A ratio-based method for calibrating estimates of total landings (numbers and pounds of fish), releases (numbers of fish), and total trips from MRIP-FCAL to SRFS for Red Snapper (*Lutjanus campechanus*) in the South Atlantic

Chloe Ramsay

SEDAR90-DW-19

April 2025
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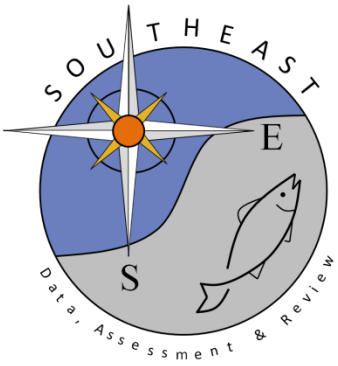

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To include final 2024 and effort estimates

Background

In response to the need for more precise estimates of recreational catch for reef fishes, particularly from private boats, the Florida Fish and Wildlife Conservation Commission developed and implemented a new survey that runs side-by-side with the historic Marine Recreational Information Program (MRIP). The MRIP is a general survey of all saltwater recreational fishing in both state and federal waters, whereas the State Reef Fish Survey (SRFS) is a supplemental, more specialized survey that directly targets participants in the reef fish fishery to collect information on effort and catch. The SRFS is the result of a decade of development and testing in Florida, in collaboration with independent statistical consultants and NOAA Fisheries scientists. The survey provides year-round, monthly estimates of fishing effort, landings, and discards for a suite of reef fish species commonly targeted by recreational anglers fishing from private boats in Florida. Initially named the Gulf Reef Fish Survey (GRFS), the methodology was implemented in May 2015 and was only conducted on the west coast of Florida, north of Monroe County (Fig. 1). In 2018, the survey design and estimation methods were peer-reviewed and subsequently certified by NOAA Fisheries as statistically valid and suitable for use (SRFS Certification Memo and design documentation, available online: https://www.fisheries.noaa.gov/recreational-fishing-data/transitioning-new-recreational-fishing-survey-designs).

The SRFS runs concurrently with the MRIP survey in Florida, which has provided vital statistics on recreational fishing effort and catch in the Gulf of America and Atlantic Ocean off the coast of Florida since 1981. The SRFS and MRIP surveys use independent methods to estimate fishing effort (angler trips). However, catch estimates derived from each method are not completely independent. To estimate catch-per-unit-effort (CPUE), MRIP uses data collected in the Access Point Angler Intercept Survey (APAIS), and SRFS uses a combination of data from the APAIS and supplemental reef fish angler intercepts. Assignments for both intercept surveys are drawn together so that sample weights are compatible (Foster, 2018).

Previous stock assessments of Florida-centric species such as Gag (SEDAR 72) and Red Grouper (SEDAR 88) in the Gulf of America and Southeast Mutton (SEDAR 79) and Yellowtail Snapper (SEDAR 96) have incorporated a time series of MRIP estimates converted to SRFS currency for historic estimates of landings and discards from recreational private boats and SRFS estimates for recent years (Cross et al., 2020a; Ramsay et al., 2024a-c). The method was developed to calibrate historic MRIP-FCAL estimates to SRFS currency and was peer-reviewed by NOAA Office of Science and Technology (OS&T) statistical consultants and approved for use (Cross et al. 2020a; Ramsay, NOAA OS&T, et al., 2024). The method is used herein to calibrate MRIP estimates to SRFS currency for South Atlantic Red Snapper, which will facilitate the use of SRFS estimates in this assessment.

Objectives

The objective is to develop conversion factors that may be applied to annual, fully calibrated MRIP estimates, and produce a historic time series in the same currency as the SRFS for Red Snapper (*Lutjanus campechanus*) in the South Atlantic.

Methods

This analysis used private boat mode recreational estimates of total landings (numbers and pounds of fish), releases (numbers), and fishing effort (angler trips) derived from SRFS and MRIP from January 2021 through December 2024. Overlapping estimates from the first six months of SRFS implementation (July-December 2020) were not included in this analysis due to challenges related to the global pandemic, which coincided with initial expansion of the survey. To our knowledge there are no biases in 2021-2024 data.

We did not apply calibrations at a fine scale back in time (*i.e.,* by month or area fished), as neither survey was designed to generate precise estimates at this scale. Instead, we quantified the overall differences between SRFS and FCAL estimates across the years over which the two surveys overlap. This allowed for a single calibration factor to be applied to FCAL estimates back in time for effort, landings, and releases. Separate conversion factors are provided for effort in angler trips, landings in numbers, landings in pounds, and releases in numbers.

All MRIP-FCAL landings and release estimates used in this calibration were generated by the NOAA Southeast Fisheries Science Center for the state of Florida. Variances for use in this calibration process were back-calculated using the PSE and estimate values. MRIP effort estimates were directed effort for the same suite of reef fish used for the SRFS Red Snapper estimates (e.g. the original GRFS species suite: Gag [*Mycteroperca microlepis*], Black Grouper [*M. bonaci*], Red Grouper [*Epinephelus morio*], Gray Triggerfish [*Balistes capriscus*], Red Snapper [*Lutjanus campechanus*], Vermilion Snapper [*Rhomboplites aurorubens*], Amberjacks [*Seriola* spp.; greater/lesser and banded rudderfish]). The MRIP effort estimates were calculated using the directed angler trips template SAS program provided by NOAA fisheries and modified for the SRFS species suite.

