CATCH AND BYCATCH IN THE SHARK DRIFT GILLNET FISHERY OFF EAST FLORIDA DURING THE CRITICAL RIGHT WHALE SEASON, 1999

John K. Carlson
Southeast Fisheries Science Center
NOAA, National Marine Fisheries Service
3500 Delwood Beach Road
Panama City, FL 32408

Dennis Lee
Southeast Fisheries Science Center
NOAA, National Marine Fisheries Service
75 Virginia Dr.
Miami, FL 33149

Sustainable Fisheries Division Contribution No. SFD-98/99-60

INTRODUCTION

The shark drift gillnet fishery developed off the east coast of Florida and Georgia in the late 1980's. Prior to their recent activities, a number of the involved vessels strike netted and drift netted for king mackerel, *Scomberomorus cavalla*, Spanish mackerel, *S. maculatus*, bluefish, *Pomotomus saltatrix*, and occasionally for sharks, from November through March. As the fishery developed, some fishers drift gillnetted for sharks from October through April before and after the mackerel seasons (Schaefer et al., 1989; Parrack et al., 1992). By 1987, many fishers were drift gillnetting for king mackerel during April-September to compensate for their reduction in quotas in their winter fisheries. However, as the king mackerel drift gillnet fishery was further restricted in about 1990, more fishers began drift gillnetting for sharks during all times of the year.

Catch and bycatch information on the shark drift gillnet fishery was collected from 1993-1995 by Trent et al. (1997). Observations of 52 net sets were made on 48 vessel trips during this period. Over the sample, no marine mammals were observed caught, however two loggerhead turtles, *Caretta caretta*, were observed caught and released alive. Recent concerns by the NMFS Atlantic and Gulf of Mexico Stock Assessment Review Group suggested that the potential for unobserved fallout of marine mammals, turtles, and other important bycatch species may have influenced results of Trent et al. (1997). This combined with the lack of observer coverage during the Critical Right Whale Season (15 November-31 March), as mandated by the Atlantic Large Whale Take Reduction Plan, required reevaluation of this fishery. The objectives of this report are to describe the catch and bycatch in the shark drift gillnet fishery during the Critical Right Whale Season for 1999.

METHODS AND MATERIALS

NMFS-approved contract observers made observations of the shark drift gillnet fishery. Observers were trained and placed on-site in the Ft. Pierce and Port Salerno, FL area beginning on 22 January 1999. Normally, the observer left port with the vessel between 1500-1700 hrs; depending on distance to the fishing grounds. For each set and haul of the net observers recorded: beginning and ending times of setting and hauling; estimated length of net set; sea and wind states; latitude and longitude coordinates; and water depth.

Observations were made as the net was hauled aboard. The observer remained about 3-8 m forward of the net reel in an unobstructed view and recorded species, numbers and estimated lengths (±50 cm) of sharks and other species caught as they were suspended in the net just after passing over the power roller. When species identification was questionable, the crew stopped the reel so that the observer could examine the animal(s). The weight of each shark was estimated through length-weight relationships provided in Kohler et al. (1998); Castro (1996); and Carlson (unpublished data). CPUE was determined as number of individuals caught / soak time (hrs). Disposition of each species brought onboard was recorded as kept, discarded alive, or discarded dead.

It has been previously discussed by NMFS Atlantic and Gulf of Mexico Stock Assessment Review Group that observer placement aboard the vessel impeded observer visibility during haulbacks of the net. The reduced visibility is suggested to influence the rate of unobserved fallout of marine mammals, turtles, and other important bycatch species. However, the observer on all trips is placed approximately 3-8 m forward of the net reels where his/her view is not obstructed during the haulbacks. In addition, any larger animals that are captured

during haulbacks are usually gaffed or hauled aboard by hand. This requires stopping the power roller/net reel system. At this time, the observers move to the stern of the vessel where they may observe the hauling in of animal(s). Any attempts by the fishers to free turtles or dolphins would be noted. However, placing the observer at the stern during the entire haulback procedure (*i.e.* when the power rollers are engaged), is unsafe to the observer and interferes with the fishing operation

DESCRIPTION OF FISHERY

Vessels, fishing gear, and fishing techniques has been previously described in Trent et al. (1997). Observations of vessels, gear, and techniques did not deviate from that described in Trent et al. (1997).

