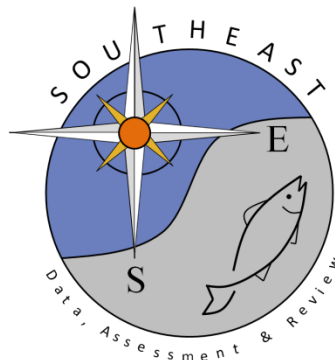


Estimated Commercial Discards of Cobia (*Rachycentron canadum*) for the Gillnet Fishery from 1999-2016 Using Limited Observer Data

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SEDAR107-DW-03

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SEDAR107-DW-03

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Introduction

The general approach for estimating discards for the commercial gillnet fleet in the Southeast utilizes a discard rate or discards-per-unit-effort from the gillnet observer program and total fishing effort from the commercial reef logbook program. Total discards include fish released alive, released dead, released in unknown condition, and used for bait. A similar approach was done using gillnet observer data for SEDAR 58, however the methods presented here have become the standard data-limited approach when a species shows a very low rate of being caught on observer trips (Thompson et al. 2024). These methods were first proposed for Atlantic Cobia during SEDAR 95 (Atkinson et al. 2024). Since this assessment was halted, the following working paper is an update to SEDAR 95 with a change in the terminal year of estimated discards.

Methods

Data Sources

The Southeast Gillnet Observer Program (GOP) was established in 1993 and initially focused exclusively on gillnet vessels fishing off of Florida in response to right whale calving season (Mathers et al. 2018, Baremore et al. 2010). In 2005, the program was expanded to include all vessels holding a directed shark permit that fished with sink gillnet gear. Coverage was further expanded in 2006 to include all gillnet vessels regardless of target species or method of fishing (sink, strike, or drift), operating year-round from Florida through North Carolina and in the Gulf of America (formerly Gulf of Mexico). However, regulatory measures in the late 2000's led to substantial declines in gillnet effort directed at large coastal and small coastal sharks (NMFS 2007, 2010). In response to these changes, fishers increasingly shifted effort toward teleost species—including Spanish Mackerel, King Mackerel, and Bluefish—using a variety of gillnet gear configurations.

In 2017, selection was limited to vessels that had a homeport outside of Virginia and North Carolina as these were picked up by the Northeast Fisheries Observer Program (NEFOP). As of the second quarter of 2024, the GOP was discontinued due to shifts in fishery participation and target species. Although the fleet was primarily based in the South Atlantic, a smaller component operated in the Gulf.

Total effort was determined from the commercial Coastal Fisheries Logbook Program (CFLP) in which fishers reported basic information on effort and catch by species for every trip (Atkinson et al. 2021). The coastal logbook program began in 1990 for a subset of vessels in the South Atlantic. In 1999, the logbook program was expanded to include vessels targeting coastal migratory pelagic species. For the purpose of estimating discards, all complete calendar years were analyzed, restricted to trips reporting Cobia landings.

Relevant Management History of Atlantic Cobia

Cobia have had the same minimum size limit of 33 inches fork length since 1985. Annual catch limits (ACLs) were set in 2012 for the Atlantic Cobia migratory group. This ACL led to closures

towards the end of the fishing year in 2014, 2016, and 2017 for as little as 20 days in 2014 and several months (117 days) in 2017. Given the limited observer coverage, these closures were not considered for the analyses.

Spatial Boundary

While the geographic range for SEDAR 107 includes fishing areas north of the Florida and Georgia border, the gillnet observer program did not sample any trips north of the North Carolina and Virginia border. For this reason, discard estimates for the gillnet fishery are limited to fishing areas off the coast of Georgia to North Carolina (Figure 1). This geographic range was utilized during SEDAR 28. For this working paper Cobia will be referred to as Cobia (GA-NC) since discard estimation is limited to this spatial extent.

Comparison of Observer and Logbook Effort Variables

Despite a lengthy historical collection of observer information from the GOP, discard information collected by the program has been utilized in only a small number of SEDAR assessments (SEDAR 58 Atlantic Cobia, SEDAR 65 Blacktip Shark, SEDAR 77 Scalloped Hammerhead and Great Hammerhead Shark, and SEDAR 78 South Atlantic Spanish Mackerel). All of these assessments have used a simple ratio estimator for discard rates, where the effort metric was number of sets (Garrison 2007). To our knowledge, a comprehensive analysis has not been conducted to identify the most unbiased effort variable. Therefore, a suite of effort metrics was evaluated in 2024 for SEDAR 95 to identify an unbiased and consistent effort variable between the gillnet observer program and the coastal logbook program in order to carry out the catch expansion. This analysis was adapted from Smith et al. (2018).

