

**Multi-year calibration ratios for Florida's State Reef Fish Survey (SRFS) to NOAA MRIP
FES and CHTS estimates of red snapper landings in numbers and pounds of fish: an
update.**

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In preparation for:

Gulf of Mexico Fishery Management Council
Scientific and Statistical Committee Meeting, January 2023

December 26, 2022

Background

Florida's State Reef Fish Survey (SRFS) was developed in collaboration with NOAA Fisheries alongside similar efforts in other states. The SRFS (formerly the Gulf Reef Fish Survey before it was expanded statewide in July 2020) was implemented in May 2015 and is currently used by the Florida Fish and Wildlife Conservation Commission (FWC) to manage recreational harvest levels for Red Snapper off the Gulf coast of the state and track landings against a state-specific allocation of the Gulf-wide ACL. The methodology and estimation methods were peer reviewed and certified by NOAA Fisheries in December 2018. For more details on the SRFS methodology and how it is used to track state landings, refer to Sauls et al. (2019).

The State Reef Fish Survey has provided continuous monthly, year-round estimates of private boat fishing effort and catch (including landings and discards) for important reef fish species from the western peninsula of Florida since May 2015. The SRFS runs concurrent with the MRIP survey in Florida and produces estimates that are consistently lower. A method was needed to convert catch advice derived from stock assessments to the same currency as the SRFS.

In 2020, a ratio-based calibration method was developed for converting NOAA MRIP estimates to State Reef Fish Survey (SRFS) currency (Cross et al. 2020). The method included overlapping estimates available from May 2015 through December 2019. This method was first reviewed by an independent expert review panel in March 2020, and final methods were presented during the 2020 NOAA Science and Technology Calibration Workshop for Red Snapper (<https://gulfcouncil.org/council/aug-calibration-workshop-rs-2020/>). Following the workshop, the Gulf SSC reviewed the methods and determined the calibration ratio provided for Florida was appropriate for quota monitoring of the red snapper state specific ACL (<https://gulfcouncil.org/wp-content/uploads/Gulf-SSC-Summary-August-2020-08182020.pdf>). In February 2022, the same calibration method was reviewed by an independent expert review panel for use in the SEDAR72 assessment model for the Gulf Gag stock, and during the July 2022 Gulf SSC meeting (<https://gulfcouncil.org/scientific-and-statistical-meetings/july-2022/>). No major concerns were identified that would preclude the use of the calibrations for their intended purpose, and the SSC recommended the use of SRFS estimates (<https://gulfcouncil.org/wp-content/uploads/Gulf-Standing-RF-Socio-and-Eco-SSC-Summary-July-2022-07232022.pdf>).

Included in State Reef Fish Survey (SRFS) estimates:

- Private boat mode
- Gulf coast of Florida
 - Excluding Monroe County from May 2015-June 2020
- Year-round monthly effort, landings and discards for:
 - Red and Vermilion Snappers
 - Gag, Red and Black Groupers
 - Gray Triggerfish
 - Greater and Lesser Amberjacks, Almaco Jack, and Banded Rudderfish
 - Hogfish, Yellowtail and Mutton Snappers (as of July 2020)

Methods

Since the SRFS calibration was initially developed and reviewed, additional overlapping years of data have become available. Here we present updated calibration ratios including estimates available through 2021 and using the same methods outlined in Cross et al. 2020. To maintain a consistent time-series, SRFS estimates for the most recent year (2021) that are included in this updated calibration only include private boat catch from the Gulf coast of Florida and excludes Monroe County. Because the SRFS covers private boat mode (PR) only, we requested that NOAA Southeast Regional Office (SERO; Mike Larkin) provide MRIP time-series that excluded state charter estimates. SERO provided base MRIP estimates calibrated for methodological changes in the Access Point Angler Intercept Survey (CHTS estimates), and base estimates calibrated for new methodologies in both the intercept survey and the new Fishing Effort Survey (FES estimates), both of which excluded state charter estimates. When comparing calibration ratios presented in this report to those recommended by Pulver and Strelcheck during the August 2020, NOAA Science and Technology Calibration Workshop for Red Snapper, please bear in mind that state charter estimates were included in the MRIP estimates Pulver and Strelcheck used to calculate calibration ratios.

