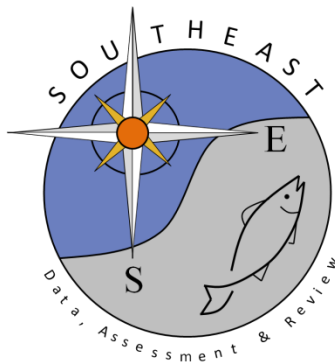


Headboat Data for Red Grouper in the US Gulf of Mexico

Robin T. Cheshire, Kenneth Brennan, and Matthew E. Green

SEDAR88-WP-01

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2024-03-01

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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 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 in any particular strata.

The SRHS implemented electronic logbook reporting in the South Atlantic and Gulf of Mexico as of Jan 1, 2013. Headboat operators now have 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 for regional headboat data 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 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. Due to confusion about the condition of the released fish, only total discards have been reported since 2013. Live and dead releases are typically combined for 2004 to 2012 as total discards to match later years.

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 25,26,27 - TX
- Areas 24 - LA
- Areas 28 - MS
- Areas 29 - AL (added in 2013)
- Areas 21,23 - FLW_AL (includes AL prior to 2013)
- Areas 24,25,26,27,28 - West Region
- Areas 21,23,29 - East 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 continue 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 is considered “released alive” if it is able to swim away on its own. If the fish floats off or is obviously dead or unable to swim, it is 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.

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 discards 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

$$proxyCV = 1 - \frac{N}{n} + 0.05 \text{ (SEDAR 2022).}$$

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 from the Marine Recreational Information Program (MRIP) 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

Annual landings and discards in number and landings in whole pounds are given in Table 2 and Figure 3. Red grouper are considered a shallow water grouper species. The primary area of red grouper landings was predominantly West Florida over the course of the survey. The SEDAR 88 landings for red grouper were nearly identical to the SEDAR 61 landings for overlapping years (Figure 4).

The 1990 size limit of 20 inches total length was likely the cause for reduced landings after 1990. This is also seen in the mean size and weight of the sampled fish (Figures 5 and 6).

3.2 Discards

Nearly all the discards were from West Florida from 2004 to 2022 which follows the pattern of landings (Tables 2, Figure 3). The discard rates were lower for 2004 - 2007, a period where captains were learning the importance of reporting discards. There is no information on the size of these fish with which to convert the discards in number to weight. Therefore discard estimates in weight were not provided for the headboat fleet.

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 annually are given in table 3. For red grouper, only the annual catch can be released to the public.

3.4 Uncertainty

Annual unweighted proxy CV estimates, CV weighted by regional landings in number, and CV weighted by regional landings in weight are provided in table 4. The weighted proxy CVs should provide the best estimate for uncertainty.

3.5 Effort

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 5 - 6). The same trend is seen in the East for the regional effort estimates (Tables 7 - 8). The finer scale effort estimates by state show the pattern observed in effort is primarily driven by the Florida - Alabama region but other states have been fairly constant (Tables 9 - 10, Figure 7). 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. One of the caveats with the expansion of angler trips to account for non-reporting is evident for Louisiana in 2002 where the estimation process for angler days used a non-standard process to account for reporting deficiencies. The estimated angler trips for LA in 2002 is zero while the estimated angler days is approximately 6000 angler days. This does not dramatically impact regional or Gulfwide estimates but demonstrates an issue with the calculation created to combine with the less informative general recreational effort unit.

3.6 Biological Samples

Annual numbers of red grouper measured for natural total length, number of trips, number of vessels sampled, and mean total lengths (mm) and weight (g) and associated CVs from which red grouper were measured are summarized in Table 11. Patterns in length and weight by year and region are shown in Figures 5 and 6.

3.7 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 number (landings.n), landings in whole pounds (landings.lbs), and discards in number (discards.n).

year	landings.n	landings.lbs	discards.n
1986	32913	118331	
1987	25729	88423	
1988	27954	103879	
1989	49777	135037	
1990	14582	91512	
1991	9509	60738	
1992	9049	52651	
1993	8802	76120	
1994	9617	55351	
1995	14499	94210	
1996	15594	84369	
1997	4676	25108	
1998	4382	23339	
1999	6918	48010	
2000	8861	51056	
2001	5560	31630	
2002	4402	24636	
2003	7521	40337	
2004	13810	68272	24121
2005	13967	78610	13033
2006	4630	26703	7349
2007	4245	25858	17452
2008	5003	39409	90522
2009	4666	31003	154668
2010	4952	27315	118248
2011	7387	38459	135008
2012	13544	87324	118350
2013	14088	81255	112266
2014	8123	47272	84237
2015	5972	53052	74376
2016	5704	59580	79409
2017	2709	22451	73658
2018	2220	23382	56930
2019	2874	19430	32962
2020	4104	23808	30798
2021	7756	33575	55074
2022	3289	20302	58283

