

Headboat Data for Gag in the US Gulf of America

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1 Survey Description

The Southeast Region Headboat Survey (SRHS) estimates landings and effort for headboats in the U.S. South Atlantic and Gulf of America. The survey began in 1972 in North Carolina and South Carolina. It expanded to northeast Florida (Nassau-Indian River counties) and Georgia in 1976, 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 was implemented in the Gulf of America in 1986, extending from Naples, FL, to South Padre Island, TX.

Annually, the survey includes approximately 70-80 participating vessels in each region (Table 1). Headboat data are considered confidential and cannot be publicly distributed if fewer than three vessels contribute to a data product.

The SRHS implemented mandatory electronic logbook reporting in the South Atlantic and Gulf of America as of January 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 concluded that the SRHS data products represent the best available information for regional headboat data and recommended their use in stock assessments. This conclusion also applies to the Gulf of America, as the data collection methodology is identical.

Paper logbook forms varied by region and year, primarily due to space limitations in the survey's early years. The predominant species listed on these forms varied by region, and the number of species listed generally increased over time. All forms included blank lines to write in species not explicitly listed. Since the transition to electronic logbooks in 2013, a comprehensive list of all species is available to users.

Reporting of discards was added to the logbook form in 2004. Due to confusion regarding the condition of released fish, only total discards have been reported since 2013. For consistency, data from 2004 to 2012, which originally distinguished between live and dead releases, are typically combined to represent total discards.

The area definitions for the SRHS were modified in 2013, primarily to remove the inshore-offshore distinction for the Carolinas and to create state-specific areas for the Gulf of America. A few other areas were collapsed in the Florida Keys and on the west coast of Florida (Figures 1 and 2).

For this assessment, state defined based on headboat areas is used to define regions rather than actual states. Much of the data at this level is confidential but has been provided to the assessment analysts. The regional based data is available to the public. The assignment of SRHS areas to state and regions is as follows:

- **Texas (TX):** Areas 25, 26, 27
- **Louisiana (LA):** Area 24

- **Mississippi (MS):** Area 28
- **Alabama (AL):** Area 29 (added in 2013)
- **Florida West/Alabama (FLW_AL):** Areas 21, 23 (includes AL prior to 2013)

Aggregated Regions:

- **West Region:** Areas 24, 25, 26, 27
- **East Region:** Areas 21, 23, 28, 29

The SRHS dockside sampling was suspended in March 2020 due to the COVID-19 pandemic, and no biological samples were collected during this time. However, port agents continued to monitor reporting compliance to ensure captains submitted trip-level catch and effort data via electronic logbooks. Consequently, reported catch and effort data were used to estimate 2020 landings and effort with no disruption. To convert landings from number of fish to weight, mean weights from 2019 were applied to the 2020 landings numbers. Port agents maintained QA/QC checks and database validations for their areas of responsibility and provided outreach to captains regarding new for-hire reporting requirements. Biological sampling did not resume until the NMFS/SEFSC approved new safety measures in July 2021, though some port agents supported by state agencies returned to dockside sampling earlier.

2 Methods

2.1 Landings

The SRHS uses a two-component system to estimate catch and effort:

1. Logbook Reporting: Vessel personnel complete a logbook for each trip, reporting total catch and effort. Port agents identify missing trip reports by contacting the vessel's captain or office, through personal observations, by reviewing weekly compliance reports, and using other methods. If trips are not reported, the monthly catch estimated for the vessel is increased by the proportion of trips missing. In the early years of the survey, when compliance was low, catch from another similarly sized vessel from the same area was adjusted based on the observed number of trips and substituted when vessels failed to report landings. Reporting compliance has been near 100% since permits were linked to reporting requirements in 2008. The proportion of trips reported is the primary information used to develop a proxy for uncertainty estimates.

2. Dockside Sampling: Port samplers collect fish size data dockside, measuring fish to the nearest millimeter (mm) and weighing them to the nearest 0.01 kg. These data are used to calculate mean weights by species, area, and month, which are then used to convert reported landings from number of fish to total weight.

2.2 Discards

In 2004, the SRHS logbook was modified to collect self-reported discards, categorized as “released alive” or “released dead.” Captains were instructed that a fish is “released alive” if it can swim away on its own and “released dead” if it floats or is obviously unable to swim. As of January 1, 2013, with the transition to electronic reporting, the logbook was simplified to collect only the total number of fish released, regardless of condition.

Some under-reporting and misunderstanding of the requested data were identified in the initial years of discard data collection (2004-2007). Annual catch rates from the at-sea headboat observer program can be compared to logbook catch rates to evaluate the validity of logbook discard data from this period. 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 and effectiveness of fish descending devices and venting tools, which are required on board in both the South Atlantic and Gulf of America.

2.3 Uncertainty

Uncertainty estimates for headboat landings were initially developed for the SEDAR 68 scamp research track assessment (Nuttall et al. 2020). While statistically valid, the approach used the uncertainty of reported landings (across areas, months, and vessels) as a proxy for uncertainty in total landings estimates, which produced unrealistic coefficients of variation (CVs) in some years. For example, some years with only 60% of vessels reporting had CVs of approximately 0.05. As an alternative, a proxy CV method was developed for the SEDAR 74 red snapper research track data workshop. This method relies on the proportion of reported trips (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 refined for the SEDAR 82 gray triggerfish research track data workshop to account for spatial variability in species abundance and reporting compliance. To address concerns that high CVs could be estimated for strata with low overall compliance even if compliance was high in the areas with the most catch, compliance rates are now weighted by the associated landings estimates:

$$proxyCV_i = 1 - \sum_j \left(\frac{n_{i,j}}{N_{i,j}} \cdot \frac{L_{i,j}}{\sum_j L_{i,j}} \right) + 0.05$$

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 paper logbooks until 2012 and electronically since 2013. After each trip, the owner, captain, or a designated crew member enters the total number of all species landed and discarded. Effort is reported as the number of anglers per trip and is standardized into **angler-day** by multiplying the number of anglers by a trip-length factor (e.g., 40 anglers on a half-day trip yields 40×0.5=20 angler-days).

As with landings, effort is expanded to account for missing trips. Effort estimates for Louisiana are zero for 2004 and 2005. During this time, only one or two vessels were active and did not report catch in 2002, 2004, 2005, or 2006 due to funding and staffing issues. Additionally, Hurricane Katrina severely impacted Louisiana fishing operations from August 2005 through much of 2006. Alabama was assigned a separate area code in 2013; prior to this, it was combined with northwest Florida. Mississippi was added to the survey in 2010.

Angler-day is considered the best practice unit of effort for headboat data. **Angler-trip** is calculated to match units for general recreational effort from the Marine Recreational Information Program (MRIP) for the purpose of combining effort across sectors if required. There are some caveats with the method because it does not account for all effort expansions in the standard estimation or the duration of the trip.

2.5 Biological Samples

Length data have been collected by SRHS dockside samplers since the survey's inception. Weights are typically collected for the same fish measured during dockside sampling. Other biological samples (scales, otoliths, spines, stomachs, gonads) and data (sex determination) are collected routinely for ageing, diet, and maturity studies. Port agents are provided with lists of priority species, but no specific sampling quotas are assigned.

3 Results and Discussion

3.1 Landings

Landings in number are given by region (Table 2, Figure 4). Landings in pounds are shown by region (Table 3). The primary area of gag landings was predominantly West Florida - Alabama in the East region. The landings have declined over the survey time period with the lowest levels in the most recent years (Table 3).

The SEDAR 105 landings for gag were nearly identical to the SEDAR 72 landings for overlapping years (Figure 5).

MRIP did not produce headboat landings estimates for Texas prior to the start of the SRHS in 1986. The average landings for the Texas SRHS landings from 1986 - 1990 could be used as a proxy for MRIP landings for each year from 1981 to 1985 (321 fish, 1,225 pounds).

3.2 Discards

Nearly all the discards were from West Florida - Alabama in the East region (Table 4). There is no information on the size of these fish in the SRHS with which to convert the discards in number to weight. Therefore discard estimates in weight were not provided for the headboat fleet. Observer data may inform the selectivity of these discards.

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 year are given in tables 5 - 7. For gag, only the regional (East, West) catch can be released to the public. The assessment analysts are provided with finer scale data and maps of landings.

