Estimated Commercial Discards of South Atlantic Blueline Tilefish (*Caulolatilus microps*) Using Limited Observer Data

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Introduction

For the previous assessment of this species in SEDAR 50, commercial discards were calculated using the discard logbook program (SEDAR 2017). However, upon an analysis to determine the reliability of discard logbook data, the Southeast Fisheries Science Center (SEFSC) no longer recommends the use of discard logbook data for estimating discards for SEDAR (Alhale et al. 2024). Therefore, alternative methods were explored using commercial observer data.

The general approach for estimating discards for the commercial reef fish fleet in the South Atlantic utilizes discards-per-unit-effort (DPUE) from the coastal reef fish observer program and total fishing effort from the commercial reef logbook program to estimate total catch,

$$totalDiscards = DPUE * totalEffort.$$

For discard estimation, DPUE is computed for total discards, including fish released alive, released dead, released in unknown condition, and used for bait. This species shows a very low rate of being caught on observer trips in this program, and as such the more robust analytical methods outlined in previous SEDARs in the South Atlantic (Atkinson et al. 2023; McCarthy et al. 2023) could not be applied for this SEDAR. The focus of these analyses and working paper is to show alternative, data-poor approaches for calculating discards using the observer and reef logbook programs and recommending which is most appropriate for this species and the subsequent annual discard estimates.

Methods

Data Sources

Observer data on vertical line vessels (e.g., handlines, electric and hydraulic reels aka bandit reels) have been collected by the Gulf and South Atlantic Fisheries Foundation (GSAFF) from 2007-2016 and starting in 2018 as part of the SEFSC South Atlantic Reef Fish Observer Program (SARF; Decossas & Mathers 2023). In this program, scientific observers on commercial fishing vessels record detailed information on catch and effort for a subset of trips. Catch by species was recorded according to the disposition category: kept (landed), released alive, released dead, released undetermined, and used for bait. Length and weight were recorded for a subsample of individual fish.

Total effort was determined from the commercial Coastal Fisheries Logbook Program 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, and expanded to all vessels in 1993; for these discard estimates, complete calendar years 1993-2023 were considered for trips that reported landings of Blueline Tilefish.

Relevant Management History of South Atlantic Blueline Tilefish

There are no size limits or species-specific management actions for Blueline Tilefish in the South Atlantic. There have been changes to state bag limits and federal trip limits, however these changes were not of a significant enough magnitude to suggest the need to break up analyses a priori due to management.

Gear

The primary gear landed for this species is Vertical Lines with catches being minimal in Bottom Longline. As such, the discards were only calculated for Vertical Line gears.

Observer Discard Rates

Sample sizes for this species were very low in the observer data (Table 1). Given the low observation rate of this species, observer discard rates had to be calculated straightforwardly. Discard rates were calculated two ways:

(1) discards estimated in number where effort is either number of trips or cumulative fishing time, and

(2) discards estimated in pounds as a trip-level ratio of discarded pounds per kept pounds of Blueline Tilefish.

Cumulative fishing time was considered as an alternative effort variable to number of trips based on analysis conducted by Smith et al. (2018). To provide analysts with options and to more fully explore these data-limited observer approaches, these different mean discard rate ($\overline{DR}$) calculations were conducted:

1a) Numbers per trip:

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

1b) Numbers per fishing time:

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

2) Pounds per kept pounds:

$$\overline{DR} = \frac{1}{n}\sum_i \frac{Discards\ (in\ pounds)_i}{Kept\ (in\ pounds)_i}$$

Discard Estimates – Logbook Effort Expansion

The calculated rates and standard deviations above were then used to calculate total discards and associated variance using the logbook data. All logbook trips that reported catch of Blueline Tilefish were used within the geographic area of the assessment (Fig 1.). Each discard rate was

applied to the appropriate metric in the logbook data to yield annual discard and variance estimates. These logbook rates were applied as:

1a) Trip Numbers:

$$Discards_t = TotalTrips_t \times \overline{DR}\ ;\ SE_t = \sqrt{\sum DRsd^2 \times TotalTrips_t{}^2}$$

1b) Fishing Time Numbers:

$$Discards_t = TotalFishingTime_t \times \overline{DR};\ SSE_t = \sqrt{\sum DRsd^2 \times TotalFishingTime_t{}^2}$$

2) Pounds per kept pounds:

$$Discards_t = Total\ Catch_t \times \overline{DR}\ ;\ SE_t = \sqrt{\sum DRsd^2 \times TotalCatch_t{}^2}$$

For the first method that used numbers, final discards were converted to weight using the observer data, calculated as the average weight of a discarded fish (*WTav*). Vice versa, method two that used pounds, estimated discards in number using the same *WTav*. This additional source of variation (average weight of discarded fish standard deviation; *WTsd*) was then also incorporated into final estimates, so for example the annual standard error for total estimated discards using method 1b (set level in numbers) was:

$$SE = \sqrt{(WTsd^2 \times AD^2) + (DRsd^2 \times WTav^2)}$$

These variance estimates were also converted to CVs.

Analyses by Sub-Region

This SEDAR terms of reference has estimates required for Hatteras-South through Florida (at the GSFMC/SAFMC boundary) and North of Hatteras to the Virginia border. However, for the Hatteras-North portion of the data, there were zero trips that observed any discards of Blueline Tilefish (Table 1). Given the spatial domain and lack of observer data for Hatteras-North, discard rates were calculated for the entire South Atlantic area for one discard rate per method for both areas defined for this assessment. When those rates were used in calculating total discards they were applied to logbook independently for those two sub-regions, with Hatteras-North defined by fishing areas between 35° and 37° latitude and the remaining areas as Hatteras-South (Fig. 1), yielding two sub-region estimates of total discards in the fishery.