The general analysis was approached involving three main steps: (1) identify a subset of logbook trips that were sampled by onboard observers; (2) calculate trip-level effort metrics for the observer data that corresponded with logbook data; (3) compare the observer and logbook effort metrics for matched trips via a paired t-test to identify potential unbiased variables.

Discard Estimation

Similar to previous assessments where GOP data were used, following Garrison (2007), discard estimation utilized a simple ratio estimator. This was due to limited observer data for Cobia (GA-NC). Unlike SEDAR 58 (Carlson & McCarthy 2019), effort metrics were explored by comparing matched observer and logbook trips to determine the most reliable, unbiased effort variable. Results from that analysis informed the effort metric(s) used for discard estimation. The simple discard rate (DR) computation is

$$\overline{DR} = \frac{1}{n} \sum_i \frac{\text{Discards (in numbers)}_i}{\text{effort}_i}$$

where i is per trip and n is the number of observer trips. Total discards per year (t) for the gillnet fleet were estimated as

$$Discards_t = Total\ Effort_t \times \overline{DR}$$

Standard error was estimated as

$$SE = \sqrt{\sum \overline{DR}sd^2 \times Total\ Effort^2}$$

According to the GOP protocol, weights and lengths are not often collected for individual fish. Therefore, numbers could not be converted to weights using an average. The only data where weights were collected were a small subsample of kept Cobia. Since the assessment inputs discards as numbers of fish, only Cobia (GA-NC) discard estimates in number were provided.

Results and Discussion

Unbiased Effort Metric

Table 1 highlights the variables collected on the logbook program and how that relates to similar information collected by observers. Although number of sets was used in SEDAR 58 (Carlson & McCarthy 2019), it is not considered a reliable measure of effort. The primary concern is that number of sets did not appear on the coastal logbook form until 2007. This conclusion is supported by a review of historical scanned logbook forms and corroborated by the data (Figure 2). Prior to 2007, all gillnet trips in the logbook dataset reported one set per trip, indicating that this variable was incorporated into the database retrospectively.

Similarly, soak time is not considered an appropriate effort variable due to inconsistencies in reporting over time. Before 2007, soak time was recorded as total fishing time per trip; beginning in 2007, the definition changed to average fishing time per set. Because of these changes in definition and reporting, neither variable provides a consistent measure of effort across years. Therefore, expansion of the discard calculation requires an effort variable that has been collected consistently over time.

Therefore, only two variables were compared as potential effort metrics: gillnet length and number of days fished. This analysis was conducted in 2024 in preparation of SEDAR 95. To maximize the number of trips available for matching with logbook data, the gillnet observer program dataset was subset to include all trips that fished in the South Atlantic, including fishing areas off Florida. There was a total of 1,313 gillnet trips observed between 1999-2023. These trips were matched based on vessel ID, trip departure date, and trip land date. There were 49 observer trips that matched to more than one logbook trip and 48 logbook trips that matched to more than one observer trip based on the criteria above. These were excluded to limit the analysis to confident matches. In the end, 530 observer trips were matched to coastal logbook trips.

The distributions of average gear length between the logbook and observer data shows differences in reporting by program (Figure 3). The mean gear length reported on the logbook is

900 yds for matched trips whereas the mean length from observers is 600 yds. Therefore, this is an unreliable effort variable for discard estimation. For the number of days fished as the effort variable, close to 90 percent of the gillnet trips are a single day. The difference in reporting between programs are shown in Figure 4. There is no significant difference between logbook and observer data ($p \geq 0.05$) and therefore, days fished is considered the best effort metric for discard estimation.

Discard Estimates

Table 1 summarizes total GOP observer trips and those with reported Cobia catches from Georgia to North Carolina. Because a shift in data collection to the NEFOP (for North Carolina and Virginia) resulted in no recorded Cobia observations after 2016, discard estimates conclude at that year. This marks a departure from SEDAR 95, following a detailed review of total observed trips within the stock area. From 1999 to 2016, there is no visual trend in annual catch of Cobia (GA-NC) or number of trips with reported Cobia (GA-NC) catch according to the logbook data (Figure 5-6). Given the stable trend and limited observer coverage, pooling all available observer data to estimate and apply a single mean discard rate across the entire time series was considered appropriate. Discard estimates in number are provided in Table 3 and shown in Figure 7 with large error bars.

