

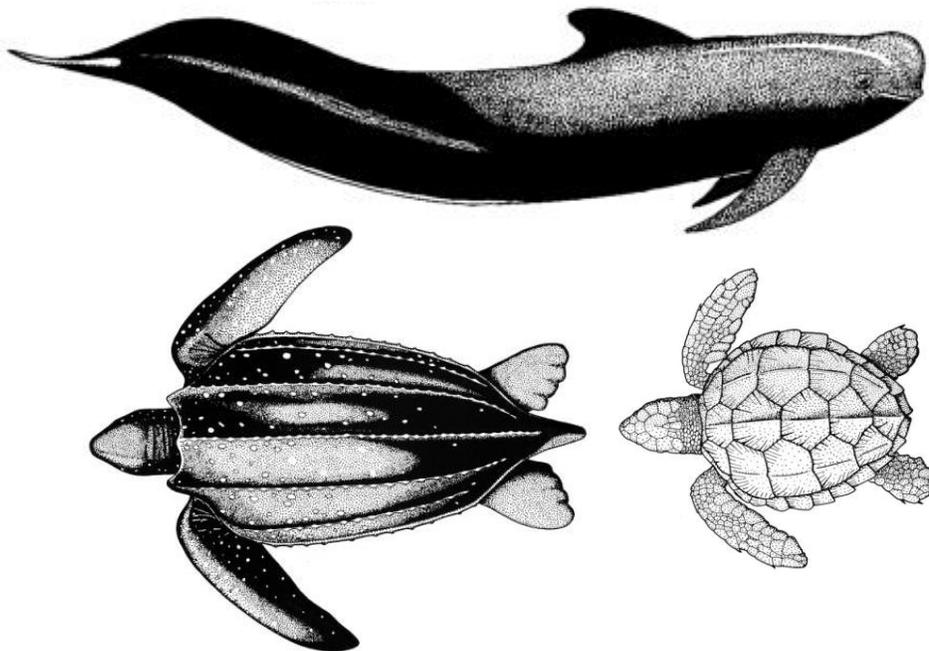


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**Estimated Bycatch of Marine Mammals and Sea Turtles in the U.S. Atlantic Pelagic Longline Fleet During 2013**

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## **Abstract**

The U.S. Atlantic Pelagic Longline fleet operates throughout the northwestern Atlantic Ocean, including along the U.S. coast from the Gulf of Mexico to New England, the waters of the Caribbean, and in international waters of the North Atlantic Ocean. The Atlantic longline fleet is defined as a Category I fishery under the Marine Mammal Protection Act, and it is also the subject of management under the Endangered Species Act due to interactions with leatherback (*Dermochelys coriacea*) and loggerhead (*Caretta caretta*) turtles. Total bycatch of marine mammals and turtles in the longline fishery was estimated for 2013 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 2013, there were an estimated 365.6 (270.2 – 494.8 [95% CI]) interactions with leatherback turtles and 377.1 (278.8 – 510.2 [95% CI]) interactions with loggerhead turtles. The primary marine mammals interacting with this fishery were pilot whales (*Globicephala* sp.) in Western North Atlantic waters with an estimated 123.8 (68.1 – 226.5 [95% CI]) interactions resulting in serious injury and an additional 59.7 (28.5 – 127.7 [95% CI]) interactions in which the animal was released alive. All interactions are most likely with short-finned pilot whales. Potential sources of bias and uncertainty in these bycatch estimates are discussed.

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## Introduction

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

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

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

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

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

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

fishery behavior, and quantify the interactions with protected species (Beerkircher *et al.*, 2004). In addition, a mandatory fishery logbook system (FLS) has been in place since 1992 requiring vessel captains to report fishing effort, gear characteristics, and commercial catch. These data have been used to generate annual estimates of marine mammal and turtle bycatch (Johnson *et al.*, 1999; Yeung, 1999a; Yeung 1999b; Yeung, 2001; Garrison 2003; Garrison and Richards, 2004; Garrison 2005; Fairfield-Walsh and Garrison, 2006, 2007, 2008; Garrison, Stokes, and Fairfield 2009; Garrison and Stokes, 2010, 2012a, 2012b, 2013).

In this report, marine mammal and marine turtle bycatch estimates are calculated for pelagic longline fishery effort during 2013. Bycatch rates (catch per 1000 hooks) are quantified based upon observer data by fishing area and quarter. The estimated bycatch rate is then multiplied by the total fishing effort (number of hooks) reported to the FLS program to obtain estimates of total interactions for each species of marine mammal and turtle.

## **Methodology**

### Geographic Stratification

Fishery observer effort is currently allocated among 10 large geographic areas and calendar quarter based upon the historical fishing range of the fleet (Figure 1). The target annual coverage is 8% of the total reported hooks, and observer effort is allocated randomly based upon reported fishing effort during the previous calendar year in each quarter/fishing area stratum (Beerkircher *et al.*, 2004). Between 15 April and 15 June of 2013, 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. The bycatch estimates developed for each species are stratified by fishing area and quarter to reflect the design of the observer program.

In addition to observation of regular fishing, the POP program participated in a cooperative research program that included longline fishing in the Mid-Atlantic bight and Northeast coastal areas to test the effectiveness of “weak hooks” on target species catch and bycatch rates. There was 100% observer coverage of all experimental sets, and the experimental fishing is not included in extrapolated bycatch estimates because it is not representative of the normal fishing effort. A total of 54 sets (23,906 hooks) were observed in experimental fishing.

Bycatch rates for quarter-area strata with more than 10 reported longline fishery sets that had no corresponding observer coverage in 2013 were replaced with previously observed mean bycatch rates from 2008-2012.

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). 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:

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

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:

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

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

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

and

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

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

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

and

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

where  $z_\alpha$  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 2013. 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 2013 (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.

## **Results and Discussion**

### Reported Fishing Effort and Observer Coverage

The total reported pelagic longline fishing effort included 7.5 million hooks during 2013 (Table 1A, Figure 2). The reported fishery effort included 10,457 sets during 2013, 1,474 of which were observed by the POP program (Tables 1B and 2B, Figure 2). The overall percent coverage during regular fishing was 14.0% expressed as a proportion of reported hooks and 14.1% as a proportion of reported sets (Table 3). The relatively high annual rate reflects the 57.7% coverage of the fishery during the second quarter in the GOM. Observer coverage for other area-quarter strata is shown in Table 3. The location of experimental fishing sets is shown in Figure 3.

Areas with no observer coverage during 2013 with more than 10 sets of reported fishing effort include the Caribbean (CAR) during Quarter 1, Northeast Coastal (NEC) during Quarter 2, Northeast Distant (NED) during Quarter 4, Tuna South (TUS) during Quarter 1, the Tuna North (TUN) during Quarters 1 and 4 (Table 3).

### Observed Protected Species Interactions

There were 72 observed interactions with leatherback turtles and 51 with loggerhead turtles (Table 4, Figure 4) in 2013 in regular and experimental fishing combined. The greatest number of observed leatherback takes occurred in the GOM during the Quarter 2 and in the NEC region during Quarter 3 (Table 4A, Figure 4). Loggerhead takes were observed in the greatest numbers in the NEC during the Quarter 3 and the MAB during the Quarter 4 (Table 4B, Figure 4). These totals include leatherback turtles taken during experimental fishing in the MAB (2 animals) and NEC (1 animal).

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 61 of the 123 turtles captured (Table 6). A total of 21 leatherbacks and 5 loggerheads were released either entangled or with the hook and line remaining that was  $> \frac{1}{2}$  the carapace length (Table 6).

There were 39 interactions observed with marine mammals (Table 7, Figure 5). This included 22 interactions with pilot whales in the Atlantic and 2 interactions with pilot whales in the GOM. Four of the pilot whale interactions occurred in experimental sets. Additional interactions of note included 1 beaked whale, 1 Minke whale, one pygmy sperm whale, and one harbor porpoise (Table 8). This was the first harbor porpoise interaction that has occurred in the longline fishery. Twenty-four of the observed marine mammal interactions were categorized as serious injuries including 15 pilot whales (Table 9). Thirteen of the serious injuries were due to animals being hooked

in the mouth/head, 7 cases involved being released with gear likely to further entangle the animal, and 4 cases occurred in animals freed from their entanglement but where other factors lead to a determination of serious injury (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 leatherback estimated interactions occurred in the NEC during Quarter 3 (70.7 animals), MAB during Quarter 4 (52.3 animals), GOM Quarter 1 (53.0), and GOM Quarter 2 (55.4, Table 10). For loggerhead turtles, the estimated interactions were highest in the NEC in Quarter 3 (123.1 animals) and the MAB in the Quarter 4 (82.2 animals, 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 in Pilot whale in the MAB (Quarter 3 and 4) and the SAB (Quarter 2).

#### Estimated Interactions in Unobserved Areas with Fishing Effort

The average bycatch rates and estimated catches in strata that were not observed during 2013 are summarized in Table 12. There were observed sea turtle takes in prior years in CAR-Quarter 1, TUN-Quarter 1, TUN-Quarter 4, and NEC-Quarter 2 for Leatherbacks. Loggerhead interactions occurred in CAR-Quarter 1, NEC-Quarter 2, and NED-Quarter 4 in prior years (Table 12a). Interactions with marine mammals in prior years included Risso's dolphins in NEC-Quarter 2 and False killer whale in TUN-Quarter 4 (Table 12b).

### Total Estimated Bycatch

There were an estimated total of 362.6 (267.2 – 491.8 [95% CI]) interactions with leatherback turtles during 2013 in regular fishing and an additional 3 interactions in experimental fishing (Table 13). The highest number of interactions occurred in the GOM and NEC areas. For loggerhead turtles, the estimated total number of interactions was 376.1 turtles (277.8 – 509.2 [95% CI], Table 13) with one additional take in experimental fishing in the NEC. The areas with the highest estimated interactions included the NEC and the MAB.

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 area), and Offshore (CAR, NED, SAR, and NCA). Offshore strata 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 effected species. The highest number of interactions and serious injuries were with Atlantic pilot whales with a total of 57.7 (CV = 0.413) animals released alive and 121.8 (CV = 0.320) animals seriously injured (Table 14a). There were an additional two serious injuries and two animals released alive during experimental fishing in the MAB. Based on the location of the catches, all of these pilot whales are presumed to be short-finned pilot whales. Interaction rates in the Gulf of Mexico were relatively low, with the highest number of serious injuries observed in Gulf of Mexico Risso's dolphins (15.2 animals, CV = 1.00; Table 14b).

### Trends in Bycatch Estimates

The leatherback take estimate reached a historical high in 2004, and prior to that had increased sharply since 1998 (Figure 6). A significant decrease in the leatherback bycatch rate and the annual estimated number of interactions with leatherback turtles occurred beginning in 2005 after the implementation of regulations in August 2004. The 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 estimate for 2013 is lower than that for 2012 and is more consistent with estimates during the period from 2004-2011.

Loggerhead turtle interactions since 2000 have been well below the historical highs that occurred in the mid-1990's (Figure 6). Following the implementation of regulations, the bycatch dropped in 2005, but rebounded to be slightly lower than the pre-regulation period. 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 pattern remains consistent with 2013 being a year with a lower estimate compared to 2012. Generally, the period from 2009-2013 has lower overall estimates of loggerhead takes relative to previous cycles despite a generally increasing trend in fishing effort over time.

For pilot whales (unspecified and short-finned pilot whales combined), the 2013 estimate was lower than that for 2012, but remains at an elevated level relative to the time

series since 1995 (Figure 7). The bycatch estimate for Risso's dolphins was much lower than that for 2012 (Figure 7).

### Sources of Bias and Uncertainty

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

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

The delta estimator was applied to calculate bycatch rates primarily to maintain consistency with previous estimates for this fishery (Johnson *et al.*, 1999; Yeung, 1999a; Yeung, 1999b; Yeung, 2001; Garrison, 2003; Garrison and Richards, 2004; Garrison, 2005; Fairfield-Walsh and Garrison, 2006, 2007, 2008; Garrison, Stokes, and Fairfield 2009; Garrison and Stokes, 2010, 2012a, 2012b, 2013). 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.

## Literature Cited

- Andersen, M. S., K. A. Forney, T. V. N. Cole, T. Eagle, R. Angliss, K. Long, L. Barre, L. Van Atta, D. Borggaard, T. Rowles, B. Norberg, J. Whaley, and L. Engleby. Differentiating Serious and Non-Serious Injury of Marine Mammals: Report of the Serious Injury Technical Workshop, 10-13 September 2008, Seattle, Washington. NOAA Technical Memorandum NMFS-OPR-39. 94 p.
- Angliss, R.P. and D.P. DeMaster. 1998. Differentiating serious and non-serious injury of marine mammals taken incidental to commercial fishing operations. NOAA Technical Memorandum NMFS-OPR-13: 48 p.
- Beerkircher, L.R., C.J. Brown, D.L. Abercrombie and D.W. Lee. 2004. SEFSC Pelagic Longline Observer Program data summary for 1992-2002, NOAA Technical Memorandum NMFS-SEFSC-522: 25 p.
- Fairfield-Walsh, C. and L. P. Garrison. 2006. Estimated Bycatch of Marine Mammals and Turtles in the U.S. Atlantic Pelagic Longline Fleet During 2005. NOAA Technical Memorandum NOAA NMFS-SEFSC-539: 52 p.
- Fairfield-Walsh, C. and L. P. Garrison. 2007. Estimated Bycatch of Marine Mammals and Turtles in the U.S. Atlantic Pelagic Longline Fleet During 2006. NOAA Technical Memorandum NOAA NMFS-SEFSC-560: 54 p.
- Fairfield, C. and L.P. Garrison. 2008. Estimated Bycatch of Marine Mammals and Sea Turtles in the U.S. Atlantic Pelagic Longline Fleet During 2007. NOAA Technical Memorandum NOAA NMFS-SEFSC-572: 62p.
- Garrison, L.P. 2003. Estimated Bycatch of Marine Mammals and Turtles in the U.S. Atlantic Pelagic Longline Fleet During 2001-2002. NOAA Technical Memorandum NOAA NMFS-SEFSC-515: 52 p.
- Garrison, L. P. 2005. Estimated Bycatch of Marine Mammals and Turtles in the U.S. Atlantic Pelagic Longline Fleet During 2004. NOAA Technical Memorandum NMFS-SEFSC-531: 52 p.
- Garrison, L. P. and P. M. Richards. 2004. Estimated Bycatch of Marine Mammals and Turtles in the U.S. Atlantic Pelagic Longline Fleet During 2003. NOAA Technical Memorandum NMFS-SEFSC-527: 57 p.
- Garrison, L.P., Stokes, L. and C. Fairfield. 2009. Estimated Bycatch of Marine Mammals and Sea Turtles in the U.S. Atlantic Pelagic Longline Fleet During 2008. NOAA Technical Memorandum NOAA NMFS-SEFSC-591: 63p.
- Garrison, L.P. and Stokes, L. 2010. Estimated Bycatch of Marine Mammals and Sea Turtles in the U.S. Atlantic Pelagic Longline Fleet During 2009. NOAA Technical Memorandum NOAA NMFS-SEFSC-607: 63p.

