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Introduction

The Southeast Gillnet Observer Program has adapted to the changes of the Florida-Georgia shark gillnet fishery since the program began in 1993 (e.g. Carlson and Bethea 2007 and references therein, Mathers et al. 2017). There are currently about 500 total directed and incidental shark permits issued for the southeastern U.S. Atlantic coast and Gulf of Mexico, while the number of gillnet fishers changes from year to year. Gillnet effort targeting large coastal (LCS) and small coastal (SCS) sharks declined as a result of Amendments 2 and 3 to the Consolidated Atlantic Highly Migratory Species Fishery Management Plan (NMFS 2007, 2010). LCS and SCS targeted gillnet effort has continued to decline in the last five years, such that it has become almost nonexistent. Fishers have consequently increased effort targeting finfish, including Spanish mackerel *Scomberomorus maculatus*, king mackerel *Scomberomorus cavalla*, and bluefish *Pomatomus saltatrix*, with varying types of gillnet gear. However, a small amount of shark targeted gillnet effort continues to be observed. The Southeast Gillnet Observer Program, in its continuing efforts to adapt to the fishery, currently covers anchored (sink and stab), strike, or drift gillnet fishing, regardless of target, by vessels that fish year-round from Florida to North Carolina and the Gulf of Mexico.

Herein, we summarize fishing effort and catch and bycatch in these fisheries during January 2017 - December 2017, collectively referred to as '2017'.

Methods

Observer protocol

Vessels were randomly selected on a quarterly basis (January, April, July, and October) from a pool of vessels that had reported fishing with gillnet gear during the same quarter in the

previous year in the NMFS Coastal Fisheries Logbook. Selection letters notifying permit holders of required observer coverage were issued via U.S. Certified mail approximately one month prior to the upcoming selection period. Receipt of selection letters was confirmed via signature upon acceptance by the permit holder or their proxy. Once the permit holder received the selection letter, he or she was required to make contact with the observer coordinator and indicate intent to fish during the upcoming selection period. Contact was usually made by phone, and the observer coordinator gathered information concerning the vessel's name, captain, contact persons and phone numbers, communications and safety equipment available aboard the vessel, and information about the vessel's location, dates, and times of departure and return. Additional information collected included whether the vessel was active in another fishery, under repair, or no longer fishing. Upon notification of the intention to fish, the observer coordinator deployed an observer to the reported port of departure of the permit holder's vessel. Because gillnet trips are generally 24 hours or less (from the time of departure from port to the time of return), the observer remained assigned to the vessel for a minimum of 3 trips.

Observations were made as the net was hauled aboard. The haul target species was determined by the captain and recorded by the observer. The observer remained on the deck of the vessel in a position with an unobstructed view and recorded species and numbers of individuals caught. When species identification was questionable, the crew stopped hauling so that the observer could examine the animal(s) for positive identification. Status (alive or dead when boated) of individuals was recorded, and disposition of individuals brought onboard was recorded as kept, discarded alive, or discarded dead. Fork lengths (cm FL) were estimated for the entire catch. When time permitted after the haulback was complete, observers directly measured a random group of 10 individuals from each species for fork length (FL, measured on a straight

line) in cm. Sex (sharks only) was determined when possible. Biological samples (e.g. otoliths, vertebrae, reproductive organs, stomach), when taken, were removed and placed on ice after collection. Data and samples were submitted to the NMFS Southeast Fisheries Science Center (SEFSC) Panama City staff immediately upon completion of observed trips. The data were entered and proofed by SEFSC staff, examined by NMFS/SEFSC Sustainable Fisheries Division staff, and reviewed with observer contract staff to resolve any questions.

Results

A total of 75 sets comprising various gillnet fisheries was observed in 2017. Set locations occurred along the Florida coast in the Atlantic Ocean, as well as the Gulf of Mexico (Figures 1-2). Location-specific reports of trips cannot be documented herein due to vessel confidentiality laws, therefore observations are summarized by gear type. Weights for shark and teleost catch referenced herein (Tables 3 and 4) were back-calculated using estimated length (cm FL) measurements and length-weight conversions (Wigley et al. 2003; NMFS, unpublished data).

