Bycatch estimates of blacktip shark in the south Atlantic coastal gillnet fishery

John Carlson, Alyssa Mathers and Kevin McCarthy

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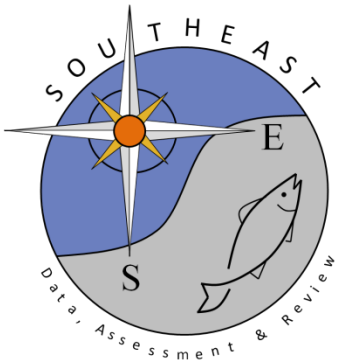

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John Carlson, Alyssa Mathers and Kevin McCarthy

National Marine Fisheries Service
Southeast Fisheries Science Center
3500 Delwood Beach Road
Panama City, FL

National Marine Fisheries Service
Southeast Fisheries Science Center
75 Virginia Beach Dr
Miami, FL

SEDAR65-DWxx

Overview

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. Mathers et al. 2018 and references therein). The observer program initially focused efforts only on those gillnets vessels targeting shark. However, gillnet effort targeting large coastal and small coastal sharks declined as a result of Amendments 2 and 3 to the Consolidated Atlantic Highly Migratory Species Fishery Management Plan. Shark targeted gillnet effort has continued to decline in the last five years. Fishers have consequently increased effort targeting fish, including Spanish mackerel *Scomberomorus maculatus*, king mackerel *Scomberomorus cavalla*, and bluefish *Pomatomus saltatrix*, with varying types of gillnet gear. Regardless of target, blacktip sharks are either kept or discarded as bycatch, depending on the time of the year and opening or closure of the fishery. 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.

Methods

Following the definition of the south Atlantic from the Highly Migratory Species Office, data were excluded from the Gulf of Mexico. Due to the nature of the data, we followed the approach of Garrison (2007) by employing a simple ratio estimator to represent bycatch rates;

Catch per unit effort (CPUE) = number of blacktip sharks discarded / number of sets

An estimate of uncertainty in these estimates was derived from bootstrap resampling of the calculated CPUE data set. A sample was drawn from the data (with replacement) and the procedure was repeated 10,000 times to generate a mean distribution for the estimate and the associated standard deviation. Estimates were derived separately for sharks discarded dead and sharks discards alive as reported by the on-board observer. Total bycatch by year for the fishery were estimated by multiplying the derived bootstrap CPUE estimates by the total number of reported sets for the US South Atlantic (Table 1).

Total effort data reflects all gillnet trip reports received by the Coastal Fisheries Logbook Program (hereafter Logbook Program) in the southeast United States (Figure 1). Four gillnet types are reported to the Coastal Fisheries Logbook: Strike, Drift, Anchor, and Other. These types are coded and reflected in the summary as follows:

Strike – Gear code: ‘475’ - gear name: ‘GILL NETS, DRIFT, RUNAROUND’
Drift – Gear code: ‘470’ - gear name: ‘GILL NETS, DRIFT, OTHER’
Anchor – Gear code:’480’ gear name: ‘GILL NETS, STAKE’
Other – Gear code: ‘425’ gear name: ‘GILL NETS, OTHER’.

However, given the nature of the data and that most gillnet effort is reported as “OTHER”, bycatch estimates were derived for the gillnet fishery regardless of gillnet type.

Results and Discussion

Calculated US south Atlantic blacktip shark discards (in numbers of fish, dead or live) from the commercial gillnet fishery are provided in Table 1 and Table 2, respectively. Also included are discard rates, number of observed trips, discard rate standard errors, and number of logbook trips reporting effort. In all the estimates, data was pooled without considering strata due to the sparse nature of the bycatch events and the fact that logbook data is reported by sampling grid (see Figure 1).

Literature cited

Garrison, L.P. 2007. Estimated Marine Mammal and Turtle Bycatch in Shark Gillnet Fisheries Along the Southeast U.S. Atlantic Coast: 2000-2006. PRD Contribution: #PRD-04/05- 10,

Mathers, A.N., B.M. Deacy, H.E. Moncrief-Cox, J.K. Carlson. 2018. Catch and Bycatch in U.S. Southeast Gillnet Fisheries, 2017. NOAA Technical Memorandum NMFS-SEFSC-728. 13 p.

Table 1. Yearly calculated dead discards of blacktip shark from US south Atlantic commercial gillnet fishery. Discards are reported as number of sharks.

YEAR	TOTAL LOGBOOK SETS	NUMBER OF OBSERVER SETS	DEAD DISCARD RATE (SHARKS/SETS)	DISCARD RATE STANDARD DEVIATION	ESTIMATED TOTAL DEAD DISCARDS (NUMBERS)
1998	2395	9	0.000		0
1999	1855	54	4.984	8.94	9,245
2000	1945	54	0.093	0.33	180
2001	1872	90	0.800	2.58	1,498
2002	1874	84	4.910	13.23	9,202
2003	1558	64	3.215	12.31	5,009
2004	1547	57	4.080	9.87	6,312
2005	1812	152	7.502	41.22	13,593
2006	2379	205	0.476	2.93	1,134
2007	3658	170	0.053	0.28	194
2008	3602	201	0.045	0.27	162
2009	4108	393	0.076	0.63	312
2010	2714	295	0.000		0
2011	3467	398	0.005	0.08	17
2012	3540	300	0.221	1.77	783
2013	1876	209	0.014	0.11	27
2014	3354	225	0.093	0.82	312
2015	3123	191	0.016	0.12	49
2016	2849	199	0.000		0
2017	2143	66	0.000		0
2018	2831	78	0.013	0.09	36

Table 2. Yearly calculated live discards of blacktip shark from US south Atlantic commercial gillnet fishery. Discards are reported as number of sharks.

