Headboat Data for Hogfish in the Southeast U.S. Atlantic and Gulf of America

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SEDAR94-DW-02

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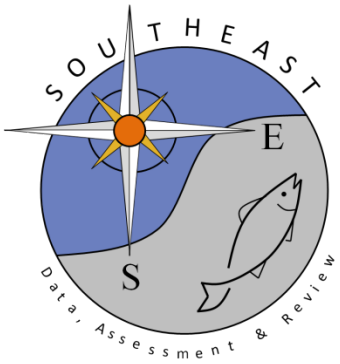

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1 Survey Description

The Southeast Region Headboat Survey (SRHS) estimates landings and effort for headboats in the southeast U.S. Atlantic and Gulf of Mexico. The Headboat Survey began in 1972 in North Carolina and South Carolina. In 1976 the survey expanded to northeast Florida (Nassau-Indian River counties) and Georgia, followed by southeast Florida (St. Lucie-Monroe counties) in 1978 (Chester et al. 1984; Grimes and Hollingsworth 1979;

Huntsman 1976; Huntsman, Colby, and Dixon 1978). The landings estimation process was developed in 1981. However, landings estimates were tabulated for a few species or species groups in earlier years. The SRHS began in the Gulf of Mexico in 1986 and extends from Naples, FL to South Padre Island, TX. The headboat survey generally includes 70-80 vessels participating in each region annually (Table 1). Headboat data are considered confidential and cannot be publicly distributed if less than three vessels contribute to the data product.

The SRHS implemented electronic logbook reporting in the South Atlantic and Gulf of Mexico as of Jan 1, 2013. Headboat operators now report trip information via a website or mobile application. A review of the headboat data methodology and validity was conducted in 2015 for the Atlantic waters of the Southeastern U.S. (Fitzpatrick et al. 2017; SEDAR 2015). Panelists agreed the SRHS data products were the best available information and should be used in stock assessments. The decision should translate to the Gulf of Mexico since the methodology and data collection are identical.

The paper headboat logbook forms varied by region and year due to space limitation on the forms during the early years of the survey. Predominant species listed on the paper forms varied by region. In general, the number of species listed increased in all regions over the early years. There were blank lines to write in species not listed on all forms. In the electronic logbook entry, starting in 2013, all species are available to users. Reporting of discards was added to the form in 2004.

The area definitions for SRHS were modified in 2013 primarily to remove the inshore - offshore component for the Carolinas and create state-specific areas for the Gulf of Mexico. A few other areas were collapsed in the Florida Keys and west Florida (Figures 1 and 2). For this assessment, subregion is used to define finer scale regions as advised by the assessment staff. The assignment of SRHS areas to subregions and regions are below:

- Subregions
  - Areas 1:6,9,10 - North_of_FL
  - Areas 24:29 - West_of_FL
  - Areas 23 - NW_FL
  - Areas 21,22 - SW_FL
  - Areas 12,17,18 - Florida Keys
  - Area 11 - SE_FL
  - Areas 7,8 - NE_FL
- Regions
  - Areas 7,8,11,12,17,18 - East FLorida and Keys Region
  - Areas 21,22,23 - West Florida Shelf Region
  - Areas 1:6,9,10,24:29 - Excluded

The SRHS dockside sampling was suspended in March 2020 due to concerns about COVID. No biological samples were collected during this time. During the dockside sampling suspension, port agents continued to monitor reporting compliance to ensure captains continued to report trip level catch and effort data via the electronic logbooks. Reported catch and effort data were used to estimate 2020 headboat landings and effort with no disruption. Converting landings in number to landings in weight requires mean weights by species. The logic for determining mean weights expands across strata and backwards in time until a minimum of 10 fish are available. The 2020 landings estimates in weight were derived by applying mean weights from 2019 to 2020 landings in number. Port agents continued to maintain QA-QC checks and validations in the database for their area of responsibility. Port agents also provided outreach and support to captains regarding the new for-hire reporting requirements and changes to the electronic reporting application. Given that headboat dockside sampling necessarily involves interactions between the sampler and headboat anglers and staff, biological samples were not collected until NMFS/SEFSC approved measures to resume sampling in July 2021. However, some port agents are supported by state agencies and returned to dockside sampling earlier.

2 Methods

2.1 Landings

The SRHS incorporates two components for estimating catch and effort. 1) Information about total catch and effort are collected via a logbook reports that are filled out by vessel personnel for individual trips. These logbooks are summarized by vessel to generate estimated landings by species, area, and month. The compliance in reporting this information has improved over the years of the survey. Port agents are able to identify missing trip reports by contacting the captain or office associated with the fishing vessel, personal observations, reviewing the weekly compliance report, and other methods. If a missing trip is identified, the catch is estimated using a report from the same vessel when possible or a vessel of similar size over the same time and area. Reporting compliance has been near 100 percent since permits were tied to reporting requirements in 2008. The proportion of trips reported is the primary information used to develop a proxy for uncertainty estimates for landings and discards. 2) The size of the fish landed are collected by port samplers during dockside sampling, where fish are measured to the nearest mm and weighed to the nearest 0.01 kg. The mean weights by species, area, and month are used to convert reported landings in numbers of fish to landings in weight.

2.2 Discards

The Southeast Region Headboat Survey logbook form was modified in 2004 to include a category to collect self-reported discards for each reported trip. This category is described on the form as the number of fish by species released alive and number released dead. Port agents instructed each captain on criteria for determining the condition of discarded fish. A fish was considered "released alive" if it was able to swim away on its own. If the fish floated off or was obviously dead or unable to swim, it was considered "released dead". As of Jan 1, 2013, the SRHS began collecting logbook data electronically. Changes to the trip report were also made at this time, one of which removed the condition category for discards i.e., released alive vs. released dead. The updated trip report collects only the total number of fish released regardless of condition. Due to the subjectivity involved in determining the condition of the released fish from 2004 to 2012, live and dead releases are typically combined for 2004 to 2012 as total discards for consistency to match later years.

Some under reporting and misunderstanding of the data requested were identified in the initial years of the discard data collection (2004 - 2007). Observers with the headboat at-sea program collect catch and discard information from a subset of anglers. Annual catch rates from the observer data can be compared to catch rates reported on logbooks to evaluate the validity of logbook discard data for 2004 to 2007. Starting in January 2023, two fields were added to the logbook form, number of discard descended and number vented. These will be used to quantify the prevalence of use and effectiveness of fish descending devices and venting tools which are required to be onboard in both the South Atlantic and Gulf of Mexico.

2.3 Uncertainty

The first attempt to provide uncertainty estimates for headboat landings were developed for the SEDAR 68 scamp research track assessment (Nuttall et al. 2020). The approach was statistically valid but applied the uncertainty of reported SRHS landings (across areas, months, and vessels) as a proxy for uncertainty in SRHS landings estimates, which produced unrealistic coefficients of variation (CV) in some years. For SEDAR 68 scamp, years with only 60 percent of the vessels reporting had CV values of approximately 0.05. As an alternative, a proxy CV method was developed for the SEDAR 74 red snapper research track data workshop that relies on the proportion of trips reported (N) to total estimated trips (n) and adds a buffer of 0.05 to prevent the CV from reaching zero $proxyCV = 1 - \frac{N}{n} + 0.05$ (SEDAR 2022). This proxy CV method was again refined for the SEDAR 82 gray triggerfish research track data workshop to account for any spatial variability in species abundance and reporting compliance. In particular, using the SEDAR 74

approach, high CVs could be estimated for strata that have low compliance rates across most areas, even if compliance was high in the few areas comprising the majority of catch. To address this concern, compliance rates are now weighted (spatially) by the associated landings estimates:

$$proxyCV_i = 1 - \sum_{j=1}^{n}\left[\left(\frac{N_{i,j}}{n_{i,j}}\right)*\left(\frac{L_{i,j}}{L_i}\right)\right]+0.05$$

where n is the number of reported trips, N is the number of estimated trips, and L is the landings in number for year i and subregion/region j.

2.4 Effort

Catch and effort data were reported on logbook forms provided to all headboats in the survey until 2012 and electronically since 2013. The information is entered by the owner, captain, or designated crew member after each trip and the total number of all the species landed on a given trip, along with the total number of fish discarded for each species. Data on effort are provided as number of anglers on a given trip. Effort is standardized as angler days by multiplying the number of hours associated with the type of trip (e.g., 40 anglers on a half-day trip would yield $40 * 0.5 = 20$ angler days). Angler days are summed by month for individual vessels. Each month, port agents collect these logbook trip reports and check for accuracy and completeness. Although reporting via the logbooks is mandatory, compliance is not 100% and is variable by location. To account for non-reporting, a correction factor is developed based on sampler observations, angler numbers headboat booking offices, and all available information. This information is used to provide estimates of effort expanded or corrected for non-reporting by month and area. The effort estimates for Louisiana in 2004 and 2005 are zero. During this time period only one or two vessels were active and did not report their catch in 2002, 2004, 2005, or 2006. In 2002, 2004 and early 2005 funding and staffing issues prevented the collection of trip information by port agents necessary to estimate effort and catch. In August 2005, Hurricane Katrina impacted Louisiana fishing operations to the extent it was unlikely there was any fishing effort through the end of the year and some of 2006. Alabama was assigned a separate area code in 2013. In prior years, Alabama was combined with northwest Florida. Mississippi was added to the headboat survey in 2010. In earlier years, there was little to no headboat fishing in Mississippi. Angler Days is the best practice unit of effort for headboat data. Angler trips can be calculated to match units for general recreational effort for the purpose of combining effort across sectors. There are some caveats with the method because it does not account for all effort expansions in the standard estimation method.

2.5 Biological Samples

Length data has been collected by SRHS dockside samplers since the initiation of the survey. Weights are typically collected for the same fish measured during dockside sampling. Other biological samples and data (scales, otoliths, spines, stomachs, gonads, and sex determination) are collected routinely and processed for ageing, diet studies, and maturity studies. Lists of priority species are provided to port agents but no specific sampling quotas are directed.

3 Results and Discussion

3.1 Landings

Landings in number are given by region (Table 2, Figure 3). These landings differ slightly from the values provided for the SEDAR 37 update (terminal year of 2016). Headboat areas 6, 7, and 8 were excluded due to a coding mistake. The annual differences averaged about 50 fish per year but ranged from 2 to 218 fish. Landings in pounds are shown by region (Table 3, Figure 4). The primary area of hogfish landings is west Florida (Table 3). Subregion tables and plots are confidential and provided to the assessment team.

3.2 Discards

Discards by subregion are primarily from southwest Florida and the west region (Table 4, Figure 6). Subregion tables and plots are confidential and provided to the assessment team. There is an increase in discards in southwest FL starting in about 2017. There is no information within the SRHS on the size of these fish with which to convert the discards in number to weight. However, the at-sea observer size data may be adequate to inform size compositions and average annual weights for converting discards from number to weight if needed for model input.

Comparisons of discard rates between SRHS logbooks and at-sea observer data can inform the validity of logbook discards. The discard rates for hogfish are difficult to compare due to limited observer records (Figure 7).

