

Preliminary Estimates of Protected Species Bycatch Rates in the U.S. Atlantic Pelagic Longline Fishery from 1 July to 30 September, 2009

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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 sea turtles and marine mammals. In June 2004, regulations were implemented to reduce interactions with sea turtles by requiring the use of “circle” hooks. The Biological Opinion also required quarterly reporting of interactions with protected species including sea turtles and marine mammals. The goal of this measure is to more closely monitor any short-term changes in interaction rates to allow more responsive management. This report meets this requirement and includes the observed fishery effort and incidental takes reported by the Pelagic Observer Program (POP) from 1 July to 30 September, 2009.

While it is desirable to estimate 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. Therefore, the bycatch rate (i.e. catch per unit effort) is presented in this report 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 3 of 2009 is compared to that observed in quarter 3 during the three year period prior to (2002-2004) and the period after (2005-2008) implementation of regulations to determine if the current rates are unusually high or low. Bycatch rates were calculated by fishing area (Figure 1) using the delta log-normal method using hooks as the unit of effort. The analytical methods are described in detail in Garrison (2003).

Results and Discussion

A total of approximately 7,300 longline sets (~220,000 hooks) were observed during the third quarter of 2009 (Table 1) during normal fishing effort with only circle hooks (16/0 and 18/0) recorded. The level of effort in the SAB fishing area and the exact total cannot be reported due

to confidentiality restrictions. The majority of the observed sets occurred in the GOM fishing area (Figure 1).

In addition, a cooperative research program with NOVA Southeastern University was conducted that included longline fishing inside and outside of areas normally closed to fishing in the FEC area. Effort levels cannot be reported since fewer than 3 vessels were observed (Table 1). The experimental fishing, and associated bycatch, is not included in estimates of bycatch rates because they are not representative of the normal fishing effort.

The locations of observed sets and turtle interactions are shown in Figure 1. During normal fishing, there were 12 observed interactions with leatherback turtles and 12 observed interactions with loggerhead turtles (Table 2). There were no interactions with turtles in experimental fishing. One leatherback turtle was listed as dead on release, and all other turtles were released alive (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. The release status for all turtles is summarized in Table 3. One leatherback turtle was released dead. Of the 11 leatherback turtles released alive, 5 were released with either all gear removed or with the hook and trailing line less than one-half of the carapace length. Of the captured loggerhead turtles, all 12 were released alive with all gear removed or with the hook and trailing line less than one-half the carapace length (Table 3).

The quarterly and regional bycatch rates are summarized for sea turtles in Table 4. These rates were compared with those from the same quarter/area for 2002-2004 before the implementation of the circle hook regulations and the average for same quarter/area for 2005-2008 after implementation (Table 5).

For leatherback turtles, there was no observed bycatch in GOM during 2009, though bycatch had been observed during the third quarter in 2002-2004 and 2005-2008. The bycatch rate in the MAB was consistent with that observed in 2005-2008, but lower than that from 2002-2004. In the NEC and NED, bycatch rates were lower than those in 2005-2008; however, those differences were not statistically significant. The 2009 bycatch rate in these strata were higher than that observed in 2002-2004 (Table 5a).

The observed bycatch rates for loggerhead turtles in 2009 were lower than those observed in 2005-2008 in the FEC, MAB, NEC, and NED fishing areas. In the NEC and NED, the rates for the current year were considerably lower than those in recent past years. The bycatch rate in the FEC area was considerably higher during 2009 compared to 2005-2008 and 2002-2004 (Table 5b).

A total of 9 marine mammals were observed interacting with longline fishing gear in the third quarter of 2009 (Table 6). Of these, 3 were classified as seriously injured based upon guidelines described in Angliss and DeMaster (1998). Bycatch rates of marine mammals are summarized in tables 7 and 8. The bycatch of pantropical spotted dolphins during the third quarter had not been observed in the Gulf of Mexico prior to 2009. The bycatch rates of Risso's dolphins in the

MAB, NEC, and NED areas were higher than those observed in previous years. The bycatch of pilot whales in the MAB was significantly lower than that in prior years, but pilot whale bycatch occurred in the NEC during 2009, which was relatively rare in recent years (Table 8).

