# 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 Gulf Gag (*Mycteroperca microlepis*)

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# 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 Gulf Gag (*Mycteroperca microlepis*)

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SEDAR 105 Gulf Gag

June 2026

*Background*

The Marine Recreational Information Program (MRIP) has provided vital statistics on recreational fishing effort and catch in the eastern U.S. Gulf of Mexico since 1981. In order to remain useful for regional stock assessments, the time-series has undergone several calibrations to account for the effects of survey design improvements in more recent years. For example, when MRIP made the transition from the coastal household telephone survey (CHTS) to the fishing effort survey (FES) the historic estimates CHTS were calibrated into FES currency. This calibration is currently used for generating historic MRIP estimates and is termed FCAL. Stock assessments require long-term time-series of landings and discards on an annual scale that are measured consistently through time.

In response to a region-wide need for more precise and timely estimates of recreational catch, Florida's Gulf Reef Fish Survey (GRFS) was developed in May 2015 in collaboration with NOAA Fisheries alongside similar efforts in other states. The GRFS generated recreational catch estimates for the Gulf of Mexico, excluding Monroe County (Fig. 1; regions A-C). Beginning July 1, 2020, the Gulf Reef Fish Survey was expanded statewide in Florida and is now known as the State Reef Fish Survey (SRFS). The SRFS runs concurrent with the MRIP survey in Florida and produces estimates that are consistently lower. The previous stock assessment for Gag in the Gulf of Mexico (SEDAR 72) incorporated MRIP-FCAL estimates converted to SRFS currency across the entire timeseries (Cross et al. 2020) and since 2025 the SRFS estimates have been used monitor landings and discards from private boats and track the recreational ACL (GMFMC 2023). Since SEDAR 72, other Florida-centric species such as Red Grouper (SEDAR 88) in the Gulf region and Mutton Snapper (SEDAR 79) and Yellowtail Snapper (SEDAR 96) in the Southeast have incorporated a long-term 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. 2020; Ramsay et al. 2024a-c). The method that was developed to calibrate historic MRIP-FCAL estimates to SRFS currency was peer-reviewed by NOAA Office of Science and Technology (OS&T) statistical consultants and approved for use (Ramsay, NOAA OS&T, et al. 2024). The method is used herein to calibrate MRIP estimates to SRFS currency for Gulf Gag, 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 Gag (*Mycteroperca microlepis*) in the Gulf, including the Keys. "The Keys" is defined as all trips taken off of mainland Monroe county and all trips taken from the Keys in the Gulf (i.e., north of U.S. 1/the island chain; Fig. 1 region D).

*Methods*

Prior to producing a calibrated time series, SRFS estimates during the early years require an adjustment to account for effort and catch from the Gulf Keys (Fig. 1; region D) because this region was not included in the SRFS survey until June 2020. To do this, data from the four most recent years, years 2021-2024, were used to produce separate recreational catch estimates for the Gulf coast with the Gulf Keys included (Gulfk; Fig. 1 regions A-D) and excluded (Gulf; Fig. 1 regions A-C), and a ratio was calculated. Application of this ratio resulted in an increase in 2016-2020 SRFS estimates because they accounted for additional landings and discards from the Gulf Keys. Next, another ratio was calculated to calibrate MRIP estimates for the Gulf (excluding the Keys; provided by NOAA Fisheries Southeast Science Center) down to the SRFS Gulfk estimates using the available overlapping years (2016-2024). This method was used to produce a calibrated time series for total landings (numbers and pounds of fish), releases (numbers), and reef fish effort (angler trips). To calibrate reef fish effort, effort estimates for SRFS and MRIP included trips that targeted and/or caught one or more of the following from the suite of reef fish species covered by the SRFS survey: red grouper, gag, black grouper, red snapper, vermilion snapper, gray triggerfish and amberjacks (greater, lesser, almaco and banded rudderfish). The estimated ratios and associated uncertainty were used to convert the historical MRIP time series (1981-2015) to a common currency with SRFS. For the years 2016-2024, SRFS Gulfk estimates are provided in place of MRIP.

Due to the variable nature of Gag recreational fishing seasons, it is more appropriate to quantify the overall differences between SRFS and FCAL estimates and between SRFS Gulf and SRFS Gulfk estimates than to apply calibrations at a fine scale back in time (e.g. by month or area fished). This single calibration factor may then be applied to annual FCAL estimates back in time. To calculate the calibration ratios, SRFS estimates ($\hat{E}$) and variances ($\hat{V}$) for each estimation method (where *m = SRFS Gulf or SRFS Gulfk*) were summed across years (*y*), two-month waves (*w*), and areas fished (*a*: federal or state waters) for each combination of estimate type variable (*v*: number landed, pounds landed, number released, angler trips) [1, 2].

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

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

This resulted in four paired overall sums for each estimate type from SRFS Gulf and SRFS Gulfk (Table 1). For each of the paired sums, the ratio was calculated as the SRFS Gulfk estimate divided by the SRFS Gulf estimate [3].