3.4 Uncertainty

Unweighted proxy CV estimates by state, region, and overall are provided in Tables 8 - 10. Regional proxy CV values weighted by state landings (in number and weight) are given in Tables 11 and 12. Annual weighted proxy CV values, weighted by regional landings, are provided in Tables 13 and 14. 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, increased until 2015, and have been relatively constant since (Tables 15 - 16). The same trend is seen in the East for the regional effort estimates (Tables 17 - 18, Figure 7). 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 19 - 20, Figure 8). 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 gag measured for total length in the headboat fleet are given by state and region in Tables 21 - 22. The number of trips from which these samples were measured are summarized in Tables 23 - 24. Mean total lengths (mm) and weights (g), with associated CVs, are tabulated by state and region in Tables 25 - 32. Patterns in length and weight by year and region are shown in Figures 9 and 10.

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
2023	61	68
2024	62	68

Table 2: Gag landings by region in number (TX and LA are West; AL, MS, FLW are East).

year	West	East	Total
1986	886	41609	42495
1987	809	31347	32156
1988	573	25763	26336
1989	240	34905	35145
1990	175	18922	19097
1991	161	11292	11453
1992	168	13621	13789
1993	589	18746	19335
1994	270	20291	20561
1995	349	17467	17816
1996	351	15711	16062
1997	223	15400	15623
1998	1704	34612	36316
1999	719	31398	32117
2000	241	30583	30824
2001	197	14297	14494
2002	316	11299	11615
2003	474	15907	16381
2004	140	24530	24670
2005	226	16558	16784
2006	170	6594	6764
2007	181	10960	11141
2008	218	10303	10521
2009	175	9308	9483
2010	122	10972	11094
2011	34	5065	5099
2012	64	5189	5253
2013	31	5245	5276
2014	13	6190	6203
2015	16	3610	3626
2016	38	2452	2490
2017	17	2915	2932
2018	28	2998	3026
2019	35	2615	2650
2020	19	2962	2981
2021	51	3586	3637
2022	13	3252	3265
2023	9	910	919
2024	11	402	413

Table 3: Gag landings by region in pounds; TX and LA are West; AL, MS, FLW are East).

year	West	East	Total
1986	2541	321429	323970
1987	3091	175311	178402
1988	2092	134792	136884
1989	710	243852	244561
1990	884	143313	144198
1991	1034	79275	80309
1992	1012	86668	87680
1993	5650	193523	199173
1994	2257	132403	134660
1995	2509	110927	113435
1996	2723	84401	87123
1997	1358	85093	86451
1998	15348	187312	202659
1999	4554	161705	166259
2000	1626	198369	199995
2001	1691	114958	116648
2002	2086	77760	79847
2003	3652	106116	109769
2004	905	168511	169416
2005	1431	111013	112443
2006	1965	47271	49236
2007	1375	72852	74227
2008	1723	73083	74806
2009	3429	63827	67255
2010	828	71920	72748
2011	344	49892	50236
2012	692	44827	45519
2013	442	34655	35096
2014	183	41715	41898
2015	184	36383	36566
2016	330	23583	23913
2017	148	25265	25412
2018	509	27929	28437
2019	373	22164	22537
2020	206	24745	24951
2021	500	32069	32568
2022	208	35945	36153
2023	105	9082	9187
2024	114	4164	4278

Table 4: Gag discards by region in number of fish (TX and LA are West; AL, MS, FLW are East.

year	West	East	Total
2008	142	53276	53418
2009	66	52378	52444
2010	93	46510	46603
2011	99	45784	45883
2012	144	37944	38088
2013	84	34672	34756
2014	41	20121	20162
2015	27	15940	15967
2016	13	20726	20739
2017	16	16539	16555
2018	2	21038	21040
2019	3	18294	18297
2020	0	10397	10397
2021	6	16325	16331
2022	1	11648	11649
2023	4	9282	9286
2024	0	11670	11670

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

year	TX	LA	MS	AL	FLW_AL
1986	15	4			45
1987	12	3			45
1988	13	4			47
1989	11	5			51
1990	10	3			58
1991	13	3			55
1992	15	4			51
1993	15	5			50
1994	14	6			51
1995	15	6			47
1996	11	7			46
1997	10	6			42
1998	17	6			42
1999	14	5			38
2000	14	2			36
2001	13	2			37
2002	18				37
2003	14	1			34
2004	16				40
2005	18				41
2006	13				38
2007	18	4			37
2008	8	4			49
2009	12	4			51
2010	13		2		47
2011	9	2	3		47
2012	13	3	1		44
2013	10	2	1	6	34
2014	8		2	4	34
2015	10		1	6	35
2016	8	2	1	6	35
2017	11	2		5	35
2018	10	1		4	39
2019	8		1	5	37
2020	6		1	7	37
2021	7			5	36
2022	4	1		1	37
2023	6			1	36
2024	3	1		1	37

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

year	West	East
1986	19	45
1987	15	45
1988	17	47
1989	16	51
1990	13	58
1991	16	55
1992	19	51
1993	20	50
1994	20	51
1995	21	47
1996	18	46
1997	16	42
1998	23	42
1999	19	38
2000	16	36
2001	15	37
2002	18	37
2003	15	34
2004	16	40
2005	18	41
2006	13	38
2007	22	37
2008	12	49
2009	16	51
2010	13	49
2011	11	50
2012	16	45
2013	12	41
2014	8	40
2015	10	42
2016	10	42
2017	13	40
2018	11	43
2019	8	43
2020	6	45
2021	7	41
2022	5	38
2023	6	37
2024	4	38

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

year	n_vessel
1986	64
1987	60
1988	64
1989	67
1990	71
1991	71
1992	70
1993	70
1994	71
1995	68
1996	64
1997	58
1998	65
1999	57
2000	52
2001	52
2002	55
2003	49
2004	56
2005	59
2006	51
2007	59
2008	61
2009	67
2010	62
2011	61
2012	61
2013	53
2014	48
2015	52
2016	52
2017	53
2018	54
2019	51
2020	51
2021	48
2022	43
2023	43
2024	42

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

year	TX	LA	MS	AL	FLW_AL
1986	0.410	0.349	0.000	0.000	0.695
1987	0.322	0.700	0.000	0.000	0.746
1988	0.268	0.685	0.000	0.000	0.551
1989	0.239	0.174	0.000	0.000	0.494
1990	0.272	0.423	0.000	0.000	0.209
1991	0.352	0.135	0.000	0.000	0.140
1992	0.201	0.242	0.000	0.000	0.138
1993	0.170	0.469	0.000	0.000	0.115
1994	0.177	0.357	0.000	0.000	0.226
1995	0.162	0.282	0.000	0.000	0.372
1996	0.252	0.550	0.000	0.000	0.312
1997	0.248	0.223	0.000	0.000	0.253
1998	0.138	0.139	0.000	0.000	0.419
1999	0.152	0.476	0.000	0.000	0.419
2000	0.163	0.371	0.000	0.000	0.436
2001	0.133	0.576	0.000	0.000	0.434
2002	0.088	0.000	0.000	0.000	0.346
2003	0.317	0.955	0.000	0.000	0.340
2004	0.119	0.000	0.000	0.000	0.296
2005	0.067	1.050	0.000	0.000	0.254
2006	0.058	1.050	0.000	0.000	0.323
2007	0.570	0.586	0.000	0.000	0.332
2008	0.273	0.104	0.000	0.000	0.074
2009	0.096	0.055	0.000	0.000	0.055
2010	0.055	0.050	0.145	0.000	0.086
2011	0.051	0.050	0.050	0.000	0.059
2012	0.095	0.050	0.050	0.000	0.066
2013	0.050	0.050	0.050	0.050	0.050
2014	0.050	0.050	0.050	0.051	0.050
2015	0.051	0.059	0.058	0.050	0.051
2016	0.052	0.050	0.050	0.052	0.050
2017	0.074	0.060	0.050	0.051	0.053
2018	0.052	0.050	0.050	0.054	0.051
2019	0.059	0.050	0.050	0.054	0.052
2020	0.050	0.050	0.050	0.050	0.050
2021	0.050	0.050	0.050	0.050	0.050
2022	0.050	0.050	0.050	0.051	0.050
2023	0.051	0.050	0.050	0.050	0.050
2024	0.051	0.050	0.050	0.050	0.050

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

year	West	East
1986	0.399	0.695
1987	0.387	0.746
1988	0.344	0.551
1989	0.233	0.494
1990	0.300	0.209
1991	0.314	0.140
1992	0.209	0.138
1993	0.239	0.115
1994	0.215	0.226
1995	0.185	0.372
1996	0.320	0.312
1997	0.243	0.253
1998	0.138	0.419
1999	0.221	0.419
2000	0.193	0.436
2001	0.211	0.434
2002	0.088	0.346
2003	0.408	0.340
2004	0.119	0.296
2005	0.208	0.254
2006	0.206	0.323
2007	0.571	0.332
2008	0.244	0.074
2009	0.092	0.055
2010	0.055	0.087
2011	0.051	0.059
2012	0.092	0.065
2013	0.050	0.050
2014	0.050	0.050
2015	0.051	0.051
2016	0.052	0.050
2017	0.073	0.052
2018	0.052	0.051
2019	0.059	0.052
2020	0.050	0.050
2021	0.050	0.050
2022	0.050	0.050
2023	0.051	0.050
2024	0.051	0.050

