



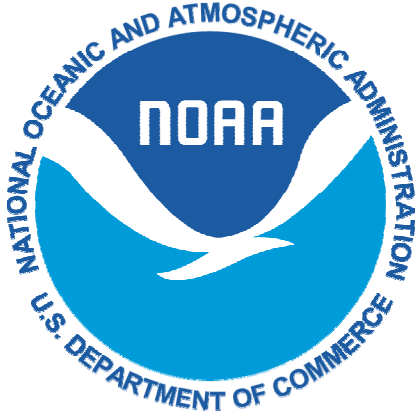
CHARACTERIZATION OF THE SHARK BOTTOM LONGLINE FISHERY: 2008

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Introduction

Observations of the shark-directed bottom longline fishery in the Atlantic Ocean and Gulf of Mexico have been conducted since 1994. From 1994 through 2001, observer coverage was voluntary but beginning with the 2002 fishing season, observer coverage became mandatory under authority of 50 CFR 635.7. Observer coverage from 1994 through the 1st trimester of 2005 was coordinated by the Commercial Shark Fishery Observer Program (CSFOP), Florida Museum of Natural History, University of Florida, Gainesville, FL (Morgan et al. in press). Observer coverage for this fishery is required under the current federal management plan for highly migratory species (NMFS, 2007). Starting with the 2nd trimester season of 2005, responsibility for the fishery observer program was transferred to National Marine Fisheries Service (NMFS), Southeast Fisheries Science Center (SEFSC), Panama City Laboratory.

Currently 214 U.S. fishers are permitted to target sharks (excluding dogfish) in the Atlantic Ocean and Gulf of Mexico, and an additional 285 fishers are permitted to land sharks incidentally. Recent amendments to the Consolidated Atlantic Highly Migratory Species Fishery Management Plan based on updated stock assessments have eliminated the major directed shark fishery in the U.S. Atlantic (NMFS, 2007). The amendments implement a shark research fishery, which allows NMFS to select a limited number of commercial shark vessels on an annual basis to collect life history data and catch data for future stock assessments. Furthermore, the revised measures drastically reduce quotas and retention limits, and modify the authorized species in commercial shark fisheries. Specifically, commercial shark fishers not participating in the research fishery are no longer allowed to land sandbar sharks, *Carcharhinus plumbeus*, which have been the main target species for most fishermen. Outside the research fishery, fishers are

permitted to land 33 non-sandbar large coastal sharks. Additionally, commercial fishermen are required to maintain shark fins naturally attached to the shark carcass through landing.

Information on fishing activities for previous years has been reported (Hale and Carlson, 2007 and Hale et al., 2007). Herein, we report on fishing activities in the bottom longline fishery for the 2008 fishing season, including coverage of the 2008 shark research fishery.

Methods

Vessels were selected from three fishing regions: northern Atlantic Ocean, southern Atlantic Ocean, and Gulf of Mexico. The northern Atlantic Ocean was defined from Virginia through Maine, the southern Atlantic Ocean was from the east coast of Florida through North Carolina and the Caribbean, and the Gulf of Mexico was defined from Texas through the west coast of Florida including the Florida Keys (NMFS, 2005). In June 2008, NMFS announced its request for applications for the shark research fishery from commercial shark fishers with a directed or incidental permit. Commercial shark fishers submitted applications to the Highly Migratory Species (HMS) Management Division. The HMS Management Division provided a list of qualified applicants to the Panama City Laboratory and based on the temporal and spatial needs of the research objectives, the availability of qualified applicants, and the available quota, 11 qualified applicants were selected for observer coverage. These vessels carried observers on 100% of trips. Outside the research fishery, vessels targeting shark and possessing current valid directed shark fishing permits were randomly selected for coverage with a target coverage level of 4-6%. Because of the overlap with vessels targeting group/snapper/tilefish and shark within the same trip and vessels possessing directed shark permits (Hale and Carlson, 2007), observers

also boarded trips regardless of the indicated target species. Thus, observers worked bottom longline trips that targeted grouper, snapper, and tilefish, as well as sharks.

Selection letters requiring observer 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. If the permit holder intended to fish, the observer coordinator deployed an observer to the 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.). On shark research fishery trips, observers were required to randomly sample sandbar sharks for biological samples for updates to life history studies, which was a research recommendation from the last large coastal shark stock assessment (SEDAR 11). Observers were also required to obtain trip weighout forms which were compared to shark dealer reports by quota monitoring managers to manage the sandbar shark quota within the research fishery.

Results

From January to December 2008, a total of 50 trips (defined as from the time a vessel leaves the port until the vessel returns to port and lands catch, including multiple hauls therein) on 17 vessels with a total of 214 hauls (defined as setting gear, soaking gear for some duration of time, and retrieving gear) were 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, non-sandbar large coastal shark, sandbar shark). There were no grouper/snapper or grouper/tilefish 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 from North Carolina to Florida (Richards, 1999).

