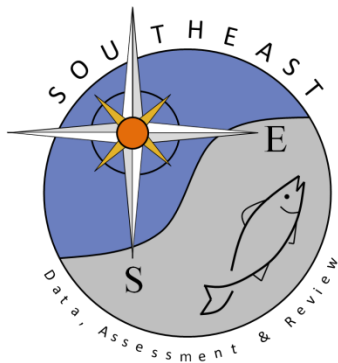


Headboat Data for Red Grouper in the Southeast US Atlantic

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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. A statistical estimation method to account for non-reporting was developed in 1981. However, landings estimates can be developed for prior years by making general assumptions about trends in compliance and the relationship between areas to fill in spatial gaps in data collection. 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 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 which gave headboat operators the ability to 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, state is used to define finer scale regions rather than actual states as advised by the assessment staff. The assignment of SRHS areas to states and regions are below:

- Areas 1,2,3,9,10 - NC
- Areas 4,5 - SC
- Areas 6,7,8 - GNFL
- Areas 11,12,17 - SFL
- Areas 1,2,3,4,5,9,10 - North Region
- Areas 6,7,8,11,12,17 - South Region

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 form that is filled out by vessel personnel for individual trips. These logbooks are summarized by vessel to generate estimated landings by species, area, and time strata. 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 new form now 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 state/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 total catch (expanded or corrected for non-reporting) by month and area, along with estimates of effort. 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, the collection of which coincides with associated catch count. 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 state (Table 2) and region (Table 3, Figure 3). Landings in pounds are shown by state (Table 4) and by region (Table 5, Figure 4). The 1976 - 1980 landings were developed in SEDAR 19 assuming the same expansion for non-reporting as the average ratio of the 1981:1983 estimated to reported landings across 3 regions (NC, SC, and GA-FL). These historical values are only presented at the region level since the strata for state is not consistent with this data provision. The primary area of red grouper landings are North Carolina and south Florida (Tables 2 - 5).

### 3.2 Discards

Discards by state and region are primarily from south Florida (Tables 6 - 7, Figure 5). Discards are highest in the South region. 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. SEDAR 19 and SEDAR 53 excluded 2004 discard estimates based on an evaluation of the reporting of discards by vessels.

### 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 state, region, and annually are given in tables 8 - 10. For red grouper, only the overall and regional (except for 2022 NORTH region) annual catch and discards can be released to the public.

### 3.4 Uncertainty

Unweighted proxy CV estimates by state, region and overall are provided in tables 11 - 13. Regional proxy CV values weighted by state landings in number and weight are given in tables 14 and 15. Annual weighted proxy CV values weighted by regional landings in number and weight are provided in tables 16 and 17. The weighted proxy CVs should provide the best estimate for uncertainty. An assumption will need to be made to assign annual CVs for 1976 - 1980 landings and discards. In general the value should be higher than the

earliest years where compliance was monitored 1981-1983 due to the assumptions about compliance rates for the 1976-1980 landings estimates.

### 3.5 Effort

Total estimated headboat 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). The same trend is seen in the regional effort estimates but more extreme in the South (Tables 20 - 21, Figure 7). The finer scale effort estimates by state show the pattern observed in effort is consistent across states with the exception of NC in the early years (Tables 22 - 23, Figure 6). 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 red grouper measured for natural total length in the headboat fleet by state and region are given in tables 24 - 25. The number of trips from which red grouper were measured are summarized in Tables 26 - 27. Mean total lengths (mm) and weight (g) and associated CVs for the headboat fishery are tabulated by state and region in Tables 28 - 35. Patterns in length and weight by year and region are shown in Figures 8 and 9. The sample sizes are very small for some states and for the North region in recent years. There is more variability in the means size of fish in the North compared to the South. The regional samples sizes for the South are adequate to develop length compositions based on the SEDAR best practice minimum sample sizes for compositions development (30 fish and 10 trips). However many years for the North region do not meet the minimum sample size requirements.

## 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
1980	89	
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



Table 2: Red grouper landings by state in number. Strata with fewer than 3 vessels reporting are confidential ('conf?').

year	NC	SC	GNFL	SFL	Total
1981	conf	29	202	7587	7964
1982	497	39	216	5610	6362
1983	241	25	263	9364	9893
1984	conf	5	256	8163	8556
1985	150	4	419	8211	8784
1986	68	9	385	5348	5810
1987	137	46	390	6464	7037
1988	374	391	1477	2859	5101
1989	187	157	589	2686	3619
1990	1073	43	692	5518	7326
1991	681	113	366	1566	2726
1992	458	85	371	3062	3976
1993	595	47	264	3880	4786
1994	1267	87	289	3822	5465
1995	1193	135	270	3652	5250
1996	798	89	387	4373	5647
1997	3020	137	768	4133	8058
1998	3554	704	942	5703	10903
1999	3126	709	572	2854	7261
2000	1155	273	408	3497	5333
2001	1062	140	373	3365	4940
2002	1099	80	352	3073	4604
2003	1192	81	128	2616	4017
2004	937	145	292	9382	10756
2005	1726	222	632	8890	11470
2006	1426	442	299	3074	5241
2007	2117	756	243	2043	5159
2008	984	215	83	1161	2443
2009	560	90	121	655	1426
2010	373	43	122	745	1283
2011	367	43	86	1062	1558
2012	258	23	42	1112	1435
2013	153	13	71	925	1162
2014	156	8	46	1644	1854
2015	34	5	21	1675	1735
2016	43	conf	7	2120	2176
2017	23	7	33	2322	2385
2018	20	10	17	3635	3682
2019	94	conf	20	2791	2906
2020	conf	2	11	2907	2923
2021	conf	conf	7	1739	1751
2022	conf	0	6	1318	1328

Table 3: Red grouper landings by region in number. Strata with fewer than 3 vessels reporting are confidential ('conf?').

year	North	South	Total
1976	157	4439	4596
1977	551	5060	5611
1978	1179	3591	4770
1979	2410	6973	9383
1980	480	7657	8137
1981	175	7789	7964
1982	536	5826	6362
1983	266	9627	9893
1984	137	8419	8556
1985	154	8630	8784
1986	77	5733	5810
1987	183	6854	7037
1988	765	4336	5101
1989	344	3275	3619
1990	1116	6210	7326
1991	794	1932	2726
1992	543	3433	3976
1993	642	4144	4786
1994	1354	4111	5465
1995	1328	3922	5250
1996	887	4760	5647
1997	3157	4901	8058
1998	4258	6645	10903
1999	3835	3426	7261
2000	1428	3905	5333
2001	1202	3738	4940
2002	1179	3425	4604
2003	1273	2744	4017
2004	1082	9674	10756
2005	1948	9522	11470
2006	1868	3373	5241
2007	2873	2286	5159
2008	1199	1244	2443
2009	650	776	1426
2010	416	867	1283
2011	410	1148	1558
2012	281	1154	1435
2013	166	996	1162
2014	164	1690	1854
2015	39	1696	1735
2016	49	2127	2176
2017	30	2355	2385
2018	30	3652	3682
2019	95	2811	2906
2020	5	2918	2923
2021	5	1746	1751
2022	conf	1324	1328

Table 4: Red grouper landings by state in pounds. Strata with fewer than 3 vessels reporting are confidential ('conf').

year	NC	SC	GNFL	SFL	Total
1981	conf	278	2981	32497	37214
1982	4455	363	3486	23175	31479
1983	3013	344	3084	32466	38907
1984	conf	60	4009	34566	40479
1985	918	24	5755	36573	43270
1986	656	87	4367	24243	29352
1987	516	96	2368	31637	34617
1988	1523	1171	7665	13043	23402
1989	784	564	1710	14858	17915
1990	7294	295	4428	35895	47913
1991	4055	544	3080	9466	17145
1992	3396	633	2431	22849	29309
1993	4709	286	1559	24519	31073
1994	8204	539	2377	24372	35492
1995	7924	1041	2193	24140	35299
1996	7362	913	1872	27006	37154
1997	21753	1127	4603	28151	55634
1998	21970	5595	5360	41476	74401
1999	27995	6236	4353	18900	57484
2000	11835	2832	3199	23126	40993
2001	12929	1604	2271	22589	39393
2002	5886	481	2681	22737	31784
2003	9137	704	1001	15822	26664
2004	8050	903	1856	63370	74179
2005	17626	1743	3433	52652	75453
2006	11301	3358	1926	16659	33245
2007	21408	7459	2354	12430	43651
2008	9606	2103	685	8391	20786
2009	5716	884	2045	7048	15693
2010	3982	510	759	4257	9509
2011	2245	258	491	7169	10163
2012	2884	255	281	8095	11516
2013	3137	201	552	7152	11043
2014	3328	126	353	12445	16252
2015	202	29	151	12144	12527
2016	503	conf	51	17399	18030
2017	67	21	180	18382	18650
2018	211	106	103	26374	26795
2019	1470	conf	128	18258	19871
2020	conf	12	64	16866	16959
2021	conf	conf	29	7448	7497
2022	conf	0	43	10539	10611

Table 5: Red grouper landings by region in pounds. Strata with fewer than 3 vessels reporting are confidential ('conf.').

year	North	South	Total
1976	1598	48948	50546
1977	5573	57653	63226
1978	11920	39156	51076
1979	24376	41966	66342
1980	4882	42062	46944
1981	1737	35478	37214
1982	4818	26661	31479
1983	3357	35550	38907
1984	1904	38575	40479
1985	942	42327	43270
1986	742	28610	29352
1987	612	34005	34617
1988	2693	20709	23402
1989	1348	16567	17915
1990	7589	40323	47913
1991	4599	12546	17145
1992	4029	25280	29309
1993	4995	26078	31073
1994	8743	26749	35492
1995	8966	26334	35299
1996	8276	28878	37154
1997	22880	32754	55634
1998	27565	46836	74401
1999	34231	23253	57484
2000	14667	26325	40993
2001	14533	24860	39393
2002	6367	25417	31784
2003	9841	16823	26664
2004	8953	65226	74179
2005	19368	56085	75453
2006	14660	18585	33245
2007	28867	14784	43651
2008	11709	9077	20786
2009	6599	9093	15693
2010	4493	5016	9509
2011	2503	7660	10163
2012	3139	8376	11516
2013	3339	7704	11043
2014	3454	12798	16252
2015	231	12295	12527
2016	580	17450	18030
2017	88	18562	18650
2018	317	26478	26795
2019	1485	18386	19871
2020	29	16930	16959
2021	20	7477	7497
2022	conf	10582	10611