Results and Discussion

Initial analyses were conducted regarding any patterns in catch, effort, or number of trips reporting Blueline Tilefish in the coastal logbook data for the two sub-regions. Generally, the trends were relatively stable with short peaks or shifts in the average fishing time, and total trips

reporting Blueline Tilefish in each region over time, with only one possible fishery regime shift in catch south of Hatteras after 2010 (Figs. 2-4). However, given the lack of observer data, a pooled discard rate was unavoidable. Furthermore, the limited samples of observer trips that had Blueline Tilefish interactions could have yielded spurious discard rates for time periods if they were broken up.

A discard rate as pounds per kept pounds as described in method 2 would not be calculated for this species. In this fishery the majority of the trips in the observer data were either fully kept or fully discarded regarding Blueline Tilefish with so few trips with both kept and discarded fish that a rate could not be determined. As such, only method 1, using number of trips or number per hour fished were calculated. Final discard rates for both data-limited regions with their associated SE and CV values are shown in Table 2. Note that CVs are the same for the time series as the rate is static through time using these methods, rather than vary by year which is commonly presented for these estimates.

The two methods, 1a and 1b, that were able to be used for this species showed relatively similar annual trends, though for Hatteras-South the method using number of trips was smaller than the estimates using total fishing time (Fig. 5). Both estimates were much more similar for Hatteras-North, where the fishery had a much smaller number of discards overall in terms of number as well as when scaled to a percent of the caught pounds in the fishery (Fig. 5 and 6). While the method 1a had lower CVs (Table 2) than the effort-based approach, previous analyses have recommended the use of effort-based metrics as they can account for fishing time, in this case, which number of trips misses. Final discard estimates using this recommended method are shown in Table 3. The final discard estimates were initially calculated in numbers and also provided in pounds using the average weight of discarded fish from the observer dataset (Table 3). Ultimately, the recommended discards using method 1b are between 0-2.5% of the fishery landings for Hatteras-North and under 10% for all years Hatteras-South, indicating this fishery has a low rate of discards relative to landings (Fig. 6).

Comparisons to SEDAR 50

In SEDAR 50, the discard estimates were calculated using the no longer recommended discard logbook data. Furthermore, the estimated discard in numbers include years with zero discards as discard rate was calculated anually (aside from ~20-70 fish kept for bait) for that (SEDAR 2017; Appendix A). Comparisons to SEDAR 50 are shown in Figure 7 and show that the updated estimates are close, yet generally higher aside from a highly anomalous year of 2015 in SEDAR 50 provided data.

Literature Cited

Atkinson, S., M. Judge, and R. Orhun. 2021. Coastal Fisheries Logbook Program Metadata. SEDAR74-DW-3. SEDAR, North Charleston, SC. 17 pp.

Atkinson, Sarina. CPUE Expansion Estimation for commercial Discards of South Atlantic Red Grouper. SEDAR82-AW09. SEDAR, North Charleston, SC. 20 pp.

Decossas, Gary & Alyssa Mathers. 2023. South Atlantic Reef Fish Observer Program Metadata. SEDAR82-AW08. SEDAR, North Charleston, SC. 11 pp.

McCarthy, K. et al. 2023. Commercial Discard Estimation of South Atlantic Gray Triggerfish. SEDAR82-AW03. SEDAR, North Charleston, SC. 46 pp.

SEDAR. 2017. SEDAR 50 Stock Assessment Report- Atlantic Blueline Tilefish. SEDAR, North Charleston, SC. 542 pp.

Table 1. Sample sizes for South Atlantic observer reef fish Vertical Line trips with Blueline Tilefish.

Observer Program	Year	Area	Blueline Tilefish Observer Trips	Kept Blueline Tilefish Trips	Discarded Blueline Tilefish Trips
GSAFF	2007	Hatteras-South	2	2	0
GSAFF	2015	Hatteras-South	2	2	0
GSAFF	2016	Hatteras-South	2	2	0
SAVLOP	2018	Hatteras-North	3	3	0
SAVLOP	2021	Hatteras-South	1	1	1
SAVLOP	2022	Hatteras-North	2	2	0
SAVLOP	2022	Hatteras-South	15	10	5
SAVLOP	2023	Hatteras-South	9	8	1

Table 2. Calculated observer discard rate, standard error, and CV values for each of the methods by management regime. Method 1a calculates a discard using number of trips as the effort metric, method 1b calculates a discard rate using hours fished as the effort metric. Method 2 uses pounds per kept pounds per trip but could not be calculated for this species as trips were primarily fully kept or fully discarded.

	Discard Rate Values			Standard Error Values		
Area	Method 1a	Method1b	Method 2	Method 1a	Method1b	Method 2
All	0.4722	0.0362	-	1.2302	0.1048	-

CVs		
Method 1a	Method1b	Method 2
2.650	2.893	-

Table 3. Commercial discard estimates in pounds and numbers with associated standard error (SE) for sub- regions. Estimated discards are recommended using method (1b) where the discard rate calculation and logbook expansion factor is in total hours fished.