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

There were 147 hauls on 7 trips observed targeting grouper/snapper or grouper/tilefish in the Gulf of Mexico. The mainline length ranged from 7 to 19 km with an average of 11.2 km. The bottom depth fished ranged from 33.5 to 160.5 m with an average of 99.7 m, and the number of hooks ranged from 180 to 2300 hooks with an average of 1135 hooks fished. There were 58 sets within 50 fathoms (< 91.4 m) depth (39.5%) and 89 sets outside of 50 fathoms (> 91.4 m) depth (60.5%). Circle hooks sized 13.0 were the most common hook utilized (32.7% of hauls). Two different hook sizes were used 14.3% 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 2.0 hr.

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

There were 10,253 individual animals caught on observed bottom longline hauls targeting grouper/snapper or grouper/tilefish in the Gulf of Mexico (Table 2). Teleosts comprised 86.1% of the catch, followed by sharks (12.0%), invertebrates (1.8%), and batoids (0.04%). Deepwater

shark species comprised 52.0% of the shark catch, small coastal shark species comprised 29.5%, large coastal sharks comprised 10.4%, and pelagic sharks comprised 0.1%. Prohibited sharks including the bigeye sixgill shark, *Hexanchus vitulus*, the night shark, *Carcharhinus signatus*, and the Atlantic angel shark, *Squatina dumeril*, made up 8.0% of the catch. Yellowedge grouper, *Epinephelus flavolimbatus*, was the most frequently caught species of teleost (37.7%), and smooth dogfish, *Mustelus canis*, was the most frequently caught species of shark (46.4%). Length frequencies of shark species are presented in Figure 2 (for species with $n \geq 10$).

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). Four (4) sea birds were observed caught. No sea turtle, sawfish, or marine mammal interactions were observed.

Gulf of Mexico shark targeted trips: gear and haul characteristics

There were 41 hauls on 27 trips observed targeting sharks in the Gulf of Mexico. All of the trips were targeting sandbar shark within the shark research fishery. The mainline length ranged from 6 to 26 km with an average of 15.2 km. The bottom depth fished ranged from 2.5 to 101.5 m with an average of 37.9 m, and the number of hooks ranged from 180 to 1200 hooks with an average of 552 hooks fished. The most commonly used hook was the 18.0 circle hook (56.1%) with 14.0 J hooks used in 26.8% of hauls. There were 26 hauls (63.4%) that employed

two different types of hooks, with 18.0 circle hooks used most commonly as the second hook (84.6%). The average soak duration was 11.3 hr.

Gulf of Mexico shark targeted trips: catch and bycatch

There were 2,540 individual animals caught on observed bottom longline hauls targeting shark in the Gulf of Mexico (Table 4). Sharks comprised 90.8% of the catch, followed by teleosts (7.7%), invertebrates (0.8%), and batoids (0.6%). Large coastal shark species comprised 75.3% of the shark catch, small coastal shark species comprised 22.3%, deep water sharks comprised 1.3%, and pelagic sharks comprised 0.1%. Prohibited shark species including the dusky shark, *Carcharhinus obscurus*, the Caribbean reef shark, *Carcharhinus perezi*, the night shark, *Carcharhinus signatus*, and the great white shark, *Carcharodon carcharias*, were also caught (1.0% of shark catch). King snake eel, *Ophichthus rex*, was the most frequently caught species of teleost (55.4%) and sandbar shark, *C. plumbeus*, was the most frequently caught species of shark (16.6%). Length frequencies of shark species are presented in Figure 3 (for species with $n \geq 10$).

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). Two (2) smalltooth sawfish were observed caught in bottom longline gear. No sea turtle, sea bird, or marine mammal interactions were observed.

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

There were 26 hauls on 16 trips observed targeting shark in the U.S. Atlantic Ocean. The mainline length ranged from 4 to 28 km with an average of 16.0 km. The bottom depth fished ranged from 3.5 to 22.5 m with an average of 16.2 m, and the number of hooks ranged from 54 to 804 hooks with an average of 385 hooks fished. The 20.0 circle hook was used in the majority of hauls (53.8%). There were 11 hauls (42.3% of hauls) that employed two different types of hooks, with 18.0 circle hooks used most commonly as the second hook (90.9% of hauls using two hooks). The average soak duration was 11.5 hr.

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

There were 1,836 individual animals caught on observed bottom longline hauls targeting shark in the U.S. Atlantic Ocean (Table 6). Sharks comprised 99.1% of the catch, followed by teleosts (0.4%), batoids (0.4%), and invertebrates (0.1%). Large coastal shark species comprised 83.8% of the shark catch, small coastal shark species comprised 16.1%, and deep water sharks comprised 0.1%. There were no pelagic or prohibited sharks caught. Cobia, *Rachycentron canadum*, were the most frequently caught species of teleost (28.6%), and the tiger shark, *Galeocerdo cuvier*, comprised the majority of the shark catch (50.5%). Length frequencies of shark species are presented in Figure 4 (for species with $n \geq 10$).

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). One (1) loggerhead sea turtle, *Caretta caretta*,

was observed caught in bottom longline gear. No sawfish, sea bird, or marine mammal interactions were observed.

Discussion

Observer coverage in 2008 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 allowed for coverage of vessels targeting deepwater grouper and tilefish that normally would be targeting sharks. This was very beneficial not only in providing information to support shark stock assessments but also to evaluate snapper-grouper bycatch rates in proposed 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 grouper-snapper bottom longline fishery. The inception of the shark research fishery allowed imperative biological data and samples of sandbar sharks to be collected, as well as provided valuable catch information for data-poor months and areas. Observer data obtained by 100% coverage of the sandbar shark research fishery will be used in the future for adjusting quotas, obtaining reliable length-weight conversions for fishery-important species, and as a means of obtaining biological samples for mandatory stock assessment life history analysis obligations.