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

This first ratio was applied as a multiplier to SRFS estimates for the years 2016-2020, to account for catch in the Gulf Keys before data were collected in this region [4].

$$\hat{E}_{SRFS,y,v} = \hat{R}_{Gulfk,v}\hat{E}_{Gulf,y,v} \text{ [4]}$$

The delta method was used to approximate the variance of the ratios ($\hat{V}(\hat{R}_v)$), and incorporates error associated with both the numerator (SRFS Gulfk estimates) and denominator (SRFS Gulf estimates).

Once the full SRFS time series was calibrated to Gulf with the Keys currency, estimates and variances for each estimation method (where *m = SRFS or FCAL*) were summed, using equation 1 above, across years (*y*), two-month waves (*w*), and areas fished (*a*: federal or state waters) for each estimate type variable (*v*: number landed, pounds landed, number released, angler trips). This resulted in four paired overall sums for SRFS Gulfk and FCAL Gulf estimates (Table 2). For this calibration, the SRFS sum was divided by the MRIP-FCAL sum to produce a second ratio that could be applied to MRIP-FCAL estimates prior to 2016, before SRFS estimates were available. MRIP-FCAL landings estimates from 1983 are for the whole Gulf, rather than just the state of Florida due to a smoothing procedure applied to this year of data by the NOAA Southeast Fisheries Science Center.

$$\hat{R}_v = \frac{\hat{E}_{SRFS,v}}{\hat{E}_{FCAL,v}} \text{ [5]}$$

Historic MRIP FES estimates were converted to SRFS currency by multiplying the annual FCAL estimate for each year and variable type (number landed, pounds landed, number released, number of trips) [6] with the corresponding ratio [5]:

$$\hat{E}_{SRFS-hind,y,v} = \hat{R}_v\hat{E}_{FCALy,v} \text{ [6]}$$

The delta method was once again used to approximate the variance of the ratios ($\hat{V}(\hat{R}_v)$), and incorporates error associated with both the numerator (SRFS estimates) and denominator (FCAL estimates). The R statistical software package 'msm' (R Core Team 2023; Jackson 2011) was used to carry out variance calculations.

MRIP and SRFS use separate methods to calculate fishing effort (angler trips); however, catch estimates from the two surveys are not completely independent. To estimate catch-per-unit-effort (CPUE), the MRIP survey uses data from the Access Point Angler Intercept Survey (APAIS), whereas the GRFS 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). 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. Additionally, SRFS Gulf and SRFS Gulfk estimates are correlated as both are generated by the same survey and generate estimates for a highly overlapped spatial distribution. For both of these calibrations we assumed a 0% correlation as this is the most conservative approximation of variance if correlation between the two estimates are ignored (Cross et al. 2020).

*Findings and Conclusions*

Figures 2 and 3 show the different time-series of estimates that are discussed throughout this document.

For the years in which SRFS estimates included the Gulf Keys, the ratios of Gag estimates with and without the Gulf Keys are provided in Table 1. When converting SRFS Gulf to SRFS Gulfk currency to account for additional trips, landings, and releases from the Gulf Keys, estimates were increased by 2-4% for the estimates of landings and releases and 9% for estimates of effort (Table 2). The average PSE value for this calibration was 16% for landings and releases and 6% for effort (Table 2).

For the years in which the SRFS and MRIP overlap, ratios of summed SRFS and FCAL estimates, and approximated variance for each ratio are provided in Table 3. When converting MRIP FES estimates to SRFS currency, estimates decreased between 58-60% for landings and releases and by 55% for effort. The average PSE value for this calibration was 23% for landings and releases and 10% for effort.

The purpose of this report was to document the method used to convert FCAL estimates to SRFS estimates for use in the SEDAR 105 Gulf Gag stock assessment. Results presented in this report include data collected from 2016 to 2024. The two surveys continue to run concurrently in Florida. Calibration factors that include the complete available time-series of overlapping data may be routinely updated and shared as needed.

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# Saltwater Recreational Fishing Survey Map

