

# Interim Analysis for Gulf of America Gag Grouper

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## Keywords

Interim Analysis, Health Check, Index of Abundance, Gag Grouper, Gulf of America

## Abstract

An Interim Analysis (IA) was conducted for Gag Grouper following the Operational SEDAR72 stock assessment (SEDAR 2022). This analysis uses a truncated (2010+) Combined Video Survey index [using data from the SEAMAP reef fish video (SRFV) survey, the NMFS Panama City laboratory (PC) survey and the Florida Fish and Wildlife Research Institute (FWRI) video survey] with terminal year 2024. This index was developed following the same habitat-based approach that has been used for a number of other reef fish species in the Gulf, and is described in detail in Thompson et al. (2022). This is a departure from SEDAR72, which included SEAMAP and PC survey data as separate indices, but is believed to result in a higher quality index for tracking the population through time. The Combined Video Index has remained largely stable in recent years, showing a slight decline in relative abundance since the previous assessment was completed. While IAs typically translate recent trends in relative abundance into adjusted catch advice, this IA is meant as a simple health check given that Gag Grouper is currently in a rebuilding plan and a new assessment is scheduled for this year.

## Introduction

Interim analyses (IA) are designed to occur between regular stock assessments conducted through the Southeast Data Assessment and Review process (SEDAR) to provide the opportunity to get a health check on the stock and, if data allow, adjust harvest recommendations based on current stock conditions. For example, unpredictable events can occur such as a change in recruitment (e.g., pulse or failure), environmental disasters (e.g., red tides or hurricanes) or man-made disasters (e.g., Deepwater Horizon).

Recently, support has grown for an index-based harvest control rule that relies solely on the observed index and uses the ratio between recent and reference time periods to adjust the catch advice. This approach has been simulation tested for Vermilion Snapper (Hunyh et al. 2020) and was first formally accepted by the Gulf Council's Scientific and Statistical Committee during the 2020 IAs for Red Snapper and Gray Triggerfish (SEFSC 2021a, 2021b). In addition to documenting acceptable performance for this index-based approach, Hunyh et al. (2020) showed

that this approach performed well when circumstances arise that are not accounted for in projections, such as episodic natural mortality (e.g., red tide mortality).

The Gulf Gag Grouper stock was last assessed in 2021/2022 (SEDAR 72; Operational assessment with terminal year 2019) and was determined to be overfished and undergoing overfishing (SEDAR 2022). As a result, NOAA Fisheries implemented a Temporary Rule (88 FR 27701) that intended to reduce overfishing of Gag during the 2023 fishing year. These interim measures reduced the total stock ACL from 3,120,000 lb gutted weight (gw) (MRIP-CHTS units) to 661,901 lb gw (MRIP-FES units), and brought modifications to the recreational fishing season. In June 2023, the Gulf Council took final action on Reef Fish Amendment 56: Modification to Catch Limits, Sector Allocation, and Recreational Fishing Seasons for Gulf of Mexico Gag (GMFMC 2023). This Amendment established a rebuilding timeline of 18 years and set corresponding annual catch limits at 75% of the fishing mortality associated with a 40% spawning potential ratio (75% of F40%SPR). The resulting total ACL for 2024 and 2025 was 444,000 lb gw and 615,000 lb gw, respectively (SRFS units). However, 2023 recreational landings exceeded the 2023 recreational ACL. As such, 2024 recreational ACL and ACT were reduced by the amount of the 2023 recreational ACL overage (50 CFR Part 622). For the 2024 fishing year, the resulting adjusted recreational ACL was 163,376 lb and the adjusted recreational ACT was 105,376 lb. In 2024, recreational landings (252,367 pounds gw) again exceeded the 2024 recreational ACT and ACL (88,991 lb overage) and resulted in the 2025 recreational ACL and ACT being reduced to 310,009 lb gw and 230,009 lb gw, respectively (50 CFR Part 622). Recent trends in catches compared with the quotas are depicted in **Figure 1**. The commercial fishery exceeded its quota in 2023 but stayed below the ACL that year, and harvested about 90%-95% of its quota in 2024 and 2025. The recreational fishery exceeded its quota in 2023 and 2024, data are not yet complete for 2025.

