

Preliminary Estimates of Protected Species Bycatch Rates in the U.S. Atlantic Pelagic Longline Fishery between 1 April and 30 June 2007

Carol Fairfield-Walsh
Southeast Fisheries Science Center
75 Virginia Beach Dr.
Miami, FL 33149
E-mail: Carol.Fairfield@noaa.gov

August 2007

PRD Contribution: #PRBD-06/07-09:23 p.

THIS REPORT IS FOR INTERNAL NMFS USE ONLY

Background

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 longline fishery has a documented history of incidental takes of non-target species including marine turtles and marine mammals. During recent years there were elevated takes of leatherback turtles in the Gulf of Mexico (Garrison, 2003). As a result, a Biological Opinion on the pelagic longline fishery was developed by NOAA Fisheries under the Endangered Species Act, which requires several actions to be taken to improve monitoring and reduce interactions with leatherback and loggerhead turtles. These regulations reopened the Northeast Distant (NED) fishing area, with restrictions, on 30 June 2004, and similar restrictions were imposed on the rest of the fleet effective 5 August 2004. These regulations eliminate J-hooks from the fishery and mandate that all pelagic longline gear use circle hooks of size 16/0 or greater, and that only hooks of size 18/0 or greater may be used in the NED area. The regulations further require that hooks less than 18/0 have no offset, while hooks of size 18/0 or greater may have an offset no greater than 10 degrees.

The Biological Opinion requires quarterly reporting of interactions with protected species including marine turtles and marine mammals. The goal of this measure is to more closely monitor any potential short-term increases in interaction rates and thereby allow a more responsive management program. This report meets this requirement and includes the observed fishery effort and incidental takes reported by the Pelagic Observer Program (POP) from 1 April 2007 to 30 June 2007.

While it would be desirable to have directly estimated the absolute level of takes (i.e. the total number of turtles or mammals estimated to be taken by the fishery), fishery effort data are reported on logbook forms by fishing captains, and current data are therefore not available until several months after the end of any given quarter. As a result, the bycatch rate (i.e. catch per unit effort) presented was based solely on observer data as an indicator of the relative level of

interactions with protected species. The observed bycatch rate by fishing area during quarter 2 of 2007 was compared to that observed in quarter 2 of 2006 and to the average of the previous five years (2002-2006) for quarter 2, to assess whether or not the observed rate in 2007 was unusually high or low. Bycatch rates were calculated by applying the delta log-normal method using hooks as the unit of effort. The analytical methods were described in detail in Garrison (2003).

Results and Discussion

The POP attempts to achieve approximately 8% observer coverage in the fishing areas illustrated in Figures 1 and 2. During most of the second quarter of 2007, observer coverage in the Gulf of Mexico (GOM) fishing area was greatly increased to improve data collection on bluefin tuna interacting with pelagic longlines and to collect biological samples from captured bluefin tuna. To accomplish these goals, the POP attempted to achieve 100% observer coverage in the GOM fishery on trips departing between 15 April and 15 June 2007. Fifty-eight trips on 31 different vessels were observed under this enhanced coverage, resulting in the observation of 410 sets (415 hauls) and 302,886 hooks, over 664 sea days. By comparison, during the entire second quarter of 2006, 99 sets (75,456 hooks) were observed by the POP in the GOM (Fairfield-Walsh and Garrison, 2007). This report includes all observed fishing effort conducted during the entire quarter 2, from 1 April through 30 June 2007, for the GOM and elsewhere.

A total of 464 longline sets (339,361 hooks) were observed during quarter 2 of 2007 (Table 1), with only circle hooks (sizes 16/0 and 18/0) recorded. The vast majority of the observed sets occurred in the GOM due to the enhanced observer coverage program (Figure 1).

The locations of observed sets and turtle interactions are shown in Figure 1. There were 31 observed interactions with leatherback turtles, 8 observed interactions with loggerhead turtles, and one observed interaction with an olive ridley turtle (Table 2). Two leatherbacks were released alive and uninjured, 27 were released alive and injured, one was released alive in an unknown condition, and it was unknown if one additional leatherback was alive or dead upon release (Appendix A). All eight of the loggerheads and the olive ridley turtle were released alive and injured (Figure 1, Appendix A).