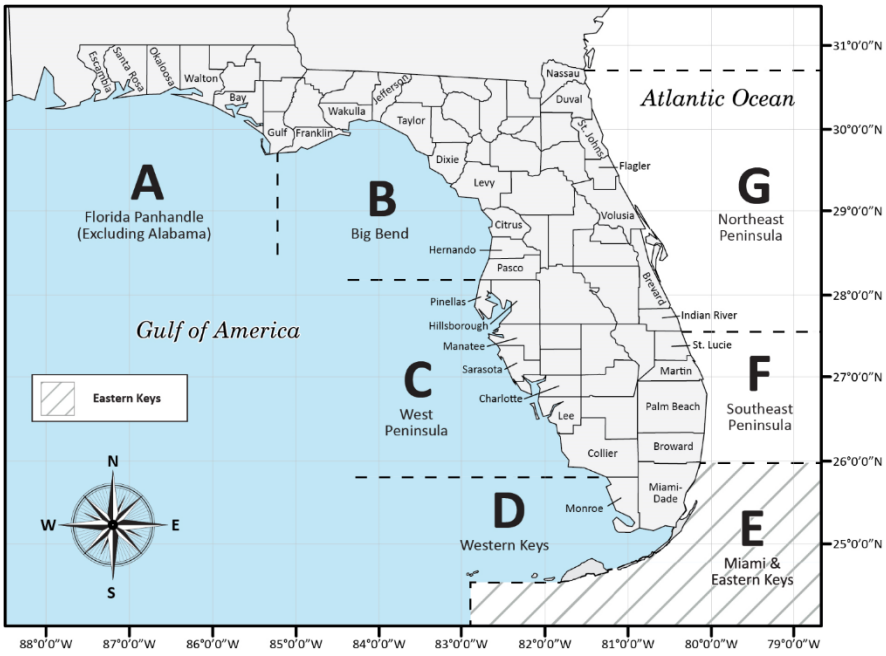


Figure 1. Regions of the state of Florida as designated by the State Reef Fish Survey (SRFS). For the purposes of this calibration, the Gulf with the Keys is defined as regions A-D. The survey ran from 2016-2020 as the Gulf Reef Fish Survey (GRFS), covering regions A-C. In June 2020, the survey was expanded to include regions D-G and renamed the SRFS.

Table 1. Annual and summed SRFS Gulf and SRFS Gulf with the Gulf Keys (Monroe County & the Keys north of the island chain/U.S. 1; Gulfk) estimates (sum) and variances (var) and ratios of SRFS Gulf to SRFS Gulfk estimates are shown for Gag (*Mycteroperca microlepis*) in Florida. Estimates for effort (number of trips) are for the whole suite of reef associated species covered by the original GRFS survey, including Gag.

| Estimate Type | Year | SRFS Gulfk Sum | SRFS Gulfk Variance | SRFS Gulf Sum | SRFS Gulf Variance | Ratio |
|---|---|---|---|---|---|---|
| Adjusted Effort (no. trips) | 2021 | 1,495,099 | 4,036,979,055 | 1,388,630 | 3,612,693,035 | 1.093 |
| | 2022 | 1,058,123 | 2,386,680,608 | 970,472 | 2,208,058,573 | |
| | 2023 | 922,297 | 2,556,260,952 | 825,711 | 2,308,049,897 | |
| | 2024 | 817,477 | 2,000,975,020 | 741,142 | 1,788,295,447 | |
| | **Total** | **4,292,996** | **10,980,895,635** | **3,925,956** | **9,917,096,952** | |
| Landings (lbs) | 2021 | 1,220,660 | 18,520,461,005 | 1,187,782 | 17,366,796,540 | 1.026 |
| | 2022 | 1,250,784 | 14,577,483,130 | 1,239,198 | 14,285,537,839 | |
| | 2023 | 236,854 | 1,495,612,385 | 215,387 | 1,407,948,900 | |
| | 2024 | 145,123 | 805,502,023 | 138,593 | 768,449,772 | |
| | **Total** | **2,853,421** | **35,399,058,542** | **2,780,961** | **33,828,733,052** | |
| Landings (no. fish) | 2021 | 124,568 | 393,752,197 | 121,137 | 367,094,097 | 1.027 |
| | 2022 | 125,868 | 316,116,373 | 125,034 | 316,452,896 | |
| | 2023 | 26,253 | 41,671,852 | 23,580 | 38,320,225 | |
| | 2024 | 14,236 | 17,581,175 | 13,566 | 16,593,857 | |
| | **Total** | **290,924** | **769,121,597** | **283,317** | **738,461,074** | |
| Releases (no. fish) | 2021 | 900,352 | 7,976,478,641 | 874,442 | 7,486,998,476 | 1.038 |
| | 2022 | 619,579 | 4,816,553,564 | 612,471 | 4,905,418,320 | |
| | 2023 | 667,574 | 8,117,721,526 | 624,953 | 7,909,519,970 | |
| | 2024 | 555,998 | 4,536,854,077 | 531,449 | 4,083,005,659 | |
| | **Total** | **2,743,502** | **25,447,607,808** | **2,643,316** | **24,384,942,425** | |

Table 2. Historic SRFS Gulf estimates and estimates converted to SRFS Gulf with the Gulf Keys (Monroe County & the Keys north of the island chain/U.S. 1; Gulfk) currency for Gag (*Mycteroperca microlepis*) in Florida. Estimates for effort (number of trips) are for the whole suite of reef associated species covered by the original GRFS survey, including Gag.

| Year | SRFS Gulf | | SRFS Gulf - SRFS Gulfk Calibration | | SRFS Gulf | | SRFS Gulf - SRFS Gulfk Calibration | |
|---|---|---|---|---|---|---|---|---|
| | Landings (no. fish) | PSE | Landings (no. fish) | PSE | Landings (pounds) | PSE | Landings (pounds) | PSE |
| 2016 | 70,912 | 17.1 | 72,816 | 21.8 | 669,444 | 11.3 | 686,887 | 14.7 |
| 2017 | 91,993 | 16.3 | 94,463 | 21.2 | 788,563 | 10.6 | 809,110 | 14.1 |
| 2018 | 99,568 | 12.1 | 102,241 | 18.2 | 903,777 | 8.3 | 927,326 | 12.5 |
| 2019 | 77,534 | 16.0 | 79,616 | 20.9 | 732,580 | 11.9 | 751,668 | 15.1 |
| 2020 | 134,134 | 16.8 | 137,735 | 21.6 | 1,251,385 | 10.7 | 1,283,991 | 14.2 |