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 2009 calendar year. 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.

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. Number of sets and hooks observed in the U.S. Atlantic Pelagic Longline Fishery between 1 July and 30 September, 2009 by fishing area during (A) normal and (B) experimental fishery operations. NR indicates areas where effort cannot be reported due to confidentiality considerations.

A. Normal Fishing

Area	Sets	Hooks
CAR	0	0
FEC	37	19,003
GOM	107	79,197
MAB	75	49,873
NCA	0	0
NEC	40	41,891
NED	39	32,081
SAB	NR	NR
SAR	0	0
TUN	0	0
Total	NR	NR

B. Experimental Fishing

Area	Sets	Hooks
CAR	0	0
FEC	NR	NR
GOM	0	0
MAB	0	0
NCA	0	0
NEC	0	0
NED	0	0
SAB	0	0
SAR	0	0
TUN	0	0
TUS	0	0
Total	NR	NR

Table 2. Total observed interactions with marine turtles in the U.S. Atlantic Pelagic Longline Fishery for sets beginning between 1 July and 30 September, 2009 by fishing area during (A) normal and (B) experimental fishing operations. Areas with missing values indicate no observer coverage during this time period.

A. Normal Fishing

Area	Leatherback	Loggerhead
CAR	-	-
FEC	0	1
GOM	0	1
MAB	2	3
NCA	-	-
NEC	6	4
NED	4	2
SAB	0	1
SAR	-	-
TUN	-	-
Total	12	12

B. Experimental Fishing

Area	Leatherback	Loggerhead
CAR	-	-
FEC	0	0
GOM	-	-
MAB	-	-
NCA	-	-
NEC	-	-
NED	-	-
SAB	-	-
SAR	-	-
TUN	-	-
Total	0	0

Table 3. Release status and gear removal for sea turtles captured in the U.S. Atlantic Pelagic Longline Fishery between 1 July and 30 September, 2009. Totals do not include 1 dead leatherback.

Release Status	Leatherback	Loggerheads
Released entangled	2	0
Released with hook and line \geq $\frac{1}{2}$ carapace length	4	0
Released with hook and line $<$ $\frac{1}{2}$ carapace length	2	2
Released with all gear removed	3	10

Table 4. Estimated bycatch rate (Catch per 1,000 hooks) for (A) Leatherback and (B) Loggerhead turtles by geographic area and between 1 July and 30 September, 2009 in the U.S. Atlantic Pelagic Longline Fishery during normal fishing operations. Missing values indicate areas with no observer coverage. CV indicates the coefficient of variation of the estimated rate. NR indicates areas where effort cannot be reported due to confidentiality considerations.

A. Leatherback Turtles

Area	Interaction Type	# Observed Sets	# Positive Sets	Mean CPUE	CV CPUE	95% Confidence Interval
CAR	Alive	0	-	-	-	-
FEC	Alive	37	0	0	-	-
GOM	Alive	107	0	0	-	-
MAB	Alive	75	2	0.0302	0.7361	0.0083 – 0.1095
NCA	Alive	0	-	-	-	-
NEC	Alive	40	4	0.1263	0.5033	0.0498 – 0.3205
NEC	Dead	40	1	0.0240	1.0000	0.0047 – 0.1229
NED	Alive	39	4	0.1269	0.5019	0.0501 – 0.3214
SAB	Alive	NR	0	0	0	0
SAR	Alive	0	0	0	-	-
TUN	Alive	0	-	-	-	-

