The Directed Shark Gillnet Fishery: Catch and Bycatch, 2004

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Introduction

Observations of the east Florida-Georgia shark drift gillnet fishery have been previously conducted and reports of the catch and bycatch from these observations were developed (Carlson and Baremore, 2003 and references therein). The Atlantic Large Whale Take Reduction Plan and The Biological Opinion issued under Section 7 of the Endangered Species Act mandate that, with respect to the southeast shark gillnet fishery, 100% observer coverage is required during the Right Whale Calving Season (15 Nov-1 Apr) for vessels operating from West Palm Beach, FL to Sebastian Inlet, FL. Outside the right whale calving season (1 Apr-14 Nov), an interim final rule published in March 2001 (March 30, 2001; 66 FR 17370) to the Fishery Management Plan for Highly Migratory Species (NMFS, 1999) established a level of observer coverage equal to that which would attain a sample size needed to provide estimates of sea turtle or marine mammal interactions with an expected coefficient of variation of 0.3. The objectives of this report are to document protected species bycatch and catch and bycatch in the southeast US coastal directed shark gillnet fishery for the calendar year, 2004.

Methods

Observer protocol

During the 100% observer requirement period, observers were deployed in ports where the vessels are currently active. Observers board all vessels for all trips during this time period. Outside the 100% requirement, vessels were randomly selected from a universe of 6 vessels for a series of 2-week coverage periods. Selection letters requiring observer coverage were issued by the SEFSC observer coordinator beginning on 1 April 2004. After the fisher made initial contact with the observer coordinator, an observer was deployed to the port where the vessel was currently active. The last assessment of sample size found that a 33.8% level of coverage is required to attain a sample size needed to provide estimates of a sea turtle or marine mammal interaction with an expected coefficient of variation of 0.3 (Carlson and Baremore, 2002).

Methods as described by Carlson and Lee (1999) were employed. Observations were made as the net was hauled aboard. The observer remained about 3-8 m forward of the net reel in a position with an unobstructed view and recorded species, numbers and lengths (±30 cm) of sharks and other species caught as they were suspended in the net just after passing over the power roller. Weights (in kg) were estimated from these estimated lengths using length-weight relationships provided Kohler et al. (1998) and Carlson (unpublished data). When species identification was questionable, the crew stopped the reel so that the observer could examine the animal(s) for positive identification. Disposition of each species brought onboard was recorded as kept, discarded alive, or discarded dead. When time permitted after the haulback was complete, observers randomly measured sharks when the vessel was returning to port. Fork length (FL, measured on a straight line), and sex, were determined for each shark. Biological samples (e.g. vertebrae, reproductive organs, stomach) were removed and placed on ice after collection. Data were submitted to the NMFS/SEFSC Sustainable Fisheries Division on a weekly basis. The data were entered by SEFSC staff, examined by NMFS/SEFSC Sustainable Fisheries Division staff, and reviewed with Johnson Controls observer contract staff to resolve any questions.

Results and Discussion

Strike gillnet fishery

Strikenet fishing techniques have been described (Carlson and Baremore, 2001). Recently, the vessels used for strikenetting sharks (smaller open boats with an electric power roller system) are also used for hauling part of the gear as well as tending the net during the strikenet operation. Moreover, the larger driftnet boats are also used for setting the gear during strikenet operations.

A total of 4 strike gillnet vessels were observed making 25 sets on 42 trips. Reasons for not striking for sharks included the inability to locate the school, sharks located in state waters, and poor weather conditions. The distribution of observed strike gillnet fishing effort is illustrated in Figure 1.

Vessel strike gillnetting for sharks carried nets ranging from 548.6-1641.6 m long and 4.6-30.4 m deep. Stretched mesh sizes ranged from 17.8-24.1 cm. The most frequently used mesh size was 22.9 cm. Setting of the gear averaged 0.1 hrs (±0.01 S.D.) and was made in sea water depths averaging 18.3 m (±6.6 S.D). Hauls averaged 3.0 hrs (±4.1 S.D.). The entire strikenetting process (time net was first set until time haulback was completed) averaged 3.5 hrs (±4.2 S.D.).