| Year | SRFS Gulf | | SRFS Gulf - SRFS Gulfk Calibration | | SRFS Gulf | | SRFS Gulf - SRFS Gulfk Calibration | |
|---|---|---|---|---|---|---|---|---|
| | Releases (no. fish) | PSE | Releases (no. fish) | PSE | Effort (no. trips) | PSE | Effort (no. trips) | PSE |
| 2016 | 596,099 | 9.9 | 618,692 | 12.9 | 1,173,293 | 5.1 | 1,282,985 | 6.2 |
| 2017 | 1,020,478 | 9.4 | 1,059,155 | 12.6 | 1,328,974 | 4.6 | 1,453,221 | 5.8 |
| 2018 | 749,927 | 11.8 | 778,351 | 14.4 | 1,116,802 | 4.4 | 1,221,213 | 5.7 |
| 2019 | 662,934 | 11.7 | 688,060 | 14.3 | 1,027,168 | 4.8 | 1,123,199 | 6.0 |
| 2020 | 982,013 | 10.6 | 1,019,233 | 13.4 | 1,223,317 | 3.5 | 1,337,686 | 5.0 |

Table 3. Annual and summed SRFS Gulf with the Keys (Monroe County; Gulfk) and MRIP-FCAL estimates (sum) and variances (var) and ratios of MRIP to SRFS estimates are shown for Gag (*Mycteroperca microlepis*) in Florida. Estimates for effort (number of trips) are for the whole suite of reef associated species covered by the original GRFS survey, including Gag.

| Estimate Type | Year | SRFS Sum | SRFS Variance | MRIP Sum | MRIP Variance | Ratio |
|---|---|---|---|---|---|---|
| Adjusted Effort (no. trips) | 2016 | 1,282,985 | 6,247,744,456 | 2,719,820 | 34,229,122,315 | 0.448 |
| | 2017 | 1,453,221 | 7,181,423,685 | 3,166,300 | 92,867,915,871 | |
| | 2018 | 1,221,213 | 4,761,244,760 | 2,991,914 | 137,866,363,632 | |
| | 2019 | 1,123,199 | 4,469,006,203 | 2,533,501 | 66,439,094,273 | |
| | 2020 | 1,337,686 | 4,437,744,736 | 2,693,137 | 45,203,695,136 | |
| | 2021 | 1,495,099 | 4,036,979,055 | 2,150,342 | 31,072,503,286 | |
| | 2022 | 1,058,123 | 2,386,680,608 | 2,449,734 | 45,952,245,492 | |
| | 2023 | 922,297 | 2,556,260,952 | 2,637,123 | 30,680,824,152 | |
| | 2024 | 817,477 | 2,000,975,020 | 2,574,042 | 55,747,978,805 | |
| | **Total** | **10,711,300** | **38,078,059,474** | **23,915,914** | **540,059,742,962** | |
| Landings (lb) | 2016 | 686,887 | 10,168,244,547 | 1,795,791 | 328,318,658,928 | 0.416 |
| | 2017 | 809,110 | 13,041,704,575 | 2,210,614 | 335,712,670,057 | |
| | 2018 | 927,326 | 13,364,869,321 | 2,355,503 | 467,047,444,701 | |
| | 2019 | 751,668 | 12,871,605,378 | 1,934,482 | 384,814,753,982 | |
| | 2020 | 1,283,991 | 33,359,020,393 | 2,644,370 | 594,729,946,931 | |
| | 2021 | 1,220,660 | 18,520,461,005 | 2,300,639 | 283,177,663,495 | |
| | 2022 | 1,250,784 | 14,577,483,130 | 2,603,881 | 827,672,215,831 | |
| | 2023 | 236,854 | 1,495,612,385 | 757,064 | 113,328,922,109 | |
| | 2024 | 145,123 | 805,502,023 | 956,183 | 196,005,844,506 | |
| | **Total** | **7,312,402** | **118,204,502,75** | **17,558,527** | **3,530,808,120,54** | |
| Landings (no. fish) | 2016 | 72,816 | 251,773,844 | 194,102 | 3,801,045,785 | 0.399 |
| | 2017 | 94,463 | 400,019,484 | 253,921 | 4,346,597,004 | |
| | 2018 | 102,241 | 345,211,714 | 280,049 | 6,555,639,459 | |
| | 2019 | 79,616 | 277,418,353 | 219,981 | 4,932,572,310 | |
| | 2020 | 137,735 | 882,602,888 | 301,443 | 7,631,476,287 | |
| | 2021 | 124,568 | 393,752,197 | 235,255 | 2,888,215,590 | |
| | 2022 | 125,868 | 316,116,373 | 288,219 | 10,031,161,696 | |
| | 2023 | 26,253 | 41,671,852 | 80,171 | 1,238,372,166 | |
| | 2024 | 14,236 | 17,581,175 | 97,699 | 2,018,750,661 | |
| | **Total** | **777,796** | **2,926,147,878** | **1,950,840** | **43,443,830,960** | |