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

year	n_vessel
1986	50
1987	43
1988	45
1989	50
1990	57
1991	49
1992	49
1993	52
1994	48
1995	40
1996	43
1997	36
1998	41
1999	32
2000	31
2001	32
2002	35
2003	40
2004	45
2005	46
2006	40
2007	41
2008	50
2009	49
2010	51
2011	46
2012	45
2013	40
2014	42
2015	40
2016	42
2017	42
2018	42
2019	41
2020	38
2021	38
2022	41
2023	39
2024	23

Table 4: Annual unweighted proxy CV values (cv.unwgt), proxy CV values weighted by regional landings in number (cv.wgt.n), and proxy CV values weighted by regional landings in weight (cv.wgt.w).

year	cv.unwgt	cv.wgt.n	cv.wgt.w
1986	0.621	0.695	0.695
1987	0.656	0.746	0.745
1988	0.496	0.551	0.551
1989	0.435	0.494	0.494
1990	0.229	0.209	0.209
1991	0.181	0.140	0.140
1992	0.158	0.139	0.139
1993	0.150	0.115	0.115
1994	0.222	0.226	0.226
1995	0.317	0.372	0.372
1996	0.314	0.312	0.312
1997	0.250	0.253	0.253
1998	0.339	0.418	0.417
1999	0.365	0.419	0.419
2000	0.376	0.436	0.436
2001	0.376	0.434	0.434
2002	0.274	0.346	0.346
2003	0.363	0.340	0.340
2004	0.252	0.296	0.296
2005	0.240	0.254	0.254
2006	0.284	0.323	0.323
2007	0.398	0.332	0.332
2008	0.101	0.074	0.074
2009	0.063	0.055	0.055
2010	0.079	0.086	0.086
2011	0.057	0.059	0.059
2012	0.071	0.066	0.066
2013	0.050	0.050	0.050
2014	0.050	0.050	0.050
2015	0.051	0.051	0.051
2016	0.050	0.050	0.050
2017	0.056	0.052	0.052
2018	0.052	0.051	0.051
2019	0.053	0.052	0.052
2020	0.050	0.050	0.050
2021	0.050	0.050	0.050
2022	0.050	0.050	0.050

Table 5: Estimates of total effort in angler - days by year.

year	Angler_Day
1986	302536
1987	286774
1988	274035
1989	274581
1990	278948
1991	240654
1992	270931
1993	300058
1994	317991
1995	283372
1996	257753
1997	240657
1998	270835
1999	242378
2000	222678
2001	218826
2002	215004
2003	225279
2004	223420
2005	190090
2006	199843
2007	203166
2008	174309
2009	196443
2010	158887
2011	207966
2012	217431
2013	233886
2014	245853
2015	253105
2016	257016
2017	251421
2018	247242
2019	240862
2020	193111
2021	270017
2022	230336

Table 6: Estimates of total effort in angler - trips by year.

year	Angler_Trip
1986	330173
1987	351541
1988	359278
1989	358847
1990	374904
1991	318585
1992	343636
1993	362102
1994	390133
1995	364384
1996	337152
1997	299961
1998	326333
1999	219374
2000	298776
2001	271970
2002	260044
2003	276561
2004	275804
2005	240459
2006	248496
2007	329881
2008	214982
2009	264403
2010	209111
2011	281137
2012	301077
2013	293420
2014	312883
2015	320289
2016	326806
2017	321268
2018	316205
2019	303721
2020	237569
2021	352783
2022	317628

Table 7: Estimates of total effort in angler - days by region.

year	West	East
1986	62459	240077
1987	69725	217049
1988	78087	195948
1989	66256	208325
1990	65042	213906
1991	66342	174312
1992	86129	184802
1993	92160	207898
1994	113429	204562
1995	100962	182410
1996	102840	154913
1997	91215	149442
1998	85504	185331
1999	66261	176117
2000	63347	159331
2001	61583	157243
2002	73173	141831
2003	81068	144211
2004	64990	158430
2005	59857	130233
2006	75794	124049
2007	66286	136880
2008	44133	130176
2009	54005	142438
2010	47371	111516
2011	49170	158796
2012	53615	163816
2013	57328	176558
2014	52865	192988
2015	56799	196306
2016	55368	201648
2017	53131	198290
2018	53698	193544
2019	53714	187148
2020	52168	140943
2021	72877	197140
2022	64563	165773

Table 8: Estimates of total effort in angler - trips by region.

year	West	East
1986	70752	259421
1987	81749	269791
1988	83764	275514
1989	75876	282971
1990	76780	298124
1991	81337	237248
1992	96090	247546
1993	100043	262058
1994	118160	271973
1995	105772	258612
1996	107764	229387
1997	94157	205804
1998	90553	235781
1999	48435	170939
2000	72056	226720
2001	64516	207453
2002	69614	190431
2003	82703	193858
2004	65024	210780
2005	62093	178366
2006	77265	171231
2007	144368	185512
2008	29253	185729
2009	58088	206315
2010	49273	159838
2011	51748	229388
2012	61315	239762
2013	60035	233385
2014	56145	256738
2015	60540	259749
2016	58190	268616
2017	56164	265103
2018	55687	260519
2019	54741	248980
2020	52947	184622
2021	86183	266600
2022	79823	237805