Table 10: Unweighted proxy CV values by year. These values are based on logbook reporting compliance and are consistent across species.

year	cv
1986	0.621
1987	0.656
1988	0.496
1989	0.435
1990	0.229
1991	0.181
1992	0.158
1993	0.150
1994	0.222
1995	0.317
1996	0.314
1997	0.250
1998	0.339
1999	0.365
2000	0.376
2001	0.376
2002	0.274
2003	0.363
2004	0.252
2005	0.240
2006	0.284
2007	0.398
2008	0.101
2009	0.063
2010	0.079
2011	0.057
2012	0.071
2013	0.050
2014	0.050
2015	0.051
2016	0.050
2017	0.056
2018	0.052
2019	0.053
2020	0.050
2021	0.050
2022	0.050
2023	0.050
2024	0.050

Table 11: Regional proxy CV values weighted by state landings of gag in number.

year	West	East
1986	0.384	0.695
1987	0.444	0.746
1988	0.512	0.551
1989	0.221	0.494
1990	0.309	0.209
1991	0.338	0.140
1992	0.205	0.138
1993	0.302	0.115
1994	0.246	0.226
1995	0.219	0.372
1996	0.419	0.312
1997	0.239	0.253
1998	0.138	0.419
1999	0.370	0.419
2000	0.228	0.436
2001	0.246	0.434
2002	0.060	0.346
2003	0.515	0.340
2004	0.119	0.296
2005	0.067	0.254
2006	0.058	0.323
2007	0.571	0.332
2008	0.223	0.074
2009	0.091	0.055
2010	0.055	0.086
2011	0.051	0.059
2012	0.089	0.066
2013	0.050	0.050
2014	0.050	0.050
2015	0.051	0.051
2016	0.052	0.050
2017	0.073	0.053
2018	0.052	0.051
2019	0.059	0.052
2020	0.050	0.050
2021	0.050	0.050
2022	0.050	0.050
2023	0.051	0.050
2024	0.051	0.050

Table 12: Regional proxy CV values weighted by state landings of gag in weight.

year	West	East
1986	0.384	0.695
1987	0.397	0.746
1988	0.455	0.551
1989	0.228	0.494
1990	0.348	0.209
1991	0.326	0.140
1992	0.207	0.138
1993	0.308	0.115
1994	0.269	0.226
1995	0.212	0.372
1996	0.419	0.312
1997	0.238	0.253
1998	0.138	0.419
1999	0.365	0.419
2000	0.235	0.436
2001	0.272	0.434
2002	0.053	0.346
2003	0.525	0.340
2004	0.119	0.296
2005	0.067	0.254
2006	0.058	0.323
2007	0.571	0.332
2008	0.200	0.074
2009	0.091	0.055
2010	0.055	0.086
2011	0.051	0.059
2012	0.089	0.066
2013	0.050	0.050
2014	0.050	0.050
2015	0.051	0.051
2016	0.052	0.050
2017	0.073	0.053
2018	0.052	0.051
2019	0.059	0.052
2020	0.050	0.050
2021	0.050	0.050
2022	0.050	0.050
2023	0.051	0.050
2024	0.051	0.050

Table 13: Annual proxy CV values weighted by regional landings of gag in number.

year	CV
1986	0.689
1987	0.737
1988	0.547
1989	0.492
1990	0.210
1991	0.142
1992	0.139
1993	0.118
1994	0.225
1995	0.369
1996	0.312
1997	0.253
1998	0.405
1999	0.415
2000	0.435
2001	0.431
2002	0.339
2003	0.342
2004	0.295
2005	0.253
2006	0.320
2007	0.336
2008	0.078
2009	0.055
2010	0.086
2011	0.059
2012	0.066
2013	0.050
2014	0.050
2015	0.051
2016	0.050
2017	0.052
2018	0.051
2019	0.052
2020	0.050
2021	0.050
2022	0.050
2023	0.050
2024	0.050

Table 14: Annual proxy CV values weighted by regional landings of gag in weight.

year	CV
1986	0.693
1987	0.740
1988	0.548
1989	0.493
1990	0.210
1991	0.142
1992	0.139
1993	0.118
1994	0.225
1995	0.368
1996	0.312
1997	0.253
1998	0.397
1999	0.414
2000	0.434
2001	0.431
2002	0.339
2003	0.342
2004	0.295
2005	0.253
2006	0.319
2007	0.336
2008	0.078
2009	0.057
2010	0.086
2011	0.059
2012	0.066
2013	0.050
2014	0.050
2015	0.051
2016	0.050
2017	0.052
2018	0.051
2019	0.052
2020	0.050
2021	0.050
2022	0.050
2023	0.050
2024	0.050

Table 15: 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
2023	223771
2024	216492

Table 16: 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	317692
2023	275582
2024	244185

Table 17: 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
2023	59885	163886
2024	58437	158055

Table 18: 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	237869
2023	64760	210822
2024	56308	187877

Table 19: 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
2023	58279	1606	1638	12513	149735
2024	57074	1363	750	10761	146544

Table 20: 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	22176	213099
2023	63662	1098	2220	19202	189400
2024	55363	945	997	15363	171517

Table 21: Gag number of fish lengths sampled by state.

year	TX	LA	AL	FLW_AL
1986	31	12		622
1987	38	11		602
1988	17	28		333
1989	13	14		423
1990	26	6		329
1991	8	4		144
1992	8	9		126
1993	21	27		82
1994	27	9		183
1995	9	31		151
1996	6	29		233
1997	5	24		281
1998	66	99		353
1999	3	131		355
2000	6	50		283
2001	4	25		234
2002	10	7		283
2003	2	13		367
2004	5			228
2005	5	12		203
2006	1	18		149
2007		1		157
2008	1	2		210
2009		2		116
2010	2			133
2011	1			41
2012	2	4		90
2013	5	1		103
2014	6			147
2015	4		4	78
2016	1	1		29
2017	2			55
2018	2			84
2019	4		1	71
2021	1			113
2022	1			127
2023				99
2024				24

Table 22: Gag number of fish lengths sampled by region.

year	West	East
1986	43	622
1987	49	602
1988	45	333
1989	27	423
1990	32	329
1991	12	144
1992	17	126
1993	48	82
1994	36	183
1995	40	151
1996	35	233
1997	29	281
1998	165	353
1999	134	355
2000	56	283
2001	29	234
2002	17	283
2003	15	367
2004	5	228
2005	17	203
2006	19	149
2007	1	157
2008	3	210
2009	2	116
2010	2	133
2011	1	41
2012	6	90
2013	6	103
2014	6	147
2015	4	82
2016	2	29
2017	2	55
2018	2	84
2019	4	72
2021	1	113
2022	1	127
2023		99
2024		24

Table 23: Gag number of trips sampled by state.

year	TX	LA	AL	FLW_AL
1986	26	9		227
1987	32	6		262
1988	15	19		169
1989	12	10		171
1990	19	3		112
1991	7	4		67
1992	8	8		66
1993	20	17		48
1994	16	6		64
1995	9	19		67
1996	6	20		95
1997	2	22		108
1998	32	56		144
1999	3	63		129
2000	5	27		101
2001	4	18		77
2002	4	7		83
2003	2	11		123
2004	5			85
2005	3	9		86
2006	1	8		58
2007		1		63
2008	1	2		78
2009		2		45
2010	2			53
2011	1			14
2012	2	3		37
2013	4	1		40
2014	5			38
2015	4		4	31
2016	1	1		20
2017	2			22
2018	1			34
2019	4		1	39
2021	1			37
2022	1			36
2023				20
2024				8

Table 24: Gag number of trips sampled by region.

year	West	East
1986	35	227
1987	38	262
1988	34	169
1989	22	171
1990	22	112
1991	11	67
1992	16	66
1993	37	48
1994	22	64
1995	28	67
1996	26	95
1997	24	108
1998	88	144
1999	66	129
2000	32	101
2001	22	77
2002	11	83
2003	13	123
2004	5	85
2005	12	86
2006	9	58
2007	1	63
2008	3	78
2009	2	45
2010	2	53
2011	1	14
2012	5	37
2013	5	40
2014	5	38
2015	4	35
2016	2	20
2017	2	22
2018	1	34
2019	4	40
2021	1	37
2022	1	36
2023		20
2024		8