To assess overall differences between SRFS and FCAL estimates the estimates ($\hat{E}$) and variances ($\hat{V}$) for each estimation method (*m: SRFS, FCAL*) were summed across years (*y*), two-month waves (*w*), and areas fished (*a*: federal or state waters) for each variable (*v*: number landed, pounds landed, number released, adjusted effort) [1, 2].

$$\hat{E}_{m,v} = \sum_{m,v} \hat{E}_{y,w,a,m,v} \quad [1]$$

$$\hat{V}(\hat{E}_{m,v}) = \sum_{m,v} \hat{V}(\hat{E}_{y,w,a,m,v}) \text{ [2]}$$

This resulted in 4 pairs of SRFS and FCAL sums (4 variables; Table 1). For each of the paired sums, the ratio was calculated as the total SRFS estimate divided by the total FCAL estimate (landings, releases, and effort) [3].

$$\hat{R}_v = \frac{\hat{E}_{SRFS,v}}{\hat{E}_{FCAL,v}} \text{ [3]}$$

Although SRFS and MRIP estimates are derived from survey data that are not completely independent, the strength of correlation between estimates from the two surveys is unknown. To calculate the variance of the ratio above, we assumed a 0% correlation as this is the most conservative approximation of variance if correlation between the two survey estimates is ignored (Cross et al. 2020a). This correlation percentage was recommended by peer review (Stokes et al. 2020). A delta method approximation for the variance of two independent variables was used to calculate the variance of the ratio above ($\hat{V}(\hat{R}_v)$) because this method incorporates error associated with both the numerator (SRFS estimates) and denominator (FCAL estimates). The R statistical software package 'msm' and the function deltamethod (R Core Team 2023; Jackson 2011) were used to carry out these calculations.

Historic estimates from 1981-2011 were converted to SRFS currency by multiplying the annual FCAL estimate for each year and variable type (number landed, pounds landing, number released, and effort in angler trips) [4] with the corresponding ratio [3]:

$$\hat{E}_{SRFS-hind,y,w,v} = \hat{R}_v \hat{E}_{FCAL,y,w,v} \text{ [4]}$$

Variance was again approximated using the delta method and, once again, a 0% correlation was assumed.

Starting in 2012, when the mini-seasons started, the same ratios [3] were applied to wave-level FCAL estimates for each year, wave, and variable type (number landed, number released, angler trips) [5]:

$$\hat{E}_{SRFS-hind,y,w,m\,v} = \hat{R}_v \hat{E}_{FCAL,y,w,v} \text{ [5]}$$

Pounds of Red Snapper landed were not calibrated at the wave level because the NOAA Southeast Fisheries Science Center does not provide error around the average pounds landed values. After discussion between FWC-FWRI, the NOAA Southeast Fisheries Science Center, and the recreational workgroup lead, it was decided that the average pounds landed with their error could be applied to the calibrated number landed estimates during the assessment process.

From 2021-2024, when SRFS estimates could be provided, estimates were provided for number landed, pounds landed, number released, and effort (angler trips) with associated error for each year and month. Since 2012 the MRIP-FES and SRFS estimates were provided at the finest scale

available, two-month wave and month respectively, to attempt to separate in-season and out-of-season landings and releases.

Findings and Conclusions

For the years in which the SRFS and MRIP overlap, annual Red Snapper estimates derived from SRFS and MRIP-FCAL and associated variances, observed ratios of summed SRFS to FCAL estimates, and approximate variance for each ratio are provided in Table 1. The annual SRFS and MRIP-FCAL estimates, as well as the compared cumulative sums are shown in Figure 2. The Red Snapper ratios were smaller for landings (number of fish = 0.25; lbs of fish = 0.22) than for releases (0.48). The effort ratio was larger (0.78). The ratios of MRIP-FCAL to SRFS release estimates are similar to those seen for other fish species (Cross et al., 2020b; Ramsay et al., 2024a-c). However, the landings estimate ratios are much smaller for Red Snapper in the Atlantic Ocean, suggesting a larger difference between these surveys for this species in this region. This is likely due to the short season in which to estimate landings and the fact that SRFS and MRIP were not designed to generate estimates for mini-seasons. Median PSE values for the calibrated landings in numbers, landings in pounds, releases, and efforts estimates were 54%, 58%, 47%, and 13%, respectively for the annual estimates. The annual MRIP and calibrated estimates are provided from 1981-2011 (Table 2; Fig. 3). PSEs were not included for calibrated estimates where the MRIP-FCAL PSEs were 0. MRIP and calibrated estimates are provided by wave from 2012-2020 (Tables 3 & 4; Fig. 4). SRFS estimates are provided by month from 2021-2024 (Table 5).

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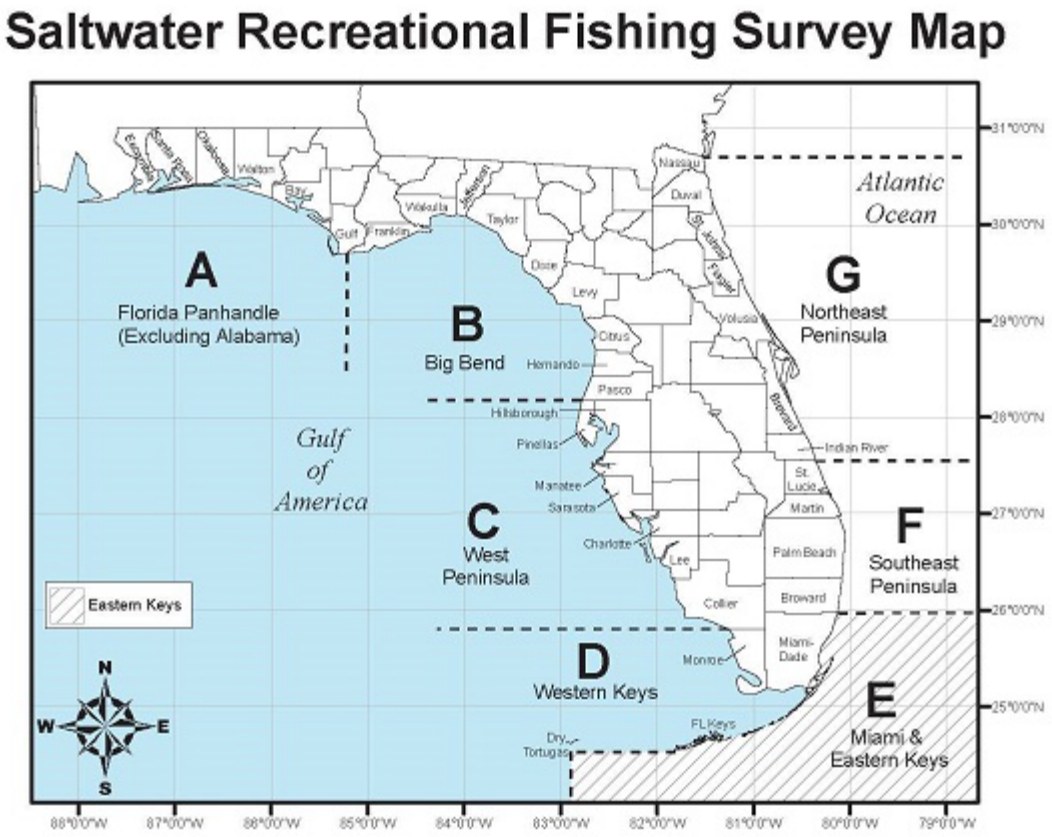