Table 6: Red grouper discards by state in number of fish. Strata with fewer than 3 vessels reporting are confidential ('conf').

year	NC	SC	GNFL	SFL	Total
2004	269	169	356	8285	9079
2005	732	211	709	8312	9964
2006	871	146	350	3675	5042
2007	682	79	225	3227	4213
2008	156	16	151	6511	6834
2009	45	25	191	12121	12382
2010	243	57	357	13746	14403
2011	52	37	251	6303	6643
2012	14	3	164	9614	9795
2013	21	0	451	9271	9743
2014	24	1	102	4907	5034
2015	31	39	58	6291	6419
2016	19	conf	24	11845	11892
2017	8	2	68	4875	4953
2018	10	8	47	8868	8933
2019	31	conf	151	9615	9797
2020	conf	6	59	4939	5004
2021	conf	conf	13	6184	6197
2022	conf	0	90	9697	9792

Table 7: Red grouper discards by region in number of fish. Strata with fewer than 3 vessels reporting are confidential ('conf').

year	North	South	Total
2004	438	8641	9079
2005	943	9021	9964
2006	1017	4025	5042
2007	761	3452	4213
2008	172	6662	6834
2009	70	12312	12382
2010	300	14103	14403
2011	89	6554	6643
2012	17	9778	9795
2013	21	9722	9743
2014	25	5009	5034
2015	70	6349	6419
2016	23	11869	11892
2017	10	4943	4953
2018	18	8915	8933
2019	31	9766	9797
2020	6	4998	5004
2021	0	6197	6197
2022	conf	9787	9792

Table 8: Red grouper number of vessels by state contributing to landings estimates. Strata with less than 3 vessels reporting are considered confidential.

year	NC	SC	GNFL	SFL
1976	4	3	11	
1977	4	4	13	
1978	5	6	14	10
1979	5	4	8	38
1980	3	5	9	32
1981	2	4	10	34
1982	5	3	9	30
1983	4	6	12	34
1984	2	3	12	32
1985	7	3	14	26
1986	4	3	14	34
1987	7	6	15	26
1988	9	8	14	24
1989	6	6	10	25
1990	6	5	7	18
1991	9	7	5	22
1992	8	7	15	36
1993	7	9	14	42
1994	5	9	14	38
1995	8	11	16	34
1996	9	10	17	33
1997	9	11	15	37
1998	10	13	16	32
1999	8	11	15	20
2000	7	14	13	20
2001	8	9	12	18
2002	7	8	11	18
2003	8	9	10	15
2004	8	12	13	20
2005	8	11	13	20
2006	9	12	12	17
2007	7	16	12	13
2008	7	14	14	28
2009	6	14	13	30
2010	7	9	15	29
2011	6	10	10	28
2012	5	10	8	29
2013	5	3	9	31
2014	5	6	10	33
2015	4	4	7	32
2016	4	2	6	30
2017	4	3	10	28
2018	5	4	8	27
2019	3	1	8	25
2020	1	4	5	29
2021	1	2	5	25
2022	1		5	27

Table 9: Red grouper number of vessels by region contributing to landings estimates. Strata with less than 3 vessels reporting are considered confidential.

year	North	South
1976	7	11
1977	8	13
1978	11	24
1979	9	45
1980	8	41
1981	6	44
1982	8	39
1983	10	46
1984	5	44
1985	10	40
1986	7	48
1987	13	41
1988	17	38
1989	12	35
1990	11	25
1991	16	27
1992	15	51
1993	16	56
1994	14	52
1995	19	50
1996	19	50
1997	20	52
1998	23	48
1999	19	35
2000	21	33
2001	17	30
2002	15	29
2003	17	25
2004	20	33
2005	19	33
2006	21	29
2007	23	25
2008	21	42
2009	20	43
2010	16	44
2011	16	38
2012	15	37
2013	8	40
2014	11	43
2015	8	39
2016	6	36
2017	7	38
2018	9	35
2019	4	33
2020	5	34
2021	3	30
2022	1	32



Table 10: Red grouper number of vessels annually contributing to landings estimates. Strata with less than 3 vessels reporting are considered confidential.

year	n_vessel
1976	18
1977	21
1978	35
1979	54
1980	49
1981	50
1982	47
1983	56
1984	49
1985	50
1986	55
1987	54
1988	55
1989	47
1990	36
1991	43
1992	66
1993	72
1994	66
1995	69
1996	69
1997	72
1998	71
1999	54
2000	54
2001	47
2002	44
2003	42
2004	53
2005	52
2006	50
2007	48
2008	63
2009	63
2010	60
2011	54
2012	52
2013	48
2014	54
2015	47
2016	42
2017	45
2018	44
2019	37
2020	39
2021	33
2022	33

Table 11: Unweighted proxy CV values by state. These values are based on logbook reporting compliance and are consistent across species.

year	NC	SC	GNFL	SFL
1981	0.514	0.204	0.485	0.250
1982	0.344	0.124	0.469	0.491
1983	0.337	0.097	0.414	0.380
1984	0.611	0.230	0.508	0.611
1985	0.619	0.226	0.535	0.603
1986	0.640	0.145	0.400	0.531
1987	0.579	0.186	0.356	0.549
1988	0.608	0.225	0.438	0.596
1989	0.869	0.275	0.501	0.632
1990	0.826	0.245	0.583	0.616
1991	0.663	0.339	0.604	0.650
1992	0.335	0.156	0.204	0.445
1993	0.474	0.077	0.146	0.397
1994	0.393	0.113	0.213	0.538
1995	0.401	0.118	0.169	0.514
1996	0.359	0.060	0.148	0.724
1997	0.425	0.076	0.154	0.538
1998	0.431	0.088	0.079	0.581
1999	0.458	0.099	0.095	0.754
2000	0.459	0.057	0.229	0.783
2001	0.478	0.091	0.136	0.776
2002	0.588	0.068	0.087	0.843
2003	0.425	0.161	0.082	0.855
2004	0.300	0.089	0.065	0.864
2005	0.542	0.055	0.122	0.850
2006	0.499	0.257	0.098	0.859
2007	0.540	0.187	0.232	0.771
2008	0.101	0.185	0.130	0.300
2009	0.175	0.160	0.176	0.096
2010	0.076	0.171	0.063	0.084
2011	0.112	0.107	0.028	0.089
2012	0.116	0.082	0.054	0.129
2013	0.072	0.079	0.053	0.134
2014	0.076	0.056	0.051	0.053
2015	0.050	0.054	0.053	0.068
2016	0.055	0.060	0.052	0.221
2017	0.051	0.057	0.056	0.060
2018	0.057	0.060	0.053	0.059
2019	0.052	0.061	0.070	0.055
2020	0.050	0.050	0.050	0.058
2021	0.050	0.050	0.050	0.050
2022	0.050	0.050	0.050	0.050

Table 12: Unweighted proxy CV values by region. These values are based on logbook reporting compliance and are consistent across species.

year	North	South
1981	0.268	0.278
1982	0.171	0.489
1983	0.151	0.385
1984	0.318	0.595
1985	0.317	0.592
1986	0.258	0.507
1987	0.272	0.514
1988	0.326	0.565
1989	0.456	0.610
1990	0.441	0.611
1991	0.434	0.643
1992	0.210	0.400
1993	0.196	0.350
1994	0.191	0.486
1995	0.203	0.458
1996	0.165	0.645
1997	0.187	0.467
1998	0.193	0.485
1999	0.218	0.636
2000	0.183	0.688
2001	0.215	0.667
2002	0.251	0.717
2003	0.265	0.710
2004	0.152	0.743
2005	0.249	0.745
2006	0.321	0.743
2007	0.274	0.659
2008	0.169	0.256
2009	0.163	0.121
2010	0.149	0.079
2011	0.108	0.074
2012	0.089	0.114
2013	0.077	0.119
2014	0.060	0.053
2015	0.053	0.066
2016	0.059	0.199
2017	0.055	0.059
2018	0.060	0.058
2019	0.059	0.057
2020	0.050	0.056
2021	0.050	0.050
2022	0.050	0.050

Table 13: Unweighted proxy CV values by year. These values are based on logbook reporting compliance and are consistent across species.

year	cv
1981	0.277
1982	0.450
1983	0.358
1984	0.557
1985	0.553
1986	0.472
1987	0.478
1988	0.527
1989	0.590
1990	0.589
1991	0.614
1992	0.372
1993	0.324
1994	0.442
1995	0.419
1996	0.579
1997	0.408
1998	0.416
1999	0.556
2000	0.589
2001	0.571
2002	0.615
2003	0.631
2004	0.620
2005	0.652
2006	0.650
2007	0.560
2008	0.233
2009	0.133
2010	0.100
2011	0.085
2012	0.107
2013	0.110
2014	0.054
2015	0.064
2016	0.170
2017	0.058
2018	0.058
2019	0.058
2020	0.054
2021	0.050
2022	0.050

Table 14: Regional proxy CV values weighted by state landings of red grouper in number.

year	North	South
1981	0.462	0.256
1982	0.328	0.490
1983	0.314	0.381
1984	0.597	0.608
1985	0.609	0.600
1986	0.582	0.522
1987	0.480	0.538
1988	0.412	0.542
1989	0.598	0.608
1990	0.804	0.612
1991	0.617	0.641
1992	0.307	0.419
1993	0.445	0.381
1994	0.375	0.515
1995	0.372	0.490
1996	0.329	0.677
1997	0.410	0.477
1998	0.374	0.510
1999	0.392	0.644
2000	0.382	0.725
2001	0.433	0.712
2002	0.552	0.765
2003	0.409	0.819
2004	0.272	0.840
2005	0.487	0.802
2006	0.442	0.791
2007	0.447	0.714
2008	0.116	0.289
2009	0.173	0.109
2010	0.086	0.081
2011	0.112	0.084
2012	0.113	0.127
2013	0.073	0.128
2014	0.075	0.053
2015	0.051	0.068
2016	0.055	0.221
2017	0.053	0.060
2018	0.058	0.059
2019	0.052	0.055
2020	0.050	0.058
2021	0.050	0.050
2022	0.050	0.050

