

Preliminary Estimates of Protected Species Bycatch Rates in the U.S. Atlantic Pelagic Longline Fishery from 1 July to 31 December, 2010

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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 31 December, 2010.

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 quarters 3 and 4 of 2010 are compared to that observed in during the three year period prior to (2002-2004) and the period after (2005-2009) 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 173 sets (147,870 hooks) were observed during the third quarter, and 146 sets (117,838 hooks) were observed during the fourth quarter (Table 1) with only circle hooks (16/0 and 18/0) recorded. The exact effort levels cannot be reported in several regions due to

confidentiality restrictions. The majority of the observed sets occurred in the MAB fishing area (Figure 1). There was relatively little observed fishing, and relatively little fishing effort available to be observed, in the GOM region during both the third and fourth quarters due to restrictions on fishing associated with the MC252 oil spill in the north-central Gulf of Mexico.

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 MAB and FEC areas. Effort levels cannot be reported since fewer than 3 vessels were observed (Table 1). Additional experimental fishing to examine the effectiveness of “weak hooks” was conducted in the GOM during the third quarter. 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 8 observed interactions with leatherback turtles and 27 observed interactions with loggerhead turtles during quarter 3 (Table 2). During quarter 4, there was 1 observed leatherback interaction, 3 loggerhead interactions, and 1 with an unidentified hardshell turtle (Table 2). There were 2 interactions with leatherback turtles during experimental fishing in the third quarter. All 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. During quarter 3, 9 of 10 leatherback turtles were released with either all gear removed or with the hook and trailing line less than one-half of the carapace length, and all 27 loggerhead turtles were released in these categories (Table 3). During quarter 4, all turtles were released with minimal or no gear attached (Table 3).

The quarterly and regional bycatch rates are summarized for sea turtles in Tables 4 and 6. 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 2005-2009 after implementation (Tables 5 and 7).

For leatherback turtles, the bycatch rate during quarter 3 of 2010 was higher than that for the 2002-2004 period in the NEC and NED, but was zero in all other strata. The bycatch rate for 2010 was lower than that for 2005-2009 in the NEC, but was elevated in the NED (Table 5a). Loggerhead turtle bycatch rates for quarter 3 of 2010 were generally higher than those for 2002-2004 for all areas. The 2010 rates were largely consistent with those from 2005-2009. However, the bycatch rate for the SAB region was zero in 2010 whereas bycatch had been observed at a relatively high average rate for 2005-2009 (Table 5b).

During quarter 4, the 2010 bycatch rates for leatherback turtles were very low relative to historical averages (Table 7a). Similarly for loggerhead turtles, bycatch rates for 2010 were zero for most strata and were lower than both historical periods (Table 7b).

Six marine mammal interactions were observed during the third quarter. This included three serious injuries of an unidentified marine mammal in the MAB, a pilot whale in the MAB, and an unidentified marine mammal in the NEC (Table 8a, Table 9a). One pantropical spotted dolphin interaction was observed in experimental fishing in the GOM. During quarter 4, there were four observed marine mammal interactions. Three of these were serious injuries to pilot whales in the MAB occurring in experimental fishing (Table 8b, 9b). These experimental takes are not reflecting in the bycatch rates presented in table 9b. The third quarter bycatch rate of pilot whales in the MAB was lower than in prior years, though not significantly so, and that in the NEC was consistent with rates in recent years (Table 10). During quarter 4, the bycatch of marine mammals in normal fishing was very low relative to prior years (Table 11)

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 2010 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 31 December, 2010 by fishing area and quarter during (A) normal and (B) experimental fishery operations. NR indicates areas where effort cannot be reported due to confidentiality considerations.

A. Normal Fishing

	Quarter 3		Quarter 4	
Area	Sets	Hooks	Sets	Hooks
CAR	0	0	0	0
FEC	26	14,008	10	6,920
GOM	NR	NR	NR	NR
MAB	52	51,665	62	55,971
NCA	0	0	0	0
NEC	66	59,018	0	0
NED	NR	NR	NR	NR
SAB	NR	NR	19	11,910
SAR	0	0	NR	NR
TUN	0	0	NR	NR
Total	173	147,870	146	117,838

B. Experimental Fishing

	Quarter 3		Quarter 4	
Area	Sets	Hooks	Sets	Hooks
CAR	0	0	0	0
FEC	NR	NR	0	0
GOM	NR	NR	0	0
MAB	NR	NR	NR	NR
NCA	0	0	0	0
NEC	0	0	0	0
NED	0	0	0	0
SAB	0	0	0	0
SAR	0	0	0	0
TUN	0	0	0	0
Total	66	34,690	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 31 December, 2010 by fishing area and quarter during (A) normal and (B) experimental fishing operations. Areas with missing values indicate no observer coverage during this time period.

