



CHARACTERIZATION OF THE SHARK BOTTOM LONGLINE FISHERY: 2007

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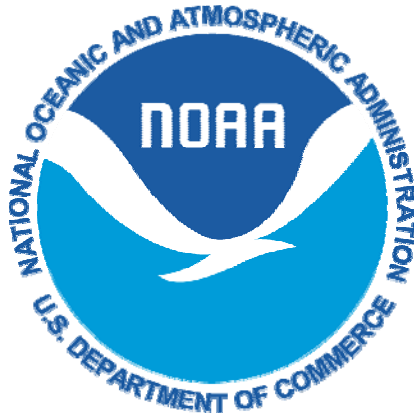
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Introduction

The shark bottom longline fishery is active in the U.S. Atlantic Ocean and Gulf of Mexico from North Carolina through Texas. Vessels in the fishery are typically fiberglass and average 50 feet in length. Longline characteristics vary regionally with gear normally consisting of about 8-24 km of longline and 500-1500 hooks. Gear is set at sunset and allowed to soak overnight before hauling back in the morning. There are currently about 100 active vessels in this fishery out of about 250 vessels that possess directed shark fishing permits. These vessels make 4000 to 9000 sets per year. The shark bottom longline fishery targets large coastal sharks but small coastal sharks, pelagic sharks, and dogfish species are also caught. Depending on the time of year and length of the large coastal shark season, these vessels may also target reef fishes such as grouper, snapper, and tilefish.

Observations of the shark directed bottom longline fishery have been conducted since 1994 (Burgess and Morgan 2003¹). From 1994 through 2001, observer coverage was conducted on a voluntary basis. Beginning with the 2002 fishing season, observer coverage of the shark directed bottom longline fishery became mandatory under the current federal management plan for highly migratory species (50 CFR 635.7, NMFS 2003). Observer coverage from 1994 through the 1st trimester season of 2005 was coordinated by the Commercial Shark Fishery Observer Program (CSFOP), Florida Museum of Natural History, University of Florida, Gainesville, FL (Burgess and Morgan 2003¹). Starting with the 2nd trimester season of 2005, responsibility for the fishery observer program was transferred to the National Marine Fisheries Service (NMFS), Southeast Fisheries Science Center (SEFSC), Panama City Laboratory.

Information on fishing activities has been previously reported (Hale and Carlson 2007 and references therein). Herein, we report on fishing activities in the shark bottom longline fishery for the fishing seasons, 2007.

Methods

Owners/vessels possessing current valid directed shark fishing permits were randomly selected for coverage with a target coverage level of 4-6%. Selection letters requiring observer

¹ Burgess, G.H. and A. Morgan. 2003. Commercial Shark Fishery Observer Program. Renewal of an observer program to monitor the directed commercial shark fishery in the Gulf of Mexico and U.S. Atlantic Ocean: 2002(2) and 2003(1) fishing seasons. Final Report, U.S. National Marine Fisheries Service, Highly Migratory Species Management Division Award NA16FM1598, 15p.

coverage were issued to the permit holder via U.S. Certified mail approximately one month prior to the upcoming fishing season. Once the permit holder receives the selection letter, he or she is required to make contact with the observer coordinator and indicate intent to fish during the upcoming fishing season. Upon indication to fish, the observer coordinator deploys an observer to the permit holder vessel's reported port of departure.

While onboard the vessel, the observer completes three data forms: Longline Gear Characteristic Log, Longline Haul Log, and Individual Animal Log. The Longline Gear Characteristic Log is used to record gear characteristics. The Longline Haul Log is used to record the information on set and haulback, as well as environmental information. The Individual Animal Log records all species caught, condition of the catch (e.g. alive, dead, damaged, or unknown), and the final disposition of the catch (e.g. kept, released, finned, etc.). Further details on the vessel selection process and recording of data are found in Hale and Carlson (2007).

Results

From January to November 2007, the shark bottom longline observer program covered a total of 42 trips (defined as from the time when a vessel leaves the port until the vessel returns to port and lands catch, including multiple hauls therein) on 25 vessels with a total of 264 hauls (defined as setting gear, soaking gear for some duration of time, and retrieving gear from water) observed (Table 1; Figure 1). Gear characteristics of trips varied by area (Gulf of Mexico or the U.S. Atlantic Ocean) and target species (grouper/snapper or grouper/tilefish, shark, or tilefish). There were no grouper/snapper-targeted trips observed in the U.S. Atlantic Ocean. No trips were observed in the northern U.S. Atlantic Ocean, therefore subsequent references to the "U.S. Atlantic Ocean" refer to the coastal waters off the southern U.S. Atlantic states (Richards 1999).