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Literature Cited

- Hale, L.F. and J.K. Carlson. 2007. Characterization of the shark bottom longline fishery, 2005-2006. NOAA Technical Memorandum NMFS-SEFSC-554, 28 p.
- Hale, L.F., L.D. Hollensead, and J.K. Carlson. 2007. Characterization of the shark bottom longline fishery, 2007. NOAA Technical Memorandum NMFS-SEFSC-564, 25 p.
- Morgan, A., P. Cooper, T. Curtis, and G. Burgess. *in press*. An overview of the United States East Coast Bottom Longline Shark Fishery, 1994-2003. Marine Fisheries Review. *in press*.
- National Marine Fisheries Service (NMFS). 2005. 2005 Guide for complying with the regulations for Atlantic Tunas, Swordfish, Sharks, and Billfish. NOAA/NMFS, Office of Sustainable Fisheries, Highly Migratory Species Management Division, Silver Spring, MD. 39 p.
- National Marine Fisheries Service (NMFS). 2007. Amendment 2 to the Consolidated Atlantic Highly Migratory Species Fishery Management Plan. NOAA/NMFS, Office of Sustainable Fisheries, Highly Migratory Species Management Division, Silver Spring, MD. 726 p.
- Richards, W.J. 1999. Problems with unofficial and inaccurate geographical names in the fisheries literature. Marine Fisheries Review 61(3): 56-57.

SEDAR 11. 2006. Stock assessment report. Large coastal shark complex, blacktip and sandbar shark. NOAA/NMFS, Office of Sustainable Fisheries, Highly Migratory Species Management Division, Silver Spring, MD. 387 p.

Table 1. Number of trips, vessels, hauls, and hook hours 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	Hook Hours
GOM GRP + TIL	7	7	147	265035.6
GOM SHX	7	27	41	246826.9
SA SHX	3	16	26	116215.7
Total	17	50	214	628078.2

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 flavolimbatus</i>	Yellowedge grouper	3332	99.1	0.8	0.0	0.1
<i>Caulolatilus microps</i>	Blueline tilefish	1818	77.0	20.6	2.0	0.4
<i>Mustelus canis</i>	Smooth dogfish	569	4.6	1.9	93.3	0.2
<i>Lopholatilus chamaeleonticeps</i>	Tilefish	552	98.0	1.6	0.2	0.2
<i>Urophycis floridana</i>	Southern hake	415	56.9	42.4	0.7	0.0
Muraenidae	Moray eel family	373	89.0	6.7	4.0	0.3
<i>Ophichthus rex</i>	King snake eel	355	57.2	7.0	34.4	1.4
<i>Rhizoprionodon terraenovae</i>	Atlantic sharpnose shark	344	9.3	41.6	48.8	0.3
<i>Epinephelus niveatus</i>	Snowy grouper	332	99.1	0.9	0.0	0.0
<i>Epinephelus morio</i>	Red grouper	323	69.0	4.0	26.9	0.0
<i>Mycteroperca phenax</i>	Scamp grouper	209	97.6	1.9	0.5	0.0
<i>Lutjanus campechanus</i>	Red snapper	179	74.3	2.8	21.8	1.1
<i>Seriola dumerili</i>	Greater amberjack	129	43.4	8.5	47.3	0.8
<i>Neomerinthe hemingwayi</i>	Spinycheek scorpionfish	126	98.4	1.6	0.0	0.0
Anthozoa	Coral	122	0.0	99.2	0.0	0.8
<i>Pagrus pagrus</i>	Red porgy	114	100.0	0.0	0.0	0.0
<i>Mycteroperca microlepis</i>	Gag grouper	103	92.2	1.0	6.8	0.0
<i>Hexanchus vitulus</i>	Bigeye sixgill shark	82	0.0	11.0	89.0	0.0
<i>Epinephelus drummondhayi</i>	Speckled hind	76	100.0	0.0	0.0	0.0
<i>Epinephelus nigritus</i>	Warsaw grouper	63	100.0	0.0	0.0	0.0
<i>Carcharhinus plumbeus</i>	Sandbar shark	47	0.0	2.1	97.9	0.0
<i>Sphyrna lewini</i>	Scalloped hammerhead shark	45	0.0	42.2	57.8	0.0
Anguilliformes	Eels	42	21.4	57.1	21.4	0.0
Congridae	Conger eels	42	90.5	0.0	9.5	0.0
<i>Ophichthus ocellatus</i>	Pale-spotted eel	37	51.4	13.5	35.1	0.0
<i>Squalus acanthias</i>	Spiny dogfish	37	0.0	5.4	94.6	0.0
<i>Brotula barbata</i>	Bearded brotula	36	100.0	0.0	0.0	0.0
Majidae	Spider crabs	27	3.7	3.7	92.6	0.0
Asteroidea	Sea stars	24	0.0	54.2	45.8	0.0
<i>Merluccius sp.</i>	Hakes	22	31.8	68.2	0.0	0.0
<i>Caulolatilus chrysops</i>	Goldface tilefish	20	100.0	0.0	0.0	0.0
<i>Pristipomoides aquilonaris</i>	Wenchman snapper	19	78.9	21.1	0.0	0.0
<i>Seriola rivoliana</i>	Almaco jack	19	100.0	0.0	0.0	0.0
<i>Trachinocephalus myops</i>	Snakefish	19	84.2	0.0	15.8	0.0
<i>Carcharhinus acronotus</i>	Blacknose shark	16	31.3	18.8	50.0	0.0
<i>Carcharhinus signatus</i>	Night shark	13	7.7	84.6	7.7	0.0
<i>Galeocerdo cuvier</i>	Tiger shark	12	0.0	16.7	83.3	0.0
<i>Scyliorhinus retifer</i>	Chain catshark	12	0.0	16.7	83.3	0.0
<i>Carcharhinus limbatus</i>	Blacktip shark	11	0.0	18.2	81.8	0.0
Tetraodontidae	Puffer family	10	0.0	0.0	100.0	0.0
<i>Opsanus pardus</i>	Leopard toadfish	9	22.2	0.0	77.8	0.0
<i>Seriola sp.</i>	Amberjacks	9	88.9	0.0	0.0	11.1
<i>Squalus cubensis</i>	Cuban dogfish	8	0.0	75.0	25.0	0.0
<i>Calappa flammea</i>	Flame box crab	7	0.0	0.0	100.0	0.0