3.3 Confidentiality

Headboat landings and discards are confidential if fewer than three vessels contributed logbook records for any strata. The number of vessels reporting by subregion, region, and annually are given in tables 5 - 7. For hogfish, only the overall and regional annual catch and discards can be released to the public.

3.4 Uncertainty

Unweighted proxy CV estimates by region and overall are provided in tables 8 - 9. Regional proxy CV values weighted by subregion landings in number and weight are given in tables 10 and 11. Annual weighted proxy CV values weighted by regional landings in number and weight are provided in tables 12 and 13. The weighted proxy CVs should provide the best estimate for uncertainty.

3.5 Effort

The finer scale effort estimates by subregion show angler days and angler trips decreased until about 2010 followed by an increase until 2015 after which it has been relatively constant. (Tables 18 - 19, Figure 8). The regional trend in effort is consistent with subregions (Tables 16 - 17, Figure 9). Total estimated headboat also has the same trend as the subregions (Tables 14 - 15). Reports from industry staff, captains or owners, and port agents indicated fuel prices, the economy and fishing regulations are the factors that most affected the amount of trips, number of passengers, and overall decrease in fishing effort through 2010.

3.6 Biological Samples

Annual numbers of hogfish measured for natural total length in the headboat fleet by subregion and region are given in tables 20 - 21. The number of trips from which hogfish were measured are summarized in Tables 22 - 23. Mean total lengths (mm) and weight (g) and associated CVs for the headboat fishery are tabulated by subregion and region in Tables 24 - 31. Patterns in length and weight by year and region are shown in Figures 10 and 11. The sample sizes are small for most years. There are only a few years that meet the SEDAR best practice minimum sample sizes for regional composition development (30 fish and 10 trips).

4 Tables

Table 1: Number of vessels in the SRHS by year and region (Gulf - SW Florida to Texas, Atlantic - North Carolina to SE Florida.

year	Atlantic	Gulf
1981	92	
1982	89	
1983	86	
1984	90	
1985	89	
1986	94	87
1987	94	79
1988	94	72
1989	95	95
1990	93	88
1991	94	80
1992	105	80
1993	95	81
1994	95	84
1995	89	82
1996	90	73
1997	92	70
1998	89	73
1999	86	69
2000	89	72
2001	84	72
2002	77	61
2003	68	65
2004	81	65
2005	76	74
2006	76	70
2007	78	69
2008	84	71
2009	82	76
2010	86	78
2011	77	73
2012	78	71
2013	76	68
2014	76	68
2015	73	68
2016	76	69
2017	66	71
2018	65	72
2019	65	72
2020	66	68
2021	62	70
2022	62	68
2023	61	68
2024	62	68

Table 2: Hogfish landings by region in number. Non-Florida landings were excluded.

year	East	West	Total
1981	1063	0	1063
1982	105	0	105
1983	314	0	314
1984	567	0	567
1985	273	0	273
1986	589	117	706
1987	562	34	596
1988	512	187	699
1989	392	41	433
1990	226	147	373
1991	239	94	333
1992	383	213	596
1993	251	167	418
1994	188	654	842
1995	414	465	879
1996	230	13	243
1997	226	7	233
1998	236	25	261
1999	207	40	247
2000	166	66	232
2001	200	57	257
2002	152	61	213
2003	146	80	226
2004	467	53	520
2005	543	123	666
2006	608	41	649
2007	336	76	412
2008	203	61	264
2009	134	125	259
2010	71	430	501
2011	95	2945	3040
2012	106	4137	4243
2013	124	1975	2099
2014	181	2030	2211
2015	283	1272	1555
2016	167	2553	2720
2017	78	2155	2233
2018	12	1405	1417
2019	0	1645	1645
2020	15	1622	1637
2021	7	2331	2338
2022	6	2168	2174
2023	43	2730	2773
2024	12	2121	2133

Table 3: Hogfish landings by region in pounds. Non-Florida landings were excluded.

year	East	West	Total
1981	1984	0	1984
1982	221	0	221
1983	848	0	848
1984	1268	0	1268
1985	721	0	721
1986	1259	191	1450
1987	1029	71	1100
1988	1072	373	1445
1989	513	59	572
1990	375	447	822
1991	1938	290	2228
1992	2869	477	3346
1993	897	887	1784
1994	543	2868	3411
1995	2451	1833	4283
1996	1646	53	1699
1997	500	15	515
1998	1191	102	1294
1999	579	83	662
2000	1248	493	1741
2001	1538	418	1956
2002	1167	393	1560
2003	209	118	327
2004	1533	103	1636
2005	950	209	1158
2006	874	244	1118
2007	1154	132	1287
2008	351	94	445
2009	195	187	382
2010	110	663	773
2011	744	4868	5612
2012	181	8560	8741
2013	251	2914	3165
2014	368	2866	3234
2015	732	2126	2858
2016	277	5299	5576
2017	138	3388	3526
2018	63	4183	4246
2019	0	4215	4215
2020	69	4082	4151
2021	13	4369	4383
2022	18	6321	6340
2023	122	6323	6445
2024	56	6409	6464

Table 4: Hogfish discards by region in number of fish. Non-Florida discards were excluded.

year	East	West	Total
2004	23	3	26
2005	99	99	198
2006	178	93	271
2007	115	12	127
2008	175	5	180
2009	73	6	79
2010	39	22	61
2011	32	402	434
2012	86	522	608
2013	110	126	236
2014	109	128	237
2015	155	282	437
2016	112	487	599
2017	149	777	926
2018	118	1857	1975
2019	66	2621	2687
2020	99	2393	2492
2021	258	4001	4259
2022	132	3587	3719
2023	213	3786	3999
2024	130	2452	2582

Table 5: Hogfish number of vessels by subregion contributing to landings estimates. Strata with less than 3 vessels reporting are considered confidential.

year	West_of_FL	NW_FL	SW_FL	Keys	SE_FL	NE_FL	North_of_FL
1981				9	3		
1982				7	2	1	5
1983				9			2
1984				10	4		5
1985				10	4		8
1986		1	8	10	4	1	5
1987	1	1	4	11	6	3	9
1988	1	1	7	9	3		6
1989			7	10	5	1	3
1990	1	2	18	6	6		7
1991	2	1	13	8	5		9
1992			8	14	13	2	13
1993		3	16	14	11		12
1994		2	12	11	12		16
1995			10	12	12	1	12
1996		1	6	14	5		13
1997			4	13	9		20
1998			4	12	7		15
1999	1	1	8	10	2		15
2000		1	11	8	1		16
2001			8	9	4		12
2002			7	9	1		11
2003			6	9	1		11
2004			9	11	3		7
2005	1		9	10	3		5
2006		1	7	10	2		8
2007	1		8	8	2	1	9
2008		1	17	8	7	1	9
2009	1	2	15	9	6	1	4
2010			11	9	9		7
2011	1	1	16	8	5	1	6
2012		1	13	8	6		4
2013	2		12	8	5	1	5
2014	2	1	12	10	8		6
2015	1		15	11	8	1	5
2016			15	10	4		2
2017	2	1	13	10	1		5
2018			15	8			4
2019			14	7	1		2
2020			15	7	2		6
2021		1	13	5	2	1	6
2022			13	5	1		5
2023	1		13	8	4		5
2024	1		16	7	4		6

Table 6: Hogfish number of vessels by region contributing to landings estimates. Strata with less than 3 vessels reporting are considered confidential.

year	East	West
1981	12	
1982	10	
1983	9	
1984	14	
1985	14	
1986	15	9
1987	20	5
1988	12	8
1989	16	7
1990	12	20
1991	13	14
1992	29	8
1993	25	19
1994	23	14
1995	25	10
1996	19	7
1997	22	4
1998	19	4
1999	12	9
2000	9	12
2001	13	8
2002	10	7
2003	10	6
2004	14	9
2005	13	9
2006	12	8
2007	11	8
2008	16	18
2009	16	17
2010	18	11
2011	14	17
2012	14	14
2013	14	12
2014	18	13
2015	20	15
2016	14	15
2017	11	14
2018	8	15
2019	8	14
2020	9	15
2021	8	14
2022	6	13
2023	12	13
2024	11	16

Table 7: Hogfish number of vessels annually contributing to landings estimates. Strata with less than 3 vessels reporting are considered confidential.

year	n_vessel
1981	12
1982	15
1983	11
1984	19
1985	22
1986	29
1987	35
1988	27
1989	26
1990	40
1991	38
1992	50
1993	56
1994	53
1995	47
1996	39
1997	46
1998	38
1999	37
2000	37
2001	33
2002	28
2003	27
2004	30
2005	28
2006	28
2007	29
2008	43
2009	38
2010	36
2011	38
2012	32
2013	33
2014	39
2015	41
2016	31
2017	32
2018	27
2019	24
2020	30
2021	28
2022	24
2023	31
2024	34

Table 8: Unweighted proxy CV values by region. These values are based on logbook reporting compliance and are consistent across species.

year	East	West
1981	0.278	
1982	0.489	
1983	0.385	
1984	0.595	
1985	0.592	
1986	0.507	0.695
1987	0.514	0.746
1988	0.565	0.551
1989	0.610	0.494
1990	0.610	0.208
1991	0.643	0.140
1992	0.400	0.139
1993	0.350	0.114
1994	0.487	0.225
1995	0.466	0.373
1996	0.655	0.312
1997	0.472	0.253
1998	0.492	0.419
1999	0.642	0.419
2000	0.696	0.436
2001	0.677	0.433
2002	0.729	0.346
2003	0.718	0.340
2004	0.752	0.296
2005	0.754	0.254
2006	0.750	0.323
2007	0.665	0.325
2008	0.250	0.074
2009	0.119	0.055
2010	0.077	0.086
2011	0.073	0.059
2012	0.114	0.066
2013	0.120	0.050
2014	0.053	0.050
2015	0.066	0.051
2016	0.201	0.050
2017	0.059	0.053
2018	0.058	0.051
2019	0.058	0.052
2020	0.057	0.050
2021	0.050	0.050
2022	0.099	0.050
2023	0.068	0.050
2024	0.064	0.050

Table 9: Unweighted proxy CV values by year. These values are based on logbook reporting compliance and are consistent across species.

year	cv
1981	0.278
1982	0.489
1983	0.385
1984	0.595
1985	0.592
1986	0.559
1987	0.582
1988	0.561
1989	0.576
1990	0.485
1991	0.509
1992	0.320
1993	0.270
1994	0.400
1995	0.434
1996	0.545
1997	0.394
1998	0.462
1999	0.562
2000	0.606
2001	0.586
2002	0.588
2003	0.574
2004	0.589
2005	0.592
2006	0.621
2007	0.544
2008	0.177
2009	0.091
2010	0.081
2011	0.067
2012	0.094
2013	0.095
2014	0.052
2015	0.061
2016	0.150
2017	0.056
2018	0.055
2019	0.055
2020	0.054
2021	0.050
2022	0.077
2023	0.060
2024	0.058