Table 15: Regional proxy CV values weighted by state landings of red grouper in weight.

year	North	South
1981	0.464	0.270
1982	0.327	0.488
1983	0.312	0.383
1984	0.599	0.600
1985	0.609	0.594
1986	0.582	0.511
1987	0.518	0.535
1988	0.442	0.537
1989	0.621	0.618
1990	0.803	0.612
1991	0.625	0.638
1992	0.306	0.422
1993	0.451	0.382
1994	0.376	0.509
1995	0.368	0.485
1996	0.326	0.687
1997	0.408	0.484
1998	0.361	0.523
1999	0.393	0.630
2000	0.381	0.716
2001	0.436	0.718
2002	0.548	0.763
2003	0.407	0.809
2004	0.279	0.842
2005	0.499	0.806
2006	0.443	0.780
2007	0.448	0.685
2008	0.116	0.287
2009	0.173	0.114
2010	0.087	0.081
2011	0.112	0.085
2012	0.113	0.127
2013	0.072	0.128
2014	0.076	0.053
2015	0.051	0.068
2016	0.056	0.221
2017	0.053	0.060
2018	0.058	0.059
2019	0.052	0.055
2020	0.050	0.058
2021	0.050	0.050
2022	0.050	0.050

Table 16: Annual proxy CV values weighted by regional landings of red grouper in number.

year	cv
1981	0.261
1982	0.476
1983	0.379
1984	0.607
1985	0.600
1986	0.523
1987	0.536
1988	0.523
1989	0.607
1990	0.641
1991	0.634
1992	0.403
1993	0.389
1994	0.480
1995	0.460
1996	0.622
1997	0.451
1998	0.457
1999	0.511
2000	0.633
2001	0.644
2002	0.711
2003	0.689
2004	0.783
2005	0.749
2006	0.667
2007	0.565
2008	0.204
2009	0.138
2010	0.083
2011	0.092
2012	0.124
2013	0.120
2014	0.055
2015	0.068
2016	0.217
2017	0.060
2018	0.059
2019	0.055
2020	0.058
2021	0.050
2022	0.050

Table 17: Annual proxy CV values weighted by regional landings of red grouper in weight.

year	cv
1981	0.279
1982	0.463
1983	0.377
1984	0.600
1985	0.594
1986	0.513
1987	0.535
1988	0.526
1989	0.619
1990	0.643
1991	0.635
1992	0.406
1993	0.393
1994	0.476
1995	0.455
1996	0.606
1997	0.453
1998	0.463
1999	0.489
2000	0.596
2001	0.614
2002	0.720
2003	0.661
2004	0.774
2005	0.727
2006	0.632
2007	0.529
2008	0.191
2009	0.139
2010	0.084
2011	0.092
2012	0.123
2013	0.111
2014	0.058
2015	0.068
2016	0.216
2017	0.060
2018	0.059
2019	0.055
2020	0.058
2021	0.050
2022	0.050



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

year	Angler_Day
1981	377287
1982	387611
1983	367426
1984	385173
1985	378230
1986	415472
1987	447108
1988	420664
1989	418250
1990	423286
1991	388940
1992	367489
1993	344216
1994	342703
1995	312748
1996	289928
1997	270612
1998	254082
1999	251147
2000	253891
2001	244433
2002	221614
2003	204565
2004	251418
2005	238448
2006	257332
2007	246881
2008	188388
2009	196807
2010	189684
2011	195594
2012	209468
2013	227189
2014	260606
2015	257397
2016	260432
2017	183210
2018	174984
2019	176734
2020	132239
2021	187994
2022	159877

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

year	Angler_Trip
1981	392582
1982	492606
1983	440260
1984	563371
1985	582528
1986	613712
1987	629483
1988	566307
1989	576728
1990	596940
1991	568273
1992	535684
1993	477228
1994	500800
1995	456414
1996	449817
1997	395596
1998	354069
1999	375615
2000	406838
2001	363286
2002	330417
2003	345668
2004	394368
2005	392462
2006	419239
2007	342745
2008	283299
2009	289138
2010	285413
2011	296527
2012	328980
2013	354387
2014	419744
2015	419991
2016	422328
2017	282412
2018	267082
2019	270159
2020	195841
2021	284343
2022	237984

Table 20: Estimates of total effort in angler - days by region.

year	North	South
1981	78404	298883
1982	94478	293133
1983	89563	277863
1984	96179	288994
1985	97385	280845
1986	98414	317058
1987	114067	333041
1988	118889	301775
1989	101386	316864
1990	100391	322895
1991	108918	280022
1992	102966	264523
1993	107243	236973
1994	99922	242781
1995	102034	210714
1996	90071	199857
1997	97339	173273
1998	98741	155341
1999	87095	164052
2000	71642	182249
2001	81044	163389
2002	70068	151546
2003	59554	145011
2004	76018	175400
2005	65609	172839
2006	81810	175522
2007	89731	157150
2008	64445	123943
2009	60387	136420
2010	66022	123662
2011	63102	132492
2012	61769	147699
2013	61510	165679
2014	64716	195890
2015	62418	194979
2016	63772	196660
2017	57084	126126
2018	54424	120560
2019	57022	119712
2020	48234	84005
2021	67627	120367
2022	54888	104989

Table 21: Estimates of total effort in angler - trips by region.

year	North	South
1981	107488	285093
1982	123667	368939
1983	118586	321674
1984	130272	433099
1985	136083	446445
1986	134900	478813
1987	153645	475837
1988	159859	406448
1989	129663	447065
1990	126632	470308
1991	141884	426389
1992	134484	401200
1993	139959	337269
1994	127512	373288
1995	127827	328588
1996	113651	336166
1997	120181	275415
1998	125776	228293
1999	112470	263145
2000	117800	289037
2001	107935	255351
2002	104246	226171
2003	101141	244527
2004	107680	286688
2005	96895	295567
2006	122235	297004
2007	121172	221574
2008	94130	189170
2009	90460	198678
2010	98587	186827
2011	95318	201209
2012	95402	233578
2013	92118	262269
2014	95545	324198
2015	92243	327748
2016	96423	325905
2017	83136	199276
2018	80350	186732
2019	84469	185691
2020	70279	125562
2021	101853	182490
2022	82486	155498

Table 22: Estimates of total effort in angler - days by state.

year	NC	SC	GNFL	SFL
1981	19374	59030	72427	226456
1982	26939	67539	66961	226172
1983	23830	65733	83499	194364
1984	28865	67314	95234	193760
1985	31384	66001	94449	186396
1986	31187	67227	113101	203957
1987	35261	78806	114144	218897
1988	42421	76468	109156	192619
1989	38678	62708	102920	213944
1990	43240	57151	98234	224661
1991	40936	67982	85111	194911
1992	41176	61790	90810	173713
1993	42786	64457	74494	162479
1994	36691	63231	65745	177036
1995	40295	61739	59106	151608
1996	35142	54929	47239	152618
1997	37189	60150	52764	120509
1998	37399	61342	51790	103551
1999	31596	55499	57010	107042
2000	31351	40291	59771	122478
2001	31779	49265	55797	107592
2002	27601	42467	48911	102635
2003	22998	36556	52795	92216
2004	27255	48763	52243	123157
2005	31573	34036	49539	123300
2006	25736	56074	48908	126614
2007	29002	60729	53762	103388
2008	17158	47287	52345	71598
2009	19468	40919	66447	69973
2010	21071	44951	53676	69986
2011	18457	44645	54707	77785
2012	20766	41003	58901	88798
2013	20547	40963	66587	99092
2014	22691	42025	60752	135138
2015	22716	39702	54480	140499
2016	21565	42207	53387	143273
2017	20170	36914	48304	77822
2018	16813	37611	43586	76974
2019	15552	41470	43139	76573
2020	14154	34080	30750	53255
2021	19719	47908	47396	72971
2022	16140	38748	33962	71027

Table 23: Estimates of total effort in angler - trips by state.

year	NC	SC	GNFL	SFL
1981	23236	84252	83851	201243
1982	30016	93651	80231	288708
1983	26254	92332	86734	234940
1984	28101	102171	108836	324262
1985	30138	105945	117459	328986
1986	31157	103743	132626	346186
1987	31967	121679	121517	354321
1988	38650	121209	112748	293699
1989	32154	97509	119207	327858
1990	36733	89899	127075	343233
1991	39724	102160	111168	315222
1992	40004	94480	113529	287671
1993	44312	95647	86316	250953
1994	33949	93563	76874	296414
1995	37666	90161	69107	259480
1996	37243	76408	56284	279882
1997	36906	83275	65080	210335
1998	40456	85320	60663	167631
1999	36054	76416	68043	195102
2000	38531	79269	69309	219728
2001	36618	71318	67778	187573
2002	38772	65474	58012	168159
2003	32010	69131	65684	178843
2004	35808	71872	63829	222859
2005	41262	55633	61316	234251
2006	33776	88459	61358	235646
2007	33576	87596	67112	154462
2008	19948	74182	66304	122866
2009	21675	68785	77866	120812
2010	24330	74256	63650	123176
2011	21976	73343	66461	134748
2012	24233	71169	77490	156087
2013	23139	68979	83043	179226
2014	24838	70707	75363	248835
2015	26233	66010	69339	258409
2016	24808	71615	68132	257773
2017	23349	59788	61860	137416
2018	18752	61598	54714	132018
2019	17401	67068	54001	131689
2020	15225	55054	37451	88111
2021	22098	79755	60033	122457
2022	18482	64004	42221	113277

Table 24: Red grouper number of fish sampled by state.