Concerted efforts by fishers to remove hooks and disentangle captured turtles are mandated by the Biological Opinion. Specific information on injuries to sea turtles and gear characteristics of each interaction are shown in Appendix A. Eight leatherbacks were reported entangled at capture (2 more were unknown if entangled); 3 of those were not hooked and 2 were not known if hooked (Appendix A1). The hook location (if any) was not determined in 8 turtles, 1 was hooked internally, and the remaining 19 leatherbacks were hooked externally. Three leatherbacks were released with all gear removed (Appendix A1). Of the remaining 28 leatherbacks, 17 were released with trailing line longer than $\frac{1}{2}$ the carapace length and at least three were still entangled at release, and an additional 4 may have been entangled at release. The hook was retrieved from only one of the hooked leatherbacks.

Only one loggerhead turtle swallowed the hook, the hook location was unknown for one, and 6 were hooked in the mouth (Appendix A2). Hooks were removed from all 6 mouth-hooked turtles and only one turtle was released with a significant amount of line ($> \frac{1}{2}$ carapace length).

One olive ridley turtle was hooked in the tongue and entangled when captured, and was released without any gear attached (Appendix A3).

Four interactions were observed with marine mammals during this quarter, all in the GOM area (Table 3, Figure 2). These included one interaction with a beaked whale (unidentified Ziphiid), one interaction with a bottlenose dolphin, and two interactions with unidentified dolphins. The beaked whale was entangled but not hooked, and was considered to be released alive uninjured following removal of all gear based upon observer comments and serious injury criteria (see Garrison, 2003; Angliss and DeMaster, 1998). The bottlenose dolphin was entangled but not hooked, was released alive with some gear around its tail stock, and was judged not to be seriously injured upon release. One of the unidentified dolphins was entangled but not hooked, and was released uninjured after removal of all gear. The second unidentified dolphin was entangled but it was unknown if it was hooked. Most of the gear was cut away, but the animal sank motionless upon release and was considered dead.

The quarterly and regional bycatch rates are summarized for marine turtles in Table 4 and for marine mammals in Table 5. These rates were compared with those from the same quarter/area for 2006 and the average for the second quarter/area from 2002-2006 in Tables 6 and 7 (Fairfield and Garrison, 2006; Garrison, 2005). Note that the number of hooks observed is used as the unit of effort for these calculations, which accounts for the increase in observer coverage in the GOM during this quarter of 2007. Caution should be used, however, in comparing bycatch rates because of the dramatic difference in the sampling effort between 2007 and previous years.

For leatherback turtles, the bycatch rate in the Caribbean (CAR) was slightly higher than the average rate for 2002-2006, but was within the bounds of the 95% confidence intervals for the latter period (Table 6A). The CAR was not observed during 2006. The bycatch rate in the GOM was slightly elevated in comparison to the 2006 bycatch rate for this area, though the 95% confidence intervals for both 2007 and 2006 overlapped. The rate for the GOM in 2007 was reduced relative to the average 2002-2006 bycatch rate, and the 95% confidence intervals did not overlap. No bycatch of leatherbacks was observed in the Florida East Coast (FEC) which was lower than both the 2006 and the average 2002-2006 bycatch rates. No leatherbacks were observed caught in the Mid-Atlantic Bight (MAB) and the South Atlantic Bight (SAB) areas, which is the same as that calculated for the second quarter of 2006, and was lower than the average bycatch rate for 2002-2006, for both areas. There were no leatherbacks observed caught in the second quarter of 2007 in the Sargasso Sea (SAR), which was the same as 2006 for this area, and was a reduction relative to the 2002-2006 bycatch rate. All other areas were not observed during the second quarter of 2007.

The bycatch rate for loggerhead turtles caught in the FEC was higher than the second quarter of 2006, though the 95% confidence intervals for both periods overlapped (Table 6B). For both of

these time periods, the bycatch rates were higher than the average for 2002-2006, with a lack of overlap in the 95% confidence intervals. In the GOM fishing area, the 2007 bycatch rate was higher than the 2006 rate, though there was an overlap in the 95% confidence intervals. Relative to the 2002-2006 bycatch rates in the GOM, the 2007 rate was lower, although the 95% confidence intervals overlapped. For the CAR fishing area, no loggerheads were observed caught in the second quarter of 2007, which was a reduction relative to the 2002-2006 rate, and this area was not observed during 2006. No loggerheads were observed caught in the MAB which is consistent with 2006 and 2002-2006. In the SAB, no loggerheads were observed caught in 2007 which was consistent with 2006, and was a reduction compared to the average 2002-2006 bycatch rate. In the SAR area, no loggerheads were observed caught, which was consistent with 2002-2006, and this area was not observed during 2006.