Table 25: Gag mean total length in mm by state.

year	TX	LA	AL	FLW_AL
1986	464	452		582
1987	441	386		564
1988	541	390		564
1989	526	378		635
1990	473	477		691
1991	607	488		664
1992	695	470		646
1993	610	655		654
1994	609	754		626
1995	605	586		597
1996	648	633		586
1997	508	613		587
1998	601	608		590
1999	588	598		568
2000	537	626		613
2001	588	686		652
2002	583	619		617
2003	418	618		622
2004	449			621
2005	576	593		620
2006	557	658		633
2007		552		618
2008	525	924		628
2009		956		596
2010	658			630
2011	610			665
2012	765	782		659
2013	823	836		630
2014	896			630
2015	786		715	680
2016	653	756		682
2017	690			665
2018	980			694
2019	719		399	689
2021	719			707
2022	884			740
2023				733
2024				722

Table 26: Gag total length CV in mm by state.

year	TX	LA	AL	FLW_AL
1986	0.24	0.25		0.27
1987	0.39	0.31		0.26
1988	0.28	0.26		0.25
1989	0.27	0.28		0.28
1990	0.26	0.20		0.19
1991	0.28	0.09		0.25
1992	0.30	0.26		0.19
1993	0.30	0.17		0.16
1994	0.14	0.34		0.16
1995	0.32	0.20		0.16
1996	0.16	0.14		0.15
1997	0.27	0.13		0.14
1998	0.25	0.16		0.14
1999	0.19	0.16		0.14
2000	0.19	0.14		0.15
2001	0.23	0.15		0.13
2002	0.06	0.18		0.12
2003	0.02	0.17		0.12
2004	0.16			0.12
2005	0.36	0.07		0.11
2006		0.10		0.12
2007				0.11
2008		0.26		0.13
2009		0.09		0.19
2010	0.00			0.11
2011				0.12
2012	0.03	0.04		0.14
2013	0.14			0.11
2014	0.23			0.09
2015	0.15		0.16	0.14
2016				0.15
2017	0.14			0.10
2018	0.07			0.13
2019	0.21			0.12
2021				0.13
2022				0.13
2023				0.13
2024				0.11

Table 27: Gag mean weight (g) by state.

year	TX	LA	AL	FLW_AL
1986	1255	1229		2927
1987	1461	1070		2753
1988	2349	1098		2795
1989	1924	1175		3787
1990	1534	2013		4409
1991	3180	1530		4037
1992	3680	1849		3600
1993	3829	4207		3761
1994	2995	7239		3173
1995	4379	2887		2878
1996	3518	3489		2591
1997	2004	2948		2494
1998	3964	2860		2645
1999	2737	2757		2324
2000	1987	3290		3095
2001	2898	4509		3753
2002	2273	3291		2921
2003	990	3538		2979
2004	1012			2984
2005	3522	2667		2970
2006		3811		3164
2007		2029		2856
2008	1490	4310		3120
2009		16930		2727
2010	3190			3012
2011	2490			3721
2012	4910	5910		3510
2013	7526	7515		2965
2014	10245			3098
2015	6768		4990	3850
2016	3090	4680		4163
2017	3965			3743
2018	13510			4185
2019	5020		700	4065
2021	4450			4058
2022	9070			5032
2023				4664
2024				4699

Table 28: Gag weight CV in g by state.

year	TX	LA	AL	FLW_AL
1986	0.69	0.70		0.85
1987	1.74	1.08		0.96
1988	0.81	1.17		1.25
1989	0.69	1.45		0.84
1990	0.77	0.56		0.59
1991	0.77	0.35		0.78
1992	0.46	0.88		0.74
1993	0.89	0.98		0.57
1994	0.54	0.94		0.53
1995	0.85	0.74		0.53
1996	0.46	0.50		0.56
1997	0.90	0.46		0.50
1998	0.87	0.57		0.48
1999	0.48	0.52		0.63
2000	0.65	0.57		0.61
2001	0.67	0.41		0.48
2002	0.22	0.62		0.42
2003		0.74		0.50
2004	0.54			0.41
2005	1.27	0.23		0.41
2006		0.37		0.46
2007				0.42
2008				0.55
2009		0.18		0.54
2010				0.42
2011				0.39
2012	0.10	0.17		0.48
2013	0.44			0.36
2014	0.68			0.28
2015	0.48		0.50	0.43
2016				0.55
2017	0.53			0.38
2018	0.35			0.47
2019	0.57			0.38
2021				0.47
2022				0.43
2023				0.40
2024				0.39

Table 29: Gag mean total length in mm by region.

year	West	East
1986	461	582
1987	429	564
1988	447	564
1989	449	635
1990	474	691
1991	567	664
1992	576	646
1993	635	654
1994	646	626
1995	590	597
1996	636	586
1997	595	587
1998	605	590
1999	598	568
2000	617	613
2001	673	652
2002	598	617
2003	591	622
2004	449	621
2005	588	620
2006	652	633
2007	552	618
2008	791	628
2009	956	596
2010	658	630
2011	610	665
2012	776	659
2013	825	630
2014	896	630
2015	786	681
2016	704	682
2017	690	665
2018	980	694
2019	719	685
2021	719	707
2022	884	740
2023		733
2024		722

Table 30: Gag total length CV in mm by region.

year	West	East
1986	0.24	0.27
1987	0.38	0.26
1988	0.32	0.25
1989	0.32	0.28
1990	0.25	0.19
1991	0.26	0.25
1992	0.35	0.19
1993	0.23	0.16
1994	0.24	0.16
1995	0.23	0.16
1996	0.14	0.15
1997	0.17	0.14
1998	0.20	0.14
1999	0.16	0.14
2000	0.15	0.15
2001	0.16	0.13
2002	0.13	0.12
2003	0.21	0.12
2004	0.16	0.12
2005	0.19	0.11
2006	0.10	0.12
2007		0.11
2008	0.36	0.13
2009	0.09	0.19
2010	0.00	0.11
2011		0.12
2012	0.03	0.14
2013	0.13	0.11
2014	0.23	0.09
2015	0.15	0.14
2016	0.10	0.15
2017	0.14	0.10
2018	0.07	0.13
2019	0.21	0.13
2021		0.13
2022		0.13
2023		0.13
2024		0.11

Table 31: Gag mean weight (g) by region.

year	West	East
1986	1246	2927
1987	1365	2753
1988	1556	2795
1989	1447	3787
1990	1637	4409
1991	2630	4037
1992	2694	3600
1993	4056	3761
1994	4152	3173
1995	3162	2878
1996	3494	2591
1997	2773	2494
1998	3204	2645
1999	2756	2324
2000	3150	3095
2001	4270	3753
2002	2822	2921
2003	3356	2979
2004	1012	2984
2005	2881	2970
2006	3811	3164
2007	2029	2856
2008	2900	3120
2009	16930	2727
2010	3190	3012
2011	2490	3721
2012	5577	3510
2013	7524	2965
2014	10245	3098
2015	6768	3908
2016	3885	4163
2017	3965	3743
2018	13510	4185
2019	5020	4018
2021	4450	4058
2022	9070	5032
2023		4664
2024		4699

Table 32: Gag weight CV in g by region.

year	West	East
1986	0.68	0.85
1987	1.67	0.96
1988	1.05	1.25
1989	1.10	0.84
1990	0.71	0.59
1991	0.81	0.78
1992	0.69	0.74
1993	0.94	0.57
1994	0.99	0.53
1995	0.79	0.53
1996	0.48	0.56
1997	0.53	0.50
1998	0.75	0.48
1999	0.52	0.63
2000	0.59	0.61
2001	0.45	0.48
2002	0.55	0.42
2003	0.78	0.50
2004	0.54	0.41
2005	0.73	0.41
2006	0.37	0.46
2007		0.42
2008	0.69	0.55
2009	0.18	0.54
2010		0.42
2011		0.39
2012	0.17	0.48
2013	0.40	0.36
2014	0.68	0.28
2015	0.48	0.44
2016	0.29	0.55
2017	0.53	0.38
2018	0.35	0.47
2019	0.57	0.39
2021		0.47
2022		0.43
2023		0.40
2024		0.39