Table 9: Estimates of total effort in angler - days by state.

year	TX	LA	MS	AL	FLW_AL
1986	56568	5891			240077
1987	63363	6362			217049
1988	70396	7691			195948
1989	63389	2867			208325
1990	58144	6898			213906
1991	59969	6373			174312
1992	76218	9911			184802
1993	80904	11256			207898
1994	100778	12651			204562
1995	90464	10498			182410
1996	91852	10988			154913
1997	82207	9008			149442
1998	77650	7854			185331
1999	58235	8026			176117
2000	58395	4952			159331
2001	55361	6222			157243
2002	66951	6222			141831
2003	74432	6636			144211
2004	64990				158430
2005	59857				130233
2006	70789	5005			124049
2007	63764	2522			136880
2008	41188	2945			130176
2009	50737	3268			142438
2010	47154	217	498		111018
2011	47284	1886	1771		157025
2012	51776	1839	1841		161975
2013	55749	1579	1827	14454	160277
2014	51231	1634	1623	16766	174599
2015	55135	1664	1923	18008	176375
2016	54083	1285	1670	16831	183147
2017	51575	1556	1633	17841	178816
2018	52160	1538	1697	19851	171996
2019	52456	1258	1374	18607	167167
2020	51498	670	1058	13091	126794
2021	71344	1533	1664	13844	181632
2022	62705	1858	1817	14588	149368

Table 10: Estimates of total effort in angler - trips by state.

year	TX	LA	MS	AL	FLW_AL
1986	65731	5021			259421
1987	74345	7404			269791
1988	76962	6802			275514
1989	73115	2761			282971
1990	69667	7113			298124
1991	75092	6245			237248
1992	86984	9106			247546
1993	89152	10892			262058
1994	106610	11550			271973
1995	95852	9920			258612
1996	96901	10863			229387
1997	85255	8903			205804
1998	82694	7858			235781
1999	42468	5967			170939
2000	67060	4996			226720
2001	57508	7009			207453
2002	69614	0			190431
2003	76160	6543			193858
2004	65024				210780
2005	62093	0			178366
2006	72260	5005			171231
2007	141783	2585			185512
2008	26540	2713			185729
2009	55440	2648			206315
2010	49105	168	652		159185
2011	50165	1583	2140		227248
2012	59623	1692	2241		237521
2013	58489	1546	2193	21045	210147
2014	54625	1520	1998	24417	230323
2015	59048	1492	2421	27054	230273
2016	57038	1152	1989	25108	241519
2017	54738	1427	1868	26497	236739
2018	54349	1338	1992	30639	227887
2019	53639	1102	1675	28188	219117
2020	52415	532	1267	19080	164275
2021	85007	1176	2259	19709	244632
2022	78377	1446	2594	22142	213069

Table 11: Red grouper number of fish measured (n.fish), number of trips sampled (n.trips), number of vessels sampled (n.ves), mean total length (mm, mean.len), and length CV (cv.len), mean weight (g, mean.wt), and weight CV in g by region (cv.wt).

year	n.fish	n.trips	n.ves	mean.tl	cv.tl	mean.wt	cv.wt
1986	370	146	38	449	0.29	1724	1.08
1987	546	206	39	456	0.23	1641	0.86
1988	353	137	33	471	0.24	1912	0.94
1989	700	151	42	431	0.27	1445	1.09
1990	240	78	38	565	0.21	3066	0.68
1991	103	49	24	612	0.17	3682	0.63
1992	54	31	18	590	0.17	3152	0.63
1993	33	22	12	602	0.22	4121	0.71
1994	52	35	26	552	0.14	2776	0.59
1995	57	33	21	577	0.13	3091	0.47
1996	71	34	21	563	0.13	2726	0.46
1997	48	24	14	551	0.20	2783	0.49
1998	40	25	14	533	0.11	2356	0.44
1999	108	39	21	578	0.13	2954	0.56
2000	69	30	17	555	0.11	2672	0.41
2001	52	30	18	557	0.12	2724	0.43
2002	135	72	34	534	0.10	2394	0.30
2003	218	118	39	535	0.10	2415	0.38
2004	173	103	38	535	0.07	2295	0.30
2005	71	44	21	561	0.07	2639	0.25
2006	78	47	24	560	0.10	2588	0.37
2007	94	50	20	565	0.12	2710	0.44
2008	87	46	26	589	0.13	3119	0.51
2009	50	31	19	554	0.12	2554	0.41
2010	52	37	20	560	0.12	2707	0.52
2011	93	52	25	543	0.09	2414	0.36
2012	149	75	28	560	0.13	2658	0.52
2013	155	77	28	541	0.10	2352	0.36
2014	113	57	23	569	0.11	2674	0.35
2015	65	40	19	566	0.11	2604	0.39
2016	49	34	14	566	0.14	2860	0.54
2017	21	14	10	608	0.18	3598	0.67
2018	33	20	12	570	0.15	2978	0.56
2019	56	39	17	579	0.16	3177	0.58
2020	11	8	8	542	0.08	2431	0.25
2021	20	11	10	560	0.08	2304	0.44
2022	49	27	12	588	0.14	3114	0.48

