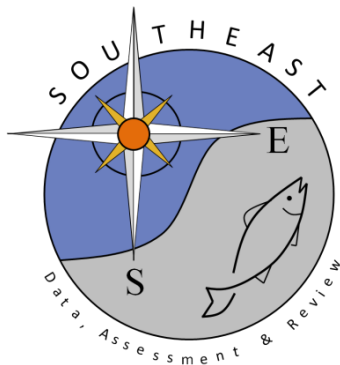


Bycatch estimates of sandbar shark in the reefish bottom longline fishery

John Carlson and Alyssa Mathers

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John Carlson
NOAA Fisheries Service
Southeast Fisheries Science Center
3500 Delwood Beach Drive
Panama City, FL 32408 USA

Alyssa Mathers
Gulf States Marine Fisheries Commission
2404 Government Street
Ocean Springs, MS 39564

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Introduction

This document details the use of the delta-lognormal method (Pennington, 1983) to calculate discard rates of sandbar shark in the reefish bottom longline fishery operating in the Gulf of America (i.e. Gulf of Mexico) to produce discard estimates and associated uncertainty. Commercial reefish bottom longline vessels are required to carry fishery observers to monitor catch and bycatch. Fishery observers are trained in fishery and biological data collection, biological sampling, and teleost and elasmobranch species identification. Observers are required to record and measure all species captured, their disposition (e.g. kept, discarded dead, used for bait) and effort (e.g. number of hooks, gear characteristics, set and haul times). Further details can be found in Scott-Denton et al. (2011).

Bottom longline landings and fishing effort of commercial vessels operating in the South Atlantic are reported to NMFS through the Coastal Fisheries Logbook Program (CFLP, conducted by the NMFS Southeast Fisheries Science Center). The program collects landings and effort data by fishing trip from vessels that are federally permitted to fish in a number of fisheries managed by NMFS and South Atlantic Fishery Management Council. The coastal logbook program began in 1990 with the objective of a complete census of coastal fisheries permitted vessel activity, with the exception of Florida, where a 20% sample of vessels was selected to report. Beginning in 1993, reporting in Florida was increased to include all vessels permitted for federally managed coastal fisheries.

Methods

Observer-reported sandbar shark discards from 2016-2020 are available for both live and dead discards. The mean and variance of discard rates were calculated using the delta-lognormal method (Pennington, 1983). The method assumes a lognormal distribution of the positive bycatch rate observations. Effectively, the estimates are constructed as a product of the proportion of successful occurrences of an event and the average rate at which the event occurs for those successful events. The variance is a function of the variability of the positive bycatch rates as well the number of successful and unsuccessful sets. The delta estimator is more appropriate than the simple ratio estimate because catch rates are generally log-normally distributed and bycatch events (i.e., positive sets) are rare. The unit of effort in this analysis is the number of hooks, consistent with previous methods used to estimate the discards. Due to small number of sets in which a non-zero bycatch of the species group was observed (positive sets), observed sets are pooled by each observed year and all observed years, respectively. The annual mean discard rate is based on the pooled observed sets for each observed year. The grand mean discard rate is based on the pooled observed sets for all observed years. Details on methods used to calculate uncertainty are found in Pennington (1983).

Fishing effort data were available from the coastal logbook program for the years 2005-2025 (Figure 1). Beginning in 1993 all commercial vessels with Federal fishing permits (other than those for swordfish, tunas, and shrimp) was required to report landings and effort to the coastal logbook program. Available coastal logbook data were filtered to include only bottom longline data and to remove records missing effort information (number of sets, number of hooks per set). After data filtering, effort data from only those trips that targeted reefish (defined as trips with reported landings of 2/3 reefish by weight) were included in the analysis. Effort was defined as hooks fished because hook hours fished could not be reliably calculated from the coastal logbook data.

Results and Discussion

No dead discards of sandbar shark were reported by observers. Estimates of live discards are available in Table 1. The distribution of observer effort is in Figure 2.

Table 1. Estimates of live discards of sandbar shark from the Reefish Bottom Longline Fishery. Discards are in number of sharks.