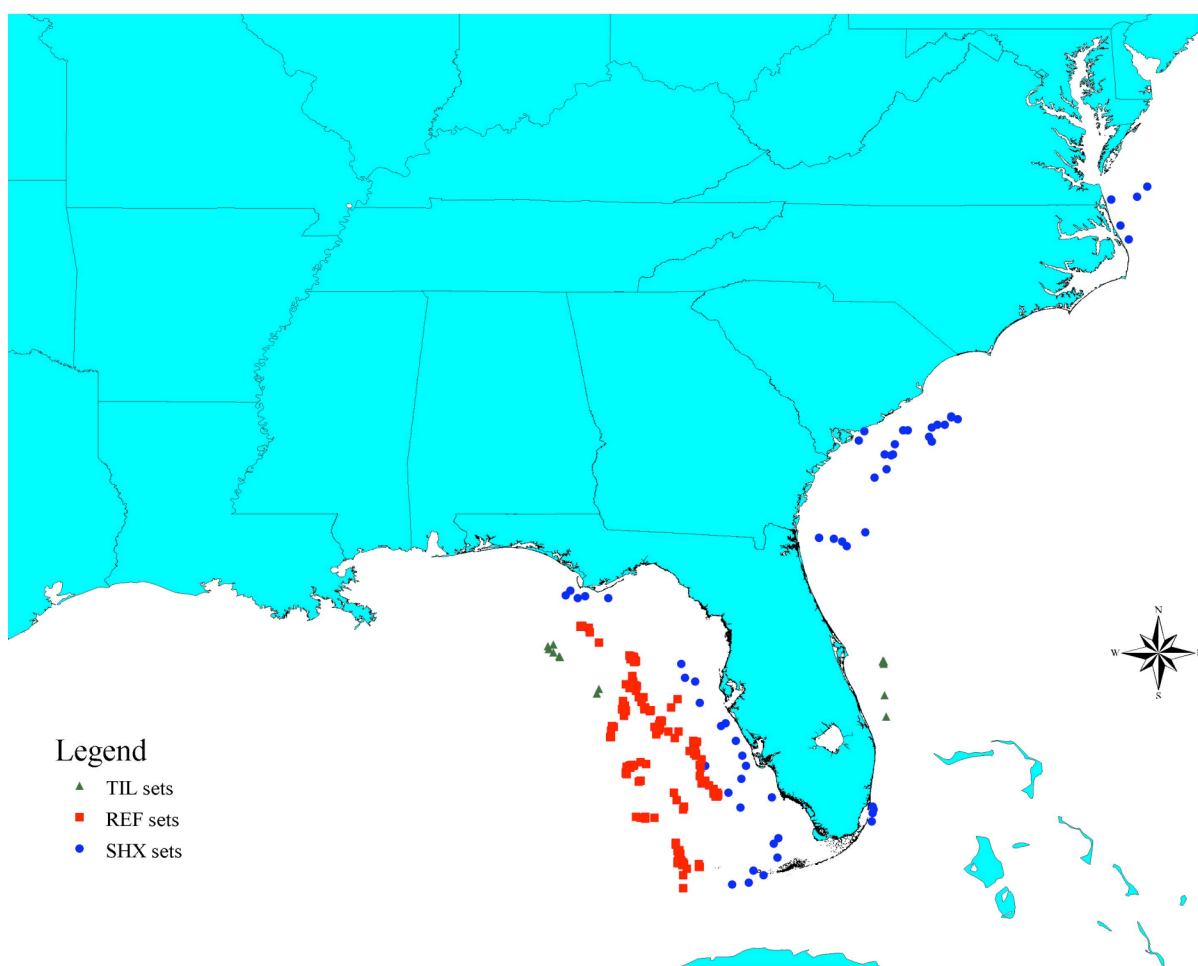


Figure 1. Distribution of all observed hauls by target in the Gulf of Mexico and U.S. Atlantic Ocean in 2007. Sets are separated by target species, including grouper/snapper (REF), shark (SHX) and tilefish (TIL) targeted sets.

Gulf of Mexico grouper/snapper and grouper/tilefish targeted trips: gear and haul characteristics

There were 179 hauls on 10 trips observed targeting grouper/snapper or grouper/tilefish in the Gulf of Mexico. The mainline length ranged from 7.4 to 16.8 km with an average of 12.9 km. The average bottom depth fished was 99.3 m and the number of hooks ranged from 36 to 1747 hooks with an average of 1121 hooks fished. Circle hooks sized 14.0 were the most common hook utilized (68.7% of hauls). Two different hook sizes were used 17.3% of the time; all hooks used were circle hooks. The average soak duration (the time from when the last hook entered the water until the first hook was hauled back) was 3.1 hr.

Gulf of Mexico grouper/snapper and grouper/tilefish targeted trips: catch and bycatch

There were 8,980 individual animals caught on observed bottom longline hauls targeting grouper/snapper or grouper/tilefish in the Gulf of Mexico (Table 2). Teleosts comprised 87.3% of the catch, followed by sharks (11.6%), invertebrates (0.8%), and batoids (0.2%). Large coastal shark species comprised 16.5% of the shark catch, while small coastal shark species comprised 73.7% of the shark catch. Red grouper, *Epinephelus morio*, was the most frequently caught species of teleost (56.2%), and Atlantic sharpnose shark, *Rhizoprionodon terraenovae*, comprised the majority of the shark catch (53.0%). Length frequencies of the shark species and their average sizes are presented in Figure 2 (for species with $n \geq 10$).

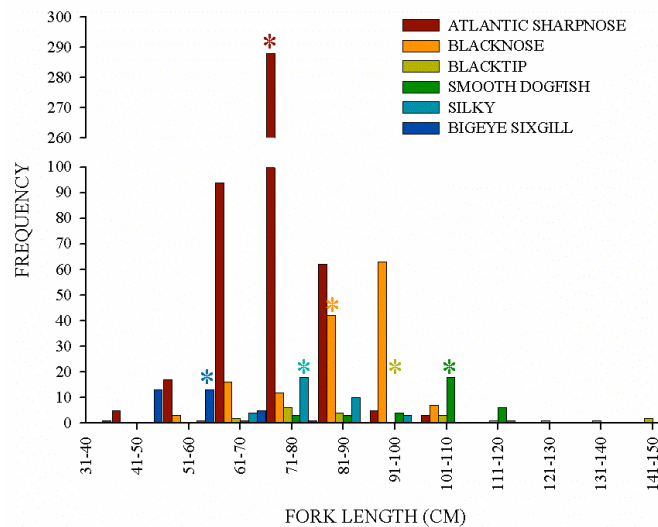


Figure 2. Length frequency (cm fork length) of sharks ($n \geq 10$) observed caught on bottom longline sets targeting grouper/snapper or grouper/tilefish in the Gulf of Mexico. Average fork length (cm) for each species is indicated by an asterisk (*).

Gulf of Mexico grouper/snapper and grouper/tilefish targeted trips: protected species interactions

Interactions with protected resources were observed for bottom longline vessels fishing in the Gulf of Mexico region targeting grouper/snapper or grouper/tilefish (Table 3). One (1) loggerhead sea turtle, *Caretta caretta*, was observed caught in bottom longline gear and was released alive. One (1) sea bird, *Larinae* sp., was observed caught and was released dead. No (0) sawfish or marine mammal interactions were observed.