Table 2 Continued.

Scientific Name	Common Name	n	% K	% DD	% DA	% U
<i>Carcharhinus falciformis</i>	Silky shark	7	28.6	42.9	28.6	0.0
Elasmobranchii	Sharks	7	0.0	28.6	57.1	14.3
Porifera	Sponges	7	0.0	100.0	0.0	0.0
Squalidae	Dogfish family	6	0.0	0.0	100.0	0.0
Synodontidae	Lizardfish family	6	100.0	0.0	0.0	0.0
<i>Synodus foetens</i>	Inshore lizardfish	5	100.0	0.0	0.0	0.0
<i>Euthynnus alletteratus</i>	Little tunny	4	75.0	25.0	0.0	0.0
<i>Rhomboplites aurorubens</i>	Vermillion snapper	4	100.0	0.0	0.0	0.0
<i>Thunnus atlanticus</i>	Blackfin tuna	4	25.0	25.0	50.0	0.0
<i>Carcharhinus brevipinna</i>	Spinner shark	3	0.0	66.7	33.3	0.0
<i>Synodus intermedius</i>	Sanddiver lizardfish	3	100.0	0.0	0.0	0.0
<i>Carcharhinus leucas</i>	Bull shark	2	0.0	0.0	100.0	0.0
<i>Coryphaena hippurus</i>	Dolphinfish	2	50.0	50.0	0.0	0.0
<i>Cynoscion sp.</i>	Seatrouts	2	0.0	100.0	0.0	0.0
<i>Mustelus norrisi</i>	Florida smoothhound shark	2	0.0	100.0	0.0	0.0
<i>Sarda sarda</i>	Bonito	2	50.0	50.0	0.0	0.0
<i>Squatina dumeril</i>	Atlantic angel shark	2	0.0	0.0	100.0	0.0
<i>Xiphius gladius</i>	Swordfish	2	100.0	0.0	0.0	0.0
<i>Cancer spp.</i>	Cancer crabs	1	0.0	100.0	0.0	0.0
Carangidae	Jack family	1	100.0	0.0	0.0	0.0
Carcharhinidae	Requiem shark family	1	0.0	0.0	0.0	100.0
<i>Dasyatis centroura</i>	Roughtail stingray	1	0.0	0.0	100.0	0.0
<i>Dipturus garricki</i>	San Blas skate	1	0.0	0.0	100.0	0.0
Echeneidae	Remora family	1	0.0	0.0	100.0	0.0
<i>Isurus oxyrinchus</i>	Shortfin mako shark	1	100.0	0.0	0.0	0.0
Lutjanidae	Snapper family	1	100.0	0.0	0.0	0.0
<i>Lutjanus griseus</i>	Gray snapper	1	100.0	0.0	0.0	0.0
<i>Narcine brasiliensis</i>	Lesser electric ray	1	100.0	0.0	0.0	0.0
<i>Paralichthys lethostigma</i>	Southern flounder	1	100.0	0.0	0.0	0.0
<i>Peprilus alepidotus</i>	Harvestfish	1	100.0	0.0	0.0	0.0
<i>Pomatomus saltatrix</i>	Bluefish	1	100.0	0.0	0.0	0.0
<i>Prionotus sp.</i>	Searobins	1	0.0	0.0	100.0	0.0
<i>Rachycentron canadum</i>	Cobia	1	100.0	0.0	0.0	0.0
<i>Raja eglanteria</i>	Clearnose skate	1	0.0	0.0	100.0	0.0
Serranidae	Seabass family	1	100.0	0.0	0.0	0.0
<i>Sphyraena barracuda</i>	Great barracuda	1	100.0	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>Pelecanus occidentalis</i>	Brown pelican	2	100.0	0.0	0.0
<i>Larus argentatus</i>	Herring gull	1	100.0	0.0	0.0
	Unidentified sea bird	1	100.0	0.0	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 plumbeus</i>	Sandbar shark	382	98.4	0.3	1.0	0.3
<i>Rhizoprionodon terraenovae</i>	Atlantic sharpnose shark	327	83.2	15.0	0.6	1.2
