# Modifications to Catch Limits, Sector Allocation, and Recreational Fishing Seasons for Gulf of Mexico Gag

## Public Hearing Draft for Amendment 56 to the Fishery Management Plan for Reef Fish Resources in the Gulf of Mexico

## April 2023

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# ENVIRONMENTAL ASSESSMENT COVER SHEET

Amendment 56 to the Fishery Management Plan for Reef Fish Resources of the Gulf of Mexico: Modifications to Catch Limits, Sector Allocation, and Fishing Seasons for Gulf of Mexico Gag

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**Type of Action**

| | |
|---|---|
| ( ) Administrative | ( ) Legislative |
| (X) Draft | ( ) Final |

This Environmental Assessment is being prepared using the 2020 CEQ NEPA Regulations as modified by the Phase I 2022 revisions. The effective date of the 2022 revisions was May 20, 2022, and reviews begun after this date are required to apply the 2020 regulations as modified by the Phase I revisions unless there is a clear and fundamental conflict with an applicable statute. This Environmental Assessment began on May 28, 2022, and accordingly proceeds under the 2020 regulations as modified by the Phase I revisions.

# ABBREVIATIONS USED IN THIS DOCUMENT

| | |
|---|---|
| ABC | acceptable biological catch |
| ACL | annual catch limit |
| ACT | annual catch target |
| AM | accountability measure |
| AP | Advisory Panel |
| APAIS | Access Point Angler Intercept Survey |
| BiOp | biological opinion |
| CFR | code of federal regulations |
| CHTS | coastal household telephone survey |
| Council | Gulf of Mexico Fishery Management Council |
| CS | consumer surplus |
| DLMToolkit | Data Limited Methods Toolkit |
| DPS | distinct population segment |
| EEZ | exclusive economic zone |
| EFH | essential fish habitat |
| EFP | exempted fishing permit |
| EIS | environmental impact statement |
| EJ | environmental justice |
| E.O. | executive order |
| ESA | Endangered Species Act |
| FES | fishing effort survey |
| FHS | for-hire survey |
| FMP | Fishery Management Plan |
| $F_{MSY}$ | maximum sustainable yield |
| FWC | Florida Fish and Wildlife Conservation Commission |
| Gulf | Gulf of Mexico |
| HAPC | habitat area of particular concern |
| IFQ | individual fishing quota |
| IPCC | Intergovernmental Panel on Climate Change |
| LAPP | Limited Access Privilege Program |
| Magnuson-Stevens Act | Magnuson-Stevens Fishery Conservation and Management Act |
| MFMT | maximum fishing mortality threshold |
| MMPA | Marine Mammal Protection Act |
| mp | million pounds |
| MPA | marine protected area |
| MRIP | Marine Recreational Information Program |
| MRFSS | Marine Recreational Fisheries Statistics Survey |
| MSST | minimum stock size threshold |
| NMFS | National Marine Fisheries Service |
| NOAA | National Oceanic and Atmospheric Administration |
| OFL | overfishing limit |
| OST | Office of Science and Technology |
| PAH | polycyclic aromatic hydrocarbons |
| Reef Fish FMP | Fishery Management Plan for Reef Fish Resources in the |

| | |
|---|---|
| | Gulf of Mexico |
| RFA | Regulatory Flexibility Act |
| RFFA | reasonably foreseeable future actions |
| RIR | regulatory impact review |
| Secretary | Secretary of Commerce |
| SEDAR | Southeast Data and Review |
| SEFSC | Southeast Fisheries Science Center |
| SERO | Southeast Regional Office |
| SPR | spawning potential ratio |
| SSB | spawning stock biomass |
| SSC | Scientific and Statistical Committee |
| TL | total length |
| VOC | volatile organic compounds |
| ww | whole weight |

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# CHAPTER 1. INTRODUCTION

## 1.1 Background

Gulf of Mexico (Gulf) gag, a type of grouper, is managed under the Fishery Management Plan (FMP) for Reef Fish Resources of the Gulf of Mexico (Reef Fish FMP). This amendment is intended to end overfishing of the Gulf gag stock, and follows an interim action to reduce overfishing of Gulf gag, which was developed by the National Marine Fishery Service (NMFS) with, and as recommended by, the Gulf of Mexico Fishery Management Council (Council). This amendment is being developed because the most recent update to the Southeast Data, Assessment, and Review (SEDAR) 72 (2022) stock assessment alternative model run estimated that gag is overfished and is undergoing overfishing as of 2019. Under the Reef Fish FMP, of which gag is part of the fishery management unit, the gag stock is managed under a stock annual catch limit (ACL), which is further divided between the commercial and recreational sectors. The commercial ACL is currently set at 39% of the stock ACL, and the recreational ACL is set at 61% of the stock ACL. The current sector allocation was set in Amendment 30B to the Reef Fish FMP, and was based on the average landings from 1986 – 2005 (GMFMC 2008a). Amendment 30B set an interim sector allocation that would be in effect until such time the Council, through the recommendations of the (now former) Ad Hoc Allocation Committee, could implement a separate amendment to allocate grouper resources between recreational and commercial sectors. This interim sector allocation was based on all available years during which grouper were identified by species, and used the longest and most robust time series to reduce the influences of short-term shifts in landings resulting from changes in recruitment or regulations. Because the Council ultimately did not initiate another amendment to the Reef Fish FMP to revisit grouper allocations, the 39:61 gag sector allocation remains in effect.