B. Loggerhead Turtles

Area	Interaction Type	# Observed Sets	# Positive Sets	Mean CPUE	CV CPUE	95% Confidence Interval
CAR	Alive	0	-	-	-	-
FEC	Alive	37	1	0.0575	1.0000	0.0112 – 0.2940
GOM	Alive	107	1	0.0104	1.0000	0.0020 – 0.0531
MAB	Alive	75	3	0.0414	0.5775	0.0145 – 0.1184
NCA	Alive	0	-	-	-	-
NEC	Alive	40	4	0.0937	0.4809	0.0383 – 0.2290
NED	Alive	39	2	0.0541	0.7337	0.0149 – 0.1957
SAB	Alive	NR	1	0.4105	1.0000	0.0803 – 2.0990
SAR	Alive	0	0	-	-	-
TUN	Alive	0	0	-	-	-

Table 5. Bycatch rates for (A) Leatherback turtles and (B) Loggerhead turtles in the U.S. Atlantic Pelagic Longline fishery between 1 July and 30 September, 2009 compared to the third quarter average rate from 2002-2004 and from 2005-2008. 95% CI indicates the estimated 95% confidence interval of the mean bycatch rate (CPUE) in each cell assuming a lognormal distribution of rates. These rates reflect combined alive, dead and unknown turtles.

A. Leatherback turtles

Area	2002-2004 CPUE	2002-2004 95% CI	2005-2008 CPUE	2005-2008 95% CI	2009 CPUE	2009 95% CI
CAR	-	-	-	-	-	-
FEC	0	-	0	-	0	-
GOM	0.1408	0.0876 – 0.2265	0.0176	0.0049 – 0.0630	0	-
MAB	0.0648	0.0183 – 0.2293	0.0368	0.0158 – 0.0858	0.0302	0.0083 - 0.1095
NCA	-	-	-	-	-	-
NEC	0.0208	0.0042 – 0.1015	0.2379	0.1603 – 0.3532	0.1485	0.0558 – 0.3954
NED	-	-	0.2038	0.1355 – 0.3061	0.1269	0.0501 – 0.3214
SAB	0.0526	0.0108 – 0.2572	0	-	0	-
SAR	-	-	-	-	-	-
TUN	-	-	-	-	-	-

B. Loggerhead Turtles

Area	2002-2004 CPUE	2002-2004 95% CI	2005-2008 CPUE	2005-2008 95% CI	2009 CPUE	2009 95% CI
CAR	-	-	-	-	-	-
FEC	0	-	0.1084	0.0395 – 0.2974	0.0575	0.0112 – 0.2940
GOM	0.0248	0.0101 – 0.0607	0	-	0.0104	0.0020 – 0.0531
MAB	0.0477	0.0133 – 0.1715	0.1056	0.0653 – 0.1712	0.0414	0.0144 – 0.1183
NCA	-	-	-	-	-	-
NEC	0.2497	0.1335 – 0.4671	0.4804	0.3571 – 0.6461	0.0937	0.0383 – 0.2290
NED	-	-	0.6083	0.3682 – 1.0050	0.0541	0.0149 - 0.1958
SAB	0	-	0.0889	0.0268 – 0.2956	0.4101	0.0803 – 2.0989
SAR	-	-	-	-	-	-
TUN	-	-	-	-	-	-

Table 6. Interactions with marine mammals observed during 1 July – 30 September, 2009 in the U.S. Atlantic Pelagic Longline Fishery by fishing area. Observer comments and criteria described in Angliss and DeMaster (1998) were used to evaluate serious injury.

Species	Region	# Released Un-injured	# Dead	# Serious Injury
Pantropical Spotted Dolphin	GOM	1	0	0
Risso's Dolphin	MAB	1	0	0
Risso's Dolphin	NEC	2	0	1
Risso's Dolphin	NED	0	0	1
Pilot Whale	MAB	1	0	0
Pilot Whale	NEC	1	0	0
Un-identified Marine Mammal	MAB	0	0	1

Table 7. Estimated bycatch rate (Catch per 1000 hooks) for marine mammals by geographic area and quarter during 1 July – 30 September, 2009 in the U.S. Atlantic Pelagic Longline Fishery during normal fishing operations. CV indicates the coefficient of variation of the estimated rate.