The SRFS incorporates catch data collected through the MRIP survey, thus estimates from the two surveys are correlated but to an unknown extent. Past reviews have recommended assuming 0% correlation because it is the most conservative. Calibration ratios are provided here with approximated variance for three assumed levels of correlation (0%, 50%, and 90%) to illustrate the influence this assumption has on variance.

In updating the calibration ratios, all years in which MRIP and SRFS surveys ran concurrently were included (2015-2019, 2021) except for year 2020, due to suspended and reduced APAIS and SRFS dockside survey sampling in Florida from March through August due to the COVID-19 pandemic. Missing 2020 data were imputed using the two prior years' data (Papacostas and Foster, 2021), and we omitted 2020 estimates to present the most accurate relationship between the SRFS and MRIP estimates. Alternative scenarios are presented:

- 1) May 2015 to December 2019, the years originally included in Cross et al. (2020);
- 2) May 2015 to December 2017, the years recommended and approved for Florida by the Gulf SSC during their August 2020 meeting (<https://gulfcouncil.org/wp-content/uploads/Gulf-SSC-Summary-August-2020-08182020.pdf>);
- 3) Years 2018, 2019, and 2021; and
- 4) All available overlapping estimates from May 2015 to December 2021, excluding 2020.

Findings and Conclusions

The MRIP-FES estimates are consistently on average two to three times greater than the SRFS estimates for Red Snapper. The MRIP-CHTS estimates are much closer to a one-to-one relationship with the SRFS estimates.

For the years in which the SRFS and MRIP overlap, paired annual SRFS and MRIP Red Snapper estimates, their summed totals, and associated coefficients of variation (CV) are provided in Table 1. Observed ratios of summed SRFS to MRIP Red Snapper landings estimates in pounds and numbers of fish and approximated variances expressed as percent standard error (PSE) for each level of correlation are provided in Table 2 for both MRIP-CHTS and MRIP-FES time series. For the full overlapping time series (omitting year 2020), the observed ratios for SRFS to MRIP-FES conversions for landings in both numbers and pounds of fish were 0.38 (Table 2, Figure 1). This result is similar to the original calibration for years 2015 to 2019 (0.37 and 0.36 for landings in numbers and pounds of fish, respectively) (Figure 1). The calibration scenario that only included years 2015 to 2017 resulted in a slightly higher ratio for the SRFS to MRIP-FES conversion of 0.40 for landings in both numbers and pounds of fish (Table 2, Figure 1). For the scenario including 2018, 2019, and 2021, the SRFS to MRIP-FES conversion was 0.36, but with higher PSEs (Table 2, Figure 1). The SRFS to MRIP-CHTS observed ratios for the full overlapping time series (omitting year 2020) were 1.2 for landings in number and 1.24 for landings in pounds, which is only slightly higher than calibration scenarios that only include years 2015 to 2019 and 2015 to 2017 (Table 2, Figure 2). The SRFS to MRIP-CHTS conversion for years 2018, 2019, and 2021 was 1.29 and 1.34 for landings in numbers of fish and landings in pounds, respectively; PSEs associated with these conversions were highest of all scenarios presented.

Because the SRFS and MRIP surveys continue to operate in tandem, we recommend using the full overlapping time series, i.e., May 2015 to December 2021, but omitting year 2020 due to reduced and interrupted APAIS and SRFS field sampling related to the COVID-19 pandemic.

References

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Table 1. Annual and summed SRFS, MRIP-FES, and MRIP-CHTS landings estimates in pounds and numbers of fish, and associated variances for Red Snapper. Note: Monroe County is included in MRIP estimates but not SRFS estimates.

Estimate Type	Year	SRFS sum	SRFS CV	MRIP-FES sum	MRIP-FES CV	MRIP-CHTS sum	MRIP-CHTS CV
Landings (no. fish)	2015	210,968	0.16	442,902	0.21	162,607	0.24
	2016	296,519	0.15	669,649	0.17	291,827	0.18
	2017	485,004	0.12	1,366,131	0.24	418,954	0.15
	2018	404,290	0.12	1,008,548	0.21	334,198	0.32
	2019	247,883	0.21	1,009,579	0.23	277,264	0.31
	2021	347,279	0.18	792,566	0.30	161,397	0.33
	TOTAL	1,991,943	0.06	5,289,759	0.10	1,646,247	0.10
Landings (pounds)	2015	1,139,846	0.12	2,333,283	0.23	831,998	0.22
	2016	1,338,059	0.10	3,290,551	0.19	1,436,908	0.18
	2017	2,440,328	0.08	6,698,077	0.24	2,026,113	0.17
	2018	1,913,216	0.08	4,679,190	0.21	1,553,416	0.32
	2019	1,244,312	0.13	5,198,177	0.22	1,428,408	0.30
	2021	2,274,100	0.18	5,186,791	0.33	1,072,334	0.34
	TOTAL	10,349,862	0.05	27,386,069	0.11	8,349,177	0.11