**Commercial Sector**

Commercial harvest of gag has been managed under an individual fishing quota (IFQ) program since 2010 (GMFMC 2009). Anyone commercially fishing for gag must possess a federal commercial reef fish permit and gag allocation under the IFQ program. IFQ allocation is determined at the beginning of each calendar year by multiplying a shareholder's IFQ gag share (represented as a fraction of the total commercial quota) times the commercial quota for gag. The commercial quota is set at 86% of the commercial annual catch target (ACT; GMFMC 2011b). The current ACT is approximately 22.84% below the commercial ACL, and the difference between the commercial ACL and quota allows for multi-use allocation, as described below. The IFQ program acts as the accountability measure (AM) for the commercial gag portion of the reef fish fishery, and the commercial quota has never been exceeded under the IFQ program.

*Gag multi-Use (GGM) Allocation*

At the time the commercial quota for gag is distributed to IFQ shareholders, a percentage of each shareholder's initial gag allocation is converted to gag multi-use allocation. This percentage is determined by a formula based on the gag and red grouper ACLs and quotas in a given year. GGM allocation may be used to possess, land, or sell either gag or red grouper under certain

conditions. GGM allocation can only be used to possess, land, or sell gag after an IFQ account holder's (shareholder and vessel account) gag allocation has been landed and sold, or transferred; and to possess, land, or sell red grouper, only after both red grouper and red grouper multi-use allocation have been landed and sold, or transferred. However, if red grouper is under a rebuilding plan, the percentage of GGM allocation is equal to zero.

*Red grouper multi-use (RGM) allocation*

At the time the commercial quota for red grouper is distributed to IFQ shareholders, a percentage of each shareholder's initial red grouper allocation is converted to red grouper multi-use allocation. This percentage is determined by a formula based on the red grouper and gag ACLs and quotas in a given year. RGM allocation may be used to possess, land, or sell either red grouper or gag under certain conditions. RGM allocation can only be used to possess, land, or sell red grouper after an IFQ account holder's (shareholder and vessel accounts) red grouper allocation has been landed and sold, or transferred; and to possess, land, or sell gag, only after both gag and gag multi-use allocation have been landed and sold, or transferred. However, if gag is under a rebuilding plan, the percentage of RGM allocation is equal to zero.

**Recreational Sector**

Both an in-season and a post-season AM apply to harvest of gag by the recreational sector. The in-season AM requires NMFS to close the recreational sector when gag recreational landings reach or are projected to reach the recreational ACL. If these landings exceed the gag ACL in a fishing year, the post-season AM requires NMFS to shorten the duration of the following recreational fishing year by the amount necessary to ensure landings do not exceed the prior year's ACT, unless NMFS determines that managing to the prior year's ACT in the following year is unnecessary. If gag is overfished and landings exceed the recreational sector ACL, the recreational ACL and ACT must be reduced in the following year by the amount of the previous year's overage.

*Gag Recreational Data*

Federal Data Collection Programs

NMFS created the Marine Recreational Fisheries Statistics Survey (MRFSS) in 1979. In the Gulf, MRFSS collected recreational catch and effort data, including for gag, since 1981. MRFSS included both offsite telephone surveys and onsite interviews at marinas and other points where recreational anglers fish. In 2008, the Marine Recreational Information Program (MRIP) replaced MRFSS to meet increasing demand for more precise, accurate, and timely recreational catch estimates. Until 2013, recreational catch, effort, and participation were estimated through a suite of independent but complementary surveys: telephone surveys of households and for-hire vessel operators that collected information about recreational fishing activity and an angler intercept survey that collected information about the fish that were caught.

The MRIP Access Point Angler Intercept Survey (APAIS) began incorporating a new survey design in 2013. This new design addressed concerns regarding the validity of the survey

approach, specifically that trips recorded during a given time period are representative of trips for a full day, by extending the time period dockside samplers stayed at an assigned location (Foster et al. 2018). The more complete temporal coverage with the new survey design provides for consistent increases or decreases in APAIS angler catch rate statistics, which are used in stock assessments and management, for at least some species (NOAA Fisheries 2019).

MRIP also transitioned from the legacy Coastal Household Telephone Survey (CHTS) to a new mail survey (Fishing Effort Survey [FES]) beginning in 2015, and in 2018, MRIP-FES replaced MRIP-CHTS. Both survey methods collect data needed to estimate marine recreational fishing effort (number of fishing trips) by shore and private/rental boat anglers on the Atlantic and Gulf coasts. MRIP-CHTS used random-digit dialing of homes in coastal counties to contact anglers. The new mail-based FES uses angler license and registration information as one way to identify and contact anglers (supplemented with data from the U.S. Postal Service, which includes virtually all U.S. households). Because FES and CHTS are so different, NMFS conducted side-by-side testing of the two methods and found that in general, total recreational fishing effort estimates generated from the FES are higher — and in some cases substantially higher — than the CHTS estimates (NOAA Fisheries 2019). This is because the FES is designed to more accurately measure fishing activity than the CHTS, albeit while recognizing a greater degree of uncertainty in those landings estimates. This increase in estimated effort is not because there was a sudden rise in fishing effort, but rather because FES better targets actual fishery participants through the directed mail survey. Likewise, the increase in uncertainty about the effort estimates reflects uncertainty that was likely also present in CHTS, but went unaccounted due to biases that were identified as FES was developed. NMFS developed a calibration model to allow historic effort estimates using MRIP-CHTS to be compared to new estimates from MRIP-FES.