Observed strike gillnet catches

Observed catch in the strike gillnet fishery consisted of 8 species of sharks (99.9% of total number caught) and 2 species of teleosts and rays (0.1% of total number caught) (Table 1). No marine mammals or sea turtles were observed caught. The blacktip shark *Carcharhinus limbatus* made up 91.2% of the number of sharks caught. Bycatch included manta ray *Manta birostris* and red drum *Sciaenops ocellatus*.

Drift gillnet fishery

A total of 32 drift gillnet sets on 31 trips were observed on 4 vessels. Driftnet vessels carried nets ranging in length from 1276.8-3237.6 m; depths from 6.1-12.2 m and stretched mesh sizes from 12.7-22.9 cm. The most frequently used mesh size was 12.7 cm. For all observed driftnet sets, set duration averaged 0.4 hrs (±0.1 S.D.). Sets were made in sea water averaging 18.8 m (±4.7 S.D.) deep. Hauls and processing of the catch averaged 3.1 hrs (±1.0 S.D.). Average soak time for the driftnet (time net was first set minus time haulback began) was 10.7 hrs (±2.7 S.D.).

Observed drift gillnet catches

The observed driftnet catch consisted of 11 species of sharks, 15 species of teleosts, and 3 species of rays. Total observed catch composition (percent of numbers caught) were 54.2% sharks, 45.5% teleosts, and 0.3% rays. Three species of sharks made up 89.3% (by number) of the observed shark catch (Table 2). These species were Atlantic sharpnose shark *Rhizoprionodon terraenovae*, blacknose shark *Carcharhinus acronotus*, and blacktip shark *C. limbatus*.

Four species of teleosts made up 92.3% by number of the overall non-shark species. These species were little tunny *Euthynnus alletteratus* (53.14%), king mackerel *Scomberomorus cavalla* (31.0%), great barracuda *Sphyraena barracuda* (5.2%), and cobia *Rachycentron canadum* (3.0%) (Table 3).

For incidental driftnet catch species, the highest proportion discarded dead (with observed catch greater than 10 specimens) was king mackerel (84.3%), Atlantic sailfish *Istiophorus platypterus* (92.5%), and cobia (21.6%) (Table 3). Cownose ray *Rhinoptera bonasus* had the highest proportion discarded alive (61.5%).

A*verage size*

When time permitted after the haul was complete or when the vessel was returning to port, observers randomly measured sharks (cm fork length). Observers measured 5.2% of the total catch of sharks. By species, 14.8% of spinner shark, 16.1% of scalloped hammerhead shark, 7.0% of blacknose shark, 2.7% of blacktip shark, 12.3% of finetooth shark, and 7.8% of Atlantic sharpnose shark were measured. Average sizes based on these measurements are found in Table 4.

Protected species interactions

No interactions with protected species were observed for vessels fishing with drift or strike gillnets in 2004. However, one loggerhead sea turtle was caught in abandoned fishing gear and was dead upon retrieval. This interaction is believed to have occurred after gear broke loose in bad weather and was not considered part of normal fishing operations. The net was recovered on 1/15/2004 at 27^{O} 6' N, 82^{O} 42' W. There were no observed interactions of smalltooth sawfish.

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Table 1. Total strike gillnet shark catch and bycatch by species and species disposition in order of decreasing abundance for all observed trips, 2004.

Species	Common Name	Total Number Caught	Kept (%)	Discard Alive (%)	Discard Dead (%)
Carcharhinus limbatus	Blacktip shark	6705	99.9	0.1	0.0
Carcharhinus brevipinna	Spinner shark	501	100.0	0.0	0.0
Carcharhinus acronotus	Blacknose shark	123	100.0	0.0	0.0
Carcharhinus isodon	Finetooth shark	11	100.0	0.0	0.0
Rhizoprionodon terraenovae	Atlantic sharpnose shark	4	100.0	0.0	0.0
Sphyrna lewini	Scalloped hammerhead shark	4	100.0	0.0	0.0
Sphyrna tiburo	Bonnethead shark	3	100.0	0.0	0.0
Manta birostris	Manta ray	2	0.0	100.0	0.0
Sciaenops ocellatus	Red drum	1	0.0	100.0	0.0
Carcharius taurus	Sand tiger shark	1	0.0	100.0	0.0

Table 2. Total directed drift gillnet shark catch by species and species disposition in order of decreasing abundance for all observed trips, 2004.