year	NC	SC	GNFL	SFL
1972	7	5		
1973	9	1		
1974	12	2		
1975	21	6		
1976	20	6	39	
1977	24		96	
1978	11	1	39	74
1979	20		17	125
1980	27	1	21	145
1981	19		20	198
1982	30		11	236
1983	24	1	18	338
1984	15	1	22	548
1985	12		28	535
1986	10		12	362
1987	12	8	8	259
1988	24	10	33	144
1989	29	6	13	196
1990	22	1	23	109
1991	28	6	7	24
1992	46	1	5	31
1993	15	5	6	85
1994	33	12	10	90
1995	60	20	6	102
1996	35	62	12	154
1997	51	159	16	178
1998	118	58	34	257
1999	109	26	18	157
2000	60	8	8	127
2001	41		12	107
2002	21	2	27	139
2003	24	6	5	85
2004	71	3	4	76
2005	51		2	101
2006	37	17	5	78
2007	37	29	4	57
2008	23	7	1	33
2009	10		1	21
2010	7	1	10	55
2011	6		6	81
2012	11		1	152
2013	8	1	9	109
2014			1	120
2015	5			87
2016	6		2	222
2017	1		4	184
2018	1		5	108
2019		1	3	38
2022			1	70

Table 25: Red grouper number of fish sampled by region.

year	North	South
1972	12	
1973	10	
1974	14	
1975	27	
1976	26	39
1977	24	96
1978	12	113
1979	20	142
1980	28	166
1981	19	218
1982	30	247
1983	25	356
1984	16	570
1985	12	563
1986	10	374
1987	20	267
1988	34	177
1989	35	209
1990	23	132
1991	34	31
1992	47	36
1993	20	91
1994	45	100
1995	80	108
1996	97	166
1997	210	194
1998	176	291
1999	135	175
2000	68	135
2001	41	119
2002	23	166
2003	30	90
2004	74	80
2005	51	103
2006	54	83
2007	66	61
2008	30	34
2009	10	22
2010	8	65
2011	6	87
2012	11	153
2013	9	118
2014		121
2015	5	87
2016	6	224
2017	1	188
2018	1	113
2019	1	41
2022		71



Table 26: Red grouper number of trips sampled by state.

year	NC	SC	GNFL	SFL
1972	6	5		
1973	8	1		
1974	7	2		
1975	17	2		
1976	17	5	18	
1977	17		56	
1978	9	1	23	30
1979	11		15	65
1980	19	1	16	79
1981	11		17	120
1982	19		10	133
1983	14	1	18	191
1984	12	1	21	254
1985	10		23	215
1986	10		8	185
1987	11	3	6	153
1988	22	4	22	92
1989	23	5	13	114
1990	16	1	20	67
1991	23	2	7	22
1992	34	1	4	20
1993	13	5	5	57
1994	27	7	9	62
1995	31	12	6	63
1996	26	24	11	96
1997	30	29	15	112
1998	55	31	25	162
1999	54	15	16	107
2000	35	6	6	85
2001	26		10	83
2002	9	2	20	111
2003	11	6	5	71
2004	31	3	4	61
2005	32		2	73
2006	20	13	5	55
2007	13	21	4	47
2008	16	5	1	27
2009	8		1	18
2010	6	1	9	44
2011	6		6	52
2012	8		1	68
2013	6	1	8	57
2014			1	57
2015	4			47
2016	4		2	60
2017	1		3	42
2018	1		3	25
2019		1	3	19
2022			1	38

Table 27: Red grouper number of trips sampled by region.

year	North	South
1972	11	
1973	9	
1974	9	
1975	19	
1976	22	18
1977	17	56
1978	10	53
1979	11	80
1980	20	95
1981	11	137
1982	19	143
1983	15	209
1984	13	275
1985	10	238
1986	10	193
1987	14	159
1988	26	114
1989	28	127
1990	17	87
1991	25	29
1992	35	24
1993	18	62
1994	34	71
1995	43	69
1996	50	107
1997	59	127
1998	86	187
1999	69	123
2000	41	91
2001	26	93
2002	11	131
2003	17	76
2004	34	65
2005	32	75
2006	33	60
2007	34	51
2008	21	28
2009	8	19
2010	7	53
2011	6	58
2012	8	69
2013	7	65
2014		58
2015	4	47
2016	4	62
2017	1	45
2018	1	28
2019	1	22
2022		39

Table 28: Red grouper mean total length in mm by state.

year	NC	SC	GNFL	SFL
1972	857	804		
1973	836	856		
1974	828	542		
1975	624	848		
1976	559	735	522	
1977	582		661	
1978	595	677	686	553
1979	619		712	430
1980	598	664	661	452
1981	590		702	478
1982	633		734	461
1983	734	682	638	440
1984	646	491	698	456
1985	488		645	484
1986	566		666	477
1987	461	284	600	500
1988	457	449	420	487
1989	500	467	538	550
1990	516	575	542	548
1991	521	517	637	552
1992	588	530	545	586
1993	594	553	561	559
1994	563	583	614	623
1995	563	619	631	563
1996	602	646	521	573
1997	591	643	541	566
1998	562	608	542	560
1999	615	613	605	564
2000	661	649	576	561
2001	664		550	571
2002	555	674	579	564
2003	603	649	603	556
2004	543	553	542	561
2005	617		500	556
2006	601	583	589	545
2007	583	666	587	563
2008	653	666	652	587
2009	680		690	578
2010	675	762	547	538
2011	626		539	558
2012	649		552	594
2013	794	682	548	603
2014			590	592
2015	531			603
2016	785		515	610
2017	304		515	626
2018	725		526	615
2019		847	572	600
2022			535	600

Table 29: Red grouper total length CV in mm by state.

year	NC	SC	GNFL	SFL
1972	0.03	0.07		
1973	0.13			
1974	0.07	0.52		
1975	0.41	0.03		
1976	0.33	0.24	0.15	
1977	0.27		0.11	
1978	0.23		0.09	0.24
1979	0.13		0.13	0.26
1980	0.16		0.24	0.23
1981	0.19		0.17	0.24
1982	0.14		0.15	0.24
1983	0.13		0.30	0.26
1984	0.23		0.21	0.25
1985	0.36		0.23	0.23
1986	0.35		0.22	0.20
1987	0.24	0.20	0.26	0.19
1988	0.25	0.07	0.34	0.20
1989	0.16	0.19	0.23	0.68
1990	0.25		0.22	0.13
1991	0.19	0.16	0.20	0.14
1992	0.09		0.16	0.13
1993	0.20	0.05	0.04	0.14
1994	0.13	0.19	0.14	0.85
1995	0.11	0.14	0.09	0.16
1996	0.13	0.10	0.06	0.11
1997	0.19	0.10	0.05	0.14
1998	0.10	0.14	0.07	0.14
1999	0.10	0.10	0.16	0.14
2000	0.06	0.08	0.13	0.12
2001	0.12		0.11	0.12
2002	0.09	0.14	0.17	0.13
2003	0.10	0.20	0.06	0.09
2004	0.15	0.05	0.05	0.11
2005	0.13		0.07	0.11
2006	0.14	0.11	0.16	0.09
2007	0.10	0.14	0.09	0.10
2008	0.11	0.03		0.10
2009	0.09			0.12
2010	0.23		0.13	0.12
2011	0.20		0.09	0.12
2012	0.15			0.11
2013	0.14		0.19	0.14
2014				0.12
2015	0.05			0.13
2016	0.18		0.05	0.16
2017			0.07	0.14
2018			0.05	0.13
2019			0.10	0.15
2022				0.14

Table 30: Red grouper mean weight (g) by state.

year	NC	SC	GNFL	SFL
1972	9670	11416		
1973	9852	11123		
1974	8985	3995		
1975	6100	10737		
1976	3680	8282	2470	
1977	3987		5125	
1978	3870	6480	6312	2412
1979	4140		7250	1570
1980	3696	4550	5422	1694
1981	4070		6728	2076
1982	4219		7315	1784
1983	5780	6300	5119	1578
1984	5667	1950	6840	1681
1985	2776		5703	2038
1986	4373		5145	1925
1987	1833	377	5933	2146
1988	1769	1398	1852	1944
1989	2005	1687	2643	2400
1990	2886	3370	3332	2620
1991	2595	2167	5005	2802
1992	3340		2835	3403
1993	3746	2786	2623	2801
1994	2978	2840	3732	2796
1995	3109	3594	4400	2968
1996	3998	4615	2162	2879
1997	3586	4320	2639	2905
1998	2847	3944	2635	2887
1999	3890	3900	3735	2794
2000	4734	4690	2868	2760
2001	5385		2713	2957
2002	2488	5365	3272	2888
2003	3518	5738	3476	2777
2004	3074	2907	2580	2904
2005	3885		1880	2657
2006	3581	3399	3325	2462
2007	3536	4916	3700	2751
2008	4452	4697	4170	3331
2009	5203		6720	3224
2010	4644	8950	3331	2496
2011	4700		2970	2879
2012	5003		3400	3404
2013	9372	6480	3521	3467
2014			3510	3345
2015	2635			3497
2016	9150		2200	3824
2017	381		2420	3837
2018	7030		2460	3584
2019		11390	3130	3685
2022			2520	3593

Table 31: Red grouper weight CV in g by state.

year	NC	SC	GNFL	SFL
1972	0.12	0.16		
1973	0.29			
1974	0.21	1.16		
1975	0.84	0.06		
1976	0.96	0.71	0.37	
1977	0.87		0.39	
1978	0.54		0.29	0.90
1979	0.42		0.33	0.92
1980	0.39		0.55	0.76
1981	0.89		0.34	0.73
1982	0.38		0.35	0.78
1983	0.42		0.69	0.88
1984	0.73		0.54	0.84
1985	1.06		0.63	0.75
1986	0.95		0.59	0.70
1987	0.66	0.59	0.88	0.60
1988	1.29	0.20	1.58	0.71
1989	0.44	0.51	1.05	0.53
1990	0.71		0.93	0.42
1991	0.63	0.45	0.92	0.44
1992	0.28		0.64	0.41
1993	0.80	0.18	0.12	0.42
1994	0.52	0.59	0.45	0.36
1995	0.31	0.39	0.39	0.41
1996	0.49	0.28	0.22	0.39
1997	0.54	0.28	0.20	0.43
1998	0.26	0.41	0.25	0.44
1999	0.31	0.28	0.58	0.48
2000	0.24	0.31	0.40	0.35
2001	0.38		0.41	0.35
2002	0.28	0.42	0.74	0.45
2003	0.37	0.60	0.21	0.35
2004	0.63	0.24	0.18	0.44
2005	0.49		0.05	0.36
2006	0.48	0.37	0.54	0.31
2007	0.40	0.42	0.24	0.29
2008	0.40	0.06		0.37
2009	0.28			0.49
2010	0.67		0.43	0.32
2011	0.67		0.25	0.39
2012	0.47			0.33
2013	0.34		0.76	0.43
2014				0.41
2015	0.25			0.39
2016	0.42		0.10	0.46
2017			0.20	0.45
2018			0.20	0.40
2019			0.28	0.52
2022				0.48