Table 2. Calibration ratios for SRFS to MRIP-CHTS and SRFS to MRIP-FES conversions, and associated PSEs at 0%, 50%, and 90% correlation for Red Snapper landings in pounds and numbers of fish under four different scenarios: 1) years 2015 to 2019; 2) years 2016 to 2019; 3) years 2018, 2019, 2021; and 4) years 2015 to 2019, and 2021.

Conversion Type	Estimate Type	Years included	Ratio	Ratio PSE		
				0% corr.	50% corr.	90% corr.
SRFS to MRIP-CHTS	Landings (no. fish)	2015-2019	1.11	12.8	9.6	5.8
		2015-2017	1.14	13.2	9.5	4.7
		2018-2019, 2021	1.29	21.2	16.3	11.0
		2015-2019, 2021	1.21	12.2	9.1	5.5
	Landings (pounds)	2015-2019	1.11	11.9	9.6	7.3
		2015-2017	1.15	12.2	9.3	6.2
		2018-2019, 2021	1.34	20.5	16.1	11.5
		2015-2019, 2021	1.24	11.8	9.2	6.3
SRFS to MRIP-FES	Landings (no. fish)	2015-2019	0.37	12.1	8.9	5.1
		2015-2017	0.40	15.9	8.5	7.2
		2018-2019, 2021	0.36	16.7	12.1	6.5
		2015-2019, 2021	0.38	11.5	8.5	4.8
	Landings (pounds)	2015-2019	0.36	11.5	9.2	6.9
		2015-2017	0.40	15.7	9.2	9.9
		2018-2019, 2021	0.36	17.4	13.1	8.3
		2015-2019, 2021	0.38	11.8	9.2	6.3