Comparison to SEDAR 58

There are two differences between discard estimates used for SEDAR 58 and SEDAR 107 for the gillnet fishery: (1) SEDAR 58 mean discard rates were calculated on an annual basis by disposition (dead vs. alive) whereas a single average discard rate was calculated using all observer data and pooled by disposition for SEDAR 107 and (2) the effort metric for SEDAR 58 was number of sets whereas total days fished was used as the effort variable for SEDAR 107. Figure 8 shows the comparison of discard estimates by assessment. SEDAR 107 estimates provide better smoothing across the time series, unlike the SEDAR 58 method where there were some years with no observer data so the total discards were assumed zero for those years.

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Tables

Table 1. Description of effort variables collected on the coastal logbook form and equivalent data collected by observers.

Variable	Logbook Definition	Observer Definition
Days fished	Trip start date minus the trip land date.	Date departed minus the date landed.
Gillnet length	Average length of net in yards.	Record the total length of the entire string for each gear configuration in feet (if there is space between each net, do not include this distance in net length).
Number of sets	Number of times this gear was set.	Number of times a piece of gear was deployed and hauled back.
Soak time	Prior to 2007, directions asked for the total time in hours the nets were in the water fishing during this trip. In 2007, instructions were changed to the average time in hours that this gear was used per set.	For each set, the time when the gear was first deployed, gear was no longer being deployed, gear was first hauled back, and last gear was hauled back were recorded.

Table 2. Sample size of observer trips fishing GA-NC and trips with Cobia catch.

Year	Total Observer Trips	Observer Trips with Landed Cobia	Observer Trips with Discarded Cobia
1999	7	0	0
2000	4	0	0
2002	4	2	0
2003	4	1	0
2006	2	1	1
2007	11	5	5
2008	11	6	5
2009	40	21	19
2010	42	9	7
2011	33	12	12
2012	29	8	4
2013	25	4	3
2014	30	4	2
2015	38	4	2
2016	32	2	2
2024	1	0	0

Table 3. Estimated commercial discards (in number) of Cobia (GA-NC) from 1999-2016.

Year	Mean Discard Rate	Discard Rate SD	Total Effort (days fished)	Estimated Discards (N)	Standard Error
1999	3.051	5.956	21	64	125
2000	3.051	5.956	126	384	750
2001	3.051	5.956	83	253	494
2002	3.051	5.956	75	229	447
2003	3.051	5.956	59	180	351
2004	3.051	5.956	77	235	459
2005	3.051	5.956	71	217	423
2006	3.051	5.956	104	317	619
2007	3.051	5.956	86	262	512
2008	3.051	5.956	145	442	864
2009	3.051	5.956	183	558	1,090
2010	3.051	5.956	160	488	953
2011	3.051	5.956	90	275	536
2012	3.051	5.956	158	482	941
2013	3.051	5.956	90	275	536
2014	3.051	5.956	153	467	911
2015	3.051	5.956	106	323	631
2016	3.051	5.956	166	506	989