| Estimate Type | Year | SRFS Sum | SRFS Variance | MRIP Sum | MRIP Variance | Ratio |
|---|---|---|---|---|---|---|
| Releases (no. fish) | 2016 | 618,692 | 6,402,939,407 | 1,635,511 | 141,397,311,712 | 0.410 |
| | 2017 | 1,059,155 | 17,669,290,741 | 2,951,475 | 314,307,990,580 | |
| | 2018 | 778,351 | 12,560,142,225 | 1,934,651 | 149,588,835,124 | |
| | 2019 | 688,060 | 9,737,499,586 | 1,685,994 | 102,542,852,031 | |
| | 2020 | 1,019,233 | 18,709,042,448 | 2,178,833 | 189,848,220,189 | |
| | 2021 | 900,352 | 7,976,478,641 | 1,511,395 | 65,844,966,001 | |
| | 2022 | 619,579 | 4,816,553,564 | 1,284,965 | 47,604,038,707 | |
| | 2023 | 667,574 | 8,117,721,526 | 2,047,055 | 167,590,084,965 | |
| | 2024 | 555,998 | 4,536,854,077 | 1,610,716 | 103,772,496,660 | |
| | **Total** | **6,906,993** | **90,526,522,215** | **16,840,595** | **1,282,496,795,96** | |

Table 4. Original MRIP-FCAL and calibrated (MRIP to SRFS) estimates for Gag (*Mycteroperca microlepis*) landings in Florida. The 1983 MRIP-FCAL estimate is for the whole Gulf rather than just the state of Florida. This is due to a smoothing procedure applied to this year's estimate by the NOAA Southeast Fisheries Science Center.

| Year | MRIP-FCAL Gulf | | SRFS-FCAL Calibration | | MRIP-FCAL Gulf | | SRFS-FCAL Calibration | |
|---|---|---|---|---|---|---|---|---|
| | Landings (no. fish) | PSE | Landings (no. fish) | PSE | Landings (pounds) | PSE | Landings (pounds) | PSE |
| 1981 | 608,806 | 39.9 | 242,730 | 41.9 | 1,936,891 | 44.8 | 806,635 | 46.3 |
| 1982 | 1,900,492 | 24.6 | 757,722 | 27.7 | 11,268,359 | 31.4 | 4,692,807 | 33.5 |
| 1983 | 839,106 | 18.9 | 334,550 | 22.8 | 3,857,173 | 25.2 | 1,606,353 | 27.8 |
| 1984 | 516,540 | 25.8 | 205,944 | 28.8 | 1,884,069 | 33.1 | 784,637 | 35.1 |
| 1985 | 823,884 | 7.0 | 328,481 | 14.6 | 5,326,920 | 17.8 | 2,218,442 | 21.3 |
| 1986 | 762,790 | 3.0 | 304,123 | 13.1 | 2,988,036 | 16.6 | 1,244,394 | 20.3 |
| 1987 | 872,083 | 17.9 | 347,698 | 21.9 | 5,022,105 | 19.6 | 2,091,500 | 22.8 |
| 1988 | 899,614 | 15.3 | 358,674 | 19.9 | 4,441,134 | 18.0 | 1,849,549 | 21.4 |
| 1989 | 727,597 | 5.3 | 290,091 | 13.8 | 4,865,318 | 13.3 | 2,026,204 | 17.7 |
| 1990 | 533,966 | 37.9 | 212,891 | 40.0 | 4,890,951 | 38.6 | 2,036,879 | 40.3 |
| 1991 | 548,806 | 23.9 | 218,808 | 27.1 | 4,193,068 | 24.6 | 1,746,240 | 27.2 |
| 1992 | 441,076 | 18.0 | 175,856 | 22.1 | 3,135,570 | 18.4 | 1,305,835 | 21.8 |
| 1993 | 648,953 | 24.0 | 258,736 | 27.2 | 4,517,183 | 24.2 | 1,881,220 | 26.9 |
| 1994 | 419,408 | 21.9 | 167,217 | 25.4 | 2,995,680 | 22.2 | 1,247,577 | 25.1 |
| 1995 | 854,066 | 25.0 | 340,514 | 28.1 | 6,081,399 | 25.2 | 2,532,652 | 27.8 |
| 1996 | 414,182 | 16.0 | 165,133 | 20.5 | 2,444,959 | 16.4 | 1,018,225 | 20.2 |
| 1997 | 788,173 | 20.0 | 314,243 | 23.7 | 4,907,480 | 20.2 | 2,043,763 | 23.3 |
| 1998 | 878,222 | 15.0 | 350,146 | 19.7 | 6,115,920 | 15.2 | 2,547,028 | 19.2 |
| 1999 | 1,098,285 | 11.0 | 437,884 | 16.8 | 7,286,147 | 11.2 | 3,034,380 | 16.2 |
| 2000 | 1,269,959 | 13.0 | 506,330 | 18.2 | 8,731,059 | 13.2 | 3,636,126 | 17.6 |
| 2001 | 998,009 | 13.6 | 397,904 | 18.7 | 8,355,836 | 13.9 | 3,479,861 | 18.1 |
| 2002 | 1,129,326 | 17.0 | 450,260 | 21.3 | 8,545,951 | 17.2 | 3,559,036 | 20.8 |