State of Florida's Supplemental Effort Survey

In 2017, the State of Florida formally created the Gulf Reef Fish Survey to monitor private angling landings of red snapper, gag, and several other species harvested in state and federal waters in the Gulf. In 2020, that survey was expanded statewide and renamed the State Reef Fish Survey (SRFS), and additional species were added.[1] SRFS was created to be compatible with MRIP-CHTS; however, calibrated historical landings for SRFS are somewhat larger for the recreational sector than that estimated by MRIP-CHTS, but much lower than estimated by MRIP-FES. SRFS reports landings and discards monthly in numbers, with a conversion to weight based on that used by MRIP. SRFS uses a combination of dockside intercepts from SRFS and APAIS to estimate catch-per-unit-effort from private recreational vessels. In order to obtain complete estimates of recreational catch, SRFS must use recreational shore and charter for-hire landings informed by MRIP-FES, as well as headboat landings informed by the Southeast Region Headboat Survey (SRHS). Thus, when "SRFS" is referred to further in this document, it encompasses all of these sources of data necessary to make landings estimates in SRFS. SRFS/GRFS has only been running since 2015, so the time series of landings/discards

[1] https://myfwc.com/research/saltwater/fishstats/srfs/program/

used in SEDAR 72 and in this report are MRIP landings converted to SRFS currency based on a ratio calculated using overlapping years of the two surveys (2015-2019) .

Recent Gulf landings of gag are shown in Table 1.1.1. Landings are shown by sector, with recreational landings shown in MRIP-FES units, and SRFS units, commensurate with the data that were used in the initial and subsequent model runs of SEDAR 72 in 2021 and 2022, respectively.

**Table 1.1.1.** Commercial and recreational landings of Gulf gag from 2002 – 2021. 2022 data are preliminary and incomplete for the recreational sector at the time of this publishing. Recreational landings are shown in MRIP-FES (column: Recreational MRIP-FES) and SRFS/MRIP-FES units (column: Recreational SRFS), commensurate with their use in both runs of SEDAR 72. Landings are in pounds gutted weight (lb gw).

| Commercial | | Recreational MRIP-FES | | Recreational SRFS | |
|---|---|---|---|---|---|
| **Year** | **lb gw** | **Year** | **lb gw** | **Year** | lb **gw** |
| 2002 | 3,140,484 | 2002 | 9,904,826 | 2002 | 4,794,637 |
| 2003 | 2,698,157 | 2003 | 6,788,877 | 2003 | 3,384,618 |
| 2004 | 3,069,788 | 2004 | 11,191,910 | 2004 | 5,226,485 |
| 2005 | 2,718,304 | 2005 | 9,029,661 | 2005 | 4,824,577 |
| 2006 | 1,452,644 | 2006 | 4,962,693 | 2006 | 2,278,256 |
| 2007 | 1,370,119 | 2007 | 4,680,935 | 2007 | 2,225,100 |
| 2008 | 1,496,740 | 2008 | 6,959,786 | 2008 | 3,510,786 |
| 2009 | 844,660 | 2009 | 3,283,394 | 2009 | 1,693,243 |
| 2010 | 496,826 | 2010 | 4,114,337 | 2010 | 2,043,467 |
| 2011 | 318,663 | 2011 | 2,131,406 | 2011 | 936,974 |
| 2012 | 523,138 | 2012 | 1,995,142 | 2012 | 1,069,391 |
| 2013 | 575,335 | 2013 | 3,352,774 | 2013 | 1,445,422 |
| 2014 | 586,362 | 2014 | 2,740,718 | 2014 | 1,160,592 |
| 2015 | 542,774 | 2015 | 2,394,461 | 2015 | 1,042,233 |
| 2016 | 910,996 | 2016 | 1,965,832 | 2016 | 916,352 |
| 2017 | 492,095 | 2017 | 2,388,215 | 2017 | 1,001,954 |
| 2018 | 492,934 | 2018 | 2,538,889 | 2018 | 964,028 |
| 2019 | 532,015 | 2019 | 2,187,540 | 2019 | 1,121,147 |
| 2020 | 475,714 | 2020 | 2,949,058 | 2020 | 1,571,768 |
| 2021 | 562,849 | 2021 | 2,627,698 | 2021 | 1,667,099 |
| 2022 | 693,616 | 2022* | 1,542,215 | 2022 | |

Source: Commercial data from 2002 – 2009: SERO ACL files; 2010 – 2022: SERO Catch Share Database (pulled February 2023). Recreational data from 2002 – 2021: MRIP-FES (pulled February 2023); recreational data using SRFS from 2016 – 2021: FWC (pulled January 2023).
*2022 recreational data are preliminary.
Note: MRIP-FES landings estimates are higher than SRFS/MRIP estimates due to the increased fishing effort by private recreational vessels estimated by MRIP-FES.