Species	Serious Injury?	Area	# Observed Sets	# Positive Sets	Mean CPUE	CV CPUE	95% Confidence Interval
Pantropical Spotted Dolphin	N	GOM	107	1	0.0118	1.0000	0.0023 – 0.0601
Risso's Dolphin	N	MAB	75	1	0.0242	1.0000	0.0047 – 0.1240
Un-identified Marine Mammal	Y	MAB	75	1	0.0149	1.0000	0.0029 – 0.0761
Pilot Whale	N	MAB	75	1	0.0208	1.0000	0.0041 – 0.1065
Risso's Dolphin	Y	NEC	40	1	0.0209	1.0000	0.0041 – 0.1072
Risso's Dolphin	N	NEC	40	2	0.0479	0.7017	0.0054 – 0.1401
Pilot Whale	N	NEC	40	1	0.0272	1.0000	0.0053 – 0.1389
Risso's Dolphin	Y	NED	39	1	0.0274	1.0000	0.0054 – 0.1401

Table 8. Bycatch rates for marine mammals in the U.S. Atlantic Pelagic Longline Fishery between 1 July and 30 September, 2009 compared to the third quarter average rate from 2002-2004 and the average rate from 2005-2008. 95% CI indicates the estimated 95% confidence interval of the mean bycatch rate (CPUE) in each cell assuming a lognormal distribution of rates. CPUEs reflect total marine mammals caught including alive, dead, and seriously injured animals.

Species	Area	2002-2004 CPUE	2002-2004 95% CI	2005-2008 CPUE	2005-2008 95% CI	2009 CPUE	2009 95% CI
Pantropical Spotted Dolphin	GOM	0	-	0	-	0.0118	0.0023 – 0.0601
Un-identified Marine Mammal	GOM	0	-	0.0057	0.0012 – 0.0280	0	-
Common Dolphin	MAB	0.0181	0.0037 – 0.0883	0	-	0	-
Risso's Dolphin	MAB	0.0141	0.0029 – 0.0688	0.0046	0.0009 – 0.0226	0.0242	0.0047 – 0.1239
Pilot Whale	MAB	0.1010	0.0428 – 0.2379	0.1783	0.1065 – 0.2984	0.0208	0.0041 – 0.1065
Un-identified Marine Mammal	MAB	0	-	0.0110	0.0033 – 0.0369	0.0149	0.0029 – 0.0761
Bottlenose Dolphin	NEC	0	-	0.0098	0.0020 – 0.4789	0	-
Risso's Dolphin	NEC	0.0518	0.0155 – 0.1725	0.0258	0.0075 – 0.0891	0.0689	0.0245 – 0.1934
Pilot Whale	NEC	0	-	0.0091	0.0019 – 0.0443	0.0272	0.0053 – 0.1389
Beaked Whale	NEC	0	-	0.0096	0.0020 – 0.0470	0	-
Risso's Dolphin	NED	-	-	0	-	0.0274	0.0054 – 0.1401

Figure 1. Pelagic Longline effort and turtle interactions observed between 1 July and 30 September 2009. Pelagic longline fishing areas include: CAR = Caribbean, GOM = Gulf of Mexico, FEC = Florida East Coast, SAB = South Atlantic Bight, SAR = Sargasso Sea, MAB = Mid-Atlantic Bight, NEC = Northeast Coastal, NED = Northeast Distant, NCA = North Central Atlantic, TUN = Tuna North. Year-round closed areas in the DeSoto Canyon (A) and the Florida East Coast (B) are indicated.