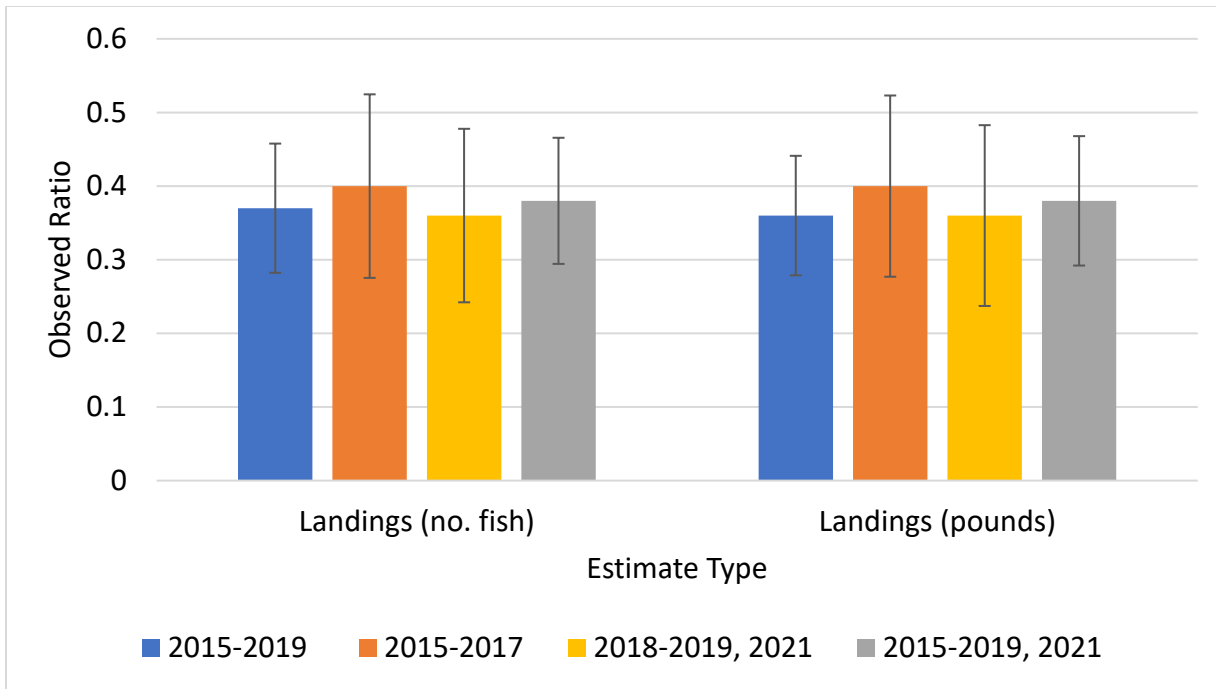


Figure 1. Observed ratios for SRFS to MRIP-FES conversion of Red Snapper landings in both numbers and pounds of fish for each calibration scenario. Error bars represent 95% confidence intervals assuming 0% correlation.

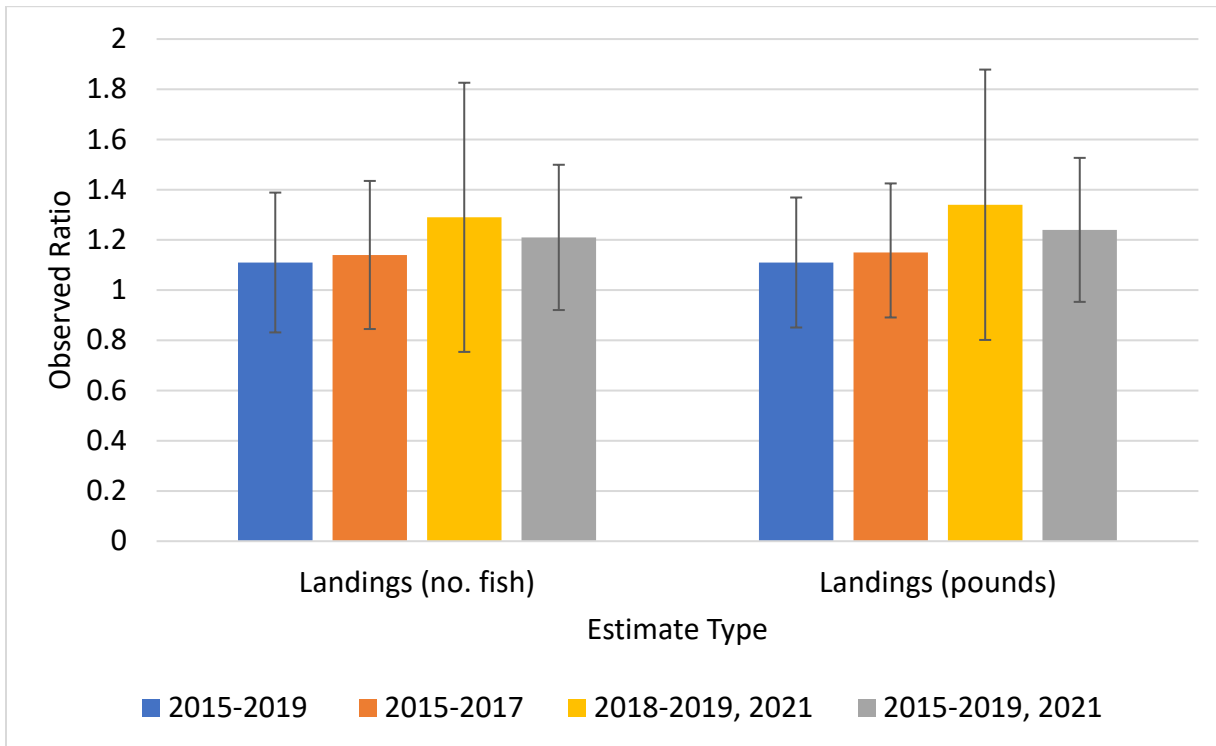


Figure 2. Observed ratios for SRFS to MRIP-CHTS conversion of Red Snapper landings in both numbers and pounds of fish for each calibration scenario. Error bars represent 95% confidence intervals assuming 0% correlation.