| Year | MRIP-FCAL Gulf | | SRFS-FCAL Calibration | | MRIP-FCAL Gulf | | SRFS-FCAL Calibration | |
|---|---|---|---|---|---|---|---|---|
| | Landings (no. fish) | PSE | Landings (no. fish) | PSE | Landings (pounds) | PSE | Landings (pounds) | PSE |
| 2003 | 862,380 | 12.0 | 343,829 | 17.5 | 5,848,044 | 12.2 | 2,435,469 | 16.9 |
| 2004 | 1,387,826 | 15.0 | 553,324 | 19.7 | 10,063,775 | 15.1 | 4,191,147 | 19.1 |
| 2005 | 1,058,617 | 19.0 | 422,069 | 22.9 | 7,505,440 | 19.2 | 3,125,706 | 22.5 |
| 2006 | 645,033 | 23.8 | 257,174 | 27.0 | 4,402,803 | 24.0 | 1,833,586 | 26.7 |
| 2007 | 507,962 | 15.0 | 202,523 | 19.7 | 4,233,794 | 15.5 | 1,763,200 | 19.4 |
| 2008 | 846,291 | 16.0 | 337,414 | 20.4 | 6,129,701 | 16.2 | 2,552,768 | 20.0 |
| 2009 | 382,960 | 15.9 | 152,685 | 20.4 | 2,681,634 | 16.2 | 1,116,790 | 20.0 |
| 2010 | 517,407 | 17.0 | 206,289 | 21.2 | 3,509,072 | 17.1 | 1,461,384 | 20.7 |
| 2011 | 300,773 | 24.0 | 119,918 | 27.2 | 1,995,080 | 24.3 | 830,868 | 26.9 |
| 2012 | 233,610 | 24.0 | 93,140 | 27.1 | 1,602,860 | 24.2 | 667,525 | 26.9 |
| 2013 | 441,048 | 24.3 | 175,845 | 27.4 | 3,229,072 | 24.5 | 1,344,775 | 27.2 |
| 2014 | 312,111 | 22.9 | 124,438 | 26.2 | 2,668,581 | 23.1 | 1,111,354 | 25.9 |
| 2015 | 263,761 | 32.0 | 105,161 | 34.4 | 2,284,940 | 32.3 | 951,583 | 34.4 |

Table 5. Original MRIP and calibrated (MRIP to SRFS) estimates for Gag (*Mycteroperca microlepis*) releases and reef fish effort in Florida. Effort estimates (angler trips) are for the whole suite of reef associated species covered by the GRFS survey, including Gag.

| Year | MRIP-FCAL | | SRFS-FCAL Calibration | | MRIP-FCAL | | SRFS-FCAL Calibration | |
|---|---|---|---|---|---|---|---|---|
| | Releases (no. fish) | PSE | Releases (no. fish) | PSE | Effort (no. trips) | PSE | Effort (no. trips) | PSE |
| 1981 | 428,251 | 92.0 | 175,643 | 92.3 | 602,950 | 18.6 | 270,045 | 18.9 |
| 1982 | 441,746 | 34.3 | 181,178 | 35.2 | 853,204 | 11.6 | 382,127 | 12.1 |
| 1983 | 818,788 | 53.4 | 335,817 | 54.0 | 1,133,988 | 18.2 | 507,883 | 18.6 |
| 1984 | 162,581 | 56.0 | 66,681 | 56.6 | 809,386 | 17.7 | 362,502 | 18.1 |
| 1985 | 205,632 | 13.8 | 84,338 | 15.9 | 843,684 | 20.6 | 377,864 | 20.9 |
| 1986 | 762,386 | 1.4 | 312,685 | 8.1 | 959,593 | 10.7 | 429,776 | 11.3 |
| 1987 | 648,759 | 14.1 | 266,082 | 16.2 | 1,176,868 | 10.1 | 527,088 | 10.7 |
| 1988 | 453,159 | 15.0 | 185,859 | 17.0 | 1,429,058 | 8.9 | 640,037 | 9.6 |
| 1989 | 916,787 | 15.9 | 376,010 | 17.8 | 2,023,590 | 7.6 | 906,312 | 8.4 |
| 1990 | 845,307 | 34.0 | 346,694 | 34.9 | 1,319,157 | 10.2 | 590,815 | 10.8 |
| 1991 | 2,153,462 | 28.0 | 883,220 | 29.1 | 1,819,994 | 9.1 | 815,127 | 9.8 |
| 1992 | 1,379,078 | 21.0 | 565,614 | 22.5 | 1,598,562 | 6.6 | 715,953 | 7.5 |
| 1993 | 2,787,465 | 21.0 | 1,143,249 | 22.5 | 1,939,765 | 7.9 | 868,769 | 8.7 |
| 1994 | 3,146,622 | 14.0 | 1,290,554 | 16.1 | 1,905,809 | 7.5 | 853,561 | 8.3 |
| 1995 | 3,981,660 | 16.0 | 1,633,036 | 17.9 | 2,028,361 | 7.5 | 908,449 | 8.3 |
| 1996 | 1,917,371 | 12.0 | 786,390 | 14.4 | 1,437,821 | 5.9 | 643,962 | 6.9 |
| 1997 | 3,427,308 | 13.0 | 1,405,674 | 15.3 | 1,972,541 | 6.5 | 883,449 | 7.4 |
| 1998 | 4,700,589 | 13.0 | 1,927,897 | 15.3 | 2,011,356 | 5.6 | 900,833 | 6.7 |
| 1999 | 4,010,739 | 11.0 | 1,644,962 | 13.6 | 2,797,424 | 5.2 | 1,252,891 | 6.3 |
| 2000 | 2,571,932 | 10.0 | 1,054,851 | 12.8 | 2,448,193 | 5.3 | 1,096,480 | 6.4 |
| 2001 | 4,848,993 | 14.1 | 1,988,763 | 16.2 | 3,617,870 | 7.1 | 1,620,347 | 7.9 |
| 2002 | 5,071,382 | 11.8 | 2,079,974 | 14.3 | 3,316,098 | 6.2 | 1,485,192 | 7.2 |
| 2003 | 6,263,309 | 10.7 | 2,568,830 | 13.4 | 3,405,723 | 6.2 | 1,525,333 | 7.2 |
| 2004 | 8,404,949 | 12.0 | 3,447,201 | 14.4 | 4,707,087 | 7.2 | 2,108,179 | 8.0 |
| 2005 | 4,875,672 | 11.0 | 1,999,706 | 13.6 | 3,562,986 | 7.2 | 1,595,766 | 8.0 |
| 2006 | 3,372,243 | 13.0 | 1,383,090 | 15.3 | 2,840,479 | 8.2 | 1,272,175 | 8.9 |