Observed_Year	Observed_Sets	Positive_Sets	Observed_Hooks	Positive_Hooks	Observed_Animals	Mean_CPUE	LCL	UCL	Logbook_Year	Logbook_Hooks	Estimated_Discard	UCI	LCI
2016-2020	411	46	301295	37086	71	0.0021018	0.00041106	0.01074673	2005	1459306	3,067	600	15,683
2016-2020	411	46	301295	37086	71	0.0021018	0.00041106	0.01074673	2006	1548722	3,255	637	16,644
2016-2020	411	46	301295	37086	71	0.0021018	0.00041106	0.01074673	2007	1264828	2,658	520	13,593
2016-2020	411	46	301295	37086	71	0.0021018	0.00041106	0.01074673	2008	1235181	2,596	508	13,274
2016-2020	411	46	301295	37086	71	0.0021018	0.00041106	0.01074673	2009	552116	1,160	227	5,933
2016-2020	411	46	301295	37086	71	0.0021018	0.00041106	0.01074673	2010	301930	635	124	3,245
2016-2020	411	46	301295	37086	71	0.0021018	0.00041106	0.01074673	2011	429879	904	177	4,620
2016-2020	411	46	301295	37086	71	0.0021018	0.00041106	0.01074673	2012	414663	872	170	4,456
2016-2020	411	46	301295	37086	71	0.0021018	0.00041106	0.01074673	2013	452025	950	186	4,858
2016-2020	411	46	301295	37086	71	0.0021018	0.00041106	0.01074673	2014	474880	998	195	5,103
2016-2020	411	46	301295	37086	71	0.0021018	0.00041106	0.01074673	2015	482299	1,014	198	5,183
2016-2020	411	46	301295	37086	71	0.0021018	0.00041106	0.01074673	2016	552852	1,162	227	5,941
2016-2020	411	46	301295	37086	71	0.0021018	0.00041106	0.01074673	2017	499663	1,050	205	5,370
2016-2020	411	46	301295	37086	71	0.0021018	0.00041106	0.01074673	2018	462474	972	190	4,970
2016-2020	411	46	301295	37086	71	0.0021018	0.00041106	0.01074673	2019	452823	952	186	4,866
2016-2020	411	46	301295	37086	71	0.0021018	0.00041106	0.01074673	2020	506199	1,064	208	5,440
2016-2020	411	46	301295	37086	71	0.0021018	0.00041106	0.01074673	2021	489120	1,028	201	5,256
2016-2020	411	46	301295	37086	71	0.0021018	0.00041106	0.01074673	2022	432997	910	178	4,653
2016-2020	411	46	301295	37086	71	0.0021018	0.00041106	0.01074673	2023	430975	906	177	4,632
2016-2020	411	46	301295	37086	71	0.0021018	0.00041106	0.01074673	2024	394740	830	162	4,242
2016-2020	411	46	301295	37086	71	0.0021018	0.00041106	0.01074673	2025	376300	791	155	4,044

References

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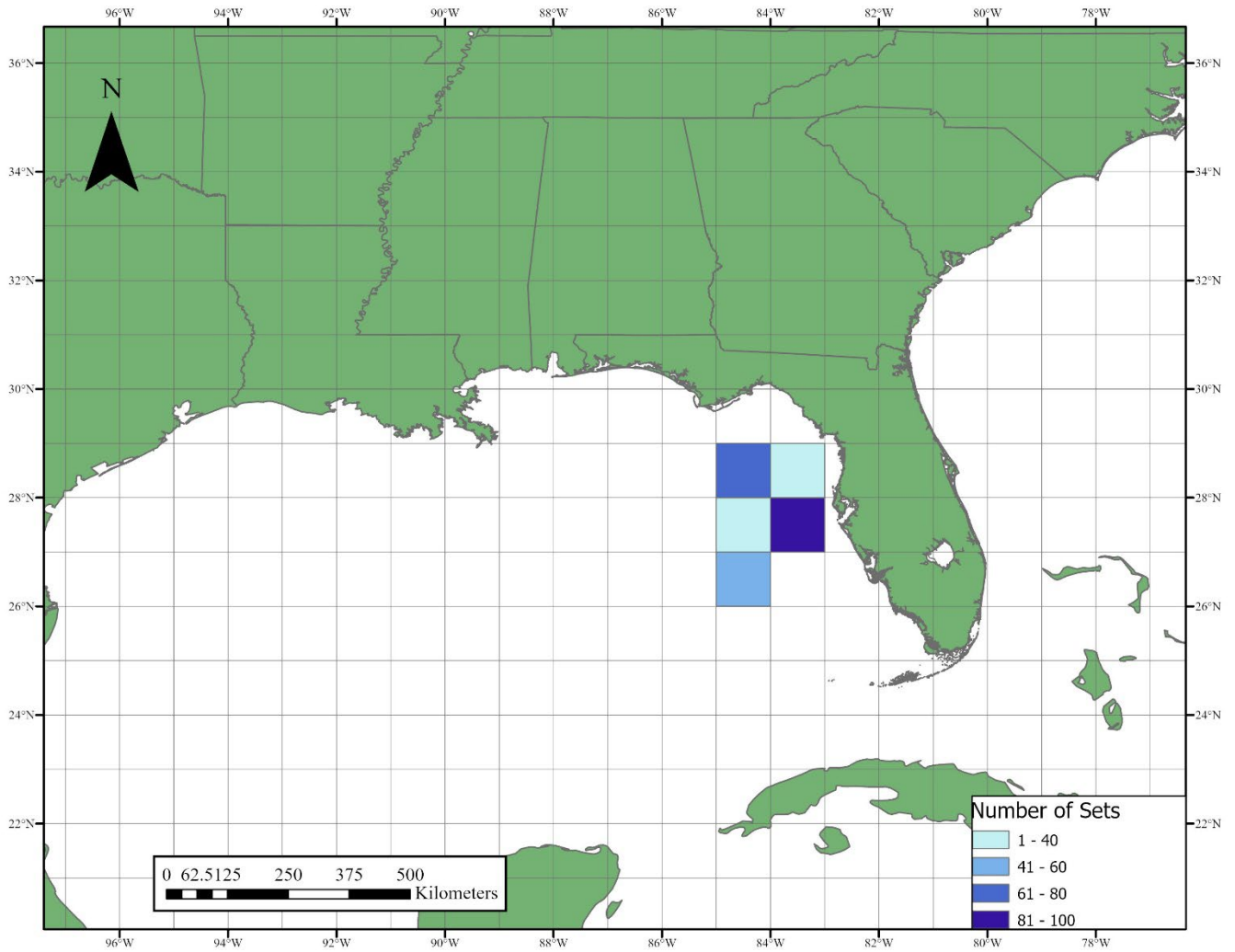


Figure 2. Distribution of observer coverage in reef fish bottom longline fishery. Individual plots by year and in some locations were not possible because of vessel confidentiality.