***Recent Gag Stock Assessments***

The Gulf gag stock was most recently assessed in SEDAR 72 (2021). Prior to SEDAR 72, gag was assessed in 2016 (SEDAR 33 Update) using female-only spawning stock biomass (SSB) and using a proxy for fishing mortality (F) at maximum sustainable yield (MSY) of $F_{MAX}$, and was found to be sustainably managed at the time. Several data inputs used in the SEDAR 33 Update were modified in SEDAR 72. Most notably was the change in the recreational catch and effort data to MRIP-FES from MRIP-CHTS. Additionally, since gag is vulnerable to episodic red tide mortality, SEDAR 72 accounted for observations of these disturbances in 2005, 2014, 2018, and 2021 (projections only) directly within the model. Lastly, changes were made to improve retention and recreational fleet selectivities (i.e., estimates of length compositions of gag retained by the private angling, for-hire, and commercial directed fleets), improve fits to the fishery-independent indices, and better quantify commercial discards by using improved methodologies and differentiating between black grouper and gag. Updated information on the maturity schedule, sex transition timing, and these influences on the observed sex ratio were informed by recent research. The base model for SEDAR 72 found gag to be overfished and undergoing overfishing for both females-only and sexes-combined estimates of SSB. The Council's Scientific and Statistical Committee (SSC) reviewed the results in November 2021 and concluded that the SEDAR 72 stock assessment base model, using the sexes-combined SSB estimate, an $F_{MSY}$ proxy of $F_{30\%SPR}$, and a moderate estimate of red tide mortality in 2021 compared to 2005, was consistent with the best scientific information available and suitable for informing fisheries management. The Council's SSC agreed with revising the $F_{MSY}$ proxy from $F_{MAX}$ to the more conservative $F_{30\%SPR}$, in light of the stock's vulnerability to episodic red tide mortality, recent low recruitment, and consideration that gag may be experiencing sperm limitation as a result of a lack of males in the population.

*Alternative Base Model Run for SEDAR 72*

At its January 2022 meeting, the Gulf Council requested that the SEFSC update the SEDAR 72 base model by replacing MRIP-FES calibrated landings for the Florida private angling mode with landings estimated by SRFS. This alternative model run ("SRFS Run") was presented to the SSC for consideration at its July 2022 meeting. Because the majority of gag are landed in Florida (greater than 98% annually for 2011 – 2020), the SRFS sampling frame includes over 95% of all gag landed by private anglers, making it an appropriate survey for estimating private angling landings of gag. The calibration of SRFS to historical gag landings was reviewed and approved by peer-review through the NOAA Office of Science and Technology in May 2022.[2] SRFS was created to be comparable to MRIP-CHTS. SRFS estimates a historically larger harvest by private anglers and state charter vessels than MRIP-CHTS, but does so to a much lesser magnitude than MRIP-FES (see Table 1.1.1). Because SRFS requires MRIP data to produce complete estimates, SRFS landings estimates will not be available until several weeks after MRIP data is available, which is generally about 45 days after the end of each two-month wave. The SSC-evaluated SEDAR 72 SRFS run was found to be consistent with the best scientific information available at the SSC's July 2022 meeting. The SSC determined that the

[2] https://gulfcouncil.org/wp-content/uploads/05h.-SRFS-gag-calibration-review-05-28-2022.pdf

majority (>95%) of private angling landings of gag were captured by the SRFS sampling frame; combined with the certification of the SRFS-calibrated historical landings data, SRFS was found to be a suitable and comprehensive survey for gag for the private angling component of the recreational sector. In addition, with further consideration of gag's susceptibility to episodic mortality from red tide and guidance from Harford et al. (2019) regarding the SPR level needed to achieve MSY in a hermaphroditic species like gag, the SSC determined that an $F_{MSY}$ proxy of $F_{40\%SPR}$ was more appropriate than the proxy of $F_{30\%SPR}$ or $F_{Max}$. In recommending this more conservative $F_{MSY}$ proxy, the SSC recognized that episodic red tide mortality was to be expected in the future. Overall, there was no difference in the stock status determination using either the recreational MRIP-FES time-series versus the recreational SRFS time-series. The SSC rationalized that the higher SPR target for the $F_{MSY}$ proxy would allow the stock to rebuild to a more robust level of SSB, making it more resilient to environmental influences like red tide, and to changes in fishing mortality. Using an $F_{MSY}$ proxy of $F_{40\%SPR}$, the SSC determined that gag is overfished and undergoing overfishing as of 2019.

The Magnuson-Stevens Fishery Conservation and Management Act (Magnuson-Stevens Act) requires that the Council prepare and implement a rebuilding plan within two years of notification that the stock is overfished. The Council was notified of the overfished status of the gag stock on January 26, 2022, following the SSC's review of the first iteration of the SEDAR 72 model using MRIP-FES. The Council intends to develop Amendment 56 with the goal of having the management measures contained herein implemented by NMFS in January 2024. However, recreational harvest for the 2023 fishing year is scheduled to begin on June 1.[3] If no changes are made to the current recreational catch limits and closed seasons (which are currently in MRIP-CHTS units[4]), NMFS expects recreational landings to significantly exceed the SEDAR 72-projected 2023 recreational ACT and ACL (which are in MRIP-FES units), which projections from SEDAR 72 suggest are higher than what the stock can sustain at this time. As explained above, current regulations require that in the year after an overage of the gag recreational ACL, the recreational stock is managed to the previous year's ACT, and if the stock is overfished, a payback of any overage is required. Using the knowledge that the 2023 catch limits need to be substantially reduced to reduce overfishing based on the SEDAR 72 projections (using MRIP-FES or SRFS), the Council recognized that maintaining the 2023 catch limits (in MRIP-CHTS) would result in negative biological effects and may lengthen the amount of time necessary to rebuild the stock. Therefore, at its June 2022 meeting, the Council voted to request that NMFS implement interim measures to reduce overfishing and change the fishing season for Gulf gag while long-term management measures and regulations to end overfishing are developed. Accordingly, the Council sent a letter to NMFS, dated July 15, 2022 (Appendix A), *requesting a reduction of the Gulf gag stock ACL to 661,901 lb gw, while maintaining the current allocation split of 61% recreational and 39% commercial, and maintaining RGM and GGM. In addition,*

[3] Historically, four Florida counties (Franklin, Wakulla, Jefferson, and Taylor) have had different season dates and are open April 1-June 30 and September 1-December 31 in state waters. The Florida Fish and Wildlife Conservation Commission is considering eliminating these special early seasons for 2023 and subsequent years.
[4] Although MRIP-CHTS, MRIP-FES, and Florida SRFS generate estimates measured in pounds of fish, these estimates are not directly comparable, as described above. The references to "MRIP-CHTS units," "MRIP-FES units," and "SRFS units" signify that the estimates use different scales.