3.8 Figures

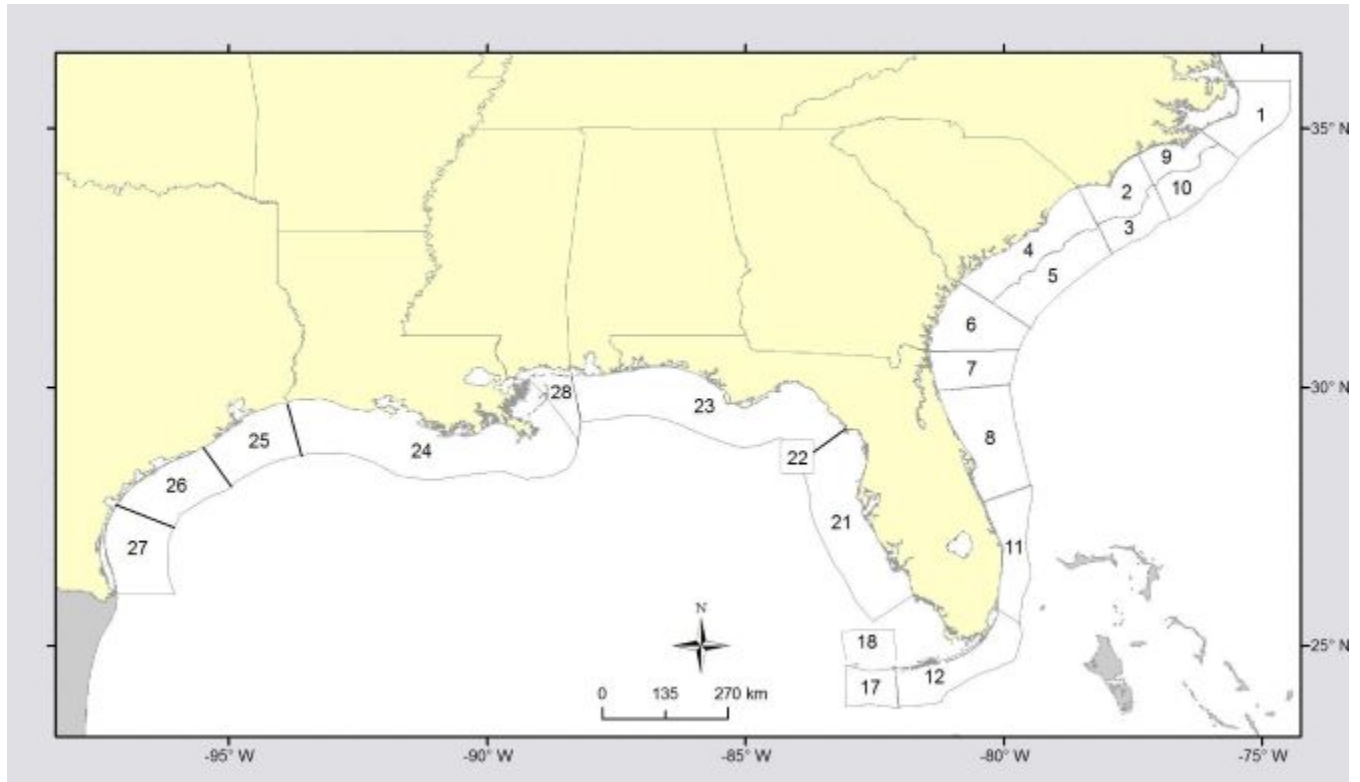


Figure 1: Headboat sampling areas prior to 2013.