Figures

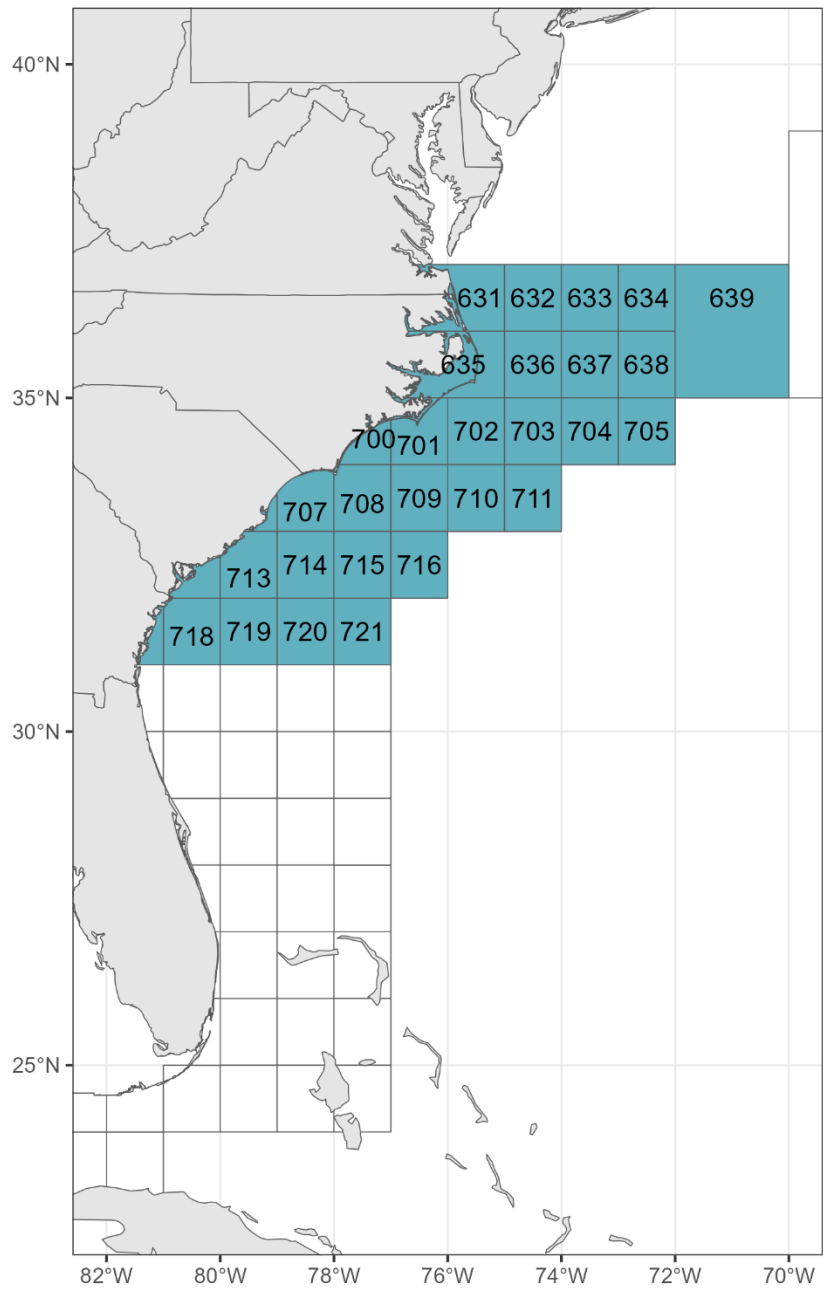


Figure 1. Spatial boundary for estimating discards of Cobia (GA-NC).

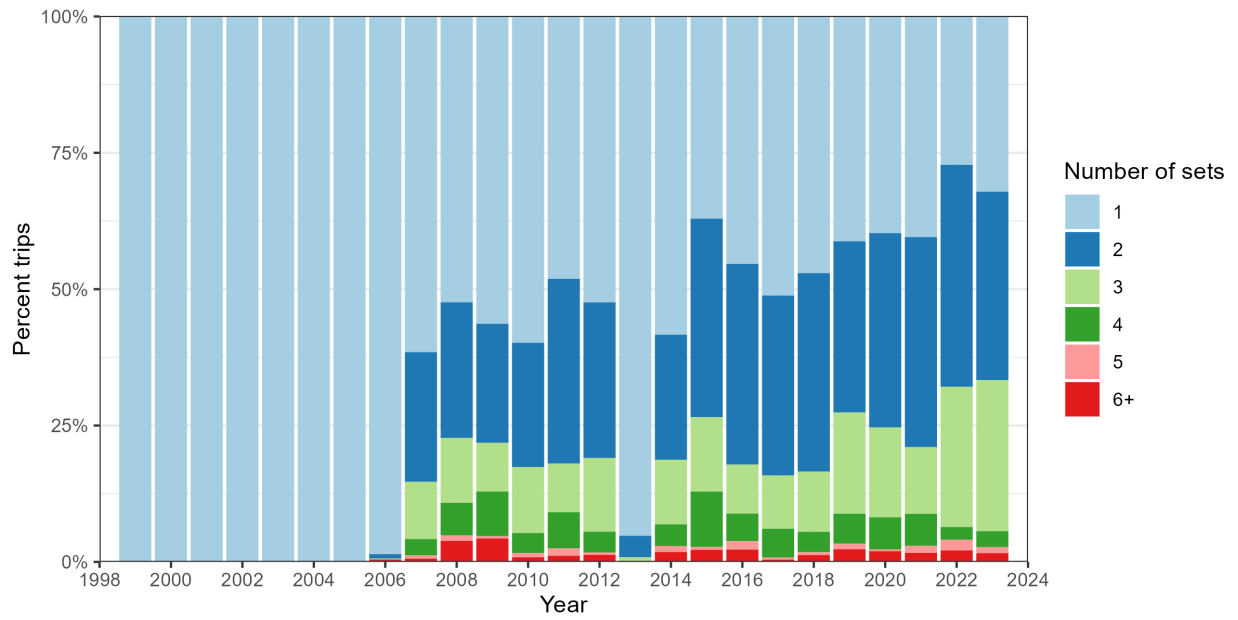


Figure 2. Percent of logbook trips with reported number of sets fished from 1999-2023.

