

Preliminary Estimates of Protected Species Bycatch Rates in the U.S. Atlantic Pelagic Longline Fishery Between 1 January and 31 March, 2009

Lance P. Garrison
Lesley Stokes

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

May 2009
PRD Contribution: #PRD-08/09-09

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 January to 31 March, 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 1 of 2009 is compared to that observed in quarter 1 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

Approximately 180 longline sets (approximately 150,000 hooks) were observed during the first quarter of 2009 (Table 1) during normal fishing effort with only circle hooks (16/0 and 18/0) recorded. Exact totals cannot be reported because one stratum (MAB) included observation of

fewer than 3 vessels. The effort in that stratum could be inferred from the exact total, violating confidentiality restrictions (Table 1). 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 during the first quarter of 2009 that included longline fishing inside and outside of areas normally closed to fishing in the SAB 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. There were no incidental takes of protected species in experimental sets in this quarter.

The locations of observed sets and turtle interactions are shown in Figure 1. During normal fishing, there were 4 observed interactions with leatherback turtles and 4 observed interactions with loggerhead turtles (Table 2). 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. Of the 4 leatherback turtles observed captured, 3 were released with either all gear removed or with the hook and trailing line less than one-half of the carapace length. The remaining turtle was released with a hook and trailing line greater than one-half of the carapace length. All 4 captured loggerhead turtles were released alive with all gear removed or with the hook and trailing line less than one-half the carapace length (Table 3).

No interactions were observed with marine mammals during this quarter.

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 2005-2008 after implementation (Tables 5 and 6)

For leatherback turtles, the observed bycatch rate in during 2009 was lower than that observed in both the 2002-2004 and 2005-2008 periods in the FEC and SAB areas. The bycatch rate in the GOM area was consistent with that from 2005-2008 and lower than that for 2002-2004. Bycatch of leatherbacks had been previously observed in the 1st quarter in the SAR, but was not observed in 2009 (Table 6a).

For loggerhead turtles, the bycatch rate during 2009 in the FEC, SAB, and SAR was lower than that observed in both the 2002-2004 and 2005-2008 periods. Bycatch had been previously observed in the GOM and MAB during the first quarter, but was not observed during 2009 (Table 6b).

For marine mammals, bycatch during the first quarter has been relatively rare historically, and there was no observed marine mammal bycatch during 2009. The exception to this is the MAB where the recent (2005-2008) rate of pilot whale bycatch has been relatively high (Table 7). A

small number of sets were observed in this area during the first quarter of 2009, and thus observation of marine mammal bycatch, if it occurred, was unlikely.

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 January and 31 March, 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	39	34,472
GOM	67	53,240
MAB	NR	NR
NCA	0	0
NEC	0	0
NED	0	0
SAB	45	39,603
SAR	19	16,338
TUN	0	0
Total	NR	NR

B. Experimental Fishing

Area	Sets	Hooks
CAR	0	0
FEC	0	0
GOM	0	0
MAB	0	0
NCA	0	0
NEC	0	0
NED	0	0
SAB	NR	NR
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 January and 31 March, 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	1	2
GOM	2	0
MAB	0	0
NCA	-	-
NEC	-	-
NED	-	-
SAB	1	1
SAR	0	1
TUN	-	-
Total	4	4

B. Experimental Fishing

Area	Leatherback	Loggerhead
CAR	-	-
FEC	-	-
GOM	-	-
MAB	-	-
NCA	-	-
NEC	-	-
NED	-	-
SAB	0	0
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 January and 31 March, 2009.

Release Status	Leatherback	Loggerheads
Released entangled	1	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	1	1
Released with all gear removed	1	3