3.8 Figures

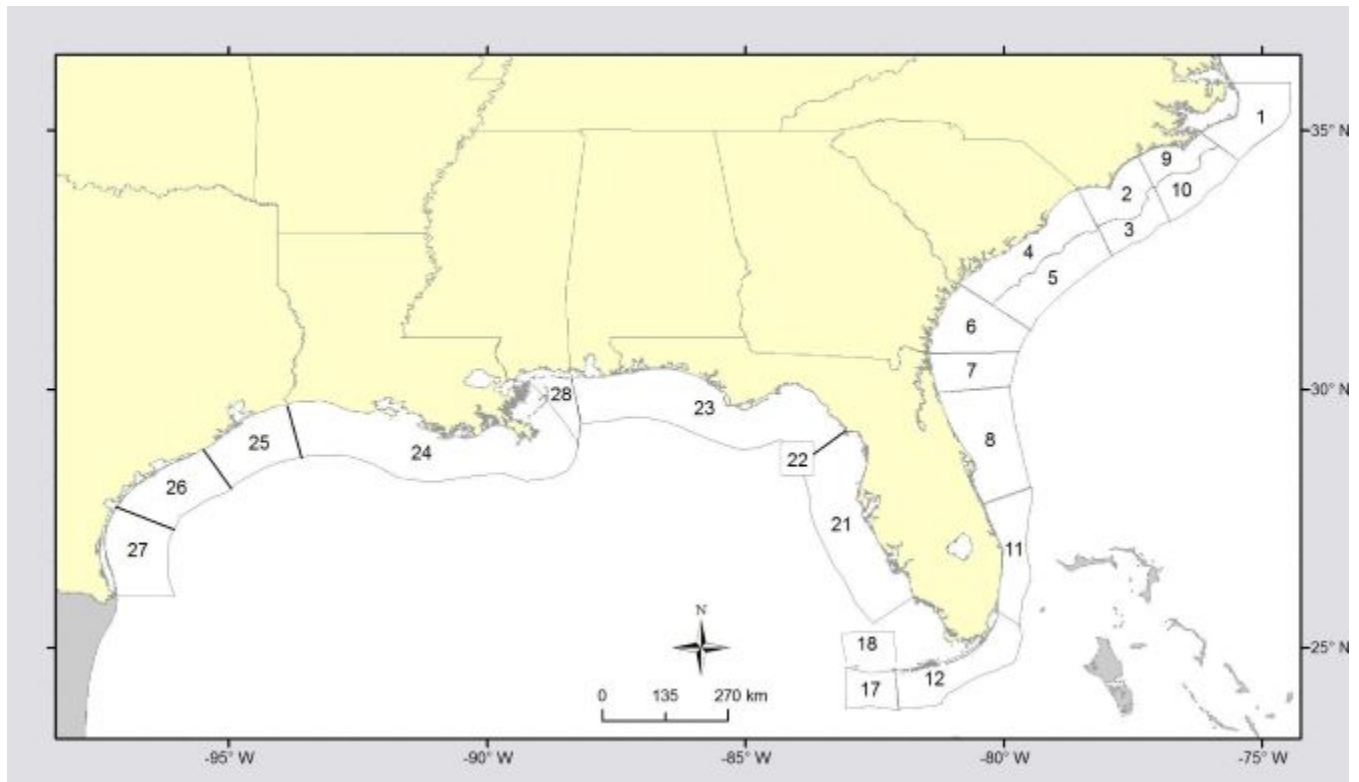


Figure 1: Headboat sampling areas prior to 2013.

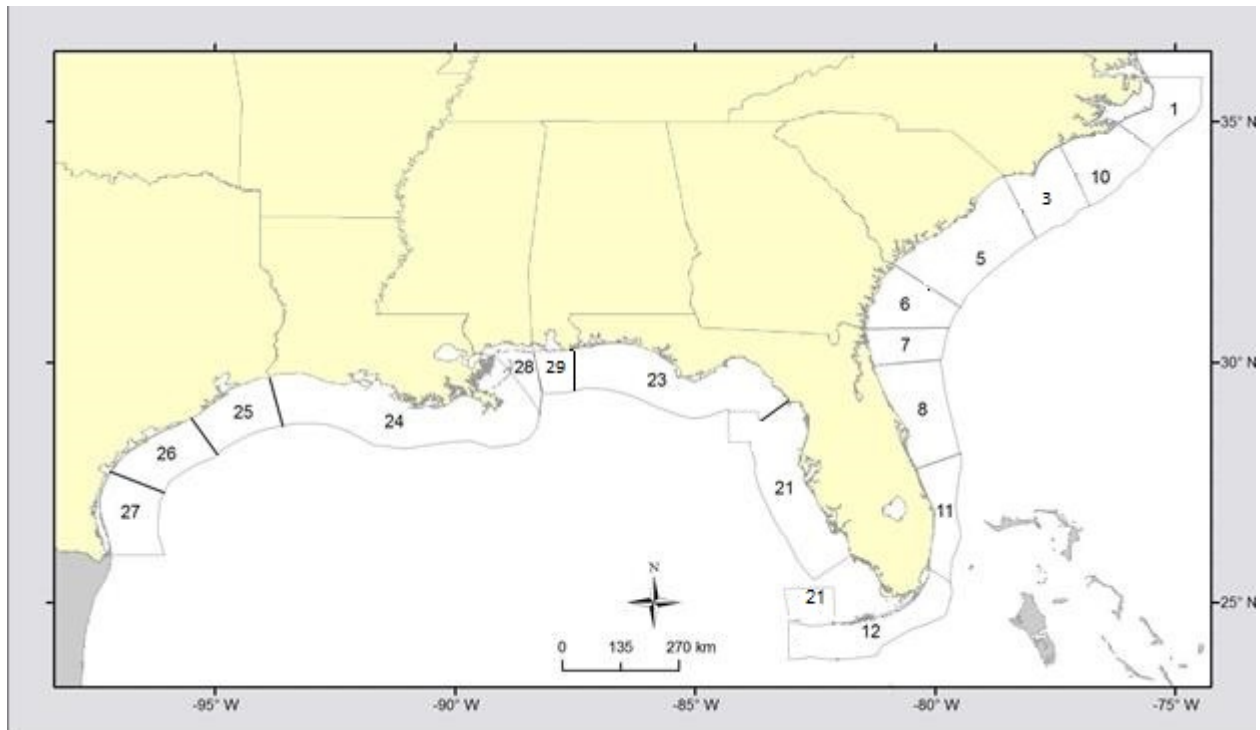


Figure 2: Headboat sampling areas 2013 - present.