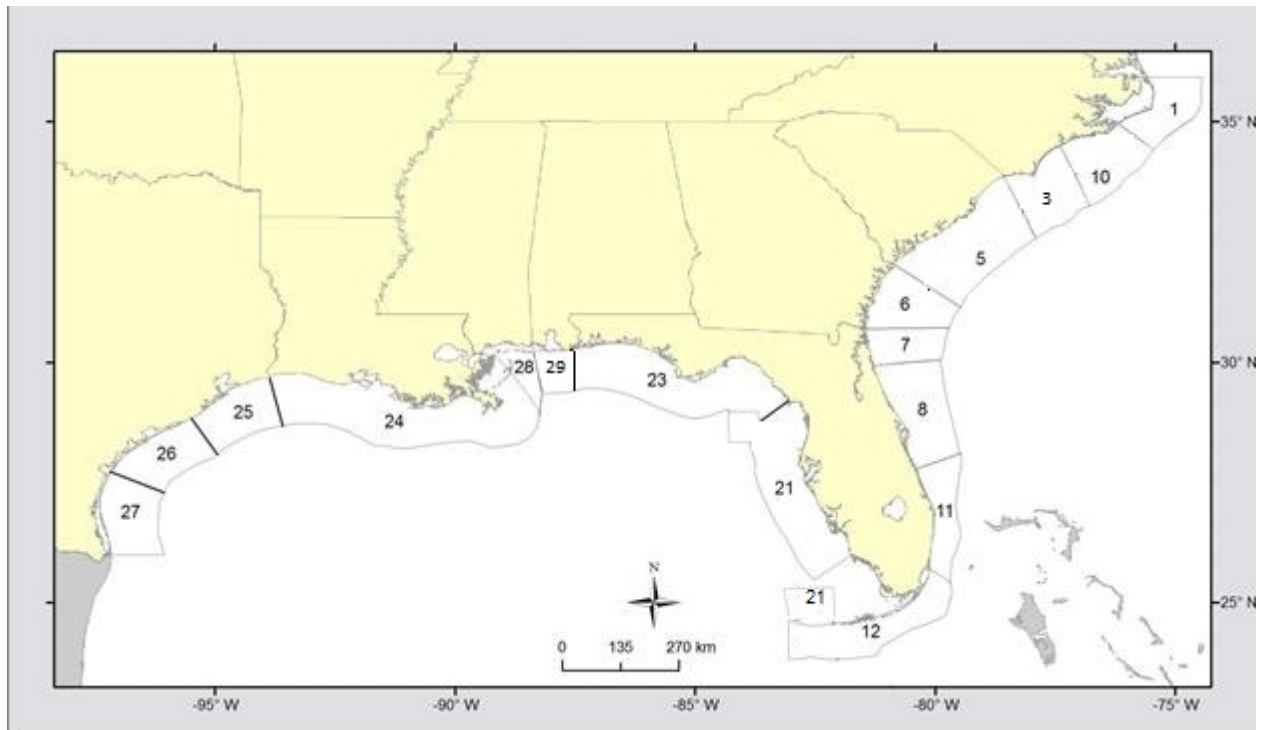


Figure 2: Headboat sampling areas 2013 - present.