Gulf of Mexico shark targeted trips: gear and haul characteristics

There were 24 hauls on 7 trips observed targeting sharks in the Gulf of Mexico. The mainline length ranged from 12.9 to 31.4 km with an average of 18.1 km. The average bottom depth fished was 25.4 m and the number of hooks ranged from 228 to 1067 hooks with an average of 602.5 hooks fished. The most commonly used hook was 18.0 circle hooks (41.7%) with 14.0 J hooks used in 20.8% of hauls. There were seven (7) hauls (29.2%) that employed two different types of hooks, with 14.0 circle hooks used most commonly as the second hook (57.1%). The average soak duration was 10.9 hr.

Gulf of Mexico shark targeted trips: catch and bycatch

There were 1,302 individual animals caught on observed bottom longline hauls targeting shark in the Gulf of Mexico (Table 4). Sharks comprised 94.9% of the catch, followed by teleosts (4.1%), invertebrates (0.5%), and batoids (0.2%). Large coastal shark species comprised 69.5% of the shark catch, while small coastal shark species comprised 30.3% of the shark catch. The dusky shark, *Carcharhinus obscurus*, which is a prohibited shark species was also caught (0.1% of shark catch). Red grouper was the most frequently caught species of teleost (56.6%) and blacktip shark, *C. limbatus*, comprised the majority of the shark catch (34.7%). Length frequencies of the shark species and their average sizes are presented in Figure 3 (for species with $n \geq 10$).

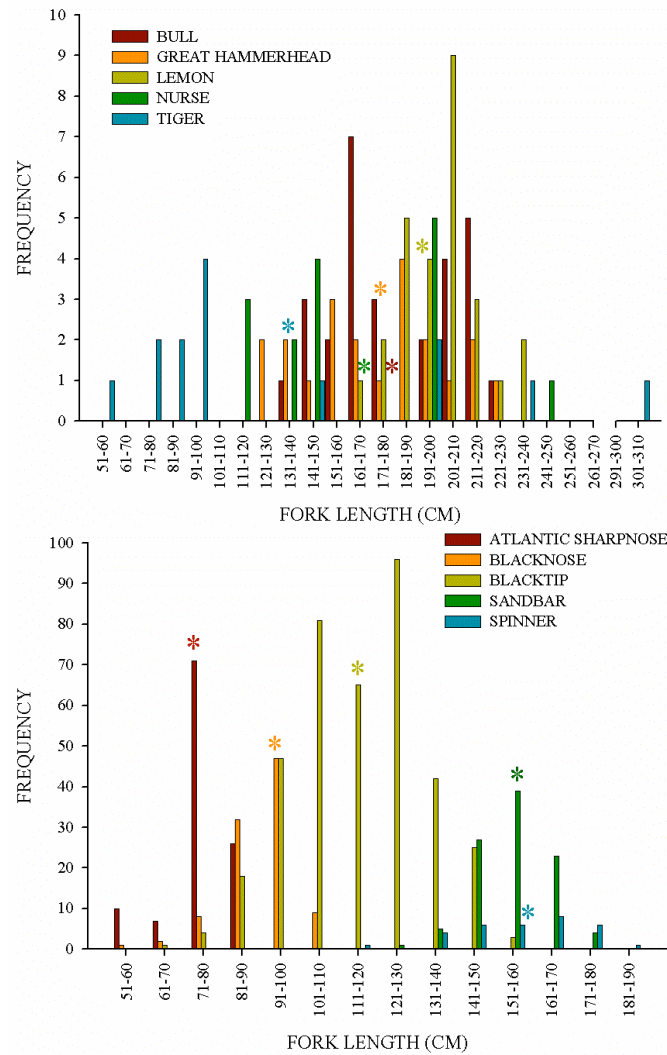


Figure 3. Length frequency (cm fork length) of sharks ($n \geq 10$) observed caught on bottom longline sets targeting shark in the Gulf of Mexico. Average fork length (cm) for each species is indicated by an asterisk (*).

Gulf of Mexico shark targeted trips: protected species interactions

Interactions with protected resources were observed for bottom longline vessels fishing in the Gulf of Mexico region targeting shark (Table 5). Four (4) loggerhead sea turtles were observed caught in bottom longline gear with two (2) released alive and two (2) released dead. No (0) sawfish, sea bird, or marine mammal interactions were observed.

U.S. Atlantic Ocean shark targeted trips: gear and haul characteristics

There were 39 hauls on 21 trips observed targeting shark in the U.S. Atlantic Ocean. The mainline length ranged from 5.6 to 50.0 km with an average of 21.1 km. The average bottom

depth fished was 40.2 m and the number of hooks ranged from 96 to 1075 hooks with an average of 587 hooks fished. The most commonly used hook was 12.0 J hooks (33.3%) with 18.0 circle hooks also used frequently (23.1% of hauls). There were 10 hauls (25.6% of hauls) that employed two different types of hooks, with 18.0 circle hooks used most commonly as the second hook (50.0% of hauls using 2 hooks). The average soak duration was 11.9 hr.

U.S. Atlantic Ocean shark targeted trips: catch and bycatch

There were 2,735 individual animals caught on observed bottom longline hauls targeting shark in the U.S. Atlantic Ocean (Table 6). Sharks comprised 95.7% of the catch, followed by teleosts (2.5%), batoids (1.2%), and invertebrates (0.4%). Large coastal shark species comprised 78.7% of the shark catch, while small coastal shark species comprised 19.2% of the shark catch. Four prohibited shark species were caught including the dusky shark, sand tiger shark, *Carcharias taurus*, night shark, *Carcharhinus signatus*, and sixgill shark, *Hexanchus griseus*. Greater amberjack, *Seriola dumerili*, almaco jack, *Seriola rivoliana*, and great barracuda, *Sphyraena barracuda* were the most frequently caught species of teleost (43.5%), and two species of shark, sandbar shark, *Carcharhinus plumbeus*, and tiger shark, *Galeocerdo cuvier*, comprised the majority of the shark catch (61.4%). Length frequencies of the shark species and their average sizes are presented in Figure 4 (for species with $n \geq 10$).