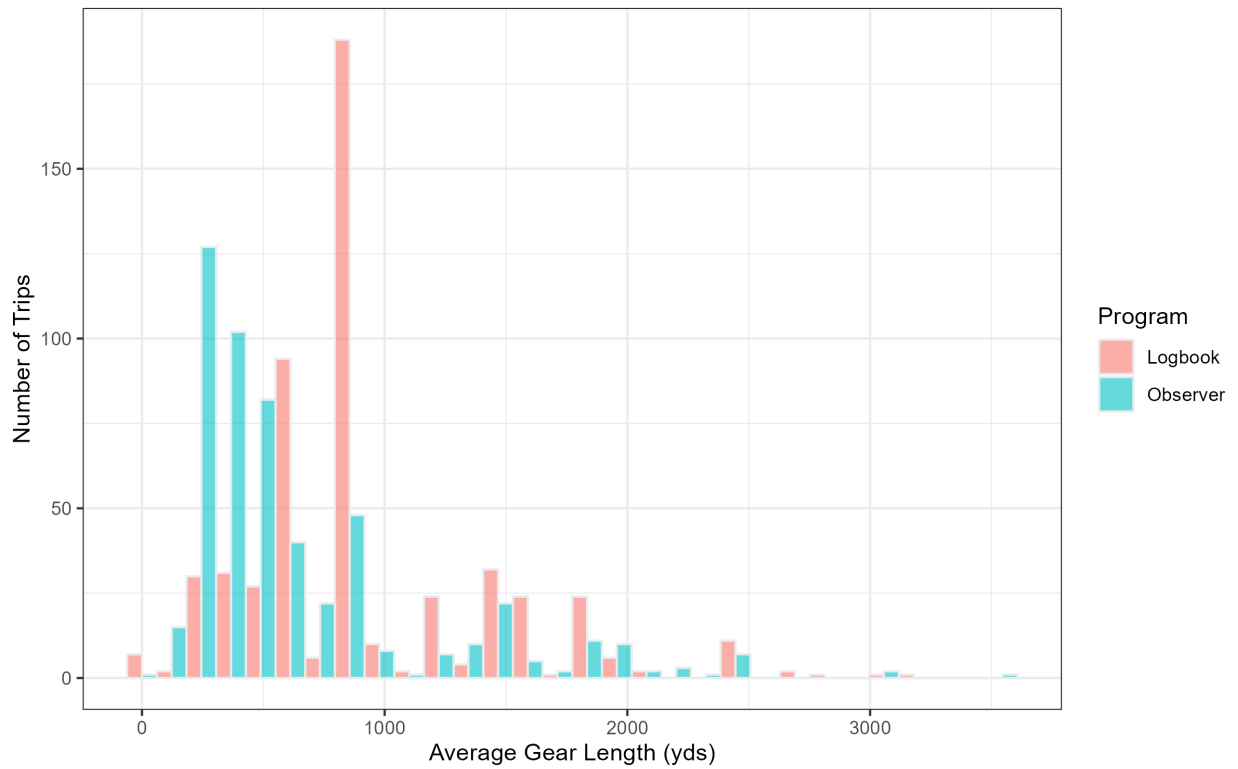


Figure 3. Distribution of average gear length in yards for logbook and observer data.