| Year | MRIP-FCAL | | SRFS-FCAL Calibration | | MRIP-FCAL | | SRFS-FCAL Calibration | |
|---|---|---|---|---|---|---|---|---|
| | Releases (no. fish) | PSE | Releases (no. fish) | PSE | Effort (no. trips) | PSE | Effort (no. trips) | PSE |
| 2007 | 4,121,561 | 11.0 | 1,690,415 | 13.6 | 3,294,412 | 7.2 | 1,475,479 | 8.0 |
| 2008 | 8,212,231 | 12.0 | 3,368,160 | 14.4 | 4,173,696 | 5.9 | 1,869,287 | 6.9 |
| 2009 | 5,319,745 | 11.1 | 2,181,838 | 13.7 | 3,527,545 | 5.8 | 1,579,893 | 6.8 |
| 2010 | 4,276,191 | 11.0 | 1,753,835 | 13.6 | 3,317,095 | 6.4 | 1,485,638 | 7.3 |
| 2011 | 3,223,163 | 17.0 | 1,321,946 | 18.8 | 2,858,990 | 6.2 | 1,280,465 | 7.2 |
| 2012 | 2,185,485 | 14.0 | 896,354 | 16.1 | 3,133,015 | 6.3 | 1,403,194 | 7.3 |
| 2013 | 2,121,606 | 15.0 | 870,155 | 17.0 | 3,865,350 | 13.9 | 1,731,187 | 14.4 |
| 2014 | 1,610,482 | 14.0 | 660,522 | 16.1 | 2,912,033 | 5.7 | 1,304,222 | 6.7 |
| 2015 | 961,197 | 14.0 | 394,225 | 16.1 | 2,396,673 | 6.5 | 1,073,406 | 7.4 |