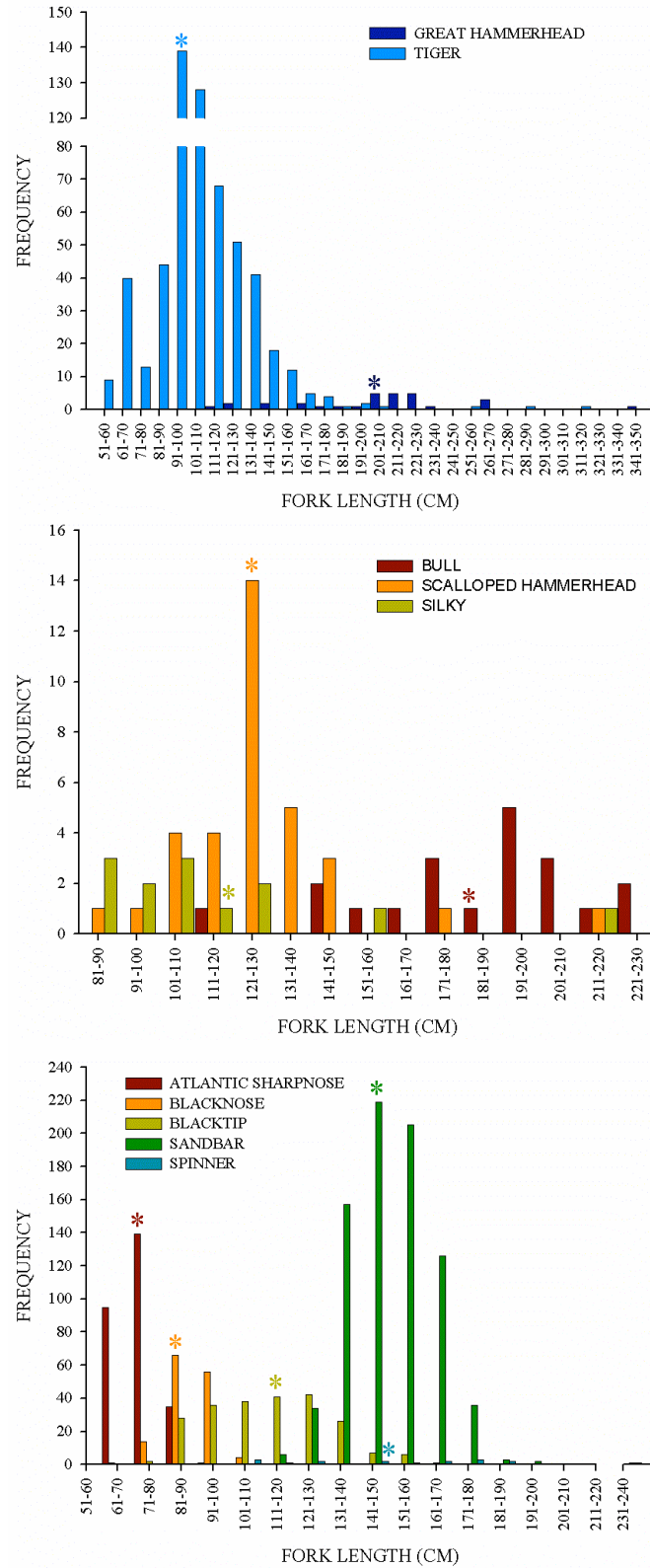


Figure 4. Length frequency (cm fork length) of sharks ($n \geq 10$) observed caught on bottom longline sets targeting shark in the U.S. Atlantic Ocean. Average fork length (cm) for each species is indicated by an asterisk (*).

U.S. Atlantic Ocean shark targeted trips: protected species interactions

Interactions with protected resources were observed for bottom longline vessels fishing in the U.S. Atlantic Ocean targeting shark (Table 7). Three (3) smalltooth sawfish, *Pristis pectinata*, were observed caught in bottom longline gear; one (1) was released dead and two (2) were released alive. No (0) sea turtle, sea bird, or marine mammal interactions were observed.

U.S. Atlantic Ocean tilefish targeted trips: gear and haul characteristics

There were 22 hauls on three (3) trips observed targeting tilefish in the U.S. Atlantic Ocean. The mainline length ranged from 5.5 to 14.8 km with an average of 8.8 km. The average bottom depth fished was 225.5 m and the number of hooks ranged from 265 to 712 hooks with an average of 479 hooks fished. The most commonly used hooks were 14.0 circle hooks (60.9% of hauls). Seven (7) hauls (38.9% of hauls) employed two different types of hooks, with 12.0 J hooks and 14.0 circle hooks used each time. The average soak duration was 0.6 hr.

U.S. Atlantic Ocean tilefish targeted trips: catch and bycatch

There were 1,293 individual animals caught on observed bottom longline hauls targeting tilefish in the U.S. Atlantic Ocean (Table 8). Teleosts comprised 97.2% of the catch, followed by sharks (2.5%), and invertebrates (0.2%). Large coastal shark species comprised 9.4% of the shark catch, while no (0) small coastal shark species were caught. Other shark species were caught including sevengill shark, *Heptranchias perlo*, shortfin mako, *Isurus oxyrinchus*, spiny dogfish, *Squalus acanthias*, and smooth dogfish, *Mustelus canis* (87.5%). Tilefish, *Lopholatilus chamaeleonticeps*, was the most frequently caught species of teleost (97.5%), and spiny dogfish was the majority of the shark catch (75.0%). Length frequency and average size of the spiny dogfish (only species with $n \geq 10$) is presented in Figure 5.

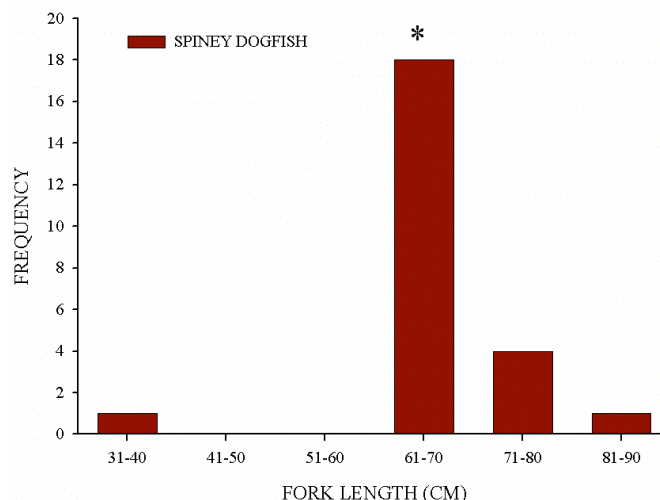


Figure 5. Length frequency (cm fork length) of sharks ($n \geq 10$) observed caught on bottom longline sets targeting tilefish in the U.S. Atlantic Ocean. Average fork length (cm) for each species is indicated by an asterisk (*).