The olive ridley turtle bycatch rate for 2007 in the CAR fishing area is higher than the average 2002-2006 rate, when no bycatch of olive ridley turtles was observed during the second quarter, and the CAR was not observed during 2006 (Table 6C). No olive ridley turtles were observed caught in the FEC, GOM, MAB and SAB which is consistent with 2006 and 2002-2006.

Bycatch of beaked whales, bottlenose dolphins and unidentified dolphins were observed during the second quarter of 2007 in the GOM fishing area (Table 7). The bycatch rates for these marine mammals were elevated relative to 2006 and 2002-2006 when no bycatch of these species was observed. During the second quarter of 2007, no bycatch of Atlantic Spotted dolphins was observed in the MAB area, and no pilot whales were observed caught in the MAB area, which was reduced relative to the average 2002-2006 bycatch rate, and was consistent with the 2006 rates. There was no bycatch of pilot whales observed in the GOM during the second quarter of 2007, which was a reduction to both the 2006 and the 2002-2006 rates. The North Central Atlantic (NCA) and Northeast Central (NEC) areas, which had bycatch of marine mammals observed during 2002-2006, were not observed during this second quarter of 2007.

There are a number of caveats and uncertainties associated with the current analysis. First, while these data have undergone an initial audit and review, they are subject to change upon further review after the end of the 2007 calendar year when all logbook data are available. Second, the delta log-normal estimator was applied to calculate bycatch rates consistent with previous estimates (e.g., Garrison 2003). This approach assumed 1) that catch rates (animals per hook) were log-normally distributed, and 2) that the number of hooks was an appropriate unit of effort. The first assumption has been evaluated for turtles; however, violations of this assumption may have resulted in biased (positive or negative) estimates of catch rate and associated variances. The second assumption has not been examined critically in previous analyses. If this assumption was not correct, for example if there were saturation effects resulting in a non-linear relationship between the number of hooks and total catch, then there potentially may have been a bias in the estimate of bycatch rates.

The interaction between longline gear and protected species is a relatively rare event and is therefore inherently variable. Historically, there have been very large inter-annual fluctuations in bycatch rates and estimates of total bycatch. Thus, any differences observed between short

term observations of bycatch rates and long term averages may be simply stochastic events and are not necessarily indicative of a significant change in the interactions between the longline fishery and protected species.

Literature Cited

Angliss, R.P. and D.P. DeMaster. 1998. Differentiating Serious and Non-Serious Injury of Marine Mammals Taken Incidental to Commercial Fishing Operations: Report of the Serious Injury Workshop 1-2 April 1997, Silver Spring, Maryland. NOAA Technical Memorandum NMFS-OPR-13: 48 p.

Fairfield-Walsh, C. and L.P. Garrison. 2006. Preliminary Estimates of Protected Species Bycatch Rates in the U.S. Atlantic Pelagic Longline Fishery Between 1 April and 30 June 2006. SEFSC Document #PRD-05/06-19: 15 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: 53p.

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.

Table 1. The number of sets and hooks observed in the U.S. Atlantic Pelagic Longline Fishery between 1 April – 30 June 2007 is shown by fishing area. Areas with missing values indicate there was no observer coverage during this time period in this area.

Area	# Sets	# Hooks
CAR	16	12,384
FEC	16	11,029
GOM	413	304,451
MAB	8	3,656
NCA	-	-
NEC	-	-
NED	-	-
SAB	11	7,841
SAR	-	-
TUN	-	-
TUS	-	-
Total	464	339,361

Table 2. Interactions with marine turtles observed during 1 April – 30 June 2007 in the U.S. Atlantic Pelagic Longline Fishery, shown by fishing area. Areas with missing values (dashes) indicate there was no observer coverage during this time period in this area.

Area	Leatherback Takes Observed	Loggerhead Takes Observed	Olive Ridley Takes Observed
CAR	1	0	1
FEC	0	2	0
GOM	30	6	0
MAB	0	0	0
NCA	-	-	-
NEC	-	-	-
NED	-	-	-
SAB	0	0	0
SAR	-	-	-
TUN	-	-	-
TUS	-	-	-
Total	31	8	1

Table 3. Interactions with marine mammals observed during 1 April – 30 June 2007 in the U.S. Atlantic Pelagic Longline Fishery, shown by fishing area. Observer comments and criteria described in Angliss and DeMaster (1998) were used to evaluate serious injury.