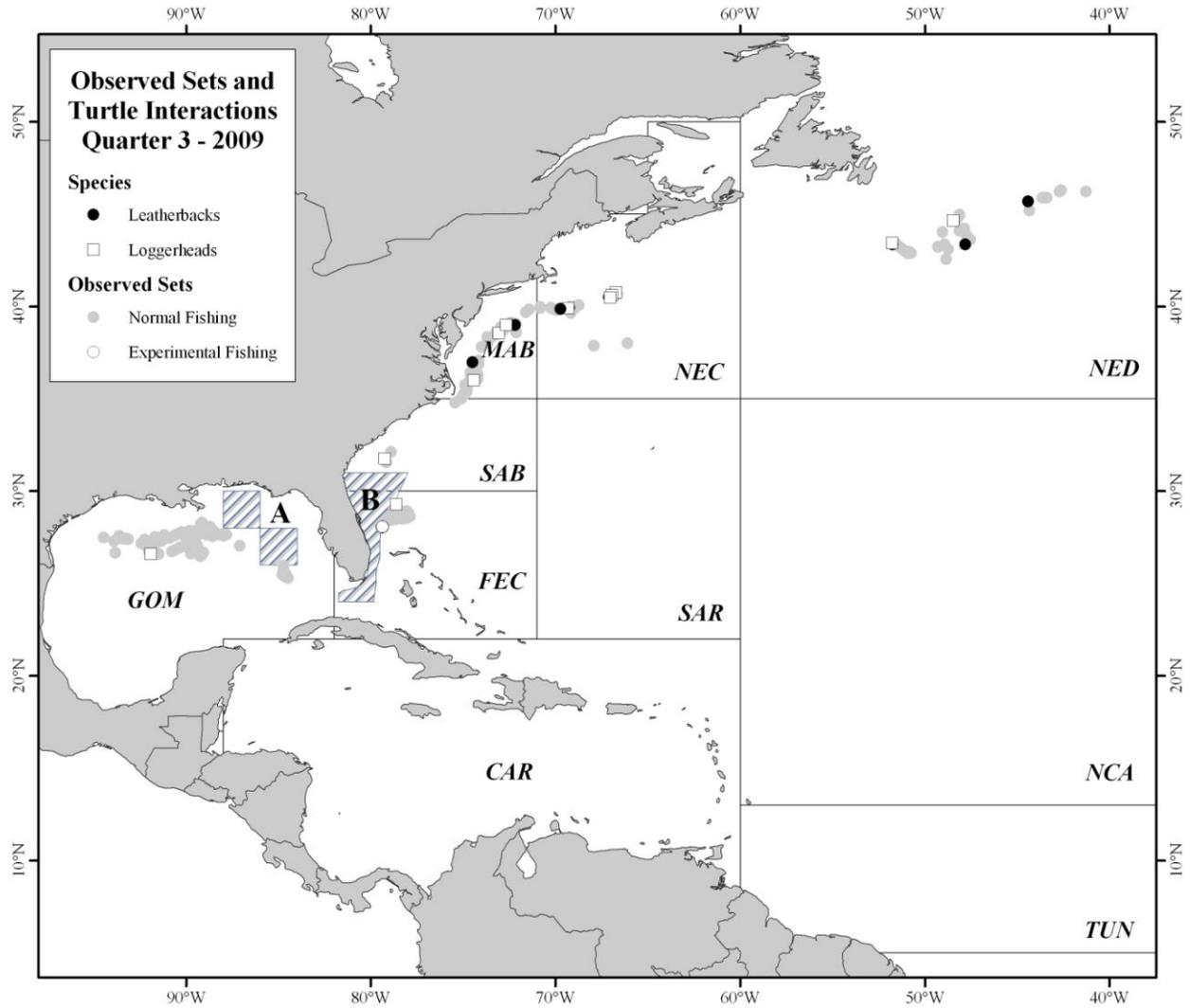