U.S. Atlantic Ocean tilefish targeted trips: protected species interactions

There were no (0) protected species interactions observed for bottom longline vessels fishing in the U.S. Atlantic Ocean region targeting tilefish.

Discussion

Observer coverage in 2007 focused primarily on vessels in the Gulf of Mexico and off the southern U.S. Atlantic states, with the majority of observed trips targeting shark. As a result of overlap in vessels targeting both shark and grouper/snapper in the same trip, observer coverage was expanded to cover all vessels fishing with bottom longline gear regardless of target in 2006. In addition, the closure of the shark fishery during the 1st trimester has allowed for coverage of vessels targeting tilefish and snapper-grouper that normally would be targeting sharks. This has proven to be very beneficial not only in providing information to support shark stock assessments but also to evaluate snapper-grouper bycatch rates in proposed South Atlantic Fishery Management Council Marine Protected Areas. Information has also been gathered to support future stock assessments for groupers and tilefish as well as to derive protected species (i.e. sea turtle, sea bird, marine mammal, and smalltooth sawfish) bycatch rates in the shark and grouper-snapper bottom longline fishery.

The NMFS Office of Sustainable Fisheries Highly Migratory Species Division (HMS) is considering changes in the management of the Atlantic shark fishery to comply with the recent

stock assessment for sandbar sharks. Management alternatives range from status quo (i.e. no change in quotas or seasons for large coastal sharks) to closing the Atlantic shark fishery. Currently, HMS is considering as their preferred alternative (alternate suite #5) a small research fishery for sandbar sharks (i.e., sandbar sharks could only be possessed by vessels in this program with a quota of 116.6 mt dw) and a limited fishery of other large coastal sharks (retention limit of 21 sharks/vessel/trip) for vessels not in the program (K. Brewster-Geisz, pers.comm.). HMS is currently working on the proposed rule with a plan to publish at the end of July 2008. If this rule is adopted, the dynamics of the Atlantic shark fishery will change as will the shark bottom longline observer program. How this shark bottom longline fishery will respond is currently unknown, but observer coverage of the bottom longline fishery will continue on all vessels regardless of target to better understand the changing dynamics of this fishery and its impact on all marine resources.

Acknowledgments

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Table 1. Number of trips, vessels, and hauls observed in the Gulf of Mexico (GOM) and southern U.S. Atlantic Ocean (SA) for all target species. Target species include grouper (GRP), a mix of grouper and shark (MIX), shark (SHX), or tilefish (TIL).

Area and Target	Vessels Observed	Trips Observed	Hauls Observed
GOM GRP + MIX	8	11	179
GOM SHX	6	7	24
SA SHX	9	21	39
SA TIL	2	3	22
Total	25	42	264

Table 2. Number caught (n) and disposition of catch in percentage for all observed hauls targeting grouper/snapper or grouper/tilefish mix in the Gulf of Mexico. Disposition of catch divided into kept (K), discard dead (DD), discard alive (DA), and unknown (U).

Scientific Name	Common Name	n	% K	% DD	% DA	% U
<i>Epinephelus morio</i>	Red grouper	4411	36.6	11.7	51.5	0.2
<i>Epinephelus flavolimbatus</i>	Yellowedge grouper	930	100.0	0.0	0.0	0.1
<i>Caulolatilus microps</i>	Blueline tilefish	560	98.9	0.2	0.0	0.9
<i>Rhizoprionodon terraenovae</i>	Atlantic sharpnose shark	552	19.7	11.6	68.8	0.2
<i>Lutjanus campechanus</i>	Red snapper	281	23.1	15.3	60.9	0.7
<i>Carcharhinus acronotus</i>	Blacknose shark	215	9.8	12.6	77.2	0.5
<i>Lopholatilus chamaeleonticeps</i>	Tilefish	214	99.5	0.5	0.0	0.0
<i>Mycteroperca phenax</i>	Scamp	202	92.1	3.0	4.5	0.5
<i>Epinephelus niveatus</i>	Snowy grouper	176	100.0	0.0	0.0	0.0
<i>Mycteroperca microlepis</i>	Gag grouper	149	98.0	0.7	1.3	0.0
Muraenidae	Moray eel family	132	95.5	3.0	1.5	0.0
<i>Ophichthus ocellatus</i>	Pale-spotted eel	65	95.4	0.0	4.6	0.0
Sparidae	Porgy family	63	92.1	3.2	4.8	0.0
<i>Lutjanus analis</i>	Mutton snapper	59	98.3	0.0	1.7	0.0
<i>Epinephelus drummondhayi</i>	Speckled hind	59	89.8	3.4	6.8	0.0
<i>Sphyrnaea barracuda</i>	Great barracuda	51	94.1	2.0	2.0	2.0
<i>Ginglymostoma cirratum</i>	Nurse shark	50	2.0	0.0	96.0	2.0
<i>Urophycis floridana</i>	Southern hake	48	85.4	2.1	12.5	0.0
<i>Seriola dumerili</i>	Greater amberjack	40	67.5	2.5	27.5	2.5
<i>Mustelus canis</i>	Smooth dogfish	38	2.6	0.0	97.4	0.0
<i>Carcharhinus falciformis</i>	Silky shark	37	8.1	32.4	59.5	0.0
<i>Mycteroperca bonaci</i>	Black grouper	35	100.0	0.0	0.0	0.0
<i>Hexanchus vitulus</i>	Bigeye sixgill shark	34	0.0	23.5	76.5	0.0
Echeneidae	Remora family	34	20.6	23.5	55.9	0.0
<i>Carcharhinus limbatus</i>	Blacktip shark	32	28.1	28.1	34.4	9.4
<i>Carcharhinus plumbeus</i>	Sandbar shark	31	12.9	6.5	77.4	3.2
<i>Calamus proridens</i>	Littlehead porgy	31	100.0	0.0	0.0	0.0
Porifera	Sponges	25	0.0	100.0	0.0	0.0
Congridae	Conger eel family	22	95.5	0.0	4.5	0.0
<i>Gymnothorax moring</i>	Spotted moray eel	21	100.0	0.0	0.0	0.0
<i>Haemulon album</i>	Margate grunt	17	100.0	0.0	0.0	0.0
<i>Balistes caprisus</i>	Gray triggerfish	16	93.8	0.0	6.3	0.0
<i>Trachinocephalus myops</i>	Snakefish	16	81.3	0.0	18.8	0.0
<i>Galeocerdo cuvier</i>	Tiger shark	15	13.3	0.0	86.7	0.0
Anthozoa	Corals	14	7.1	85.7	7.1	0.0
Mollusca	Molluscs	14	0.0	85.7	14.3	0.0
<i>Neomerinthe hemingwayi</i>	Spinycheek scorpionfish	14	100.0	0.0	0.0	0.0
<i>Seriola</i> sp.	Amberjacks	13	92.3	0.0	7.7	0.0
Batrachoididae	Toadfish family	12	16.7	41.7	41.7	0.0
Sphyrnaidae	Barracuda family	12	66.7	0.0	33.3	0.0
<i>Haemulon plumieri</i>	White grunt	10	100.0	0.0	0.0	0.0
<i>Lutjanus griseus</i>	Gray snapper	10	90.0	10.0	0.0	0.0
<i>Rhomboplites aurorubens</i>	Vermillion snapper	10	30.0	10.0	60.0	0.0
<i>Squalus acanthias</i>	Spiny dogfish	9	11.1	0.0	88.9	0.0