A) Hatteras-South

Year	Sub-Region	Estimated Discards in Weight	SE of Estimated Discards in Weight	Estimated Discards in Number	SE of Estimated Discards in Number
1993	Hatteras-South	1708.711	5013.700	553.222	1600.692
1994	Hatteras-South	1852.922	5436.843	599.912	1735.786
1995	Hatteras-South	1894.205	5557.975	613.278	1774.460
1996	Hatteras-South	1912.049	5610.335	619.056	1791.176
1997	Hatteras-South	2309.663	6777.014	747.789	2163.654
1998	Hatteras-South	1836.140	5387.602	594.479	1720.066
1999	Hatteras-South	1555.919	4565.379	503.753	1457.560
2000	Hatteras-South	1071.455	3143.862	346.900	1003.721
2001	Hatteras-South	1393.551	4088.958	451.184	1305.456
2002	Hatteras-South	1331.459	3906.767	431.080	1247.289
2003	Hatteras-South	1349.080	3958.470	436.785	1263.795
2004	Hatteras-South	1293.308	3794.826	418.729	1211.550
2005	Hatteras-South	1309.643	3842.754	424.017	1226.852
2006	Hatteras-South	1390.978	4081.407	450.351	1303.045
2007	Hatteras-South	1700.768	4990.393	550.650	1593.251
2008	Hatteras-South	1398.921	4104.715	452.922	1310.486
2009	Hatteras-South	1884.359	5529.088	610.091	1765.237
2010	Hatteras-South	1461.125	4287.234	473.062	1368.758
2011	Hatteras-South	972.331	2853.013	314.807	910.863
2012	Hatteras-South	1068.434	3134.999	345.922	1000.891
2013	Hatteras-South	1374.084	4031.838	444.881	1287.219
2014	Hatteras-South	1140.260	3345.750	369.177	1068.176
2015	Hatteras-South	676.414	1984.733	218.999	633.653
2016	Hatteras-South	1338.283	3926.791	433.290	1253.682
2017	Hatteras-South	1537.202	4510.459	497.693	1440.026
2018	Hatteras-South	1623.236	4762.900	525.548	1520.621
2019	Hatteras-South	1465.265	4299.380	474.402	1372.636
2020	Hatteras-South	1356.184	3979.315	439.086	1270.451
2021	Hatteras-South	1194.856	3505.946	386.853	1119.321
2022	Hatteras-South	1543.467	4528.842	499.721	1445.895
2023	Hatteras-South	924.895	2713.826	299.449	866.426

B) Hatteras-North

Year	Sub-Region	Estimated Discards in Weight	SE of Estimated Discards in Weight	Estimated Discards in Number	SE of Estimated Discards in Number
1993	Hatteras-North	180.0115	528.1899	58.2815	168.6318
1994	Hatteras-North	221.7979	650.7995	71.8105	207.7766
1995	Hatteras-North	119.0381	349.2815	38.5404	111.5129
1996	Hatteras-North	308.5592	905.3745	99.9008	289.0532
1997	Hatteras-North	405.4455	1189.6582	131.2693	379.8146
1998	Hatteras-North	155.3425	455.8059	50.2945	145.5222
1999	Hatteras-North	156.6291	459.5810	50.7111	146.7275
2000	Hatteras-North	109.3047	320.7219	35.3891	102.3948
2001	Hatteras-North	209.7822	615.5431	67.9202	196.5205
2002	Hatteras-North	236.4539	693.8032	76.5556	221.5061
2003	Hatteras-North	184.5426	541.4849	59.7485	172.8764
2004	Hatteras-North	70.2593	206.1549	22.7475	65.8178
2005	Hatteras-North	94.2571	276.5693	30.5172	88.2985
2006	Hatteras-North	136.6365	400.9188	44.2382	127.9988
2007	Hatteras-North	113.5001	333.0321	36.7474	106.3250
2008	Hatteras-North	222.6370	653.2615	72.0822	208.5627
2009	Hatteras-North	174.0820	510.7914	56.3617	163.0771
2010	Hatteras-North	74.3932	218.2846	24.0860	69.6903
2011	Hatteras-North	11.4115	33.4838	3.6947	10.6901
2012	Hatteras-North	66.0359	193.7626	21.3802	61.8614
2013	Hatteras-North	91.5161	268.5266	29.6298	85.7308
2014	Hatteras-North	69.9796	205.3342	22.6570	65.5558
2015	Hatteras-North	15.9985	46.9429	5.1798	14.9872
2016	Hatteras-North	111.6877	327.7141	36.1606	104.6272
2017	Hatteras-North	68.9168	202.2156	22.3129	64.5601
2018	Hatteras-North	112.3254	329.5852	36.3671	105.2246
2019	Hatteras-North	156.5731	459.4168	50.6930	146.6751
2020	Hatteras-North	136.4910	400.4920	44.1911	127.8625
2021	Hatteras-North	131.6803	386.3763	42.6335	123.3559
2022	Hatteras-North	83.1812	244.0703	26.9312	77.9228
2023	Hatteras-North	76.1888	223.5533	24.6673	71.3724