- Garrison, L.P and Stokes, L. 2012a. Estimated Bycatch of Marine Mammals and Sea Turtles in the U.S. Atlantic Pelagic Longline Fleet During 2010. NOAA Technical Memorandum NOAA NMFS-SEFSC-624: 59p.
- Garrison, L.P and Stokes, L. 2012b. Estimated Bycatch of Marine Mammals and Sea Turtles in the U.S. Atlantic Pelagic Longline Fleet During 2011. NOAA Technical Memorandum NOAA NMFS-SEFSC-632: 61p.
- Garrison, L.P and Stokes, L. 2013. Estimated Bycatch of Marine Mammals and Sea Turtles in the U.S. Atlantic Pelagic Longline Fleet During 2012. NOAA Technical Memorandum NOAA NMFS-SEFSC-655: 62p.
- Johnson, D.R., C. Yeung, and C.A. Brown. 1999. Estimates of marine mammal and marine turtle bycatch by the U.S. Atlantic pelagic longline fleet in 1992-1997. NOAA Technical Memorandum NMFS-SEFSC-418: 70 p.
- NMFS. 2003. Guide for complying with the regulations for Atlantic tunas, swordfish, sharks, and billfish. September 2003.  
[http://www.nmfs.noaa.gov/sfa/hms/2003\\_ComplianceGuide.pdf](http://www.nmfs.noaa.gov/sfa/hms/2003_ComplianceGuide.pdf)
- NMFS 2012a. Process for distinguishing serious from non-serious injury of marine mammals. National Marine Fisheries Service Policy Directive PD 02-038. January 2012. <http://www.nmfs.noaa.gov/directives>.
- NMFS 2012b. Process for distinguishing serious from non-serious injury of marine mammals: Process for injury determinations. National Marine Fisheries Service Policy Directive PD 02-038-01. January 2012.  
<http://www.nmfs.noaa.gov/directives>.
- Pennington, M. 1983. Efficient estimators of abundance for fish and plankton surveys. *Biometrics* 39: 281-286.
- Southeast Fisheries Science Center. 2012. Protocols for categorizing sea turtles for post-release mortality estimates. NMFS Southeast Fisheries Science Center Contribution PRD-2011-07, August 17, 2011, revised February 2012, 8p. Available from: Southeast Fisheries Science Center, 75 Virginia Beach Dr., Miami, FL 33149;  
[http://www.sefsc.noaa.gov/turtledocs/UPR\\_SEFSC\\_PHMortality\\_2012.pdf](http://www.sefsc.noaa.gov/turtledocs/UPR_SEFSC_PHMortality_2012.pdf)
- Watson, J.W., S.P. Epperly, A.K. Shah and D.G. Foster. 2005. Fishing methods to reduce sea turtle mortality associated with pelagic longlines. *Canadian Journal of Fisheries and Aquatic Science* 62: 965-981.
- Yeung, C. 1999a. Revised mortality estimates of marine mammal bycatch by the U.S. Atlantic pelagic longline fleet in 1992-1997 based on serious injury guidelines. NOAA Technical Memorandum NMFS-SEFSC-429: 23 p.

Yeung, C. 1999b. Estimates of marine mammal and marine turtle bycatch by the U.S. Atlantic pelagic longline fleet in 1998. NOAA Technical Memorandum NMFS-SEFSC-430: 26 p.

Yeung, C. 2001. Estimates of marine mammal and marine turtle bycatch by the U.S. Atlantic pelagic longline fleet in 1999-2000. NOAA Technical Memorandum NMFS-SEFSC-467: 43 p.

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**Table 1.** Total amount of fishing effort reported to the pelagic longline logbook program during 2013 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	19.4	463.2	588.7	124.5	NR	NR	0	246.8	97.6	24.2	NR	1,582.7
2	0	252.2	606.4	194.0	NR	49.0	0	693.3	5.2	60.8	0	1,864.7
3	0	269.4	653.4	624.5	0	393.8	295.8	128.5	0	NR	0	2,397.8
4	NR	259.2	464.0	484.0	0	64.9	53.3	116.3	139.6	NR	0	1,643.9
<b>Total</b>	<b>NR</b>	1,243.9	2,312.5	1,427.0	6.9	NR	349.1	1,185.0	242.3	160.0	NR	7,489.2

**B. Number of Sets**

Quarter	CAR	FEC	GOM	MAB	NCA	NEC	NED	SAB	SAR	TUN	TUS	Total
1	22	628	870	189	NR	NR	0	298	107	32	NR	2,163
2	0	390	896	289	NR	58	0	855	6	72	0	2,570
3	0	469	950	957	0	438	288	220	0	NR	0	3,366
4	NR	401	653	772	0	82	53	161	142	NR	0	2,358
<b>Total</b>	<b>NR</b>	1,888	3,369	2,207	7	NR	341	1,534	255	203	NR	10,457

**Table 2.** Total amount of fishing effort observed during 2013 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	0	42.4	142.9	NR	0	0	-	21.4	NR	0	0	225.4
2	-	17.7	350.1	24.1	NR	0	-	45.5	0	NR	-	445.7
3	-	22.6	34.7	47.1	-	54.1	NR	NR	-	NR	-	199.7
4	NR	14.7	44.7	59.8	-	20.3	0	2.5	31.6	0	-	176.1
<b>Total</b>	<b>NR</b>	97.5	572.3	<b>NR</b>	<b>NR</b>	74.4	<b>NR</b>	<b>NR</b>	<b>NR</b>	10.1	0.0	1,046.8

**B. Number of Sets**

Quarter	CAR	FEC	GOM	MAB	NCA	NEC	NED	SAB	SAR	TUN	TUS	Total
1	0	54	203	NR	0	0	-	26	NR	0	0	304
2	-	25	508	31	NR	0	-	60	0	NR	-	633
3	-	41	55	78	-	67	NR	NR	-	NR	-	283
4	NR	27	65	99	-	23	0	5	30	0	-	254
<b>Total</b>	<b>NR</b>	147	831	<b>NR</b>	<b>NR</b>	90	<b>NR</b>	<b>98</b>	<b>NR</b>	13	0	1,474

**Table 3.** Percentage of reported fishing effort observed during 2013 by quarter and fishing area by A) Number of hooks and B) Number of sets. Dashes indicate no reported fishing effort. Cells in which >10 longline sets were reported with no observer coverage are indicated in bold. Totals indicate overall percentage coverage by area and quarter and exclude experimental fishing.

**A. Number of Hooks**

Quarter	CAR	FEC	GOM	MAB	NCA	NEC	NED	SAB	SAR	TUN	TUS	Total
1	0.0	9.2	24.3	1.9	0.0	0.0	-	8.7	16.7	0.0	0.0	14.2
2	-	7.0	57.7	12.4	80.0	0.0	-	6.6	0.0	8.5	-	23.9
3	-	8.4	5.3	7.5	-	13.7	10.8	3.3	-	15.4	-	8.3
4	12.5	5.7	9.6	12.4	-	31.2	0.0	2.2	22.6	0.0	-	10.7
<b>Total</b>	6.3	7.8	24.8	9.3	45.0	14.6	9.1	6.2	19.8	6.3	0.0	14.0

**B. Number of Sets**

Quarter	CAR	FEC	GOM	MAB	NCA	NEC	NED	SAB	SAR	TUN	TUS	Total
1	0.0	8.6	23.3	1.6	0.0	0.0	-	8.7	16.8	0.0	0.0	14.1
2	-	6.4	56.7	10.7	75.0	0.0	-	7.0	0.0	8.3	-	24.7
3	-	8.7	5.8	8.2	-	15.3	9.7	3.2	-	15.9	-	8.4
4	12.8	6.7	10.0	12.8	-	28.0	0.0	3.1	21.1	0.0	-	10.8
<b>Total</b>	8.2	7.8	24.7	9.6	42.9	15.5	8.2	6.4	18.8	6.4	0.0	14.1

**Table 4.** Total number of observed interactions with A) Leatherback turtles, B) Loggerhead turtles, and C) All sea turtles in the pelagic longline fishery during 2013 by quarter and fishing area. Dashes indicate areas where there was no observed fishing effort, and an X indicates an area where no effort was reported. Counts include turtles taken during experimental fishing.

**A. Leatherback Turtles**

Quarter	CAR	FEC	GOM	MAB	NCA	NEC	NED	SAB	SAR	TUN	TUS	Total
1	-	1	12	0	-	-	X	1	1	-	-	15
2	X	1	29	0	0	-	X	0	X	0	X	30
3	X	0	1	1	X	11	1	0	-	0	X	14
4	0	1	1	7	X	4	-	0	0	-	X	13
<b>Total</b>	<b>0</b>	<b>3</b>	<b>43</b>	<b>8</b>	<b>0</b>	<b>15</b>	<b>1</b>	<b>1</b>	<b>1</b>	<b>0</b>	<b>-</b>	<b>72</b>

**B. Loggerhead Turtles**

Quarter	CAR	FEC	GOM	MAB	NCA	NEC	NED	SAB	SAR	TUN	TUS	Total
1	-	1	2	0	-	-	X	0	1	-	-	4
2	X	0	4	1	0	-	X	1	X	0	X	6
3	X	2	0	0	X	18	4	0	-	0	X	24
4	0	1	1	11	X	3	-	0	1	-	X	17
<b>Total</b>	<b>-</b>	<b>4</b>	<b>7</b>	<b>12</b>	<b>0</b>	<b>21</b>	<b>4</b>	<b>1</b>	<b>2</b>	<b>0</b>	<b>-</b>	<b>51</b>

**C. All Turtles**

Quarter	CAR	FEC	GOM	MAB	NCA	NEC	NED	SAB	SAR	TUN	TUS	Total
1	-	2	14	0	-	-	X	1	2	-	-	19
2	X	1	33	1	0	-	X	1	X	0	X	36
3	X	2	1	1	X	29	5	0	-	0	X	38
4	0	2	2	18	X	7	-	0	1	-	X	30
<b>Total</b>	<b>0</b>	<b>7</b>	<b>50</b>	<b>20</b>	<b>0</b>	<b>36</b>	<b>5</b>	<b>2</b>	<b>3</b>	<b>0</b>	<b>-</b>	<b>123</b>

**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 2013. Hook location information is recorded on the sea turtle life history form (Appendix A) by the observer. Counts include turtles taken during experimental fishing.

**A. Capture condition**

Species	Alive, Uninjured	Alive, Unknown	Alive, injured	Total
Leatherback	13	5	54	72
Loggerhead	1	1	49	51
<b>Total</b>	<b>14</b>	<b>6</b>	<b>103</b>	<b>123</b>

**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	14	5	8	1	0	7	37	72
Loggerhead	1	2	1	4	13	26	4	51
<b>Total</b>	<b>15</b>	<b>7</b>	<b>9</b>	<b>5</b>	<b>13</b>	<b>33</b>	<b>41</b>	<b>123</b>

**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	14	0	2	0	0	0	12	28
Loggerhead	1	1	0	1	2	24	4	33
<b>Total</b>	<b>1</b>	<b>1</b>	<b>2</b>	<b>1</b>	<b>2</b>	<b>24</b>	<b>16</b>	<b>61</b>

**Table 6.** Release status and gear removal for sea turtles captured and released alive in the U.S. Atlantic Pelagic Longline Fishery during 2013. Counts include turtles captured during experimental fishing. Condition columns refer to post-release mortality categories in Table 1 of SEFSC 2012.

<b>Release Status</b>	<b>Leatherback</b>	<b>Loggerheads</b>
Released entangled (Condition Column A)	4	0
Released with hook and line $\geq$ $\frac{1}{2}$ carapace length (Condition Column B)	17	5
Released with hook and line $<$ $\frac{1}{2}$ carapace length (Condition Column C)	23	13
Released with all gear removed (Condition Column D)	28	33

**Table 7.** Total number of marine mammals observed in interactions with the pelagic longline fishery during 2013 by quarter and fishing area. Dashes indicate areas where there was no observed fishing effort, and an X indicates an area where no effort was reported. Counts include five interactions observed during experimental fishing.