Table 2 Continued.

Scientific Name	Common Name	n	% K	% DD	% DA	% U
<i>Remora remora</i>	Remora	9	44.4	0.0	55.6	0.0
<i>Rachycentron canadum</i>	Cobia	9	88.9	11.1	0.0	0.0
<i>Pagrus pagrus</i>	Red porgy	9	77.8	22.2	0.0	0.0
<i>Raja eglanteria</i>	Clearnose skate	7	14.3	0.0	85.7	0.0
<i>Cancer</i> spp.	Cancer crab	7	0.0	28.6	71.4	0.0
<i>Opsanus pardus</i>	Leopard toadfish	7	57.1	14.3	28.6	0.0
<i>Euthynnus alletteratus</i>	Little tunny	7	85.7	14.3	0.0	0.0
<i>Synodus foetens</i>	Inshore lizardfish	7	71.4	14.3	14.3	0.0
Elasmobranchii	Sharks	6	16.7	16.7	66.7	0.0
<i>Caranx crysos</i>	Bluerunner	6	83.3	0.0	16.7	0.0
<i>Echeneis naucrates</i>	Sharksucker	6	0.0	16.7	83.3	0.0
<i>Sarda sarda</i>	Bonito	6	83.3	16.7	0.0	0.0
<i>Scomberomorus cavalla</i>	King mackerel	6	83.3	16.7	0.0	0.0
Synodontidae	Lizardfish family	6	83.3	16.7	0.0	0.0
<i>Carcharhinus brevipinna</i>	Spinner shark	5	100.0	0.0	0.0	0.0
<i>Scyliorhinus retifer</i>	Chain catshark	5	0.0	0.0	100.0	0.0
<i>Calappa flammea</i>	Flame box crab	5	0.0	0.0	100.0	0.0
Anguilliformes	Eels	5	80.0	0.0	20.0	0.0
<i>Malacanthus plumieri</i>	Sand tilefish	5	80.0	0.0	20.0	0.0
<i>Thunnus atlanticus</i>	Blackfin tuna	5	100.0	0.0	0.0	0.0
Teleostei	Unknown fishes	5	40.0	0.0	0.0	60.0
<i>Caranx hippos</i>	Crevalle jack	4	100.0	0.0	0.0	0.0
<i>Coryphaena hippurus</i>	Dolphinfish	4	100.0	0.0	0.0	0.0
<i>Menticirrhus littoralis</i>	Gulf kingfish	4	50.0	50.0	0.0	0.0
<i>Dasyatis americana</i>	Southern stingray	3	100.0	0.0	0.0	0.0
<i>Dasyatis</i> sp.	Stingrays	3	33.3	0.0	66.7	0.0
<i>Carcharhinus signatus</i>	Night shark	3	33.3	0.0	66.7	0.0
<i>Sphyrna</i> sp.	Hammerhead sharks	3	0.0	0.0	100.0	0.0
<i>Balistes vetula</i>	Queen triggerfish	3	100.0	0.0	0.0	0.0
<i>Holocentrus</i> sp.	Squirrelfishes	3	66.7	0.0	33.3	0.0
<i>Ocyurus chrysurus</i>	Yellowtail snapper	3	66.7	0.0	33.3	0.0
<i>Rhinoptera bonasus</i>	Cownose ray	2	100.0	0.0	0.0	0.0
Carcharhinidae	Requiem shark family	2	0.0	0.0	50.0	50.0
<i>Sphyrna mokarran</i>	Great hammerhead shark	2	0.0	50.0	50.0	0.0
Crustacea	Sand fleas	2	0.0	100.0	0.0	0.0
<i>Lutjanus synagris</i>	Lane snapper	2	0.0	100.0	0.0	0.0
<i>Epinephelus adscensionis</i>	Rock hind	2	100.0	0.0	0.0	0.0
<i>Diplectrum formosum</i>	Sand perch	2	50.0	0.0	50.0	0.0
<i>Dasyatis centroura</i>	Roughtail stingray	1	100.0	0.0	0.0	0.0
Rajiformes	Skates and rays	1	100.0	0.0	0.0	0.0
<i>Alopias superciliosus</i>	Bigeye thresher shark	1	100.0	0.0	0.0	0.0
<i>Carcharhinus obscurus</i>	Dusky shark	1	0.0	0.0	100.0	0.0
Asteroidea	Sea star	1	0.0	0.0	100.0	0.0
Nephropidae	Lobster	1	0.0	0.0	0.0	100.0
Echinodermata	Sea urchin	1	0.0	100.0	0.0	0.0
Majidae	Spider crab	1	0.0	0.0	100.0	0.0
Polychaeta	Worm	1	0.0	0.0	100.0	0.0
<i>Caranx</i> sp.	Jacks	1	0.0	100.0	0.0	0.0

Table 2 Continued.