Species	Common Name	Total Number Caught	Kept (%)	Discard Alive (%)	Discard Dead (%)
Rhizoprionodon terraenovae	Atlantic sharpnose shark	2727	99.6	0.0	0.4
Carcharhinus acronotus	Blacknose shark	718	100.0	0.0	0.0
Carcharhinus limbatus	Blacktip shark	462	35.3	14.5	50.2
Sphyrna lewini	Scalloped hammerhead shark	244	22.1	1.6	76.2
Carcharhinus brevipinna	Spinner shark	107	82.2	4.7	13.1
Carcharhinus isodon	Finetooth shark	54	96.3	3.7	0.0
Sphyrna tiburo	Bonnethead shark	49	100.0	0.0	0.0
Sphyrna mokarran	Great hammerhead shark	5	0.0	20.0	80.0
Unidentified shark	Carcharhiniformes	3	0.0	0.0	100.0
Carcharhinus falciformis	Silky shark	1	100.0	0.0	0.0
Carcharhinus plumbeus	Sandbar shark	1	0.0	0.0	100.0
Galeocerdo cuvier	Tiger shark	1	100.0	0.0	0.0

Table 3. Total drift gillnet teleost and ray bycatch by species in order of decreasing abundance and species disposition for all observed trips, 2004.

Species	Common Name	Total Number Caught	Kept (%)	Discard Alive (%)	Discard Dead (%)
Euthynnus alletteratus	Little tunny	1963	85.5	0.0	14.5
Scomberomorus cavalla	King mackerel	1147	15.3	0.4	84.3
Sphyraena barracuda	Great barracuda	193	100.0	0.0	0.0
Rachycentron canadum	Cobia	111	74.8	3.6	21.6
Istiophorus platypterus	Atlantic sailfish	67	0.0	7.5	92.5
Caranx crysos	Blue runner	59	100.0	0.0	0.0
Echeneididae	Remora	55	0.0	70.9	29.1
Rhinoptera bonasus	Cownose ray	26	0.0	38.5	61.5
Scomber scombrus	Atlantic mackerel	17	100.0	0.0	0.0
Caranx hippos	Crevalle jack	10	90.0	0.0	10.0
Coryphaena hippurus	Dolphin	9	100.0	0.0	0.0
Scomberomorus maculatus	Spanish mackerel	9	100.0	0.0	0.0
Thunnus atlanticus	Blackfin tuna	9	100.0	0.0	0.0
Lobotes surinamensis	Tripletail	5	100.0	0.0	0.0
Megalops atlanticus	Tarpon	5	0.0	20.0	80.0
Acanthocybium solanderi	Wahoo	4	100.0	0.0	0.0
Aetobatus narinari	Spotted eagle ray	2	0.0	100.0	0.0
Lutjanus campechanus	Red snapper	2	50.0	0.0	50.0
Alectis ciliaris	African pompano	1	100.0	0.0	0.0
Manta birostris	Manta ray	1	0.0	0.0	100.0
Selene setapinnis	Atlantic moonfish	1	0.0	0.0	100.0

Table 4. Average size of sharks measured for all observed trips, 2004. N=the number of measured sharks.

Species	Common name	N	Average Size (cm FL)	S.D.	Percent Measured (%)
Rhizoprionodon terraenovae	Atlantic sharpnose shark	216	79.2	6.3	7.9
Carcharhinus limbatus	Blacktip shark	193	121.9	25.8	2.7
Carcharhinus brevipinna	Spinner shark	90	143.6	27.2	14.8
Carcharhinus acronotus	Blacknose shark	59	105.8	9.0	7.0
Sphyrna lewini	Scalloped hammerhead shark	40	142.8	56.9	16.1
Carcharhinus isodon	Finetooth shark	8	116.5	3.8	12.3

Figure 1. Distribution of observed strike and drift gillnet sets, 2004.