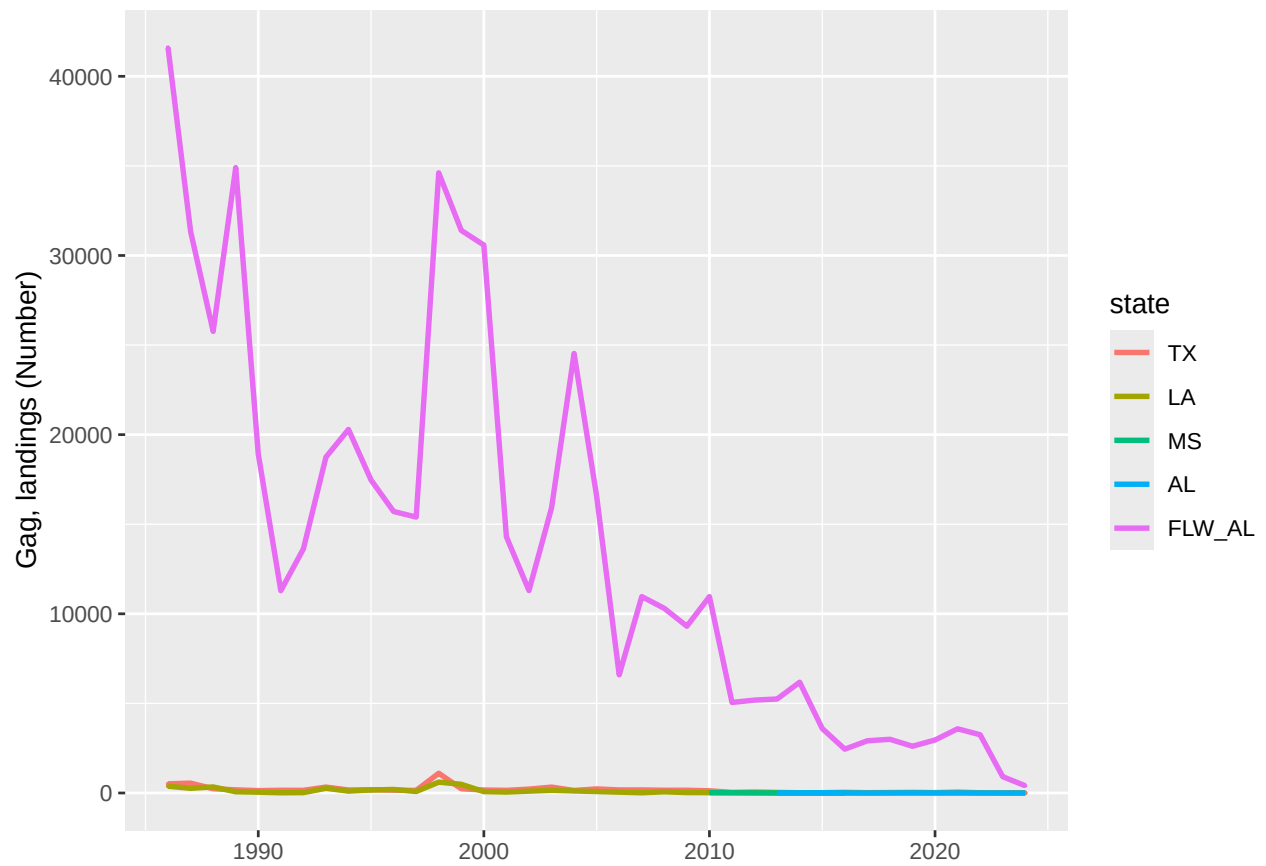


Figure 3: Gag landings in number

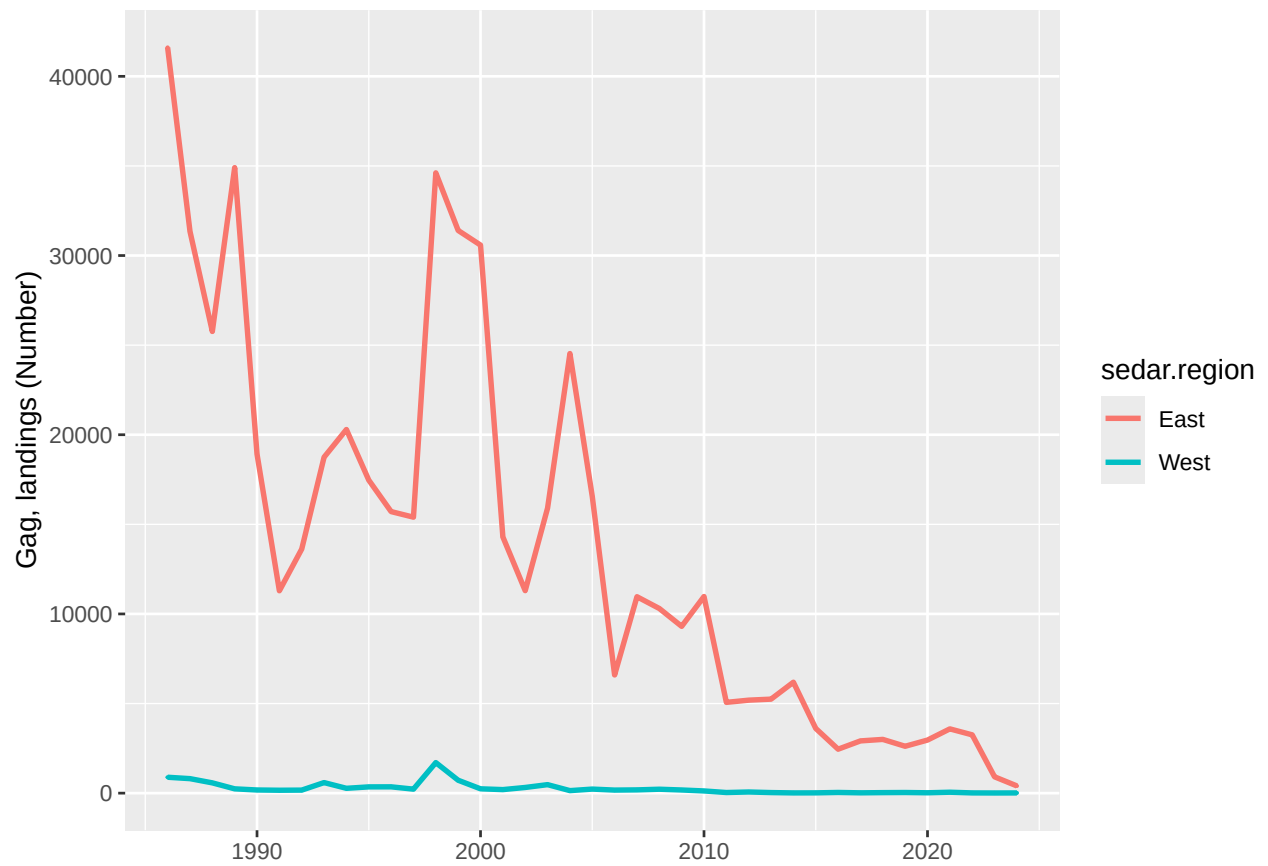


Figure 4: Gag landings in number

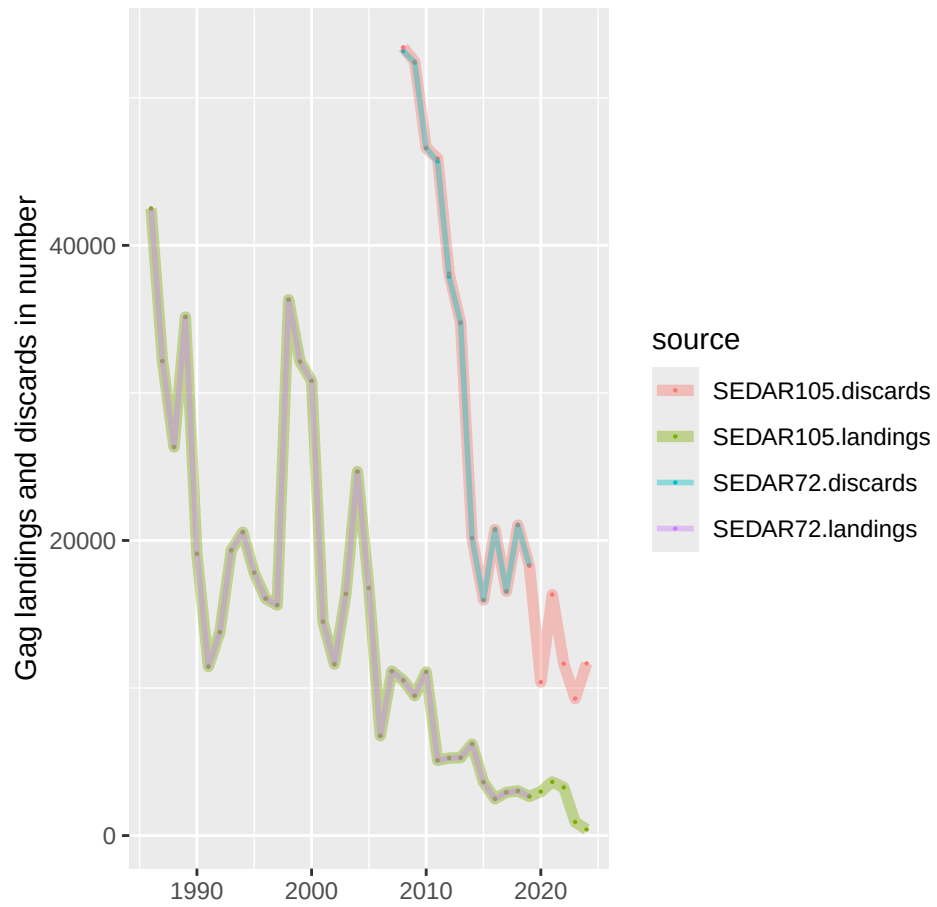


Figure 5: Comparison to SEDAR 72 gag landings and discards.