Figure 1. The Gulf Reef Fish Survey was only conducted in regions A-C. In July 2020, the survey was expanded to encompass all of Florida and renamed the State Reef Fish Survey (SRFS). The SRFS encompasses regions A-G on this map. The South Atlantic SRFS estimates come from regions E-G.

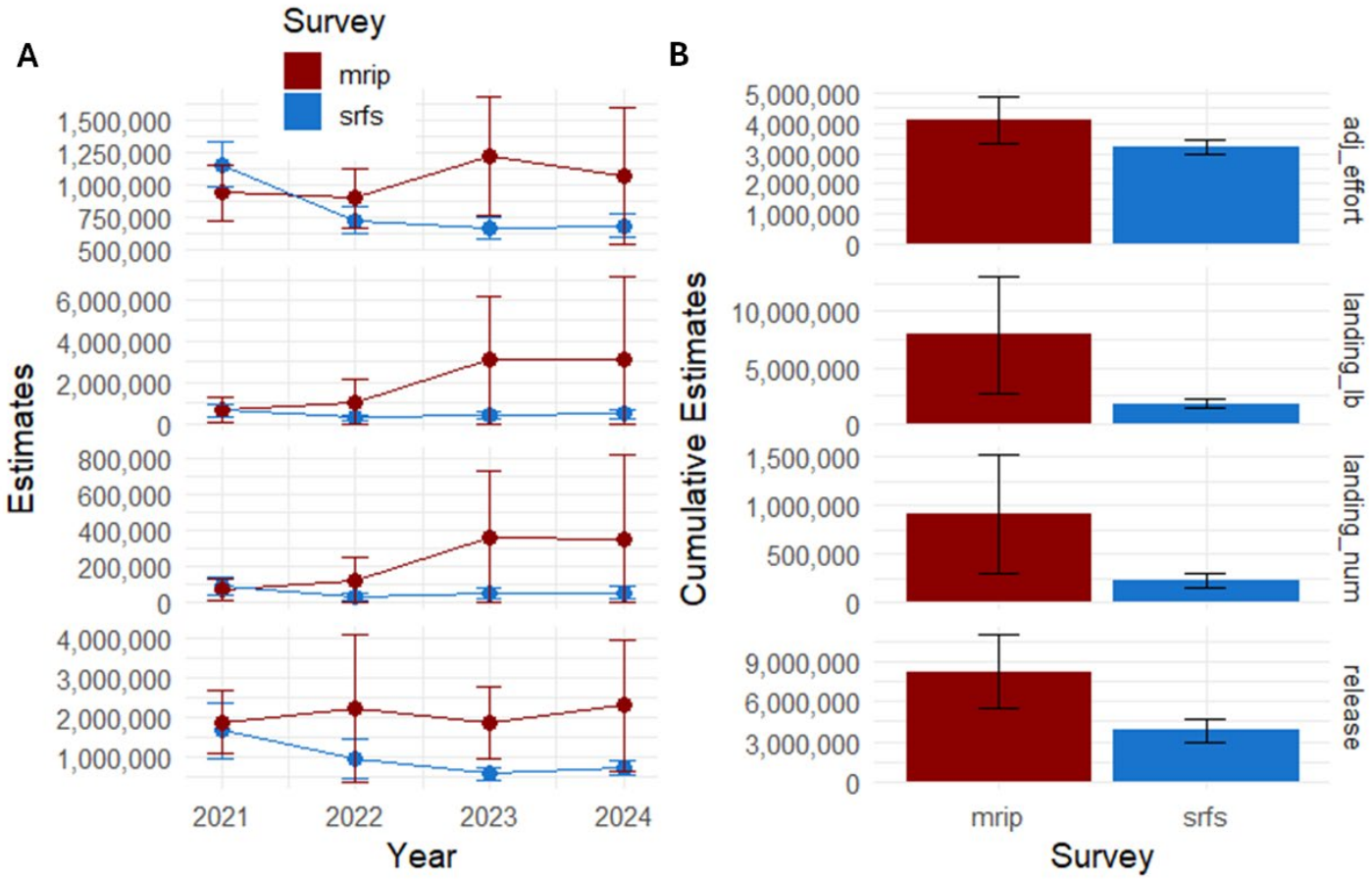

Figure 2. Estimates of effort, landings, and releases of Red Snapper (*Lutjanus campechanus*) across years (**A**) or with all the years combined (**B**; 2021-2024) for the South Atlantic. Estimates generated by SRFS are shown in blue and estimates generated by MRIP are shown in red. Error bars depict 95% confidence limits.

Table 1. Annual and summed SRFS and MRIP estimates (sum), variances, and ratios of MRIP to SRFS estimates are shown for Red Snapper (*Lutjanus campechanus*) in Florida in the south Atlantic.