Table 32: Red grouper mean total length in mm by region.

year	North	South
1972	835	
1973	838	
1974	787	
1975	674	
1976	600	522
1977	582	661
1978	602	599
1979	619	464
1980	600	479
1981	590	499
1982	633	473
1983	731	450
1984	636	465
1985	488	492
1986	566	483
1987	391	503
1988	455	475
1989	494	549
1990	518	547
1991	520	571
1992	587	580
1993	584	559
1994	568	622
1995	577	567
1996	631	569
1997	630	564
1998	577	558
1999	615	568
2000	660	562
2001	664	569
2002	565	567
2003	612	559
2004	543	560
2005	617	555
2006	595	548
2007	619	564
2008	656	589
2009	680	583
2010	686	539
2011	626	557
2012	649	594
2013	782	599
2014		592
2015	531	603
2016	785	609
2017	304	623
2018	725	611
2019	847	598
2022		599

Table 33: Red grouper total length CV in mm by region.

year	North	South
1972	0.06	
1973	0.12	
1974	0.18	
1975	0.36	
1976	0.33	0.15
1977	0.27	0.11
1978	0.22	0.22
1979	0.13	0.31
1980	0.16	0.27
1981	0.19	0.27
1982	0.14	0.26
1983	0.13	0.29
1984	0.24	0.27
1985	0.36	0.24
1986	0.35	0.22
1987	0.33	0.19
1988	0.21	0.23
1989	0.16	0.66
1990	0.24	0.15
1991	0.18	0.16
1992	0.09	0.13
1993	0.18	0.14
1994	0.15	0.81
1995	0.12	0.16
1996	0.12	0.11
1997	0.13	0.13
1998	0.12	0.14
1999	0.10	0.14
2000	0.06	0.12
2001	0.12	0.12
2002	0.11	0.14
2003	0.13	0.09
2004	0.14	0.11
2005	0.13	0.11
2006	0.13	0.09
2007	0.14	0.10
2008	0.10	0.10
2009	0.09	0.12
2010	0.21	0.12
2011	0.20	0.12
2012	0.15	0.11
2013	0.14	0.14
2014		0.12
2015	0.05	0.13
2016	0.18	0.16
2017		0.15
2018		0.13
2019		0.15
2022		0.14



Table 34: Red grouper mean weight (g) by region.

year	North	South
1972	10397	
1973	9979	
1974	8272	
1975	7131	
1976	4742	2470
1977	3987	5125
1978	4088	3991
1979	4140	2275
1980	3727	2202
1981	4070	2464
1982	4219	2014
1983	5801	1749
1984	5435	1864
1985	2776	2215
1986	4373	2012
1987	1220	2233
1988	1660	1927
1989	1950	2414
1990	2910	2739
1991	2519	3243
1992	3340	3338
1993	3506	2795
1994	2944	2892
1995	3230	3047
1996	4390	2827
1997	4143	2883
1998	3200	2864
1999	3892	2891
2000	4730	2764
2001	5385	2932
2002	2776	2948
2003	3962	2816
2004	3067	2888
2005	3885	2641
2006	3522	2504
2007	4466	2816
2008	4515	3356
2009	5203	3383
2010	5362	2624
2011	4700	2886
2012	5003	3404
2013	9051	3471
2014		3347
2015	2635	3497
2016	9150	3808
2017	381	3804
2018	7030	3542
2019	11390	3640
2022		3576

Table 35: Red grouper weight CV in g by region.

year	North	South
1972	0.16	
1973	0.28	
1974	0.34	
1975	0.69	
1976	0.95	0.37
1977	0.87	0.39
1978	0.52	0.70
1979	0.42	1.08
1980	0.38	0.93
1981	0.89	0.83
1982	0.38	0.91
1983	0.41	0.99
1984	0.76	0.97
1985	1.06	0.84
1986	0.95	0.75
1987	0.96	0.70
1988	1.15	0.92
1989	0.45	0.58
1990	0.68	0.59
1991	0.61	0.73
1992	0.28	0.43
1993	0.75	0.42
1994	0.53	0.39
1995	0.34	0.42
1996	0.36	0.39
1997	0.35	0.42
1998	0.38	0.43
1999	0.30	0.51
2000	0.24	0.35
2001	0.38	0.36
2002	0.44	0.52
2003	0.52	0.34
2004	0.62	0.44
2005	0.49	0.36
2006	0.45	0.33
2007	0.44	0.30
2008	0.34	0.36
2009	0.28	0.50
2010	0.62	0.37
2011	0.67	0.38
2012	0.47	0.33
2013	0.35	0.46
2014		0.41
2015	0.25	0.39
2016	0.42	0.46
2017		0.45
2018		0.41
2019		0.51
2022		0.48

## 5 Figures

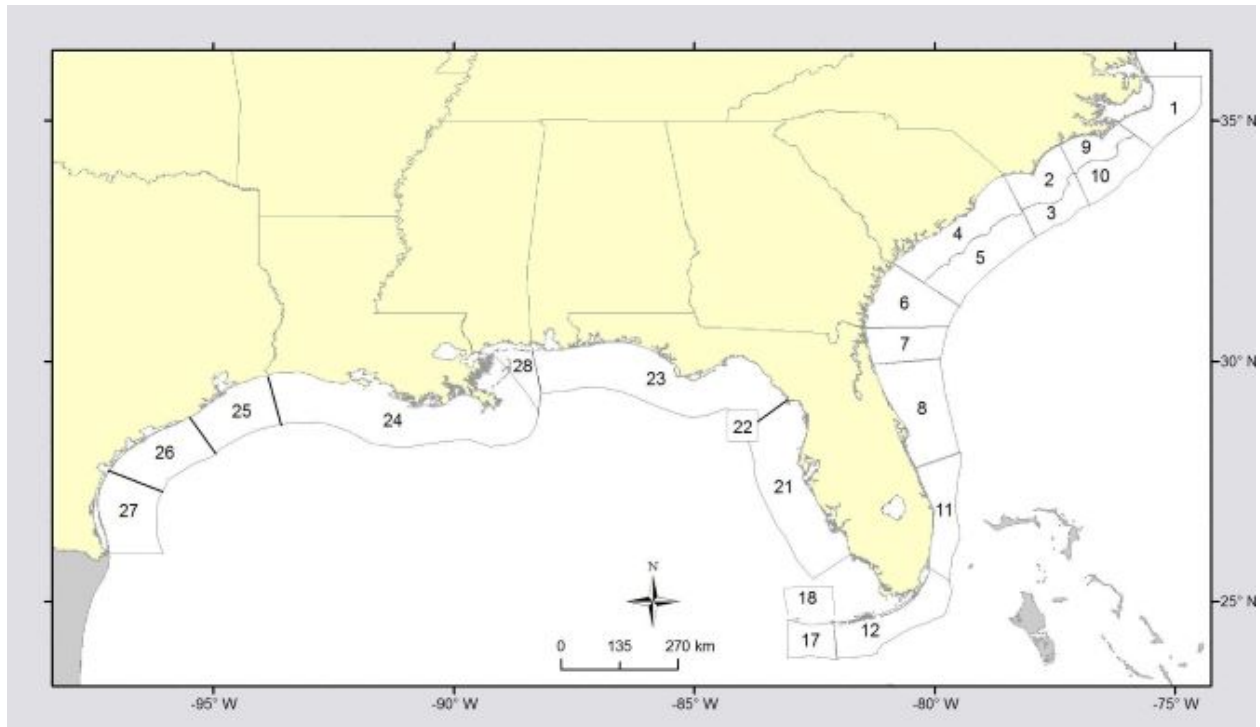


Figure 1: Headboat sampling areas prior to 2013.

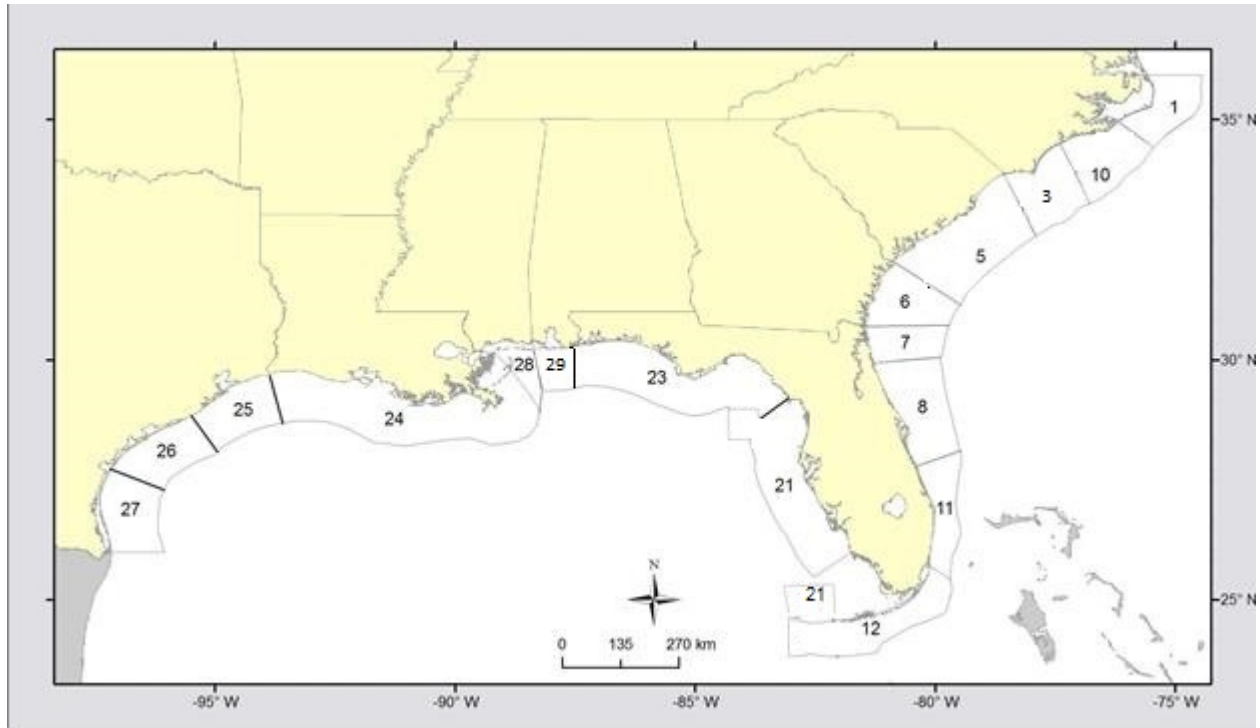


Figure 2: Headboat sampling areas 2013 - present.