Strikenetting

The use of the word 'strikenet' is sometimes restricted in use to being synonymous to the 'runaround net fished' (Dumont and Sundstrom, 1961). For the purpose of this fishery, the word 'strikenet' implies a net that can be rapidly set in a circle around a school of sharks and actively fished. This contrasts a drift gillnet which is usually set in a straight line, and left to fish passively in a location where sharks are thought to be abundant or moving past the area.

For this fishery, the same nets were used as a strikenet or as a drift gillnet. The technique for strike netting sharks involves the use of a smaller open set vessel (~8-10 m long) equipped with an outboard motor which have no power roller system and the "standard" shark driftnet vessel (~12-20 m long) with the power roller system described in Trent et al. (1997). When a school of sharks is located (usually by spotter pilot), the strikenet is set in a half to full circle

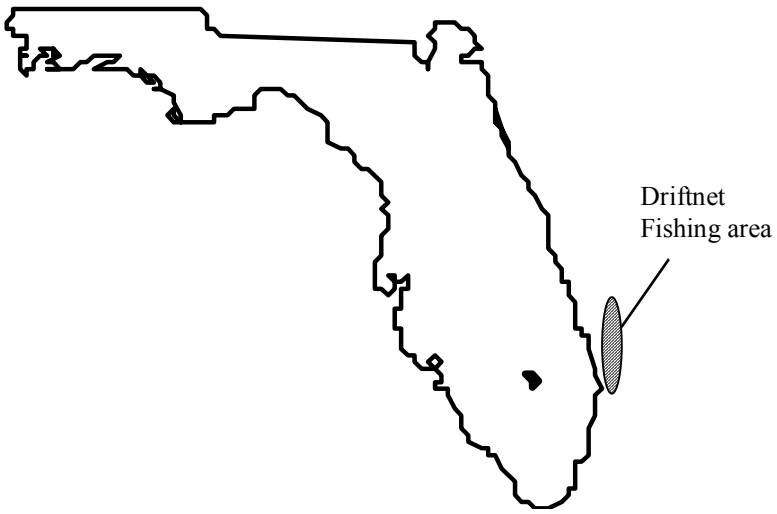
around the school using the smaller open vessel. The set is started by throwing a buoy overboard and the water resistance anchors the net as it is deployed over the stern of the boat. Set times for this type of fishery observed were all less than 20 minutes. If four vessels worked together (*i.e.* 2 open set boats and 2 driftnet boats with power rollers), 2 nets were set independently in a half circle with the open end of the half circle facing each other and surrounding the school. After the set, a smaller open vessel was run rapidly around inside of the circle to panic and drive sharks into the net. Fishers on these vessels would also make noise by pounding on the water or on the hull of the vessel.

After a short soak time (~15 minutes) the larger vessels with the power roller system would pick up one end of the net and begin hauling back. Hauling the net was similar to that observed during drift gillnetting, *i.e.* using the hydraulic powered rollers.

RESULTS AND DISCUSSION

During the portion of the right whale season (8 January-31 March) that observations were made, fishing was found to take place between Ft. Pierce, FL (~27° 51.0' N) and West Palm Beach, FL (26° 46.5' N) (Figure 1). Fishing vessels observed departed either from Inlet Fisheries, Ft. Pierce or C&W Fish Co., Port Salerno. Vessels would usually travel up 1-2 hr before selecting a fishing location.

Figure 1. Location of drift gillnet fishing area for the critical right whale season, 1999.



Since drift gillnet fishing is prohibited in territorial waters of Florida, gillnets were set at least 4.8 km offshore in Exclusive Economic Zone (EEZ) waters outside of state jurisdiction. Shark drift gillnets were set in waters 7.5-18.1 m deep over bottoms with no known obstructions, and on outgoing tides to prevent the gillnet from drifting into state waters when set near inlets. Gillnets were sometimes fished offshore of inlets because these areas often had high concentrations of sharks.