A. Normal Fishing

Quarter 3			Quarter 4		
Area	Leatherback	Loggerhead	Leatherback	Loggerhead	Unid. Turtle
CAR	-	-	-	-	-
FEC	0	1	0	0	0
GOM	0	0	0	0	0
MAB	0	5	0	1	0
NCA	-	-	-	-	-
NEC	3	12	-	-	-
NED	5	9	0	0	0
SAB	0	0	0	0	0
SAR	-	-	1	2	1
TUN	-	-	0	0	0
Total	8	27	1	3	1

B. Experimental Fishing

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

Table 3. Release status and gear removal for sea turtles captured in the U.S. Atlantic Pelagic Longline Fishery during (A) 1 July – 30 September 2010, and (B) 1 October – 31 December, 2010. These tables include turtles captured during experimental fishing.

A. Quarter 3

Release Status	Leatherback	Loggerhead
Released entangled	0	0
Released with hook and line \geq $\frac{1}{2}$ carapace length	1	0
Released with hook and line \leq $\frac{1}{2}$ carapace length	3	6
Released with all gear removed	6	21

B. Quarter 4

Release Status	Leatherback	Loggerhead	Unid. Turtle
Released entangled	0	0	0
Released with hook and line \geq $\frac{1}{2}$ carapace length	0	0	0
Released with hook and line \leq $\frac{1}{2}$ carapace length	0	1	0
Released with all gear removed	1	3	0
Unknown	0	0	1*

*It is unknown whether or not the unidentified turtle was hooked. It is also unknown whether gear remained attached when it was released.

Table 4. Estimated bycatch rate (Catch per 1,000 hooks) for (A) Leatherback, (B) Loggerhead turtles by geographic area and between 1 July and 30 September, 2010 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. Quarter 3: Leatherback Turtles

Area	Interaction Type	# Observed Sets	# Positive Sets	Mean CPUE	CV CPUE	95% Confidence Interval
CAR	Alive	0	-	-	-	-
FEC	Alive	26	0	0	-	-
GOM	Alive	NR	0	0	-	-
MAB	Alive	52	0	0	-	-
NCA	Alive	0	-	-	-	-
NEC	Alive	66	3	0.0570	0.5732	0.0200 – 0.1619
NED	Alive	NR	4	0.2603	0.4811	0.1065 – 0.6367
SAB	Alive	NR	0	0	-	-
SAR	Alive	0	-	-	-	-
TUN	Alive	0	-	-	-	-

B. Quarter 3: Loggerhead Turtles

Area	Interaction Type	# Observed Sets	# Positive Sets	Mean CPUE	CV CPUE	95% Confidence Interval
CAR	Alive	0	-	-	-	-
FEC	Alive	26	1	0.0625	1.000	0.0122 – 0.3198
GOM	Alive	NR	0	0	-	-
MAB	Alive	52	5	0.0811	0.4358	0.0358 – 0.1837
NCA	Alive	0	-	-	-	-
NEC	Alive	66	10	0.1775	0.3012	0.0996 – 0.3163
NED	Alive	NR	5	0.4611	0.4679	0.1928 – 1.103
SAB	Alive	NR	0	0	-	-
SAR	Alive	0	-	-	-	-
TUN	Alive	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, 2010 compared to the first quarter average rate from 2002-2004 and from 2005-2009. 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. Quarter 3: Leatherback turtles

Area	2002-2004 CPUE	2002-2004 95% CI	2005-2009 CPUE	2005-2009 95% CI	2010 CPUE	2010 95% CI
CAR	0	-	0	-	-	-
FEC	0	-	0	-	0	-
GOM	0.1408	0.0864-0.2295	0.0116	0.0031-0.0431	0	-
MAB	0.0648	0.0177-0.2377	0.0348	0.0165-0.0733	0	-
NCA	0	-	0	-	-	-
NEC	0.0208	0.0041-0.1062	0.2149	0.1468-0.3146	0.0570	0.0200 – 0.1619
NED	0	-	0.1862	0.1267-0.2738	0.2603	0.1065 – 0.6367
SAB	0.0526	0.0103-0.2690	0	-	0	-
SAR	0	-	0	-	-	-
TUN	0	-	0	-	-	-