Species	Area	# Released Uninjured	# Serious Injury	# Dead
Beaked Whale ¹	GOM	1	0	0
Bottlenose Dolphin	GOM	1	0	0
Unid. Dolphin	GOM	1	0	1

¹Unidentified Ziphiid

Table 4. Estimated bycatch rate (Catch per unit effort (CPUE) = catch per 1000 hooks) for (A) Leatherback, (B) Loggerhead, and (C) Olive Ridley turtles by area during 1 April – 30 June 2007 in the U.S. Atlantic Pelagic Longline Fishery. Missing values (dashes) indicate areas with no observer coverage. CV indicates the coefficient of variation of the estimated rate.

A. Leatherback Turtles

Area	Type of Injury	Number of Turtles	Observed Sets	# Positive Sets	Mean CPUE	Var CPUE	CV
CAR	Alive	1	16	1	0.0789	0.0062	1.0000
FEC	-	0	16	0	0	-	-
GOM	Alive	29	413	27	0.0851	0.0003	0.1912
GOM	Unknown	1	413	1	0.0026	0.000006	1.0000
MAB	-	0	8	0	0	-	-
NCA	-	-	-	-	-	-	-
NEC	-	-	-	-	-	-	-
NED	-	-	-	-	-	-	-
SAB	-	0	11	0	0	-	-
SAR	-	-	-	-	-	-	-
TUN	-	-	-	-	-	-	-
TUS	-	-	-	-	-	-	-

Table 4 (cont.)

B. Loggerhead Turtles

Area	Type of Injury	Number of Turtles	Observed Sets	# Positive Sets	Mean CPUE	Var CPUE	CV
CAR	-	0	16	0	0	-	-
FEC	Alive	2	16	2	0.2298	0.0251	0.6895
GOM	Alive	6	413	5	0.0190	0.00008	0.4659
MAB	-	0	8	0	0	-	-
NCA	-	-	-	-	-	-	-
NEC	-	-	-	-	-	-	-
NED	-	-	-	-	-	-	-
SAB	-	0	11	0	0	-	-
SAR	-	-	-	-	-	-	-
TUN	-	-	-	-	-	-	-
TUS	-	-	-	-	-	-	-

Table 4 (cont.)

C. Olive Ridley Turtles

Area	Type of Injury	Number of Turtles	Observed Sets	# Positive Sets	Mean CPUE	Var CPUE	CV
CAR	Alive	1	16	1	0.0755	0.0057	1.0000
FEC	-	0	16	0	0	-	-
GOM	-	0	413	0	0	-	-
MAB	-	0	8	0	0	-	-
NCA	-	-	-	-	-	-	-
NEC	-	-	-	-	-	-	-
NED	-	-	-	-	-	-	-
SAB	-	0	11	0	0	-	-
SAR	-	-	-	-	-	-	-
TUN	-	-	-	-	-	-	-
TUS	-	-	-	-	-	-	-

Table 5. Estimated bycatch rate (Catch per unit effort (CPUE) = catch per 1000 hooks) for marine mammals by area during 1 April – 30 June 2007 in the U.S. Atlantic Pelagic Longline Fishery. Missing values (dashes) indicate areas with no observer coverage. Under “Type of Injury” Alive indicates animal released alive uninjured, based on observer comments and criteria described in Angliss and DeMaster (1998). CV indicates the coefficient of variation of the estimated rate.

Species	Type of Injury	Number of Animals	Area	# Positive Sets	# Observed Sets	Mean CPUE	Var CPUE	CV
Beaked Whale ¹	Alive	1	GOM	1	413	0.0027	0.000007	1
Bottlenose Dolphin	Alive	1	GOM	1	413	0.0034	0.00001	1
Unid. Dolphin	Alive	1	GOM	1	413	0.0026	0.000007	1
Unid. Dolphin	Dead	1	GOM	1	413	0.0027	0.000007	1

¹ Unidentified Ziphiid

Table 6. The bycatch rates are shown for (A) Leatherback turtles, (B) Loggerhead turtles, (C) Olive Ridley turtles, and (D) Unidentified Marine turtles in the U.S. Atlantic longline fishery during 1 April- 30 June 2007 in comparison to 2006 and the average rate from 2002-2006. 95% CI indicates the estimated 95% confidence interval of the mean bycatch rate (CPUE) in each cell assuming a log-normal distribution of rates. CPUEs reflect total turtles caught including alive and dead turtles.

