

Preliminary Estimates of Protected Species Bycatch Rates in the U.S. Atlantic Pelagic Longline Fishery from 1 January to 31 March, 2012

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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 January to 31 March, 2012.

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 2012 are compared to that observed in during the prior five years (2007-2011) 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 130 sets (~90,000 hooks) were observed during the first quarter with only circle hooks (16/0 and 18/0) recorded. The majority of observed sets occurred in the FEC and GOM fishing areas (Figure 1). The observed effort in the SAR area cannot be reported because it included three or fewer vessels, and the exact total effort likewise cannot be reported.

There were 36 experimental sets comprising 16,373 hooks in the GOM area to investigate the effectiveness of weak hook designs.

The locations of observed sets and turtle interactions are shown in Figure 1. There were 4 observed interactions with leatherback turtles, and 7 observed interactions with loggerhead turtles (Table 2). One of the leatherback interactions occurred in an experimental set in the GOM. 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. The information provided in Appendix A may be used to categorize turtles for post-release mortality estimates as described in SEFSC (2012). During the first quarter, 1 leatherback turtle was released with a hook and trailing line more than one-half of the carapace length. Two of the leatherbacks and five of the loggerheads were released with all gear removed (Table 3).

The quarterly and regional bycatch rates are summarized for sea turtles in Table 4. These rates were compared with the average for 2007-2011 (Table 5).

For leatherback turtles, the bycatch rate during Quarter 1 of 2012 was lower than that for 2007-2011 in the FEC area but was higher than prior years in the GOM and SAB areas. The bycatch rates were not statistically different from the 5-year average. Loggerhead turtle bycatch rates for Quarter 1 of 2012 were higher than those from 2007-2011 in the FEC, GOM and SAB areas. The rate for the SAR was significantly higher. The CAR area also had bycatch of loggerhead turtles in prior years, but bycatch was not observed during 2011.

Four marine mammal interactions occurred during quarter 1 of 2012 including one serious injury of a pilot whale and two serious injuries of bottlenose dolphins (Table 6, Table 7). Serious injury determinations are preliminary pending additional review (NMFS 2012). Marine mammal bycatch had not been observed in the prior five years in the MAB area during Quarter 1 (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 2012 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

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NMFS 2012. 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>.

Table 1. Number of sets and hooks observed in the U.S. Atlantic Pelagic Longline Fishery between 1 January and 31 March, 2012 by fishing area. NR indicates areas where effort cannot be reported due to confidentiality considerations. Total effort is not reported because this would allow simple calculation of the effort level in the SAR which includes fewer than 3 vessels.

Area	Sets	Hooks
CAR	0	0
FEC	54	36,295
GOM	37	29,336
MAB	10	6,130
NCA	0	0
NEC	0	0
NED	0	0
SAB	20	13,760
SAR	NR	NR
TUN	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, 2012 by fishing area. Areas with missing values indicate no observer coverage during this time period. Counts include one leatherback turtle taken in an experimental set in the Gulf of Mexico.

Area	Leatherback	Loggerhead
CAR	-	-
FEC	1	4
GOM	2	1
MAB	0	0
NCA	-	-
NEC	-	-
NED	-	-
SAB	1	2
SAR	0	0
TUN	-	-
Total	4	7

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, 2012. Condition columns refer to post-release mortality categories in Table 1 of SEFSC (2012). Counts include one leatherback turtle taken in an experimental set in the Gulf of Mexico.

Release Status	Leatherback	Loggerheads
Released entangled (Condition Column A)	0	0
Released with hook and line \geq ½ carapace length (Condition Column B)	1	0
Released with hook and line \leq ½ carapace length (Condition Column C)	1	2
Released with all gear removed (Condition Column D)	2	5

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, 2012 in the U.S. Atlantic Pelagic Longline Fishery. 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	54	1	0.025	1.000	0.005 – 0.129
GOM	Alive	37	1	0.034	1.000	0.007 – 0.173
MAB	Alive	10	0	0	-	-
NCA	Alive	0	-	-	-	-
NEC	Alive	0	-	-	-	-
NED	Alive	0	-	-	-	-
SAB	Alive	20	1	0.054	1.000	0.011 – 0.277
SAR	Alive	NR	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	54	4	0.101	0.491	0.041 – 0.252
GOM	Alive	37	1	0.034	1.000	0.007 – 0.173
MAB	Alive	10	0	0	-	-
NCA	Alive	0	-	-	-	-
NEC	Alive	0	-	-	-	-
NED	Alive	0	-	-	-	-
SAB	Alive	20	2	0.165	0.688	0.049 – 0.558
SAR	Alive	NR	0	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 January and 31 March, 2012 compared to the first quarter average rate from 2007-2011. 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	2007-2011 CPUE	2007-2011 95% CI	2012 CPUE	2012 95% CI
CAR	0.122	0.024 – 0.625	-	-
FEC	0.053	0.025 – 0.117	0.025	0.005 – 0.129
GOM	0.025	0.012 – 0.049	0.034	0.007 – 0.173
MAB	0	-	0	-
NCA	-	-	-	-
NEC	-	-	-	-
NED	-	-	-	-
SAB	0.028	0.010 – 0.079	0.054	0.011 – 0.277
SAR	0	-	0	-
TUN	0.045	0.009 – 0.232	-	-