*the Council requested that the recreational fishing season begin on September 1 (rather than the traditional date of June 1), and that the season close on November 10.* This action would modify the stock, commercial, and recreational ACLs, as well as the commercial quota and the recreational ACT. It would also implement a September 1 through November 10 open season for recreational gag fishing. These measures are expected to reduce overfishing, but still provide for gag harvest in 2023 while the Council continues to develop Amendment 56. Because the SSC's review of the SRFS Run of SEDAR 72 predates the initiation of the request for interim measures for gag, that interim rule uses MRIP-FES calibrated landings and projections to reduce overfishing, while Amendment 56 will use SRFS calibrated landings (supplemented by MRIP-FES as noted above) and projections to end overfishing and rebuild the stock.

## 1.2 Purpose and Need

The purpose of this action is to modify the status determination criteria, optimum yield, catch limits, accountability measures, sector allocations, and the recreational fishing season and establish a rebuilding timeline for Gulf gag.

The need for this action is to use the best scientific information available to end overfishing of Gulf gag and rebuild the stock to a level commensurate with maximum sustainable yield, consistent with the authority under the Magnuson-Stevens Act.

## 1.3 History of Management

Amendment 1, including an Environmental Assessment (EA), regulatory impact review (RIR), and regulatory flexibility analysis (RFA), implemented in 1990, set objectives to stabilize long-term population levels of all reef fish species by establishing a survival rate of biomass into the stock of spawning age fish to achieve at least 20% spawning stock biomass per recruit by January 1, 2000. It also set a 20-inch total length (TL) minimum size limit on gag; set a five-grouper recreational daily bag limit; set an 11.0 million pound (mp) commercial quota for grouper, with the commercial quota divided into a 9.2 mp shallow-water grouper (black grouper, gag, red grouper, Nassau grouper, yellowfin grouper, yellowmouth grouper, rock hind, red hind, speckled hind, and scamp) quota and a 1.8 mp deep-water grouper (misty grouper, snowy grouper, yellowedge grouper, and warsaw grouper, and scamp once the shallow-water grouper quota was filled) quota; allowed a two-day possession limit for charter vessels and headboats on trips that extend beyond 24 hours; established a longline and buoy gear boundary at the 50-fathom depth contour west of Cape San Blas, Florida, and the 20-fathom depth contour east of Cape San Blas, inshore of which the directed harvest of reef fish with longline gear and buoy gear was prohibited, and the retention of reef fish captured incidentally in other longline operations (e.g., sharks) was limited to the recreational daily bag limit; limited trawl vessels to the recreational size and daily bag limits of reef fish; established fish trap permits (up to 100 fish traps per permit holder); and established a commercial reef fish vessel permit.

Amendment 5, including an EA, RIR, and RFA implemented in February 1994, established restrictions on the use of fish traps in the Gulf exclusive economic zone; implemented a three-year moratorium on the use of fish traps by creating a fish trap endorsement for fishermen with historical landings; created a special management zone (SMZ) with gear restrictions off the

Alabama coast; created a framework procedure for establishing future SMZ's; required that all finfish except for oceanic migratory species be landed with head and fins attached; and closed the region of Riley's Hump (near Dry Tortugas, Florida) to all fishing during May and June to protect mutton snapper spawning aggregations.

A Framework Action, including an EA, RIR, and RFA implemented in June 2000, increased the commercial size limit for gag and black grouper from 20 to 24 inch TL; increased the recreational size limit for gag from 20 to 22 inch TL; prohibited commercial sale of gag, black, and red grouper each year from February 15 to March 15 (during the peak of gag spawning season); and established two marine reserves (Steamboat Lumps and Madison-Swanson) that are closed year-round to fishing for all species under the Council's jurisdiction.

Amendment 29 including an EA, RIR, and RFA, implemented January 2010, established an individual fishing quota (IFQ) system for the commercial harvest of grouper and tilefish, including gag.

Amendment 30B including a final Supplemental Environmental Impact Statement (SEIS), RIR and an Initial Regulatory Flexibility Analysis, implemented May 2009, established ACLs and AMs for gag and red grouper; managed shallow-water grouper to achieve optimum yield (OY) and improve the effectiveness of federal management measures; defined the gag minimum stock size threshold (MSST) and OY; set interim allocations of gag and red grouper between recreational and commercial sectors, setting gag at 61% recreational and 39% commercial based on average landings from 1986 – 2005; made adjustments to the gag and red grouper ACLs to reflect the current status of these stocks; established ACLs and AMs for the commercial and recreational gag harvest, and commercial aggregate shallow-water grouper harvest; adjusted recreational grouper bag limits and seasons; adjusted commercial grouper quotas; replaced the one-month February 15 through March 15 commercial grouper closed season with a four-month seasonal area closure at the Edges, a 390 square nautical mile area in the dominant gag spawning grounds; eliminated the end date for the Madison-Swanson and Steamboat Lumps marine reserves; and required that vessels with federal commercial or charter reef fish permits comply with the more restrictive of state or federal reef fish regulations when fishing in state waters.