Scientific Name	Common Name	n	% K	% DD	% DA	% U
	Bearded		100.			
<i>Brotula barbata</i>	brotula	1	0	0.0	0.0	0.0
			100.			
<i>Thunnus obesus</i>	Bigeye tuna	1	0	0.0	0.0	0.0
			100.			
<i>Acanthocybium solanderi</i>	Wahoo	1	0	0.0	0.0	0.0
	Scorpionfish					
Scorpaenidae	family	1	0.0	0.0	100.0	0.0
	Grouper					
Serranidae	family	1	0.0	100.0	0.0	0.0
	Goliath					
<i>Epinephelus itajara</i>	grouper	1	0.0	0.0	100.0	0.0
<i>Epinephelus guttatus</i>	Red hind	1	0.0	100.0	0.0	0.0
			100.			
<i>Synodus intermedius</i>	Sanddiver	1	0	0.0	0.0	0.0
			100.			
Tetraodontidae	Puffer family	1	0	0.0	0.0	0.0

Table 3. Number (n) of protected species interactions for all observed hauls targeting grouper/snapper or grouper/shark mix in the Gulf of Mexico. Disposition of catch divided into released dead (RD), released alive (RA), and unknown (U).

Scientific Name	Common Name	n	% RD	% RA	% U
<i>Larinae</i> sp.	Gull	1	100.0	0.0	0.0
<i>Caretta caretta</i>	Loggerhead turtle	1	0.0	100.0	0.0

Table 4. Number caught (n) and disposition of catch in percentage for all observed hauls targeting shark in the Gulf of Mexico. Disposition of catch divided into kept (K), discard dead (DD), discard alive (DA), and unknown (U).

Scientific Name	Common Name	n	% K	% DD	% DA	% U
<i>Carcharhinus limbatus</i>	Blacktip shark	428	95.6	3.7	0.7	0.0
<i>Carcharhinus acronotus</i>	Blacknose shark	199	74.9	20.6	4.5	0.0
<i>Rhizoprionodon terraenovae</i>	Atlantic sharpnose shark	174	57.5	42.5	0.0	0.0
<i>Carcharhinus plumbeus</i>	Sandbar shark	160	98.8	0.0	0.0	1.3
<i>Ginglymostoma cirratum</i>	Nurse shark	95	0.0	0.0	100.0	0.0
<i>Carcharhinus brevipinna</i>	Spinner shark	56	96.4	0.0	1.8	1.8
<i>Galeocerdo cuvier</i>	Tiger shark	34	8.8	8.8	82.4	0.0
<i>Negaprion brevirostris</i>	Lemon shark	32	84.4	3.1	0.0	12.5
<i>Epinephelus morio</i>	Red grouper	30	60.0	23.3	16.7	0.0
<i>Carcharhinus leucas</i>	Bull shark	29	96.6	0.0	0.0	3.4
<i>Sphyrna mokarran</i>	Great hammerhead shark	21	61.9	0.0	38.1	0.0
<i>Epinephelus itajara</i>	Goliath grouper	13	0.0	0.0	100.0	0.0
<i>Bagre marinus</i>	Gafftopsail catfish	6	0.0	0.0	0.0	0.0
Porifera	Sponges	5	0.0	80.0	0.0	20.0
Elasmobranchii	Sharks	2	0.0	100.0	0.0	0.0
<i>Sphyrna lewini</i>	Scalloped hammerhead shark	2	100.0	0.0	0.0	0.0
<i>Mycteroperca bonaci</i>	Black grouper	2	100.0	0.0	0.0	0.0
<i>Dasyatis</i> sp.	Stingrays	1	0.0	0.0	100.0	0.0
<i>Aetobatis narinari</i>	Spotted eagle ray	1	0.0	0.0	100.0	0.0
<i>Carcharhinus obscurus</i>	Dusky shark	1	0.0	0.0	100.0	0.0
<i>Carcharhinus isodon</i>	Finetooth shark	1	100.0	0.0	0.0	0.0
<i>Carcharhinus falciformis</i>	Silky shark	1	0.0	100.0	0.0	0.0
Anthozoa	Coral	1	0.0	100.0	0.0	0.0
Mollusca	Mollusc	1	0.0	100.0	0.0	0.0
Anguilliformes	Eel	1	0.0	0.0	100.0	0.0
<i>Mycteroperca microlepis</i>	Gag grouper	1	100.0	0.0	0.0	0.0
Teleostei	Unknown fish	1	100.0	0.0	0.0	0.0

Table 5. Number (n) of protected species interactions for all observed hauls targeting shark in the Gulf of Mexico. Disposition of catch divided into released dead (RD), released alive (RA), and unknown (U).

Scientific Name	Common Name	n	% RD	% RA	% U
<i>Caretta caretta</i>	Loggerhead turtle	4	50.0	50.0	0.0

Table 6. Number caught (n) and disposition of catch in percentage for all observed hauls targeting shark in the southern U.S. Atlantic Ocean. Disposition of catch divided into kept (K), discard dead (DD), discard alive (DA), and unknown (U).