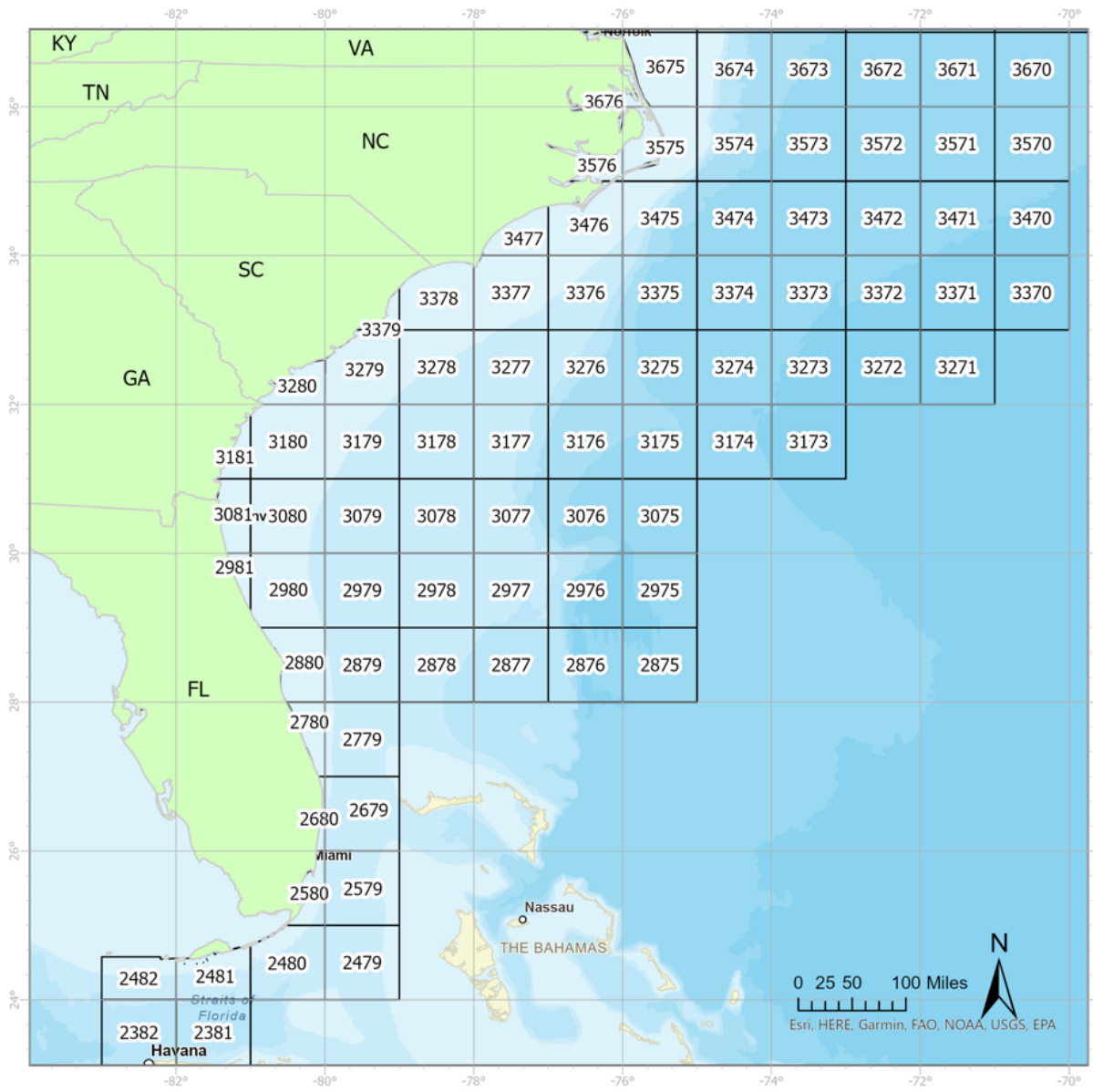

Figure 1. Coastal logbook fishing areas in the South Atlantic.

