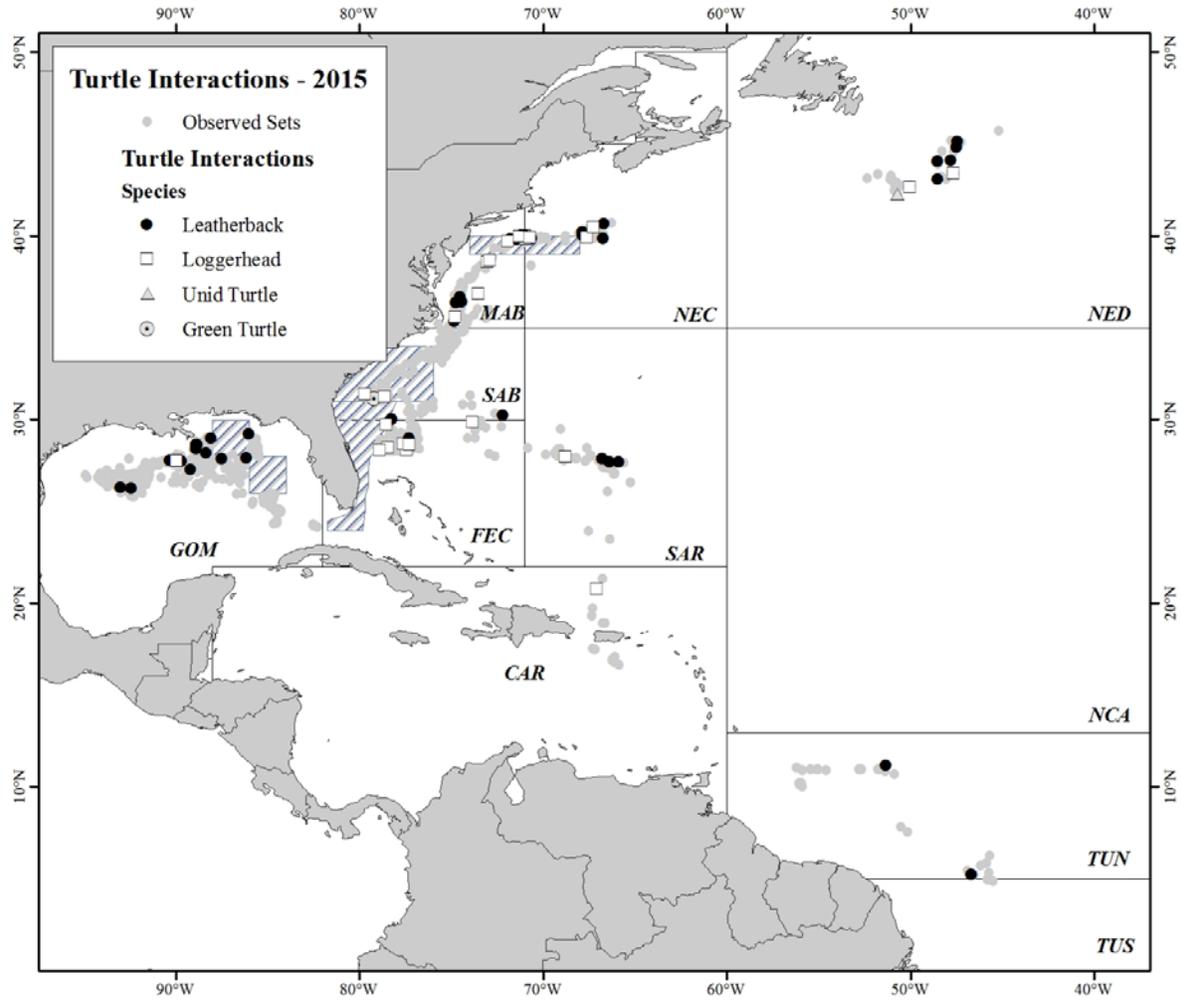


Figure 4. Observed pelagic longline fishing effort and marine mammal takes during 2015.