Scientific Name	Common Name	n	% K	% DD	% DA	% U
<i>Carcharhinus plumbeus</i>	Sandbar shark	827	98.8	0.1	0.1	1.0
<i>Galeocerdo cuvier</i>	Tiger shark	779	23.2	19.4	56.9	0.5
<i>Rhizoprionodon terraenovae</i>	Atlantic sharpnose shark	352	91.5	7.7	0.6	0.3
<i>Carcharhinus limbatus</i>	Blacktip shark	243	98.8	0.8	0.0	0.4
<i>Carcharhinus acronotus</i>	Blacknose shark	148	98.0	2.0	0.0	0.0
<i>Ginglymostoma cirratum</i>	Nurse shark	83	0.0	0.0	100.0	0.0
<i>Sphyrna lewini</i>	Scalloped hammerhead shark	37	91.9	2.7	2.7	2.7
<i>Sphyrna mokarran</i>	Great hammerhead shark	29	100.0	0.0	0.0	0.0
<i>Raja eglanteria</i>	Clearnose skate	22	90.9	0.0	9.1	0.0
<i>Carcharhinus leucas</i>	Bull shark	21	90.5	4.8	0.0	4.8
<i>Carcharhinus brevipinna</i>	Spinner shark	17	100.0	0.0	0.0	0.0
<i>Carcharhinus falciformis</i>	Silky shark	15	73.3	20.0	6.7	0.0
<i>Mustelus canis</i>	Smooth dogfish	14	71.4	0.0	28.6	0.0
<i>Carcharhinus obscurus</i>	Dusky shark	13	0.0	84.6	15.4	0.0
<i>Seriola dumerili</i>	Greater amberjack	10	90.0	0.0	10.0	0.0
<i>Sphyrna barracuda</i>	Great barracuda	10	50.0	50.0	0.0	0.0
<i>Seriola rivoliana</i>	Almaco jack	10	100.0	0.0	0.0	0.0
<i>Carcharias taurus</i>	Sand tiger shark	10	0.0	0.0	100.0	0.0
Elasmobranchii	Sharks	10	0.0	100.0	0.0	0.0
<i>Negaprion brevirostris</i>	Lemon shark	9	100.0	0.0	0.0	0.0
<i>Hexanchus griseus</i>	Sixgill shark	7	0.0	0.0	100.0	0.0
Porifera	Sponges	6	0.0	100.0	0.0	0.0
Anthozoa	Corals	5	0.0	100.0	0.0	0.0
<i>Epinephelus morio</i>	Red grouper	5	100.0	0.0	0.0	0.0
<i>Dasyatis centroura</i>	Roughtail stingray	5	0.0	0.0	100.0	0.0
<i>Mycteroperca bonaci</i>	Black grouper	4	100.0	0.0	0.0	0.0
<i>Mycteroperca microlepis</i>	Gag grouper	4	100.0	0.0	0.0	0.0
<i>Epinephelus itajara</i>	Goliath grouper	4	0.0	0.0	100.0	0.0
<i>Lutjanus analis</i>	Mutton snapper	4	100.0	0.0	0.0	0.0
<i>Dasyatis</i> sp.	Stingrays	4	0.0	0.0	100.0	0.0
<i>Rachycentron canadum</i>	Cobia	3	100.0	0.0	0.0	0.0
<i>Epinephelus nigritus</i>	Warsaw grouper	3	100.0	0.0	0.0	0.0
<i>Sphyrna tiburo</i>	Bonnethead shark	3	100.0	0.0	0.0	0.0
<i>Dasyatis americana</i>	Southern stingray	3	0.0	0.0	100.0	0.0
<i>Remora remora</i>	Remora	2	0.0	0.0	100.0	0.0
<i>Centropristis striata</i>	Black seabass	2	100.0	0.0	0.0	0.0
Sphyrnaeidae	Barracuda family	1	0.0	0.0	100.0	0.0
<i>Coryphaena hippurus</i>	Dolphinfish	1	0.0	100.0	0.0	0.0
<i>Scianops ocellatus</i>	Red drum	1	0.0	100.0	0.0	0.0
<i>Brotula barbata</i>	Bearded brotula	1	100.0	0.0	0.0	0.0
<i>Ophichthus ocellatus</i>	Pale-spotted eel	1	100.0	0.0	0.0	0.0
Serranidae	Grouper family	1	0.0	100.0	0.0	0.0

Table 6 Continued.

Scientific Name	Common Name	n	% K	% DD	% DA	% U
<i>Mycteroperca phenax</i>	Scamp	1	100.0	0.0	0.0	0.0
<i>Carcharhinus signatus</i>	Night shark	1	0.0	100.0	0.0	0.0
Carcharhinidae	Requiem shark family	1	0.0	0.0	0.0	100.0
<i>Caulolatilus cyanops</i>	Blackline tilefish	1	0.0	0.0	0.0	100.0

Table 7. Number (n) of protected species interactions for all observed hauls targeting shark in the southern U.S. Atlantic Ocean. Disposition of catch divided into released dead (RD), released alive (RA), and unknown (U).

Scientific Name	Common Name	n	% RD	% RA	% U
<i>Pristis pectinata</i>	Smalltooth sawfish	3	33.3	66.7	0.0

Table 8. Number caught (n) and disposition of catch in percentage for all observed hauls targeting tilefish in the southern U.S. Atlantic Ocean. Disposition of catch divided into kept (K), discard dead (DD), discard alive (DA), and unknown (U).

Scientific Name	Common Name	n	% K	% DD	% DA	% U
<i>Lopholatilus chamaeleonticeps</i>	Tilefish	1226	99.8	0.2	0.0	0.0
<i>Urophycis floridana</i>	Southern hake	27	33.3	11.1	55.6	0.0
<i>Squalus acanthias</i>	Spiny dogfish	24	0.0	0.0	100.0	0.0
<i>Carcharhinus brevipinna</i>	Spinner shark	3	0.0	33.3	66.7	0.0
<i>Caulolatilus chrysops</i>	Goldface tilefish	3	100.0	0.0	0.0	0.0
Squalidae	Dogfish family	2	0.0	0.0	100.0	0.0
<i>Cancer irroratus</i>	Atlantic rock crab	2	100.0	0.0	0.0	0.0
<i>Heptranchias perlo</i>	Sevengill shark	1	0.0	100.0	0.0	0.0
<i>Isurus oxyrinchus</i>	Shortfin mako shark	1	0.0	100.0	0.0	0.0
<i>Mustelus canis</i>	Smooth dogfish	1	0.0	0.0	100.0	0.0
Asteroidea	Sea star	1	0.0	0.0	100.0	0.0
Congridae	Conger eel family	1	100.0	0.0	0.0	0.0
Teleostei	Unknown fish	1	0.0	100.0	0.0	0.0