Total fishing effort varied by month with most trips observed (and fished) in February and fewest in March. Trips in the shark drift gillnet fishery varied by vessel in crew size, duration, and length of sets. Crew size, including the captain, ranged from 3 to 6 depending on the vessel. Net retrieval and processing averaged 3.9 hrs (range 0.8-10.3 hrs). The known

number of boats in the shark drift gillnet fishery during Jan-Mar 1999 was 4 with an average of 5.25 trips per boat. However, most trips were made by a single vessel (13 trips, with the remaining 3 vessels making 7 trips).

A total of 20 sets on 20 known vessel trips were observed from 8 January-31 March 1999. Two sets included 2 independent strike net sets by two vessels. Two additional known vessel trips (12 and 13 Jan) were not observed representing 91.3% coverage of this fishery from 8 January-31 March 1999. These two vessel trips were not covered because the observer was refused boarding of the vessel due to a question of liability of the vessel owner to NMFS employees. Additional trips were initiated in that the observer traveled to the port of anticipated departure but the trips were aborted before or after departure from the dock. Reasons for not fishing included bad weather before or after departure, equipment failure, and failure of a full crew to report.

OBSERVED CATCHES

An estimated 2,923 animals were caught on all observed trips. The catch consisted of 12 species of sharks, 21 species of teleosts and rays, and 1 species of marine mammal. Total observed catch composition (percent of numbers caught) were 89% sharks, 10% teleosts, 0.9% rays, and 0.1% marine mammals (Figure 2). Two species of sharks made up 90% (by number) (Figure 3) and 73% (by weight) (Figure 4) of the observed shark catch, respectively. These species were the blacktip, *Carcharhinus limbatus*, and the finetooth shark, *C. isodon*. Ten species of teleosts and rays made up over 89% by number of the overall non-shark species (Figure 5). The bycatch was dominated by crevalle jack, *Caranx hippos*, spanish mackerel, *Scomberomorus maculatus*, tarpon, *Megalops atlanticus*, cobia, *Rachycentron canadum*, king

mackerel, *Scomberomorus cavalla*, spotted eagle ray, *Aetobatus narinari*, and menhaden, *Brevoortia spp*.

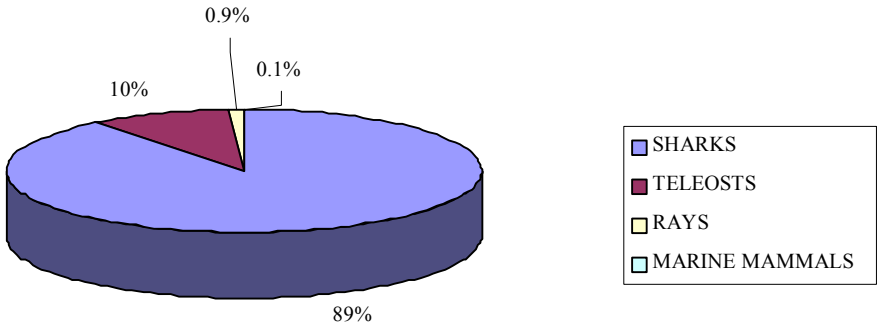


Figure 2. Total observed catch composition (percent of numbers caught) during the critical right whale season, Jan-Mar 1999.