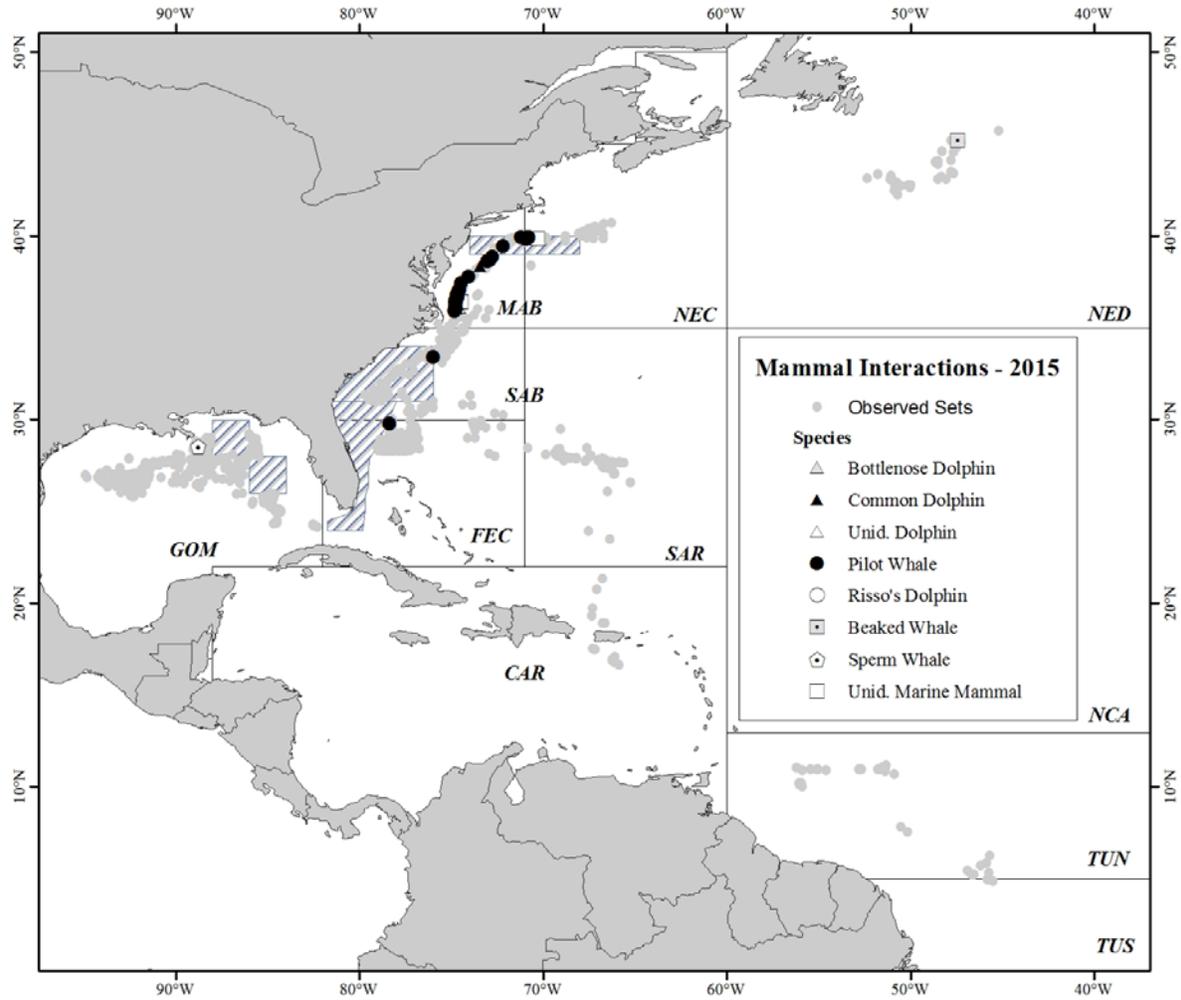
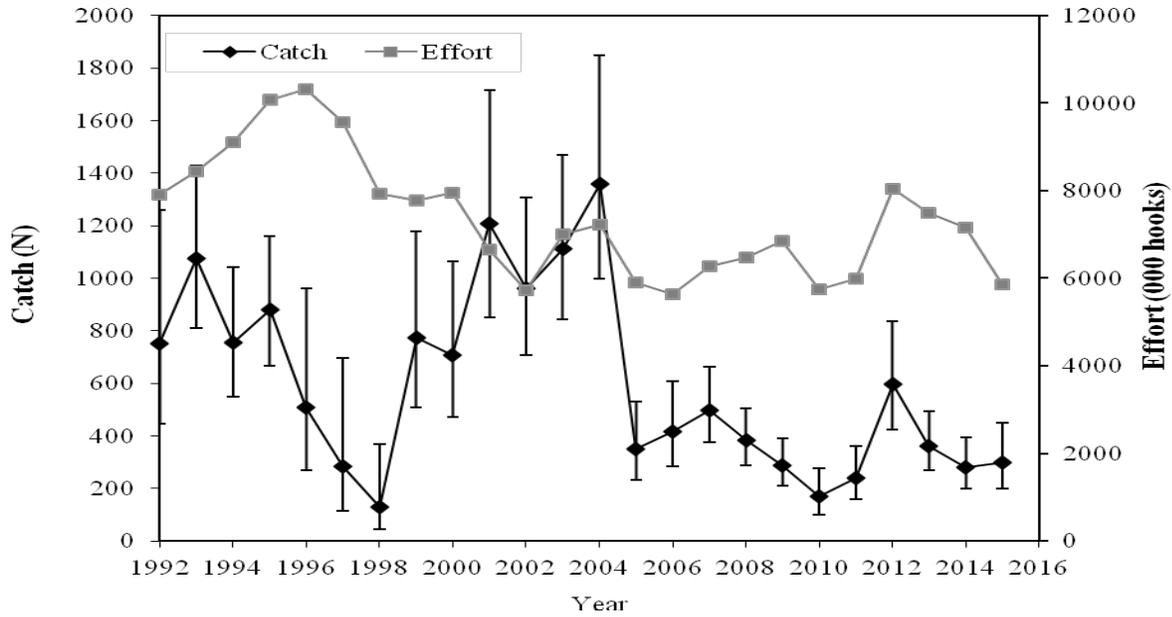


Figure 5. Historical trends in fishery effort and estimated marine turtle takes in the pelagic longline fishery from 1992 to 2015 for A) Leatherback Turtles, and B) Loggerhead Turtles. Errors bars represent 95% confidence intervals.