Table 4. Estimated bycatch rate (Catch per 1,000 hooks) for (A) Leatherback and (B) Loggerhead turtles by geographic area and between 1 January and 31 March, 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	39	1	0.0237	1.0000	0.0049 – 0.1161
GOM	Alive	67	2	0.0330	0.7018	0.0009 – 0.1101
MAB	Alive	NR	0	0	-	-
NCA	Alive	0	-	-	-	-
NEC	Alive	0	-	-	-	-
NED	Alive	0	-	-	-	-
SAB	Alive	45	1	0.0225	1.000	0.0046 – 0.1097
SAR	Alive	19	-	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	39	2	0.0460	0.7063	0.0137 – 0.1547
GOM	Alive	67	0	0	-	-
MAB	Alive	NR	0	0	-	-
NCA	Alive	0	-	-	-	-
NEC	Alive	0	-	-	-	-
NED	Alive	0	-	-	-	-
SAB	Alive	45	1	0.0234	1.000	0.0048 – 0.1143
SAR	Alive	19	1	0.0594	1.000	0.0122 – 0.2904
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 January and 31 March, 2009 compared to the first 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	0.0372	0.0076 – 0.1819	0	-	-	-
FEC	0.1895	0.1142 – 0.3146	0.1407	0.0678 – 0.2922	0.0237	0.0049 – 0.1161
GOM	0.1480	0.0972 – 0.2250	0.0354	0.0195 – 0.0641	0.0330	0.0009 – 0.1101
MAB	0.0472	0.0097 – 0.2309	0	-	0	-
NCA	0	-	-	-	-	-
NEC	-	-	-	-	-	-
NED	-	-	-	-	-	-
SAB	0.7970	0.2767 – 2.295	0.0841	0.0239 – 0.2956	0.0225	0.0046 – 0.1097
SAR	0.1262	0.0604 – 0.2636	0.0413	0.0084 – 0.2017	0	-
TUN	-	-	0.0476	0.0097 – 0.2328	-	-