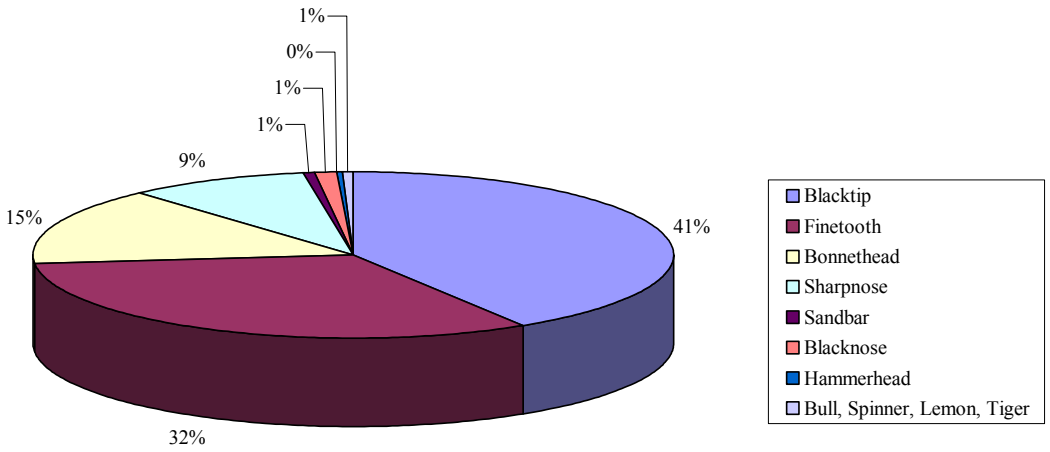


Figure 3. Observed shark catch composition (percent of numbers caught).

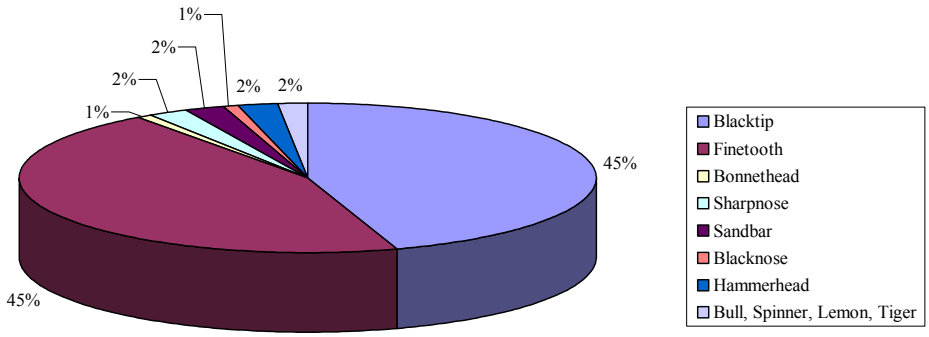


Figure 4. Observed shark catch composition (percent of weight caught) during the critical right whale season, 1999.

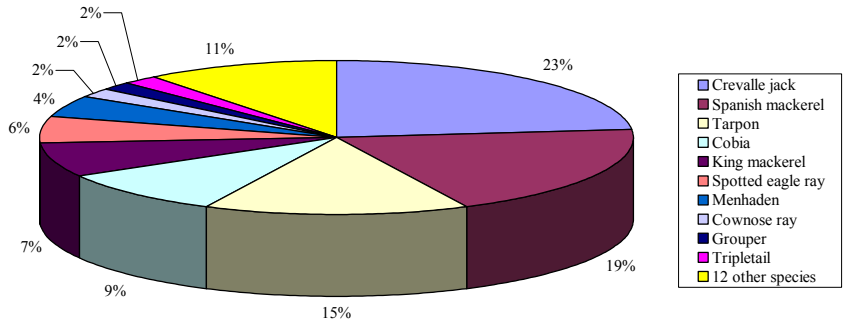


Figure 5. Observed bycatch composition (percent of numbers caught) during the critical right whale season, 1999.

Catch per unit effort (number caught per net hour of soak time) for all species varied by month. (Figure 6). Although effort was lowest in January (1 observed set), the highest CPUE was in January and lowest was in March (2 observed sets).