Drift gillnet fishery

One gillnet vessel was observed making 3 driftnet sets on 3 trips in 2017. Due to vessel confidentiality, these sets cannot be further described.

Strike gillnet fishery

A total of 4 gillnet vessels were observed making 9 strike sets on 7 trips in 2017. Trips were made targeting king mackerel exclusively.

King mackerel targeted strike gillnet

Vessels fished with nets ranging 502.9 – 594.4 m (1650 - 1950 ft) long, net depths of 22.9 – 28.6 m (75.0 – 93.8 ft) and 11.4 – 12.1 cm (4.5 – 4.75 in) stretched mesh size. Set duration averaged 0.05 hr (0.02 S.D.), while hauls averaged 0.99 hr (0.45 S.D.). The entire fishing process (time net was first set until time haul back was completed) averaged 5.36 hr (2.99 S.D.). Sets were made in waters averaging 21.5 m (0.8 S.D.) deep. The distribution of observed strike gillnet fishing effort is illustrated in Figure 1.

Observed king mackerel strike gillnet fishery catches

Catch composition by number of all king mackerel targeted sets was 99.98 % teleosts and 0.02 % elasmobranchs (Table 1). Teleost catch was almost completely composed of king mackerel (99.28 %). Other teleost catch by number included little tunny, *Euthynnus alletteratus* (0.5 %) and Spanish mackerel (0.15 %). Shark catch by number was blacktip shark, *Carcharhinus limbatus* (50.00 %), and scalloped hammerhead shark, *Sphyrna lewini* (50.00 %). Catches by weight of commercially important teleosts are given in Table 4.

Average size from king mackerel targeted strike gillnet sets

Average (S.D.) fork lengths of teleosts caught in king mackerel targeted sets ranged from 52.0 cm (4.8) for little tunny, to 77.2 cm (13.1) for king mackerel. Average (S.D.) lengths of teleosts ($n \geq 5$) measured by target can be found in Table 6.

Sink gillnet fishery

A total of 7 trips totaling 63 sink net sets on 3 vessels were observed in 2017. Trips were made targeting Spanish mackerel exclusively.

Spanish mackerel targeted sink gillnet

Vessels fished with nets ranging 182.9 – 731.5 m (600 - 2400 ft) long, net depths of 4.0 – 5.2 m (13.0 – 17.0 ft) and stretched mesh sizes of 8.9 cm (3.5 in). Set duration averaged 0.03 hr (0.02 S.D.), while hauls averaged 0.22 hr (0.32 S.D.). The entire fishing process (time net was first set until time haul back was completed) averaged 0.39 hr (0.47 S.D.). Sets were made in waters averaging 11.1 m (4.3 S.D.) deep. Observed Spanish mackerel targeted sink gillnet fishing effort is illustrated in Figure 2.

Observed Spanish mackerel targeted sink gillnet catches

Catch composition by number of all Spanish mackerel targeted sets was 97.30 % teleosts and 2.70 % elasmobranchs (Table 2). By number, shark catch was made up of Atlantic sharpnose shark, *Rhizoprionodon terraenovae* (82.56 %), bonnethead shark, *Sphyrna tiburo* (15.12 %), and blacktip shark, (2.33 %). By weight, the shark catch was made up of Atlantic sharpnose shark (71.92 %), blacktip shark (14.84 %), and bonnethead shark (13.23 %). Catches by weight of sharks are given in Table 3. Bluefish made up 70.67 % of the teleost catch by number, followed by Spanish mackerel (23.33 %), and bluerunner jack, *Caranx crysos* (2.74 %). Catches by weight of commercially important teleosts can be found in Table 4.