A. Leatherback Turtles



B. Loggerhead Turtles

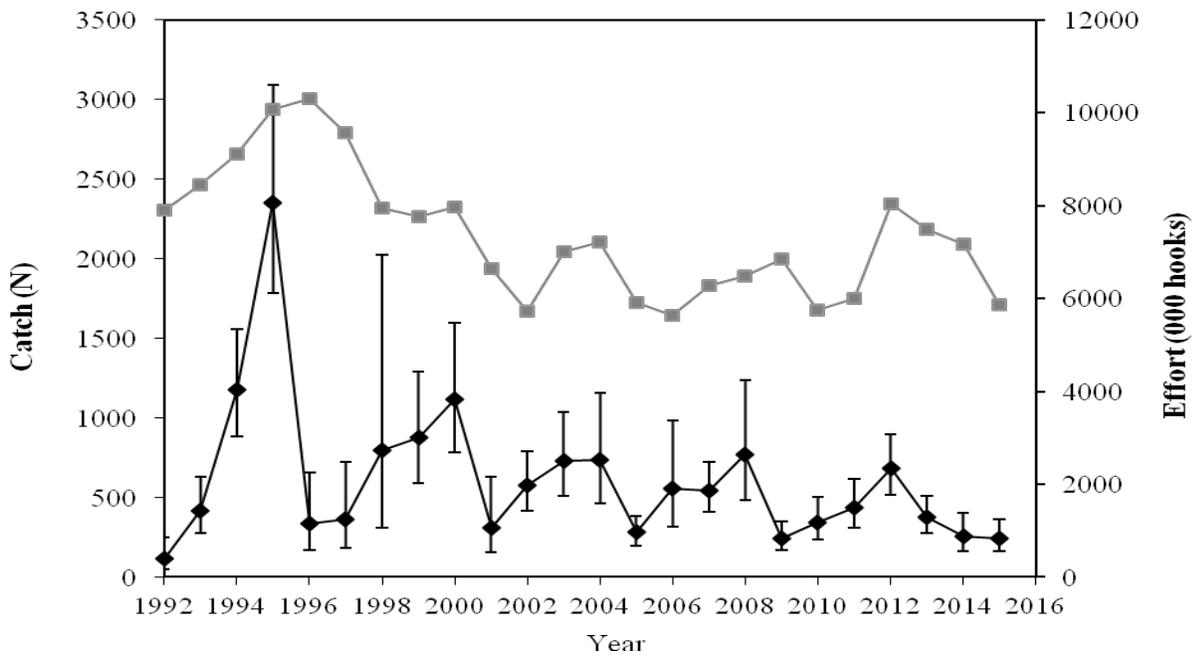
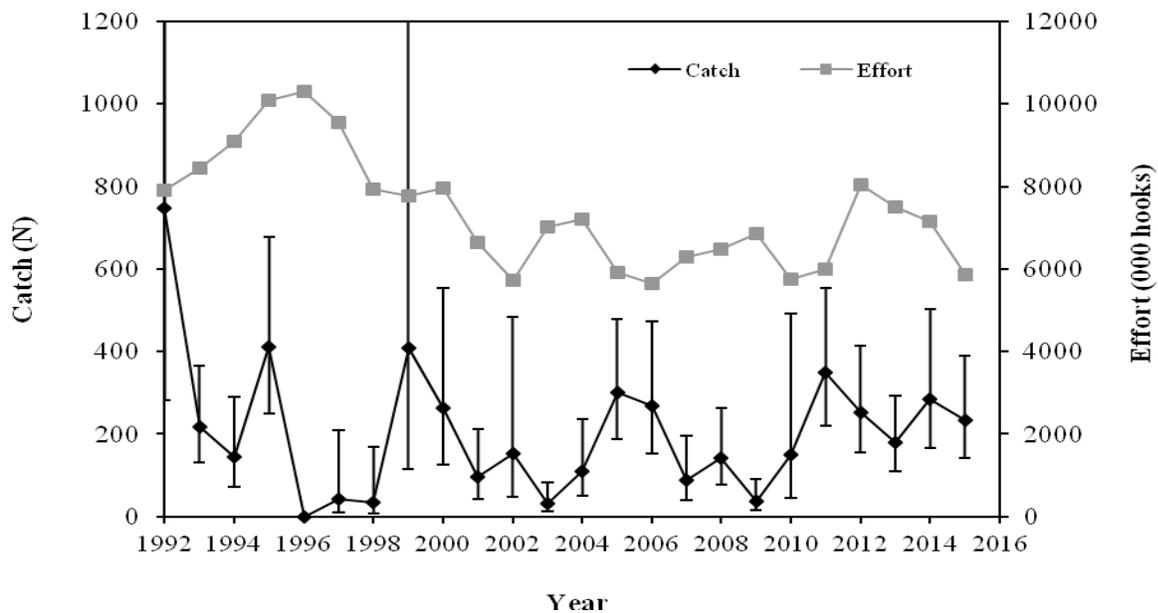
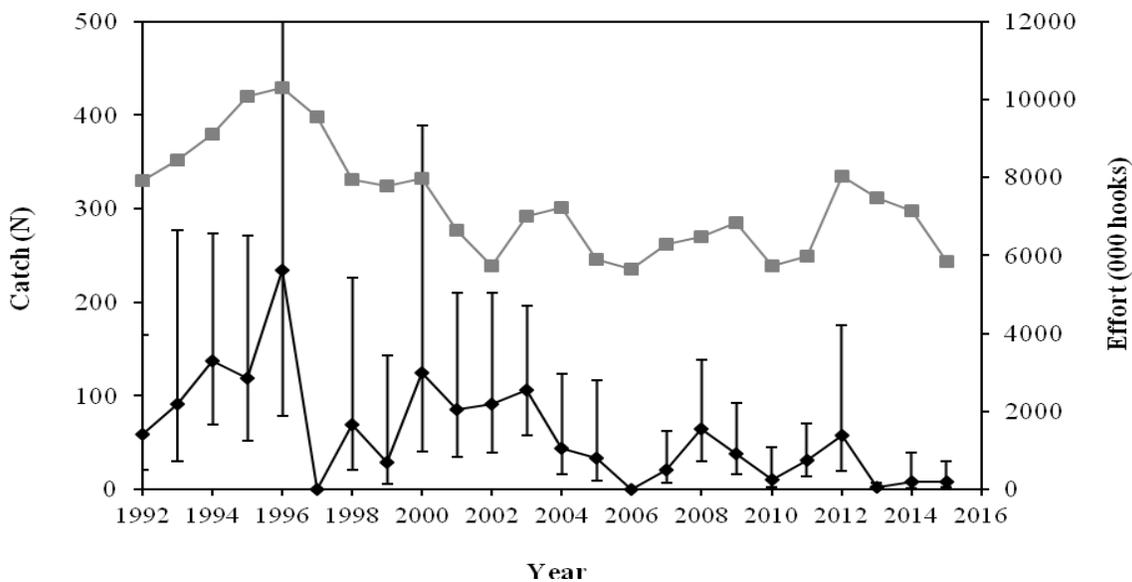


Figure 6. Historic trends in fishery effort and estimated marine mammal takes in the pelagic longline fishery from 1992 to 2015 for A) Pilot Whales and B) Risso’s Dolphins in Western North Atlantic waters. Errors bars represent 95% confidence intervals. For pilot whales, all takes are most likely of 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	<input type="text"/> <input type="text"/> <input type="text"/> . <input type="text"/> notch-to-tip	<input type="text"/> <input type="text"/> <input type="text"/> . <input type="text"/> notch-to-tip	<input type="text"/> <input type="text"/> <input type="text"/> . <input type="text"/> notch-to-notch
Carapace Width	<input type="text"/> <input type="text"/> <input type="text"/> . <input type="text"/>	<input type="text"/> <input type="text"/> <input type="text"/> . <input type="text"/>	

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?
<input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/>	<input type="text"/>	<input type="text"/> <input type="text"/>	<input type="text"/>	Y / N
<input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/>	<input type="text"/>	<input type="text"/> <input type="text"/>	<input type="text"/>	Y / N
<input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/>	<input type="text"/>	<input type="text"/> <input type="text"/>	<input type="text"/>	Y / N
<input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/>	<input type="text"/>	<input type="text"/> <input type="text"/>	<input type="text"/>	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) .

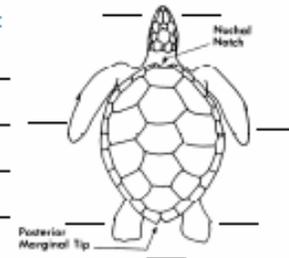
DATE, if different from capture: YEAR 20 MONTH DAY

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	<input type="text"/>	Overlapping Scutes?	Y / N / U
Right Lateral Scutes	<input type="text"/>	Inframarginal Pores?	Y / N / U
Vertebral Scutes	<input type="text"/>	1 Pair Prefrontal Scales?	Y / N / U
L. Inframarginal Scutes	<input type="text"/>	Lacks Bony Shell?	Y / N
R. Inframarginal Scutes	<input type="text"/>	Does Nuchal Scute Touch 1 st Lateral Scute?	Y / N / U
Dorsal Coloration	<input type="checkbox"/> Black <input type="checkbox"/> Orange/Red-Brown <input type="checkbox"/> Brown <input type="checkbox"/> Gray-Green <input type="checkbox"/> Other _____		