The first IA for Gag Grouper occurred in 2023 (SEFSC 2023), a health check was conducted then, using the PC and SEAMAP survey indices updated to 2021 (**Table 1**). Given that the stock is in a rebuilding plan and a new assessment is currently underway, the current analysis serves as a simple health check for the status of the stock.

## Materials and Methods

### Index Data Source

Historically, three different stationary video surveys were conducted in the northern Gulf of America (Gulf) to derive abundance estimates of important reef fish stocks. The longest running survey was the SEAMAP reef fish video (SRFV) survey initiated by the NMFS Mississippi Laboratory in 1992, followed in 2005 by the NMFS Panama City laboratory (PC) survey, and finally the Florida Fish and Wildlife Research Institute (FWRI) video survey, which started in 2010. From 2020 onward, video survey efforts were unified under the Gulf Fishery Independent Survey of Habitat and Ecosystem Resources (G-FISHER). An index combining all three surveys was presented for review during SEDAR 72 (Thompson et al. 2021) but was not ultimately used in the base run, which instead included the SRFV and PC survey data as separate indices (Campbell et al. 2020, Gardner et al. 2020) as had been done in past assessments. Although the methodology for combining the three surveys into a single index (Thompson et al 2022) had successfully been used for other reef stocks (e.g. GOM Vermillion Snapper, GOM Greater Amberjack), there were two major concerns in its application to gag grouper. The first was that

the proportion present varied substantially between surveys (SRFV 7.3%, PC 20.8%, FWRI 3.2%). The second was that selectivity varied substantially across surveys due to the ontogenetic migration patterns of Gag Grouper. As such, the selectivity of the Combined Index varied through time as different surveys came online (1993-2005, 2006-2009, 2010+). For this interim analysis, an alternative Combined Index has been put forth, which truncates the index in 2010 in an attempt to eliminate the issue of shifting selectivity through time and select a timeframe where the proportion present is more similar among surveys (SRFV 6%, PC 16%, FWRI 5%).

## Index of Abundance

A standardized index of abundance was developed from the Combined Video Survey data using the CART-based habitat area weighted index methods described in Thompson et al. (2022). Data were limited to stations completed in the eastern GOM from 2010 to 2024. Relative abundance indices were generated using a stepwise approach. First, a standardized habitat variable was created by conducting a classification and regression tree (CART) analysis for each lab to determine which lab-specific explanatory variables were important determinants of presence/absence. Terminal nodes were then assigned a habitat class of High (more than twice the nominal frequency of occurrence), Low (less than half the nominal frequency of occurrence), or Medium (all values that fall between High and Low). All individual observations were then assigned values of the newly defined habitat variable. Second, annual estimates of relative abundance and standard error were produced for each combination of survey and habitat classes. Finally, abundance and variance estimates were then calculated following a post-stratified design-based approach whereby estimates of each stratum mean and variance were weighted by the proportion of survey area that contained reef and the overall proportion of each habitat class sampled by a given survey. This same habitat-area weighting scheme was also applied to the annual length compositions.

## Interim Approach

Interim approaches conducted for past SEDAR assessments (e.g. red grouper) typically seek to quantify a target ABC adjustment through the use of a harvest control rule that utilizes recent trends in observed indices of abundance following the general methodology proposed by Huynh et al. (2020). The harvest control rule takes the following forms depending on the number of years used in the moving average:

$$3\text{-year moving average: } C_{y+1} = C_{ref} * \left( \frac{1}{3} \sum_{k=y-2}^y I_k \right) / \left( \frac{1}{3} \sum_{ref=yref-1}^{yref+1} I_{ref} \right) \text{ (Equation 1)}$$

$$5\text{-year moving average: } C_{y+1} = C_{ref} * \left( \frac{1}{5} \sum_{k=y-4}^y I_k \right) / \left( \frac{1}{5} \sum_{ref=yref-3}^{yref+1} I_{ref} \right) \text{ (Equation 2)}$$

where:

$C_{y+1}$  = adjusted catch recommendation for year  $y+1$ .

$C_{ref}$  = reference catch level to be adjusted ( $Y_{ref}$  = 2020, assumed to be the year that catch advice would be implemented).