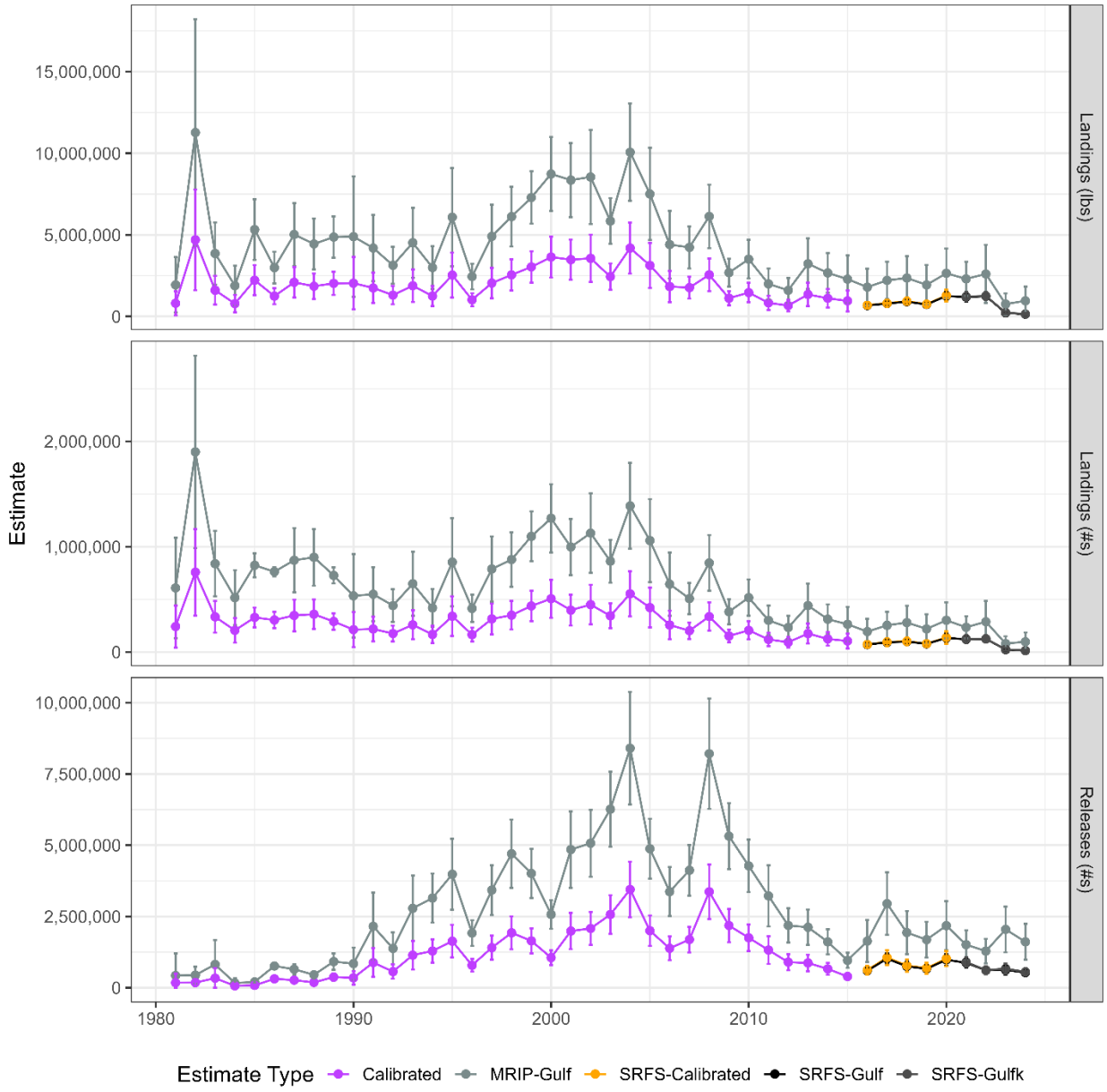


Figure 2. Gulf Gag (*Mycteroperca microlepis*) estimates including: original SRFS estimates excluding the Keys (2016-2024, SRFS-Gulf), original SRFS time-series including the Keys (2021-2024, SRFS-Gulfk), calibrated SRFS time-series accounting for years 2016-2020 before data were collected in the Keys (2016-2020, SRFS-calibrated), original MRIP-FCAL time-series (MRIP-Gulf), and MRIP-FCAL time-series calibrated to SRFS currency (calibrated). Landings in pounds, landings in numbers of fish and releases in numbers of fish are shown. Error bars are 95% confidence limits.

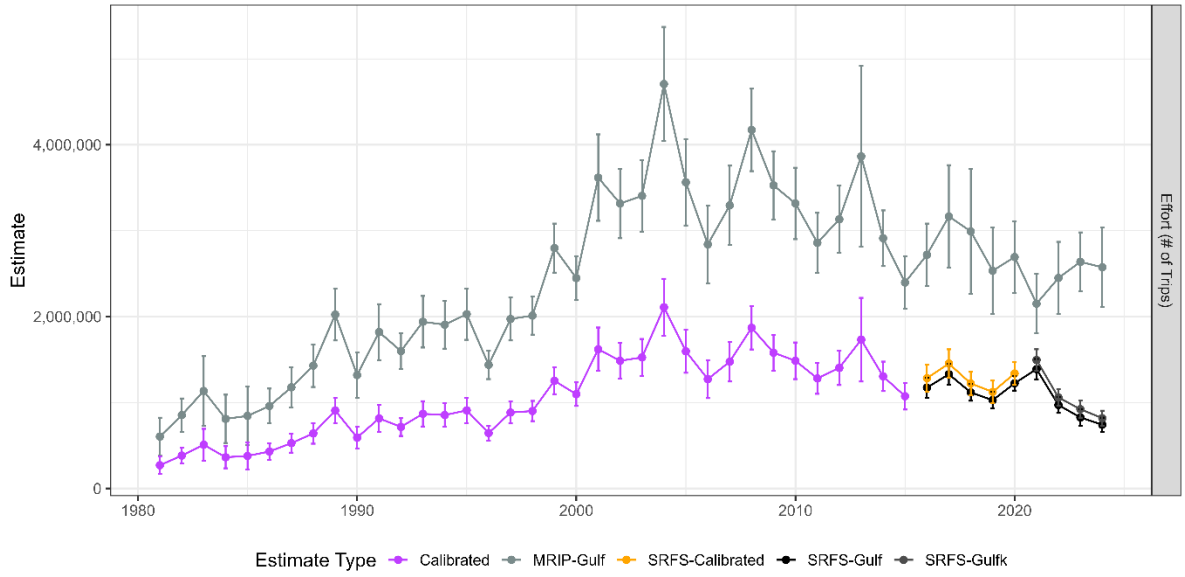


Figure 3. Private boat recreational effort estimates (in angler trips) off the Gulf coast of Florida for the original suite of GRFS species. Effort estimates include original SRFS time-series excluding the Keys (2016-2024, SRFS-Gulf), original SRFS time-series including the Keys (2021-2024, SRFS-Gulfk), calibrated SRFS time-series accounting for years 2016-2020 before data were collected in the Keys (2016-2020, SRFS-calibrated), original MRIP-FCAL time-series (MRIP-Gulf), and MRIP-FCAL time-series calibrated to SRFS currency (calibrated).