A. Leatherback Turtles

Area	2007 CPUE	2007 95% CI	2006 CPUE	2006 95% CI	2002-2006 CPUE	2002-2006 95% CI
CAR	0.0790	0.0161 – 0.3858	-	-	0.0598	0.0122 – 0.2924
FEC	0	-	0.2137	0.0437 – 1.0445	0.1343	0.0463 – 0.3890
GOM	0.0878	0.0616 – 0.1251	0.0636	0.0249 – 0.1621	0.1712	0.1271 – 0.2306
MAB	0	-	0	-	0.3165	0.1543 – 0.6492
NCA	-	-	-	-	0.0283	0.0058 – 0.1386
NEC	-	-	0.3438	0.1504 – 0.7859	0.2057	0.0947 – 0.4467
NED	-	-	-	-	0	-
SAB	0	-	0	-	0.0218	0.0078 – 0.0611
SAR	0	-	-	-	0	-
TUN	-	-	-	-	0	-
TUS	-	-	-	-	-	-

Table 6 (cont.)

B. Loggerhead Turtles

Area	2007 CPUE	2007 95% CI	2006 CPUE	2006 95% CI	2002-2006 CPUE	2002-2006 95% CI
CAR	0	-	-	-	0.0575	0.0118 – 0.2801
FEC	0.2298	0.0700 – 0.7545	0.2058	0.0421 – 1.0058	0.1485	0.0487 – 0.4532
GOM	0.0190	0.0082 – 0.0442	0.0243	0.0072 – 0.0822	0.0315	0.0170 – 0.0584
MAB	0	-	0	-	0	-
NCA	-	-	-	-	0.1934	0.0844 – 0.4436
NEC	-	-	0.1502	0.0463 – 0.4873	0.7339	0.3826 – 0.4078
NED	-	-	-	-	0	-
SAB	0	-	0	-	0.0360	0.0146 – 0.0875
SAR	0	-	-	-	0	-
TUN	-	-	-	-	0	-
TUS	-	-	-	-	-	-

Table 6 (cont.)

C. Olive Ridley Turtles

Area	2007 CPUE	2007 95% CI	2006 CPUE	2006 95% CI	2002-2006 CPUE	2002-2006 95% CI
CAR	0.0755	0.0154 – 0.3690	-	-	0	-
FEC	0	-	0	-	0	-
GOM	0	-	0	-	0	-
MAB	0	-	0	-	0	-
NCA	-	-	-	-	0	-
NEC	-	-	0	-	0	-
NED	-	-	-	-	0	-
SAB	0	-	0	-	0	-
SAR	-	-	-	-	0	-
TUN	-	-	-	-	0	-
TUS	-	-	-	-	-	-

Table 6 (cont.)

D. Unidentified Marine Turtles

Area	2007 CPUE	2007 95% CI	2006 CPUE	2006 95% CI	2002-2006 CPUE	2002-2006 95% CI
CAR	0	-	-	-	0	-
FEC	0	-	0	-	0	-
GOM	0	-	0	-	0.0033	0.0007 – 0.0162
MAB	0	-	0	-	0	-
NCA	-	-	-	-	0	-
NEC	-	-	0	-	0	-
NED	-	-	-	-	0	-
SAB	0	-	0	-	0	-
SAR	-	-	-	-	0	-
TUN	-	-	-	-	0	-
TUS	-	-	-	-	-	-

Table 7. The summary of bycatch rates for marine mammals in the U.S. Atlantic longline fishery during 1 April– 30 June 2007 is shown in comparison to rates from the previous year (2006) and the average of the previous five years (2002-2006). 95% CI indicates the estimated 95% confidence interval of the mean bycatch rate (CPUE) in each cell assuming a log-normal distribution of rates. CPUEs reflect total marine mammals caught including alive, dead, and seriously injured animals.

Species	Area	2007 CPUE	2007 95% CI	2006 CPUE	2006 95% CI	2002-2006 CPUE	2002-2006 95% CI
Atlantic Spotted Dolphin	MAB	0	-	0	-	0.0370	0.0076 – 0.1811
Beaked Whale ¹	GOM	0.0027	0.0006 – 0.0132	0	-	0	-
Bottlenose Dolphin	GOM	0.0034	0.0007 – 0.0164	0	-	0	-
Bottlenose Dolphin	NCA	-	-	-	-	0.0283	0.0058 – 0.1386
Minke Whale	NEC	-	-	0	-	0.0427	0.0087 – 0.2086
Pilot Whale	GOM	0	-	0.0104	0.0021 – 0.0510	0.0029	0.0006 – 0.0140
Pilot Whale	MAB	0	-	0	-	0.0894	0.0328 – 0.2436
Risso's Dolphin	NEC	-	-	0	-	0.0672	0.0137 – 0.3285
Unid. Dolphin	GOM	0.0053	0.0016 – 0.0177	0	-	0	-

¹2007 bycatch was an unidentified Ziphiid; no beaked whales of any species observed caught from 2002-2006.