<b>Quarter</b>	<b>CAR</b>	<b>FEC</b>	<b>GOM</b>	<b>MAB</b>	<b>NCA</b>	<b>NEC</b>	<b>NED</b>	<b>SAB</b>	<b>SAR</b>	<b>TUN</b>	<b>TUS</b>	<b>Total</b>
1	-	3	2	0	-	-	X	1	0	-	-	<b>6</b>
2	X	0	6	0	0	-	X	1	X	0	X	<b>7</b>
3	X	0	1	12	X	0	1	0	-	0	X	<b>14</b>
4	0	0	0	12	X	0	-	0	0	-	X	<b>12</b>
<b>Total</b>	<b>0</b>	<b>3</b>	<b>9</b>	<b>24</b>	<b>0</b>	<b>0</b>	<b>1</b>	<b>2</b>	<b>0</b>	<b>0</b>	<b>-</b>	<b>39</b>

**Table 8.** Marine mammal interactions with the pelagic longline fishery during 2013 by species, quarter, and fishing area. Exp indicates interactions observed during experimental fishing.

<b>Species</b>	<b>Quarter</b>	<b>Fishing Area</b>	<b>Serious Injuries</b>	<b>Released Alive</b>	<b>Total</b>
Unidentified dolphins	2	GOM	2	0	2
Unidentified dolphins	4	MAB	0	1	1
Bottlenose dolphin	3	MAB-Exp	0	1	1
Bottlenose dolphin	4	MAB	0	1	1
Pantropical spotted dolphin	1	GOM	0	1	1
Pantropical spotted dolphin	2	GOM	1	1	2
Risso's dolphin	3	GOM	1	0	1
Risso's dolphin	3	NED	1	0	1
Harbor porpoise	3	MAB	1	0	1
Unidentified marine mammal	1	FEC	1	0	1
Pilot whale	1	SAB	0	1	1
Pilot whale	2	GOM	1	1	2
Pilot whale	2	SAB	1	0	1
Pilot whale	3	MAB	2	4	6
Pilot whale	3	MAB-Exp	2	2	4
Pilot whale	4	MAB	8	2	10
Minke whale	1	FEC	1	0	1
Pygmy sperm whale	1	GOM	0	1	1
Beaked whale	1	FEC	1	0	1
<b>Totals</b>			<b>21</b>	<b>13</b>	<b>39</b>

**Table 9.** Summary of release condition and serious injury types for marine mammals observed in the pelagic longline fishery during 2013. Serious injury determinations were based upon written observer comments (Appendix B). “Entangled” indicates that the animal was released with line remaining attached that is likely to further entangle the animal. Codes indicate table injury categories defined in the Small Cetacean Serious Injury Guidelines (NMFS, 2012).

Species	Alive	Dead	Serious Injury Type			Serious Injury Total	Total
			Hooked in Head/Mouth (S5a)	Gear Attached Likely to Entangle (S6)	Freed After Entanglement (S7b)		
Unidentified dolphin	1	0	1	0	1	2	3
Bottlenose dolphin	2	0	0	0	0	0	2
Pantropical spotted dolphin	2	0	1	0	0	1	3
Risso’s dolphin	0	0	0	0	2	2	2
Harbor porpoise	0	0	0	1	0	1	1
Unidentified marine mammal	0	0	0	1	0	1	1
Pilot whale	9	0	10	4	1	15	24
Minke whale	0	0	1	0	0	1	1
Pygmy sperm whale	1	0	0	0	0	0	1
Beaked whale	0	0	0	1	0	1	1
<b>Total</b>	<b>15</b>	<b>0</b>	<b>13</b>	<b>7</b>	<b>4</b>	<b>24</b>	<b>39</b>

**Table 10.** Estimated interactions with sea turtles in the pelagic longline fishery during 2013 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	54	0.027	1.000	463.2	12.7
Leatherback	GOM	1	11	203	0.090	0.310	588.7	53.0
Leatherback	SAB	1	1	26	0.044	1.000	246.8	10.8
Leatherback	SAR	1	1	NR	0.062	1.000	97.6	6.1
Leatherback	FEC	2	1	25	0.057	1.000	252.2	14.4
Leatherback	GOM	2	25	508	0.091	0.210	606.4	55.4
Leatherback	GOM	3	1	55	0.021	1.000	653.4	13.7
Leatherback	NEC	3	7	67	0.179	0.402	393.8	70.7
Leatherback	NED	3	1	28	0.035	1.000	295.8	10.5
Leatherback	FEC	4	1	27	0.051	1.000	259.2	13.3
Leatherback	GOM	4	1	65	0.047	1.000	464.0	22.0
Leatherback	MAB	4	7	99	0.108	0.373	484.0	52.3
Leatherback	NEC	4	3	23	0.295	0.593	64.9	19.1

Table 10 – Continued

## B. Loggerheads

Species	Area	Quarter	# Positive Sets	# Observed Sets	Mean CPUE	CV	Hooks Reported (x1000)	Estimated Catch
Loggerhead	FEC	1	1	54	0.027	1.000	463.2	12.5
Loggerhead	GOM	1	1	203	0.009	1.000	588.7	5.6
Loggerhead	SAR	1	1	<b>NR</b>	0.062	1.000	97.6	6.1
Loggerhead	GOM	2	4	508	0.008	0.521	606.4	4.8
Loggerhead	MAB	2	1	31	0.038	1.000	194.0	7.3
Loggerhead	SAB	2	1	60	0.020	1.000	693.3	13.8
Loggerhead	FEC	3	2	41	0.087	0.709	269.4	23.3
Loggerhead	NEC	3	13	67	0.313	0.279	393.8	123.1
Loggerhead	NED	3	4	28	0.119	0.475	295.8	35.3
Loggerhead	FEC	4	1	27	0.054	1.000	259.2	13.9
Loggerhead	GOM	4	1	65	0.021	1.000	464.0	9.8
Loggerhead	MAB	4	9	99	0.170	0.345	484.0	82.2
Loggerhead	NEC	4	3	23	0.145	0.562	64.9	9.4
Loggerhead	SAR	4	1	30	0.034	1.000	139.6	4.8

**Table 11.** Estimated A) Serious Injury and B) Released Alive marine mammals in the pelagic longline fishery during 2013 by fishing area and quarter. NR indicates strata where effort cannot be reported due to confidentiality considerations. Totals exclude experimental sets.

**A. Serious Injury**

Species	Area	Quarter	# Positive Sets	# Observed Sets	Mean CPUE	CV CPUE	# Hooks Reported (x1000)	Estimated Catch
Unidentified dolphin	GOM	2	2	508	0.005	0.708	606.4	3.1
Pantropical spotted dolphin	GOM	2	1	508	0.004	1.000	606.4	2.1
Risso's dolphin	GOM	3	1	55	0.023	1.000	653.4	15.2
Risso's dolphin	NED	3	1	28	0.026	1.000	295.8	7.8
Harbor porpoise	MAB	3	1	78	0.022	1.000	624.5	13.6
Unid. Marine mammal	FEC	1	1	54	0.027	1.000	463.2	12.5
Pilot whale	GOM	2	1	508	0.004	1.000	606.4	2.5
Pilot whale	SAB	2	1	60	0.037	1.000	693.3	26.0
Pilot whale	MAB	3	3	78	0.052	0.574	624.5	32.3
Pilot whale	MAB	4	8	99	0.131	0.351	484.0	63.5
Minke whale	FEC	1	1	54	0.027	1.000	463.2	12.4
Beaked whale	FEC	1	1	54	0.024	1.000	463.2	11.0

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

<b>Species</b>	<b>Area</b>	<b>Quarter</b>	<b># Positive Sets</b>	<b># Observed Sets</b>	<b>Mean CPUE</b>	<b>CV CPUE</b>	<b># Hooks Reported (x1000)</b>	<b>Estimated Catch</b>
Unidentified dolphin	MAB	4	1	99	0.016	1.000	484.0	7.7
Bottlenose dolphin	MAB	4	1	99	0.017	1.000	484.0	8.1
Pantropical spotted dolphin	GOM	1	1	203	0.008	1.000	588.7	4.5
Pantropical spotted dolphin	GOM	2	1	508	0.004	1.000	606.4	2.2
Pilot whale	SAB	1	1	26	0.051	1.000	246.8	12.6
Pilot whale	GOM	2	1	508	0.006	1.000	606.4	3.6
Pilot whale	MAB	3	3	78	0.049	0.571	624.5	30.9
Pilot whale	MAB	4	2	99	0.030	0.704	484.0	14.3
Pygmy sperm whale	GOM	1	1	203	0.006	1.000	588.7	3.6

**Table 12.** Bycatch rates for A) sea turtles and B) marine mammals in area-quarter strata that were not observed in 2013. NR indicates strata where effort cannot be reported for 2013 due to confidentiality restrictions.

A. Sea Turtles

Bycatch Rate Source	Species	Area	Quarter	# Positive Sets	#Observed Sets	Mean CPUE	CV CPUE	# Hooks Reported (X1000) 2013	Estimated Catch 2013
Quarterly 08-12	Leatherback	CAR	1	1	14	0.148	1.000	19.4	2.9
Quarterly 08-12	Leatherback	TUN	1	1	21	0.045	1.000	NR	1.1
Quarterly 08-12	Leatherback	NEC	2	3	53	0.065	0.577	49.0	3.2
Quarterly 08-12	Leatherback	TUN	4	1	21	0.031	1.000	NR	1.3
Quarterly 08-12	Loggerhead	CAR	1	1	14	0.184	1.000	19.4	3.6
Quarterly 08-12	Loggerhead	NEC	2	6	53	0.138	0.409	49.0	6.8
Quarterly 08-12	Loggerhead	NED	4	4	23	0.262	0.493	53.3	14.0

B. Marine Mammals

Bycatch Rate Source	Species	Area	Quarter	# Positive Sets	#Observed Sets	Mean CPUE	CV CPUE	# Hooks Reported (X1000) 2013	Estimated Catch 2013
Quarterly 08-12	Risso's dolphin	NEC	2	2	53	0.040	0.703	49.0	1.9
Quarterly 08-12	False killer whale	TUN	4	1	21	0.035	1.000	NR	1.5

**Table 13.** Total estimated interactions and experimental takes for A) Leatherback and B) Loggerhead turtles in the pelagic longline fishery during 2013 by fishing area. This includes estimates for strata that were not observed during 2013.

**A. Leatherbacks**

Area	Total	Total CV	Total 95% Confidence Interval	Experimental Takes
CAR	2.9	1.000	0.6 - 14.7	-
FEC	40.5	0.578	14.1 - 115.9	-
GOM	144.2	0.228	92.8 - 224.2	-
MAB	52.3	0.373	25.8 - 106.1	1
NCA	0	-	-	-
NEC	93.0	0.329	49.6 - 174.4	2
NED	10.5	1.000	2 - 53.6	-
SAB	10.8	1.000	2.1 - 55	-
SAR	6.1	1.000	1.2 - 30.9	-
TUN	2.4	0.710	0.7 - 8.5	-
TUS	0	1.000	0.6 - 14.7	-
<b>Total</b>	<b>362.6</b>	<b>0.156</b>	<b>267.2 – 491.8</b>	<b>3</b>

**B. Loggerheads**

Area	Total	Total CV	Total 95% Confidence Interval	Experimental Takes
CAR	3.6	1.000	0.7 - 18.3	-
FEC	49.7	0.502	19.6 - 125.9	-
GOM	20.1	0.574	7.1 - 57.2	-
MAB	89.5	0.327	47.9 - 167.2	0
NCA	0	-	-	-
NEC	139.2	0.250	85.9 - 225.8	1
NED	49.3	0.368	24.5 - 99.1	-
SAB	13.8	1.000	2.7 - 70.3	-
SAR	10.9	0.712	3.1 - 38.1	-
TUN	0	-	-	-
TUS	0	-	-	-
<b>Total</b>	<b>376.1</b>	<b>0.155</b>	<b>277.8 – 509.2</b>	<b>1</b>

**Table 14.** Total estimated interactions with marine mammals in the pelagic longline fishery during 2013.

**A. Atlantic**

Species	Estimated Alive	CV Alive	Exp. Alive	Total Alive	Estimated Serious Injury	CV Serious Injury	Exp. SI	Total SI
Unidentified dolphin	7.7	1.000	0	7.7	0	-	0	0
Bottlenose dolphin	8.1	1.000	1	9.1	0	-	0	0
Risso's dolphin	0	-	0	0	1.9	0.703	0	1.9
Harbor porpoise	0	-	0	0	13.6	1.000	0	13.6
Unidentified marine mammal	0	-	0	0	12.5	1.000	0	12.5
Pilot whale	57.7	0.413	2	59.7	121.8	0.320	2	123.8
Minke whale	0	-	0	0	12.4	1.000	0	12.4
Beaked whale	0	-	0	0	11.0	1.000	0	11.0