$I_k$  = average of the observed index values during the recent period (3-year 2022-2024 or 5-year 2020-2024).

$I_{ref}$  = average of the observed index values during the reference period (3-year 2019-2021 or 5-year 2017-2021).

This approach could not be applied to Gulf Gag Grouper because the stock is currently undergoing a rebuilding plan. As such, changes in the index cannot be related to changes in the catch advice in the same way that could be done with a healthy stock for which a constant catch has been implemented. Instead, recent trends in the index of abundance were used as a simple health check on the current condition of the stock. Index trends since the terminal year of the assessment (2019) are described in more detail below.

## Results

### Index of Abundance

**Figure 2A** provides a comparison of the Combined Video Survey index used for this IA with the two indices (SRFV and PC) that were used in SEDAR 71. The overall trend of the Combined Video Index is similar to the separate SRFV and PC indices between 2010 and 2019 with the PC index showing a slightly flatter trend between 2012 and 2016 and a larger uptick from 2016 to 2019 compared to the other two indices. In the year following the terminal year of the assessment, the Combined Index decreased to its lowest value in the time series but increased back up in 2021 and has remained mostly flat since then.

The weighted length compositions associated with the Combined Video Index are shown in **Figure 2B**.

### Interim Analysis

Calculations on the percent change in the index since the last assessment were made using two separate moving average periods of 3- or 5- years. Recent index values were slightly below the reference index values for both the 3-year (**Figure 3**) and 5-year scenarios (**Figure 4**), with index ratios of 0.86 and 0.87, respectively (**Table 2**).

## Discussion

The Combined Video Index has remained largely stable in recent years, showing a slight decline in relative abundance since the previous assessment was completed. Given that the stock is currently in a rebuilding plan and that the recreational fishery has experienced overages in recent years, it is difficult to determine, from this exercise alone, whether or not the stock is on track for rebuilding. It is therefore not prudent to provide catch limit adjustments without more work to evaluate the trends observed. A new assessment is currently underway for Gulf Gag (SEDAR 105) and will provide a more accurate and complete depiction of stock status and rebuilding trends.

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## Tables

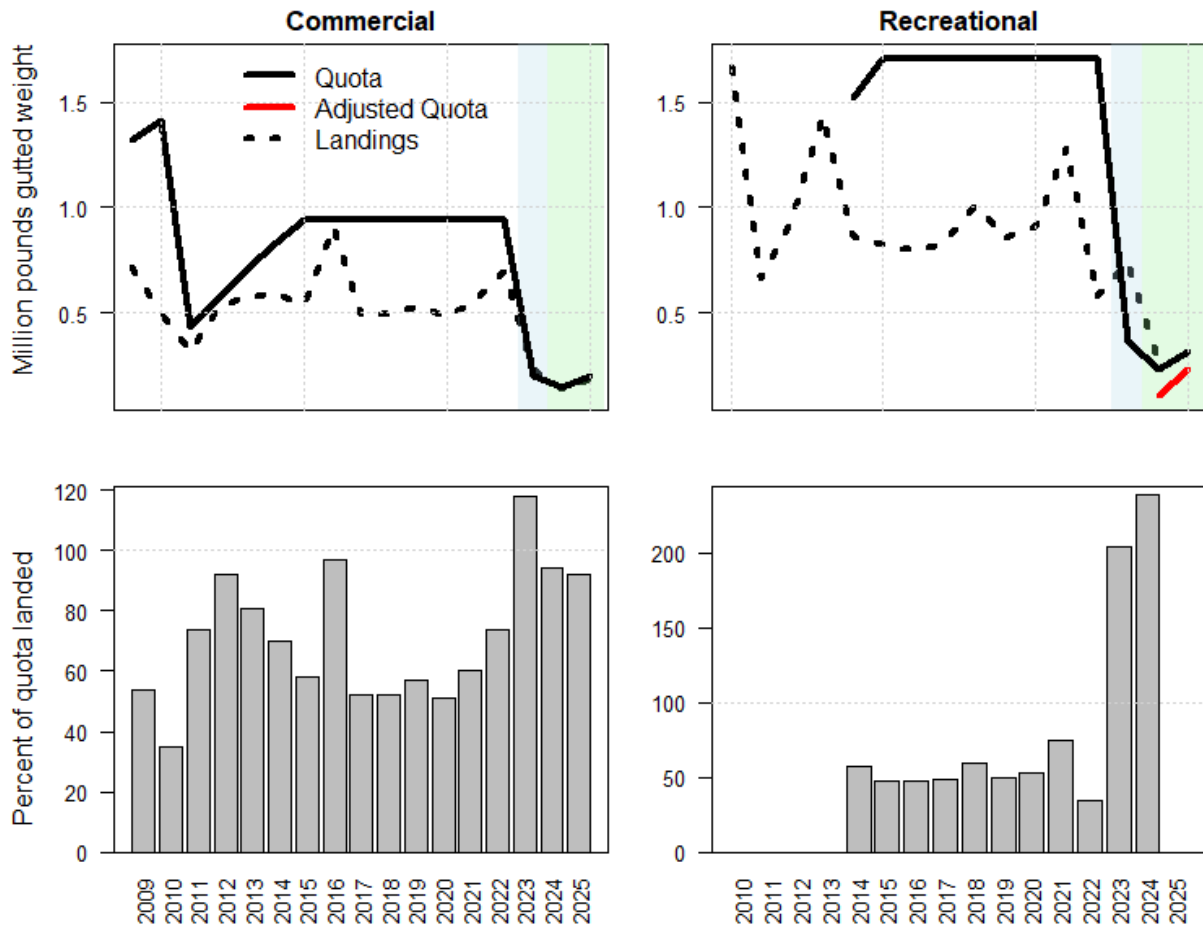
**Table 1.** History of interim analyses (IA) conducted and outcomes for Gulf of America Gag Grouper.