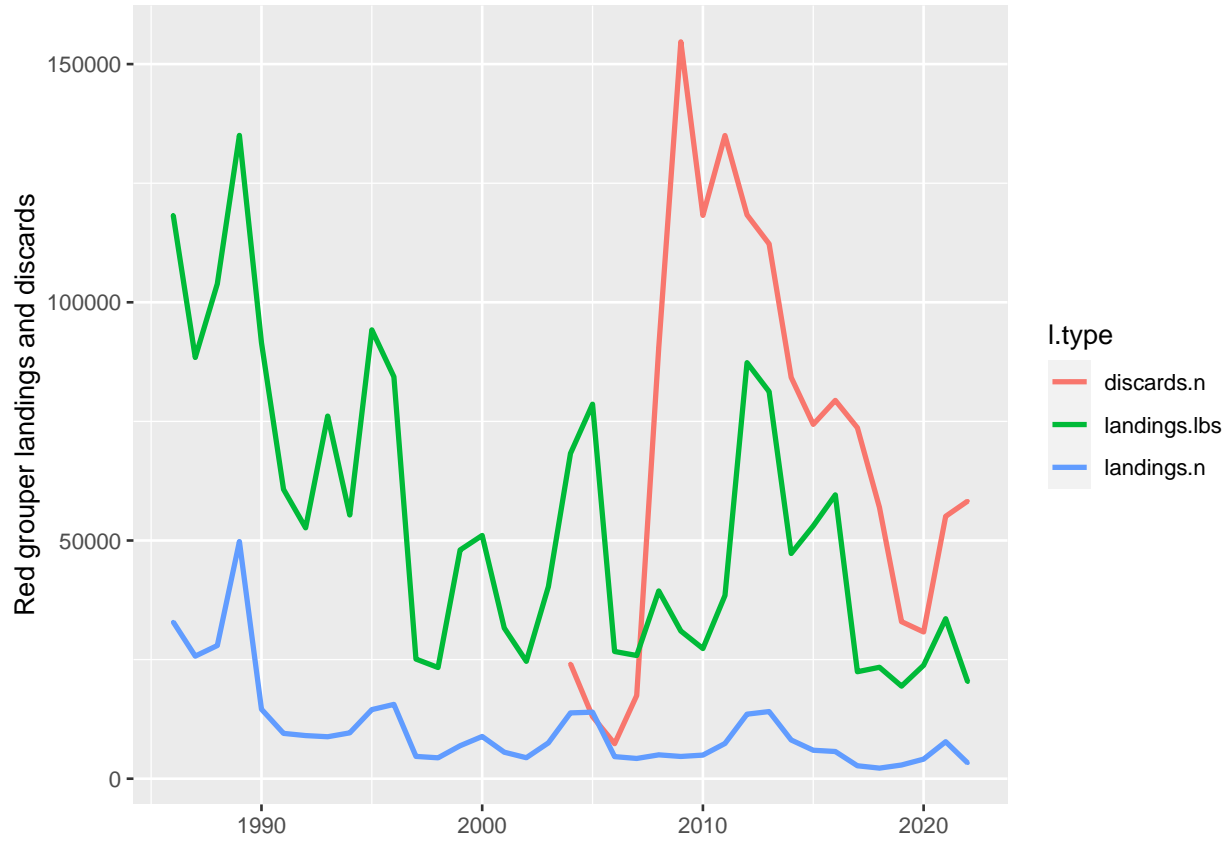


Figure 3: Red grouper landings in number (landings.n), landings in whole pounds (landings.lbs), and discards in number (discards.n).

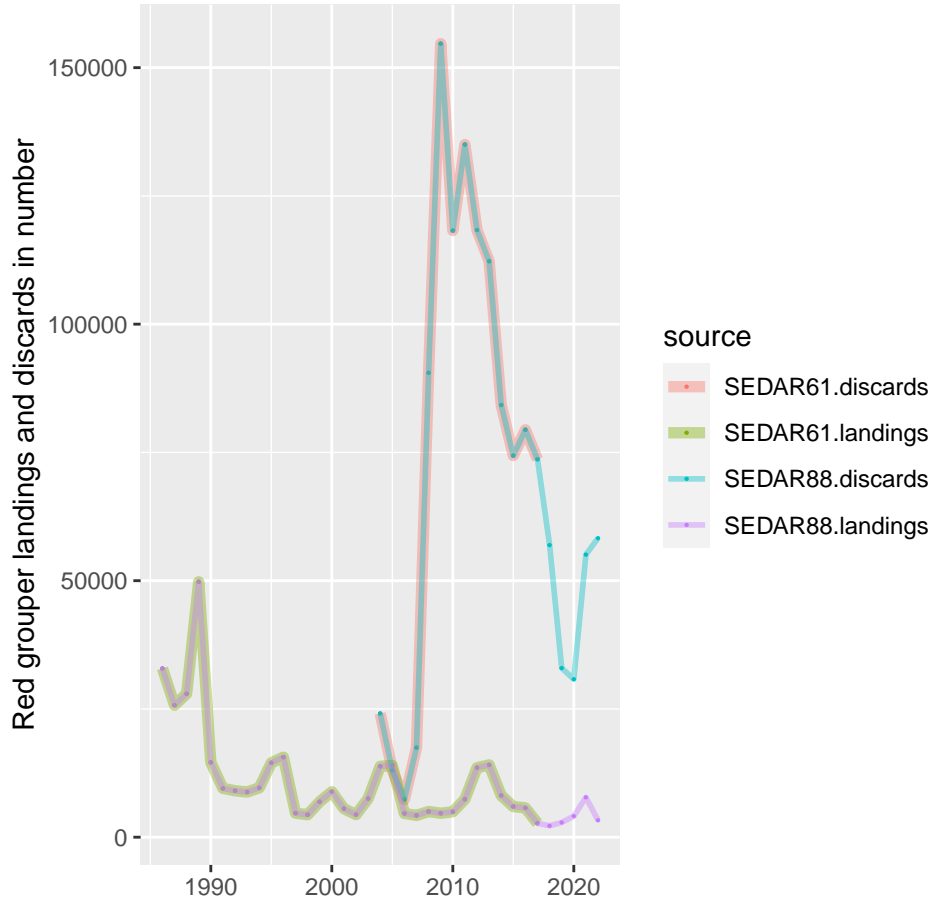


Figure 4: Comparison to SEDAR 61 Red grouper landings and discards.