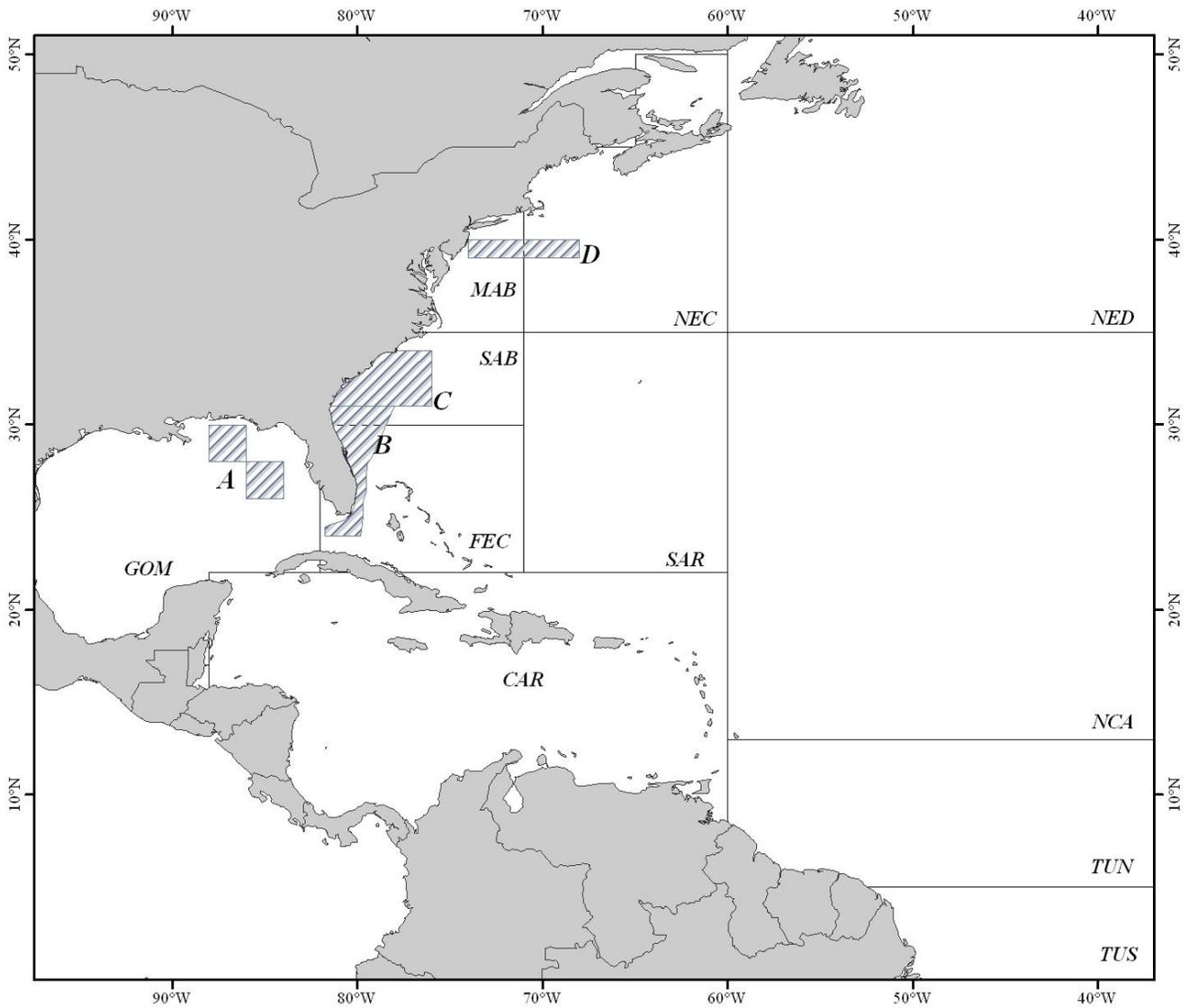
**B. Gulf of Mexico**

Species	Estimated Alive	CV Alive	Exp. Alive	Total Alive	Estimated Serious Injury	CV Serious Injury	Exp. SI	Total SI
Unidentified dolphin	0	-	-	0	3.1	0.708	-	3.1
Pantropical spotted dolphin	6.7	0.749	-	6.7	2.1	1.000	-	2.1
Risso's dolphin	0	-	-	0	15.2	1.000	-	15.2
Pilot whale	3.6	1.000	-	3.6	2.5	1.000	-	2.5
Pygmy sperm whale	3.6	1.000	-	3.6	0	-	-	0

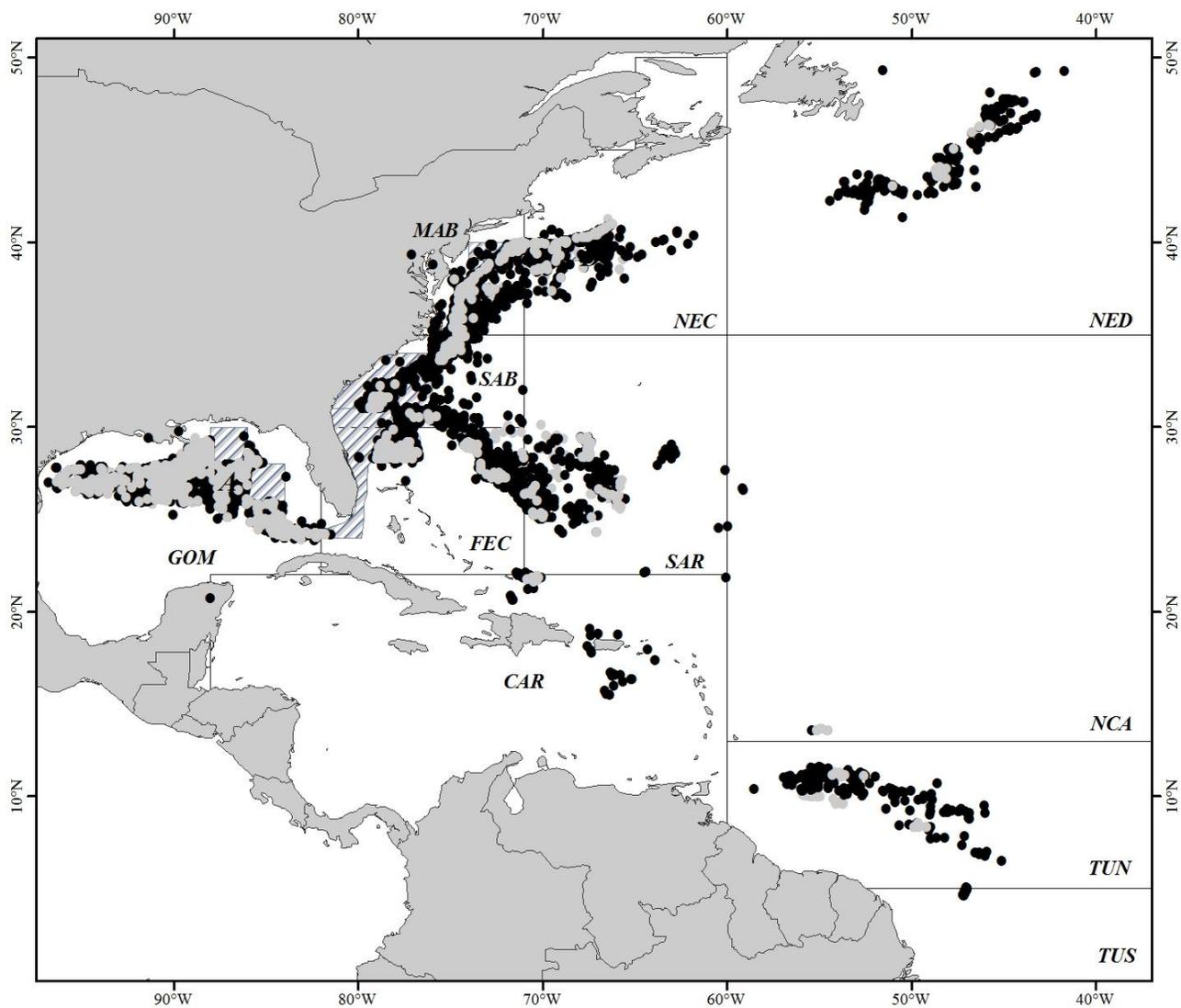
**C. Offshore**

Species	Estimated Alive	CV Alive	Exp. Alive	Total Alive	Estimated Serious Injury	CV Serious Injury	Exp. SI	Total SI
Risso's dolphin	0	-	-	0	7.8	1.000	-	7.8
False Killer whale	1.5	1.000	-	1.5	0	-	-	0

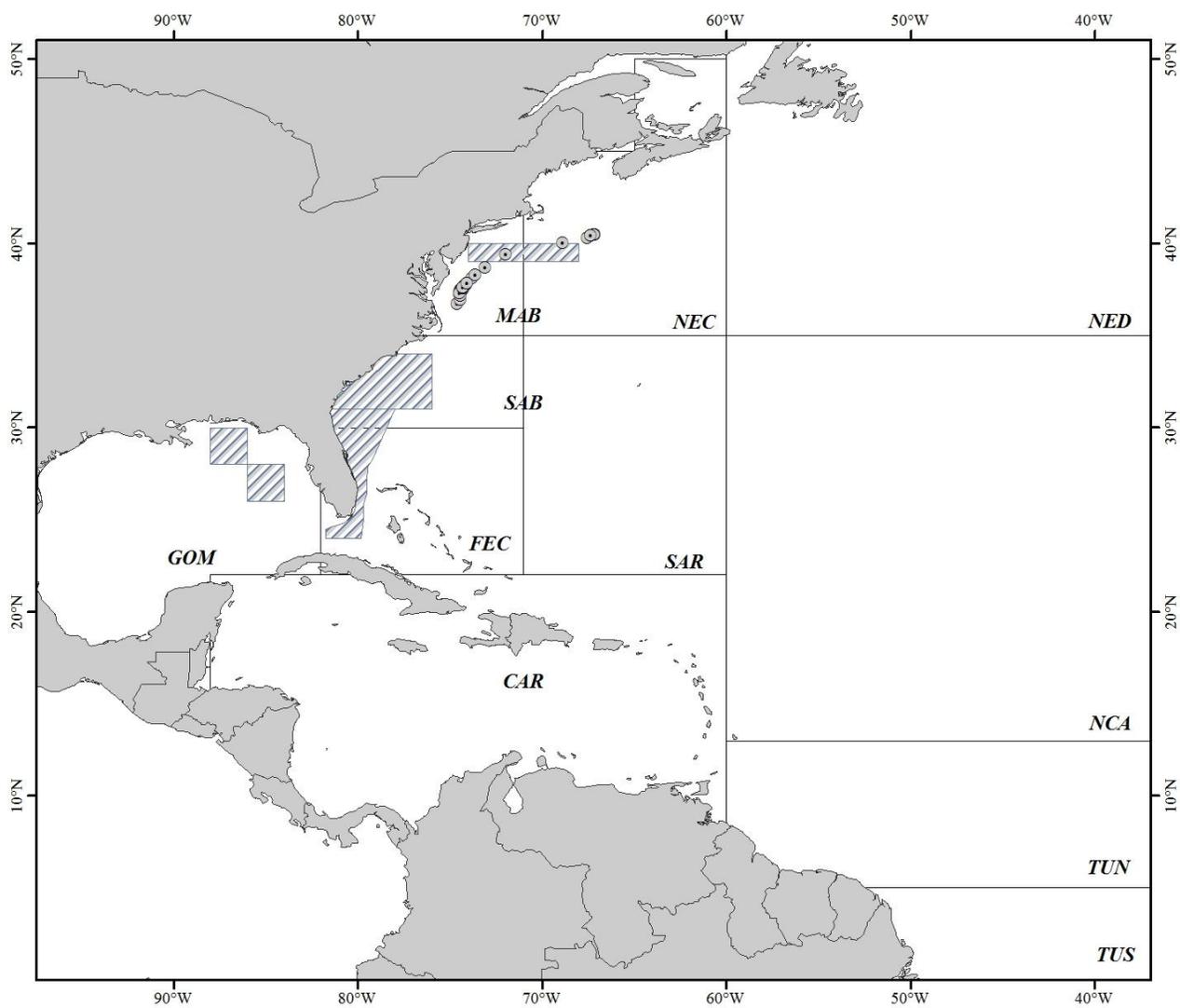
**Figure 1.** Pelagic longline fishing areas in the North Atlantic Ocean: CAR = Caribbean, GOM = Gulf of Mexico, FEC = Florida East Coast, SAB = South Atlantic Bight, SAR = Sargasso Sea, MAB = Mid-Atlantic Bight, NEC = Northeast Coastal, NED = Northeast Distant, NCA = North Central Atlantic, TUN = Tuna 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).