Estimate Type	Year	SRFS Sum	SRFS Variance	MRIP Sum	MRIP Variance	Ratio
Adjusted Effort (angler trips)	2021	1,156,499	7,277,257,887	938,214	11,761,226,125	0.7839
	2022	722,222	2,670,205,441	897,323	13,592,620,744	
	2023	665,020	2,047,095,430	1,216,788	55,697,433,361	
	2024	684,411	2,080,165,375	1,065,989	72,454,672,472	
	Total	3,228,152	14,074,724,133	4,118,315	153,505,952,702	
Landings (lbs)	2021	623,833	18,152,728,054	681,951	100,414,949,112	0.2238
	2022	280,754	4,190,606,215	1,053,527	296,509,264,740	
	2023	387,957	7,158,166,731	3,085,201	2,529,463,509,822	
	2024	475,652	10,760,909,613	3,099,267	4,327,660,000,000	
	Total	1,768,196	40,262,410,613	7,919,947	7,254,047,723,674	
Landings (no. fish)	2021	89,358	577,694,408	70,472	1,005,686,394	0.2492
	2022	31,687	107,252,493	126,122	4,137,339,502	
	2023	50,704	187,214,068	362,752	34,226,275,505	
	2024	55,175	311,596,719	352,113	55,656,165,634	
	Total	226,924	1,183,757,688	911,459	95,025,467,035	
Releases (no. fish)	2021	1,647,587	131,682,298,723	1,870,610	169,360,470,737	0.483
	2022	932,173	64,665,008,913	2,226,391	916,515,683,993	
	2023	557,231	5,604,397,474	1,845,544	212,877,034,816	
	2024	711,604	7,603,253,300	2,297,420	722,577,000,000	
	Total	3,848,596	209,554,958,410	8,239,966	2,021,330,189,545	

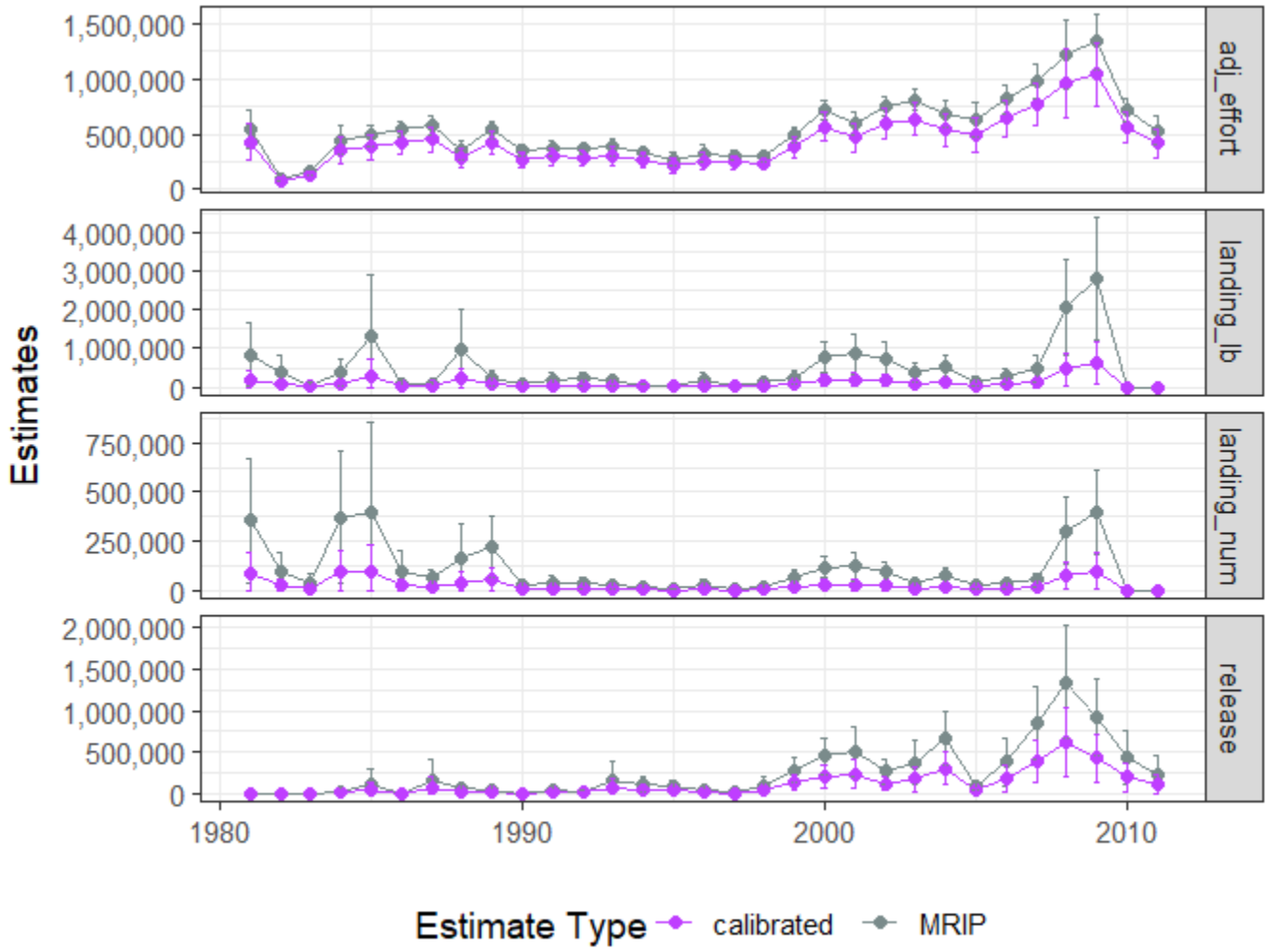

Figure 3. Red Snapper (*Lutjanus campechanus*) annual estimates in the Atlantic Ocean, including original MRIP-FCAL time-series (MRIP) and the MRIP-FCAL time-series calibrated to SRFS currency (calibrated). Estimates are shown from 1981-2011, before the start of the mini-seasons. Adjusted effort estimates (angler trips), landings in pounds (landing_lb), landings in numbers of fish (landing_num), and releases in numbers of fish (release) are shown. Error bars are 95% confidence limits.

Table 2. Original and calibrated MRIP-FCAL annual estimates for Red Snapper (*Lutjanus campechanus*) landing, release, and effort estimates in Florida from 1981-2011. The recreational fishery was closed in 2010 & 2011. 2012 was the start of the Red Snapper mini-seasons in the South Atlantic.