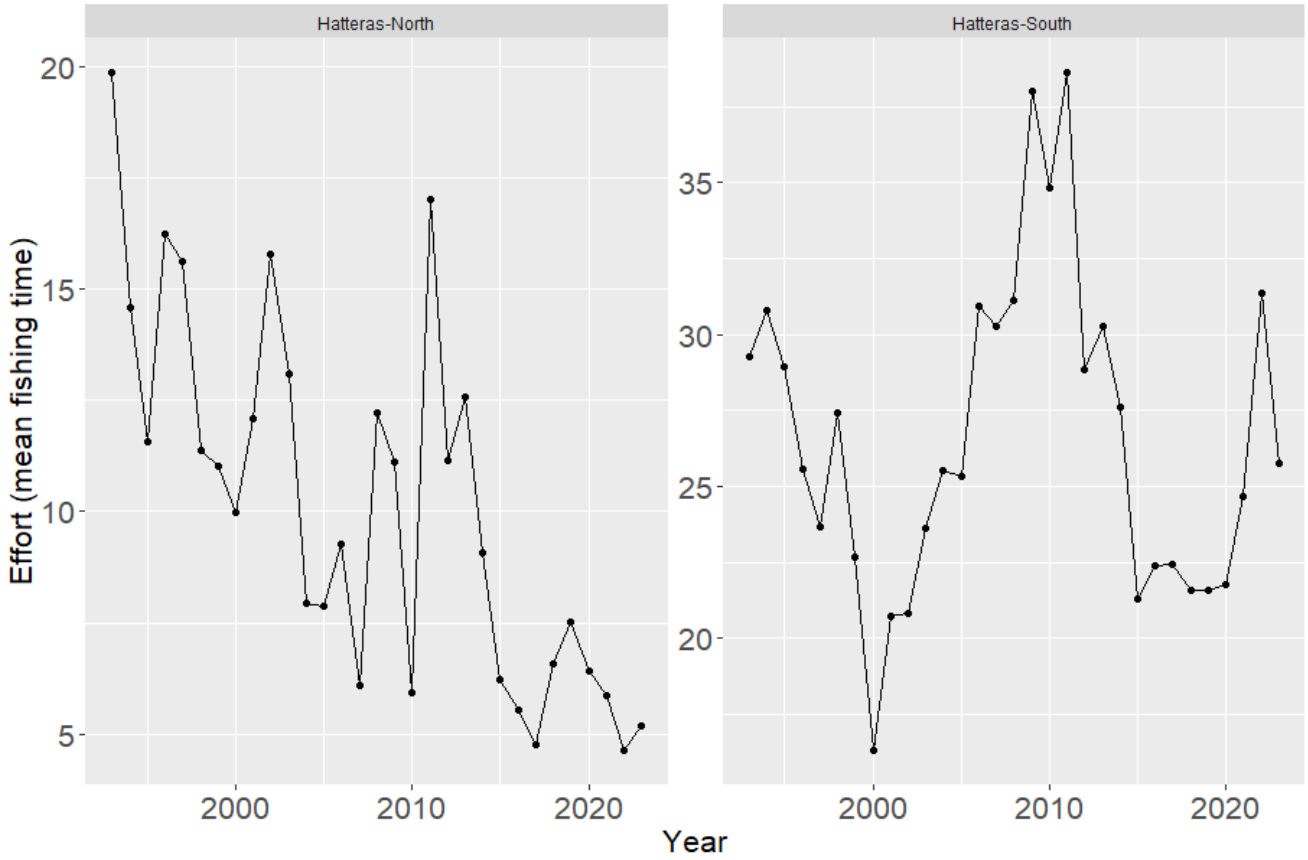

Figure 2. Mean vertical line effort in hours fished per trip from 1993-2023 for the two sub-regions. Note different y-axis scales.

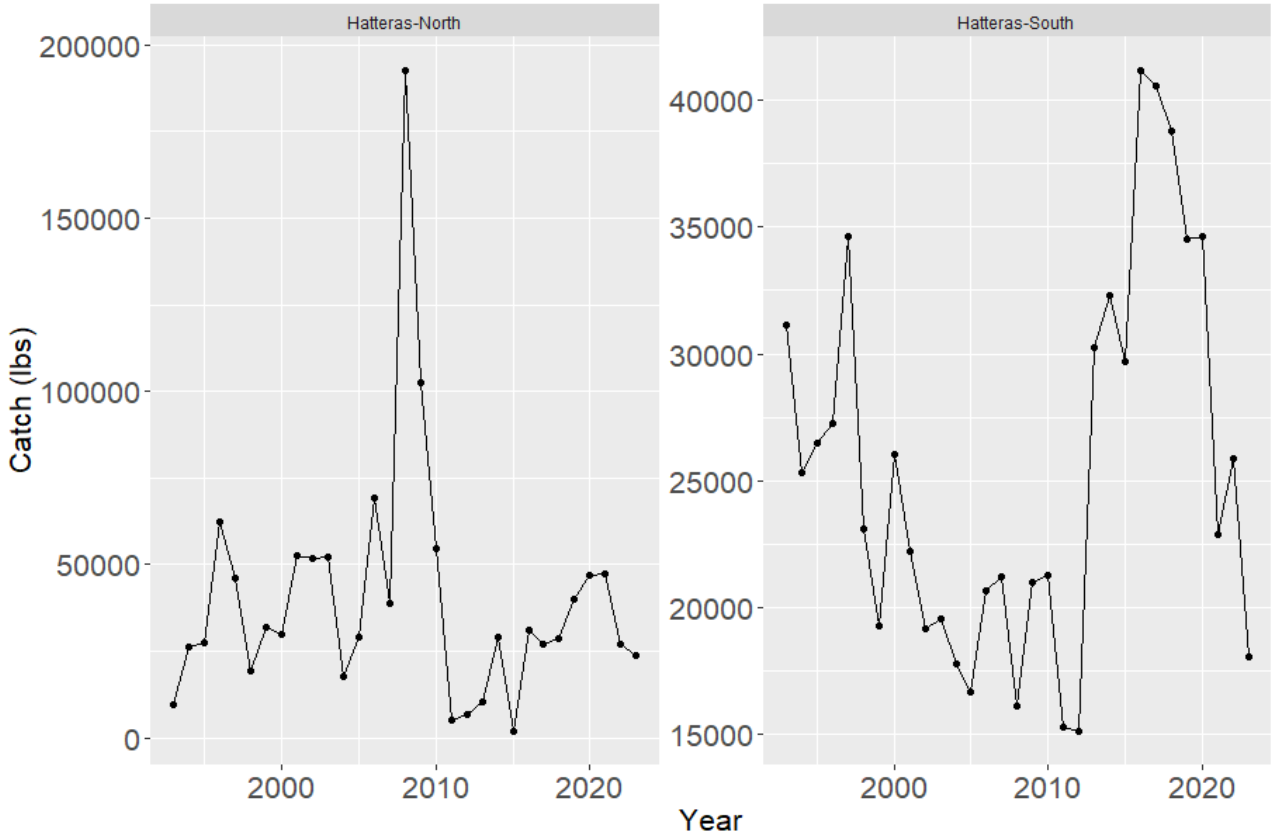

Figure 3. Total vertical line catch in pounds of Blueline Tilefish from 1993-2023 for the two sub- regions. Note different y-axis scales.