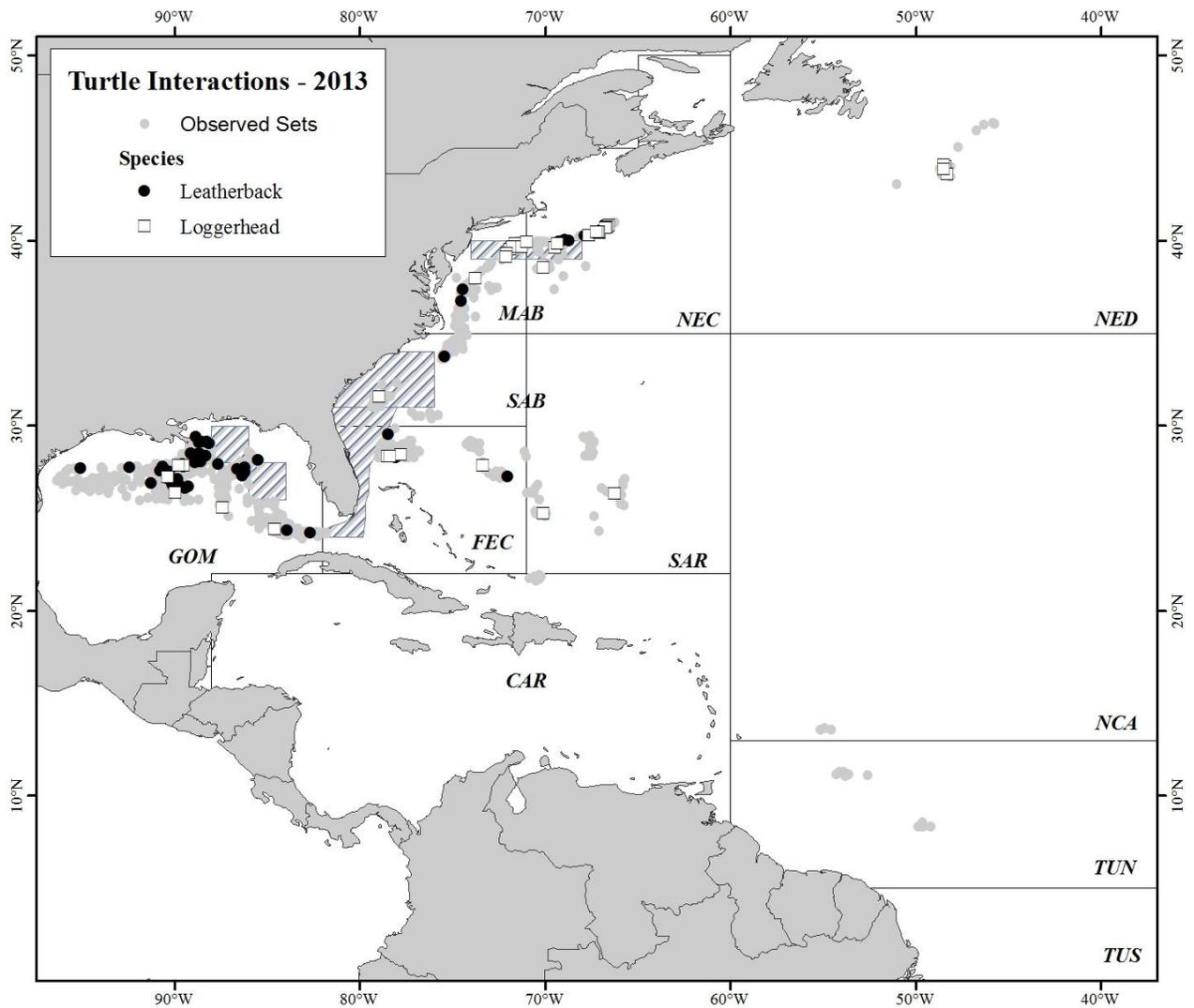
**Figure 2.** Observed (gray circles) and reported (black circles) pelagic longline fishing effort during 2013



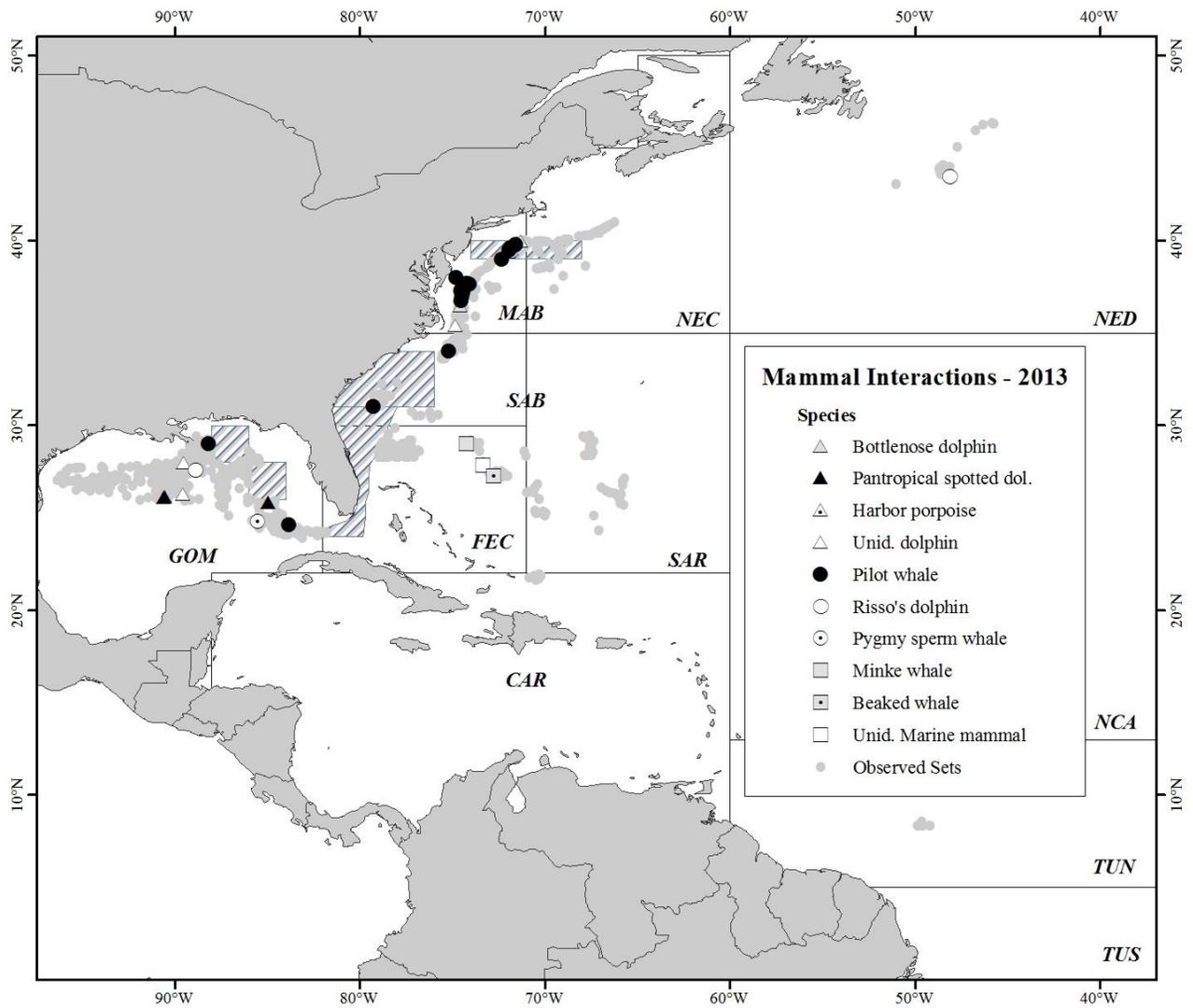
**Figure 3.** Locations of experimental sets during 2013.



**Figure 4.** Observed pelagic longline fishing effort and sea turtle interactions during 2013

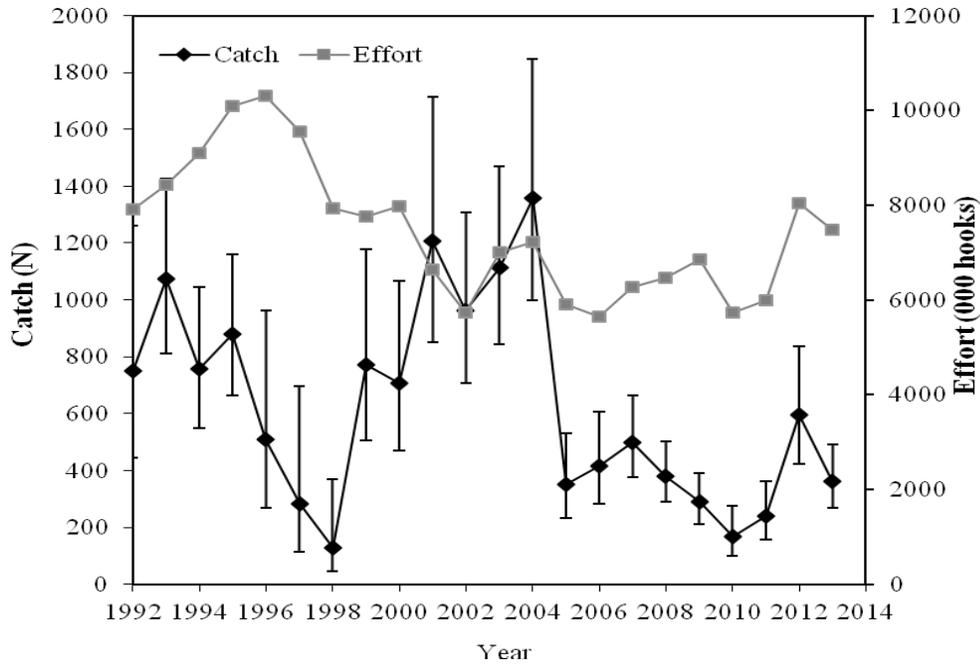


**Figure 5.** Observed pelagic longline fishing effort and marine mammal takes during 2013.

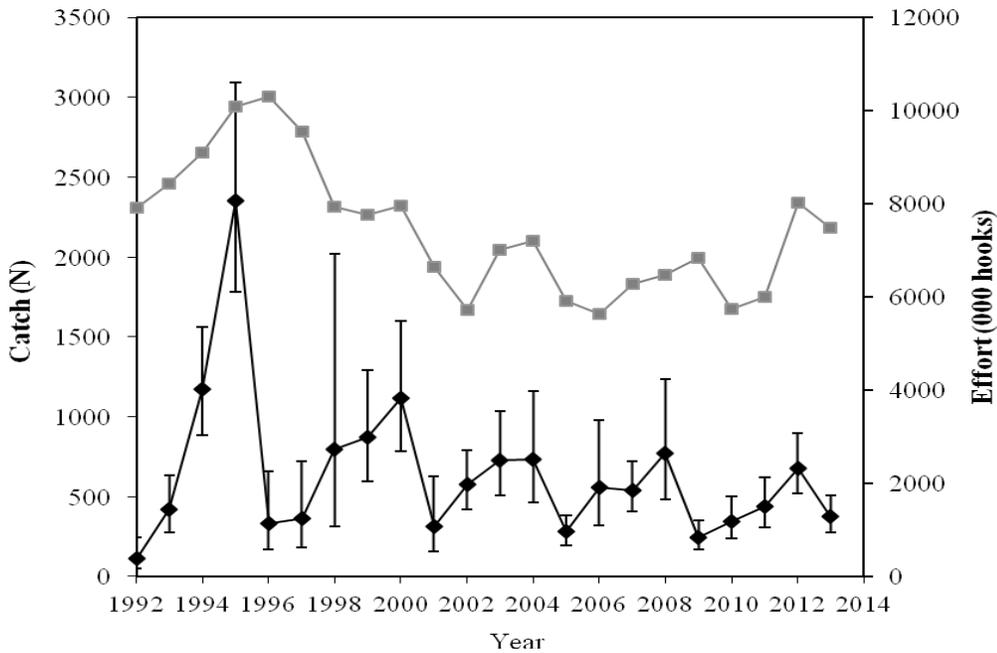


**Figure 6.** Historical trends in fishery effort and estimated marine turtle takes in the pelagic longline fishery from 1992 to 2013 for A) Leatherback Turtles, and B) Loggerhead Turtles. Errors bars represent 95% confidence intervals.

**A. Leatherback Turtles**

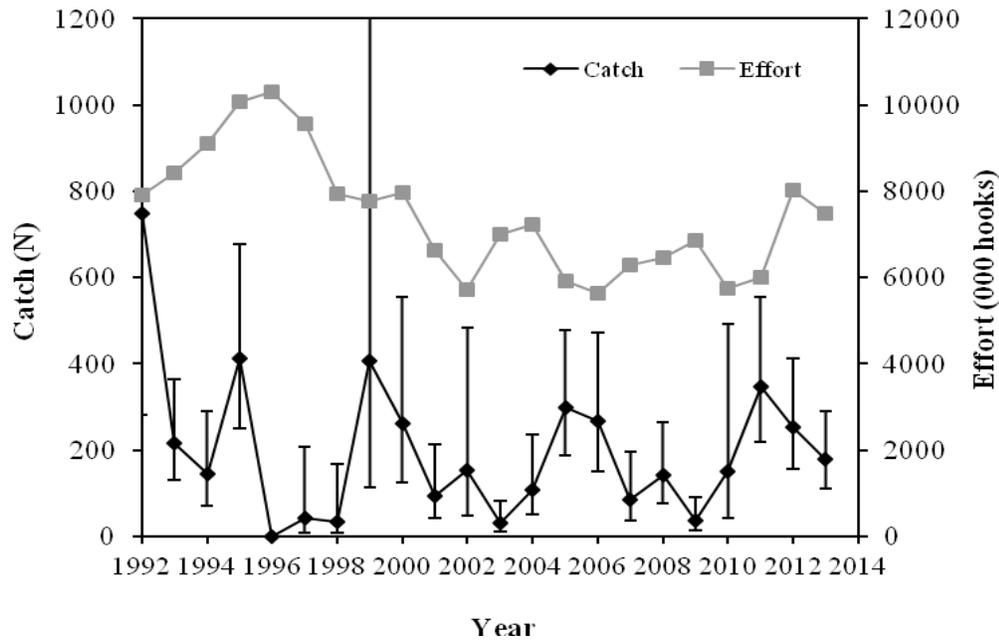


**B. Loggerhead Turtles**

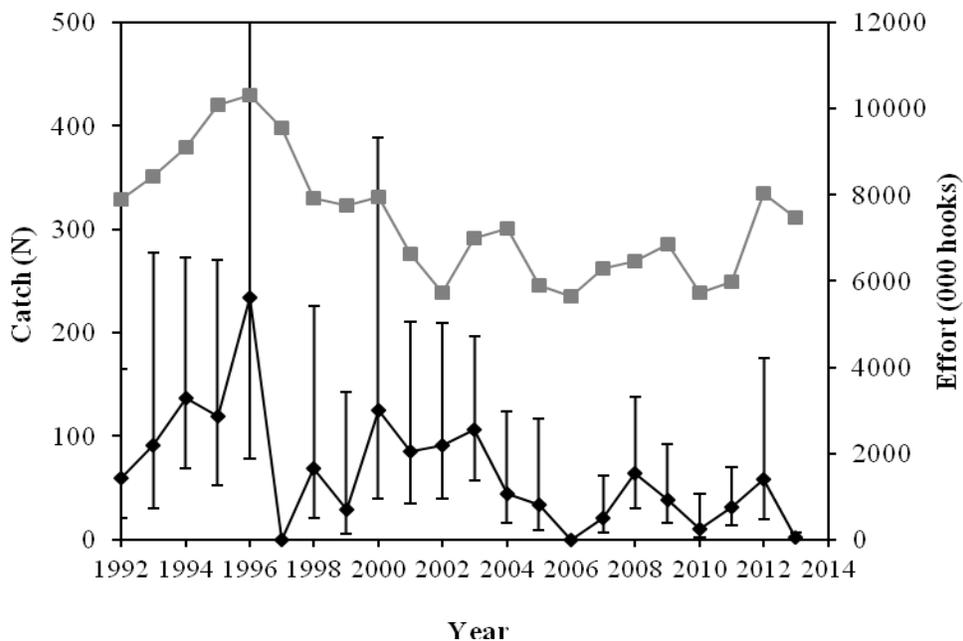


**Figure 7.** Historic trends in fishery effort and estimated marine mammal takes in the pelagic longline fishery from 1992 to 2013 for A) Pilot Whales and B) Risso’s Dolphins in Western North Atlantic waters. Errors bars represent 95% confidence intervals. For pilot whales, all takes are most likely of short-finned pilot whales.