B. Quarter 3: Loggerhead Turtles

Area	2002-2004 CPUE	2002-2004 95% CI	2005-2009 CPUE	2005-2009 95% CI	2010 CPUE	2010 95% CI
CAR	0	-	0	-	-	-
FEC	0	-	0.0900	0.0361-0.2245	0.0625	0.0122 – 0.3198
GOM	0.0248	0.0099-0.0623	0.0035	0.0007-0.0180	0	-
MAB	0.0477	0.0128-0.1778	0.0860	0.0545-0.1356	0.0811	0.0358 – 0.1837
NCA	0	-	0	-	-	-
NEC	0.2497	0.1312-0.4754	0.3802	0.2825-0.5116	0.1775	0.0996 – 0.3163
NED	0	-	0.4763	0.2892-0.7843	0.4611	0.1928 – 1.103
SAB	0	-	0.1188	0.0424-0.3329	0	-
SAR	0	-	0	-	-	-
TUN	0	-	0	-	-	-

Table 6. Estimated bycatch rate (Catch per 1,000 hooks) for (A) Leatherback and (B) Loggerhead turtles by geographic area and between 1 October and 31 December, 2010 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. Quarter 4: Leatherback Turtles

Area	Interaction Type	# Observed Sets	# Positive Sets	Mean CPUE	CV CPUE	95% Confidence Interval
CAR	Alive	0	-	-	-	-
FEC	Alive	10	0	0	-	-
GOM	Alive	NR	0	0	-	-
MAB	Alive	62	0	0	-	-
NCA	Alive	0	-	-	-	-
NEC	Alive	0	-	-	-	-
NED	Alive	NR	0	0	-	-
SAB	Alive	19	0	0	-	-
SAR	Alive	NR	1	0.0387	1.000	0.0076 – 0.1976
TUN	Alive	NR	0	0	-	-

B. Quarter 4: Loggerhead Turtles

Area	Interaction Type	# Observed Sets	# Positive Sets	Mean CPUE	CV CPUE	95% Confidence Interval
CAR	Alive	0	-	-	-	-
FEC	Alive	10	0	0	-	-
GOM	Alive	NR	0	0	-	-
MAB	Alive	62	1	0.0122	1.000	0.0024 – 0.0625
NCA	Alive	0	-	-	-	-
NEC	Alive	0	-	-	-	-
NED	Alive	NR	0	0	-	-
SAB	Alive	19	0	0	-	-
SAR	Alive	NR	2	0.0774	0.6892	0.0228 – 0.2628
TUN	Alive	NR	0	0	-	-

Table 7. Bycatch rates for (A) Leatherback turtles and (B) Loggerhead turtles in the U.S. Atlantic Pelagic Longline fishery between 1 October and 31 December, 2010 compared to the first quarter average rate from 2002-2004 and from 2005-2009. 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. Quarter 4: Leatherback turtles

Area	2002-2004 CPUE	2002-2004 95% CI	2005-2009 CPUE	2005-2009 95% CI	2010 CPUE	2010 95% CI
CAR	0	-	0	-	-	-
FEC	0	-	0	-	0	-
GOM	0.2300	0.1493-0.3545	0.0834	0.0536-0.1297	0	-
MAB	0.3117	0.0783-0.2584	0.0505	0.0279-0.0916	0	-
NCA	0	-	0	-	-	-
NEC	0.3472	0.1449-0.5438	0.0549	0.0160-0.1891	-	-
NED	0	-	0.2324	0.1437-0.3758	0	-
SAB	0	-	0.0872	0.0247-0.3075	0	-
SAR	-	-	0.1789	0.0816-0.3918	0.0387	0.0076 – 0.1976
TUN	-	-	0.0597	0.0117-0.3050	0	-