<i>Galeocerdo cuvier</i>	Tiger shark	324	38.6	4.3	55.9	1.2
<i>Carcharhinus leucas</i>	Bull shark	320	92.5	0.3	4.7	2.5
<i>Carcharhinus limbatus</i>	Blacktip shark	270	85.2	11.5	3.0	0.4
<i>Ginglymostoma cirratum</i>	Nurse shark	241	10.0	0.8	89.2	0.0
<i>Carcharhinus acronotus</i>	Blacknose shark	177	83.1	15.3	1.7	0.0
<i>Ophichthus rex</i>	King snake eel	108	100.0	0.0	0.0	0.0
<i>Sphyrna mokarran</i>	Great hammerhead shark	69	94.2	1.4	2.9	1.4
<i>Negaprion brevirostris</i>	Lemon shark	65	98.5	0.0	0.0	1.5
<i>Sphyrna lewini</i>	Scalloped hammerhead shark	38	92.1	2.6	2.6	2.6
<i>Squalus mitsukurii</i>	Shortspine dogfish	28	32.1	17.9	50.0	0.0
<i>Lutjanus cyanopterus</i>	Cubera snapper	20	90.0	0.0	0.0	10.0
<i>Epinephelus morio</i>	Red grouper	19	78.9	15.8	5.3	0.0
<i>Carcharhinus falciformis</i>	Silky shark	19	89.5	5.3	5.3	0.0
<i>Carcharhinus obscurus</i>	Dusky shark	16	0.0	100.0	0.0	0.0
<i>Lutjanus analis</i>	Mutton snapper	16	75.0	25.0	0.0	0.0
<i>Dasyatis americana</i>	Southern stingray	13	7.7	0.0	92.3	0.0
Mollusca	Molluscs	8	0.0	0.0	100.0	0.0
<i>Epinephelus flavolimbatus</i>	Yellowedge grouper	8	87.5	12.5	0.0	0.0
<i>Sphyrna tiburo</i>	Bonnethead shark	7	57.1	42.9	0.0	0.0
<i>Carcharhinus perezii</i>	Caribbean reef shark	7	71.4	28.6	0.0	0.0
<i>Epinephelus itajara</i>	Goliath grouper	7	0.0	0.0	100.0	0.0
Porifera	Sponges	6	0.0	100.0	0.0	0.0
<i>Bagre marinus</i>	Gafftopsail catfish	4	25.0	75.0	0.0	0.0
<i>Seriola dumerili</i>	Greater amberjack	4	75.0	0.0	25.0	0.0
<i>Seriola rivoliana</i>	Almaco jack	3	100.0	0.0	0.0	0.0
Anthozoa	Coral	3	0.0	100.0	0.0	0.0
<i>Isurus oxyrinchus</i>	Shortfin mako shark	3	100.0	0.0	0.0	0.0
<i>Carcharhinus brevipinna</i>	Spinner shark	3	66.7	0.0	33.3	0.0
Anguilliformes	Eels	2	50.0	0.0	50.0	0.0
<i>Carcharhinus signatus</i>	Night shark	2	0.0	50.0	50.0	0.0
Carcharhinidae	Requiem shark family	2	0.0	100.0	0.0	0.0
<i>Epinephelus niveatus</i>	Snowy grouper	2	100.0	0.0	0.0	0.0
<i>Myliobatis freminvillei</i>	Bullnose ray	1	0.0	0.0	100.0	0.0
<i>Cancer spp.</i>	Cancer crabs	1	0.0	0.0	100.0	0.0
<i>Raja eglanteria</i>	Clearnose skate	1	0.0	0.0	100.0	0.0
<i>Carcharhinus isodon</i>	Finetooth shark	1	0.0	100.0	0.0	0.0
<i>Carcharodon carcharias</i>	Great white shark	1	0.0	100.0	0.0	0.0
Cephalopoda	Octopus	1	0.0	0.0	100.0	0.0
Asteroidea	Sea stars	1	0.0	0.0	100.0	0.0
Elasmobranchii	Sharks	1	0.0	0.0	0.0	100.0
<i>Mustelus canis</i>	Smooth dogfish	1	0.0	100.0	0.0	0.0
<i>Sphyrna zygaena</i>	Smooth hammerhead shark	1	100.0	0.0	0.0	0.0

Table 4 Continued.