**A. Pilot Whales**



**B. Risso’s Dolphins**



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

**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  Other \_\_\_\_\_ (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 B

**Table B1.** Gear types and hooking locations based upon observed comments and the sea turtle life history form for each A) Leatherback, and B) Loggerhead turtles observed during 2013. These data are summarized in Tables 5 and 6. Q indicates calendar quarter, “CL Est.” indicates an estimated carapace length in feet, “CCL” indicates a measured curved carapace length in cm, and “N-N” indicates a straight line measurement of the turtle carapace from notch to notch (see Appendix A). Areas denoted with “Exp” indicate takes in experimental fishing. “Injury Cat. Row” and “Release Cond. Col.” refer to rows and columns, respectively, for post-release mortality assignments in SEFSC 2013.

### A. Leatherback Turtles

#	Area	Q	Hook Type	Offset (degrees)	Bait	Bait Size (g)	Capture Condition	Final Disposition	Hook Location	Hook Removed?	Entangled Capture?	Entangled Release?	Line Left (ft)	Injury Cat. Row	Release Cond. Col.	CL Est. (ft)	CCL (cm)	N-N (cm)
1	SAB	1	C-16/0	0	Squid	194	Alive, injured	Released alive	Unknown location	Yes	No	No	0.0	IV	D	3.5		
2	FEC	1	C-16/0	0	Squid	450	Alive, injured	Released alive	Beak (external) unknown	No	No	No	2.0	I	C	5.5		
3	GOM	1	C-16/0	0	Squid	95	Alive, unknown	Released alive	Not known if hooked	No	Unknown	Unknown	6.0	IV	A	7.0		
4	GOM	1	C-16/0	0	Squid	140	Alive, injured	Released alive	Shoulder	No	No	No	1.0	I	C	4.0		
5	GOM	1	C-16/0	0	Squid	140	Alive, injured	Released alive	Shoulder	No	No	No	2.0	I	B	4.0		
6	GOM	1	C-16/0	0	Squid	135	Alive, injured	Released alive	Shoulder	Yes	No	No	0.0	I	D	4.5		
7	GOM	1	C-16/0	0	Squid	135	Alive, unknown	Released alive	Unknown location	Yes	No	No	0.0	IV	D	6.0		
8	GOM	1	C-16/0	0	Squid	90	Alive, uninjured	Released alive	Not hooked	N/A	Yes	No	0.0	V	D	4.0		
9	SAR	1	C-18/0	10	Squid	311	Alive, injured	Released alive	Beak (external) unknown	No	No	No	0.0	I	C	3.0		
10	GOM	1	C-16/0	0	Squid or mackerel	252 or 176	Alive, injured	Released alive	Shoulder	No	Yes	No	1.0	I	C	5.0		
11	GOM	1	C-16/0	0	Mackerel	270	Alive, injured	Released alive	Shoulder	No	No	No	1.0	I	C	5.0		

**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?	Line Left (ft)	Injury Cat. Row	Release Cond. Col.	CL Est. (ft)	CCL (cm)	N-N (cm)
12	GOM	1	C-16/0	0	Squid	189	Alive, injured	Released alive	Shoulder	No	Yes	No	0.5	I	C	4.5		
13	GOM	1	C-18/0	10	Mackerel	270	Alive, injured	Released alive	Roof of mouth	No	Yes	No	0.5	III	C	5.0		
14	GOM	1	C-16/0	0	Squid or mackerel	216 or 180	Alive, injured	Released alive	Carapace	No	No	No	0.5	I	C	5.0		
15	GOM	1	C-16/0	0	Squid	113	Alive, injured	Released alive	Carapace	No	No	No	5.0	I	B	5.0		
16	GOM	2	C-16/0	0	Squid	270	Alive, injured	Released alive	Front flipper	No	No	No	3.0	I	B	4.0		
17	GOM	2	C-16/0	0	Mackerel	162	Alive, injured	Released alive	Shoulder	No	No	No	0.0	I	C	6.0		
18	FEC	2	C-18/0	0	Squid	243	Alive, unknown	Released alive	Not known if hooked	No	Yes	No	1.0	IV	C	5.0		
19	GOM	2	C-16/0	0	Squid	225	Alive, injured	Released alive	Unknown location	No	Yes	No	0.1	IV	C	3.8		
20	GOM	2	C-16/0	0	Squid	225	Alive, injured	Released alive	Not known if hooked	No	Unknown	Unknown	4.0	IV	A	5.5		
21	GOM	2	C-16/0	0	Squid	117	Alive, injured	Released alive	Shoulder	No	No	No	2.0	I	B	3.5		
22	GOM	2	C-16/0	0	Squid	117	Alive, injured	Released alive	Unknown external	No	Unknown	Unknown	25.0	I	A	4.0		
23	GOM	2	C-16/0	0	Squid	108	Alive, injured	Released alive	Shoulder	No	No	No	12.0	I	B	5.0		
24	GOM	2	C-16/0	0	Squid or Sardine	203 or 117	Alive, injured	Released alive	Front flipper/shoulder/arm pit	Yes	Yes	No	0.0	I	D	5.0		

**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?	Line Left (ft)	Injury Cat. Row	Release Cond. Col.	CL Est. (ft)	CCL (cm)	N-N (cm)
25	GOM	2	C-16/0	0	Sardine	59	Alive, injured	Released alive	Front flipper	Yes	No	No	0.0	I	D	4.2		
26	GOM	2	C-16/0	0	Sardine	77	Alive, injured	Released alive	Shoulder	Yes	No	No	0.0	I	D	5.0		
27	GOM	2	C-16/0	0	Sardine	90	Alive, injured	Released alive	Front flipper	No	No	No	0.1	I	C	4.5		
28	GOM	2	C-16/0	0	Squid	90	Alive, injured	Released alive	Unknown location	No	No	No	6.0	IV	B	5.0		
29	GOM	2	C-16/0	0	Mackerel	153	Alive, injured	Released alive	Shoulder	No	No	No	0.2	I	C	4.0		
30	GOM	2	C-16/0	0	Sardine	90	Alive, uninjured	Released alive	Not hooked	N/A	Yes	No	0.0	V	D	4.5		
31	GOM	2	C-16/0	0	Sardine	72	Alive, injured	Released alive	Shoulder	Yes	No	No	0.0	I	D	5.0		
32	GOM	2	C-16/0	0	Squid	90	Alive, injured	Released alive	Unknown location	No	No	No	162.0	IV	B	5.0		
33	GOM	2	C-16/0	0	Squid	135	Alive, injured	Released alive	Shoulder	No	No	No	1.0	I	C	4.0		
34	GOM	2	C-16/0	0	Squid	131	Alive, injured	Released alive	Shoulder	Yes	No	No	0.0	I	D	5.0		
35	GOM	2	C-16/0	0	Squid	158	Alive, injured	Released alive	Mouth, side, other	No	No	No	3.0	II	B	6.0		
36	GOM	2	C-16/0	0	Squid	180	Alive, injured	Released alive	Shoulder	Yes	No	No	0.0	I	D	5.0		
37	GOM	2	C-16/0	0	Squid	180	Alive, injured	Released alive	Beak (internal), lower jaw	No	No	No	3.0	I	B	3.0		

**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?	Line Left (ft)	Injury Cat. Row	Release Cond. Col.	CL Est. (ft)	CCL (cm)	N-N (cm)
38	GOM	2	C-16/0	0	Herring	72	Alive, uninjured	Released alive	Not hooked	N/A	Yes	No	0.0	V	D	5.0		
39	GOM	2	C-16/0	0	Sardine	77	Alive, injured	Released alive	Armpit	No	No	No	2.0	I	B	4.0		
40	GOM	2	C-16/0	0	Squid or herring	131 or 81	Alive, injured	Released alive	Unknown internal	No	No	No	0.5	IV	C	3.5		
41	GOM	2	C-16/0	0	Squid or herring	131 or 81	Alive, injured	Released alive	Front flipper	No	No	No	0.5	I	C	4.0		
42	GOM	2	C-16/0	0	Squid	131	Alive, unknown	Released alive	Not known if hooked	No	Unknown	Unknown	3.0	IV	A	4.0		
43	GOM	2	C-16/0	0	Herring	81	Alive, injured	Released alive	Shoulder	No	No	No	0.5	I	C	3.5		
44	GOM	2	C-16/0	0	Squid or herring	131 or 81	Alive, injured	Released alive	Side, jaw joint	No	No	No	0.2	III	C	4.5		
45	GOM	2	C-16/0	0	Squid	140	Alive, injured	Released alive	Unknown location	No	No	No	2.0	IV	B	4.0		
46	NEC	3	C-18/0	10	Mackerel	180	Alive, injured	Released alive	Shoulder	No	No	No	0.5	I	C	5.0		
47	NEC	3	C-18/0	10	Mackerel	171	Alive, uninjured	Released alive	Not hooked	N/A	Yes	No	0.0	V	D	4.0		
48	NEC	3	C-18/0	10	Mackerel	171	Alive, injured	Released alive	Rear flipper	Yes	No	No	0.0	I	D	5.0		
49	NEC	3	C-18/0	10	Squid	180	Alive, injured	Released alive	Shoulder	No	No	No	0.5	I	C	5.0		
50	NEC	3	C-18/0	10	Squid or mackerel	180 or 315	Alive, injured	Released alive	Unknown location	No	No	No	15.0	IV	B	6.0		

**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?	Line Left (ft)	Injury Cat. Row	Release Cond. Col.	CL Est. (ft)	CCL (cm)	N-N (cm)
51	NEC	3	C-18/0	10	Mackerel	180	Alive, injured	Released alive	Shoulder	Yes	No	No	0.0	I	D	4.0		
52	NEC	3	C-18/0	10	Mackerel	180	Alive, injured	Released alive	Armpit	No	Yes	No	4.0	I	B	4.0		
53	NEC	3	C-18/0	10	Squid	180	Alive, injured	Released alive	Shoulder	No	No	No	1.0	I	C	5.0		
54	MAB (exp)	3	C-18/0	0 or 10	Squid	158	Alive, uninjured	Released alive	Not hooked	N/A	Yes	No	0.0	V	D	5.0		
55	NEC (exp)	3	C-18/0	0	Mackerel	216	Alive, uninjured	Released alive	Not hooked	N/A	Yes	No	0.0	V	D	5.5		
56	NEC (exp)	3	C-18/0	0	Squid	185	Alive, injured	Released alive	Shoulder	Yes	No	No	0.0	I	D	5.0		
57	NEC	3	C-16/0	0	Squid	221	Alive, injured	Released alive	Armpit	No	No	No	1.0	I	C	4.7		
58	NED	3	C-18/0	10	Mackerel	401	Alive, injured	Released alive	Armpit	Yes	No	No	0.0	I	D	4.0		
59	GOM	3	C-16/0	0	Squid	140	Alive, injured	Released alive	Unknown location	No	No	No	108.0	IV	B	5.5		
60	MAB	4	C-18/0	10	Squid	167	Alive, injured	Released alive	Not hooked	N/A	Yes	No	0.0	V	D	5.0		
61	NEC	4	C-18/0	10	Squid or mackerel	135 or 450	Alive, uninjured	Released alive	Not hooked	N/A	Yes	No	0.0	V	D	6.0		
62	MAB	4	C-18/0	10 or 0	Squid	162	Alive, unknown	Released alive	Not known if hooked	Unknown	Yes	No	3.0	IV	B	6.0		
63	GOM	4	C-16/0	0	Mackerel	279	Alive, uninjured	Released alive	Not hooked	N/A	Yes	No	0.0	V	D	5.0		

**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?	Line Left (ft)	Injury Cat. Row	Release Cond. Col.	CL Est. (ft)	CCL (cm)	N-N (cm)
64	MAB	4	C-16/0	0	Squid or mackerel	225 or 180	Alive, injured	Released alive	Carapace	No	No	No	4.0	I	B	6.0		
65	NEC	4	C-18/0	10	Squid	450	Alive, uninjured	Released alive	Not hooked	N/A	Yes	No	0.0	V	D	6.0		
66	NEC	4	C-18/0	10	Squid	450	Alive, uninjured	Released alive	Not hooked	N/A	Yes	No	0.0	V	D	6.0		
67	NEC	4	C-16/0	0	Squid	189	Alive, injured	Released alive	Mouth, side, other	No	Yes	No	0.1	II	C	5.0		
68	MAB	4	C-18/0	10	Squid or mackerel	135 or 450	Alive, uninjured	Released alive	Not hooked	N/A	Yes	No	0.0	V	D	6.0		
69	MAB	4	C-16/0	0	Squid	189	Alive, injured	Released alive	Shoulder	Yes	No	No	0.0	I	D	5.0		
70	MAB	4	C-16/0	0	Squid	158	Alive, uninjured	Released alive	Not hooked	N/A	Yes	No	0.0	V	D	7.0		
71	MAB	4	C-18/0	10	Mackerel	450	Alive, uninjured	Released alive	Not hooked	N/A	Yes	No	0.0	V	D	8.0		
72	FEC	4	C-16/0	0	Squid	135	Alive, injured	Released alive	Shoulder	No	No	No	6.0	I	B	6.0		