Average size from Spanish mackerel targeted sets

Average (S.D.) fork lengths of sharks caught in Spanish mackerel targeted sets ranged from 42.4 cm (3.3) for Atlantic sharpnose shark, to 81.3 cm (11.0) for bonnethead shark. The average (S.D.) lengths of sharks measured by target can be found in Table 5. Average (S.D.) fork lengths of teleosts caught in Spanish mackerel targeted sets ranged from 12.0 cm (0.0) for blueline tilefish, *Caulolatilus microps*, to 47.1 cm (6.6) for ladyfish, *Elops saurus*. Average (S.D.) lengths of teleosts ($n \geq 5$) measured by target can be found in Table 6.

Discussion

The trend of declining effort in the LCS targeted gillnet fishery continued to be observed in 2017. Strike gillnet gear was observed exclusively in teleost-targeted (king mackerel) sets. The majority of sink gillnet fishers continued to target teleost species. Incidental take of protected species, such as sea turtles and marine mammals, remained a rare occurrence, with none observed in 2017.

The general gillnet fishing effort continues to decrease. During the 2017 hurricane season, seventeen named storms and four hurricanes made landfall in the U.S., invariably impacting fishing effort in the southeast gillnet fisheries.

The SGOP continues to monitor catch and bycatch as the Southeast US gillnet fishery continues to adapt to changing regulations.

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Table 1. Total strike gillnet catch from king mackerel targeted sets by species, and species disposition in order of decreasing abundance for all observed trips, 2017. Catch disposition is by percent kept (Kept %), percent discarded alive (D.A. %), and percent discarded dead (D.D. %).

Species Caught	Common Name	Total Number Caught	Kept (%)	D.A. (%)	D.D. (%)
<i>Scomberomorus cavalla</i>	King Mackerel	10145	99.78	0	0.22
<i>Euthynnus alletteratus</i>	Little Tunny	51	100	0	0
<i>Scomberomorus maculatus</i>	Spanish Mackerel	15	100	0	0
<i>Epinephelus morio</i>	Red Grouper	5	0	100	0
<i>Sparidae</i>	Porgy Family	2	0	100	0
<i>Carcharhinus limbatus</i>	Blacktip Shark	1	0	100	0
<i>Lachnolaimus maximus</i>	Hogfish	1	0	100	0
<i>Sphyrna lewini</i>	Scalloped Hammerhead Shark	1	0	100	0

Table 2. Total sink gillnet catch from Spanish mackerel targeted sets by species, and species disposition in order of decreasing abundance for all observed trips, 2017. Catch disposition is by percent kept (Kept %), percent discarded alive (D.A. %), and percent discarded dead (D.D. %).

Species Caught	Common Name	Total Number Caught	Kept (%)	D.A. (%)	D.D. (%)
<i>Pomatomus saltatrix</i>	Bluefish	2193	97.63	1	1.37
<i>Scomberomorus maculatus</i>	Spanish Mackerel	724	100	0	0
<i>Caranx crysos</i>	Bluerunner Jack	85	100	0	0
<i>Rhizoprionodon terraenovae</i>	Atlantic Sharpnose Shark	71	76.06	23.94	0
<i>Cynoscion nothus</i>	Silver Seatrout	32	100	0	0
<i>Brevoortia tyrannus</i>	Atlantic Menhaden	26	96.15	3.85	0
<i>Sphyrna tiburo</i>	Bonnethead Shark	13	53.85	46.15	0
<i>Larimus fasciatus</i>	Banded Drum	11	27.27	0	72.73
<i>Cynoscion regalis</i>	Weakfish Seatrout	7	100	0	0
<i>Elops saurus</i>	Ladyfish	7	100	0	0
<i>Chloroscombrus chrysurus</i>	Atlantic Bumper	3	100	0	0
<i>Menticirrhus americanus</i>	Southern Kingfish	3	100	0	0
<i>Peprilus paru</i>	Harvestfish	3	100	0	0
<i>Trachinotus carolinus</i>	Florida Pompano	3	66.67	33.33	0
<i>Caranx hippos</i>	Crevalle Jack	2	100	0	0
<i>Carcharhinus limbatus</i>	Blacktip Shark	2	100	0	0
<i>Micropogonias undulatus</i>	Atlantic Croaker	2	100	0	0
<i>Peprilus triacanthus</i>	Atlantic Butterfish	2	100	0	0

Table 3. Estimated shark catch by weight (kg), back-calculated from estimated lengths of all sharks observed caught in sink and strike (king mackerel) gillnet gear by target, 2017.