Scientific Name	Common Name	n	% K	% DD	% DA	% U
<i>Urophycis floridana</i>	Southern hake	1	0.0	100.0	0.0	0.0
<i>Squalus acanthias</i>	Spiny dogfish	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>Epinephelus nigritus</i>	Warsaw grouper	1	100.0	0.0	0.0	0.0
Polychaeta	Worms	1	0.0	0.0	100.0	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>Pristis pectinata</i>	Smalltooth sawfish	2	0.0	100.0	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>Galeocerdo cuvier</i>	Tiger shark	920	12.2	10.2	76.8	0.8
<i>Carcharhinus plumbeus</i>	Sandbar shark	383	85.9	1.3	11.7	1.0
<i>Rhizoprionodon terraenovae</i>	Atlantic sharpnose shark	290	94.1	5.5	0.0	0.3
<i>Carcharhinus limbatus</i>	Blacktip shark	148	80.4	15.5	3.4	0.7
<i>Sphyrna mokarran</i>	Great hammerhead shark	34	88.2	8.8	0.0	2.9
<i>Carcharhinus leucas</i>	Bull shark	23	73.9	4.3	21.7	0.0
<i>Ginglymostoma cirratum</i>	Nurse shark	13	0.0	0.0	100.0	0.0
<i>Raja eglanteria</i>	Clearnose skate	5	100.0	0.0	0.0	0.0
<i>Carcharhinus acronotus</i>	Blacknose shark	4	100.0	0.0	0.0	0.0
<i>Negaprion brevirostris</i>	Lemon shark	3	66.7	0.0	33.3	0.0
<i>Rachycentron canadum</i>	Cobia	2	0.0	50.0	50.0	0.0
<i>Remora remora</i>	Remora	2	0.0	0.0	100.0	0.0
<i>Dasyatis americana</i>	Southern stingray	2	0.0	0.0	100.0	0.0
Anthozoa	Coral	1	0.0	0.0	0.0	100.0
<i>Epinephelus itajara</i>	Goliath grouper	1	0.0	0.0	100.0	0.0
Echeneidae	Remora family	1	0.0	0.0	100.0	0.0
Elasmobranchii	Sharks	1	0.0	100.0	0.0	0.0
<i>Mustelus canis</i>	Smooth dogfish	1	100.0	0.0	0.0	0.0
<i>Epinephelus nigritus</i>	Warsaw grouper	1	100.0	0.0	0.0	0.0

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>Caretta caretta</i>	Loggerhead sea turtle	1	0.0	100.0	0.0

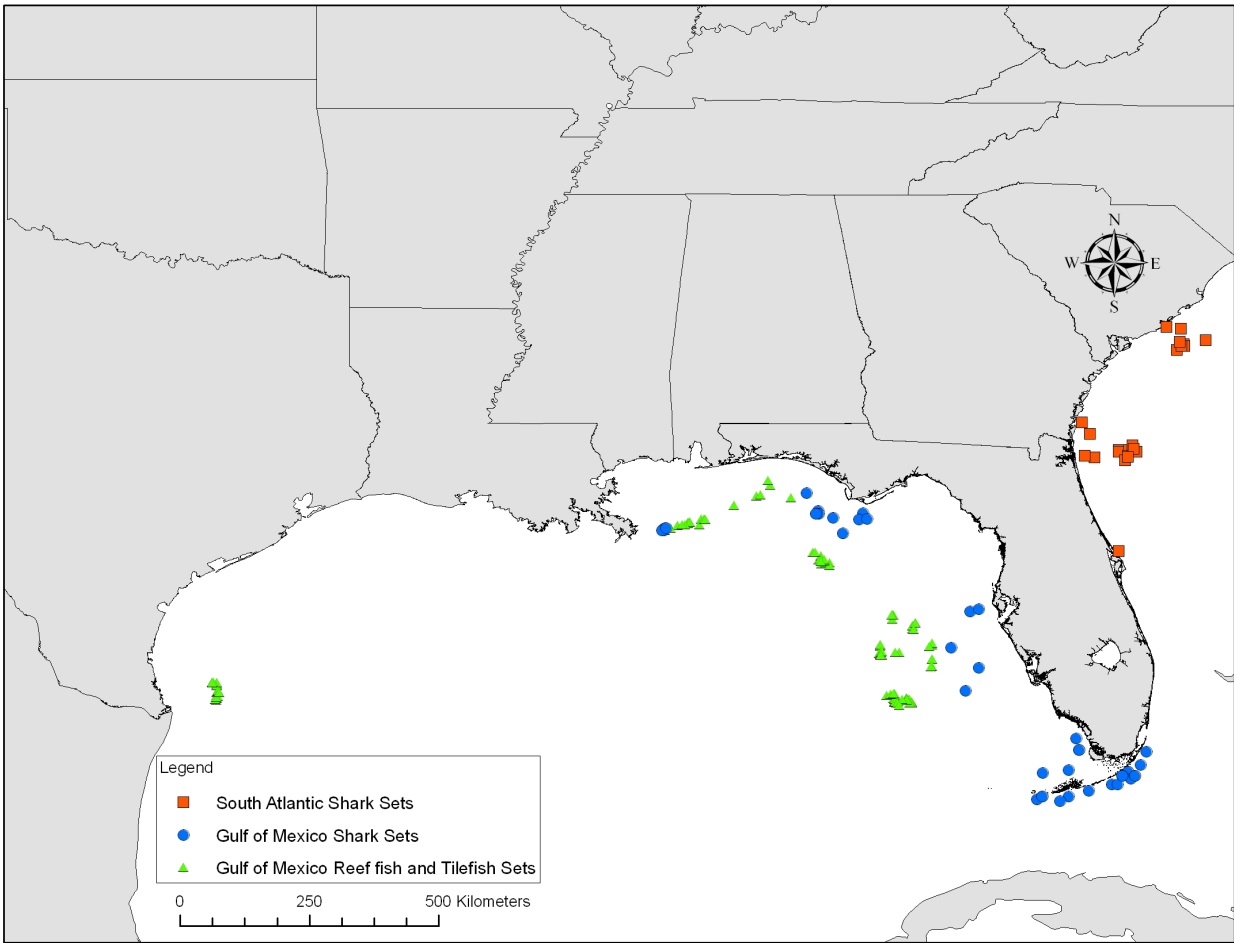


Figure 1. Distribution of all observed hauls by target in the Gulf of Mexico and U.S. Atlantic Ocean in 2008.