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

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 2015. 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	FEC	1	C-16/0	0	Squid	284	Alive, injured	Released alive	Shoulder	No	No	No	I	C	0.2	4.5		
2	GOM	1	C-16/0	0	Squid	113	Alive, injured	Released alive	Armpit	No	No	No	I	C	0.5	5.0		
3	TUN	1	C-16/0	0	Squid	68	Alive, unknown	Released alive	Not known if hooked	No	Yes	Yes	IV	A	10.0	5.0		
4	GOM	2	C-16/0	0	Squid	189	Alive, injured	Released alive	Armpit	No	No	No	I	C	0.1	5.0		
5	GOM	2	C-16/0	0	Squid	149	Alive, injured	Released alive	Shoulder	No	No	No	I	C	1.0	4.5		
6	GOM	2	C-16/0	0	Squid	153	Alive, injured	Released alive	Shoulder	No	No	No	I	B	2.0	4.0		
7	GOM	2	C-16/0	0	Squid	158	Alive, injured	Released alive	Beak(internal, lower jaw)	No	No	No	I	B	2.0	4.0		
8	GOM	2	C-16/0	0	Sardine	90	Alive, injured	Released alive	Front flipper/shoulder/arm-pit	No	No	No	I	B	10.0	5.0		
9	GOM	2	C-16/0	0	Sardine	90	Alive, injured	Released alive	Armpit	No	Yes	No	I	C	2.0	5.5		
10	MAB	2	C-16/0	0	Squid	140	Alive, injured	Released alive	Front flipper	No	Yes	No	I	B	2.0	4.0		
11	SAB	2	C-16/0	0	Squid or mackerel	261 or 351	Alive, injured	Released alive	Front flipper	Yes	No	No	I	D	0.0	4.0		

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	3	C-16/0	0	Squid or herring	149 or 117	Alive, injured	Released alive	Not hooked	N/A	Yes	No	V	D	0.0	6.0		
13	GOM	3	C-16/0	0	Squid or herring	149 or 113	Alive, injured	Released alive	Armpit	No	No	No	I	B	3.0	3.5		
14	GOM	3	C-16/0	0	Squid or herring	149 or 117	Alive, injured	Released alive	Shoulder	No	No	No	I	C	2.0	5.5		
15	GOM	3	C-16/0	0	Squid or herring	149 or 126	Alive, injured	Released alive	Rear flipper	No	No	No	I	B	3.0	6.0		
16	GOM	3	C-16/0	0	Squid or herring	149 or 126	Alive, injured	Released alive	Shoulder	No	No	No	I	B	3.0	5.5		
17	NEC	3	C-16/0	0	Squid or mackerel	113 or 270	Unknown	Unknown	Not hooked	N/A	Yes	No	V	Unk final disp.	0.0	5.5		
18	NEC	3	C-18/0 or C-16/0	10 or 0	Squid	176	Alive, injured	Released alive	Not hooked	N/A	Yes	No	V	D	0.0	7.0		
19	NEC	3	C-16/0	0	Squid	585	Alive, injured	Released alive	Shoulder	No	No	No	I	C	0.0	5.0		
20	NEC	3	C-16/0	0	Squid	585	Alive, injured	Released alive	Shoulder	No	Yes	No	I	B	3.0	5.0		
21	NEC	3	C-16/0	0	Squid	585	Alive, injured	Released alive	Armpit	No	No	No	I	C	2.0	7.0		
22	NED	3	C-16/0	0	Mackerel	360	Alive, injured	Released alive	Unknown	No	No	No	IV	B	3.0	4.0		
23	NED	3	C-16/0	0	Mackerel	320	Alive, unknown	Released alive	Not known if hooked	No	Unknown	Unknown	IV	A	30.0	7.0		
24	NED	3	C-16/0	0	Mackerel	320	Alive, injured	Released alive	Unknown	No	No	No	IV	B	3.0	4.0		

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)
25	NED	3	C-18/0	10	Mackerel	360	Alive, injured	Released alive	Armpit	No	No	No	I	C	0.1	4.0		
26	NED	3	C-18/0	10	Mackerel	360	Alive, injured	Released alive	Shoulder	Yes	No	No	I	D	0.0	4.5		
27	NED	3	C-18/0	10	Mackerel	360	Alive, injured	Released alive	Mouth, side, other	No	No	No	II	C	0.3	5.0		
28	NED	3	C-18/0	10	Squid or mackerel	203 or 360	Alive, injured	Released alive	Shoulder	No	No	No	I	C	0.1	5.0		
29	TUN	3	C-16/0	0	Scad	18	Alive, uninjured	Released alive	Not hooked	N/A	Yes	No	V	D	0.0	4.0		
30	FEC	4	C-16/0	0	Squid or Mackerel	135 or 225	Alive, unknown	Released alive	Not known if hooked	Unknown	Yes	No	IV	C	0.0	5.5		
31	GOM	4	C-16/0	0	Sardine	45	Alive, uninjured	Released alive	Not hooked	N/A	Yes	Unknown	V	A	0.0	5.0		
32	GOM	4	C-16/0	0	Sardine	99	Alive, uninjured	Released alive	Not hooked	N/A	Yes	No	V	D	0.0	6.0		
33	MAB	4	C-16/0	0	Squid or Mackerel	180 or 225	Alive, injured	Released alive	Head	yes	No	No	I	D	0.0	6.0		
34	MAB	4	C-16/0	0	Squid or Mackerel	180 or 270	Alive, injured	Released alive	Unknown external	No	Unknown	Unknown	I	A	1.0	4.0		
35	MAB	4	C-16/0	0	Squid	315	Alive, injured	Released alive	Mouth side other	Yes	No	No	II	D	0.0	4.0		
36	MAB	4	C-16/0	0	Squid	176	Alive, injured	Released alive	Armpit	No	No	No	I	C	1.0	4.0		

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)
37	NEC	4	C-16/0	0	Squid	135	Alive, unknown	Unknown	Not known if hooked	Unknown	Yes	Unknown	IV	Unknown final disposition	Unknown	4.0		
38	NEC	4	C-16/0	0	Squid	135	Alive, injured	Released alive	Shoulder	No	No	No	I	C	2.0	4.5		
39	NEC	4	C-16/0	0	Squid	135	Alive, uninjured	Released alive	Not hooked	N/A	Yes	No	V	D	0.0	5.0		
40	NEC	4	C-16/0	0	Squid	270	Alive, uninjured	Released alive	Not hooked	N/A	Yes	No	V	D	0.0	5.0		
41	SAR	4	C-18/0	10	Squid	329	Alive, injured	Released alive	Armpit	No	No	No	I	B	2.0	3.5		
42	SAR	4	C-18/0	10	Squid	342	Alive, uninjured	Released alive	Not hooked	N/A	Yes	Yes	V	A	3.0	4.0		
43	SAR	4	C-18/0	10	Squid	230	Alive, unknown	Released alive	Not known if hooked	No	Yes	No	IV	C	2.0	5.0		