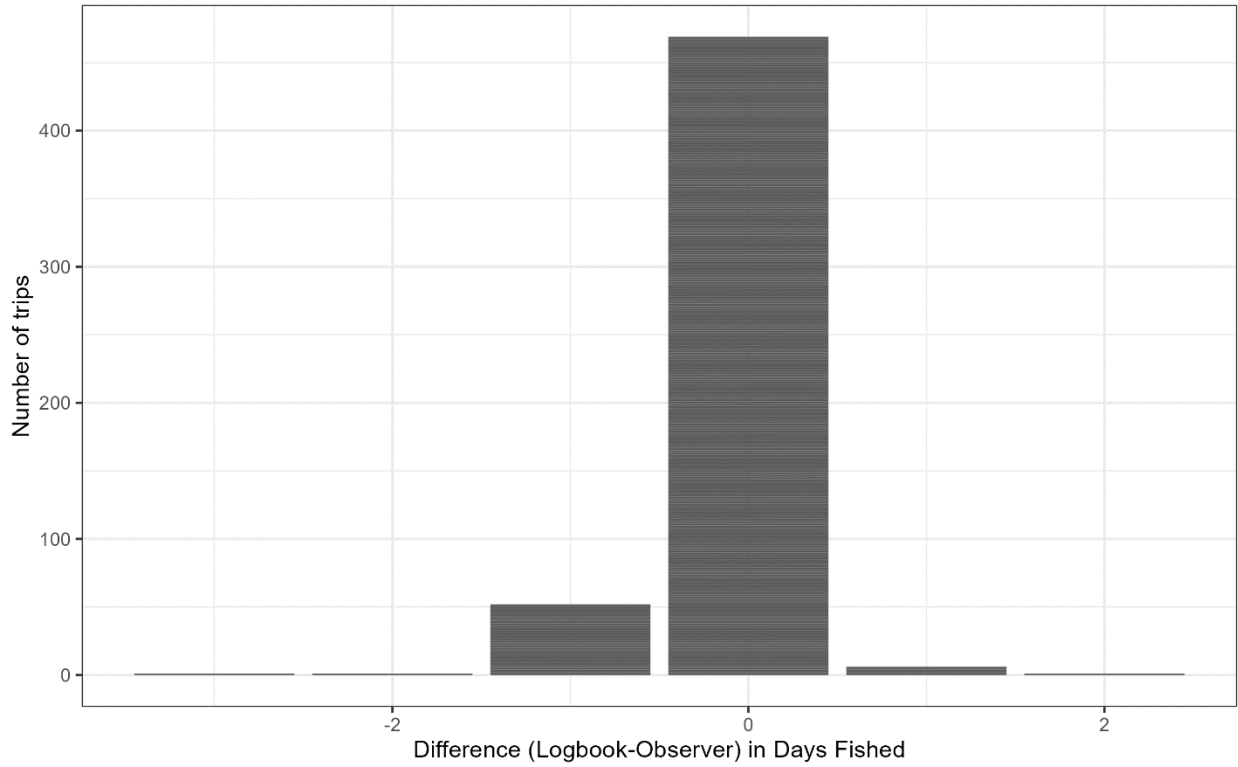


Figure 4. Difference in number of days fished between logbook and observer data.

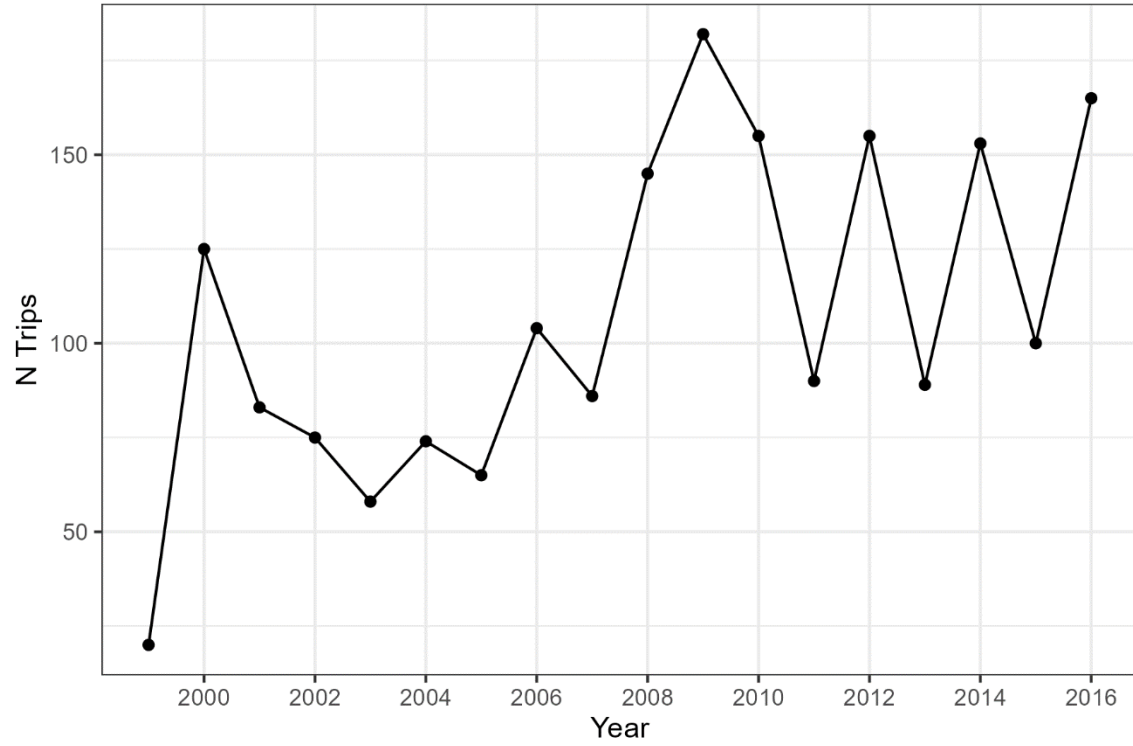


Figure 5. Annual total number of logbook trips reporting Cobia (GA-NC) from 1999-2016.