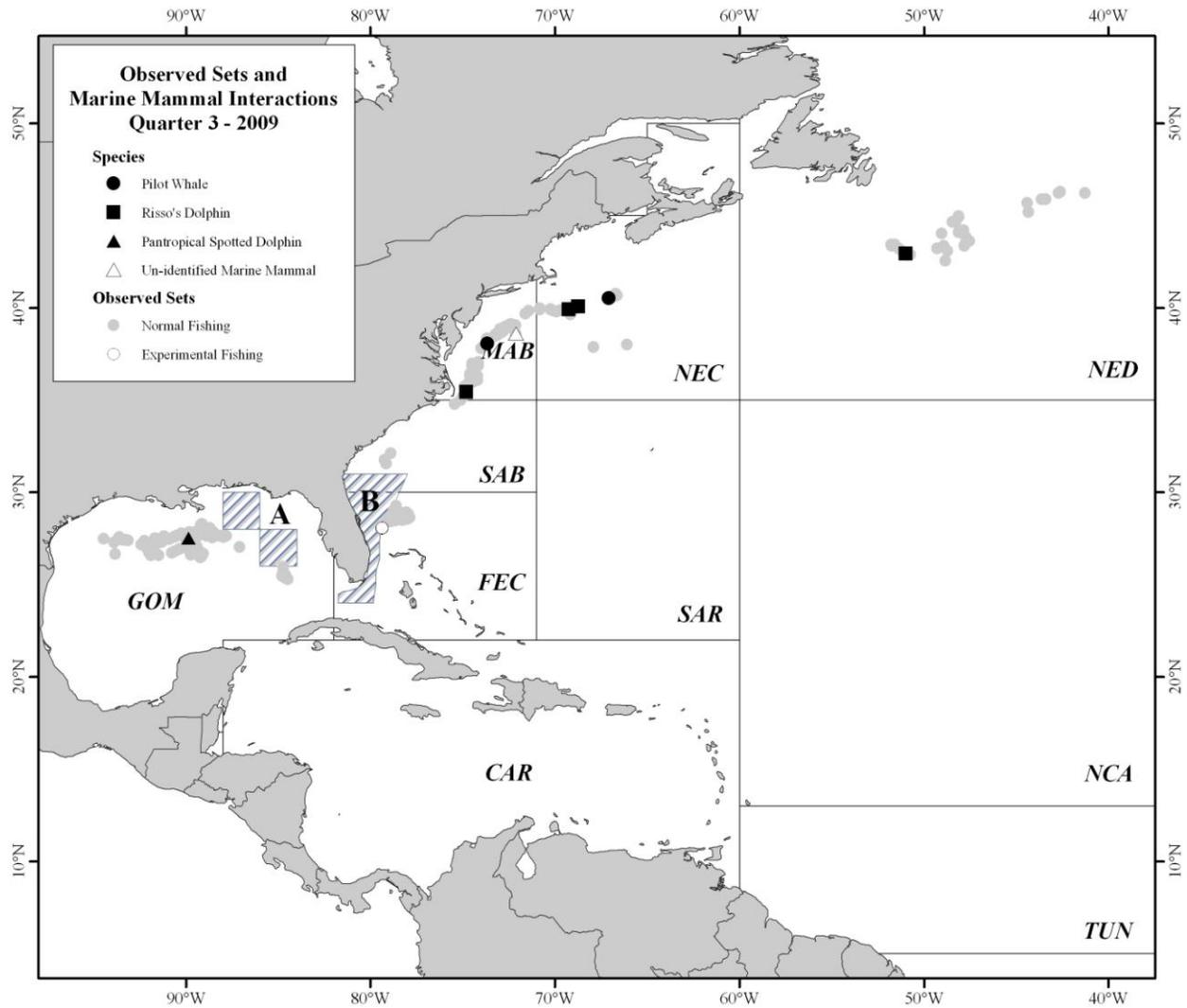