	MRIP -FCAL		SRFS-FCAL Calibration		MRIP - FCAL		SRFS-FCAL Calibration	
Year	Landings (no. fish)	PSE	Landings (no. fish)	PSE	Landings (pounds)	PSE	Landings (pounds)	PSE
1981	353,410	46.0	87,988	59.1	846,497	50.9	188,988	62.2
1982	91,983	57.0	22,901	68.0	370,165	61.5	82,642	71.2
1983	32,073	92.0	7,985	99.2	36,681	97.9	8,189	104.3
1984	370,907	46.0	92,344	59.1	366,727	47.2	81,875	59.3
1985	398,073	59.0	99,107	69.7	1,340,067	59.8	299,181	69.7
1986	99,140	51.0	24,683	63.0	97,324	53.0	21,728	64.0
1987	61,481	32.0	15,307	49.0	74,775	34.5	16,694	49.8
1988	166,627	53.0	41,485	64.7	969,558	55.7	216,462	66.2
1989	221,145	36.0	55,058	51.7	241,028	42.6	53,812	55.7
1990	23,227	55.0	5,783	66.3	74,949	64.0	16,733	73.4
1991	34,947	64.0	8,701	74.0	153,180	68.2	34,199	77.1
1992	40,380	38.0	10,053	53.1	216,416	42.8	48,317	55.9
1993	26,534	40.0	6,606	54.5	178,968	45.4	39,956	57.9
1994	19,568	51.0	4,872	63.0	45,075	60.6	10,063	70.4
1995	4,040	60.0	1,006	70.5	16,517	61.8	3,688	71.5
1996	27,163	61.0	6,763	71.4	165,164	62.9	36,874	72.4
1997	4,903	62.0	1,221	72.2	15,016	63.3	3,352	72.7
1998	19,921	48.0	4,960	60.6	137,104	53.9	30,610	64.8
1999	64,588	31.0	16,080	48.3	249,324	36.3	55,664	51.1
2000	116,211	24.0	28,933	44.2	772,899	25.0	172,556	43.7
2001	119,990	30.0	29,874	47.7	859,667	31.6	191,928	47.8
2002	93,976	27.0	23,397	45.9	747,918	27.5	166,979	45.2
2003	38,326	34.0	9,542	50.3	383,077	35.5	85,525	50.4
2004	77,864	27.0	19,386	45.9	525,250	27.5	117,267	45.2
2005	27,747	33.0	6,908	49.6	149,337	37.4	33,341	51.8
2006	32,439	35.0	8,076	51.0	271,421	40.0	60,597	53.7
2007	51,557	36.0	12,836	51.7	478,041	38.2	106,727	52.4
2008	302,958	29.0	75,427	47.1	2,081,176	30.6	464,640	47.1
2009	395,369	28.0	98,434	46.5	2,811,253	28.7	627,636	45.9
2010	0	NA	0	NA	0	NA	0	NA
2011	0	NA	0	NA	0	NA	0	NA

Table 2 cont.

	MRIP-FCAL		SRFS-FCAL Calibration		MRIP-FCAL		SRFS-FCAL Calibration	
Year	Releases (no. fish)	PSE	Releases (no. fish)	PSE	Effort (no. trips)	PSE	Effort (no. trips)	PSE
1981	0	NA	0	NA	541,286	16.8	424,289	19.7
1982	0	NA	0	NA	100,326	13.6	78,641	17.0
1983	0	NA	0	NA	161,284	8.1	126,423	13.0
1984	30,866	100.0	14,417	102.2	446,093	14.3	349,671	17.5
1985	110,324	92.0	51,528	94.4	484,909	10.2	380,097	14.4
1986	0	NA	0	NA	541,024	6.9	424,083	12.3
1987	162,180	83.0	75,749	85.6	580,212	7.2	454,801	12.5
1988	61,695	44.0	28,815	48.7	352,442	12.3	276,262	15.9
1989	57,047	53.0	26,644	57.0	539,819	7.3	423,138	12.6
1990	0	NA	0	NA	345,056	7.6	270,473	12.7
1991	44,765	53.0	20,908	57.0	373,952	9.8	293,124	14.2
1992	26,919	44.0	12,573	48.7	362,854	5.8	284,424	11.8
1993	156,893	76.0	73,279	78.8	379,684	9.5	297,617	13.9
1994	119,120	41.0	55,637	46.0	340,591	6.8	266,973	12.2
1995	81,744	45.0	38,180	49.6	273,971	12.6	214,753	16.2
1996	37,867	72.0	17,686	75.0	323,962	11.9	253,938	15.7
1997	15,049	43.0	7,029	47.8	307,411	6.7	240,965	12.2
1998	100,271	53.0	46,833	57.0	294,523	7.4	230,863	12.6
1999	283,511	26.0	132,418	33.4	490,685	7.1	384,624	12.4
2000	450,581	26.0	210,451	33.4	720,627	5.8	564,866	11.7
2001	506,411	31.0	236,527	37.4	595,123	8.8	466,489	13.5
2002	271,011	28.0	126,579	35.0	753,917	5.6	590,960	11.6
2003	379,936	36.0	177,455	41.7	806,099	6.2	631,863	11.9
2004	658,035	25.0	307,345	32.6	683,862	9.1	536,047	13.6
2005	94,405	29.0	44,093	35.8	628,250	12.2	492,456	15.9
2006	388,768	38.0	181,580	43.4	816,339	8.3	639,890	13.1
2007	849,085	26.0	396,578	33.4	978,763	8.0	767,206	13.0
2008	1,346,474	26.0	628,890	33.4	1,219,085	13.0	955,583	16.5
2009	921,503	26.0	430,401	33.4	1,332,552	9.5	1,044,525	13.9
2010	430,059	38.0	200,865	43.4	720,797	7.7	564,999	12.8
2011	237,813	4.4	111,074	53.3	531,625	12.1	416,715	15.8