**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?	Line Left (ft)	Injury Cat. Row	Release Cond. Col.	CL Est. (ft)	CCL (cm)	N-N (cm)
1	FEC	1	C-16/0	0	Squid	450	Alive, injured	Released alive	Swallowed, hook partially visible	No	No	No	0.0	III	C		57.5	52.2
2	SAR	1	C-18/0	10	Mackerel	495	Alive, injured	Released alive	Beak (internal) / mouth, lower jaw	Yes	No	No	0.0	III	D		72.0	66.0
3	GOM	1	C-16/0	0	Squid	338	Alive, injured	Released alive	Swallowed, hook not visible	No	No	No	0.0	IV	C		71.0	64.6
4	GOM	1	C-16/0	0	Squid	338	Alive, injured	Released alive	Beak (internal) / mouth, upper jaw	Yes	No	No	0.0	III	D	5.5		
5	GOM	2	C-16/0	0	Squid	360	Alive, injured	Released alive	Swallowed, hook partially visible	No	No	No	0.2	III	C		72.0	63.0
6	GOM	2	C-16/0	0	Squid	117	Alive, injured	Released alive	Mouth, side, other	Yes	No	No	0.0	II	D		64.0	57.5
7	GOM	2	C-16/0	0	Squid	131	Alive, injured	Released alive	Swallowed, hook partially visible	Yes	No	No	0.0	III	D	2.5		
8	GOM	2	C-16/0	0	Squid	131	Alive, injured	Released alive	Carapace	Yes	No	No	0.0	I	D	2.0		
9	SAB	2	C-16/0	0	Squid or mackerel	225 or 270	Alive, injured	Released alive	Unknown internal	No	No	No	1.0	IV	C	2.5		
10	MAB	2	C-16/0	0	Squid	167	Alive, injured	Released alive	Mouth, side, unknown	Yes	No	No	0.0	III	D	2.5		
11	NEC	3	C-18/0	10	Squid	180	Alive, injured	Released alive	Swallowed, hook not visible	No	No	No	0.1	IV	C		68.0	63.0
12	NEC	3	C-18/0	10	Squid	180	Alive, injured	Released alive	Mouth, lower, other	Yes	No	No	0.0	II	D		66.0	60.0
13	NEC	3	C-18/0	10	Squid	180	Alive, injured	Released alive	Swallowed, hook partially visible	No	No	No	0.0	III	C		72.0	68.0
14	NEC	3	C-18/0	10	Mackerel	171	Alive, injured	Released alive	Beak (external), unknown	No	No	No	8.0	I	B	2.0		

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

#	Area	Q	Hook Type	Offset (degrees)	Bait	Bait Size (g)	Capture Condition	Final Disposition	Hook Location	Hook Removed?	Entangled Capture?	Entangled Release?	Line Left (ft)	Injury Cat. Row	Release Cond. Col.	CL Est. (ft)	CCL (cm)	N-N (cm)
15	NEC	3	C-18/0	10	Squid or mackerel	180	Alive, injured	Released alive	Unknown location	No	No	No	36.0	IV	B	2.5		
16	NEC	3	C-18/0	10	Mackerel	171	Alive, injured	Released alive	Front flipper	Yes	Yes	No	0.0	I	D	3.0		
17	NEC	3	C-18/0	10	Squid or mackerel	180	Alive, injured	Released alive	Armpit	Yes	No	No	0.0	I	D		59.0	54.5
18	NEC	3	C-18/0	10	Squid	180	Alive, injured	Released alive	Mouth, lower, unknown	Yes	No	No	0.0	III	D		70.3	64.0
19	FEC	3	C-16/0	0	Squid	288	Alive, injured	Released alive	Swallowed, hook partially visible	Yes	No	No	0.0	III	D	2.0		
20	NEC	3	C-18/0	0	Squid	180	Alive, injured	Released alive	Mouth, lower jaw, other	Yes	No	No	0.0	II	D		62.0	56.3
21	NED	3	C-18/0	10	Mackerel	396	Alive, injured	Released alive	Swallowed, hook partially visible	No	No	No	0.1	III	C		66.0	59.0
22	FEC	3	C-16/0 or C-18/0	0	Squid	252	Alive, injured	Released alive	Unknown internal	No	No	No	3.0	IV	B	3.5		
23	NED	3	C-18/0	10	Mackerel	396	Alive, uninjured	Released alive	Not hooked (holding bait)	Yes	No	No	0.0	V	D		70.0	63.5
24	NEC	3	C-16/0	0	Squid	225	Alive, injured	Released alive	Beak (internal) /mouth lower jaw	Yes	No	No	0.0	III	D	2.0		
25	NEC	3	C-16/0	0	Squid	225	Alive, injured	Released alive	Swallowed, hook not visible	No	No	No	0.5	IV	C		74.1	67.4
26	NEC	3	C-16/0	0	Squid	221	Alive, injured	Released alive	Mouth, lower jaw, other	Yes	No	No	0.0	II	D		73.2	66.1
27	NEC	3	C-16/0	0	Squid	239	Alive, injured	Released alive	Tongue	Yes	No	No	0.0	III	D		66.0	

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

#	Area	Q	Hook Type	Offset (degrees)	Bait	Bait Size (g)	Capture Condition	Final Disposition	Hook Location	Hook Removed?	Entangled Capture?	Entangled Release?	Line Left (ft)	Injury Cat. Row	Release Cond. Col.	CL Est. (ft)	CCL (cm)	N-N (cm)
28	NED	3	C-18/0	10	Mackerel	396	Alive, unknown	Released alive	Not known if hooked	Yes	No	No	0.0	III	D	2.2		
29	NEC	3	C-16/0	0	Squid	225	Alive, injured	Released alive	Front flipper	Yes	No	No	0.0	I	D		54.8	49.2
30	NEC (exp)	3	C-16/0	0	Squid	225	Alive, injured	Released alive	Swallowed, hook partially visible	No	No	No	0.0	III	C		66.4	60.1
31	NEC	3	C-16/0	0	Squid	216	Alive, injured	Released alive	Mouth, lower jaw, other	Yes	No	No	0.0	II	D		74.0	67.4
32	NEC	3	C-16/0	0	Squid	216	Alive, injured	Released alive	Mouth, lower jaw, other	Yes	No	No	0.0	II	D		57.9	52.2
33	NEC	3	C-16/0	0	Squid	203	Alive, injured	Released alive	Mouth, lower jaw, other	Yes	No	No	0.0	II	D		58.0	52.8
34	NED	3	C-18/0	10	Mackerel	401	Alive, injured	Released alive	Swallowed, hook not visible	No	No	No	0.8	IV	C		65.8	58.7
35	MAB	4	C-18/0	10	Squid	162	Alive, injured	Released alive	Mouth, lower jaw, other	Yes	No	No	0.0	II	D		60.0	53.5
36	MAB	4	C-16/0	0	Squid	225	Alive, injured	Released alive	Mouth, lower jaw, unknown	Yes	Yes	No	0.0	III	D	4.0		
37	MAB	4	C-16/0	0	Squid	225	Alive, injured	Released alive	Unknown internal	No	No	No	0.3	IV	C	3.0		
38	NEC	4	C-16/0	0	Squid	176	Alive, injured	Released alive	Tongue	Yes	Yes	No	0.0	III	D		69.1	not avail.
39	MAB	4	C-18/0	10	Squid or mackerel	176	Alive, injured	Released alive	Beak (internal), lower jaw	Yes	No	No	0.0	I	D	2.5		
40	MAB	4	C-16/0	0	Squid	180	Alive, injured	Released alive	Unknown internal	Yes	No	No	0.0	IV	D	2.0		

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

#	Area	Q	Hook Type	Offset (degrees)	Bait	Bait Size (g)	Capture Condition	Final Disposition	Hook Location	Hook Removed?	Entangled Capture?	Entangled Release?	Line Left (ft)	Injury Cat. Row	Release Cond. Col.	CL Est. (ft)	CCL (cm)	N-N (cm)
41	NEC	4	C-18/0	10	Squid or mackerel	135 or 450	Alive, injured	Released alive	Beak (internal), lower jaw	No	No	No	5.0	I	B	3.5		
42	MAB	4	C-18/0	10	Squid	450	Alive, injured	Released alive	Mouth, lower jaw, other	Yes	No	No	0.0	II	D		68.5	not avail.
43	MAB	4	C-18/0	10	Squid or mackerel	135 or 450	Alive, injured	Released alive	Unknown	No	Yes	No	5.0	IV	B	4.0		
44	MAB	4	C-16/0	0	Squid or mackerel	225 or 180	Alive, injured	Released alive	Beak (internal), lower jaw	Yes	No	No	0.0	I	D	3.0		
45	MAB	4	C-16/0	0	Squid	189	Alive, injured	Released alive	Mouth, lower jaw, other	Yes	No	No	0.0	II	D		71.6	68.0
46	MAB	4	C-16/0	0	Squid	189	Alive, injured	Released alive	Swallowed, hook not visible	No	No	No	0.3	IV	C		67.8	62.8
47	MAB	4	C-16/0	0	Squid	189	Alive, injured	Released alive	Tongue	Yes	No	No	0.0	III	D		64.4	57.6
48	FEC	4	C-16/0	0	Squid	135	Alive, injured	Released alive	Mouth, lower jaw, other	Yes	No	No	0.0	II	D		64.0	57.0
49	SAR	4	C-18/0	10	Squid	455	Alive, injured	Released alive	Swallowed, hook not visible	No	No	No	0.2	IV	C		66.6	61.4
50	GOM	4	C-16/0	0	Squid	131	Alive, injured	Released alive	Tongue	Yes	No	No	0.0	III	D		70.8	70.0
51	NEC	4	C-16/0	0	Squid	189	Alive, injured	Released alive	Mouth, lower jaw, other	Yes	No	No	0.0	II	D		50.4	45.2

**Appendix B cont.**

**Table B2:** 2013 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	Beaked whale	750	Serious Injury	S6 - Gear attached to free-swimming animal with potential to be ingested or entangle	[Check boxes indicate unknown if hooked. Released with approx 90 feet of trailing gear. Entangled around body and involved with all parts of gear] Crew noticed tension on mainline beginning approx. 1350 with much fouled gear. Tension increased until whale sighted 1405. approx 500 feet from boat. Whale sounded twice after sighting, crew continued to haul mainline in attempt to come close enough to remove gear from animal, but mainline parted 1407 as whale sounded 2nd time. Whale surfaced soon after, still entangled around tail/flukes and body with one dropline and bullet float, between 1 and 5 gangions, and remaining 3nm (approx) of mainline. Mainline broke under tension as animal sounded. After part off, animal surfaced swam away from vessel, then sounded again 2-5 min later. Animal was not sighted again.
2	Pilot whale	210	Released Alive	S5d - Hook in appendage without trailing gear	[Check boxes indicate hooked in tail. Line cut with 2 feet remaining with animal on release] The mammal surfaced from beneath boat, after pulling gangion for several moments, once surfaced, the hook was in the tail and line was cut. After surfacing from beneath boat and upon release, the mammal dove strongly and slightly slapped its tail/fluke on the water as it was diving.
3	Unid. marine mammal	NA	Serious Injury	S6 - Gear attached to free-swimming animal with potential to be ingested or entangle	[Check boxes indicate unknown if hooked, but entangled around unknown portion of body. Mainline parted and gear left with animal.] Crew noticed increased tension and gear fouling on mainline beginning approx 935. At 0948, blow sighted approx 120m from boat. Mainline bowed out toward animal's apparent position. "Bow" of mainline broke 0949; animal not sighted again. Uncertain how much gear, if any, remained on animal. No more than 250m of mainline could have been entangled on release, estimate from distance of animal to boat multiplied by two. Did not sight animal after mainline bow/loop broke.
4	Minke whale	750	Serious Injury	S5a - Hook in head	[Check boxes indicate likely hooked near mouth/head, unknown if entangled. Released with 5 feet of line remaining] Difficult to discern nature of take - whether hooked in mouth/rostrum, entangled, or both. Appeared more likely to be hooked in mouth/rostrum. Crew slowly reeled in mainline until animal came alongside vessel, then cut gangion leading to animal's head. Approx. 5 feet of gangion still attached; uncertain if more gear entangled in body, fins, or flukes. Whale sounded immediately after line was cut, did not sight again.
5	Pantropical spotted dolphin	150	Released Alive	S7b - Entangled before being freed without gear attached	[Check boxes indicate animal was hooked in the dorsal fin. Hook was removed and line was cut. All gear removed.] MPD quickly swam away from stern once released.
6	Pygmy sperm whale	150	Released Alive	S7b - Entangled before being freed without gear attached	[Check boxes indicate not hooked, entangled through mouth in mainline. Wraps cut and all gear removed.] Top of beak wrapped back to hook. Cut with mono cutters. All gear off. Swam off vigorously