B. Quarter 4: Loggerhead Turtles

Area	2002-2004 CPUE	2002-2004 95% CI	2005-2009 CPUE	2005-2009 95% CI	2010 CPUE	2010 95% CI
CAR	0.2451	0.0479-1.253	0	-	0	-
FEC	0.5617	0.1699-1.853	0.2002	0.0862-0.4652	0	-
GOM	0.0350	0.0132-0.0930	0.0107	0.0037-0.0305	0	-
MAB	0.1436	0.0792-0.2603	0.0319	0.0135-0.0755	0.0122	0.0024 – 0.0625
NCA	0	-	0	-	-	-
NEC	0.0914	0.0270-0.3093	0.0183	0.0036-0.0934	-	-
NED	0	-	0.2142	0.1250-0.3672	0	-
SAB	0.4673	0.1500-1.4592	0	-	0	-
SAR	-	-	0.1802	0.0725-0.4477	0.0774	0.0228 – 0.2628
TUN	-	-	0	-	0	-

Table 8. Interactions with marine mammals observed during (A) 1 July – 30 September 2010 and (B) 1 October – 31 December, 2010 in the U.S. Atlantic Pelagic Longline Fishery by fishing area. “Exp” indicates an experimental set. Observer comments and criteria described in Angliss and DeMaster (1998) were used to evaluate serious injury.

A. Quarter 3

Species	Region	# Released Un-injured	# Dead	# Serious Injury
Unid. Marine Mammal	MAB	0	0	1
Pilot Whale	MAB	1	0	1
Unid. Marine Mammal	NEC	0	0	1
Pilot Whale	NEC	1	0	0
Pantropical Spotted Dolphin	GOM (Exp.)	1	0	0

B. Quarter 4

Species	Region	# Released Un-injured	# Dead	# Serious Injury
Risso’s Dolphin	MAB	1	0	0
Pilot Whale	MAB (Exp.)	0	0	3

Table 9. Estimated bycatch rate (Catch per 1000 hooks) for marine mammals by geographic area for (A) quarter 3 and (B) quarter 4 of 2010 in the U.S. Atlantic Pelagic Longline Fishery during normal fishing operations. CV indicates the coefficient of variation of the estimated rate. Type indicates Released Alive (Alive), Serious Injury (SI) and Mortality (Mort.).

A. Quarter 3

Species	Type	Area	# Observed Sets	# Positive Sets	Mean CPUE	CV CPUE	95% Confidence Interval
Unid. Marine Mammal	SI	MAB	52	1	0.0178	1.000	0.0035-0.0910
Pilot Whale	SI	MAB	52	1	0.0178	1.000	0.0035-0.0910
Pilot Whale	Alive	MAB	52	1	0.0219	1.000	0.0043-0.1117
Unid. Marine Mammal	SI	NEC	66	1	0.0200	1.000	0.0039-0.1025
Pilot Whale	Alive	NEC	66	1	0.0148	1.000	0.0029-0.0755

B. Quarter 4

Species	Type	Area	# Observed Sets	# Positive Sets	Mean CPUE	CV CPUE	95% Confidence Interval
Risso's Dolphin	Alive	MAB	62	1	0.0175	1.000	0.0034 – 0.0893

Table 10. Bycatch rates for marine mammals in the U.S. Atlantic Pelagic Longline Fishery between 1 July and 30 September, 2010 compared to the first quarter average rate from 2002-2004 and the average rate from 2005-2009. 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	2005-2009 CPUE	2005-2009 95% CI	2010 CPUE	2010 95% CI
Beaked Whale	NEC	0	-	0.0072	0.0015-0.0350	0	-
Bottlenose Dolphin	NEC	0	-	0.0073	0.0015-0.0356	0	-
Common Dolphin	MAB	0.0181	0.0037-0.0883	0	-	0	-
Pantrop. Spotted Dolphin	GOM	0	-	0.0040	0.0008-0.1952	0	-
Pilot Whale	MAB	0.1010	0.0429-0.2379	0.1300	0.0787-0.2148	0.0397	0.0114-0.1375
Pilot Whale	NEC	0	-	0.0137	0.0041-0.0460	0.0148	0.0029-0.0755
Risso's Dolphin	MAB	0.0141	0.0029-0.0689	0.0106	0.0029-0.0385	0	-
Risso's Dolphin	NEC	0.0518	0.0155-0.1725	0.0367	0.0159-0.0846	0	-
Risso's Dolphin	NED	0	-	0.0062	0.0013-0.0305	0	-
Unid. Marine Mammal	GOM	0	-	0.0038	0.0008-0.0185	0	-
Unid. Marine Mammal	MAB	0	-	0.0122	0.0044-0.0338	0.0178	0.0035-0.0911
Unid. Marine Mammal	NED	0	-	0	-	0.0200	0.0039-0.1025