Table 10: Regional proxy CV values weighted by subregion landings of hogfish in number.

year	West	East
1981	0.0000	0.5385
1982	0.0000	0.4099
1983	0.0000	0.5541
1984	0.0000	0.5719
1985	0.0000	0.5587
1986	0.1005	0.3933
1987	0.0432	0.4279
1988	0.1170	0.4331
1989	0.0542	0.5830
1990	0.0839	0.3566
1991	0.0241	0.4226
1992	0.0410	0.2451
1993	0.0388	0.1788
1994	0.1867	0.0971
1995	0.2602	0.2002
1996	0.0215	0.4092
1997	0.0100	0.3665
1998	0.0561	0.3574
1999	0.0878	0.2460
2000	0.1707	0.2586
2001	0.1352	0.4907
2002	0.1381	0.4495
2003	0.1461	0.4305
2004	0.0334	0.5914
2005	0.0474	0.5149
2006	0.0169	0.5537
2007	0.0435	0.4144
2008	0.0153	0.1299
2009	0.0265	0.0392
2010	0.0840	0.0091
2011	0.0635	0.0026
2012	0.0523	0.0049
2013	0.0470	0.0051
2014	0.0464	0.0044
2015	0.0411	0.0111
2016	0.0469	0.0082
2017	0.0517	0.0021
2018	0.0511	0.0005
2019	0.0513	0.0000
2020	0.0495	0.0005
2021	0.0499	0.0001
2022	0.0499	0.0003
2023	0.0492	0.0013
2024	0.0497	0.0003

Table 11: Regional proxy CV values weighted by subregion landings of hogfish in weight.

year	West	East
1981	0.0000	0.5386
1982	0.0000	0.4165
1983	0.0000	0.5541
1984	0.0000	0.5702
1985	0.0000	0.5589
1986	0.0801	0.4083
1987	0.0486	0.4247
1988	0.1640	0.4388
1989	0.0591	0.5776
1990	0.1158	0.2685
1991	0.0111	0.5119
1992	0.0163	0.3268
1993	0.0484	0.1493
1994	0.2022	0.0692
1995	0.2104	0.2401
1996	0.0125	0.4204
1997	0.0100	0.3665
1998	0.0463	0.3667
1999	0.0679	0.2564
2000	0.1700	0.2587
2001	0.1303	0.4958
2002	0.1214	0.4713
2003	0.1486	0.4266
2004	0.0206	0.6171
2005	0.0462	0.5179
2006	0.0584	0.4619
2007	0.0242	0.4560
2008	0.0140	0.1315
2009	0.0269	0.0387
2010	0.0840	0.0091
2011	0.0569	0.0109
2012	0.0525	0.0041
2013	0.0460	0.0069
2014	0.0447	0.0061
2015	0.0374	0.0156
2016	0.0475	0.0067
2017	0.0515	0.0023
2018	0.0508	0.0009
2019	0.0513	0.0000
2020	0.0492	0.0010
2021	0.0498	0.0002
2022	0.0499	0.0003
2023	0.0491	0.0016
2024	0.0496	0.0005

Table 12: Annual proxy CV values weighted by regional landings of hogfish in number. Non-Florida areas are excluded.

year	cv
1981	0.539
1982	0.410
1983	0.554
1984	0.572
1985	0.559
1986	0.494
1987	0.471
1988	0.550
1989	0.637
1990	0.441
1991	0.447
1992	0.286
1993	0.218
1994	0.284
1995	0.460
1996	0.431
1997	0.377
1998	0.414
1999	0.334
2000	0.429
2001	0.626
2002	0.588
2003	0.577
2004	0.625
2005	0.562
2006	0.571
2007	0.458
2008	0.145
2009	0.066
2010	0.093
2011	0.066
2012	0.057
2013	0.052
2014	0.051
2015	0.052
2016	0.055
2017	0.054
2018	0.052
2019	0.051
2020	0.050
2021	0.050
2022	0.050
2023	0.051
2024	0.050

Table 13: Annual proxy CV values weighted by regional landings of hogfish in weight. Non-Florida areas are excluded.

year	cv
1981	0.539
1982	0.416
1983	0.554
1984	0.570
1985	0.559
1986	0.488
1987	0.473
1988	0.603
1989	0.637
1990	0.384
1991	0.523
1992	0.343
1993	0.198
1994	0.271
1995	0.451
1996	0.433
1997	0.377
1998	0.413
1999	0.324
2000	0.429
2001	0.626
2002	0.593
2003	0.575
2004	0.638
2005	0.564
2006	0.520
2007	0.480
2008	0.145
2009	0.066
2010	0.093
2011	0.068
2012	0.057
2013	0.053
2014	0.051
2015	0.053
2016	0.054
2017	0.054
2018	0.052
2019	0.051
2020	0.050
2021	0.050
2022	0.050
2023	0.051
2024	0.050

Table 14: Estimates of total effort in angler - days by year.

year	Angler_Day
1981	298883
1982	293133
1983	277863
1984	288994
1985	280845
1986	557135
1987	550090
1988	497723
1989	525189
1990	536801
1991	454334
1992	449325
1993	444871
1994	446858
1995	389910
1996	352086
1997	319809
1998	338670
1999	338312
2000	339428
2001	318295
2002	291105
2003	287796
2004	332131
2005	301311
2006	297653
2007	292064
2008	252545
2009	276767
2010	232723
2011	287952
2012	308613
2013	324066
2014	368422
2015	369577
2016	378060
2017	303201
2018	290875
2019	285809
2020	209893
2021	301291
2022	253800
2023	254880
2024	255506

Table 15: Estimates of total effort in angler - trips by year.

year	Angler_Trip
1981	302697
1982	364921
1983	329299
1984	433144
1985	447240
1986	753878
1987	741192
1988	667221
1989	720214
1990	769582
1991	664356
1992	648175
1993	600420
1994	641823
1995	575313
1996	551787
1997	473674
1998	450424
1999	418781
2000	507403
2001	455579
2002	410414
2003	419985
2004	475973
2005	445598
2006	453207
2007	373958
2008	368223
2009	402650
2010	342991
2011	426029
2012	471001
2013	469136
2014	552102
2015	556085
2016	564193
2017	434012
2018	412635
2019	403548
2020	288531
2021	426182
2022	373913
2023	352348
2024	326001

Table 16: Estimates of total effort in angler - days by region.

year	West	East
1981	0	298883
1982	0	293133
1983	0	277863
1984	0	288994
1985	0	280845
1986	239303	317832
1987	217049	333041
1988	195948	301775
1989	207739	317450
1990	210379	326422
1991	172990	281344
1992	183470	265855
1993	204659	240212
1994	203616	243242
1995	181464	208446
1996	154913	197173
1997	149442	170367
1998	185331	153339
1999	176117	162195
2000	159331	180097
2001	156676	161619
2002	141831	149274
2003	144211	143585
2004	158430	173701
2005	130233	171078
2006	124049	173604
2007	133856	158208
2008	129480	123065
2009	141289	135478
2010	109707	123016
2011	155620	132332
2012	161135	147478
2013	160277	163789
2014	174599	193823
2015	176375	193202
2016	183147	194913
2017	178816	124385
2018	171996	118879
2019	167167	118642
2020	126794	83099
2021	181632	119659
2022	149368	104432
2023	149735	105145
2024	146544	108962

Table 17: Estimates of total effort in angler - trips by region.

year	West	East
1981	0	302697
1982	0	364921
1983	0	329299
1984	0	433144
1985	0	447240
1986	274184	479694
1987	267591	473601
1988	260726	406495
1989	272942	447272
1990	297207	472376
1991	239661	424696
1992	248208	399967
1993	261706	338714
1994	271068	370755
1995	253612	321701
1996	226101	325685
1997	203473	270201
1998	234487	215936
1999	171206	247575
2000	225250	282154
2001	208022	247557
2002	192385	218029
2003	193631	226354
2004	210896	265077
2005	178513	267085
2006	172654	280553
2007	187669	186289
2008	185656	182567
2009	206000	196650
2010	158641	184350
2011	226768	199261
2012	237568	233433
2013	210147	258989
2014	230317	321785
2015	230305	325780
2016	241519	322674
2017	236702	197310
2018	227879	184757
2019	219139	184409
2020	164275	124256
2021	244632	181550
2022	213103	160810
2023	189400	162948
2024	171517	154484

Table 18: Estimates of total effort in angler - days by subregion.

year	West_of_FL	NW_FL	SW_FL	Keys	SE_FL	NE_FL	North_of_FL
1981				71709	154747	72427	78404
1982				71614	154558	66961	94478
1983				64721	129643	83499	89563
1984				71314	122446	95234	96179
1985				67227	119169	94449	97385
1986	62459	101336	137967	76218	128513	113101	98414
1987	69725	76111	140938	82174	136723	114144	114067
1988	78087	67648	128300	76641	115978	109156	118889
1989	66256	57233	150506	81586	132944	102920	101386
1990	65042	60758	149621	81182	147006	98234	100391
1991	66342	62392	110598	68468	127765	85111	108918
1992	86129	66180	117290	68002	107043	90810	102966
1993	92160	73703	130956	74698	91020	74494	107243
1994	113429	69110	134506	64656	113326	65260	100407
1995	100962	67798	113666	58261	94293	55892	105248
1996	102840	64336	90577	58821	93797	44555	92755
1997	91215	65599	83843	56059	64450	49858	100245
1998	85504	66664	118667	49605	53946	49788	100743
1999	66261	60959	115158	41781	65261	55153	88952
2000	63347	57106	102225	46228	76250	57619	73794
2001	61583	55748	100928	45888	62271	53460	83381
2002	73173	55554	86277	47904	54731	46639	72340
2003	81068	62555	81656	42544	49672	51369	60980
2004	64990	63494	94936	48319	74838	50544	77717
2005	59857	52797	77436	50785	72515	47778	67370
2006	75794	66346	57703	52678	73936	46990	83728
2007	66286	67997	65859	36431	69981	51796	91697
2008	44133	62118	67362	31345	40949	50771	66019
2009	54005	65623	75666	32241	38881	64356	62478
2010	47869	40594	69113	28835	42462	51719	67979
2011	50941	77303	78317	34382	44808	53142	64667
2012	55456	77770	83365	38610	51028	57840	62830
2013	73609	65525	94752	35887	63205	64697	63400
2014	71254	71758	102841	46296	88842	58685	66783
2015	76730	68465	107910	48115	92384	52703	64195
2016	73869	74046	109101	45183	98090	51640	65519
2017	72605	71131	107685	41656	36166	46563	58825
2018	75246	71976	100020	42692	34282	41905	56105
2019	73695	65503	101664	44404	32169	42069	58092
2020	66317	55296	71498	29919	23336	29844	49140
2021	88385	71915	109717	43598	29373	46688	68335
2022	80968	60660	88708	39496	31531	33405	55445
2023	74036	61289	88446	39999	33832	31314	52457
2024	69948	63194	83350	37471	43392	28099	45557