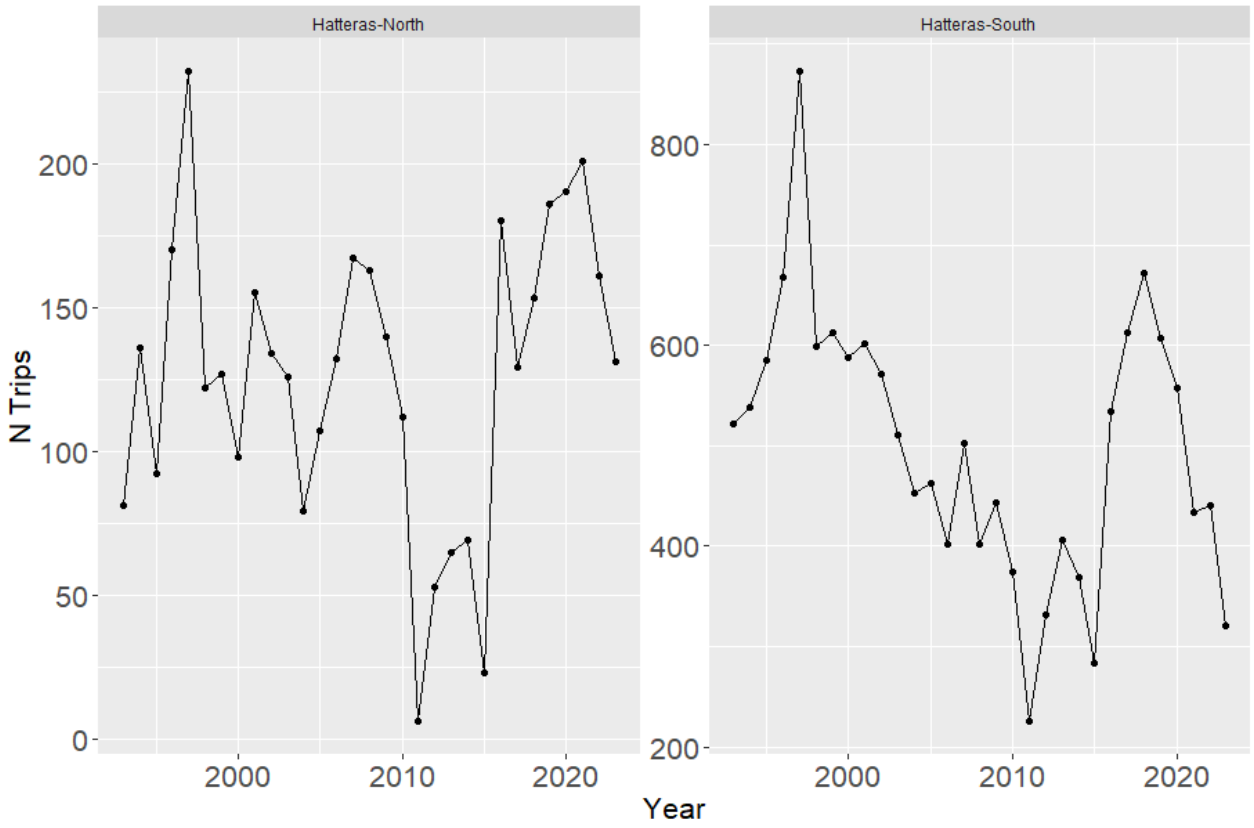

Figure 4. Annual total number of logbook trips reporting South Atlantic Blueline Tilefish for the two sub-regions from 1993-2022.