Figure 1. The observed U.S. Pelagic Longline Fishery effort and marine turtle interactions during 1 April – 30 June 2007 are shown. The pelagic longline fishing areas in the North Atlantic Ocean are as follows: 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 and TUS = Tuna South. Area closures and the U.S. Exclusive Economic Zone (EEZ) are shown.

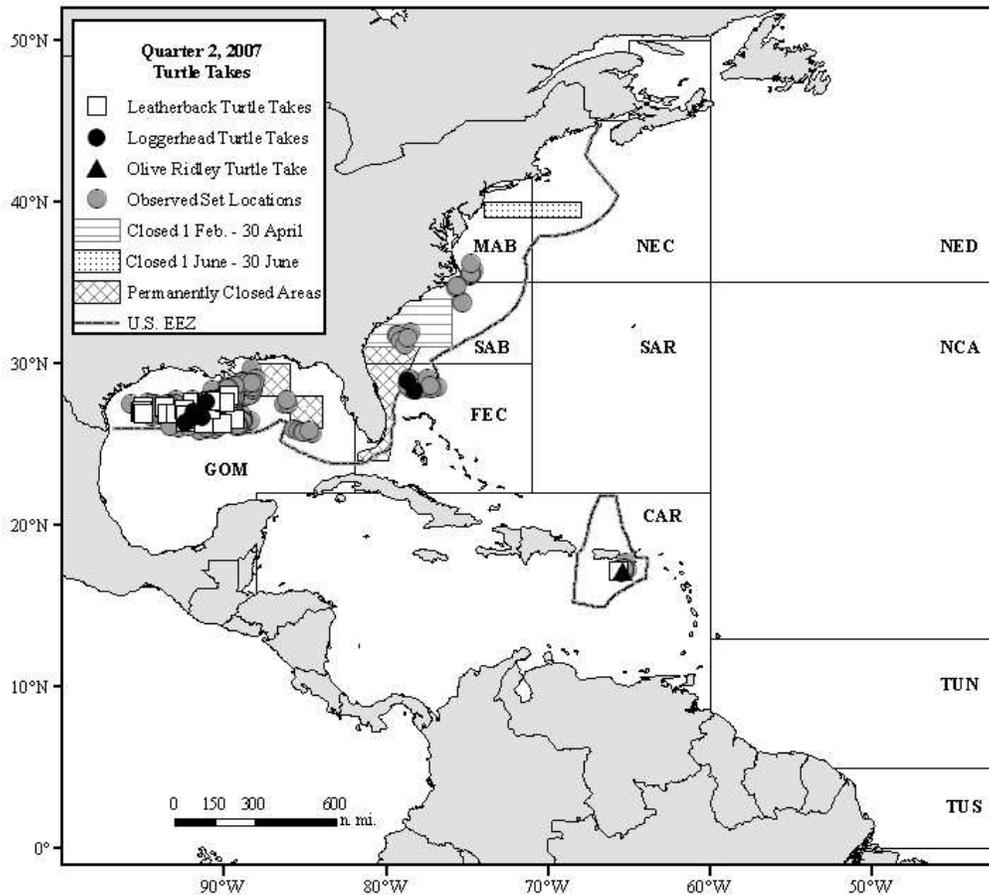
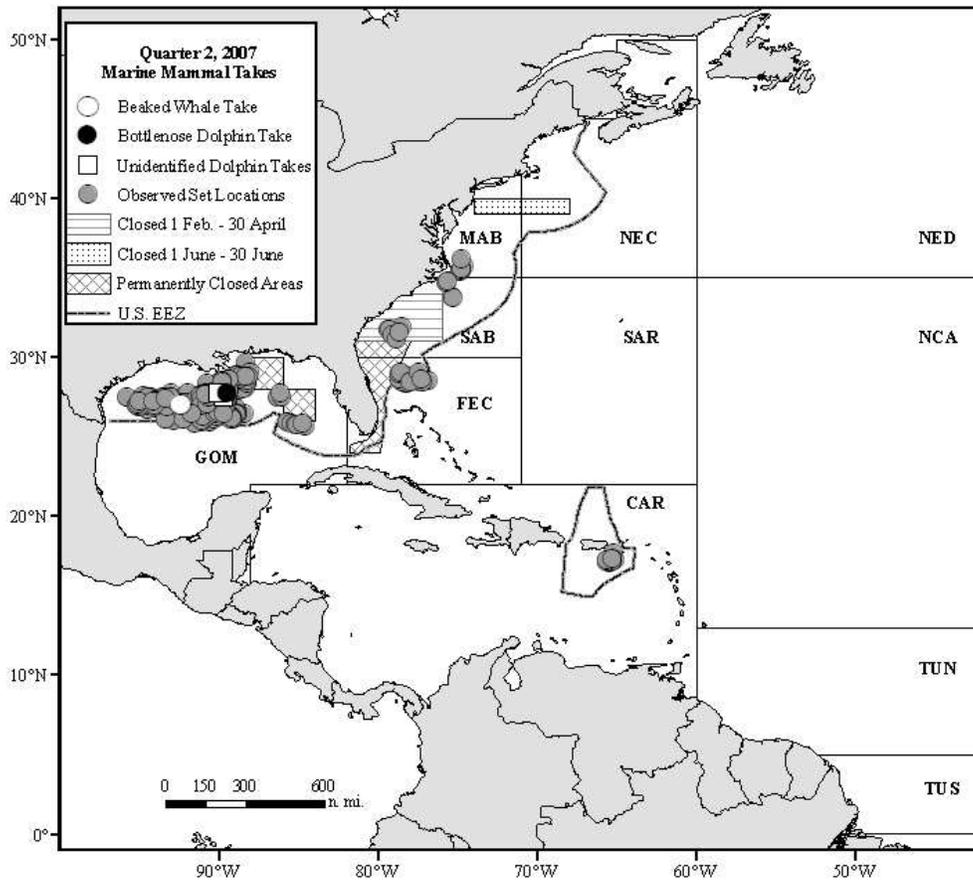