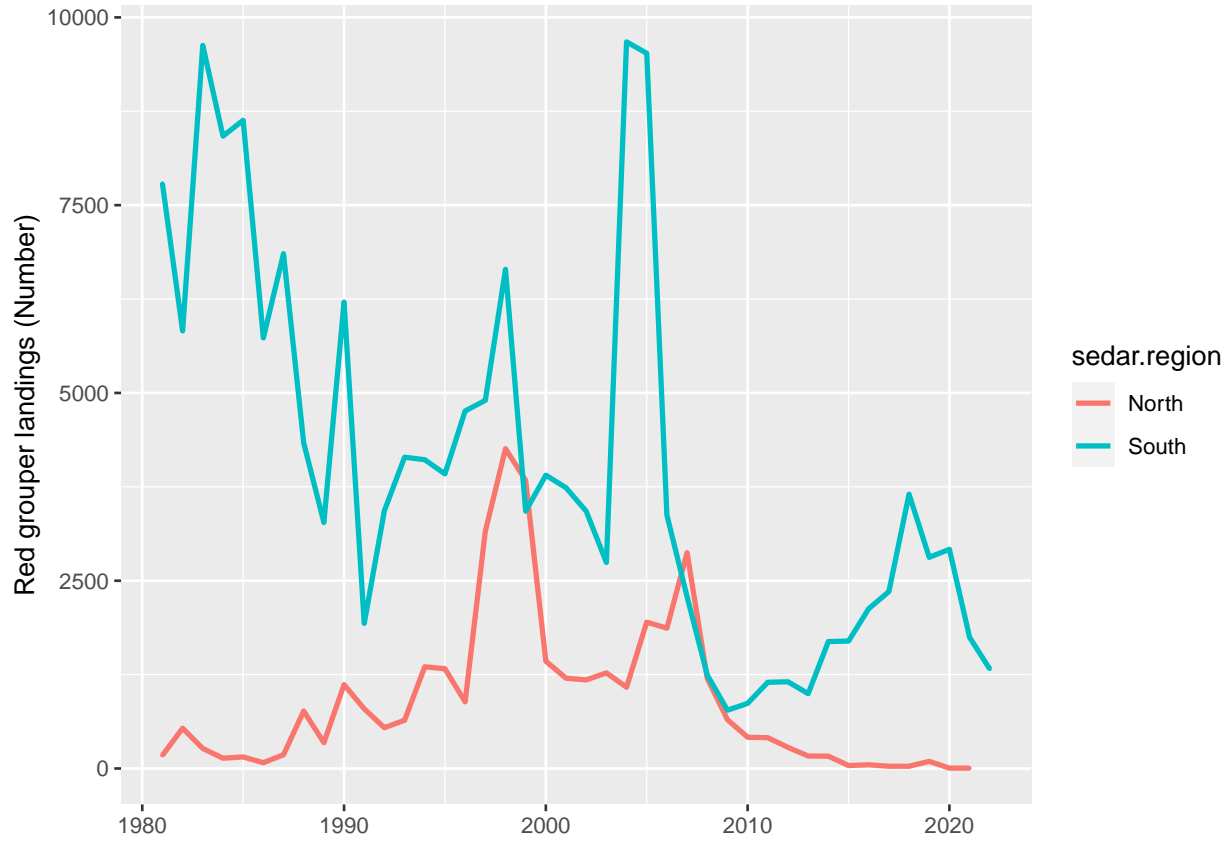


Figure 3: Red grouper landings in number by region. The 2022 value for the North region is confidential and a very low value.

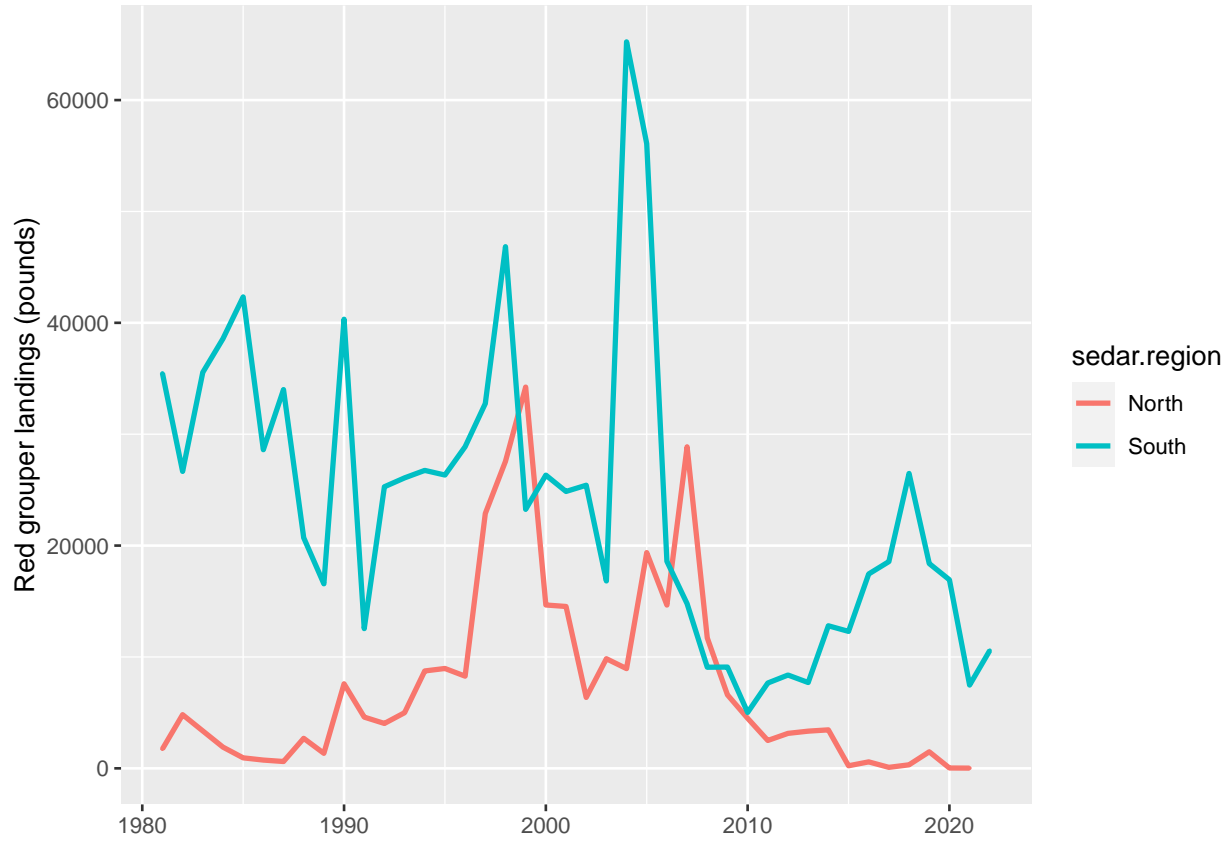


Figure 4: Red grouper landings in pounds by region. The 2022 value for the North region is confidential and a very low value.

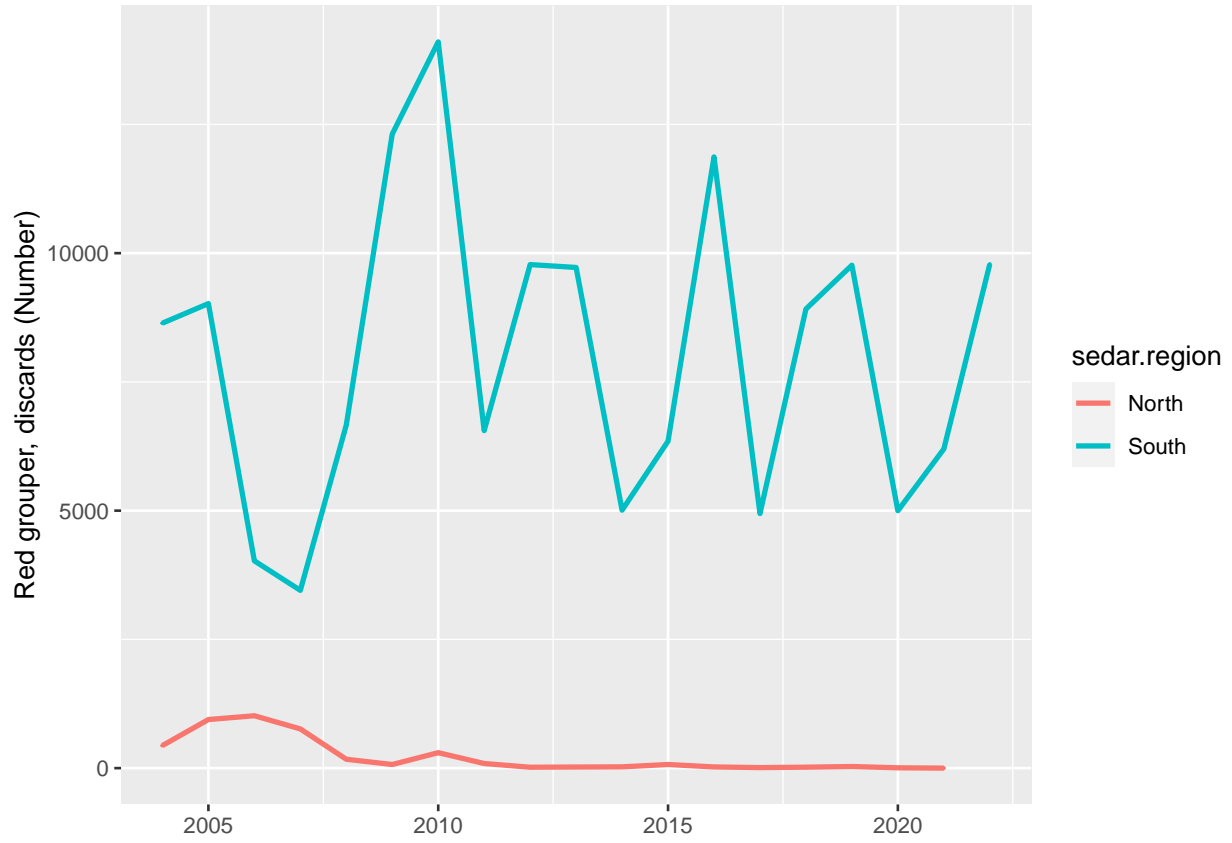


Figure 5: Red grouper discards in number by region. The 2022 value for the North region is confidential and a very low value.