Amendment 31 including a final SEIS, RIR and IRFA, implemented May 2010, prohibited the use of bottom longline gear shoreward of a line approximating the 35-fathom contour from June through August; established a longline endorsement; and restricted the total number of hooks onboard each reef fish bottom longline vessel to 1,000, only 750 of which may be rigged for fishing.

An Interim Rule, published December 1, 2010. While management measures for the gag rebuilding plan were being developed through Amendment 32, the Interim Rule reduced gag landings consistent with ending overfishing; implemented conservative management measures while a rerun of the update stock assessment was being completed; reduced the commercial quota to 100,000 lb gw; suspended the use of red grouper multi-use IFQ allocation so it would not be used to harvest gag, and; temporarily halted the recreational harvest of gag until recreational fishing management measures being developed in Amendment 32 could be implemented to allow harvest at the appropriate levels.

An Interim Rule, effective from June 1, 2011, through November 27, 2011, and was extended for another 186 days or until Amendment 32 was implemented. The gag 2009 update stock assessment was rerun in December 2010 addressing the problems with discards identified earlier in 2010. This assessment was reviewed in January 2011 by the Council's SSC and presented to the Council at its February 2011 meeting. The assessment indicated that the gag commercial quota implemented in the December 1, 2010, interim rule could be increased and that a longer recreational season could be implemented. In response, the Council requested an interim rule while they continued to work on long-term measures including a gag rebuilding plan in Amendment 32. The interim rule set the commercial gag quota at 430,000 lb gw (including the 100,000 lb gw previously allowed) for the 2011 fishing year, and temporarily suspended the use of red grouper multi-use IFQ allocation so it could not be used to harvest gag. It also set a two-month recreational gag fishing season from September 16 through November 15.

Amendment 32, including a final Environmental Impact Statement, RIR and IRFA implemented in March 2012, set the commercial and recreational gag ACLs and ACTs for 2012 through 2015 and beyond; implemented gag commercial quotas for 2012 through 2015 and beyond that included a 14% reduction from the ACL to account for additional dead discards of gag resulting from the reduced harvest; modified grouper IFQ multi-use allocations; reduced the commercial minimum size limit of gag from 24 to 22 inches TL to reduce discards; set the gag recreational season from July 1 through October 31 (the bag limit remained two gag in the four-grouper aggregate bag limit); simplified the commercial shallow-water grouper AMs by using the IFQ program to reduce redundancy; and added an overage adjustment and in-season closure to the gag and red grouper recreational AMs to avoid exceeding the ACL.

Amendment 38, including EA, RIR, and RFA implemented in March 2013, revised the postseason recreational AM that reduces the length of the recreational season for all shallow-water grouper in the year following a year in which the ACL for gag or red grouper is exceeded. The modified AM reduces the recreational season of only the species for which the ACL was exceeded.

A 2016 Framework Action revised the gag recreational closed season to January 1 to May 31, annually. This revised closed season was expected to reduce dead discards of gag during the Gulf recreational red snapper season that begins on June 1, annually, and extend the gag recreational fishing season. The framework action also increased the recreational minimum size limit in Gulf federal waters to 24 inches TL to be consistent with the federal waters of the South Atlantic and state waters off Monroe County, Florida. This final rule was effective May 25, 2016.

Reef Fish Amendment 44 standardized the MSST for certain reef fish species, including gag. The MSST is used to determine whether or not a stock is considered to be overfished; if the biomass of the stock falls below the threshold then the stock is considered to be overfished. The MSST for gag and other reef fish species was set equal to 50% of the biomass at MSY. This amendment was approved on December 21, 2017.

A 2018 Framework Action increased the commercial minimum size limit for gag to 24 inches TL. This final rule was effective July 23, 2018.

The Council requested interim measures to reduce gag overfishing for the 2023 fishing year. This request would decrease the stock ABC for Gulf gag to 661,000 lb gw. The sector allocation was retained at 61% recreational and 39% commercial. The recreational fishing season was modified to open on September 1 and close on November 10. The purpose of this interim rule is to reduce overfishing ahead of the development of Amendment 56 to the Reef Fish FMP. This interim rule is expected to be effective in the spring of 2023, ahead of the 2023 recreational fishing season. On January 1, 2023, adequate commercial gag allocation was withheld from IFQ shareholders by NMFS Southeast Regional Office in anticipation of this interim rule's implementation.

# CHAPTER 2. MANAGEMENT ALTERNATIVES

## 2.1 Action 1: Modification of Gulf of Mexico (Gulf) Gag Status Determination Criteria (SDC)

**Alternative 1:** No Action. Retain the SDC for gag as defined in Amendments 30B and 44 to the Fishery Management Plan for Reef Fish Resources in the Gulf (Reef Fish FMP). Maximum sustainable yield (MSY) is defined as the fishing mortality rate (F) assuming the maximum yield per recruit ($F_{MAX}$). The current definition for the maximum fishing mortality threshold (MFMT) is $F_{MAX}$. The minimum stock size threshold (MSST) is defined as 50% of the biomass at $F_{MAX}$ ($B_{MAX}$). The optimum yield (OY) is defined as 75% of the yield at $F_{MAX}$.