Table 11. Bycatch rates for marine mammals in the U.S. Atlantic Pelagic Longline Fishery between 1 October and 31 December, 2010 compared to the first quarter average rate from 2002-2004 and the average rate from 2005-2009. 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	2005-2009 CPUE	2005-2009 95% CI	2010 CPUE	2010 95% CI
Atlantic Spotted Dolphin	SAR	-	-	0.0551	0.0113-0.2694	0	-
Bottlenose Dolphin	MAB	0	-	0.0103	0.0031-0.0345	0	-
Common Dolphin	MAB	0.0313	0.0064 – 0.1531	0.0050	0.0010-0.0242	0	-
False Killer Whale	TUN	-	-	0.0673	0.0138-0.3292	0	-
Pantropical Spotted Dolphin	GOM	0	-	0.0036	0.0007-0.0177	0	-
Pilot Whale	MAB	0.1969	0.0797 – 0.4867	0.0961	0.0529-0.1747	0	-
Risso's Dolphin	MAB	0.1274	0.0658 – 0.2465	0.0206	0.0083-0.0509	0.0175	0.0034 – 0.0893
Risso's Dolphin	NEC	0.2438	0.1178 – 0.5046	0.0238	0.0048-0.1163	0	-
Unid. Dolphin	MAB	0	-	0.0098	0.0029-0.0327	0	-
Unid. Dolphin	SAR	-	-	0.0330	0.0068-0.1617	0	-
Unid. Marine Mammal	MAB	0	-	0.0188	0.0066-0.0533	0	-

Figure 1. Observed Pelagic Longline effort and turtle interactions between 1 July and 31 December, 2010. 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 as are seasonal closed areas in the SAB (C) and the mid-Atlantic (D).