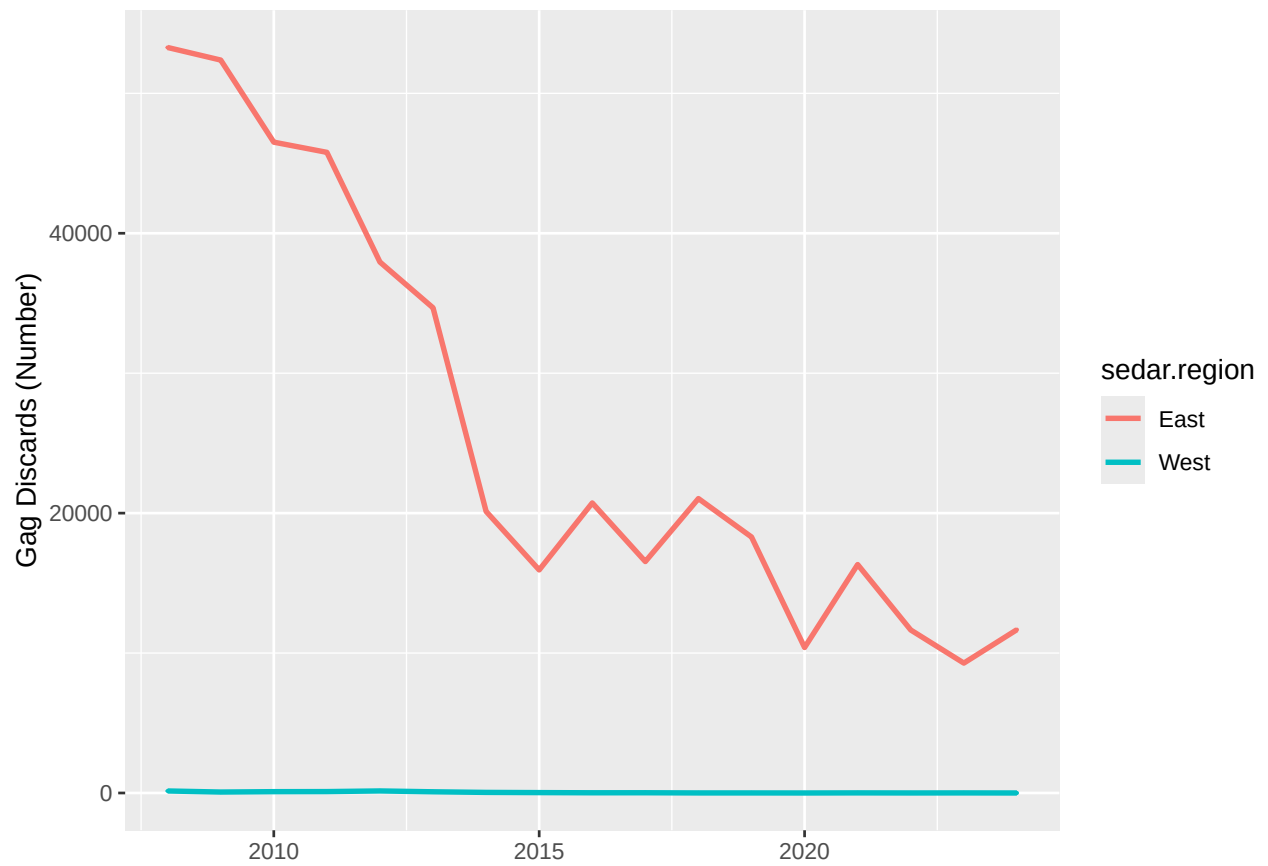


Figure 6: Gag discards in number

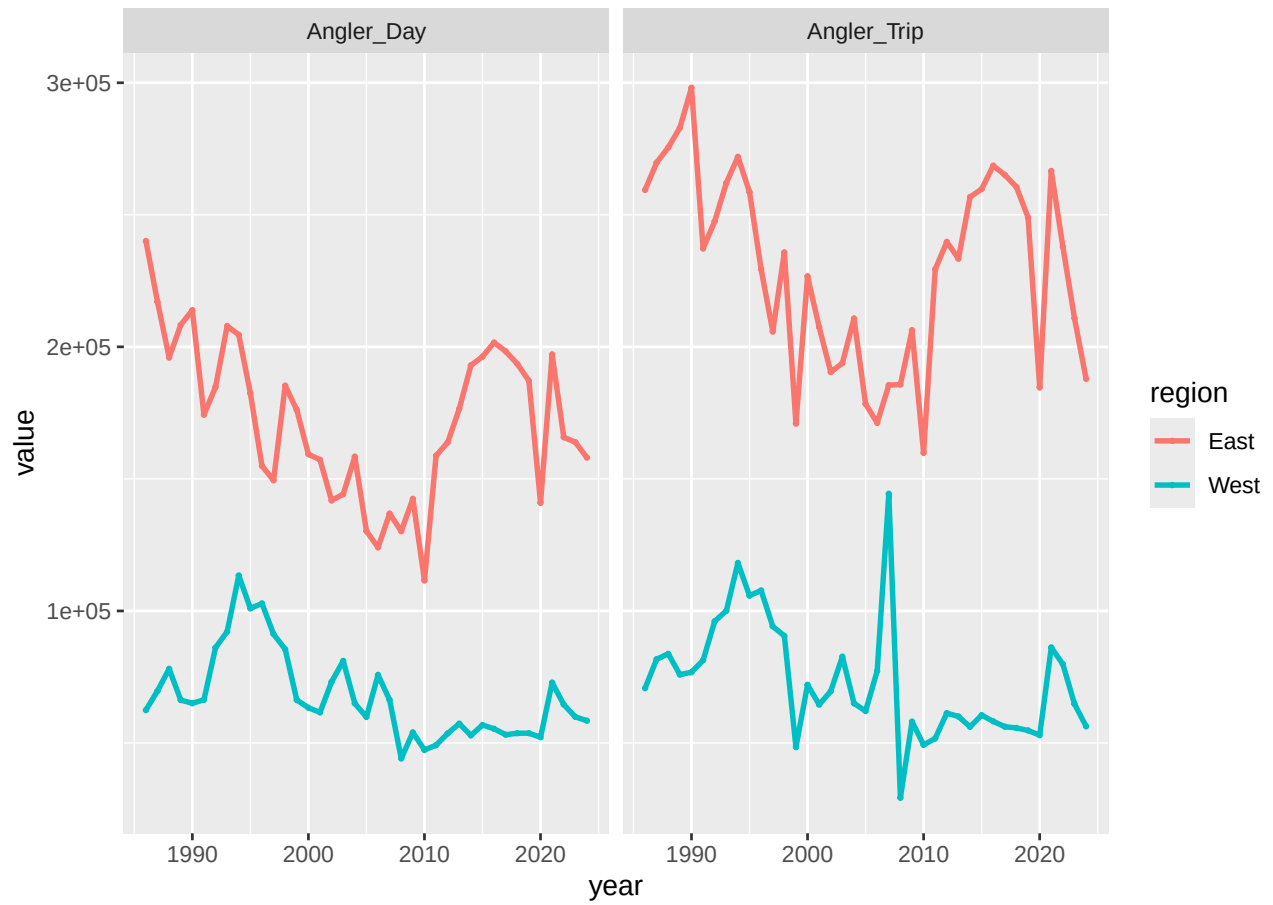


Figure 7: SRHS total estimated angler days and angler trips.