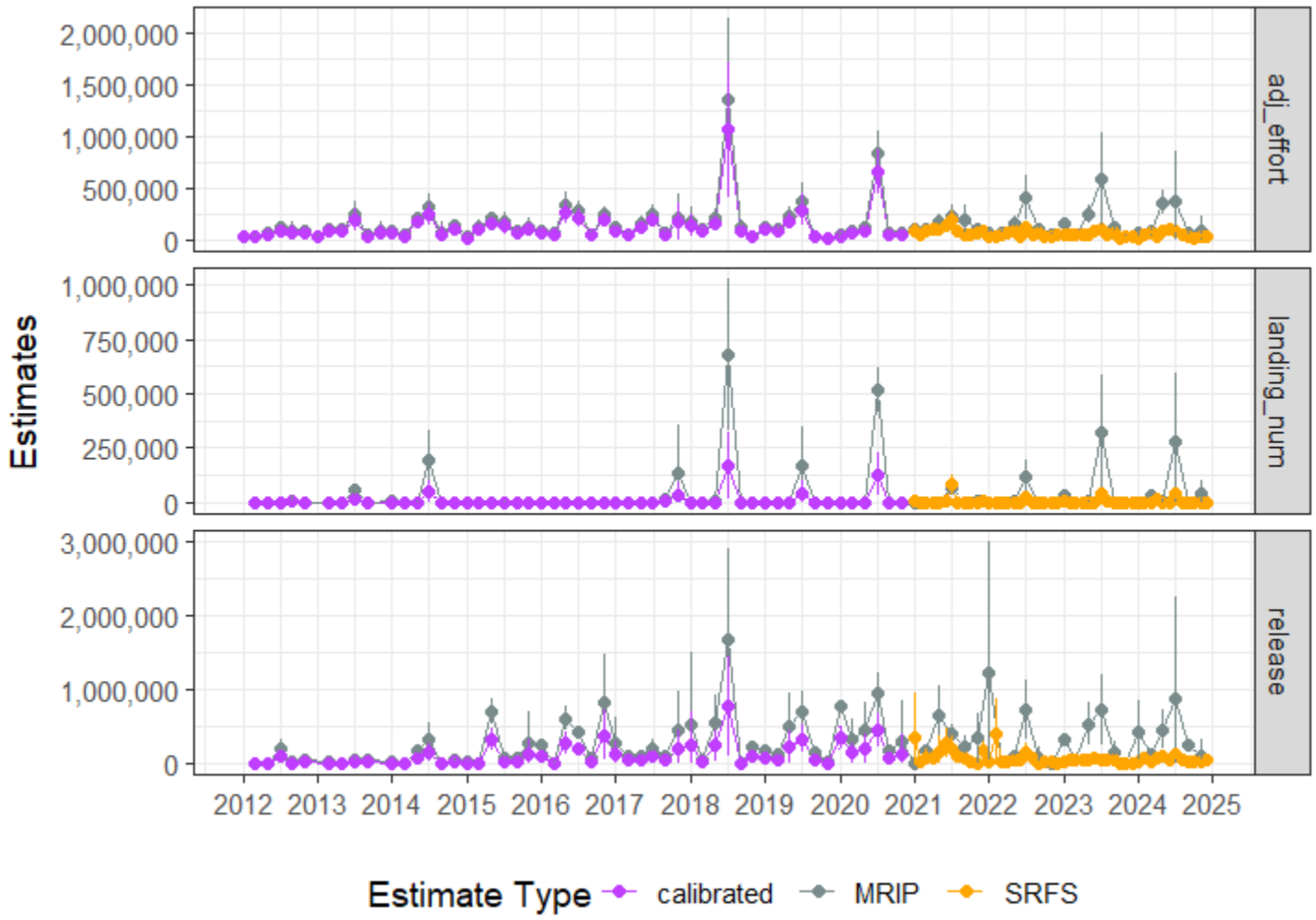

Figure 4. Red Snapper (*Lutjanus campechanus*) estimates in the Atlantic Ocean, including: original SRFS estimates by month (SRFS), original MRIP-FCAL time-series estimates by wave (MRIP), and the MRIP-FCAL time-series calibrated to SRFS currency by wave (calibrated). Estimates are shown from 2012-2024 at the finest time scale possible to account for differences between in-season and out-of-season landings while the mini-seasons were in place. Adjusted effort (angler trips), landings in numbers of fish (landing_num) and releases in numbers of fish (release) are shown. Error bars are 95% confidence limits.

Table 3. Original and calibrated MRIP-FCAL estimates for Red Snapper (*Lutjanus campechanus*) landing and release estimates (in numbers of fish) in Florida from 2012-2020 by two-month wave. Wave estimates allow for differentiation of landings and releases that occurred outside of the mini-season.