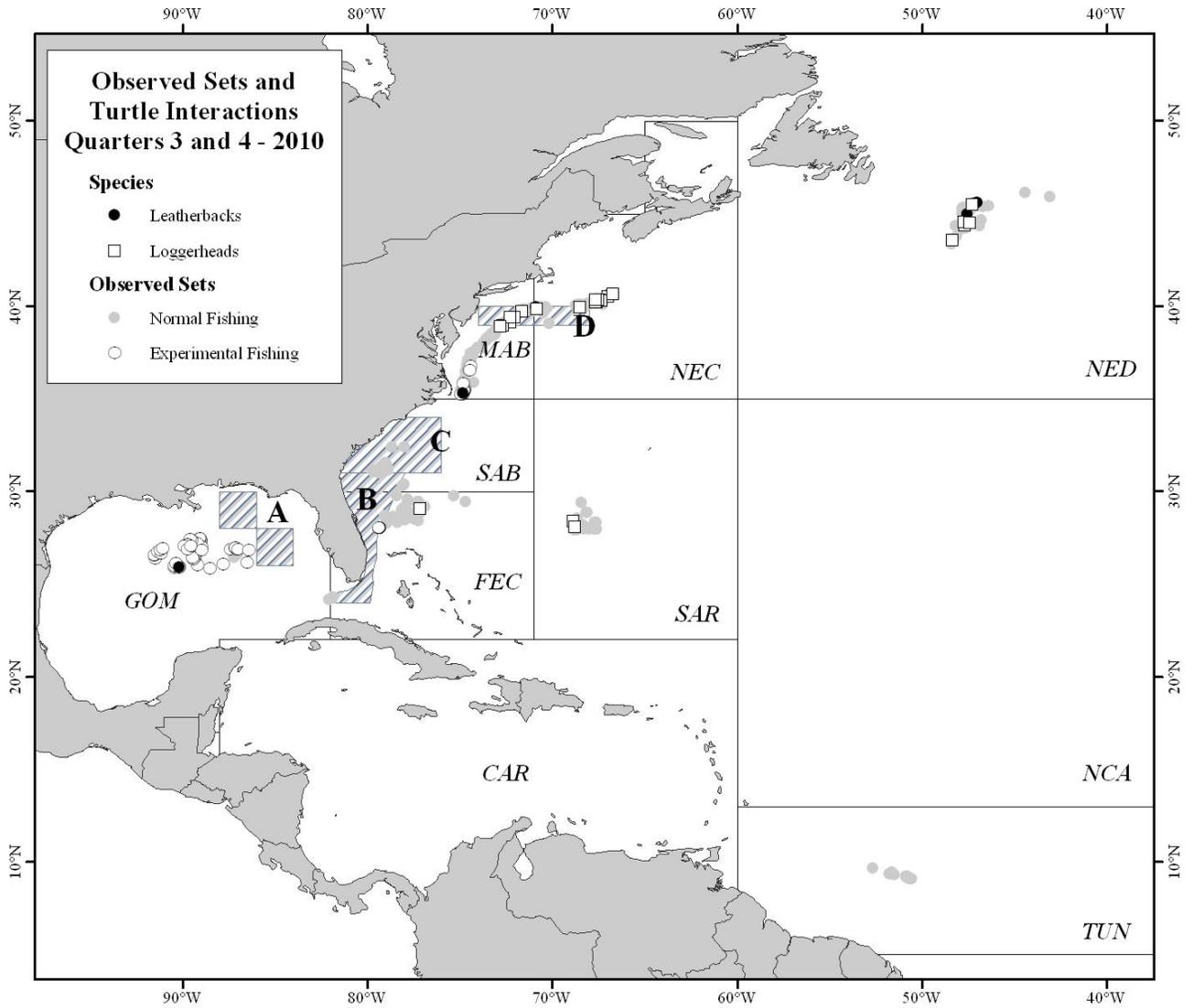
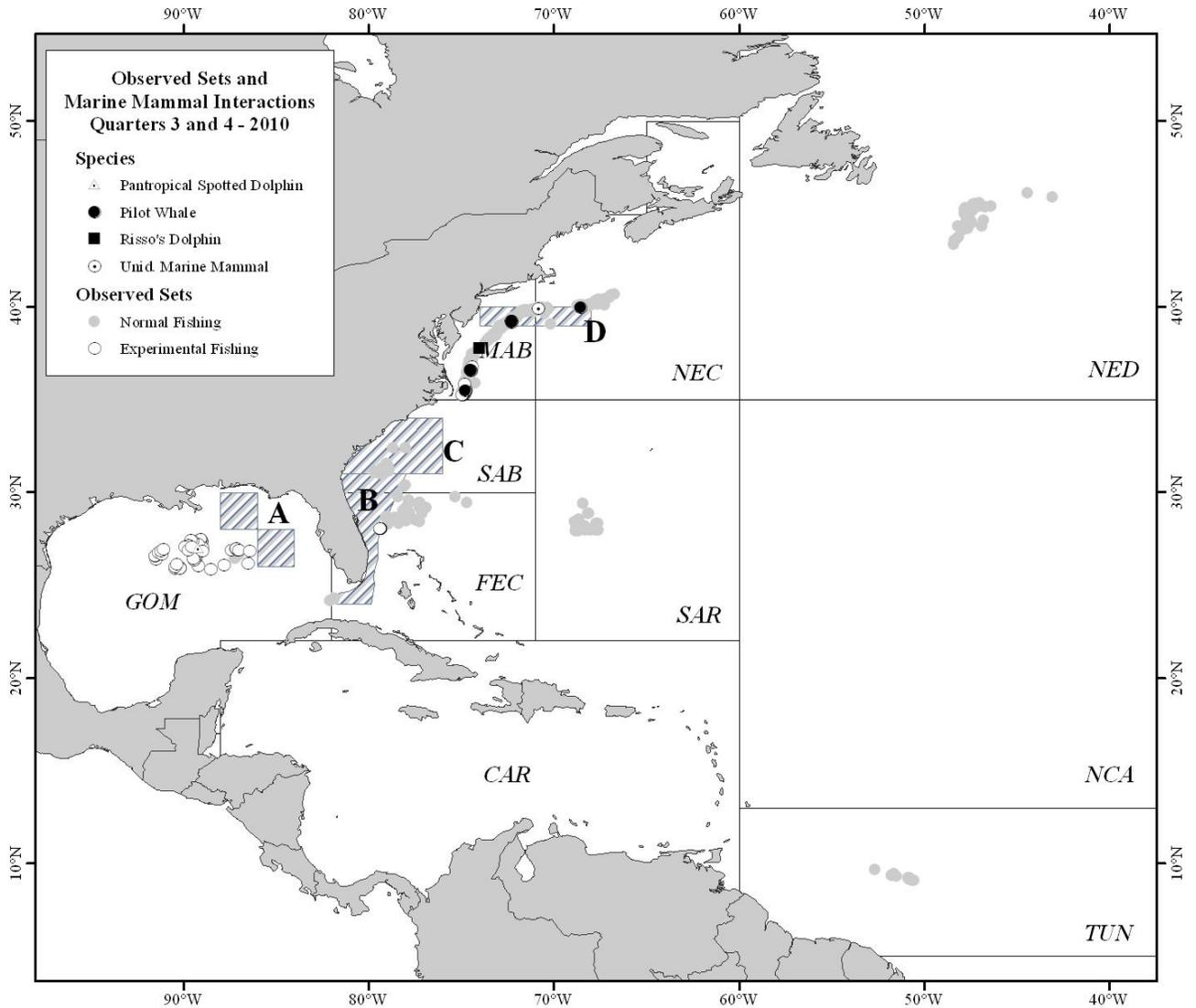