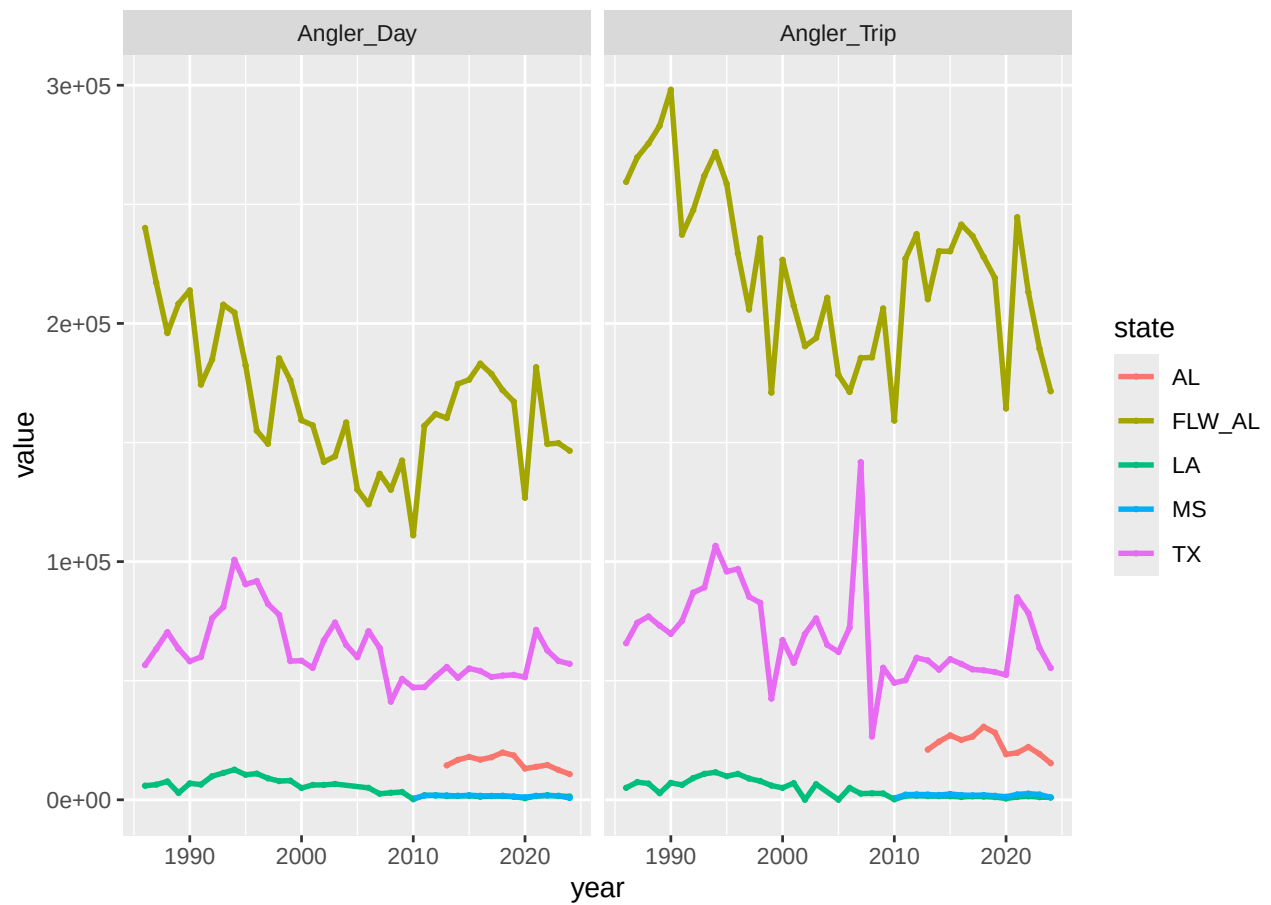


Figure 8: SRHS total estimated angler days and angler trips.

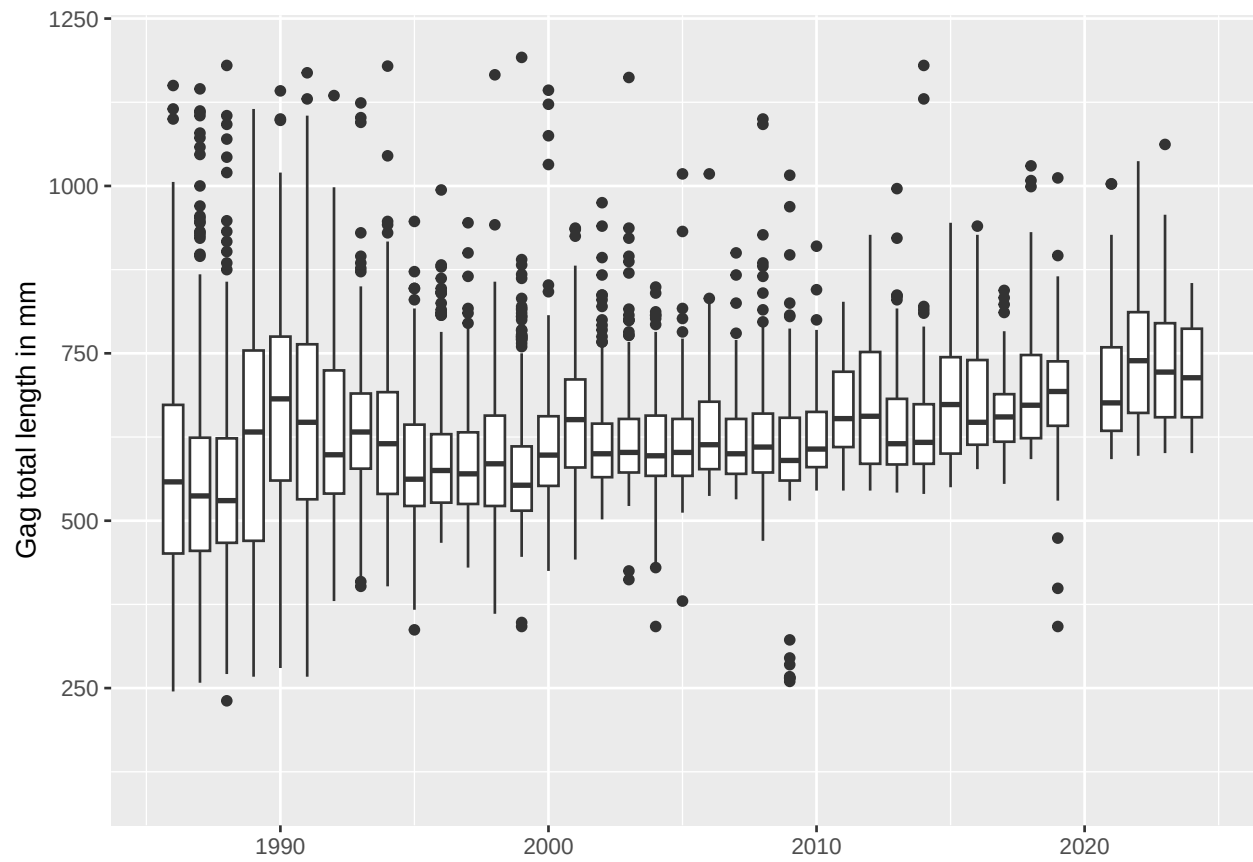


Figure 9: Gag total length.

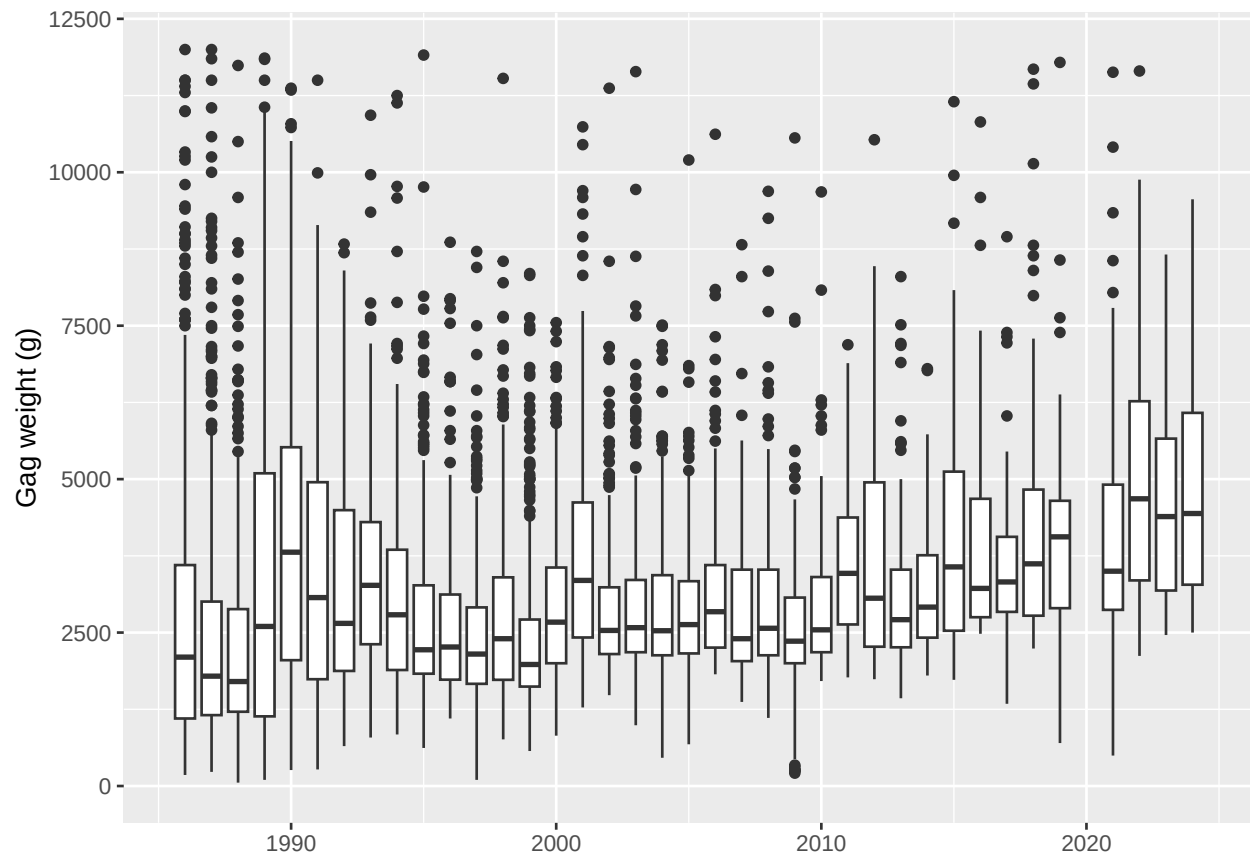


Figure 10: Gag weight (g).

3.9 References

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