Year	Outcome
2023-Sep	IA used as a health check by SSC
2026-Jan	IA undergoing review by SSC

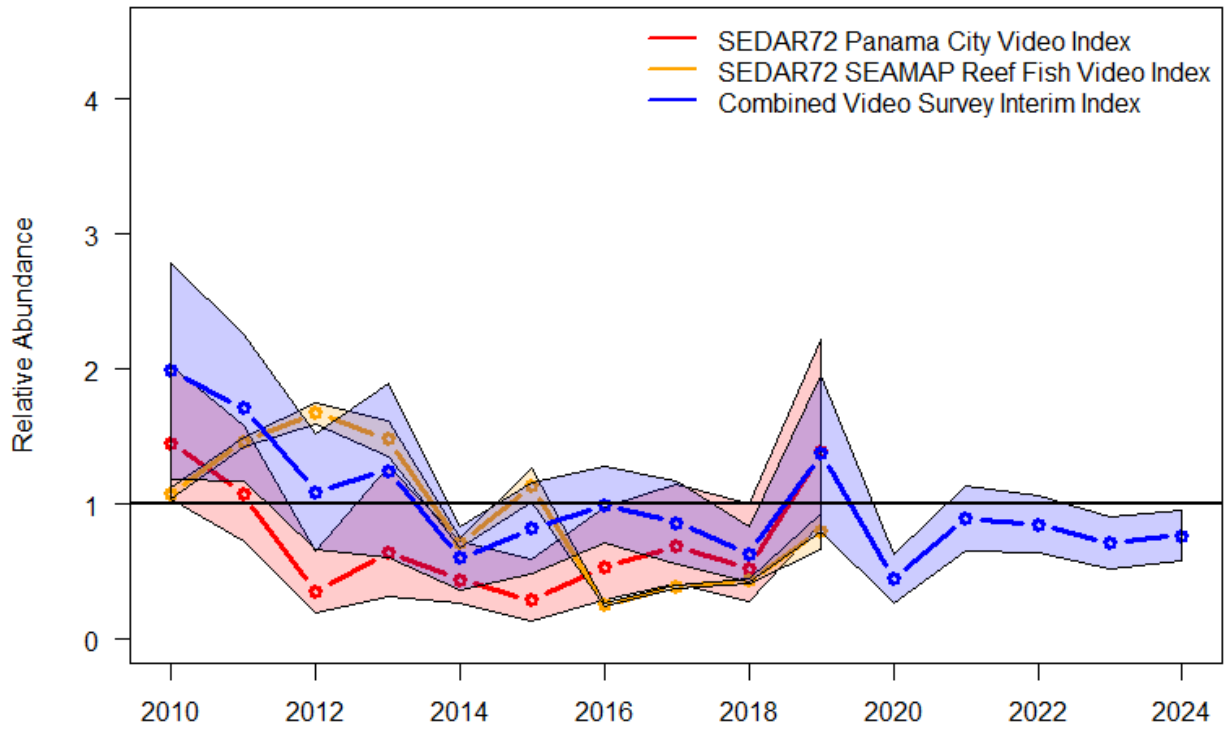
**Table 2.** Index reference ( $I_{ref}$ ), index recent ( $I_k$ ), and index ratios ( $I_{ratio}$ ) for the 2024 Combined Video Survey index averaged over 3- and 5-year time periods. The reference value  $I_{ref}$  was the average of index values from 2019-2021 or 2017-2021. The recent index value,  $I_k$ , was the average of index values for 2022-2024 or 2020-2024.