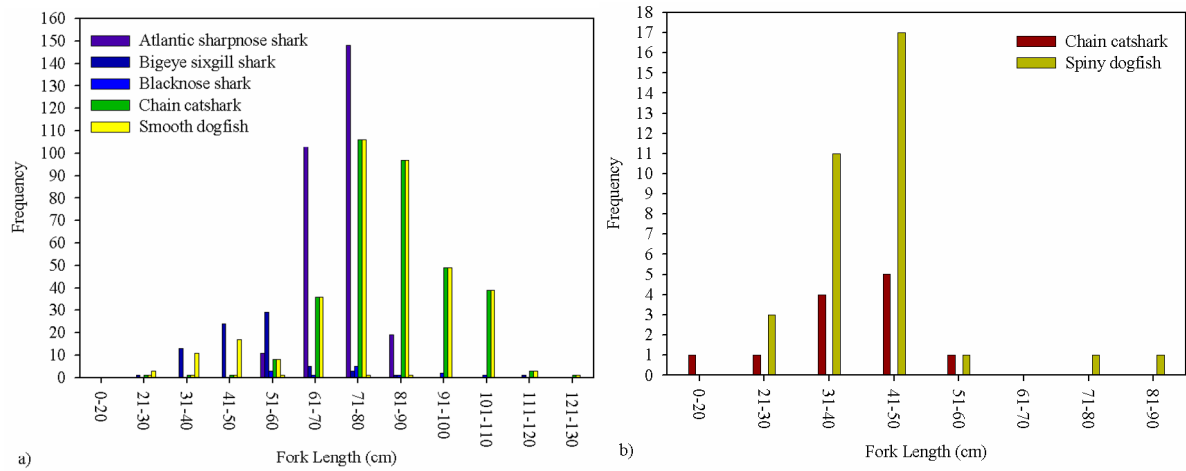


Figure 2. Length frequency (cm fork length) of sharks ($n \geq 10$) observed caught on bottom longline sets targeting grouper/snapper or grouper/tilefish in the Gulf of Mexico.