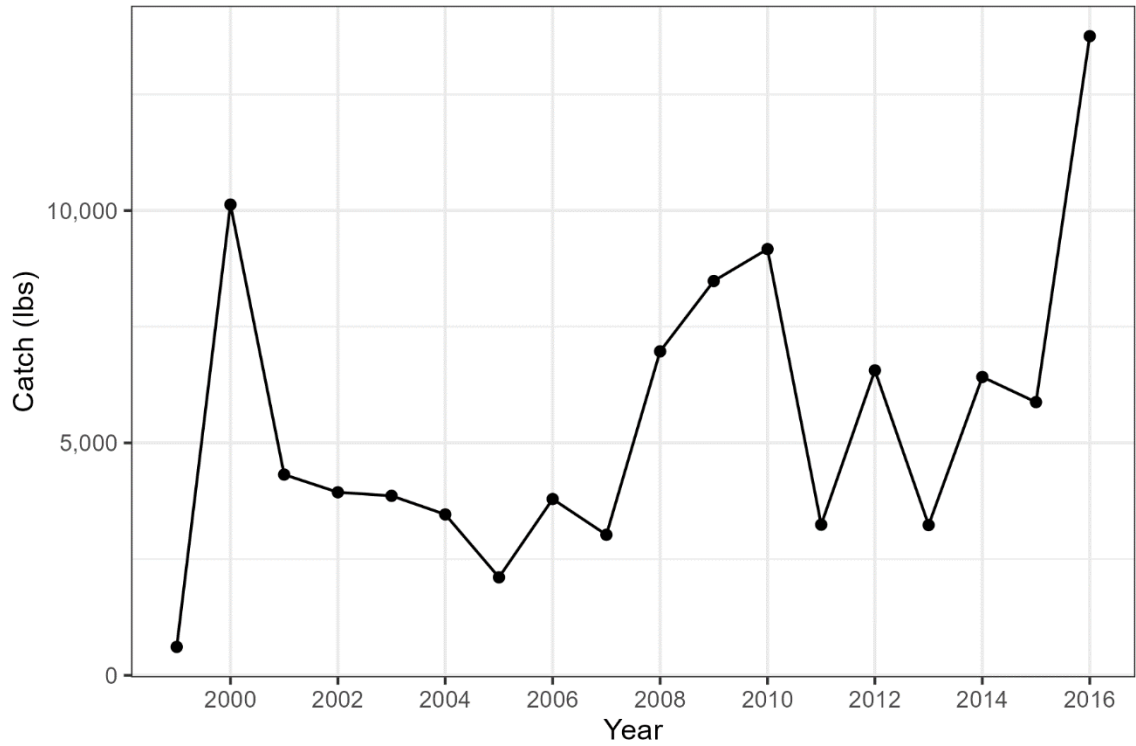


Figure 6. Total annual catch in pounds for Cobia (GA-NC) from 1999-2016.