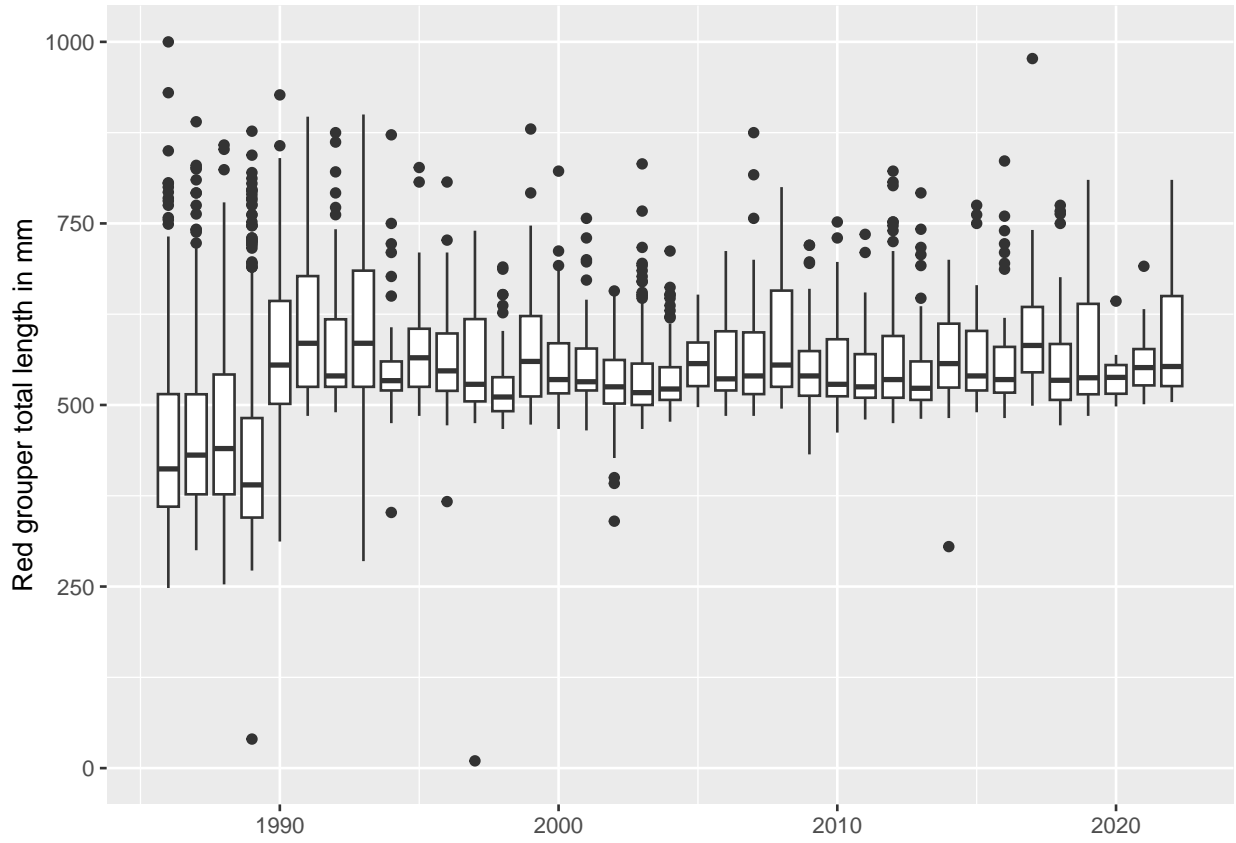


Figure 5: Red grouper total length.