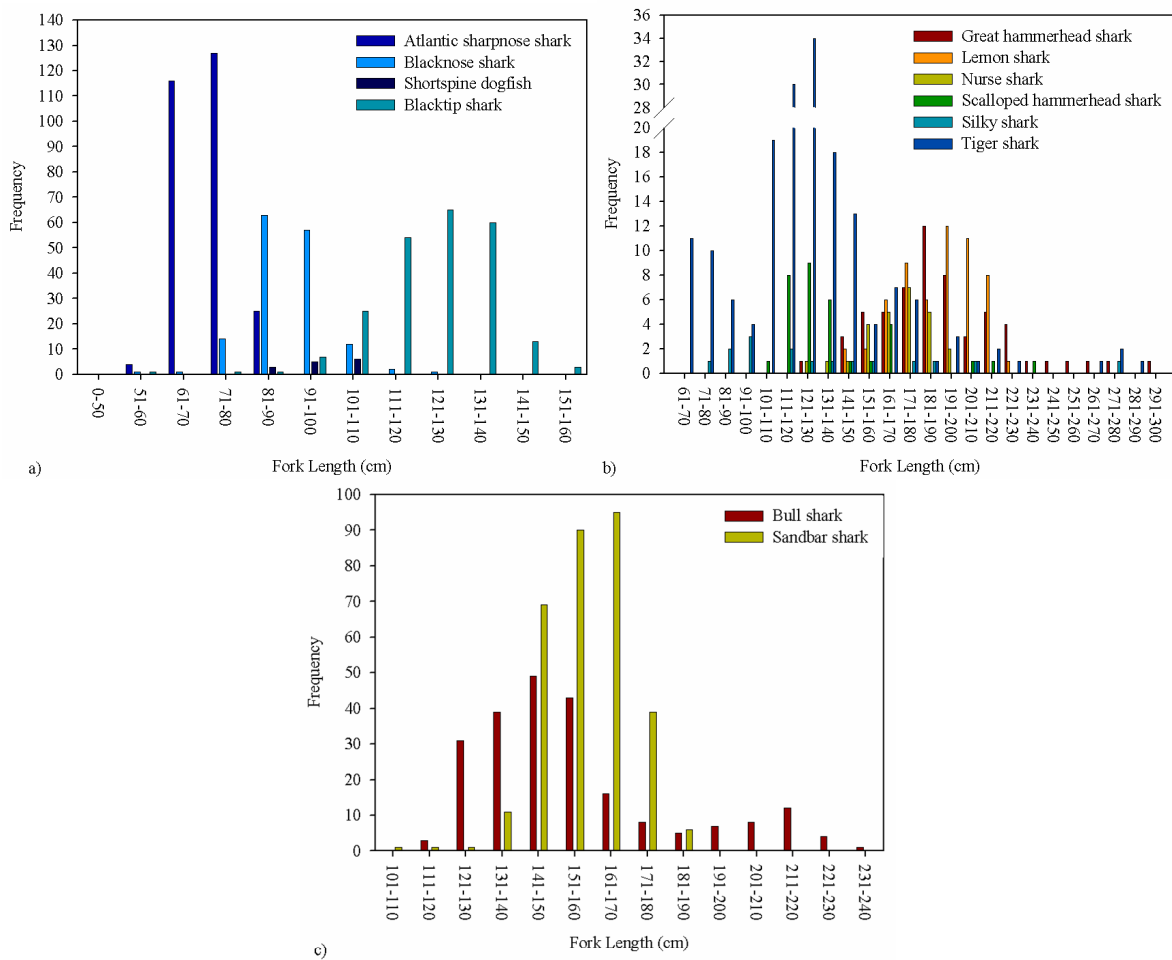


Figure 3. Length frequency (cm fork length) of sharks ($n \geq 10$) observed caught on bottom longline sets targeting shark in the Gulf of Mexico.

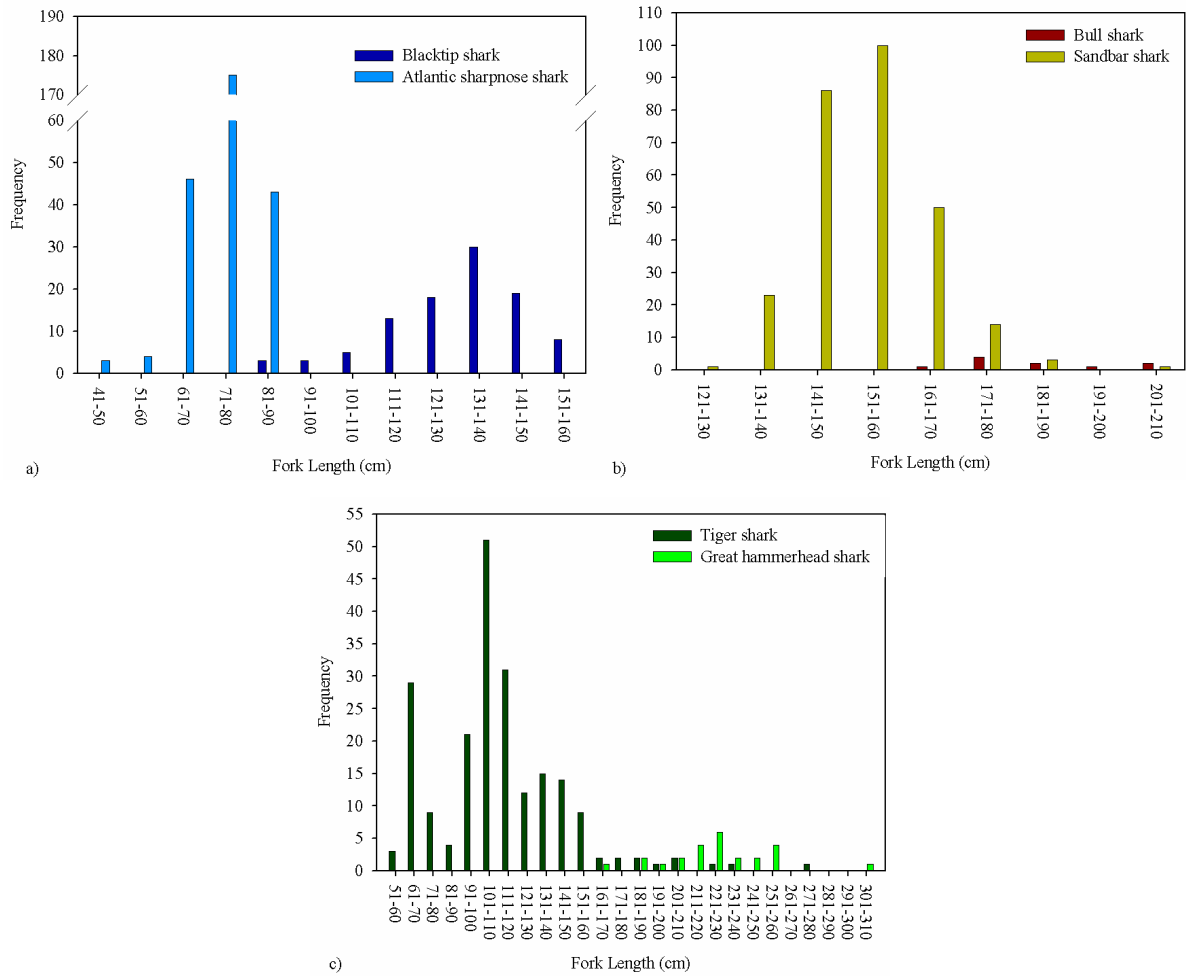


Figure 4. Length frequency (cm fork length) of sharks ($n \geq 10$) observed caught on bottom longline sets targeting shark in the U.S. Atlantic Ocean.