Table 19: Estimates of total effort in angler - trips by subregion.

year	West_of_FL	NW_FL	SW_FL	Keys	SE_FL	NE_FL	North_of_FL
1981				84900	133946	83851	107251
1982				69033	215658	80231	122718
1983				74993	167572	86734	118800
1984				76002	248306	108836	131691
1985				65527	264254	117459	137814
1986	68694	113266	160918	83754	263314	132626	134601
1987	85413	81574	186017	87207	264877	121517	154256
1988	88270	89839	170887	84949	208798	112748	161398
1989	75636	83495	189447	92295	235771	119207	135207
1990	78145	86057	211150	91706	253595	127075	132695
1991	77947	91359	148302	75381	238147	111168	141571
1992	96417	93415	154793	82288	204150	113529	134327
1993	104299	103730	157976	81800	170598	86316	138047
1994	120991	95943	175125	82434	211815	76507	127944
1995	107211	99130	154482	70598	184790	66313	130203
1996	112858	88637	137464	81250	190666	53770	116680
1997	93261	92456	111017	75220	133604	61377	124494
1998	90448	94472	140016	68172	89202	58562	126846
1999	50053	60200	111006	58777	122283	66515	114072
2000	73436	81876	143374	61821	152460	67873	118440
2001	66753	77104	130918	65210	116563	65784	108881
2002	69614	78282	114102	60904	101257	55869	103905
2003	88314	88820	104811	68544	93512	64298	104090
2004	65024	89440	121456	72088	130811	62178	108273
2005	73063	70467	108046	83127	124135	59824	96490
2006	85195	93998	78657	73814	147977	58762	123430
2007	144779	97819	89850	49925	73033	63331	122910
2008	28633	86463	99193	45222	74805	62540	97579
2009	57952	95887	110112	47327	73720	75603	92653
2010	50057	55243	103398	42097	81302	60951	101153
2011	53878	108573	118195	49460	85627	64173	97150
2012	63406	112360	125208	61019	96531	75883	96725
2013	83273	88296	121851	58223	120260	80506	94472
2014	82557	97097	133220	75614	173200	72971	97847
2015	90059	90528	139778	79327	178991	67461	94139
2016	85289	97570	143949	72487	183958	66229	98321
2017	84382	95083	141619	69037	68349	59924	85085
2018	88292	96370	131509	68641	63347	52768	82307
2019	84556	89143	129996	71556	60085	52767	85746
2020	73294	74486	89789	45397	42612	36247	71483
2021	108151	102584	142048	67558	54899	59093	102793
2022	104595	86934	126169	62860	56419	41530	83258
2023	86177	84979	104421	63755	61202	37991	76527
2024	72668	79520	91997	56241	64669	33574	64633

Table 20: Hogfish number of fish sampled by subregion.

year	SW_FL	Keys	SE_FL	North_of_FL
1972				2
1973				10
1974				2
1975				7
1976				27
1977				4
1978		20		1
1979		4		
1980		13	1	1
1981		28		5
1982		41	1	2
1983		48	1	1
1984		49		2
1985		28	1	6
1986	1	34	5	1
1987	1	39	3	3
1988		31		1
1989	2	18	1	3
1990		28		2
1991	4	2	1	10
1992		1	3	10
1993		8		7
1994	2	7	2	8
1995	3	1	2	22
1996	29	3		30
1997		4	6	50
1998		2	3	22
1999		7	1	15
2000		2	1	19
2001	1	2	1	7
2002	2	2	1	4
2003	3	7	3	1
2004	1	7	2	1
2005	1	9	5	3
2006		4	1	4
2007	3	3		10
2008	2	6	3	5
2009		2	1	
2010	1	1		1
2011	9	12		1
2012	30	27	2	
2013	27	5	1	1
2014	29	6	5	
2015	10	4	2	
2016			1	
2017	2		1	
2018	14			
2019	10	1		
2020	5			
2021	17			
2022	16			
2023	73	2	1	1
2024	93	2		1

Table 21: Hogfish number of fish sampled by region.

year	East	West
1972		
1973		
1974		
1975		
1976		
1977		
1978	20	
1979	4	
1980	14	
1981	28	
1982	42	
1983	49	
1984	49	
1985	29	
1986	39	1
1987	42	1
1988	31	
1989	19	2
1990	28	2
1991	3	4
1992	4	
1993	8	
1994	9	2
1995	3	3
1996	3	29
1997	10	
1998	5	
1999	8	
2000	3	
2001	3	1
2002	3	2
2003	10	3
2004	9	1
2005	14	1
2006	5	
2007	3	3
2008	9	2
2009	3	
2010	1	1
2011	12	9
2012	29	30
2013	6	27
2014	11	29
2015	6	10
2016	1	
2017	1	2
2018		14
2019	1	10
2020		5
2021		17
2022		16
2023	3	73
2024	2	93

Table 22: Hogfish number of trips sampled by subregion.

year	SW_FL	Keys	SE_FL	North_of_FL
1972				2
1973				7
1974				2
1975				7
1976				22
1977				4
1978		6		1
1979		4		
1980		9	1	1
1981		17		4
1982		33	1	2
1983		37	1	1
1984		34		2
1985		20	1	4
1986	1	25	3	1
1987	1	34	1	3
1988		22		1
1989	2	15	1	3
1990		18		2
1991	1	2	1	9
1992		1	3	7
1993		7		6
1994	2	6	2	5
1995	3	1	2	20
1996	1	3		15
1997		3	6	24
1998		2	3	13
1999		6	1	12
2000		2	1	16
2001	1	2	1	7
2002	2	1	1	4
2003	3	7	3	1
2004	1	6	2	1
2005	1	8	5	1
2006		4	1	4
2007	2	3		6
2008	2	5	3	4
2009		2	1	
2010	1	1		1
2011	1	10		1
2012	10	16	2	
2013	7	4	1	1
2014	14	6	5	
2015	6	4	2	
2016			1	
2017	2		1	
2018	11			
2019	6	1		
2020	4			
2021	8			
2022	15			
2023	34	2	1	1
2024	35	2		1

Table 23: Hogfish number of trips sampled by region.

year	East	West
1972		
1973		
1974		
1975		
1976		
1977		
1978	6	
1979	4	
1980	10	
1981	17	
1982	34	
1983	38	
1984	34	
1985	21	
1986	28	1
1987	35	1
1988	22	
1989	16	2
1990	18	2
1991	3	1
1992	4	
1993	7	
1994	8	2
1995	3	3
1996	3	1
1997	9	
1998	5	
1999	7	
2000	3	
2001	3	1
2002	2	2
2003	10	3
2004	8	1
2005	13	1
2006	5	
2007	3	2
2008	8	2
2009	3	
2010	1	1
2011	10	1
2012	18	10
2013	5	7
2014	11	14
2015	6	6
2016	1	
2017	1	2
2018		11
2019	1	6
2020		4
2021		8
2022		15
2023	3	34
2024	2	35

Table 24: Hogfish mean total length in mm by subregion.

year	SW_FL	Keys	SE_FL	North_of_FL
1972				520
1973				623
1974				548
1975				700
1976				713
1977				680
1978		424		580
1979		426		
1980		453	788	255
1981		382		246
1982		390	505	702
1983		397	455	203
1984		415		773
1985		424	563	708
1986	380	417	423	601
1987	405	377	405	694
1988		413		897
1989	438	349	277	616
1990		376		732
1991	277	326	407	678
1992		270	471	654
1993		361		671
1994	366	313	358	641
1995	462	340	381	637
1996	503	361		684
1997		348	422	658
1998		376	441	651
1999		377	525	671
2000		376	342	672
2001	472	378	452	700
2002	398	348	392	650
2003	416	348	444	757
2004	392	421	450	860
2005	427	401	501	347
2006		377	472	768
2007	393	427		667
2008	432	369	423	701
2009		378	420	
2010	480	385		487
2011	388	392		705
2012	403	396	442	
2013	388	432	485	415
2014	431	381	424	
2015	426	362	448	
2016			357	
2017	402		430	
2018	474			
2019	393	485		
2020	414			
2021	417			
2022	462			
2023	422	472	455	563
2024	449	568		513

Table 25: Hogfish total length CV in mm by subregion.

year	SW_FL	Keys	SE_FL	North_of_FL
1972				0.18
1973				0.17
1974				0.22
1975				0.13
1976				0.17
1977				0.09
1978		0.17		
1979		0.13		
1980		0.31		
1981		0.17		0.17
1982		0.21		0.16
1983		0.19		
1984		0.20		0.13
1985		0.24		0.05
1986		0.27	0.14	
1987		0.18	0.10	0.30
1988		0.21		
1989	0.07	0.11		0.26
1990		0.14		0.07
1991	0.07	0.02		0.19
1992			0.17	0.20
1993		0.11		0.23
1994	0.14	0.12	0.03	0.18
1995	0.35		0.09	0.20
1996	0.15	0.13		0.13
1997		0.22	0.10	0.17
1998		0.06	0.28	0.13
1999		0.12		0.16
2000		0.09		0.17
2001		0.03		0.13
2002	0.13	0.11		0.14
2003	0.15	0.12	0.07	
2004		0.17	0.09	
2005		0.16	0.17	0.02
2006		0.10		0.16
2007	0.04	0.11		0.18
2008	0.17	0.07	0.10	0.07
2009		0.05		
2010				
2011	0.10	0.10		
2012	0.13	0.11	0.11	
2013	0.12	0.27		
2014	0.14	0.14	0.11	
2015	0.16	0.13	0.21	
2016				
2017	0.07			
2018	0.22			
2019	0.07			
2020	0.09			
2021	0.08			
2022	0.21			
2023	0.09	0.04		
2024	0.34	0.01		

Table 26: Hogfish mean weight (g) by subregion.

year	SW_FL	Keys	SE_FL	North_of_FL
1972				2248
1973				3264
1974				3586
1975				4358
1976				4950
1977				4926
1978		1192		4250
1979		1235		
1980		1875	4750	226
1981		848		215
1982		914	1600	5470
1983		921	2200	90
1984		1013		4950
1985		1249	2900	4733
1986	742	929	1338	3200
1987	950	813	960	5300
1988		983		9330
1989	1065	672	320	3707
1990		795		5180
1991	322	550	810	4849
1992		270	1065	4196
1993		638		4451
1994	800	559	580	3517
1995	2167	720	615	3843
1996	1849	667		3972
1997		630	1253	3676
1998		645	1317	3459
1999		660	1550	4286
2000		585	540	4931
2001	1700	610	1170	5537
2002	865	610	1020	4620
2003	887	519	957	5070
2004	700	879	1100	6540
2005	1050	738	1137	600
2006		665	890	6110
2007	667	903		4185
2008	985	568	800	5350
2009		555	770	
2010	1290	870		1830
2011	748	706		6380
2012	852	775	915	
2013	769	682	1310	1090
2014	1006	577	934	
2015	1002	600	1265	
2016			680	
2017	670		900	
2018	1139			
2019	772	1450		
2020	908			
2021	868			
2022	1297			
2023	929	1310	1260	2580
2024	992	2315		1870