Figure 2. Pelagic Longline effort and marine mammal interactions observed between 1 July and 30 September, 2009. Pelagic longline fishing areas include: CAR = Caribbean, GOM = Gulf of Mexico, FEC = Florida East Coast, SAB = South Atlantic Bight, SAR = Sargasso Sea, MAB = Mid-Atlantic Bight, NEC = Northeast Coastal, NED = Northeast Distant, NCA = North Central Atlantic, TUN = Tuna North. Year-round closed areas in the DeSoto Canyon (A) and the Florida East Coast (B) are indicated.



Appendix A: Injury details and hook type for turtles captured in the U.S. Atlantic Pelagic Longline Fishery for sets between 1 July and 30 September 2009.

A1. Leatherback Turtles

#	Area	Hook Type	Offset (degrees)	Bait	Bait Size (g)	Capture Condition	Final Disposition	Hook Location	Hook Removed?	Entangled Capture?	Entangled Release?	Line Left (ft)	CL Est. (ft)	CCL (cm)	Straight N-N (cm)
1	MAB	C-16/0	0	Squid	171	Alive, uninjured	Released alive	not hooked	NA	Yes	Yes	6.00	4.5		
2	NED	C-18/0	10	Mackerel	356	Alive, injured	Released alive	shoulder	No	No	Unknown	3.00	5.0		
3	NED	C-18/0	10	Mackerel	320	Alive, injured	Released alive	shoulder	Yes	No	No	0.00	5.0		
4	NED	C-18/0	10	Mackerel	333	Alive, injured	Released alive	armpit	No	No	No	0.00	5.5		
5	NED	C-18/0	10	Mackerel	365	Alive, injured	Released alive	armpit	No	No	No	0.50	4.5		
6	NEC	C-18/0	10	Squid or Mackerel	203 or 338	Alive, injured	Released alive	shoulder	No	No	No	2.00	4.0		
7	NEC	C-18/0	10	Mackerel	338	Alive, injured	Released alive	shoulder	Yes	No	No	0.00	5.0		
8	NEC	C-18/0	10	Squid or Mackerel	203 or 338	Alive, injured	Released alive	shoulder	No	No	No	5.00	5.0		
9	NEC	C-18/0	10	Unknown	Unknown	fresh dead	Discarded unmarked dead/unresponsive carcass	not hooked	No	Yes	Yes	24.00	6.0		
10	NEC	C-18/0	10	Squid or Mackerel	203 or 338	Alive, injured	Released alive	not hooked	NA	Yes	Yes	6.00	6.0		
11	MAB	C-18/0	10	Squid	134	Alive, injured	Released alive	shoulder	No	No	No	5.00	3.5		
12	NEC	C-18/0	10	Squid or Mackerel	243 or 284	Alive, injured	Released alive	armpit	Yes	No	No	0.00	6.0		

A2. Loggerhead Turtles

#	Area	Hook Type	Offset (degrees)	Bait	Bait Size (g)	Capture Condition	Final Disposition	Hook Location	Hook Removed?	Entangled Capture?	Entangled Release?	Line Left (ft)	CL Est. (ft)	CCL (cm)	Straight N-N (cm)
1	NED	C-18/0	10	Mackerel	383	Alive, injured	Released alive	mouth, lower, other	Yes	No	No	0.00		51.6	46.1
2	MAB	C-16/0	0	Squid	180	Alive, injured	Released alive	tongue	Yes	No	No	0.00	3.5		
3	NED	C-18/0	10	Mackerel	365	Alive, unknown	Released alive	not known if hooked	Yes	No	No	0.00	2.2		
4	FEC	C-16/0	0	Squid	239	Alive, injured	Released alive	swallowed, hook not visible	No	No	No	1.00		88	78
5	SAB	C-16/0	0	Squid or Mackerel	198 or 135	Alive, injured	Released alive	swallowed, hook partially visible	Yes	No	No	0.00		64	57.6
6	NEC	C-18/0	10	Squid or Mackerel	203 or 338	Alive, injured	Released alive	tongue	No	No	No	0.00		68	58.7
7	NEC	C-18/0	10	Squid or Mackerel	203 or 338	Alive, injured	Released alive	shoulder	Yes	No	No	0.00		67	57
8	NEC	C-18/0	10	Squid or Mackerel	230 or 270	Alive, injured	Released alive	tongue	Yes	No	No	0.00		68	60.5
9	NEC	C-18/0	10	Squid	194	Alive, injured	Released alive	mouth, side, other	Yes	No	No	0.00		66	58.2
10	MAB	C-16/0	0	Squid	212	Alive, injured	Released alive	glottis	Yes	No	No	0.00		74	67.9
11	GOM	C-16/0	0	Squid	212	Alive, uninjured	Released alive	beak internal, lower jaw	Yes	No	No	0.00	4.5		
12	MAB	C-18/0	10	Squid	176	Alive, injured	Released alive	mouth, side, other	Yes	No	No	0.00		80	76