Appendix B, Table B1, 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	FEC	1	C-16/0	0	Squid	284	Alive, injured	Released alive	Swallowed, hook not visible	No	No	No	IV	C	0.3		64.0	60.0
2	FEC	1	C-16/0	0	Mackerel	338	Alive, injured	Released alive	Swallowed, hook not visible	No	No	No	IV	B	2.0	2.0		
3	FEC	2	C-16/0	0	Squid	135	Alive, injured	Released alive	Beak(internal)upper jaw	No	Yes	No	I	C	1.0	4.0		
4	FEC	2	C-16/0	0	Squid	212	Alive, injured	Released alive	Swallowed, hook not visible	No	No	No	IV	C	0.1	2.5		
5	FEC	2	C-16/0	0	Squid	347	Alive, injured	Released alive	Swallowed, hook partially visible	No	No	No	III	C	0.1	2.0		
6	FEC	2	C-16/0	0	Squid	347	Alive, injured	Released alive	Mouth, lower jaw, unknown	Partially	No	No	III	C	0.0	2.0		
7	GOM	2	C-16/0	0	Herring	86	Alive, injured	Released alive	Armpit	No	No	No	I	B	2.0	3.0		
8	SAB	2	C-18/0	10	Mackerel	140	Alive, injured	Released alive	Mouth, side, other	No	No	No	II	B	4.0	3.2		
9	FEC	3	C-16/0	0	Squid	248	Alive, injured	Released alive	Tongue	No	No	No	III	C	0.1	2.0		
10	MAB	3	C-18/0	10	Squid	189	Alive, injured	released alive	Beak(internal), lower jaw	No	No	No	I	C	1.0	3.0		
11	MAB	3	C-16/0	0	Squid	194	Alive, injured	released alive	Glottis	No	No	No	III	C	0.3		67.5	57.0
12	NEC	3	C-16/0	0	Squid	113	Alive, injured	Released alive	Beak(internal), lower jaw	Yes	No	No	I	D	0.0	3.0		
13	NEC	3	C-16/0	0	Squid	113	Alive, injured	Released alive	Beak(internal), lower jaw	Yes	No	No	I	D	0.0		64.0	
14	NEC	3	C-18/0 or C-16/0	10 or 0	Squid	171	Alive, injured	released alive	Swallowed, hook not visible	No	No	No	IV	C	0.2		61.8	

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	NEC	3	C-16/0	0	Squid	585	Alive, injured	released alive	Mouth, side, other	Yes	Yes	No	II	D	0.0		68.0	
16	NED	3	C-16/0	0	Mackerel	414	Alive, injured	Released alive	Beak(internal), lower jaw	Yes	No	No	I	D	0.0	3.0		
17	NED	3	C-16/0	0	Mackerel	360	Alive, injured	Released alive	Side, jaw joint	Yes	No	No	III	D	0.0		75.0	
18	SAB	3	C-16/0	0	Mackerel	338	Alive, injured	Released alive	Mouth, side, other	Yes	No	No	II	D	0.0		69.0	
19	CAR	4	C-16/0	0	Squid	158	Alive, injured	Released alive	Tongue	No	No	No	III	C	0.1	3.0		
20	FEC	4	C-16/0	0	Squid	297	Alive, uninjured	Released alive	Not hooked	Yes	Yes	No	V	D	0.0	3.0		
21	MAB	4	C-16/0	0	Squid	185	Alive, injured	Released alive	Mouth, lower jaw, other	Yes	No	No	II	D	0.0	4.0		
22	MAB	4	C-16/0	0	Squid	185	Alive, injured	Released alive	Tongue	Yes	Yes	No	III	D	0.0	3.0		
23	MAB	4	C-16/0	0	Squid or Mackerel	135 or 225	Alive, injured	Released alive	Mouth, lower jaw, other	Yes	No	No	II	D	0.0			57.5
24	MAB	4	C-16/0	0	Squid	167	Alive, injured	Released alive	Tongue	Yes	No	No	III	D	0.0		67.0	
25	MAB	4	C-16/0	0	Squid	171	Alive, injured	Released alive	Beak(internal)lower jaw	Yes	No	No	I	D	0.0		63.0	
26	MAB	4	C-16/0	0	Squid	203	Alive, injured	Released alive	Swallowed, hook partially visible	No	No	No	III	C	0.0		64.0	
27	MAB	4	C-16/0	0	Squid	167	Alive, injured	Released alive	Swallowed, hook not visible	No	No	No	IV	C	0.0		65.0	
28	MAB	4	C-18/0	10	Squid	225	Alive, injured	Released alive	Mouth, lower jaw, other	Yes	No	No	II	D	0.0		93.0	
29	NEC	4	C-16/0	0	Squid	180	Alive, injured	Released alive	Glottis	No	No	No	III	C	0.2		64.0	53.5
30	SAR	4	C-18/0	10	Squid	230	Alive, uninjured	Released alive	Not hooked/holding bait	Yes	No	No	V	D	0.0		55.0	49.5

Appendix B, Table B1, C. Other Species (GT = GreenTurtle, UN = Unidentified 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. Row	Release Cond. Col.	Line Left (ft)	CL Est. (ft)	CCL (cm)	N-N (cm)
GT	SAB	2	C-16/0	0	Mackerel	257	Alive, injured	Released alive	Unknown	No	No	No	IV	B	25.0	4.0		
UN	NED	3	C-16/0	0	Mackerel	495	Alive, injured	Released alive	Unknown	No	No	No	IV	B	Unk	2.0		

Appendix B cont.

Table B2: 2015 observer comments and serious injury codes for marine mammals are presented. Lengths (cm) are estimated visually by the observer. Interaction type categories are based on NMFS Serious Injury determination policy.

Animal #	Species	Length (cm)	Release Condition	Interaction Type	Observer Comments
1	Pilot Whale	270	Serious Injury	S6 - Gear attached to free-swimming animal with potential to be ingested or entangle	[Check boxes indicate animal was hooked, unknown whether in head/mouth or external. Line cut 25 feet of trailing line. Not entangled.] Only gangion involved. Location of hook unknown. Not know if animal had hook in mouth or snagged. Unable to get animal close to boat to cut line shorter. Alive, well underwater when line cut.
2	Pilot Whale	270	Serious Injury	S7b - Entangled before being freed without gear attached	[Check boxes indicate animal was not hooked. Entangled in mainline around tail/flukes. 2 feet of line left, wraps cut] Crew pulled the tail up out of the water to cut the mainline as close to the animal as possible. Swam away fine with other whales. NOTE: SI based on animal pulled out of water.
3	Sperm Whale	600	Serious Injury – Prorate 0.75	L10 – Evidence of Entanglement	[Check boxes indicate unknown if hooked, but note that interaction was with gangion/leader. Line cut with 10 feet of trailing line. Animal entangled around tail/flukes in mainline, gangion. Partial gear removed, 60 feet of line, with wraps not cut.] Entangled mainline was cut. Brought to boat with gangion/leader and cut with about 10' of leader remaining using short handled line cutters/clippers. Actively trying to escape entanglement. Gangion/leader cut made several kicks with tail and slowly swam away on surface. Too dark/far away to see if it eventually dove.
4	Pilot Whale	210	Serious Injury	S5a - Hook in head	[Check boxes indicate hooked, debrief note that line was coming from mouth. Line cut with 10 feet trailing. Not entangled] Pilot whale surfaces and captain immediately cut the line leaving approximately 10 feet of line on the hook. Pilot whale surfaced, swimming normally. Captain cut the line and the pilot whale dove down and swam normally and appeared unharmed. NOTE: In deterrence/avoidance section - While gear was being set out there were hundreds of pilot whales in the vicinity. No actions taken to above incidental take.
5	Beaked Whale	450	Serious Injury	S5a - Hook in head	[Check boxes indicate animal was hooked, unknown location. Drawing indicates line coming from mouth. Line cut, amount trailing unknown. Not entangled] Leader was cut using long pole line cutter. WBK swam to other side of boat. The wave wall was blocking my view of the release. I could not see how much line remaining. There was also what looked like net or twine on beak of animal. WBK swam away normally when released. The twine or netting around its beak looked to still be there when released.
6	Bottlenose Dolphin	210	Released Alive	S7b - Entangled before being freed without gear attached	[Check boxes indicate animal not hooked. Entangled around tail/flukes with mainline. Gear removed] Dolphin was brought alongside of boat and crew grabbed tail and untangled mainline by hand. No gear remaining on dolphin. Upon release dolphin swam away normally. There was another bottlenose dolphin at the scene waiting for the entangled dolphin. Entangled dolphin swam up to and away with other dolphin. Dolphin was injured with noticeable blood all around base of fluke.