Table 27: Hogfish weight CV in g by subregion.

year	SW_FL	Keys	SE_FL	North_of_FL
1972				0.41
1973				0.41
1974				0.11
1975				0.25
1976				0.34
1977				0.29
1978		0.48		
1979		0.30		
1980		0.73		
1981		0.39		0.38
1982		0.63		0.48
1983		0.61		
1984		0.71		0.21
1985		0.75		0.11
1986		0.65	0.39	
1987		0.52	0.32	0.64
1988		0.69		
1989	0.09	0.38		0.62
1990		0.46		0.03
1991	0.26	0.08		0.47
1992			0.60	0.51
1993		0.22		0.54
1994	0.14	0.29	0.12	0.65
1995	1.06		0.43	0.53
1996	0.40	0.30		0.30
1997		0.62	0.38	0.44
1998		0.32	0.80	0.33
1999		0.35		0.41
2000		0.08		0.43
2001		0.00		0.17
2002	0.16	0.09		0.34
2003	0.43	0.33	0.04	
2004		0.52	0.08	
2005		0.42	0.47	0.13
2006		0.40		0.47
2007	0.07	0.30		0.36
2008	0.25	0.13	0.28	0.23
2009		0.06		
2010				
2011	0.22	0.25		
2012	0.34	0.40	0.18	
2013	0.29	0.24		
2014	0.34	0.40	0.33	
2015	0.55	0.27	0.63	
2016				
2017	0.17			
2018	0.35			
2019	0.14			
2020	0.22			
2021	0.25			
2022	0.88			
2023	0.24			
2024	0.23	0.02		

Table 28: Hogfish mean total length in mm by region.

year	East	West
1972		
1973		
1974		
1975		
1976		
1977		
1978	424	
1979	426	
1980	477	
1981	382	
1982	393	
1983	398	
1984	415	
1985	429	
1986	418	380
1987	379	405
1988	413	
1989	345	438
1990	376	308
1991	353	277
1992	420	
1993	361	
1994	323	366
1995	367	462
1996	361	503
1997	392	
1998	415	
1999	395	
2000	365	
2001	403	472
2002	363	398
2003	377	416
2004	427	392
2005	437	427
2006	396	
2007	427	393
2008	387	432
2009	392	
2010	385	480
2011	392	388
2012	399	403
2013	441	388
2014	401	431
2015	391	426
2016	357	
2017	430	402
2018		474
2019	485	393
2020		414
2021		417
2022		462
2023	467	422
2024	568	449

Table 29: Hogfish total length CV in mm by region.

year	East	West
1972		
1973		
1974		
1975		
1976		
1977		
1978	0.17	
1979	0.13	
1980	0.34	
1981	0.17	
1982	0.21	
1983	0.19	
1984	0.20	
1985	0.24	
1986	0.26	
1987	0.18	
1988	0.21	
1989	0.12	0.07
1990	0.14	0.08
1991	0.13	0.07
1992	0.29	
1993	0.11	
1994	0.12	0.14
1995	0.09	0.35
1996	0.13	0.15
1997	0.17	
1998	0.23	
1999	0.17	
2000	0.09	
2001	0.11	
2002	0.10	0.13
2003	0.16	0.15
2004	0.15	
2005	0.20	
2006	0.14	
2007	0.11	0.04
2008	0.10	0.17
2009	0.07	
2010		
2011	0.10	0.10
2012	0.11	0.13
2013	0.24	0.12
2014	0.13	0.14
2015	0.18	0.16
2016		
2017		0.07
2018		0.22
2019		0.07
2020		0.09
2021		0.08
2022		0.21
2023	0.03	0.09
2024	0.01	0.34

Table 30: Hogfish mean weight (g) by region.

year	East	West
1972		
1973		
1974		
1975		
1976		
1977		
1978	1192	
1979	1235	
1980	2137	
1981	848	
1982	930	
1983	947	
1984	1013	
1985	1306	
1986	984	742
1987	824	950
1988	983	
1989	653	1065
1990	795	430
1991	637	322
1992	800	
1993	638	
1994	563	800
1995	650	2167
1996	667	1849
1997	1004	
1998	1048	
1999	771	
2000	570	
2001	797	1700
2002	747	865
2003	650	887
2004	928	700
2005	838	1050
2006	710	
2007	903	667
2008	646	985
2009	627	
2010	870	1290
2011	706	748
2012	784	852
2013	808	769
2014	739	1006
2015	822	1002
2016	680	
2017	900	670
2018		1139
2019	1450	772
2020		908
2021		868
2022		1297
2023	1285	929
2024	2315	992

Table 31: Hogfish weight CV in g by region.

year	East	West
1972		
1973		
1974		
1975		
1976		
1977		
1978	0.48	
1979	0.30	
1980	0.73	
1981	0.39	
1982	0.62	
1983	0.62	
1984	0.71	
1985	0.74	
1986	0.61	
1987	0.50	
1988	0.69	
1989	0.40	0.09
1990	0.46	0.16
1991	0.24	0.26
1992	0.81	
1993	0.22	
1994	0.26	0.14
1995	0.30	1.06
1996	0.30	0.40
1997	0.53	
1998	0.80	
1999	0.49	
2000	0.08	
2001	0.41	
2002	0.32	0.16
2003	0.39	0.43
2004	0.44	
2005	0.47	
2006	0.35	
2007	0.30	0.07
2008	0.27	0.25
2009	0.20	
2010		
2011	0.25	0.22
2012	0.39	0.34
2013	0.39	0.29
2014	0.43	0.34
2015	0.62	0.55
2016		
2017		0.17
2018		0.35
2019		0.14
2020		0.22
2021		0.25
2022		0.88
2023	0.03	0.24
2024	0.02	0.23

5 Figures

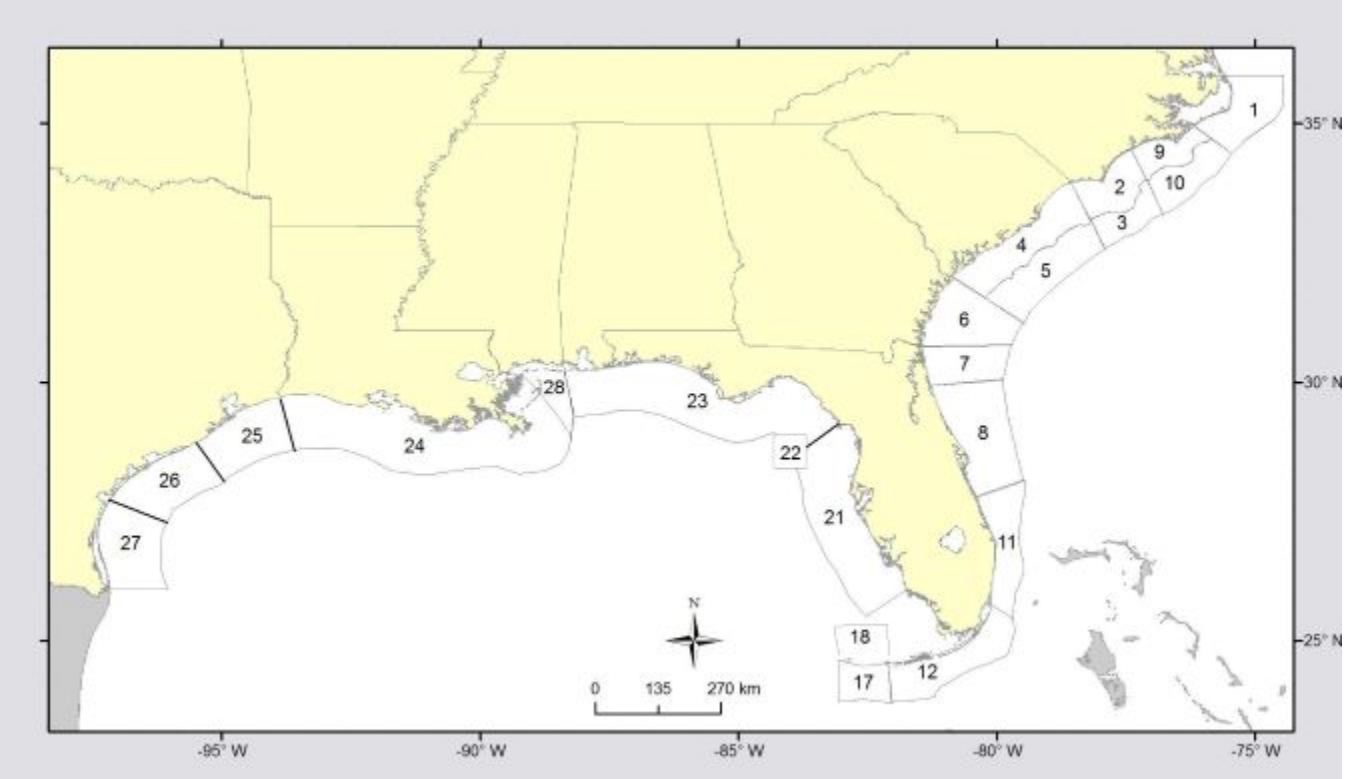

Figure 1: Headboat sampling areas prior to 2013.

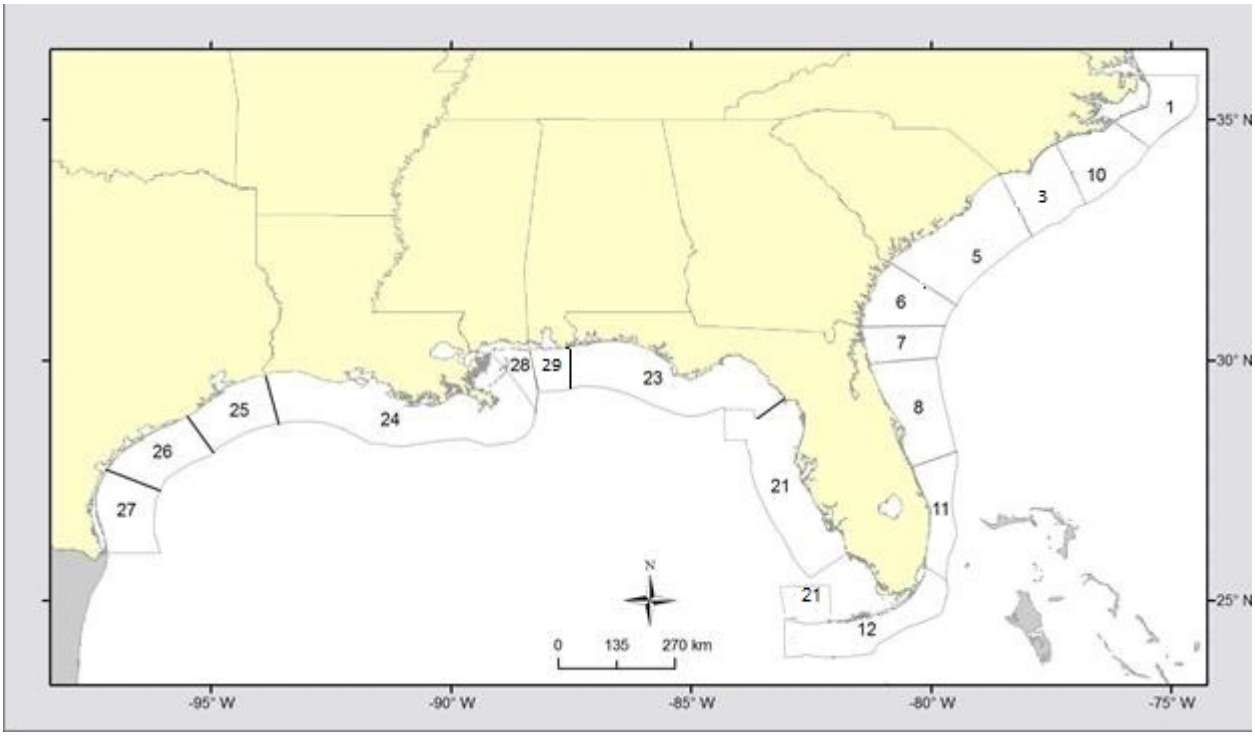

Figure 2: Headboat sampling areas 2013 - present.