B. Loggerhead Turtles

Area	2007-2011 CPUE	2007-2011 95% CI	2012 CPUE	2012 95% CI
CAR	0.221	0.061 - 0.804	-	-
FEC	0.057	0.026 - 0.120	0.101	0.041 – 0.252
GOM	0	-	0.034	0.007 – 0.173
MAB	0	-	0	-
NCA	-	-	-	-
NEC	-	-	-	-
NED	-	-	-	-
SAB	0.037	0.015 - 0.120	0.165	0.049 – 0.558
SAR	0.157	0.081 – 0.302	0	-
TUN	0	-	-	-

Table 6. Interactions with marine mammals observed during 1 January – 31 March 2012 in the U.S. Atlantic Pelagic Longline Fishery by fishing area. Observer comments and criteria described in NMFS (2012) were used to make preliminary serious injury determinations.

Species	Region	# Released Uninjured	# Dead	#Serious Injury
Bottlenose Dolphin	MAB	1	0	0
Pilot Whale	MAB	0	0	1
Bottlenose Dolphin	SAB	0	0	2

Table 7. Estimated bycatch rate (Catch per 1000 hooks) for marine mammals by geographic area for quarter 1 of 2012 in the U.S. Atlantic Pelagic Longline Fishery during normal fishing operations. CV indicates the coefficient of variation of the estimated rate. Interaction type indicates preliminary determination of serious injury (Alive = no serious injury, SI = serious injury) based upon NMFS (2012).

Species	Area	Interaction Type	# Observed Sets	# Positive Sets	Mean CPUE	CV CPUE	95% Confidence Interval
Bottlenose dolphin	MAB	Alive	10	1	0.133	1.000	0.026 – 0.682
Pilot whale	MAB	SI	10	1	0.119	1.000	0.023 – 0.609
Bottlenose dolphin	SAB	SI	20	2	0.232	1.000	0.060 – 0.895

Table 8. Bycatch rates for marine mammals in the U.S. Atlantic Pelagic Longline Fishery between 1 January and 31 March, 2012 compared to the first quarter average rate from from 2007-2011. 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	2007-2011 CPUE	2007-2011 95% CI	2012 CPUE	2012 95% CI
Pilot Whale	FEC	0.012	0.002 – 0.057	0	-
Pantropical Spotted Dolphin	GOM	0.003	0.001 – 0.014	0	-
Risso's Dolphin	GOM	0.003	0.001 – 0.014	0	-
Unid. Marine Mammal	GOM	0.003	0.001 – 0.015	0	-
Bottlenose Dolphin	MAB	0	-	0.133	0.026 – 0.682
Pilot Whale	MAB	0	-	0.119	0.023 – 0.609
Bottlenose Dolphin	SAB	0	-	0.232	0.060 – 0.895
Minke Whale	SAB	0.017	0.003 – 0.083	0	-

Figure 1. Observed Pelagic Longline effort and turtle interactions between 1 January and 31 March, 2012. 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 and the Florida East Coast are indicated.