Figure 2. Observed Pelagic Longline effort and marine mammal interactions between 1 July and 31 December, 2010. Pelagic longline fishing areas include: CAR = Caribbean, GOM = Gulf of Mexico, FEC = Florida East Coast, SAB = South Atlantic Bight, SAR = Sargasso Sea, MAB = Mid-Atlantic Bight, NEC = Northeast 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 as are seasonal closed areas in the SAB (C) and the mid-Atlantic (D).



Appendix A: Injury details and hook type for turtles captured in the U.S. Atlantic Pelagic Longline Fishery for sets between 1 July and 31 December 2010.

A1a. Leatherback Turtles – Quarter 3

#	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 (Exp.)	C-16/0	0	Squid	131	Alive, uninjured	Released alive	not hooked	N/a	Yes	No	0.00	5.0		
2	GOM (Exp.)	C-16/0	0	Sardine	81	Alive, injured	Released alive	mouth, upper jaw, other	No	No	No	2.00	5.0		
3	NEC	C-18/0	10	Squid or Mackerel	185 or 293	Alive, injured	Released alive	mouth, side, other	Yes	No	No	0.00	5.0		
4	NEC	C-18/0	10	Squid	185	Alive, injured	Released alive	armpit	No	No	No	8.00	5.5		
5	NEC	C-18/0	10	Squid	203	Alive, injured	Released alive	shoulder	No	No	No	1.00	4.5		
6	NED	C-18/0	10	Squid or Mackerel	243 or 216	Alive, injured	Released alive	shoulder	Yes	Yes	No	0.00		129	
7	NED	C-18/0	10	Squid	216	Alive, injured	Released alive	armpit	Yes	No	No	0.00	6.0		
8	NED	C-18/0	10	Mackerel	216	Alive, injured	Released alive	armpit	No	No	No	0.00	6.0		
9	NED	C-18/0	10	Squid or Mackerel	243 or 216	Alive, injured	Released alive	shoulder	Yes	No	No	0.00	6.0		
10	NED	C-18/0	10	Squid or Mackerel	243 or 216	Alive, injured	Released alive	shoulder	Yes	No	No	0.00	6.0		

A1b. Leatherback Turtles – Quarter 4

#	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	SAR	C-18/0 or C-16/0	10 or 0	Squid or Mackerel	216 or 293	Alive, uninjured	Released alive	not hooked	N/a	Yes	No	0.00	4.50		

A2a. Unidentified Hardshell Turtle – Quarter 4

#	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	SAR	C-18/0	10	Squid or Mackerel	225 or 306	Alive, unknown	Released alive	not known if hooked	No	Unknown	Unknown	Unknown	2.00		