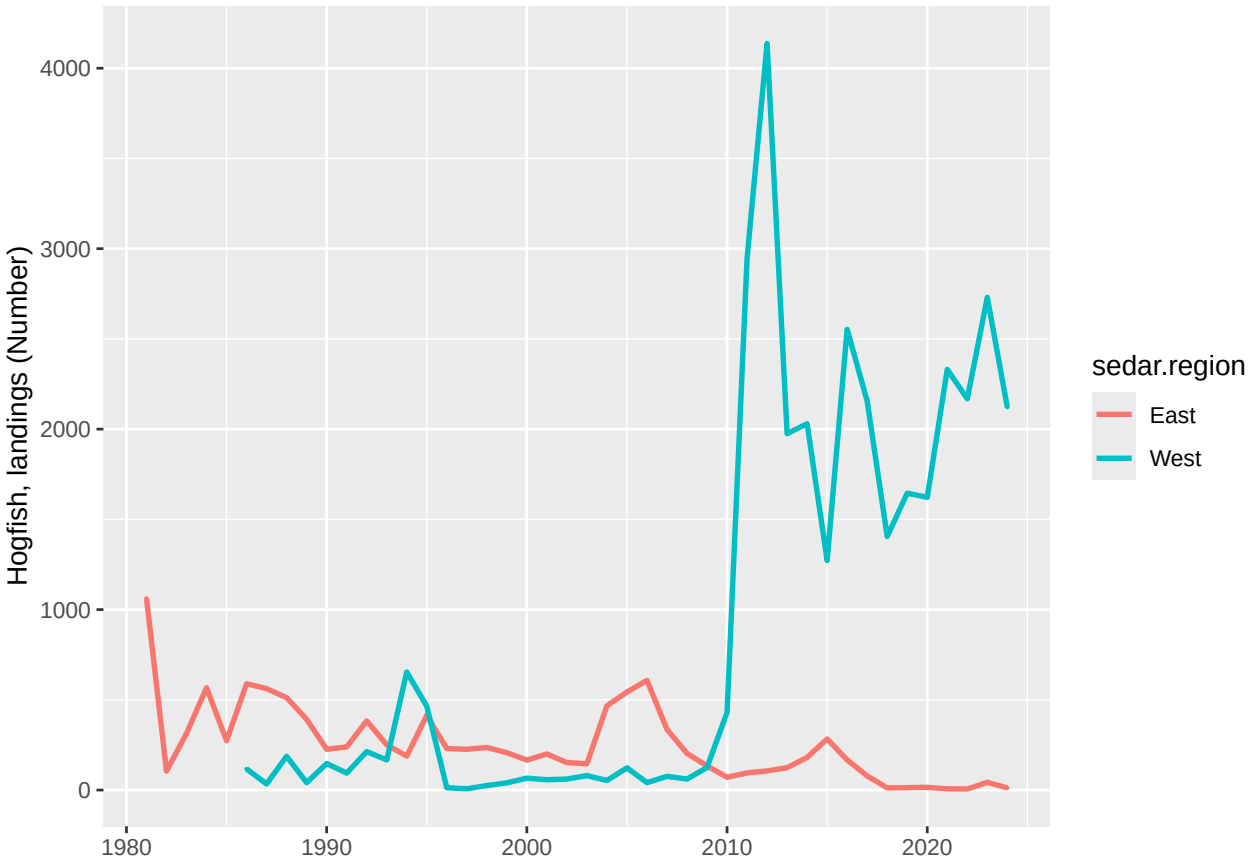

Figure 3: Hogfish landings in number by region. Non-Florida areas excluded.

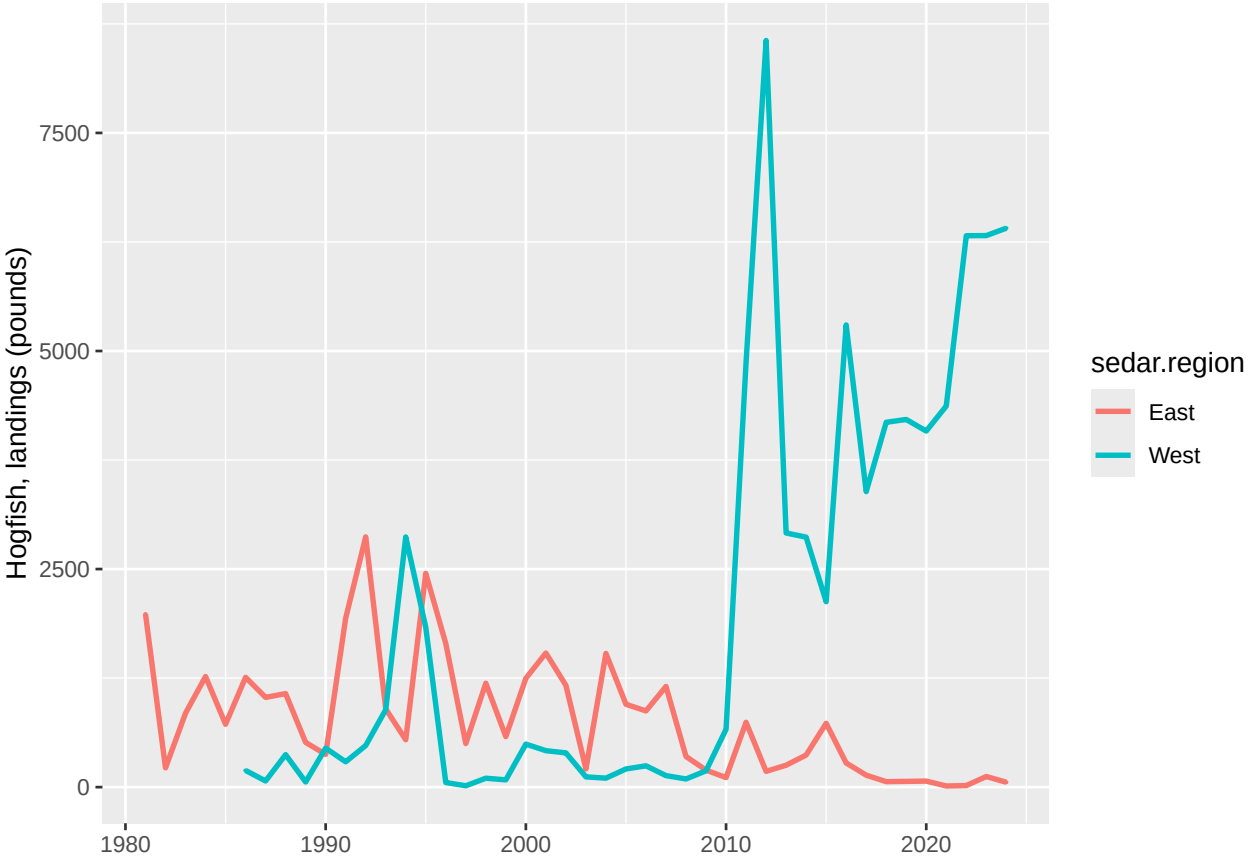

Figure 4: Hogfish landings in pounds by region. Non-Florida areas excluded.

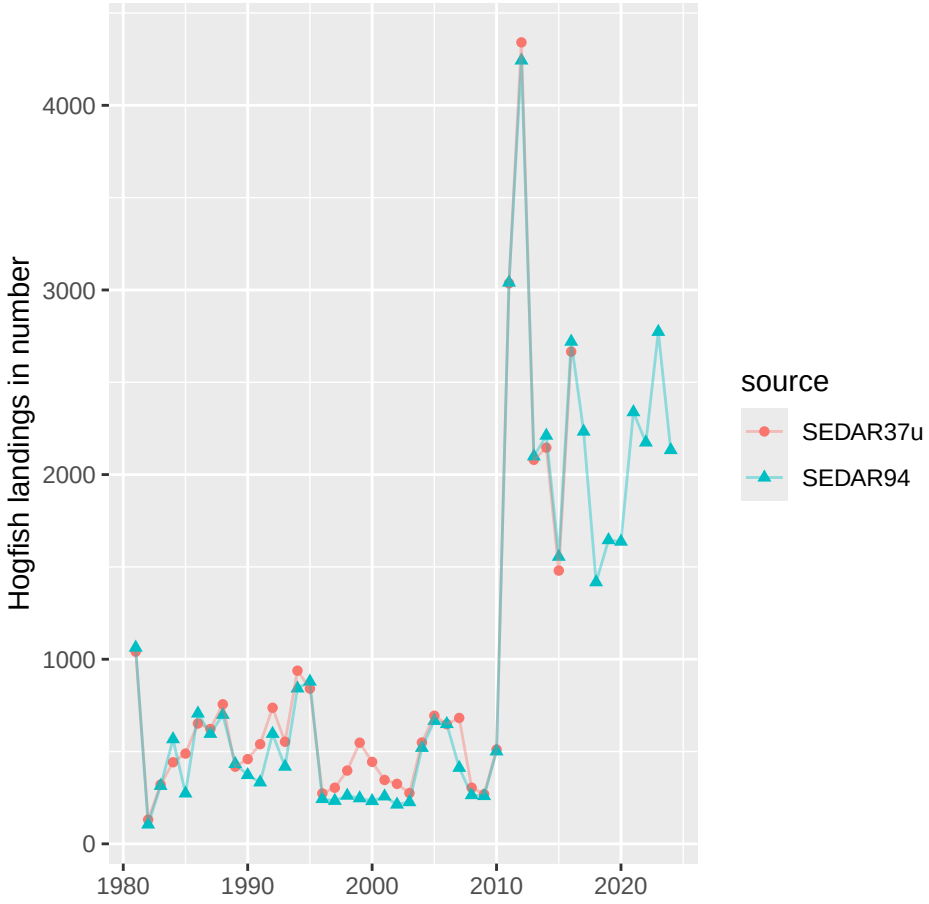

Figure 5: Comparison to SEDAR 37 update model input for hogfish landings in number.