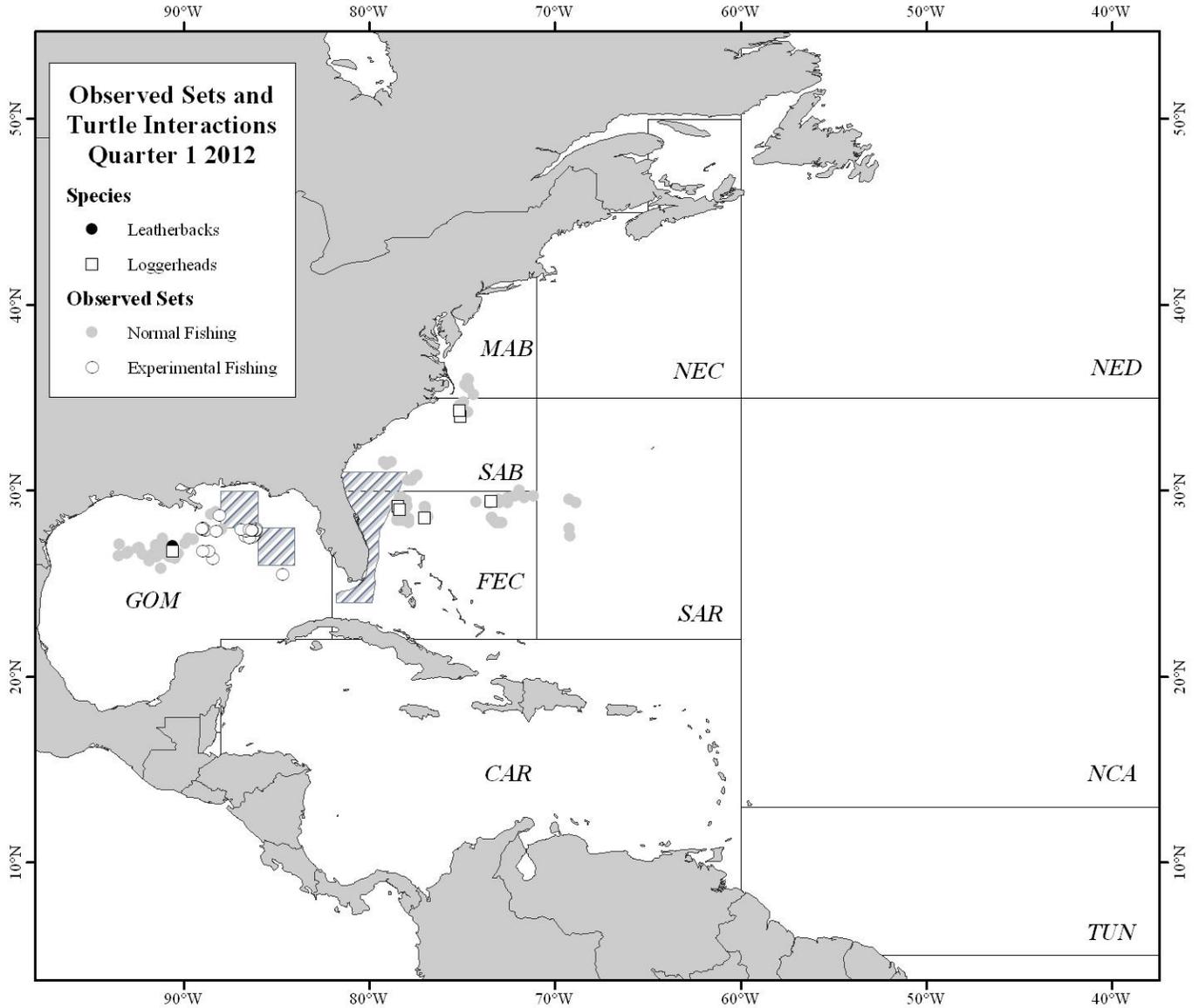
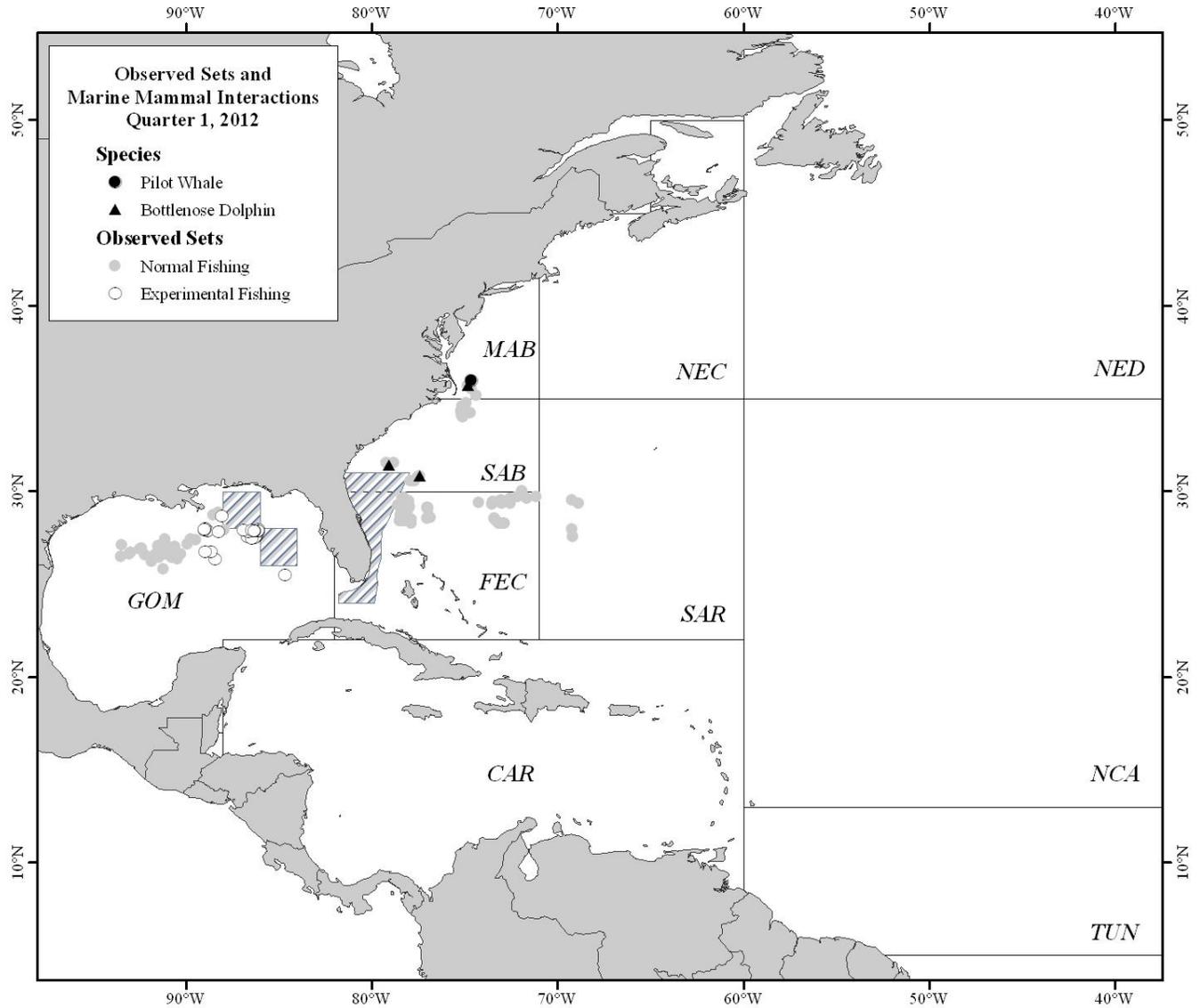