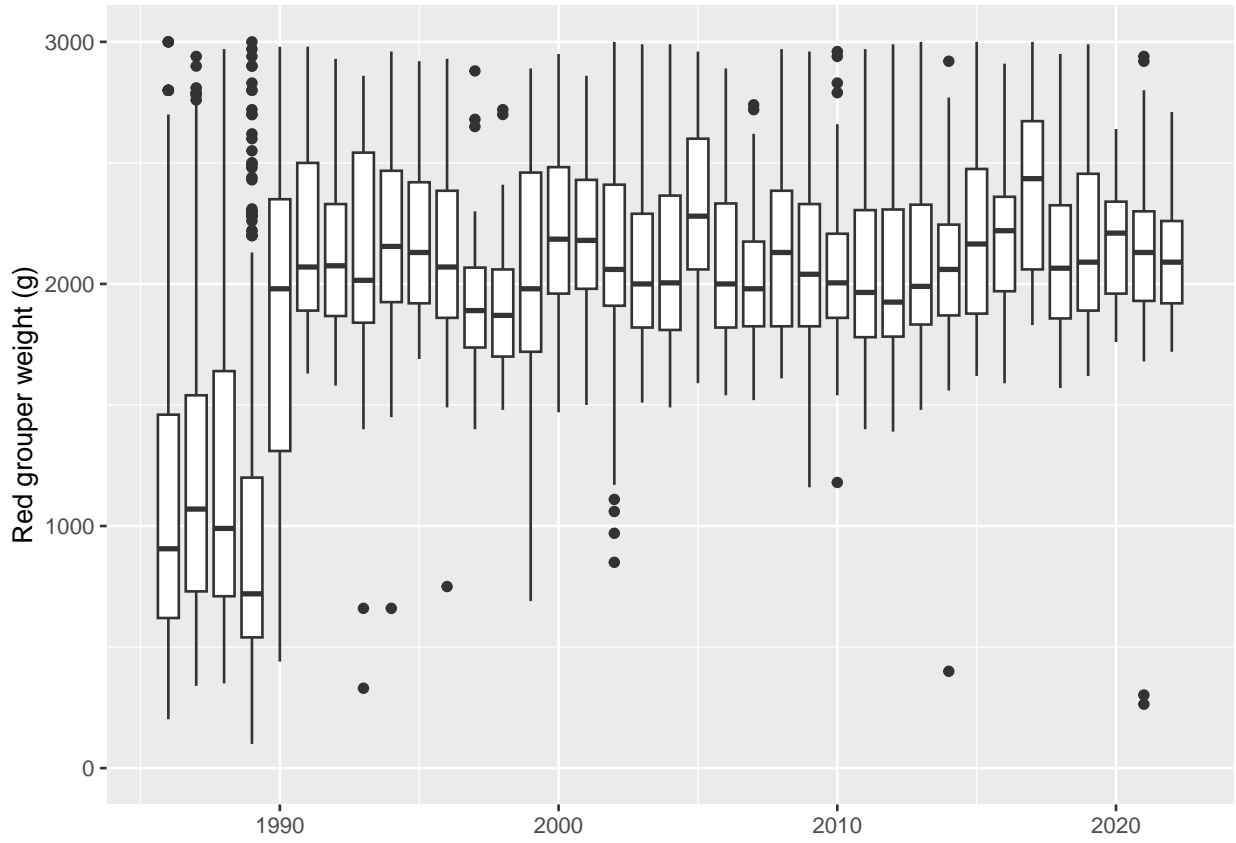


Figure 6: Red grouper weight (g).

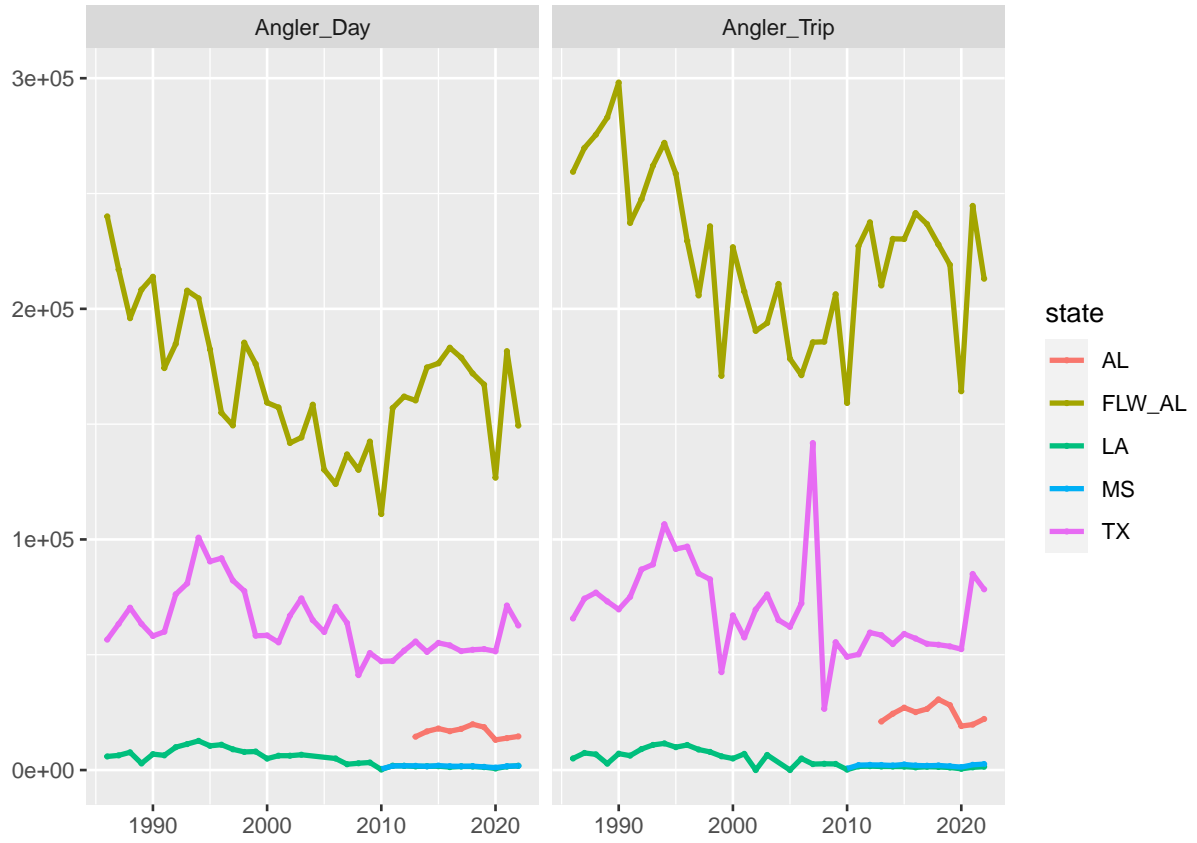


Figure 7: SRHS total estimated angler days and angler trips.

3.9 References

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