**Alternative 2:** Revise the SDC for gag based on the results of the updated Southeast Data, Assessment, and Review (SEDAR) 72 stock assessment as reviewed by the Gulf of Mexico Fishery Management Council's (Council) Scientific and Statistical Committee (SSC) in July 2022. MSY is defined as the yield when fishing at a 40% spawning potential ratio (SPR) or $F_{40\%SPR}$. The MFMT is equal to the fishing mortality at the $F_{MSY}$ proxy (e.g., $F_{40\%SPR}$). The MSST is defined as 50% of the biomass at MSY or its proxy. The OY is defined as being conditional on rebuilding plan, such that: if the stock is under a rebuilding plan, OY is equal to the stock annual catch limit (ACL); if the stock is not under a rebuilding plan, OY is equal to 90% of MSY or its proxy.

**Discussion:**

This action would modify Gulf gag SDC to use the best scientific information available. There is only one alternative other than the no-action alternative because the Council's SSC determined that the best scientific information available supports only one proxy for $F_{MSY}$MSY based on $F_{40\%SPR}$. SEDAR 72 (2022) estimated that the spawning stock biomass (SSB) for gag when accounting for both mature males and females is below the MSST, or 50% of the biomass at MSY ($B_{MSY}$). In its review of SEDAR 72, the SSC determined that $F_{MAX}$ was an inappropriate $F_{MSY}$ proxy for gag because of the species hermaphroditism (changing sex from female to male) and susceptibility to episodic mortality from red tide harmful algal blooms. The SSC, also reviewed guidance from Harford et al. (2019)[5] regarding the SPR level needed to achieve MSY in a hermaphroditic species like gag, and ultimately determined that an $F_{MSY}$ proxy of the yield when fishing at $F_{40\%SPR}$ was more appropriate than a proxy of the yield when fishing at $F_{30\%SPR}$ or $F_{MAX}$.

[5] Harford, W.J., S.R. Sagarese, and M. Karnauskas. 2019. Coping with information gaps in stock productivity for rebuilding and achieving maximum sustainable yield for grouper–snapper fisheries. Fish and Fisheries 20(2):303-321. The SSC discussed this publication during its consideration of guidance to the Council for setting $F_{MSY}$ proxies for hermaphroditic species, namely gag. The SSC thought the empirically-based recommendations from Harford et al. 2019 were particularly appropriate for gag, and supported its resultant recommendation of a revised $F_{MSY}$proxy of $F_{40\%SPR}$.

**Alternative 1** would retain the current SDC for gag as defined in Amendments 30B and 44 to the Reef Fish FMP. $F_{MSY}$ is defined as the yield when fishing at $F_{MAX}$. The MFMT is equal to $F_{MAX}$; MSST is defined as 50% of $B_{MAX}$; and, OY is defined as 75% of the yield at $F_{MAX}$. These SDC, based on $F_{MAX}$, are not consistent with the best scientific information available. As such, **Alternative 1** is not a viable alternative.

**Alternative 2** would revise the SDC for gag based on the results of the SEDAR 72 stock assessment as reviewed by the SSC in July 2022. SEDAR 72 (2022) used recreational landings data for private vessels from the State of Florida's State Reef Fish Survey (SRFS) in place of the same from the Marine Recreational Information Program's (MRIP) Fishing Effort Survey (FES). SRFS must use recreational shore and charter for-hire landings informed by MRIP-FES, as well as headboat landings informed by the Southeast Region Headboat Survey (SRHS) in order to obtain catch estimates necessary for management. Thus, when "SRFS" is referred to further in these actions, it encompasses all of these sources of data necessary to make these landings estimates. SEDAR 72 (2022) using SRFS landing was determined by the SSC to be consistent with the best scientific information available (see Chapter 1 for more information on this assessment review). Under **Alternative 2**, and based on the SSC's recommendation of an $F_{MSY}$ proxy of $F_{40\%SPR}$, $F_{MSY}$ is defined as the yield when fishing $F_{40\%SPR}$, the MFMT is equal to $F_{MSY}$ or its proxy. The MSST would continue to be defined as 50% of the biomass at MSY or its proxy.

In addition to the change of the $F_{MSY}$ proxy **Alternative 2** would modify the definition of OY. Under **Alternative 2**, OY would be conditioned on stock status. If the stock is under a rebuilding plan, OY is equal to the stock ACL and if the stock is not under a rebuilding plan, OY is equal to 90% of MSY or its proxy. The Magnuson-Stevens Fishery Conservation and Management Act (Magnuson-Stevens Act) requires, among other things, that management measures achieve OY on a continuing basis. Per the SSC's review of SEDAR 72 (2022), gag is overfished and undergoing overfishing as of 2020, and thus requires rebuilding from the current SSB to the SSB corresponding with MSY. As represented in Action 2 of this document, this necessitates setting catch limits at a fishing mortality rate corresponding to a rebuilding timeline ($F_{Rebuild}$). Scientific uncertainty, as it relates to the physical, biological, and ecological environments, is accounted for in the difference between the overfishing limit (OFL) and acceptable biological catch (ABC) as recommended by the SSC. Further reducing the sector-specific ACLs (which sum to the total stock ACL) from the ABC accounts for management uncertainty. The buffer between the ABC and ACL includes social and economic considerations by way of Council consideration and pertinent SSC recommendations (if any), which must also be accounted for when defining OY. Therefore, when the stock is under a rebuilding plan, OY is defined as being equal to the stock ACL (e.g., the sum of the recreational and commercial ACLs). Once the gag SSB reaches a level equal to or greater than the MSST, the stock will no longer be considered overfished; however, the stock will still be under a rebuilding plan until the SSB is equal to or greater than the SSB at MSY. Thus, it is at this point (when the stock is rebuilt) that the definition of OY in **Alternative 2** specifies that OY is equal to 90% of MSY or its proxy. Ideally, management measures should be able to maintain the SSB at or above that level over time. Defining the OY as 90% of MSY or its proxy when the stock is considered