Figure 2. The observed U.S. Pelagic Longline Fishery effort and marine mammal interactions during 1 April – 30 June 2007 are shown. The pelagic longline fishing areas in the North Atlantic Ocean are as follows: CAR = Caribbean, GOM = Gulf of Mexico, FEC = Florida East Coast, SAB = South Atlantic Bight, SAR = Sargasso Sea, MAB = Mid-Atlantic Bight, NEC = Northeast Coastal, NED = Northeast Distant, NCA = North Central Atlantic, TUN = Tuna North and TUS = Tuna South. Area closures and the U.S. Exclusive Economic Zone (EEZ) are shown.



Appendix A: Injury details and hook types for turtles captured in the U.S. Atlantic Pelagic Longline Fishery during 1 April – 30 June 2007.

1. Leatherback Turtles

#	Area	Hook Type	Offset (degrees)	Bait	Bait Size (g)	Release Condition	Hook Location	Hook Removed?	Entangled Capture?	Entangled Release?	Line Left (ft)	CL Est. (ft)	CCL (cm)	Straight N-N (cm)
1	CAR	C-18/0	10	squid	113	Alive, uninjured	not hooked	N/A	Yes	No	0.0	4.0		
2	GOM	C-18/0	0	sardine	90	Alive, uninjured	not hooked	N/A	Yes	No	0.0	6.0		
3	GOM	C-16/0	0	squid	180	Alive, injured	not hooked	N/A	Yes	Yes	20.0	5.0		
4	GOM	C-16/0	0	squid	100	Alive, injured	beak (external)/head/neck	No	No	No	1.0	5.0		
5	GOM	C-16/0	0	squid	258	Alive, injured	mouth, side, jaw joint	No	No	No	5.0	7.0		
6	GOM	C-16/0	0	squid	100	Alive, injured	neck	No	No	No	3.0	4.0		
7	GOM	C-16/0	0	squid	182	Alive, injured	shoulder	No	No	No	0.0	6.0		
8	GOM	C-16/0	0	squid	300	Alive, injured	shoulder	No	No	No	0.3	5.0		
9	GOM	C-16/0	0	squid	186	Alive, injured	shoulder	No	No	No	0.5	7.0		
10	GOM	C-16/0	0	sardine	70	Alive, injured	shoulder	No	No	No	0.8	5.0		
11	GOM	C-16/0	0	squid	136	Alive, injured	shoulder	No	No	No	2.0	5.0		
12	GOM	C-16/0	0	sardine	85	Alive, injured	shoulder	No	No	No	3.0	4.0		

Appendix A (cont.)