Year - Wave	MRIP-FCAL Landings (no. fish)	PSE	SRFS-FCAL calibration Landings (no. fish)	PSE	MRIP-FCAL Releases (no. fish)	PSE	SRFS-FCAL calibration Releases (no. fish)	PSE
2012 - 1	0	NA	0	NA	0	NA	0	NA
2012 - 2	955	0.0	238	37.1	8,734	0.0	4,079	21.0
2012 - 3	0	NA	0	NA	22,044	0.0	10,296	21.0
2012 - 4	0	NA	0	NA	212,294	31.1	99,155	37.5
2012 - 5	9,827	100.0	2,447	106.6	38,401	2.4	17,936	21.1
2012 - 6	0	NA	0	NA	65,358	0.0	30,526	21.0
2013 - 1	0	NA	0	NA	0	NA	0	NA
2013 - 2	0	NA	0	NA	32,355	0.0	15,112	21.0
2013 - 3	0	NA	0	NA	20,291	0.0	9,477	21.0
2013 - 4	53,547	20.9	13,331	42.6	66,694	16.5	31,150	26.7
2013 - 5	0	NA	0	NA	61,639	4.1	28,789	21.4
2013 - 6	0	NA	0	NA	0	NA	0	NA
2014 - 1	2,962	0.0	737	37.1	41,223	0.0	19,254	21.0
2014 - 2	0	NA	0	NA	3,119	0.0	1,457	21.0
2014 - 3	1,908	100.0	475	106.6	175,131	22.7	81,798	30.9
2014 - 4	196,713	35.3	48,975	51.2	337,207	34.1	157,497	40.1
2014 - 5	0	NA	0	NA	3,644	0.0	1,702	21.0
2014 - 6	451	100.0	112	106.6	57,009	25.1	26,627	32.7
2015 - 1	0	NA	0	NA	27,208	67.3	12,708	70.5
2015 - 2	0	NA	0	NA	11,569	38.8	5,403	44.1
2015 - 3	0	NA	0	NA	713,003	13.1	333,018	24.7
2015 - 4	1,297	100.0	323	106.6	88,967	41.6	41,553	46.6
2015 - 5	0	NA	0	NA	88,735	0.0	41,445	21.0
2015 - 6	0	NA	0	NA	289,758	73.1	135,336	76.0
2016 - 1	0	NA	0	NA	254,363	0.0	118,804	21.0
2016 - 2	0	NA	0	NA	20,463	43.2	9,557	48.0
2016 - 3	0	NA	0	NA	619,452	14.1	289,324	25.3
2016 - 4	0	NA	0	NA	427,358	5.3	199,604	21.6
2016 - 5	0	NA	0	NA	73,147	0.0	34,164	21.0
2016 - 6	0	NA	0	NA	839,383	39.1	392,046	44.4
2017 - 1	0	NA	0	NA	288,123	60.4	134,572	63.9
2017 - 2	0	NA	0	NA	110,191	0.0	51,466	21.0
2017 - 3	0	NA	0	NA	119,803	3.5	55,956	21.2
2017 - 4	0	NA	0	NA	211,242	28.9	98,663	35.7
2017 - 5	17,606	0.0	4,383	37.1	100,887	0.0	47,121	21.0
2017 - 6	135,898	81.6	33,834	89.6	453,123	58.4	211,638	62.0

Table 3 cont.

Year - Wave	MRIP-FCAL Landings (no. fish)	PSE	SRFS-FCAL calibration Landings (no. fish)	PSE	MRIP-FCAL Releases (no. fish)	PSE	SRFS-FCAL calibration Releases (no. fish)	PSE

2018 - 1	0	NA	0	NA	541,100	91.7	252,729	94.1
2018 - 2	0	NA	0	NA	71,188	0.0	33,249	21.0
2018 - 3	3,185	100.0	793	106.6	547,992	36.5	255,948	42.1
2018 - 4	677,203	26.1	168,602	45.3	1,673,241	37.9	781,511	43.3
2018 - 5	0	NA	0	NA	14,102	0.0	6,587	21.0
2018 - 6	0	NA	0	NA	226,723	0.0	105,894	21.0
2019 - 1	0	NA	0	NA	184,216	0.0	86,041	21.0
2019 - 2	0	NA	0	NA	138,361	7.6	64,623	22.3
2019 - 3	0	NA	0	NA	505,308	44.6	236,012	49.3
2019 - 4	169,208	54.6	42,127	66.0	717,883	19.5	335,298	28.6
2019 - 5	0	NA	0	NA	153,517	0.0	71,702	21.0
2019 - 6	0	NA	0	NA	22,475	0.0	10,497	21.0
2020 - 1	0	NA	0	NA	775,271	0.0	362,101	21.0
2020 - 2	0	NA	0	NA	333,179	40.6	155,616	45.7
2020 - 3	0	NA	0	NA	456,650	42.5	213,285	47.4
2020 - 4	516,372	9.8	128,560	38.3	964,042	14.5	450,270	25.5
2020 - 5	0	NA	0	NA	196,110	0.0	91,596	21.0
2020 - 6	0	NA	0	NA	309,330	92.3	144,477	94.6

Table 4. Original and calibrated MRIP-FCAL estimates for Red Snapper (*Lutjanus campechanus*) effort estimates (angler trips) in Florida from 2012-2020 by two-month wave. Wave estimates allow for differentiation of landings and releases that occurred outside of the mini-season.

	MRIP-FCAL		SRFS-FCAL calibration	
Year - Wave	Effort (no. trips)	PSE	Effort (no. trips)	PSE

	MRIP-FCAL		SRFS-FCAL calibration	
Year	Effort (no. trips)	PSE	Effort (no. trips)	PSE

2012 - 1	45,117	19.7	35,365	22.2
2012 - 2	38,990	14.5	30,562	17.7
2012 - 3	69,014	14.8	54,097	17.9
2012 - 4	127,586	18.1	100,008	20.8
2012 - 5	99,913	45.5	78,317	46.7
2012 - 6	99,758	15.8	78,195	18.8
2013 - 1	40,722	19.2	31,920	21.7
2013 - 2	108,058	4.4	84,701	11.1
2013 - 3	108,473	12.7	85,027	16.3
2013 - 4	249,874	26.0	195,864	27.9
2013 - 5	59,416	15.3	46,574	18.4
2013 - 6	95,031	49.2	74,490	50.2
2014 - 1	92,454	26.3	72,470	28.2
2014 - 2	58,531	40.2	45,880	41.4
2014 - 3	222,307	12.7	174,256	16.3
2014 - 4	322,883	18.4	253,093	21.1
2014 - 5	77,927	62.8	61,083	63.6
2014 - 6	136,088	25.5	106,673	27.4
2015 - 1	32,594	23.4	25,549	25.5
2015 - 2	129,852	23.5	101,785	25.7
2015 - 3	207,844	12.6	162,919	16.2
2015 - 4	174,145	25.9	136,504	27.8
2015 - 5	86,330	15.2	67,670	18.3
2015 - 6	133,281	30.8	104,473	32.4
2016 - 1	88,786	27.2	69,595	29.0
2016 - 2	68,472	6.4	53,672	12.0
2016 - 3	346,887	16.5	271,908	19.4
2016 - 4	282,374	17.7	221,340	20.4
2016 - 5	62,826	25.0	49,247	27.0
2016 - 6	251,645	15.9	197,253	18.9
2017 - 1	124,193	11.7	97,349	15.6
2017 - 2	62,777	24.9	49,208	26.9
2017 - 3	161,455	22.4	126,557	24.6
2017 - 4	258,525	15.4	202,646	18.4
2017 - 5	65,817	16.7	51,591	19.6
2017 - 6	223,370	50.4	175,089	51.4
2018 - 1	186,595	35.6	146,263	37.0
2018 - 2	108,737	9.8	85,234	14.2
2018 - 3	216,050	19.5	169,351	22.0
2018 - 4	1,360,708	29.4	1,066,595	31.1
2018 - 5	120,289	18.4	94,289	21.0
2018 - 6	43,984	15.5	34,477	18.6
2019 - 1	134,470	18.0	105,404	20.7
2019 - 2	112,386	11.0	88,094	15.0
2019 - 3	234,518	19.9	183,827	22.4
2019 - 4	372,820	24.4	292,236	26.4
2019 - 5	41,477	0.0	32,512	10.2
2019 - 6	27,629	26.3	21,657	28.2
2020 - 1	49,661	16.9	38,927	19.8
2020 - 2	98,883	13.6	77,509	17.0
2020 - 3	126,886	13.7	99,460	17.1
2020 - 4	843,229	12.3	660,967	15.9
2020 - 5	72,821	32.1	57,081	33.7
2020 - 6	67,337	41.7	52,782	42.9