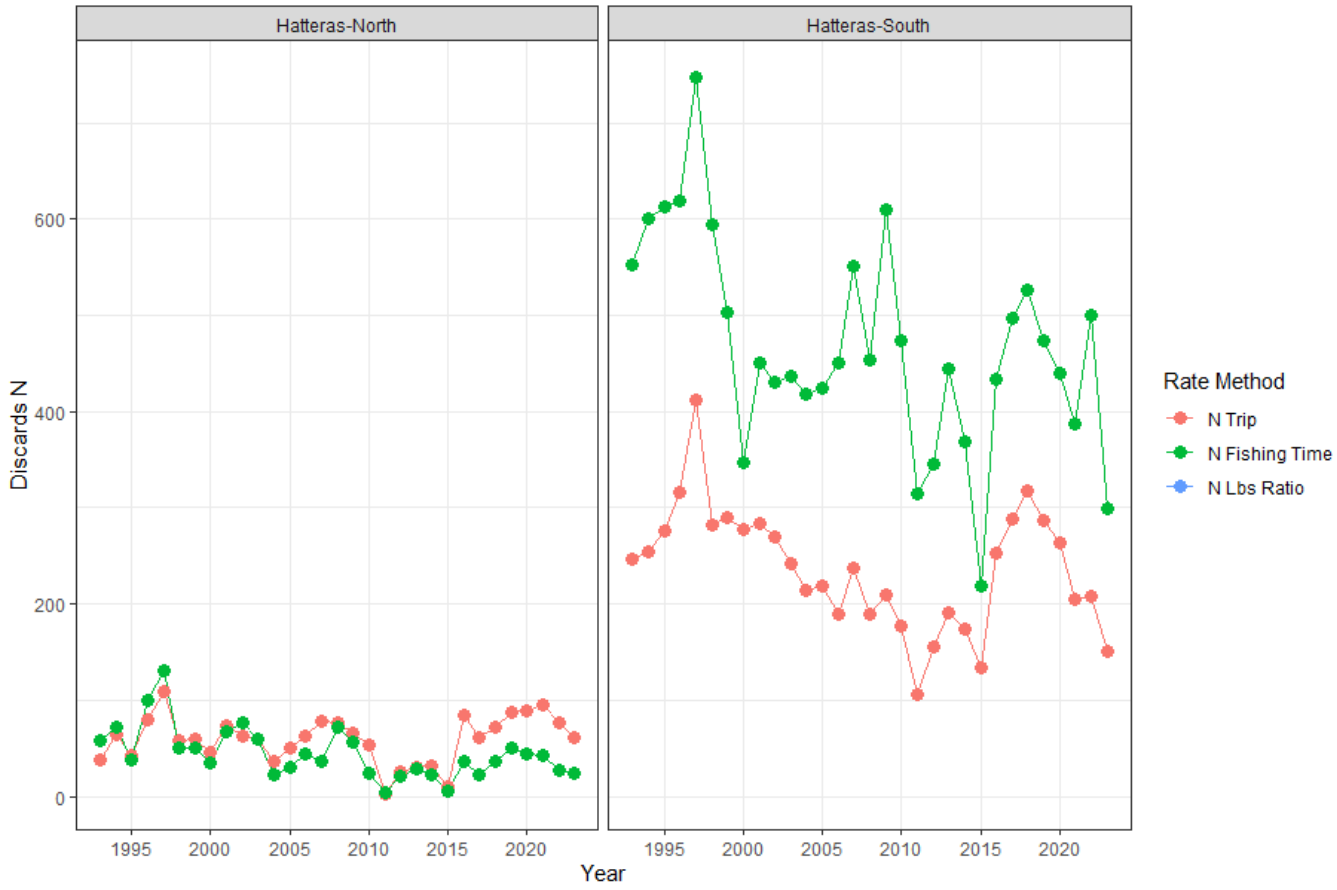

Figure 5. Commercial discard estimates in numbers for the two completed methods for Blueline Tilefish for the sub- regions from 1993-2023. Estimated discards using fishing time as the effort metric is recommended for SEDAR 96.

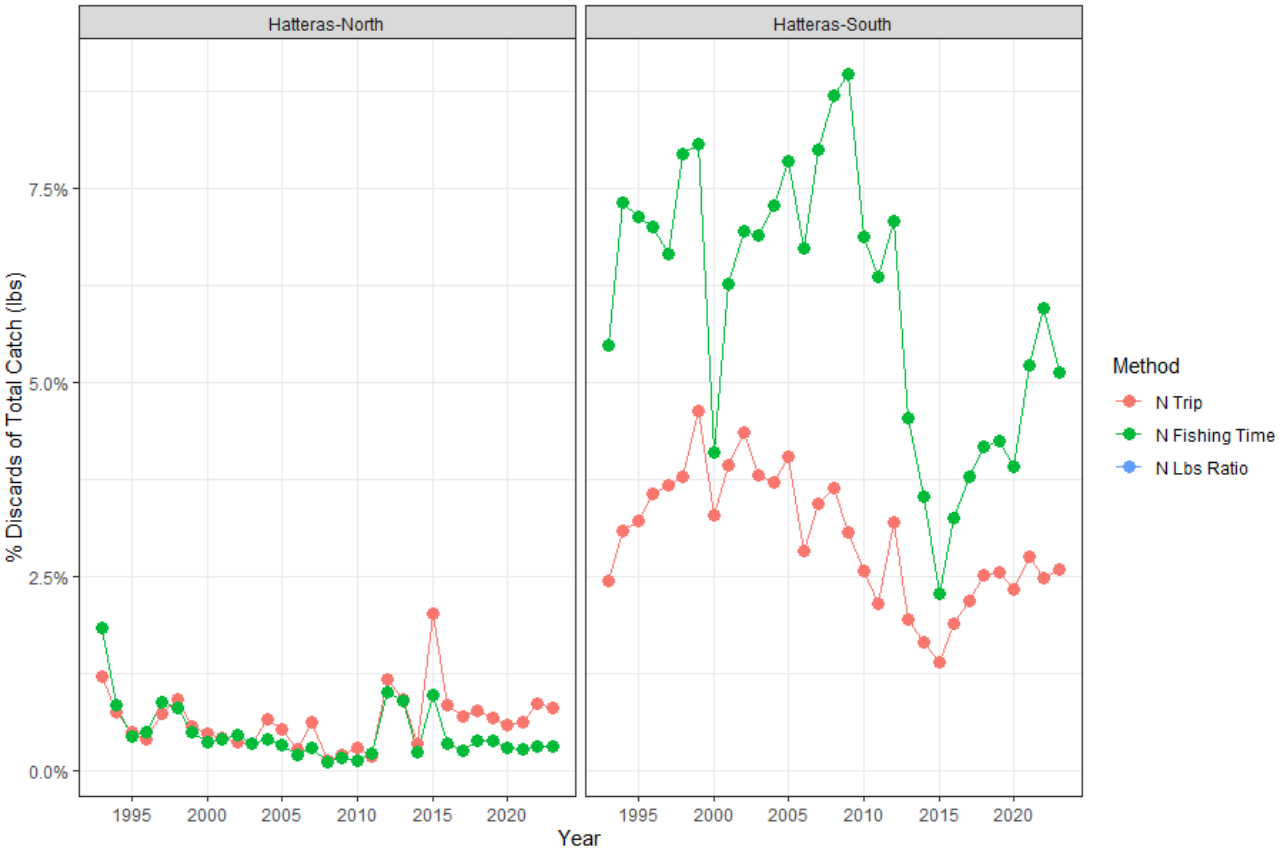

Figure 6. Discard estimates as a percent of catch in pounds for the two completed methods for Blueline Tilefish for the sub- regions from 1993-2023. Estimated discards using fishing time as the effort metric is recommended for SEDAR 92.