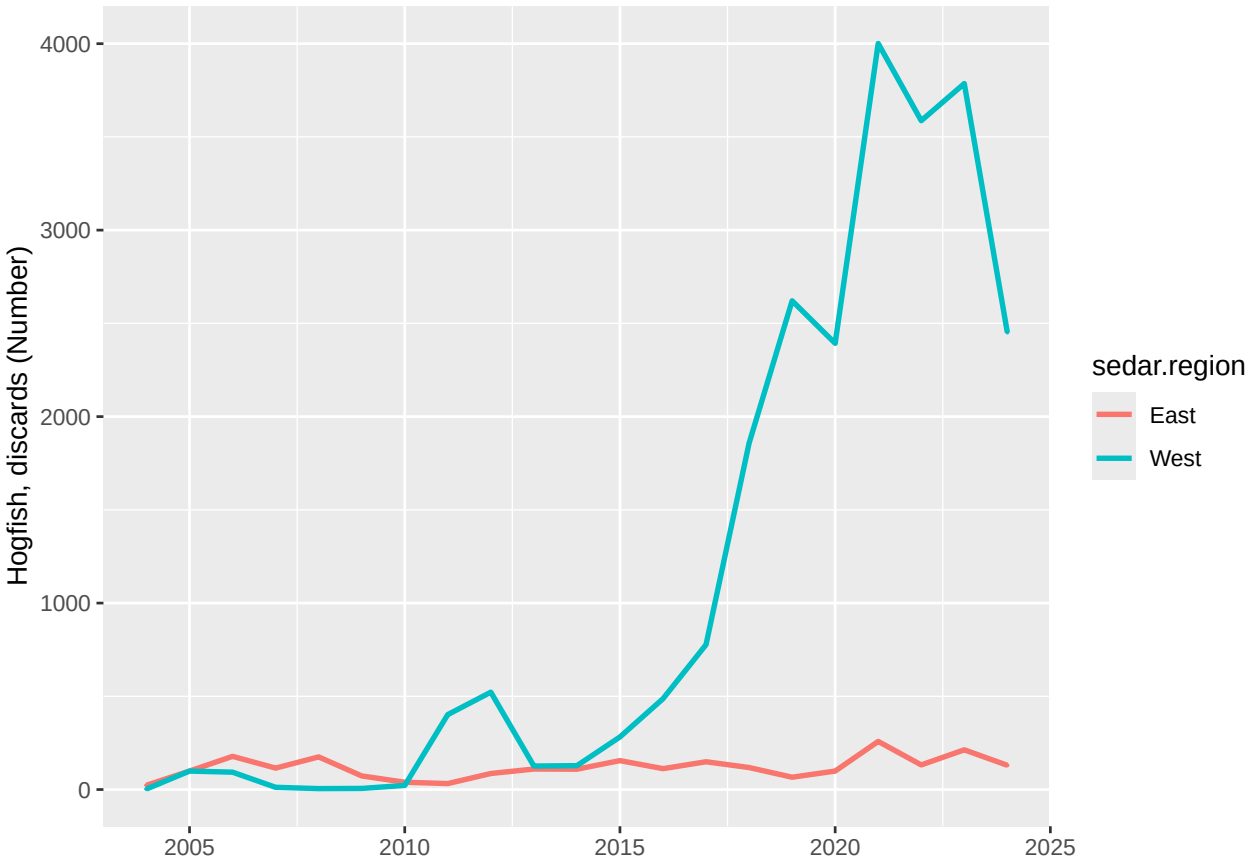

Figure 6: Hogfish discards in number by region. Non-Florida areas are excluded.

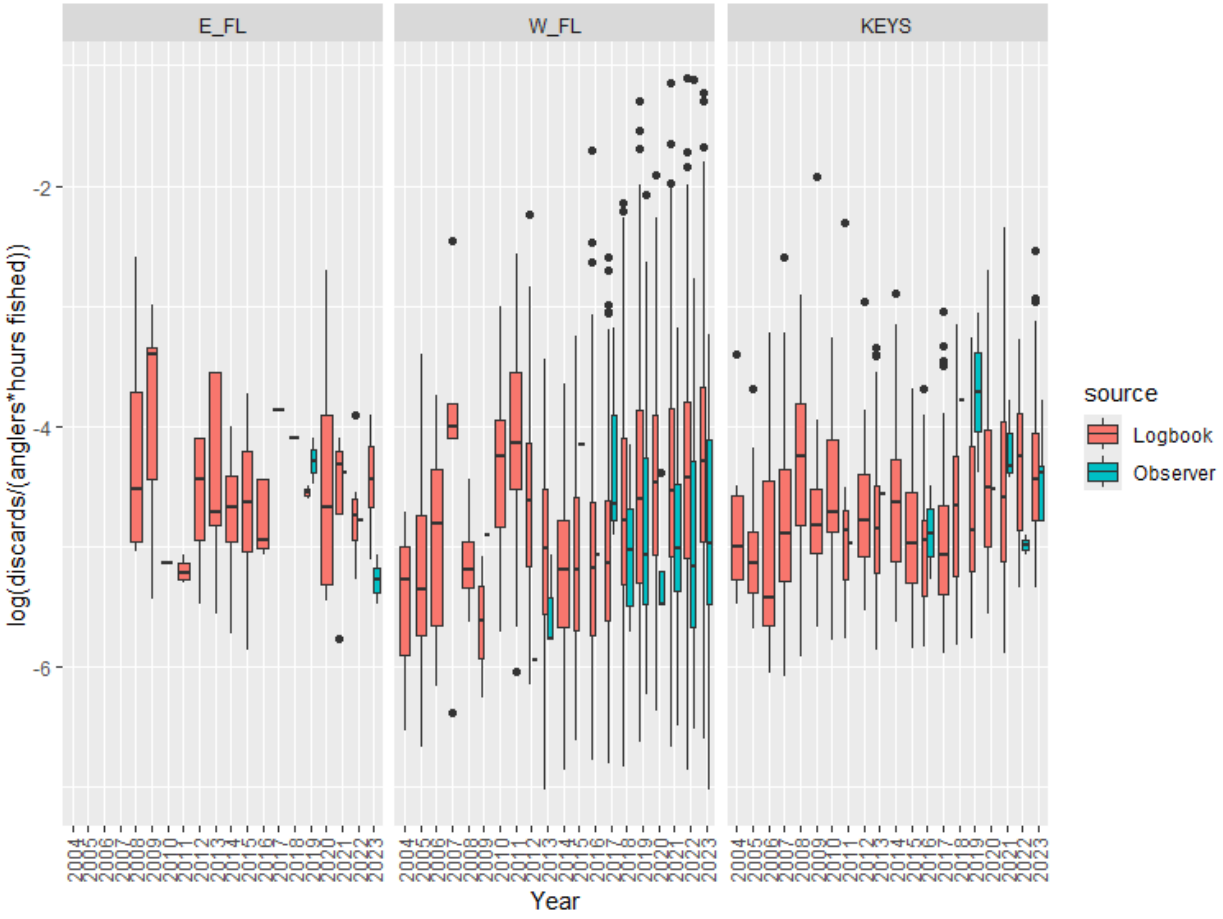

Figure 7: Comparison of SHRS logbook and headboat at-sea observer discard rates for hogfish

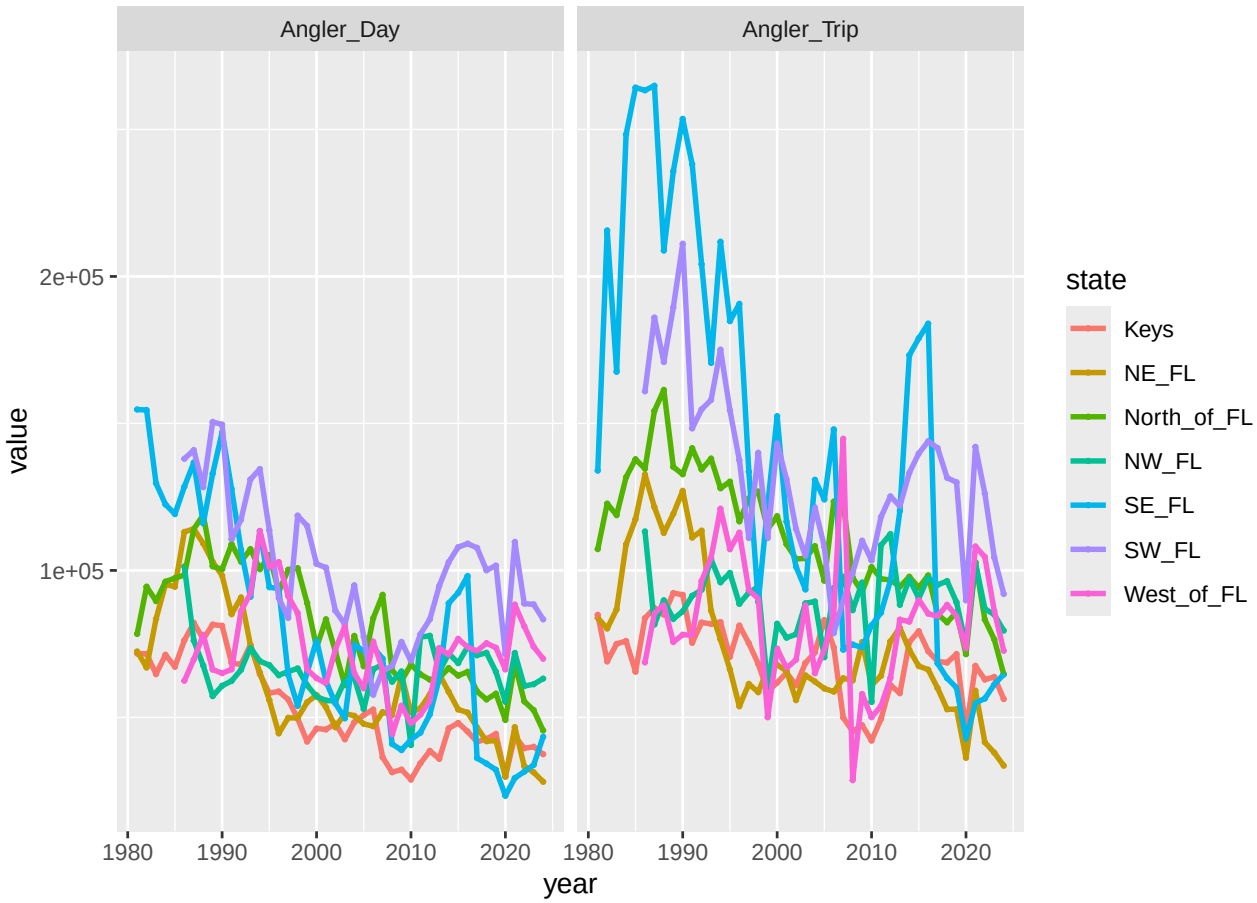

Figure 8: SRHS total estimated angler days and angler trips by subregion.