Target Species	Species Caught	Common Name	Total Number Caught	kg	%
King Mackerel	<i>Carcharhinus limbatus</i>	Blacktip Shark	1	13.55	52.44
	<i>Sphyrna lewini</i>	Scalloped Hammerhead Shark	1	12.29	47.56
		Total	2	25.84	
Spanish Mackerel	<i>Rhizoprionodon terraenovae</i>	Atlantic Sharpnose Shark	71	47.44	71.93
	<i>Sphyrna tiburo</i>	Bonnethead Shark	13	8.73	13.23
	<i>Carcharhinus limbatus</i>	Blacktip Shark	2	9.79	14.84
		Total	86	65.96	

Table 4. Estimated catch by weight (kg) of commercially important teleosts, back-calculated from estimated lengths of all individuals observed caught in sink and strike (king mackerel) gillnet gear by target, 2017.

Target Species	Species Caught	Common Name	Total Number Caught	kg
King Mackerel	<i>Scomberomorus cavalla</i>	King Mackerel	10145	35093.13
	<i>Euthynnus alletteratus</i>	Little Tunny	51	94.62
	<i>Scomberomorus maculatus</i>	Spanish Mackerel	15	13.23
Spanish Mackerel	<i>Pomatomus saltatrix</i>	Bluefish	2193	2675.84
	<i>Scomberomorus maculatus</i>	Spanish Mackerel	724	638.74
	<i>Brevoortia tyrannus</i>	Atlantic Menhaden	26	1.56
	<i>Larimus fasciatus</i>	Banded Drum	11	0.53
	<i>Cynoscion regalis</i>	Weakfish Seatrout	7	5.98
	<i>Chloroscombrus chrysurus</i>	Atlantic Bumper	3	0.18
	<i>Menticirrhus americanus</i>	Southern Kingfish	3	3.73
	<i>Micropogonias undulatus</i>	Atlantic Croaker	2	0.08
	<i>Peprilus triacanthus</i>	Atlantic Butterfish	2	0.13

Table 5. Average size (fork length, FL) and standard deviation (S.D.) of sharks measured for all observed sink gillnet trips by target, 2017.

Target	Species	Common Name	n	Avg FL (cm)	S.D.
Spanish mackerel	<i>Rhizoprionodon terraenovae</i>	Atlantic Sharpnose Shark	23	42.4	3.3
	<i>Sphyrna tiburo</i>	Bonnethead Shark	7	81.3	11.0
	<i>Carcharhinus limbatus</i>	Blacktip Shark	2	70.5	0.7

Table 6. Average size (fork length, FL) and standard deviation (S.D.) of non-sharks measured for all observed sink and strike (king mackerel) gillnet trips by target, 2017, where sample size ≥ 5 .

Target	Species	Common Name	n	Avg FL (cm)	S.D.
King mackerel	<i>Scomberomorus cavalla</i>	King Mackerel	80	77.2	13.1
	<i>Euthynnus alletteratus</i>	Little Tunny	25	52.0	4.8
Spanish mackerel	<i>Scomberomorus maculatus</i>	Spanish Mackerel	173	40.2	5.1
	<i>Pomatomus saltatrix</i>	Bluefish	62	38.7	3.7
	<i>Caranx crysos</i>	Bluerunner Jack	34	27.5	3.1
	<i>Brevoortia tyrannus</i>	Atlantic Menhaden	22	19.3	1.8
	<i>Cynoscion nothus</i>	Silver Seatrout	10	30.6	1.6
	<i>Cynoscion regalis</i>	Weakfish Seatrout	7	38.9	4.6
	<i>Elops saurus</i>	Ladyfish	7	47.1	6.6

Figure 1. Distribution of observed strike gillnet sets targeting king mackerel, *Scomberomorus cavalla*, 2017 (n=9 sets).