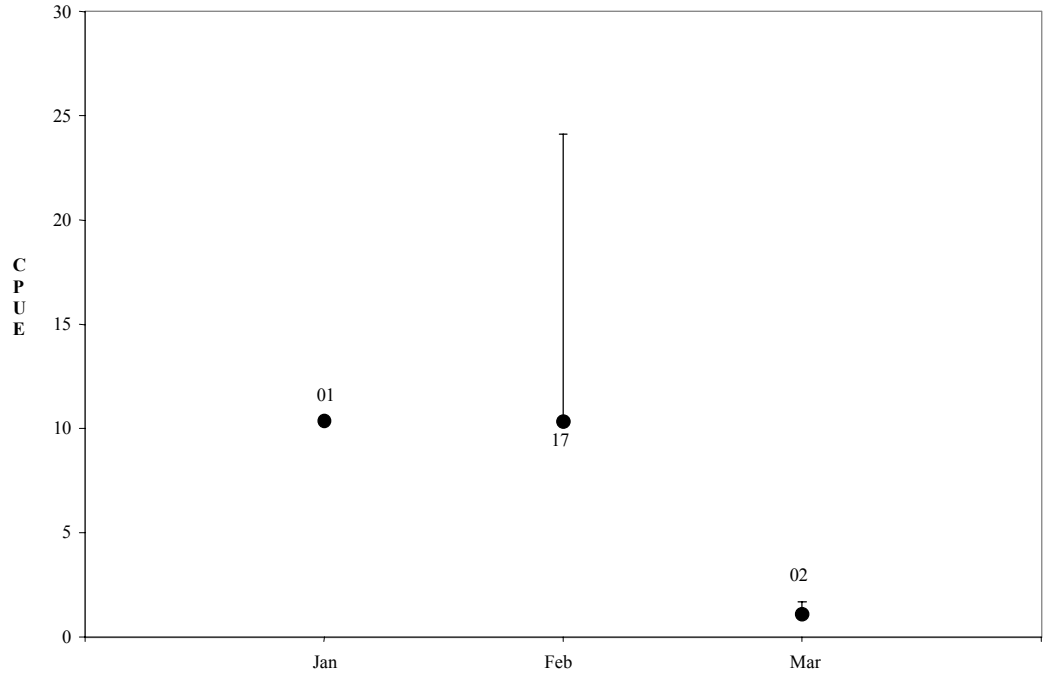


Figure 6. Monthly catch per unit effort (+s.d.) for all species during the critical right whale season, 1999. Numbers adjacent to the mean are number of observed trips.

DISPOSITION OF CATCH

Portions of both the targeted catch (sharks) (Table 1) and incidental catch (Table 2) were discarded. The proportions discarded varied among target and incidental catch. In the targeted catch, the highest amount (54.0%) discarded was for bonnethead shark, *Sphyrna tiburo*, and least (0.0%) was for spinner shark, *Carcharhinus brevipinna*, (species unweighed by number caught). In most cases, shark bycatch were discarded due to the lower quality of flesh and lower market value among the hammerheads, in particular bonnethead.

For incidental catch species, the highest proportion discarded was for menhaden (100.0%) and least was for cobia (0.0%). Rays had the highest discard proportion alive, 72.2% for spotted eagle ray and 100% for cownose ray. Bottlenose dolphin, *Tursiops truncatus*, (n=4)

were captured in 2 separate sets. All of these animals were discarded dead. Other species for which observed catch was 5 or more specimens with dead discard percentages greater than 50% were crevalle jack, *Caranx hippos*, tarpon, *Megalops atlanticus*, and sailfish, *Istiophorus platypterus*.

UNOBSERVED CATCH

Observer data obtained during the right whale season (Jan-Mar 1999) has shown that in two separate sets, observers noted and recorded 4 incidental takes of bottlenose dolphin, *Tursiops truncatus*. In 3 of these 4 incidental takes, the dolphins were completely wrapped within the mesh and were cut loose in order to free them from the webbing. This information suggests that if interactions were to occur with bottlenose dolphin, observers would be in a position to record this interaction.

It has also been a criticism that observer placement aboard the vessel during haulbacks has influenced the lack of incidental take data available for sea turtles and other bycatch species. However, the shark drift gillnet fishery operates in a relatively similar fashion to the swordfish drift gillnet fishery. The swordfish drift gillnet fishery has a much higher incidental take of marine mammals and sea turtles. Based on information in the swordfish drift gillnet fishery (Cheryl Ryder, NEFSC-Woods Hole, MA; personal communication), observer placement is similar to placement in the shark drift gillnet fishery. Observers in the swordfish drift gillnet fishery record incidental take of sea turtles and also record fall-out of sea turtles in the net from the position they are stationed. Therefore, if fall-out did occur in the shark drift gillnet fishery, observers would also be in a position to record this information.

Table 1. Total shark catch by species and species disposition in order of decreasing abundance during all observer trips.