Appendix B, Table B2 (cont.)

Animal #	Species	Length (cm)	Release Condition	Interaction Type	Observer Comments
7	Pilot Whale	300	Serious Injury	S5a - Hook in head	[Check boxes indicate animal hooked, line was going to mouth, hook not visible. Line cut with 4 ft remaining. Not entangled.] Crew tried pulling the whale as close to boat as possible for approximately 1 minute. When whale was close to boat, crew member cut leader. There was approximately 4 feet of line and hook remaining with whale. Once the line was cut the whale swam away normally and quickly out of sight.
8	Pilot Whale	300	Serious Injury	S5a - Hook in head	[Check boxes indicate animal hooked, location unknown, with line going to mouth/head area. Line cut with 7 feet remaining. Not entangled] Crew struggled with whale for over 2 minutes to get whale close enough to boat. Once whale was close enough line was cut leaving approximately 7 feet of line and hook still on whale. Upon being released whale took one breath and swam away normally. Animal was very strong and active.
9	Risso's Dolphin	240	Serious Injury	S7b - Entangled before being freed without gear attached	[Check boxes indicate animal not hooked. Entangled around tail/flukes in mainline. Gear removed from animal.] Dolphin seemed very exhausted and was easily pilled alongside to the boat. Crew untangled line from dolphin's fluke. No gear left on dolphin. Once dolphin was released, it was very slow to move. Eventually came to and swam away slowly. NOTE: SI due to slow response after release
10	Unid. Marine Mammal	180	Serious Injury	S5a - Hook in head	[Check boxes indicate animal was hooked, hook swallowed. Not entangled] Line was cut about 6 feet from the mammal. Animal swam away normally.
11	Pilot Whale	240	Released Alive	S7b - Entangled before being freed without gear attached	[Check boxes indicate animal was not hooked. Entangled in mainline around tail/flukes. Gear removed from animal] Whale was tail wrapped in mainline and crew struggled for a few minutes with whale until they were able to untangle mainline from fluke. Once the whale was free from the line whale swam away freely and normally. NOTE: SI due to prolonged struggle
12	Pilot Whale	240	Serious Injury	S5a - Hook in head	[Check boxes indicate animal was hooked, line going to head/mouth. Line cut leaving 6 feet trailing. Not entangled.] Whale first surfaced directly next to the boat and the line was cut immediately. ~6.0 ft of line and hook still attached to whale. After line was cut, whale took a breath and went underwater and swam away normally.
13	Risso's Dolphin	210	Serious Injury	S5a - Hook in head	[Check boxes indicate animal was hooked, line going to head/mouth. Line broke (not cut), no trailing gear. Not entangled] Crew fought to get dolphin close to boat for several minutes until eventually dolphin broke the line at the hook. Hook assumed to remain with dolphin. Dolphin broke the line underwater and was never seen again.

Appendix B, Table B2 (cont.)

Animal #	Species	Length (cm)	Release Condition	Interaction Type	Observer Comments
14	Pilot Whale	270	1	S5a - Hook in head	[Check boxes indicate animal was hooked, line going to head/mouth. Line cut, released with 6 feet of trailing line. Not entangled] Crew attempted to use experimental submarine line cutter, MPW stayed near surface so line cutter didn't go down. Capt. cut line as close as possible. No wraps. Disappeared quickly.
15	Pilot Whale	360	1	S5a - Hook in head	[Check boxes indicate animal was hooked in side of mouth. Line cut with 30 feet of trailing line remaining. Not entangled] The mammal surfaced, it was quickly identified, the line was cut. The mammal submerged and was never seen again. The interaction last about as long as a normal pilot whale surfacing for breath. At most 7 fathoms of gangion mono remained with the animal. Surfaced for breath normally. Dove and swam away normally after surfacing and line was cut.
16	Pilot Whale	270	1	S5a - Hook in head	[Check boxes indicate animal was hooked, line going to mouth but exact location unknown. Line cut with 0,5 feet of trailing gear. Not entangled] Underwater line cutter was sent down leader until it bottomed out on whale head, line cut against head. Line cut well below surface, not seen again on surface briefly once (1 sec)
17	Unid. Dolphin	240	0	S7b - Entangled before being freed without gear attached	[Check boxes indicate animal was not hooked. Entangled in mainline around tail/flukes. Gear removed from animal] Mammal pulled up by tail when a mass of entangled gear was being untangled. Big loop of mainline was around tail. Loop was cut and mammal was free of gear. It surfaced near the vessel after being freed and had no gear or injuries. Dolphin surfaced next to vessel after being freed and showed that no gear was still attached and it had no injuries.
18	Pilot Whale	360	1	S5a - Hook in head	[Check boxes indicate animal was hooked in side of mouth. Line cut with 30 feet of trailing line remaining. Not entangled.] Animal surfaced as usual to take a breath, that's when it was first ID as a marine mammal/pilot whale. Line was cut as soon as it was ID as a whale. Whale dove as normal after taking a breath at the surface and swam away normally. Surfaced for a breath normally. Dove and swam away normally when line was cut.
19	Pilot Whale	300	1	S5a - Hook in head	[Check boxes indicate animal was hooked in mouth or swallowed. Line cut with 2 feet of line remaining. Not entangled.] Gaff hooks and a long handled line cutter were used to untangle and cut line. The gangion that had hooked the animal were from a different vessel (the gangion "snap" was still attached; it was a different "gorilla" model than what my vessel uses.) Apparently, this animal was hooked by another boat but escaped with the entire gangion attached to it which later got entangled with our gear when the animal was likely feeding on our squid bait. Crew cut the animal free within a minute. It swam away vigorously]
20	Unid. Marine Mammal	270	0	S5a - Hook in head	[Check boxes indicate animal was not hooked/ Entangled around body in mainline. Gear removed from animal] The mammal was brought to the side of the vessel where a crew member used a long handled line cutter to remove the mainline wrap from the mid-section. No gear was left attached to the animal. After the mainline was removed from the animal it swam down and away from the vessel in a normal manner.