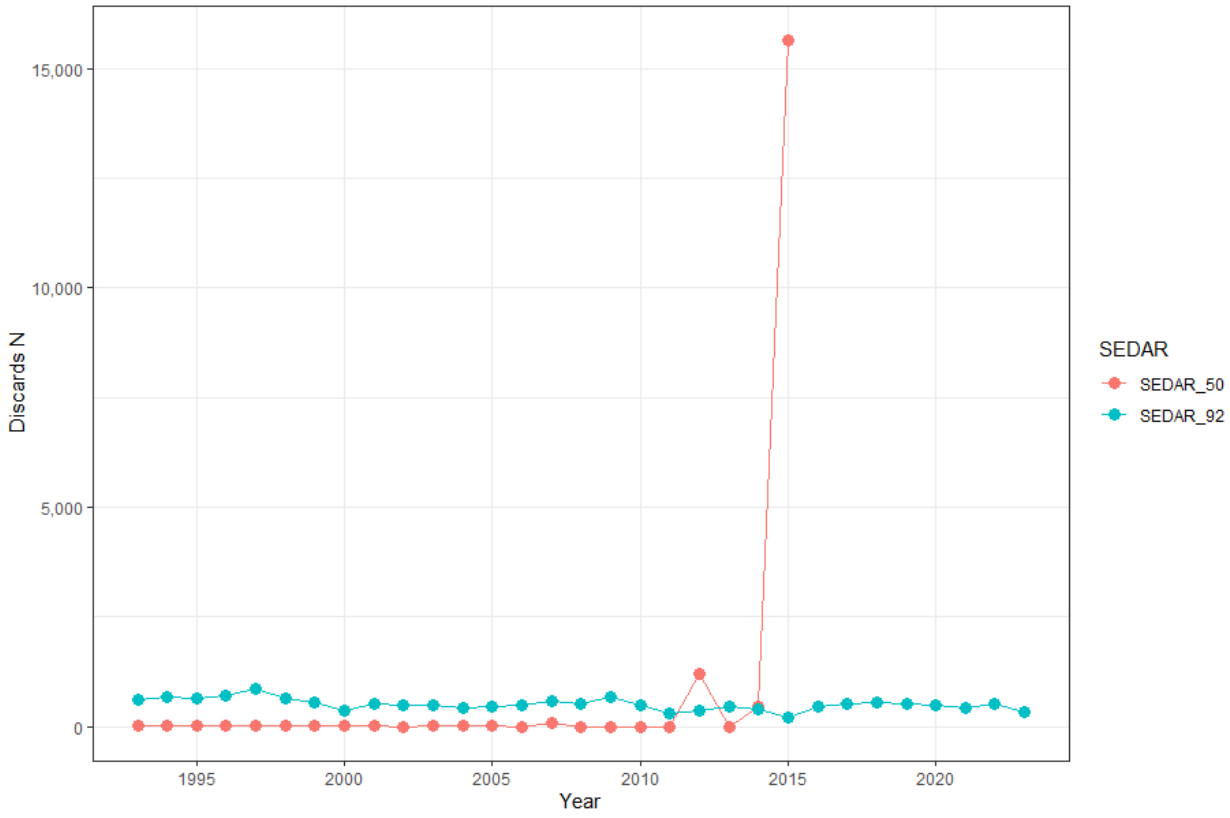

Figure 7. Final discard estimate comparison between SEDAR 50 and the submitted SEDAR 92 values for Blueline Tilefish.

Appendix A. Estimated South Atlantic VL discards from SEDAR 50.

Table 3.5 Calculated Blueline Tilefish discards and kept discards (bait) from the US South Atlantic commercial fishery.

Year	Bottom longline calculated discards wwt	Bottom longline calculated discards number of fish	Bottom longline calculated kept for bait wwt	Bottom longline calculated kept for bait number of fish	Vertical line calculated discards wwt	Vertical line calculated discards number of fish	Vertical line calculated kept for bait wwt	Vertical line calculated kept for bait number of fish
1993	0	0	0	0	0	0	69	28
1994	0	0	0	0	0	0	86	34
1995	0	0	0	0	0	0	89	36
1996	0	0	0	0	0	0	89	35
1997	0	0	0	0	0	0	91	36
1998	0	0	0	0	0	0	70	28
1999	0	0	0	0	0	0	59	24
2000	0	0	0	0	0	0	59	24
2001	0	0	0	0	0	0	64	26
2002	0	0	0	0	0	0	0	0
2003	0	0	0	0	0	0	31	12
2004	0	0	0	0	0	0	100	40
2005	0	0	0	0	0	0	103	41
2006	0	0	0	0	0	0	0	0
2007	0	0	0	0	0	0	189	76
2008	0	0	0	0	0	0	0	0
2009	0	0	0	0	0	0	0	0
2010	0	0	0	0	0	0	0	0
2011	0	0	0	0	6	1	0	0
2012	0	0	0	0	5,069	1,215	0	0
2013	300	64	0	0	0	0	0	0
2014	0	0	0	0	1,970	472	0	0
2015	470	99	0	0	65,246	15,640	0	0