Value	3-year moving average	5-year moving average
$I_{ref}$	0.91	0.84
$I_k$	0.78	0.73
$I_{ratio}$	0.86	0.87

## Figures



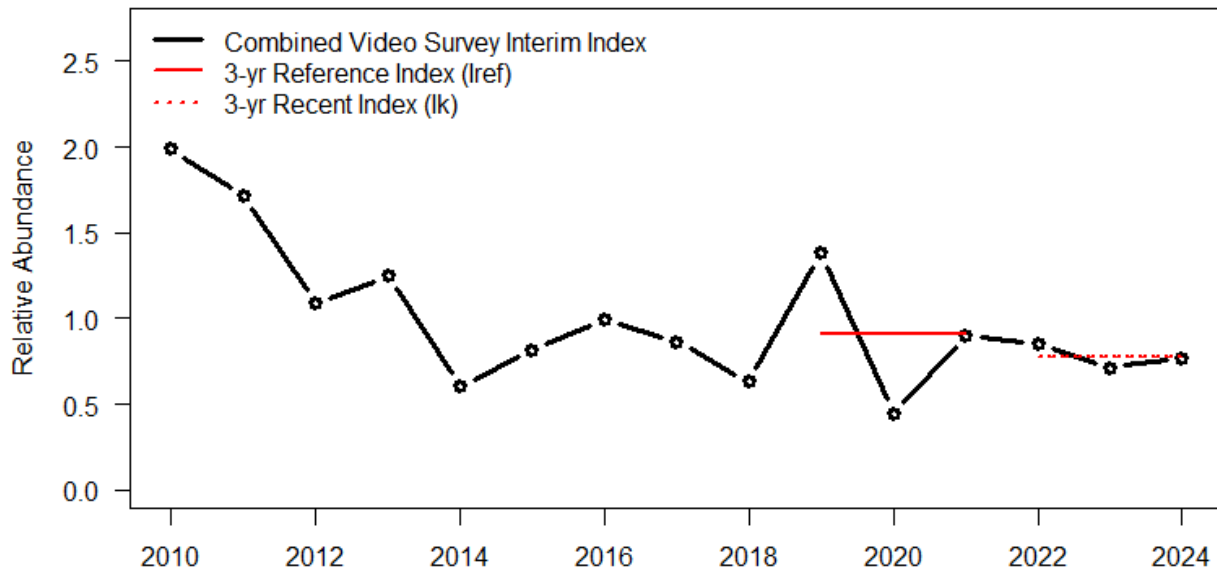
**Figure 1.** Commercial and recreational landings (dashed line) and quotas/ACT (thick black line) for Gulf of America Gag Grouper. Recreational ACTs were adjusted downward in 2023 and 2024 due to overages, adjusted values are shown in red. Bars represent the percent of quota landed. Note that y-axes differ between panels. Commercial data from 2009 to 2025 were obtained from the Quotas and Catch Allowances, accessed January 12, 2026 (<https://secatchshares.fisheries.noaa.gov/additionalInformation> [select Commercial Quotas/Catch Allowances (all years)]), remaining years were obtained from the Gulf of America Historical Commercial Landings and Annual Catch Limits (ACLs), updated January 20, 2023 (<https://www.fisheries.noaa.gov/southeast/gulf-mexico-historical-commercial-landings-and-annual-catch-limit-monitoring>). Recreational data from 2010 through 2023 were obtained from recreational historical landings, updated August 06, 2025 (<https://www.fisheries.noaa.gov/southeast/recreational-fishing-data/gulf-mexico-historical-recreational-landings-and-annual-catch>), data from 2024 were obtained January 12, 2026 from <https://www.fisheries.noaa.gov/southeast/recreational-fishing/2024-and-2025-gulf-america-recreational-landings-and-annual-catch> (last updated on December 15, 2025). Recreational data for 2025 are incomplete and therefore not reported. Note that values from 2009-2022 are in MRIP-CHTS units, values from 2023 (blue shading) are in MRIP-FES units and values from 2024 and 2025 (green shading) are in SRFS units.