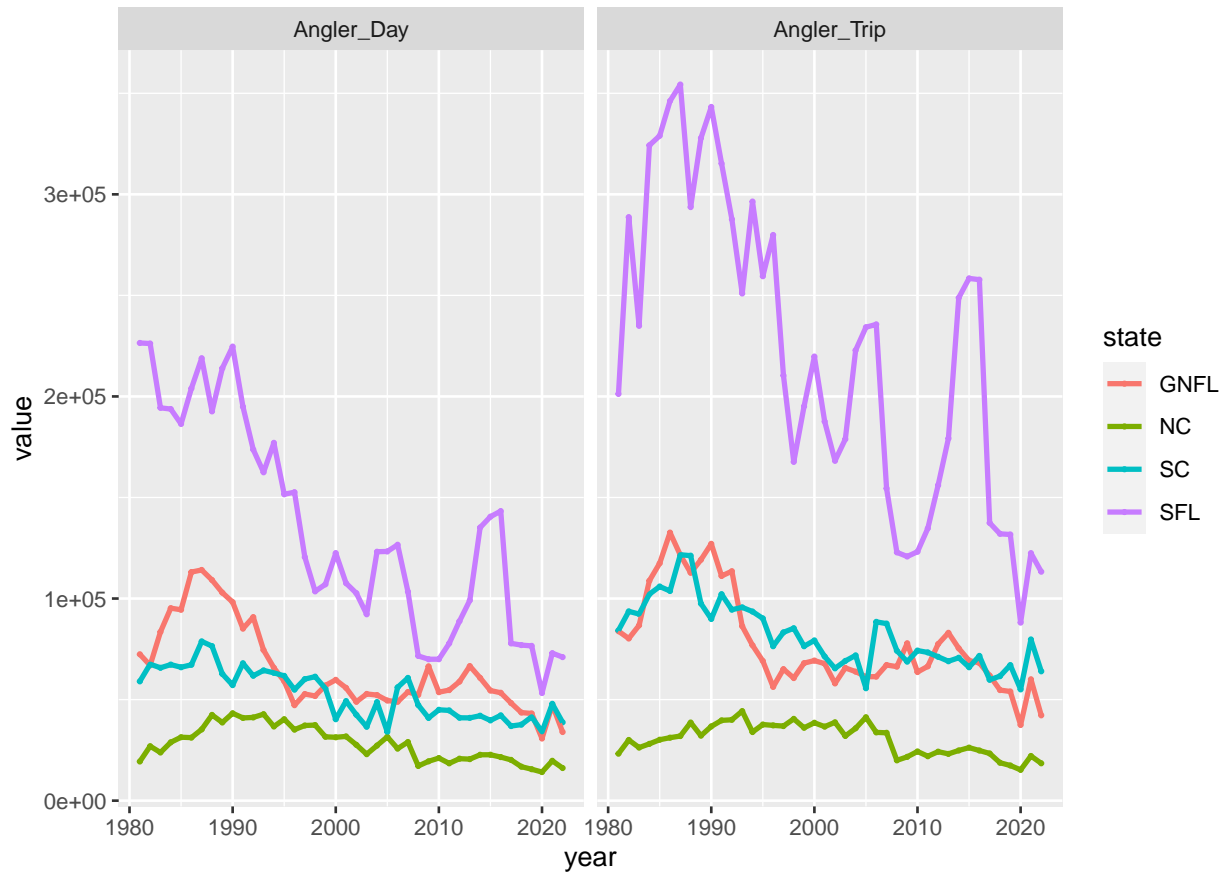


Figure 6: SRHS total estimated angler days and angler trips by state.



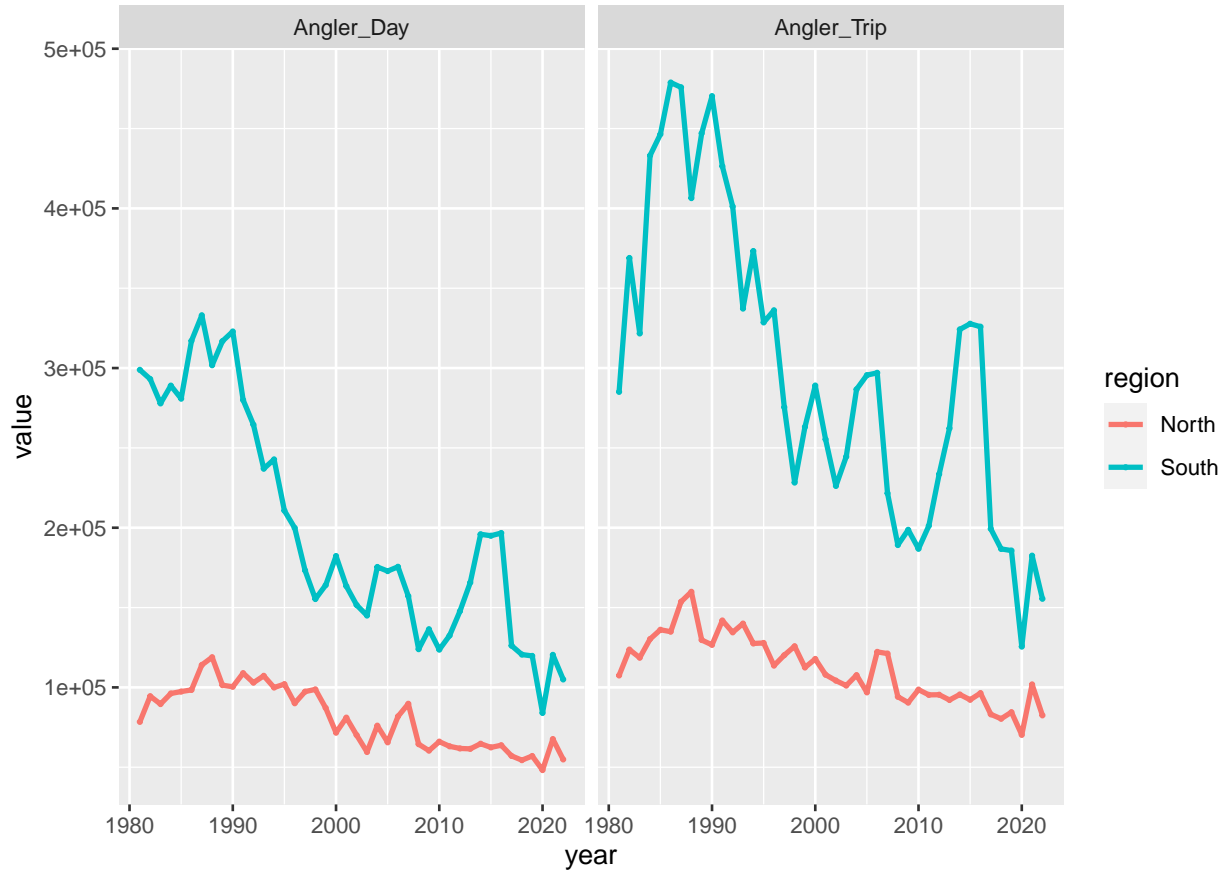


Figure 7: SRHS total estimated angler days and angler trips by region. East represents the Atlantic from NC to FL, West represents the Gulf of Mexico and the Keys.