Appendix B, Table B2 (cont.)

Animal #	Species	Length (cm)	Release Condition	Interaction Type	Observer Comments
21	Pilot Whale	unk	Released Alive	unknown	[Check boxes indicate unknown if hooked or entangled. Amount of gear on animal on release unknown] Pilot whale was about 70ft from vessel. Line snapped before photos or samples could be taken. Animal breached surface multiple times until line snapped. Animal breached once more while swimming away from vessel. Never resurfaced.
22	Pilot Whale	unk	Serious Injury	S6 - Gear attached to free-swimming animal with potential to be ingested or entangle	[Check boxes indicate unknown if hooked or entangled. Released with 10 feet of trailing line]. Only saw crew cut line close enough not to damage animal any more. Saw animal very briefly when line was cut, but not long enough to picture or video. Enough to determine pilot whale but not whole body to estimate size. Swam away normally, still could not see full body
23	Pilot Whale	270	Serious Injury	S5a - Hook in head	[Check boxes indicate animal was hooked, hook swallowed. Line cut with 2 feet remaining. Not entangled.] Animal was pulled in close to the side of the boat and the line was cut with hand shears. Animal swam away vigorously for about 20 feet and then dove out of sight.
24	Pilot Whale	unk	Serious Injury	S6 - Gear attached to free-swimming animal with potential to be ingested or entangle	[Check boxes indicate unknown if hooked or entangled. Line cut with 10 feet remaining] Same as previous day. Only saw crew cut line close enough not to damage anymore. Saw animal very briefly when line was cut, but not long enough to picture or video. Enough to determine pilot whale, but not whole body to estimate size. Swam away normally, still could not see full body.
25	Pilot Whale	150	Serious Injury	S6 - Gear attached to free-swimming animal with potential to be ingested or entangle	[Check boxes indicate unknown if hooked or entangled. Line cut with 10 feet remaining] Only saw crew cut line close enough to not damage the animal anymore. Saw full animal very briefly when line was cut and it dove back under, but not long enough to picture or video. Swam away normally, saw full body when diving under.
26	Pilot Whale	360	Serious Injury	S5a - Hook in head	[Check boxes indicate animal was hooked, line coming out of left side of mouth. Line cut leaving 5 feet trailing. Not entangled] Pulled animal as close as possible to boat and used long-handled line cutter to break animal free as close to mouth as possible. Actively dove down and swam away.
27	Pilot Whale	210	Serious Injury	S5a - Hook in head	[Check boxes indicate animal was hooked in mouth, location not visible. Line cut with 20 feet of line trailing. Not entangled.] The crew struggled to pull the animal in close to the boat but the leader line eventually broke. There was about 20 feet of line still remaining attached to the animal. Animal swam away vigorously and quickly dove out of view once the leader broke.
28	Unid. Dolphin	150	Released Alive	S7b - Entangled before being freed without gear attached	[Check boxes indicate animal was hooked externally, location unknown. Drawing indicated hooked "somewhere on front of body". Line cut with 1 ft of trailing line. Entangled around tail/flukes in mainline. Gear removed from animal.] Dolphin was pulled as close to boat as crew could manage, long-handled line cutter used to cut line. At most 1 ft of line left. Dolphin fought strongly against line, as soon as line was cut dolphin swam away strongly and dove.

Appendix B, Table B2 (cont.)

Animal #	Species	Length (cm)	Release Condition	Interaction Type	Observer Comments
29	Pilot Whale	390	Serious Injury	S5a - Hook in head	[Check boxes indicate animal was hooked in mouth, hook not visible. Line cut leaving 25 ft trailing. Not entangled.] The crew struggled to pull the large animal in as close as possible but they ended up having to cut the line when the animal was still about 35 feet from the stern. There were two leaders tightly spun together leading to the animal's mouth. The animal swam away vigorously, diving immediately.
30	Pilot Whale	270	Released Alive	S5c – Hooked in any body part but hook removed or pulled out	[Check boxes indicate animal was hooked in mouth. Hook bent/broke and removed from animal. Released with all gear removed. Not entangled]
31	Common Dolphin	180	Serious Injury	S5a - Hook in head	[Check boxes indicate animal was hooked "somewhere in mouth". Line cut leaving 40-45 feet trailing. Not entangled.] The mammal surfaced away from the vessel. The captain and crew pulled a little line in an cut the leader leaving approximately 6-7 fathoms of line attached to the animal. When they got to the gangion that this animal was on they pulled in approximately 3 feet of line then cut it to release the line. The animal swam away normally with the rest of the line from the gangion still attached.
32	Pilot Whale	360	Serious Injury	S5a - Hook in head	[Check boxes indicate animal was hooked in mouth, lower portion of jaw. Line broke at hook, no line trailing. Not entangled.] Mammal popped the line at the hook on its own while diving after a breif surface for breath. Actively swimming, surfacing, breathing, diving.
33	Pilot Whale	300	Serious Injury	S5a - Hook in head	[Check boxes indicate animal was hooked in mouth, lower portion of jaw. Line broke with 30 ft remaining trailing. Not entangled.] During a surface/dive, line parted between the snap and the hook. Actively swimming, surfacing, breathing, diving.
34	Pilot Whale	240	Serious Injury	S5a - Hook in head	[Check boxes indicate animal was hooked in mouth, hook not visible. Line cut leaving 10 ft trailing. Not entangled.] The crew pulled the animal close to the vessel and then cut the leader (approximately 10 feet remained attached to the animal, from its mouth). The animal swam away energetically and dove immediately.
35	Pilot Whale	300	Released Alive	S5c – Hooked in any body part but hook removed or pulled out	[Check boxes indicate animal was hooked in mouth, noted could not see hook but could see the squid in the mouth, center of lower jaw. Hook pulled out. All gear removed. Not entangled.] Mainline was coming in, pilot whale was surfacing for air coming towards starboard side. Deckhand S**** start to handline the gangion. Pilot whale came up by the stern. Rolled, P**** (deckhand) tried using a long handled line cutter. Ineffective. Hook pulled out of the pilot whale's mouth. The hook pulled and the pilot whale submerged. I looked for it to surface, but never saw it rise within view. Before release it was swimming normally and looked healthy and in good shape.

Appendix B, Table B2 (cont.)