Figure 2. Observed Pelagic Longline effort and marine mammal interactions between 1 January and 31 March, 2012. Pelagic longline fishing areas include: CAR = Caribbean, GOM = Gulf of Mexico, FEC = Florida East Coast, SAB = South Atlantic Bight, SAR = Sargasso Sea, MAB = Mid-Atlantic Bight, NEC = Northeast Coastal, NED = Northeast Distant, NCA = North Central Atlantic, TUN = Tuna North. Year-round closed areas in the DeSoto Canyon and the Florida East Coast 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, 2012. “Injury Cat. Row” and “Release Cond. Col” refer to rows and columns, respectively, for post-release mortality assignments in SEFSC (2012). Exp. indicates that the take occurred in an experimental set.

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)	Injury Cat. Row	Release Cond. Col.	CL Est. (ft)	CCL (cm)	Straight N-N (cm)
1	FEC	C-16/0	0	Squid	203	Alive, injured	Released alive	Neck	Yes	Yes	No	0.0	I	D	4.5		
2	GOM	C-16/0	0	Squid	135	Alive, injured	Released alive	Armpit	No	No	No	2.0	I	B	3.5		
3	SAB	C-18/0	10	Squid, mackerel or herring	104, 194, or 329	Alive, injured	Released alive	Shoulder	No	No	No	0.0	I	C	5.0		
4	GOM Exp.	C-16/0	0	Sardine	81	Alive, uninjured	Released alive	Not hooked	N/A	Yes	No	0.0	V	D	4.3		

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)	Injury Cat. Row	Release Cond. Col.	CL Est. (ft)	CCL (cm)	Straight N-N (cm)
1	FEC	C-16/0	0	Squid	212	Alive, injured	Released alive	Roof of mouth	No	No	No	1.0	III	C	3.0		
2	FEC	C-16/0	0	Squid	203	Alive, injured	Released alive	Swallowed, hook not visible	No	No	No	0.5	IV	C	2.5		
3	FEC	C-16/0	0	Squid	203	Alive, injured	Released alive	Front flipper	Yes	No	No	0.0	I	D	2.5		
4	GOM	C-16/0	0	Squid	135	Alive, injured	Released alive	Tongue	Yes	No	No	0.0	III	D	2.5		
5	SAB	C-16/0	0	Squid or mackerel	225 or 360	Alive, injured	Released alive	Mouth, side, other	Yes	No	No	0.0	II	D	2.0		
6	SAB	C-16/0	0	Squid or mackerel	225 or 360	Alive, injured	Released alive	Beak (internal), lower jaw	Yes	No	No	0.0	I	D		73.0	67.5
7	FEC	C-18/0	10	Squid or mackerel	180 or 270	Alive, injured	Released alive	Beak (internal), lower jaw	Yes	No	No	0.0	I	D		65.0	58.0