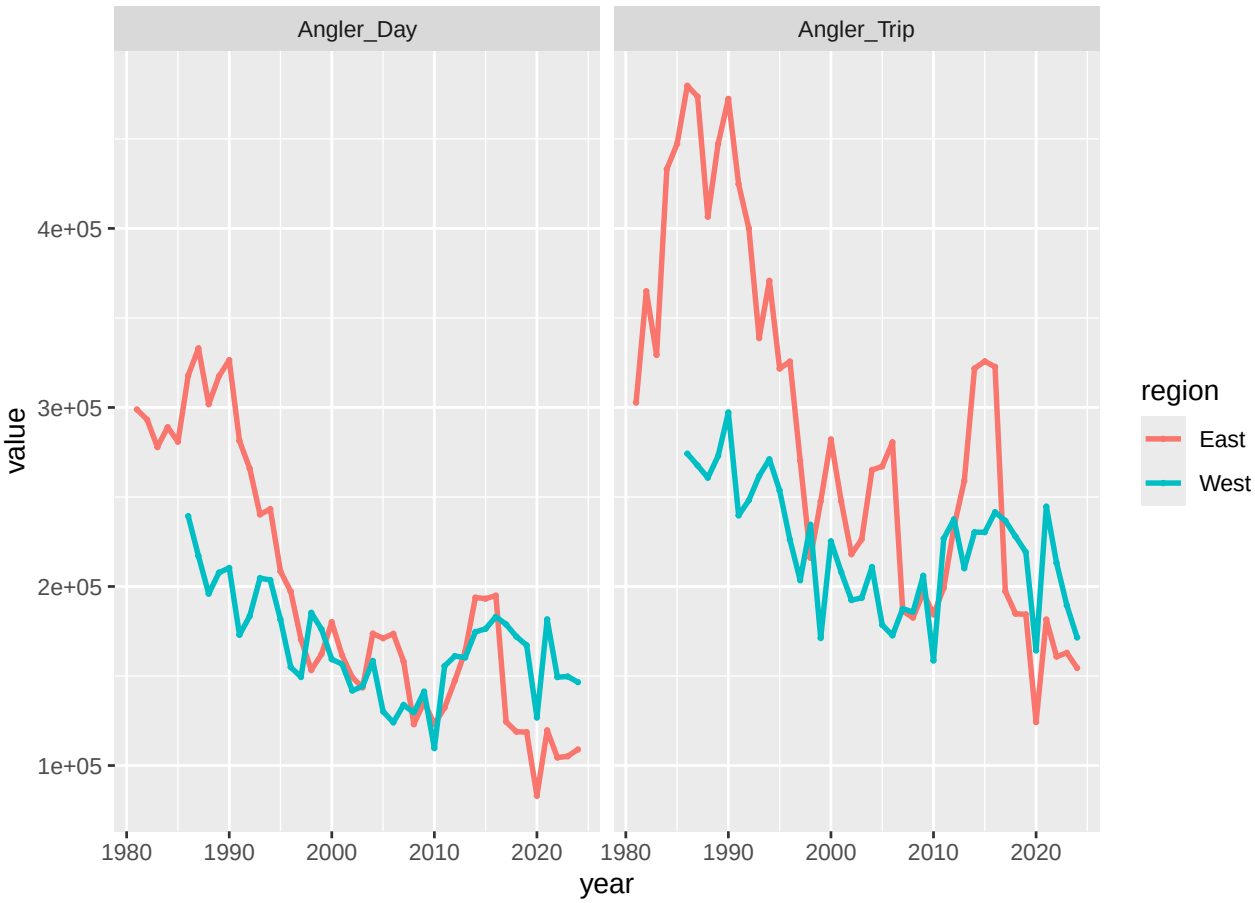

Figure 9: SRHS total estimated angler days and angler trips by region. East represents the East FL, West represents the West FL and the FL Keys. Non-Florida effort is excluded.

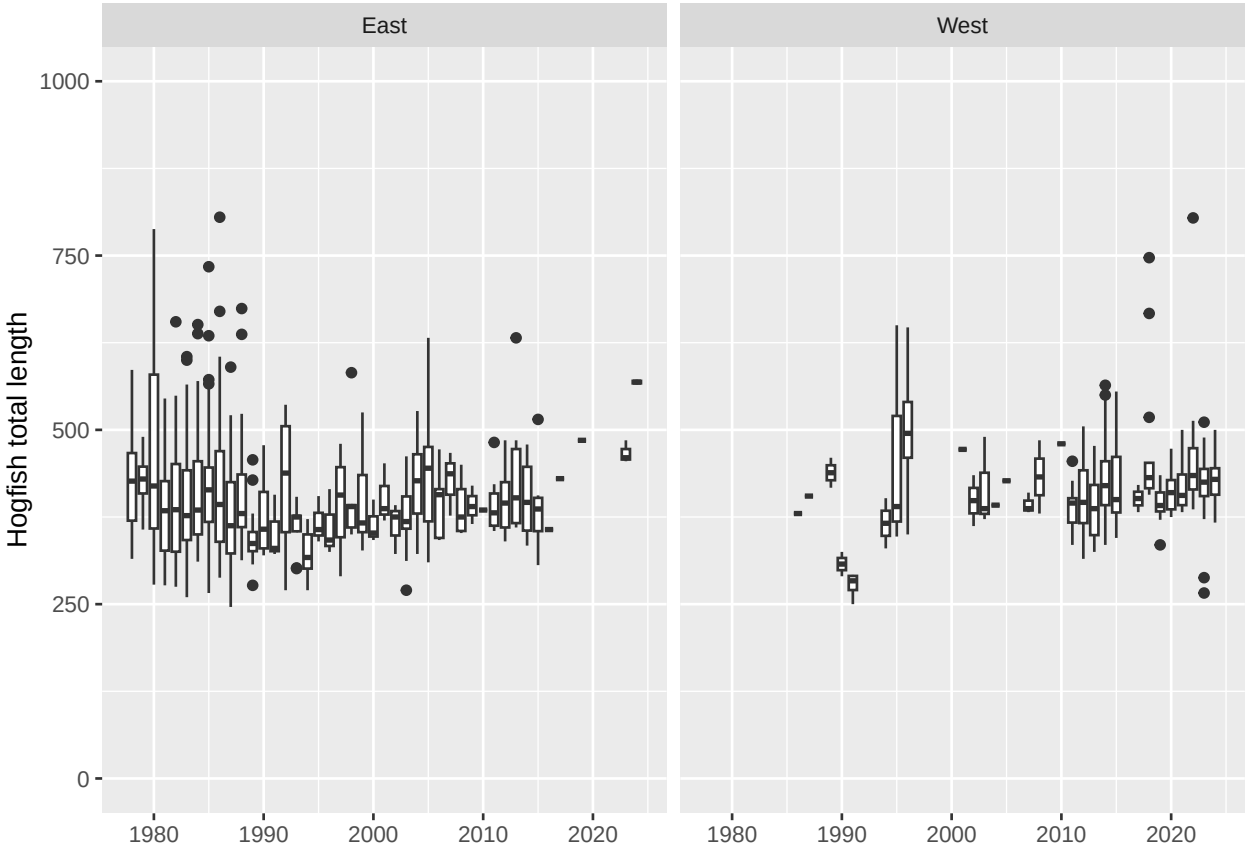

Figure 10: Hogfish total length by region.

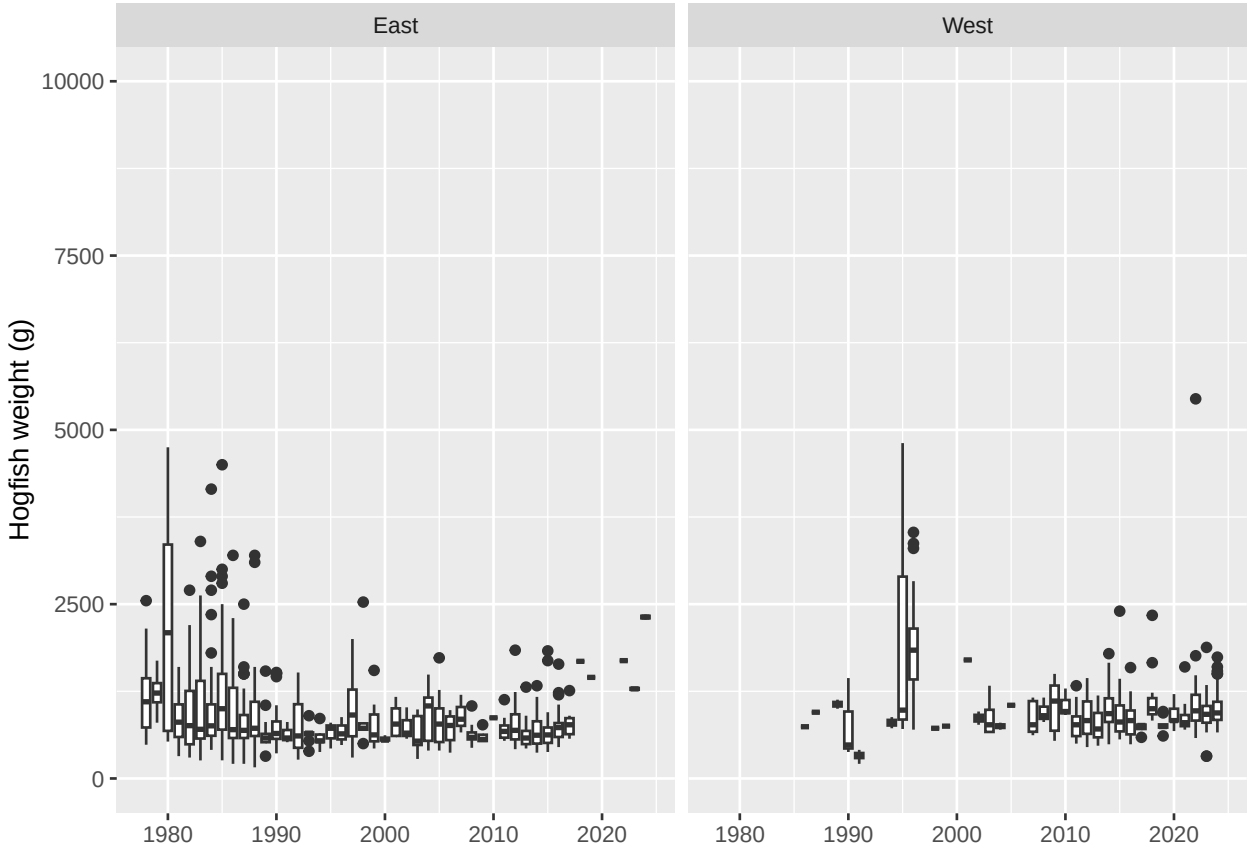

Figure 11: Hogfish weight (g) by region.

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