**Appendix B, Table B2 (cont.)**

<b>Animal #</b>	<b>Species</b>	<b>Length (cm)</b>	<b>Release Condition</b>	<b>Interaction Type</b>	<b>Observer Comments</b>
7	Pilot whale	450	Serious Injury	S5a - Hook in head	[Check boxes and drawing indicate hooked and likely attached to head/mouth. Line cut leaving 15 feet of line with animal] Hook and 15 feet of line remaining on animal. Gear was cut at leader by crew using fishing snips. Line was extremely tense. Animal seemed to be acting normal. Upon release looked healthy. Swam away and went deep quick.
8	Pantropical spotted dolphin	105	Released Alive	S7b - Entangled before being freed without gear attached	[Check boxes indicate not hooked, wrapped around mouth with mainline. Gear removed from animal] Captain pulled dolphin alongside boat, manually disentangled. Dolphins beak wrapped 3 or 4 times, tail once or twice with gangion. Deep cuts in dolphin's rostrum. No gear remained on dolphin upon release. Dolphin swam away immediately upon release. Dolphin exhibited deep cuts on dorsal surface of rostrum, no apparent injury to tail.
9	Pilot whale	180	Released Alive	S7b - Entangled before being freed without gear attached	[Check boxes indicate animal hooked in the side of mouth. Hook removed and animal released with no trailing gear. Not entangled.] This pilot whale was hooked in the corner of the mouth on a single gangion. As they were pulling it to boat, the hook straightened out releasing the whale with no gear remaining. It was pulling very hard when hook straightened. As soon as the hook pulled free the whale swam away quickly.
10	Pantropical spotted dolphin	150	Serious Injury	S5a - Hook in head	[Check boxes indicated hooked in side of mouth. Hook remained with animal, but no trailing line on release] Dolphin pulled alongside boat and gangion cut at point of attachment to hook. Hook remained lodged in the corner of dolphin's mouth with no line attached. Swam away, dove normally.
11	Unid. dolphin	180	Serious Injury	S5a - Hook in head	[Check boxes indicate animal was hooked in mouth, lower portion of jaw. Line cut with 30 feet of trailing line remaining. Wrapped around mouth] Dolphin was brought to surface. Line cut with 30 ft remaining. No attempt was made to untangle snout. Animal immediately darted below surface and did not surface again. Swam away normally.
12	Unid. dolphin	150	Serious Injury	S7b - Entangled before being freed without gear attached	[Check boxes indicate animal was entangled in mainline around tail/flukes. Line cut and gear removed] The crew pulled the dolphin to the vessel and lifted the tail out of the water using the mainline. One crew member used snips to cut the line from the tail. The dolphin swam away with no apparent injury. The dolphin was noticeably stressed. The animal was upright on the surface when discovered. Used blow hole numerous times. When freed from gear, dolphin swam away from the vessel on the surface for approx. twenty feet then diving below the surface. [SI because Observer notes animal was hauled upright and noticeably stressed]
13	Pilot whale	240	Serious Injury	S6 - Gear attached to free-swimming animal with potential to be ingested or entangle	[Check boxes indicate animal was hooked with line going to the mouth. Line was cut with 60 feet of trailing line left. Not entangled] As soon as crew could reach the gangion, they cut it with a knife near the clip. This left ~60 ft of line which included a 60g weighted swivel. Animal quickly swam away once line was cut.
14	Pilot whale	330	Released Alive	S7b - Entangled before being freed without gear attached	[Check boxes indicate animal was hooked in front flipper, not entangled. Hook removed from animal] MPW was hooked right pectoral fin. Hook bent and came out of MPW. Hook bent while MPW was under water. It left area quickly with the other MPW that was nearby.

**Appendix B, Table B2 (cont.)**

Animal #	Species	Length (cm)	Release Condition	Interaction Type	Observer Comments
15	Pilot whale	210	Released Alive	S7b - Entangled before being freed without gear attached	[Check boxes indicate animal was not hooked, but entangled. Mainline wrapped around tail/flukes. Gear partially removed with 3 feet left on animal] Capt brought MPW to side of boat. Then he cleated mainline off and started cutting wraps around flukes with mono cutters. With MPW in this position it could not breathe, so crew let MPW get a breath and it got away with a few wraps of mainline still around flukes. MPW took off at a quick pace away from boat after it escaped. It stayed at surface not diving at release.
16	Pilot whale	330	Serious Injury	S5a - Hook in head	[Check boxes indicate animal was hooked near head/mouth at unknown location. Line broke leaving hook in mouth with four feet of line remaining. Not entangled.] Leader broke when MPW surfaced close to boat. When leader broke MPW was at the surface. Then it dove and swam away normally.
17	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 in unknown location. Leader was cut with 20 feet of trailing gear remaining with the animal] Mono cutters cut leader. Once leader was cut MPW quickly dove and swam away normally.
18	Pilot whale	180	Released Alive	S7b - Entangled before being freed without gear attached	[Check boxes indicate animal was not hooked but entangled in mainline around tail/flukes. Wraps cut and gear removed from animal] Animal was coming up and taking breaths while alongside, did not struggle very hard. Captain was able to cut several of the mainline wraps with his nippers and the rest fell away. This whale was wrapped around the tail 5-6 times with clear/whitish color mainline. When gear came off animal swam away very quickly. Animal dove and swam away from vessel very quickly. Did not see it again.
19	Risso's dolphin	240	Serious Injury	S7b - Entangled before being freed without gear attached	[Check boxes indicate animal was not hooked but entangled in mainline around tail/flukes. Wraps were cut and all gear removed.] Animal pulled next to boat. Crewman laid on deck with upper body out of tuna door. Another crewman held him. Crewman leaning out of boat cut all wraps with hand clippers. Animal pulled to boat not moving, at first appeared dead then saw and heard breathing through blowhole. Animal very still while multiple wraps were cut off tail above flukes. Light colored, extensive scarring, less robust than pilot whale of same length. Swam away. [SI because animal was not moving initially and breathing hard]
20	Risso's dolphin	220	Serious Injury	S7b - Entangled before being freed without gear attached	[Check boxes indicate animal not hooked, entangled around tail/flukes in mainline. Wraps partially cut leaving 2 feet on animal] Crewman reached down with hand clippers with other crewman lifting tail out of water using mainline. Mainline was tightly wound three times around keel. Crewman was able to cut off two of the three loops. Stayed dormant for a couple of minutes then swam away. Looked very tired. Blew a few times out of blow hole. [SI because animal "looked tired" and animal pulled out of water by tail]
21	Harbor porpoise	150	Serious Injury	S6 - Gear attached to free-swimming animal with potential to be ingested or entangle	[Check boxes indicate animal was not hooked. Entangled in mainline with wraps around tail/fluke. Wraps were partially cut with 2 feet remaining with animal] Porpoise was pulled alongside and line was mostly removed using long-handled line cutter. 1 braided (2 strands) wrap left on tail with 6-8 inches of trailing mainline. Animal was tired but swimming away normally and slowly upon release. Coming to surface to breathe often.
22	Pilot whale	300	Released Alive	S7b - Entangled before being freed without gear attached	[Check boxes indicate animal was not hooked but wrapped in gangion around tail/flukes. Gear removed from animal] Gear was wrapped several times around tail/flukes. Line was hooked with a gaff and then whale was brought partially out of the water and the line was cut. The whale surfaced a few times and blew out of its blow hole before diving. No harm was done to the whale. Whale surfaced two or three times and blew water out of its blow hole then dove. Swam away fine. No harm appeared to have been done.

**Appendix B, Table B2 (cont.)**

<b>Animal #</b>	<b>Species</b>	<b>Length (cm)</b>	<b>Release Condition</b>	<b>Interaction Type</b>	<b>Observer Comments</b>
23	Pilot whale	450	Serious Injury	S5a - Hook in head	[Check boxes indicate animal was entangled, unknown if hooked. Line cut with 10 feet of trailing gear] Line was cut with a long line cutter. Whale swam away. Did not get a good view before line was cut, but crew said hook was in the corner of mouth and the whale was not entangled in the gear. It did not appear to be tangled, but I could not see for sure. When the line was cut the animal swam away normally. It did not appear damaged or injured.
24	Pilot whale	420	Serious Injury	S6 - Gear attached to free-swimming animal with potential to be ingested or entangle	[Check boxes indicate unknown if hooked, unknown if entangled. Line broke with 25 feet remaining with animal] Massive tangle of gear with multiple leaders and droplines involved. Crew attempted to bring animal closer to vessel to remove as much gear as possible. Animal was only tangled/hooked on one leader, but it snapped when animal was still 35 feet away from vessel. Animal swam away normally.
25	Pilot whale	420	Released Alive	S7b - Entangled before being freed without gear attached	[Check boxes indicate animal was not hooked but entangled in mainline around body. Gear was removed from animal and wraps cut] Animal was entangled behind pec flippers in mainline wrap. Animal was brought closer to vessel and then mainline was cut, allowing animal to disentangle itself. As soon as mainline wrap was cut, the animal quickly disentangled itself and swam away.
26	Pilot whale	360	Serious Injury	S5a - Hook in head	[Check boxes indicate animal was hooked somewhere in mouth area. Hook was not removed and line was cut with 3 feet remaining. Not entangled.] Animal was brought as close as possible to vessel, line was cut with about 3 feet left trailing from animal. Animal swam away quickly with no visible distress. Swam away quickly, no apparent injury.
27	Bottlenose dolphin	210	Released Alive	S7b - Entangled before being freed without gear attached	[Check boxes indicate animal was not hooked. Entangled through mouth and around tail in mainline. Wraps cut and gear removed] Dolphin has mainline wrapped around its tail with one loop leading to beak. They used longhandled line cutter and small mono cutters to remove all gear when they cut the loops the line unwrapped from tail. The dolphin then swam away. When they cut the line away the dolphin swam away normally with 2 others.
28	Pilot whale	270	Serious Injury	S5a - Hook in head	[Check boxes indicate animal was hooked in side of the mouth. Line cut leaving 5 feet trailing.] Crew used long handled line cutters to cut leader after wiring MPW for quite awhile to get it close to the boat. When MPW was released it swam away normally. It seemed healthy when released.
29	Unid. dolphin	240	Released Alive	S7b - Entangled before being freed without gear attached	[Check boxes indicate animal was not hooked but entangled in mainline around tail/flukes. Wraps were cut and gear was removed] The mainline was twisted around the tail of the animal. The deckhands pulled up the mainline and cut the wrap off. The animal swam away unharmed without gear attached. The animal behaved as if it never had been entangled.
30	Pilot whale	210	Serious Injury	S5a - Hook in head	[Check boxes indicate hooked in mouth. Line was cut leaving 24 feet of gear trailing] As soon as the crew could reach the gangion, they cut the line with a pair of line cutters leaving 24' of line. MPW quickly swam away.
31	Pilot whale	180	Serious Injury	S5a - Hook in head	[Check boxes indicate animal was hooked with hook not visible. Drawing indicates hooked in mouth. Line cut with 6 feet trailing] Whale was pulled in as far as possible and line was cut using knife. Approx 6 feet left trailing from mouth. Swam quickly away from boat.

**Appendix B, Table B2 (cont.)**

<b>Animal #</b>	<b>Species</b>	<b>Length (cm)</b>	<b>Release Condition</b>	<b>Interaction Type</b>	<b>Observer Comments</b>
32	Pilot whale	240	Released Alive	S7b - Entangled before being freed without gear attached	[Check boxes indicate animal was hooked in mouth. Hook removed when line was pulled] While pulling animal in the hook came out of mouth. Whale swam away quickly. Swam away quickly when hook pulled out.
33	Pilot whale	300	Serious Injury	S5a - Hook in head	[Check boxes indicate hooked in side of mouth. Line cut leaving 25 feet of trailing line] Gangion broke as animal was being pulled in. I saw part of the hook in corner of mouth when whale surfaced once. Hook, 8 feet of leader, weighted swivel, and about 17 more ft of gangion trailing from corner of mouth on release. Dove and swam away quickly.
34	Pilot whale	450	Serious Injury	S5a - Hook in head	[Check boxes indicate animal was hooked in mouth, line cut leaving 4 feet remaining] Gangion cut with mono cutters at hauling station. Once gangion was cut MPW dove and swam away.
35	Pilot whale	240	Released Alive	S7b - Entangled before being freed without gear attached	[Check boxes indicate unknown if hooked or entangled. Pulled off of line] Unknown how whale was on line, got off on its own. Swam away quickly and dived.
36	Bottlenose dolphin	150	Released Alive	S7b - Entangled before being freed without gear attached	[Check boxes indicate not hooked. Entangled in mainline and leader lassoed over beak] Leader lassoed around beak by hook, Capt grabbed leader close to beak and leader came free. Disappeared immediately
37	Pilot whale	330	Serious Injury	S6 - Gear attached to free-swimming animal with potential to be ingested or entangle	[Check boxes indicate not hooked. Wrapped in mainline around body. Wraps not cut released with 8 feet wrapped round body] Whale broke mainline on its own while boat was bringing it closer. Active when entangled dove as soon as line broke.
38	Pilot whale	200	Serious Injury	S7b - Entangled before being freed without gear attached	[Check boxes indicate animal was not hooked. Entangled in mainline and gangion around tail/flukes. Gear was removed from animal] Animal pulled alongside vessel, crew cut wraps with handheld line cutters. No gear remaining.. Swam slowly away from boat, staying at surface. Fresh, open wound and scars along black and tail apparently from recent entanglement in different line. Open minor laceration apparent on flukes from this entanglement.
39	Pilot whale	240	Serious Injury	S5a - Hook in head	[Check boxes indicate animal hooked in mouth. Line cut leaving 18 ft of trailing line] Crew pulled as much line in as they could by hand and then cut the line when the pilot whale felt my biopsy attempt and swam away. Once the line was cut, the pilot whale swam away normally. Prior to the line being cut, the MPW was slow and lethargic.