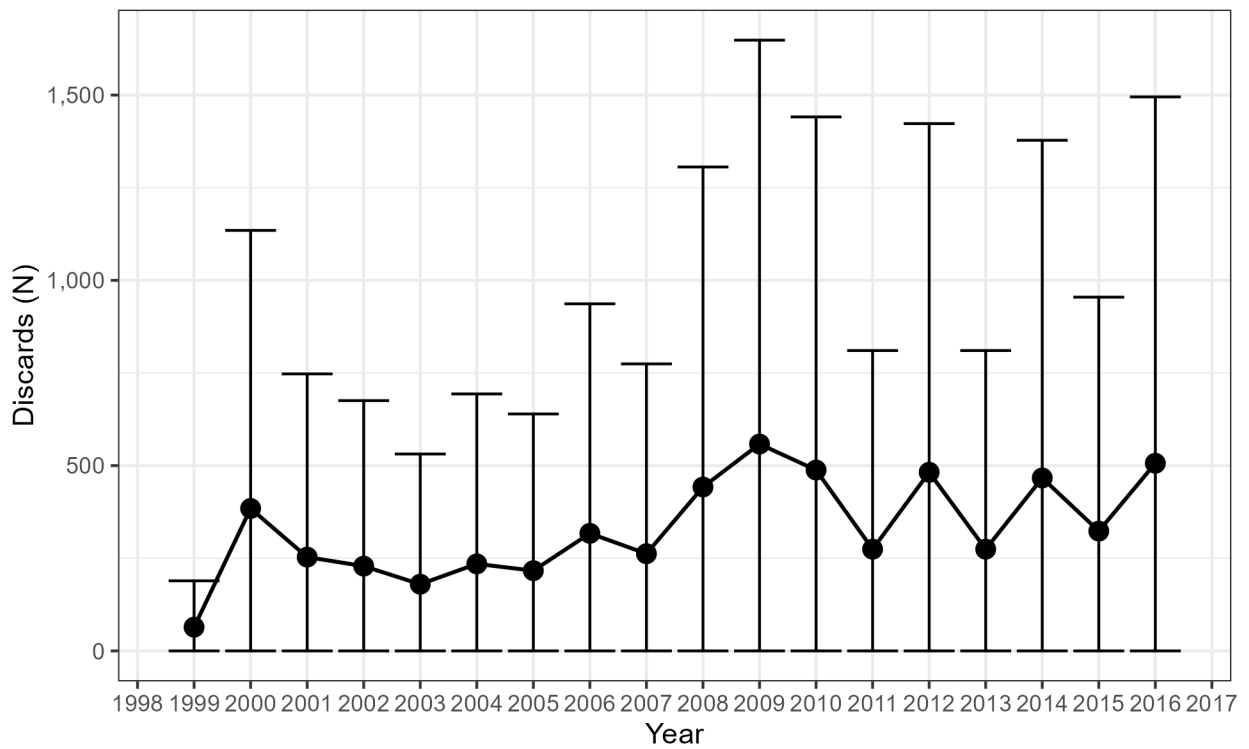


Figure 7. Commercial discards for Cobia (GA-NC) from 1999-2016 with standard error bars.

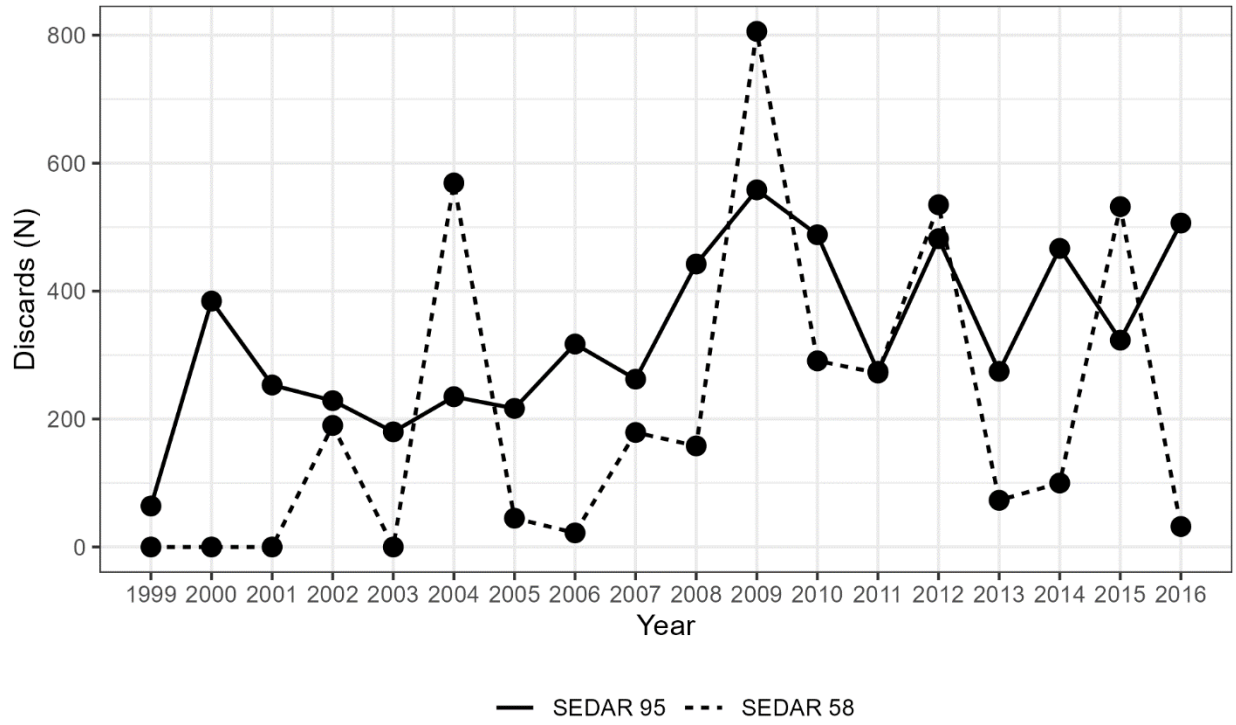


Figure 8. Comparison of commercial discard estimates for Cobia (GA-NC) from the gillnet fishery between the current assessment (SEDAR 107) and the previous assessment (SEDAR 58).