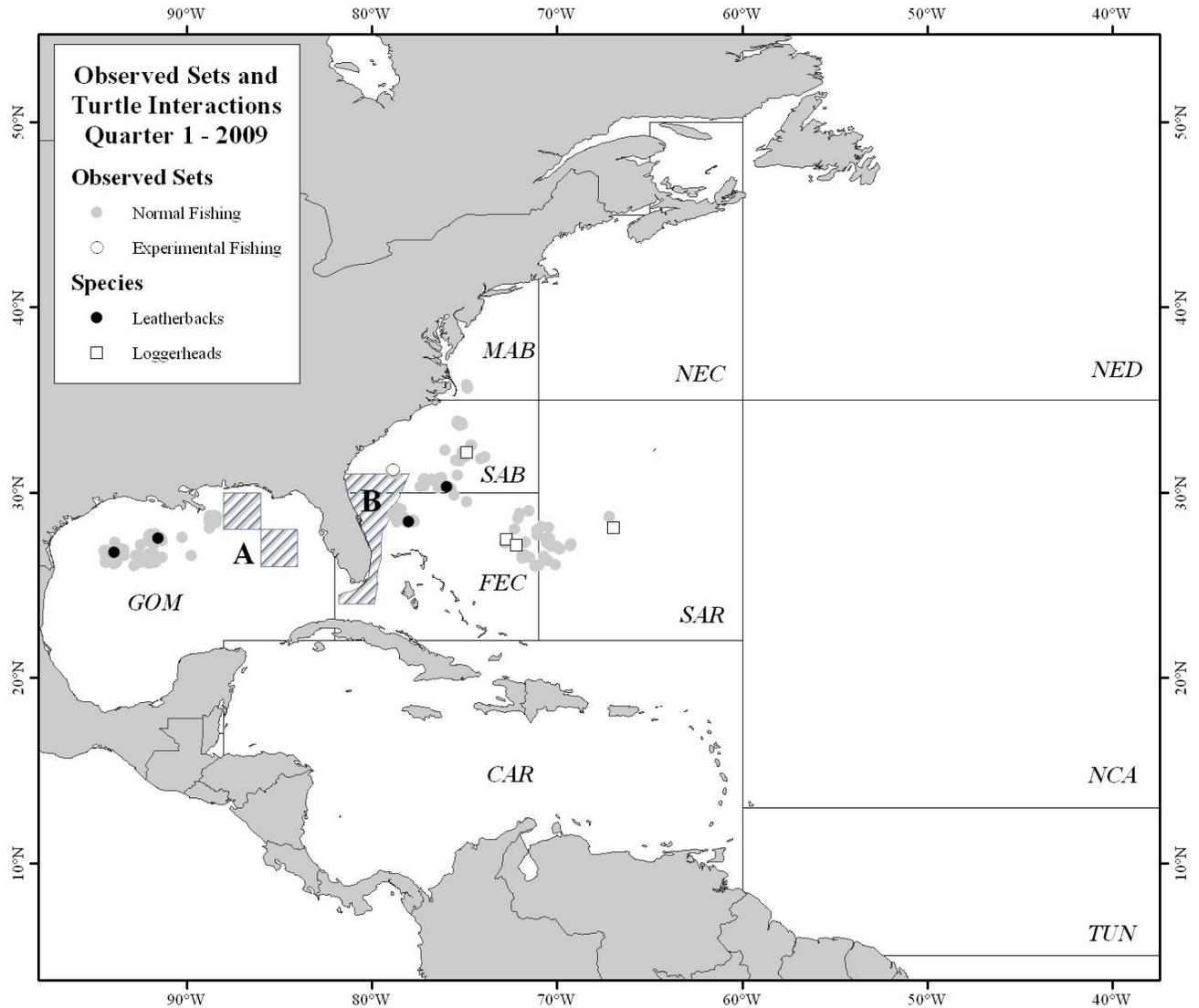
B. Loggerhead Turtles

Area	2002-2004 CPUE	2002-2004 95% CI	2005-2008 CPUE	2005-2008 95% CI	2009 CPUE	2009 95% CI
CAR	0.2845	0.1575 – 0.5140	0.2854	0.1110 – 0.7336	-	-
FEC	0.2954	0.1900 – 0.4591	0.0567	0.0221 – 0.1451	0.0460	0.0137 – 0.1547
GOM	0.0066	0.0013 – 0.0322	0.0061	0.0018 – 0.0204	0	-
MAB	0.1372	0.0509 – 0.3697	0.0200	0.0041 – 0.0979	0	-
NCA	0.1612	0.0541 – 0.4804	0	-	-	-
NEC	-	-	-	-	-	-
NED	-	-	-	-	-	-
SAB	0.1131	0.0231 – 0.5527	0.1555	0.0577 – 0.4189	0.0234	0.0048 – 0.1143
SAR	0.5604	0.3546 – 0.8858	0.0776	0.0234 – 0.2566	0.0594	0.0122 – 0.2904
TUN	-	-	-	-	-	-

Table 6. Bycatch rates for marine mammals in the U.S. Atlantic Pelagic Longline Fishery between 1 January and 31 March, 2009 compared to the first 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
Beaked Whales	CAR	0.0544	0.0111 – 0.2660	0	-	-	-
Beaked Whales	SAR	0.0212	0.0044 – 0.1039	0	-	0	-
Unid. Dolphin	GOM	0.0091	0.0019 – 0.0445	0	-	0	-
Pilot Whale	CAR	0.061	0.0183 – 0.2011	0	-	-	-
Pilot Whale	MAB	0.0527	0.0108 – 0.2578	0.2996	0.1349 – 0.6649	0	-
Bottlenose Dolphin	SAB	0	-	0.0246	0.0050 – 0.1202	0	-
Risso's Dolphin	GOM	0	-	0.0072	0.0021 – 0.0245	0	-

Figure 1. Observed Pelagic Longline effort and turtle interactions between 1 January and 31 March, 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 January and 31 March 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	FEC	C-18/0	10	Squid	167	Alive, injured	Released alive	shoulder	Yes	No	No	0.00	4.50		
2	GOM	C-16/0	0	Squid	159	Alive, injured	Released alive	shoulder	No	No	No	3.00	5.00		
3	SAB	C-18/0	10	Squid	198	Alive, injured	Released alive	unknown internal	No	Yes	Yes	3.00	4.00		
4	GOM	C-16/0	0	Squid	150	Alive, injured	Released alive	front flipper	No	No	No	1.00	4.00		

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	SAB	C-18/0	10	Squid	239	Alive, injured	Released alive	swallowed, hook partially visible	No	No	No	0.00		76.1	
2	SAR	C-18/0	10	Squid	225	Alive, injured	Released alive	beak internal, lower jaw	Yes	No	No	0.00		65.6	59.7
3	FEC	C-18/0	10	Squid	266	Alive, injured	Released alive	tongue	Yes	No	No	0.00		62.5	60.2
4	FEC	C-18/0	10	Squid or Mackerel	266 or 450	Alive, injured	Released alive	glottis	Yes	No	No	0.00		71.8	66