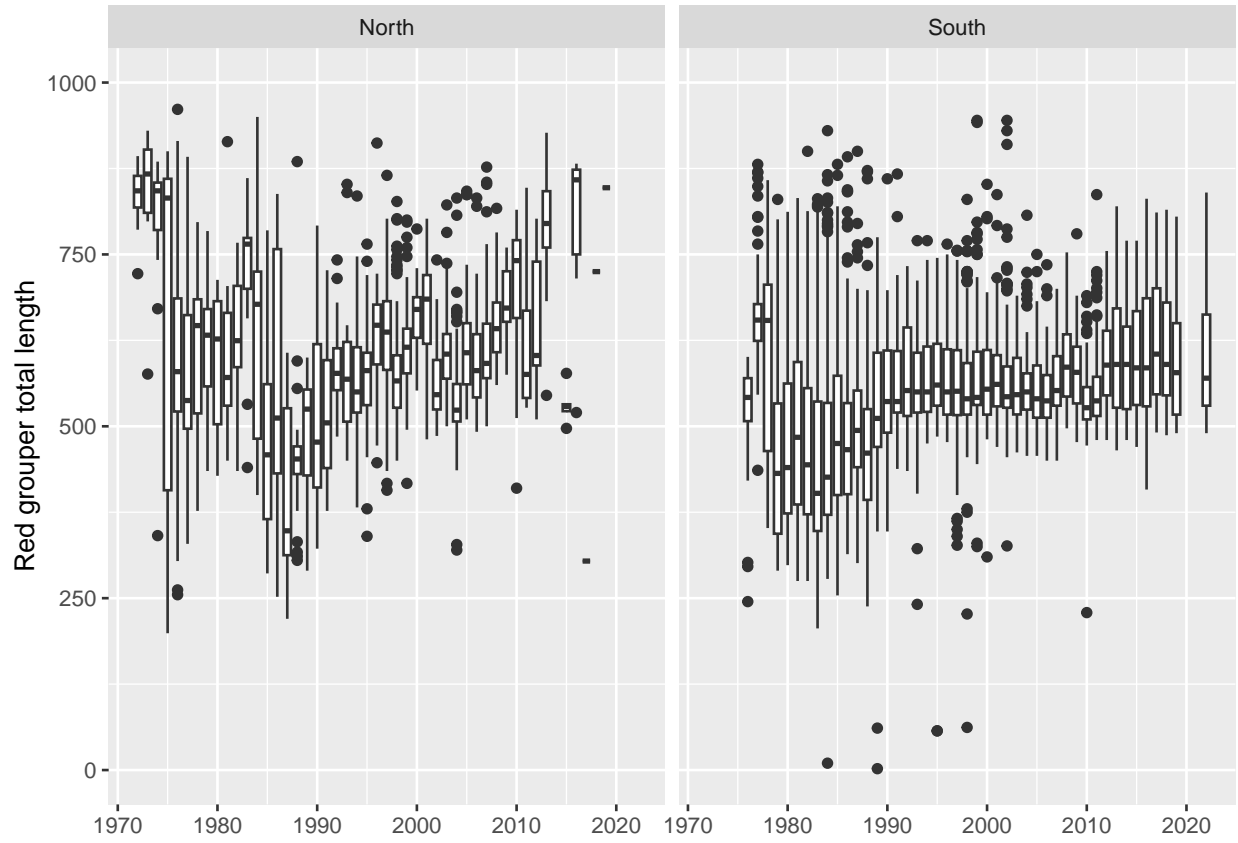


Figure 8: Red grouper total length by SEDAR region. North Carolina and South Carolina are considered North. Georgia and Florida are considered South.

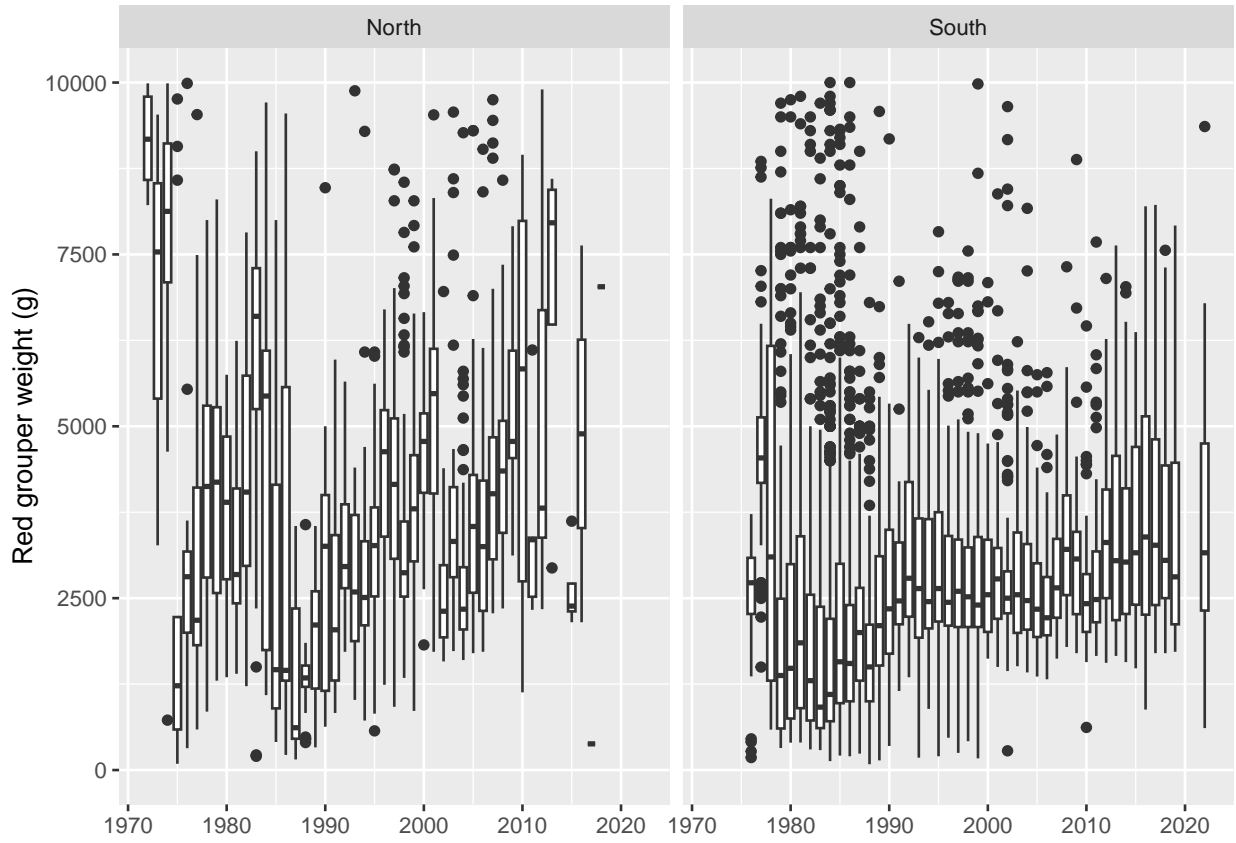


Figure 9: Red grouper weight (g) by SEDAR region. North Carolina and South Carolina are considered North. Georgia and Florida are considered South.

## 6 Files written to S drive

1. RGR\_rec\_effSRHS\_7622\_20230623C.xlsx
  - metadata - description of information in workbook
  - angler days by state
  - angler trips by state
  - angler days by region
  - angler trips by region
  - angler days by year
  - angler trips by year
  - raw\_effort - angler days and angler trips by year and state
2. RGR\_rec\_catSRHS\_7622\_20230623C.xlsx
  - metadata - description of information in workbook
  - land\_region\_n - landings by region in numbers of fish (North/South)
  - land\_region\_w\_kg\_whole - landings by region (North/South)
  - land\_region\_w\_lbs\_gw - landings in pounds
  - disc\_region\_n - discards in numbers of fish (North/South)
  - land\_state\_n - landings by state in numbers of fish
  - land\_state\_w\_kg\_whole - landings by state
  - land\_state\_w\_lbs\_gw - landings in pounds
  - disc\_state\_n - discards in numbers of fish
  - raw\_land\_data - landings in numbers and weight (kg) by year and headboat area
  - raw\_disc\_data - discards in number by year and headboat area
  - conf\_state\_land - number of unique vessels contributing logbooks by state
  - conf\_region\_land - number of unique vessels contributing logbooks by region (North/South)
  - conf\_year\_land - number of unique vessels contributing logbooks by year
3. RGR\_rec\_cvSRHS\_7622\_20230623C.xlsx
  - metadata - description of information in workbook
  - cv\_region - unweighted proxy CVs by region
  - cv\_region\_wgt\_n - proxy CVs by region weighted by state landings in number
  - cv\_region\_wgt\_w - proxy CVs by region weighted by state landings in weight
  - cv\_annual - unweighted proxy CVs by year
  - cv\_annual\_wgt\_n - proxy CVs by year weighted by regional (North/South) landings in number
  - cv\_annual\_wgt\_w - proxy CVs by year weighted by regional (North/South) landings in weight
  - cv\_state - unweighted proxy CVs by state
4. RGR\_rec\_sizeSRHS\_7222\_20230623C.xlsx
  - metadata - description of information in workbook
  - LH\_Template - SRHS data in SEDAR LH Template format, length\_flag=1 represents records with fork length and total length equal.
  - n\_fish\_region - fish measured by region (North/South)
  - n\_trips\_region - number of trips sampled by region (North/South)
  - mean\_tl\_region - mean total length by region (North/South)
  - cv\_tl\_region - cv of total length by region
  - mean\_wt\_region - mean weight (g) by region
  - cv\_wt\_region - cv of weight (g) by region
  - n\_fish\_state - fish measured by state
  - n\_trips\_state - number of trips sampled by state

- mean\_tl\_state - mean total length by state
- cv\_tl\_state - cv of total length by state
- mean\_wt\_state - mean weight (g) by state
- cv\_wt\_state - cv of weight (g) by state
- annual\_summary - number of fish measured, number of trips sampled, and mean total length by year

## References

- Chester, A. J., G. R. Huntsman, P. A. Tester, and C. S. Manooch III. 1984. "The NMFS Southeast Region Headboat Survey: History, Methodology, and Data Integrity." *Bull. Mar. Sci.* 34: 267–79.
- Fitzpatrick, E. E., E. H. Williams, K. W. Shertzer, K. I. Siegfried, J. K. Craig, R. T. Cheshire, G. T. Kellison, K. E. Fitzpatrick, and K. Brennan. 2017. "The NMFS Southeast Region Headboat Survey: History, Methodology, and Data Integrity." *Marine Fisheries Review* 79: 1–27.
- Grimes, C. B., and J. E. Hollingsworth. 1979. "An Automatic Data Processing System for Storage and Manipulation of Life History, Catch, and Angler Effort Data." *Estuaries* 2: 123–26.
- Huntsman, G. R. 1976. "Offshore Headboat Fishing in North Carolina and South Carolina." *Mar. Fish. Rev.* 1: 13–23.
- Huntsman, G. R., D. R. Colby, and R. L. and Dixon. 1978. "Measuring Catches in the Carolina Headboat Fishery." *Trans. Am. Fish. Soc.* 107: 241–45.
- Nuttall, M. A., K. Detloff, K. E. Fitzpatrick, K. Brennan, and V. M. Matter. 2020. *SEDAR 86 DW 31: SEFSC Computation of Uncertainty for Southeast Regional Headboat Survey and Total Recreational Landings Estimates, with Applications to SEDAR 68 Scamp and Yellowmouth Grouper*. <https://sedarweb.org/documents/sedar-68-dw-31-sefsc-computation-of-uncertainty-for-southeast-regional-headboat-survey-and-total-recreational-landings-estimates-with-applications-to-sedar-68-scamp-and-yellowmouth-grouper/>.
- SEDAR. 2015. *SEDAR 41 DW 46: Headboat Data Evaluation*. <https://sedarweb.org/documents/s41dw46-headboat-data-evaluation/>.
- . 2022. *SEDAR 74 Gulf of Mexico Red Snapper Data Workshop Report*. <https://sedarweb.org/documents/sedar-74-gulf-of-mexico-data-workshop-report/>.