1. Leatherback Turtles (cont.)

#	Area	Hook Type	Offset (degrees)	Bait	Bait Size (g)	Release Condition	Hook Location	Hook Removed?	Entangled Capture?	Entangled Release?	Line Left (ft)	CL Est. (ft)	CCL (cm)	Straight N-N (cm)
13	GOM	C- 16/0	0	squid	150	Alive, injured	shoulder	No	No	No	4.5	6.5		
14	GOM	C-18/0	0	squid	183	Alive, injured	armpit	No	No	No	0.1	4.5		
15	GOM	C- 16/0	0	squid	300	Alive, injured	armpit	No	No	No	1.0	5.0		
16	GOM	C- 16/0	0	squid	300	Alive, injured	armpit	No	No	No	1.0	5.0		
17	GOM	C- 16/0	0	squid	258	Alive, injured	armpit	No	No	No	7.0	5.0		
18	GOM	C- 16/0	0	squid	170	Alive, injured	armpit	No	Yes	No	10.0	6.0		
19	GOM	C- 16/0	0	squid	182	Alive, injured	front flipper	No	No	No	0.5	5.0		
20	GOM	C- 16/0	0	squid	179	Alive, injured	front flipper	No	No	No	0.5	7.0		
21	GOM	C- 16/0	0	squid	258	Alive, injured	front flipper/shoulder/ armpit	No	No	No	4.0	5.0		
22	GOM	C- 16/0	0	squid	180	Alive, injured	front flipper/shoulder/ armpit	No	No	No	10.0	4.0		
23	GOM	C- 16/0	0	squid	180	Alive, injured	front flipper/shoulder/ armpit	No	No	Unknown	10.0	4.0		
24	GOM	C- 16/0	0	squid	180	Alive, injured	unknown external	No	Yes	Yes	9.0	5.0		
25	GOM	C- 16/0	0	squid	100	Alive, injured	unknown	No	Yes	Yes	3.0	5.0		

Appendix A (cont).

1. Leatherback Turtles (cont.)

#	Area	Hook Type	Offset (degrees)	Bait	Bait Size (g)	Release Condition	Hook Location	Hook Removed?	Entangled Capture?	Entangled Release?	Line Left (ft)	CL Est. (ft)	CCL (cm)	Straight N-N (cm)
26	GOM	C- 16/0	0	squid	284	Alive, injured	unknown	No	No	No	10.0	5.0		
27	GOM	C- 16/0	0	sardine	54	Alive, injured	unknown	No	No	No	12.0	3.0		
28	GOM	C- 16/0	0	squid	150	Alive, injured	unknown	No	Yes	Unknown	6.0	7.0		
29	GOM	C- 16/0	0	squid	180	Alive, injured	unknown	No	Unknown	Unknown	10.0	3.5		
30	GOM	C- 16/0	0	squid	125	Alive, unknown	not known if hooked	Yes	Yes	No	0.0	5.0		
31	GOM	C- 16/0	0	squid	179	Unknown	not known if hooked	No	Unknown	Unknown	60.0	6.0		

Appendix A (cont.)

2. Loggerhead Turtles

#	Area	Hook Type	Offset (degrees)	Bait	Bait Size (g)	Release Condition	Hook Location	Hook Removed?	Entangled Capture?	Entangled Release?	Line Left (ft)	CL Est. (ft)	CCL (cm)	Straight N-N (cm)
1	FEC	C-18/0	10	squid	316	Alive, injured	mouth, lower jaw, other	Yes	No	No	0.0		68.5	65.3
2	FEC	C-18/0	10	squid	316	Alive, injured	mouth, lower jaw, other	Yes	No	No	0.0		64.4	57.9
3	GOM	C-16/0	0	squid	182	Alive, injured	mouth, lower jaw, other	Yes	No	No	0.0		70.5	64.7
4	GOM	C-16/0	0	squid	136	Alive, injured	mouth, side, unknown	Yes	No	No	0.0	3.0		
5	GOM	C-16/0	0	squid	150	Alive, injured	tongue	Yes	No	No	0.0	2.5		
6	GOM	C-16/0	0	squid	136	Alive, injured	tongue	Yes	No	No	0.0		95.2	
7	GOM	C-16/0	0	squid	182	Alive, injured	swallowed, hook not visible	No	No	No	0.8		75.1	70.5
8	GOM	C-18/0	0	squid	209	Alive, injured	unknown	No	Unknown	Unknown	120.0	3.0		

3. Olive Ridley Turtles

#	Area	Hook Type	Offset (degrees)	Bait	Bait Size (g)	Release Condition	Hook Location	Hook Removed?	Entangled Capture?	Entangled Release?	Line Left (ft)	CL Est. (ft)	CCL (cm)	Straight N-N (cm)
1	CAR	C-18/0	10	squid	113	Alive, injured	tongue	Yes	Yes	No	0.0		60.0	55.5