Table 5. SRFS estimates for Red Snapper (*Lutjanus campechanus*) landing, release, and effort estimates in Florida from 2021-2024 by month. Month estimates allow for differentiation of landings, releases, and effort that occurred outside of the mini-season.

Year	Month	Landings (no. fish)	PSE	Landings (pounds)	PSE	Releases (no. fish)	PSE	Effort (no. trips)	PSE
2021	1	2826.818	93.9	NA	NA	353,827	85.7	88,286	38.6
2021	2	0	NA	0	NA	25,479	56.2	51,485	22.2
2021	3	0	NA	0	NA	96,083	58.2	95,261	22.8

2021	4	0	NA	0	NA	91,532	48.6	106,115	22.4
2021	5	0	NA	0	NA	170,471	64.5	102,058	22.9
2021	6	2154.846	97.0	10,040	65.3	283,652	34.1	146,821	21.2
2021	7	79384.46	29.6	545,573	23.8	220,481	36.4	195,143	21.9
2021	8	0	NA	0	NA	119,975	32.8	91,219	23.4
2021	9	0	NA	0	NA	73,799	36.9	54,897	23.6
2021	10	0	NA	0	NA	25,483	53.6	62,927	20.3
2021	11	0	NA	0	NA	0	NA	78,989	26.6
2021	12	4992.271	78.2	68,220	52.8	186,805	34.4	83,298	23.3
2022	1	0	NA	0	NA	38,746	42.6	44,135	26.5
2022	2	0	NA	0	NA	410,277	57.7	39,064	19.7
2022	3	0	NA	0	NA	23,471	57.0	49,654	19.2
2022	4	0	NA	0	NA	34,509	51.6	69,679	18.4
2022	5	0	NA	0	NA	58,806	40.0	91,907	22.6
2022	6	1726.324	69.7	9,248	45.2	49,329	41.9	42,585	25.0
2022	7	27079.89	37.3	240,003	26.0	152,086	42.1	120,644	22.9
2022	8	1972.707	88.1	29,299	55.4	80,731	47.7	58,166	23.0
2022	9	0	NA	0	NA	10,157	60.6	72,892	26.9
2022	10	0	NA	0	NA	31,551	42.6	39,852	23.6
2022	11	908.3697	105.5	2,203	71.1	32,356	97.7	40,654	25.2
2022	12	0	NA	0	NA	10,154	47.3	52,990	23.2
2023	1	5953.657	87.2	14,926	61.5	38,278	57.1	54,716	36.1
2023	2	536.1752	30.7	544	20.7	52,994	48.1	48,564	17.7
2023	3	0	NA	0	NA	53,017	65.0	58,586	23.6
2023	4	0	NA	0	NA	60,113	31.4	49,630	19.6
2023	5	165.8722	86.4	918	53.3	51,941	40.9	50,419	29.2
2023	6	439.1545	100.4	445	67.6	75,258	35.3	92,311	17.6
2023	7	38017.25	32.5	351,126	23.9	65,196	30.2	100,368	16.6
2023	8	4521.746	57.9	17,336	43.6	54,172	37.1	58,559	26.1
2023	9	0	NA	0	NA	61,552	43.8	65,376	20.2
2023	10	325.6252	89.8	2,072	66.1	12,754	81.4	22,030	26.3
2023	11	0	NA	0	NA	21,546	49.9	32,595	21.5
2023	12	744.2268	43.7	591	29.4	10,410	54.4	31,866	22.5

Table 5 cont.

Year	Month	Landings (no. fish)	PSE	Landings (pounds)	PSE	Releases (no. fish)	PSE	Effort (no. trips)	PSE
2024	1	0	NA	0	NA	27,158	47.5	22,881	31.7
2024	2	0	NA	0	NA	75,866	39.1	62,198	24.1
2024	3	0	NA	0	NA	24,256	36.7	73,290	18.0
2024	4	13336.51	74.3	112,775	48.7	75,990	35.4	37,714	23.6
2024	5	182.1454	103.5	2,843	69.7	100,898	43.4	86,050	23.7
2024	6	1222.224	90.5	754	61.0	71,283	34.8	101,891	17.9

2024	7	40198.9	36.2	358,038	24.6	133,428	25.9	97,886	16.5
2024	8	0	NA	0	NA	53,294	41.3	56,216	21.2
2024	9	0	NA	0	NA	22,079	40.8	41,062	26.0
2024	10	0	NA	0	NA	27,677	39.4	22,123	35.3
2024	11	0	NA	0	NA	33,022	54.6	41,426	28.2
2024	12	234.7351	105.6	1,242	71.1	66,654	48.1	41,674	22.1