Animal #	Species	Length (cm)	Release Condition	Interaction Type	Observer Comments
36	Pilot Whale	270	Released Alive	S7b - Entangled before being freed without gear attached	[Check boxes indicate unknown if hooked. Animal entangled around front flipper in gangion/leader. Unknown if gear remained with animal.] The crew pulled the animal in close to the side of the boat. The leader was wrapped around the base of the animal's front right flipper. When the animal was about 10 feet from the side of the boat, the animal became disentangled from the line without the crew having to cut the line. I could not see whether or not the animal still had line attached to it, but one crewman said that the hook came out. NOTE: Video shows gangion pops, returns to vessel without hook. The animal immediately dove out of sight.
37	Pilot Whale	270	Serious Injury	S5a - Hook in head	[Check boxes indicate animal hooked in mouth, line cut leaving 10 feet trailing. Not entangled.] Animal was pulled in close to the side of the vessel and the line was cut. There was 10 feet of leader leading to the mouth of the animal remaining after cut. Swam away vigorously and then dove out of view.
38	Pilot Whale	360	Serious Injury	S5a - Hook in head	[Check boxes indicate animal hooked. Location unknown, but in the head/mouth area. Line cut leaving 30 feet trailing. Not entangled] It is believed the animal was hooked and not entangled, but hook location is unknown. Line was cut above weighted swivel with about 6 ft of line to the weighted swivel and an additional 24 ft of line to the hooks on the animal. In total about 30 ft of line remained with a weighted swivel and hook. Animal surfaced for a breath. Crew realized it was a marine mammal and cut the line. Animal not seen except for that single breath.
39	Pilot Whale	390	Serious Injury	S6 - Gear attached to free-swimming animal with potential to be ingested or entangle	[Check boxes indicate unknown if hooked or entangled. Line cut with 34 feet remaining with animal] Unknown if animal was hooked or entangled. Line was cut above weighted swivel with about 10 feet of line to weighted swivel and another 24 feet of line to the hook on or around the animal. In total about 34ft of line remained with a weighted swivel and hook. Animal pulled line from starboard midship to port stern. Animal came close to approaching surface when it was identified and cut loose. It was swimming strongly and never surfaced near vessel after released.
40	Pilot Whale	360	Serious Injury	S6 - Gear attached to free-swimming animal with potential to be ingested or entangle	[Check boxes indicate hooked, location unknown. Drawing indicates line attached to mouth/head. Line cut with 24 feet remaining. Unknown if entangled.] When crew noticed a pilot whale was on the line they pulled in tangled gear around the weighted swivel and cut below it. This left about 24 ft of monofilament and the hook remaining. As mainline was pulled up into the block the MPS was seen surfacing 3 times to take a quick breaths. Crew pulled in tangled gear around weighted swivel and the MPW surfaced about 3 more times in the same manner. When line was cut the MPS was seen taking a breath and then no longer observed afterward. Breath intervals of about 5 sec.
41	Pilot Whale	270	Serious Injury	S5a - Hook in head	[Check boxes indicate animal hooked in the mouth. Line cut with 15 feet of line trailing. Not entangled] Animal was pulled as close as possible towards the stern of the boat and then the line was cut. Approximately 15 feet of leader was left trailing from the animal's mouth once cut. Animal swam away vigorously and dove out of sight.
42	Common Dolphin	150	Released Alive	S7b - Entangled before being freed without gear attached	[Check boxes indicate animal not hooked. Entangled around mouth in mainline. All gear removed.] Crew laid on deck out of the tuna door to hold flippers while another crew member cut mono off from around its beak. When released, MCO swam away normally.

Appendix B, Table B2 (cont.)

Animal #	Species	Length (cm)	Release Condition	Interaction Type	Observer Comments
43	Pilot Whale	360	Serious Injury	S5a - Hook in head	[Check boxes indicate animal was hooked, internal. Line was not cut, unknown amount trailing. Entangled around front flipper, partial gear removal] MPW was hooked and entangled in gear around the head. Gear included mainline, gangion, leader and dropline. When MPW was near vessel crew attempted to cut away line. MPW then dove downwards under vessel and towards the stern. Animal broke free of gear and some was recovered. It is unknown how much remained on the MPW. MPW was alive but distressed upon capture. MPW dove under vessel and broke free of gear. MPW was not observed after released.
44	Pilot Whale	360	Serious Injury	S5a - Hook in head	[Check boxes indicate animal was hooked, internal location unknown. Entangled around tail/flukes, gear partially removed. Released with unknown amount of gear attached] MPW brought near vessel with hook near mouth and gangion partially wrapped around caudal peduncle. When MPW was near vessel it dove under and to stern. MPW resurfaced and gangion broke free. It is unknown how much gear remained of the gangion and leader. MPW broke free of gear at stern. 3 minutes after interaction a pair of MPWs were observed 400m off of the starboard stern. They were riding the swells and taking breaths at 5-10 second intervals.
45	Pilot Whale	360	Serious Injury	S5a - Hook in head	[Check boxes indicate animal was hooked, internal location unknown. Line cut leaving 24 feet trailing. Not entangled.] MPW neared vessel and dove down under the vessel and toward the stern. MPW surfaced 20ft off stern and line was quickly cut just below the weighted swivel. It is estimated that 24 feet of monofilament and a green light stick remained on the MPW. Up-on the release of the MPW the animal was taking strong breaths and swimming vigorously. After line was cut the MPW was not observed again.
46	Pilot Whale	360	Serious Injury	S5a - Hook in head	[Check boxes indicate animal was hooked, internal, location unknown. Line broke, unknown amount of gear remaining. Entangled around flipper and head/mouth, with mainline and gangion/leader. Partial gear removed.] MPW had gear heavily fouled around head and fluke. Animal very distressed and flopping at surface with awkward movements. When crew attempted to cut gear away, the MPW kicked under the vessel. Gear was partially cut away, but MPW broke free with some gear remaining. Upon release MPW was heavily distressed. When cut/broke free the MPW was not observed at surface again.
47	Pilot Whale	360	Serious Injury	S5a - Hook in head	[Check boxes indicate animal was hooked, noted in comments near head. Line cut leaving 24 feet of trailing line. Not entangled.] MPW hooked near head and not entangled. When brought along side line was quickly cut below weighted swivel. Estimated that 24ft of 300lb mono and a green lightstick remained attached to MPW. MPW took 8 strong breaths at short intervals before release. When line was cut the MPW was not observed again.
48	Pilot Whale	210	Serious Injury	S5a - Hook in head	[Check boxes indicate animal was hooked internally in mouth. Hook not visible. Line cut with less than 1 foot remaining. Not entangled] Mono was cut with long pole line cutter. Capt cut mono very close to MPW's mouth. MPW swam normally to the other two MPW nearby. They all swam away together.
49	Pilot Whale	300	Released Alive	S5d – Hooked in appendage or body without trailing gear that poses an entanglement risk	[Check boxes indicate animal was hooked in tail. Line cut leaving 3 feet of mono trailing. Not entangled.] Brought as near to vessel as necessary, used long handled line cutters to cut gangion. After line was cut, took a breath at the surface before swimming away and slowly diving.