YEAR	TOTAL LOGBOOK SETS	NUMBER OF OBSERVER SETS	LIVE DISCARD RATE (SHARKS/SETS)	DISCARD RATE STANDARD DEVIATION	ESTIMATED TOTAL LIVE DISCARDS (NUMBERS)
1998	2395	9	0.000	0.00	0
1999	1855	54	1.598	3.85	2,964
2000	1945	54	0.000	0.00	0
2001	1872	90	0.923	3.78	1,728
2002	1874	84	2.301	6.97	4,312
2003	1558	64	2.011	5.20	3,133
2004	1547	57	1.210	3.34	1,872
2005	1812	152	0.228	1.32	414
2006	2379	205	0.380	2.07	903
2007	3658	170	0.076	0.38	278
2008	3602	201	0.234	0.78	843
2009	4108	393	0.130	0.79	534
2010	2714	295	0.024	0.23	64
2011	3467	398	0.065	0.36	226
2012	3540	300	0.070	0.43	248
2013	1876	209	0.058	0.41	108
2014	3354	225	0.058	0.36	193
2015	3123	191	0.047	0.34	148
2016	2849	199	0.030	0.26	87
2017	2143	66	0.000	0.00	0
2018	2831	78	0.039	0.22	109

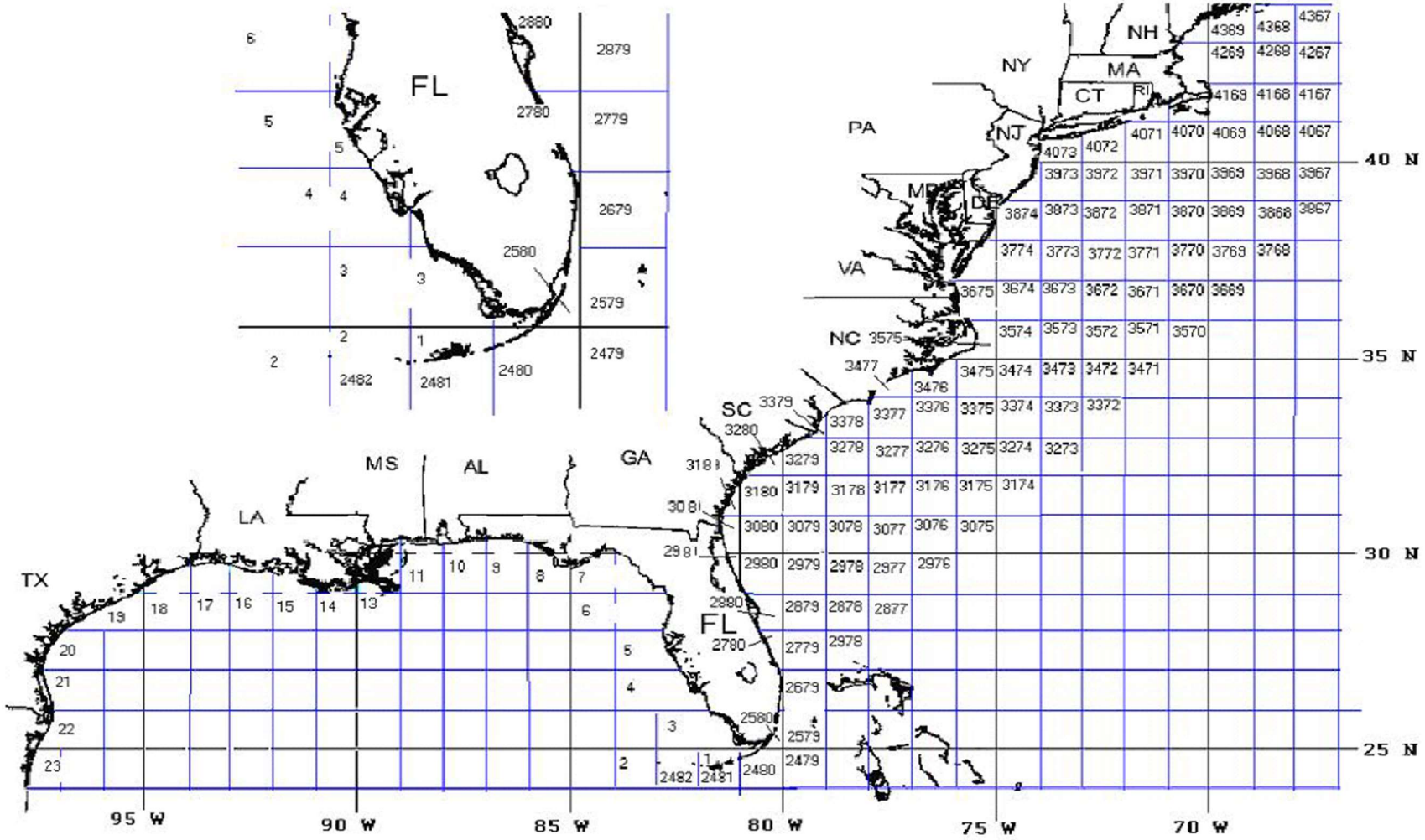

Figure 1. Coastal logbook statistical areas.