Species	Common name	Total number caught	Kept (%)	Discard Alive (%)	Discard Dead (%)
Carcharhinus limbatus	Blacktip	1068	99.8	0.0	0.2
C. isodon	Finetooth	839	99.8	0.0	0.2
Sphyrna tiburo	Bonnethead	393	45.8	0.2	54.0
Rhizoprionodon terraenovae	Sharpnose	238	98.7	0.4	0.9
C. acronotus	Blacknose	28	100.0	0.0	0.0
C. plumbeus	Sandbar	19	94.7	0.0	5.3
C. brevipinna	Spinner	7	100.0	0.0	0.0
C. leucas	Bull	6	100.0	0.0	0.0
S. lewini	Scalloped hammerhead	5	20.0	0.0	80.0
S. mokarran	Great hammerhead	2	100.0	0.0	0.0
Galeocerdo cuvieri	Tiger	2	100.0	0.0	0.0
Negaprion brevirostris	Lemon	1	100.0	0.0	0.0

Table 2. Total bycatch caught by species and species disposition during all observer trips.

Species	Common name	Total number caught	Kept (%)	Discard Alive (%)	Discard Dead (%)
Caranx hippos	Crevalle jack	75	17.3	0.0	82.7
Scomberomorus maculatus	Spanish mackerel	62	95.1	0.0	4.9
Megalops atlanticus	Tarpon	47	0.0	8.5	91.5
Rachycentron canadum	Cobia	30	100.0	0.0	0.0
Scomberomorus cavalla	King mackerel	23	47.8	4.4	47.8
Aetobatus narinari	Spotted eagle ray	18	0.0	72.2	27.8
Brevoortia spp.	Menhaden	14	0.0	0.0	100.0
Rhinoptera bonasus	Cownose ray	6	0.0	100.0	0.0
Mycteroperca microlepis	Gag grouper	6	100.0	0.0	0.0
Lobotes surinamensis	Tripletail	6	100.0	0.0	0.0
Istiophorus platypterus	Sailfish	6	0.0	33.3	66.7
Sphyraena barracuda	Barracuda	5	100.0	0.0	0.0
Trachinotus falcatus	Pompano	4	100.0	0.0	0.0
Manta birostris	Manta ray	3	0.0	0.0	100.0
Selene setapinnis	Atlantic moonfish	2	0.0	50.0	50.0
Peprilus burti	Harvestfish	2	0.0	0.0	100.0
Peprilus alepidotus	Butterfish	2	0.0	0.0	100.0
Anisotremus surinamensis	Black margate	2	100.0	0.0	0.0
Selene vomer	Lookdown	1	100.0	0.0	0.0
Sarda sarda	Atlantic bonito	1	0.0	0.0	100.0
Euthynnus alletteratus	Little tunny	1	0.0	0.0	100.0
Cynoscion regalis	Weakfish	1	0.0	0.0	100.0
Tursiops truncatus	Bottlenose dolphin	4	0.0	0.0	100.0

LITERATURE CITED

Castro, J.I. 1993. The biology of the finetooth shark, *Carcharhinus isodon*. Env. Biol. Fish. 36:219-232.

Dumont, W.H. and G.T. Sundstrum. 1961. Commercial Fishing Gear of the United States. United States Department of the Interior. Fish and Wildlife Circular 109. 61 pp.

Kohler, N.E., J.G. Casey, and P.A. Turner. 1994. Length-weight relationships for 13 species of sharks from the western North Atlantic. Fish. Bull. 93:412-418.

Parrack, M.L., J.I. Castro, and J.E. Powers. 1992. The United States Atlantic coastal shark fishery. Int. Comm. Conserv. Atl. Tunas, Collect. Bol. Sci. Pap. 40(2):406-408.

Schaefer, H.C., L.E. Barger, and H.E. Kumpf. 1989. The driftnet fishery in the Fort Pierce-Port Salerno area off southeast Florida. Mar. Fish. Rev. 51(1):44-49.

Trent, L. , D.E. Parshley and J.K. Carlson. 1997. Catch and bycatch in the shark drift gillnet fishery off Georgia and east Florida. Mar. Fish. Rev. 59(1):19-28.