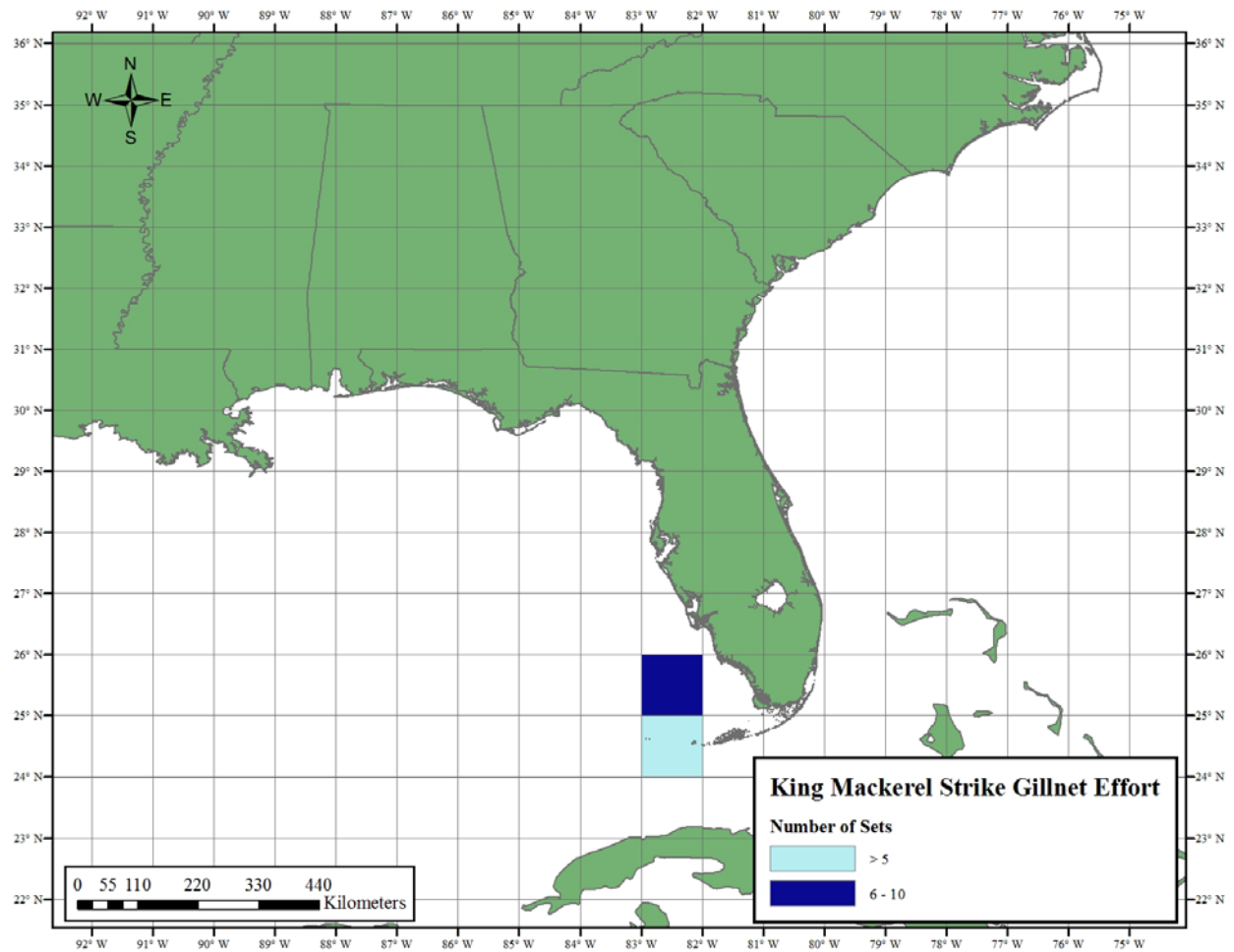


Figure 2. Distribution of observed sink gillnet sets targeting Spanish mackerel, *Scomberomorus maculatus*, 2017 (n=63 sets).