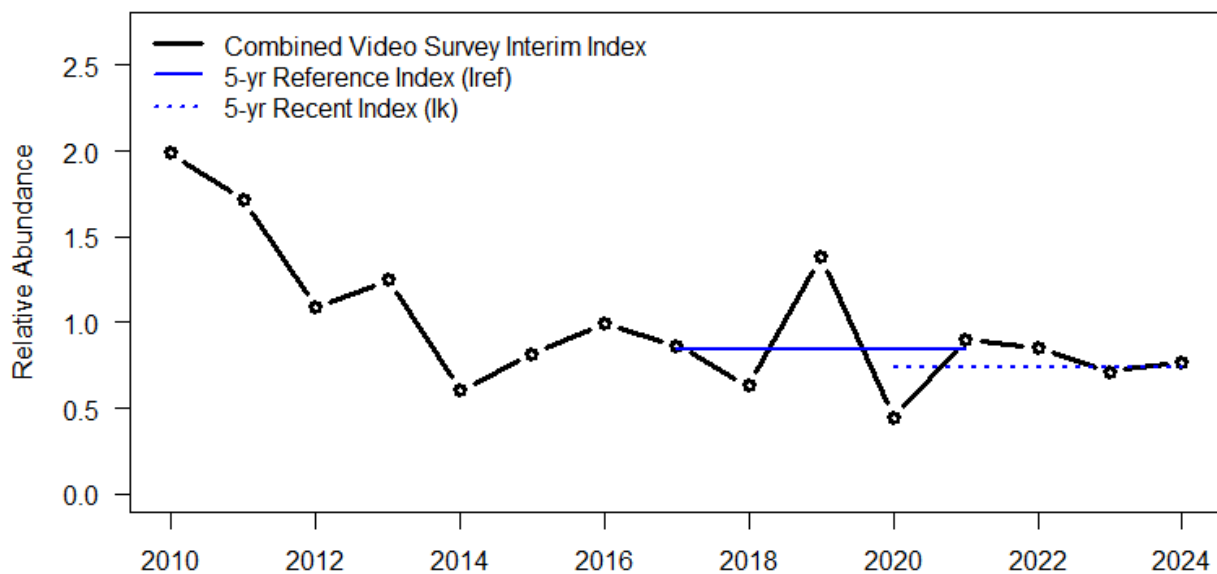
**Figure 2A.** Comparison of the Panama City Laboratory Video Survey and SEAMAP Reef Fish Video Survey indices of abundance derived for Gag Grouper in the Gulf of America for SEDAR72 compared to the Combined Video Survey index provided through 2024 with 95% confidence intervals. All indices have been standardized to a mean of 1.



**Figure 2B.** Annual length compositions for the Combined Video Survey index, weighted by habitat class proportion and area. Sample sizes are shown in each panels, with the first number representing the number of sites where measurements were taken and the second number in parentheses representing the total number of individuals measured.



**Figure 3.** Comparison of the index of abundance derived for Gag Grouper in the Gulf of America through 2024 with the reference index value (solid line) and recent index value (dashed line) using a 3-year moving average for the recent period.



**Figure 4.** Comparison of the index of abundance derived for Gag Grouper in the Gulf of America through 2024 with the reference index value (solid line) and recent index value (dashed line) using a 5-year moving average for the recent period.