A3a. Loggerhead Turtles – Quarter 3

#	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	NEC	C-18/0	10	Squid	162	Alive, injured	Released alive	mouth, lower jaw, other	Yes	No	No	0.00		78	68
2	NEC	C-18/0	10	Squid or Mackerel	144 or 288	Alive, uninjured	Released alive	not hooked, holding bait/hook	N/a	No	No	0.00	2.3		
3	NEC	C-18/0	10	Squid or Mackerel	144 or 288	Alive, injured	Released alive	tongue	Yes	No	No	0.00		55.5	49
4	NEC	C-18/0	10	Squid or Mackerel	144 or 288	Alive, injured	Released alive	swallowed, hook partially visible	No	No	No	0.10		69	60.8
5	MAB	C-18/0	10	Squid	144	Alive, injured	Released alive	tongue	Yes	No	No	0.00		84.3	77.7
6	MAB	C-18/0	10	Squid	144	Alive, injured	Released alive	tongue	Yes	No	No	0.00		78.2	
7	NEC	C-18/0	10	Mackerel	288	Alive, injured	Released alive	side jaw joint	Yes	No	No	0.00		81	73
8	NEC	C-18/0	10	Squid	185	Alive, injured	Released alive	glottis	Yes	No	No	0.00		70.2	63.2
9	NEC	C-18/0	10	Squid	185	Alive, injured	Released alive	swallowed, hook visible to insertion pt	Yes	No	No	0.00		72.6	64.8
10	NEC	C-18/0	10	Squid	185	Alive, unknown	Released alive	not known if hooked	Yes	No	No	0.00	2.3		
11	NEC	C-18/0	10	Squid	162	Alive, injured	Released alive	side jaw joint	Yes	No	No	0.00		80.4	75.8
12	MAB	C-16/0	0	Squid	153	Alive, injured	Released alive	tongue	Yes	No	No	0.00	2.5		

A3a. Loggerhead Turtles – Quarter 3 (cont.)

#	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)
13	NEC	C-18/0	10	Squid or Mackerel	189 or 162	Alive, injured	Released alive	tongue	No	No	No	0.00	3.0		
14	NEC	C-18/0	10	Squid or Mackerel	239 or 126	Alive, injured	Released alive	beak internal, lower jaw	Yes	No	No	0.00		70.2	60
15	NEC	C-18/0	10	Squid or Mackerel	131 or 243	Alive, uninjured	Released alive	not hooked	N/a	Yes	No	0.00		65	60
16	MAB	C-16/0	10	Squid	198	Alive, injured	Released alive	mouth, side, other	Yes	No	No	0.00		79.6	68.5
17	MAB	C-16/0	0	Squid	198	Alive, uninjured	Released alive	not hooked	N/a	Yes	No	0.00	2.7		
18	NED	C-18/0	10	Mackerel	216	Alive, injured	Released alive	mouth, side, other	Yes	No	No	0.00		66	59.5
19	FEC	C-16/0	10	Squid	189	Alive, injured	Released alive	swallowed, hook not visible	No	No	No	0.20		65	59.6
20	NED	C-18/0	10	Squid or Mackerel	243 or 216	Alive, injured	Released alive	swallowed, hook partially visible	No	No	No	0.00		81.5	73
21	NED	C-18/0	10	Squid or Mackerel	243 or 216	Alive, injured	Released alive	swallowed, hook not visible	No	No	No	0.10		66	59
22	NED	C-18/0	10	Mackerel	216	Alive, injured	Released alive	mouth, lower jaw, other	Yes	No	No	0.00		62	56
23	NED	C-18/0	10	Mackerel	216	Alive, injured	Released alive	beak internal, upper jaw	Yes	No	No	0.00		68	60.5
24	NED	C-18/0	10	Mackerel	216	Alive, unknown	Released alive	not known if hooked	Yes	No	No	0.00		67.5	59

A3a. Loggerhead Turtles – Quarter 3 (cont.)

#	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)
25	NED	C-18/0	10	Mackerel	216	Alive, injured	Released alive	mouth, lower jaw, other	Yes	No	No	0.00		62	54.5
26	NED	C-18/0	10	Mackerel	216	Alive, injured	Released alive	swallowed, hook not visible	No	Yes	No	0.50		66	59.5
27	NED	C-18/0	10	Squid or Mackerel	243 or 216	Alive, injured	Released alive	tongue	Yes	No	No	0.00		60	55.5

A3b. Loggerhead Turtles – Quarter 4

#	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-18/0	10	Squid or Mackerel	225 or 360	Alive, uninjured	Released alive	not hooked	N/a	Yes	No	0.00	2.00		
2	SAR	C-16/0	0	Squid or Mackerel	216 or 293	Alive, injured	Released alive	mouth, lower, other	Yes	No	No	0.00		68.8	60.2
3	SAR	C-16/0	0	Squid or Mackerel	216 or 293	Alive, injured	Released alive	swallowed, hook partially visible	No	No	No	0.10		66	59.7