healthy is consistent with the decision made with respect to other reef fish stocks in Amendment 48 to the Reef Fish FMP (GMFMC 2021b).

## 2.2 Action 2: Modification of Gulf Gag Catch Limits, Sector Allocation, and Rebuilding Timeline

**Alternative 1:** No Action. Retain the current catch limits and sector allocation of 61% recreational, 39% commercial for gag. The current OFL, ABC, and ACLs are based on a proxy for $F_{MSY}$ of $F_{MAX}$ and were derived, in part, using the MRIP Coastal Household Telephone Survey (CHTS) data. These catch limits in pounds (lb) gutted weight (gw) are as follows, with the recreational ACL in MRIP-CHTS units:

| | |
|---|---|
| **OFL** | 4,180,000 |
| **ABC** | 3,120,000 |
| **Stock ACL** | 3,120,000 |
| **Commercial ACL (39% of Stock ACL)** | 1,217,000 |
| **Recreational ACL (61% of Stock ACL)** | 1,903,000 |

The Council requested interim measures to reduce overfishing for the 2023 fishing year. If implemented as expected in May 2023, these interim measures would be effective for up to 366 days. Catch limits are in MRIP-FES units and in lb gw as follows:

| | |
|---|---|
| **OFL** | 4,180,000 |
| **ABC** | 3,120,000 |
| **Stock ACL** | 661,901 |
| **Commercial ACL (39% of Stock ACL)** | 258,142 |
| **Recreational ACL (61% of Stock ACL)** | 403,759 |

**Alternative 2:** Revise the catch limits for gag and establish a rebuilding time for the gag stock. The OFL, ABC, and ACLs are based on an $F_{MSY}$ proxy of the yield when fishing at $F_{40\%SPR}$. The ABC is equal to the stock ACL, which equals the combined total ACLs from both sectors. Retain the current sector allocation percentages of 61% recreational, 39% commercial, which were based on the percentages of recreational to commercial landings from a 1986-2005 reference period using MRIP-CHTS recreational data. The catch limits in lb gw are rounded down to the nearest thousand pounds to ensure the sum of the sector ACLs does not exceed the ABC; the recreational ACL is informed by SRFS for private recreational vessels, by MRIP-FES data for the for-hire and shore modes, and by the Southeast Region Headboat Survey for headboats, and are as follows for each rebuilding timeline option:

**Option 2a**: The minimum time to rebuild ($T_{Min}$) in the absence of direct fishing pressure (F = 0), equal to 11 years. This option does not include dead discards.

| **F = $F_{40\%SPR}$** | **OFL** | **ABC/ Stock ACL** | **Rec ACL** | **Com ACL** |
|---|---|---|---|---|
| **Year** | **mp gw** | **mp gw** | **mp gw** | **mp gw** |
| **2024** | 0.603 | 0 | 0 | 0 |
| **2025** | 0.821 | 0 | 0 | 0 |
| **2026** | 1.009 | 0 | 0 | 0 |
| **2027** | 1.222 | 0 | 0 | 0 |
| **2028** | 1.48 | 0 | 0 | 0 |

**Option 2b**: 75% of $F_{40\%SPR}$, which would rebuild the stock in 18 years.

| **F = $F_{40\%SPR}$** | **OFL** | **ABC** | **Rec ACL** | **Com ACL** |
|---|---|---|---|---|
| **Year** | **mp gw** | **mp gw** | **mp gw** | **mp gw** |
| **2024** | 0.603 | 0.453 | 0.276 | 0.176 |
| **2025** | 0.821 | 0.627 | 0.382 | 0.244 |
| **2026** | 1.009 | 0.783 | 0.477 | 0.305 |
| **2027** | 1.222 | 0.961 | 0.586 | 0.374 |
| **2028** | 1.48 | 1.177 | 0.718 | 0.459 |

**Option 2c**: $T_{Min}$ * 2, which would rebuild the stock in 22 years.

| **F = $F_{40\%SPR}$** | **OFL** | **ABC** | **Rec ACL** | **Com ACL** |
|---|---|---|---|---|
| **Year** | **mp gw** | **mp gw** | **mp gw** | **mp gw** |
| **2024** | 0.603 | 0.547 | 0.333 | 0.213 |
| **2025** | 0.821 | 0.749 | 0.456 | 0.292 |
| **2026** | 1.009 | 0.926 | 0.564 | 0.361 |
| **2027** | 1.222 | 1.127 | 0.687 | 0.439 |
| **2028** | 1.48 | 1.371 | 0.836 | 0.534 |

**Alternative 3:** Revise the catch limits for gag and establish a rebuilding time for the gag stock. The OFL, ABC, and ACLs are based on the $F_{MSY}$ proxy of the yield when fishing at $F_{40\%SPR}$. The ABC is equal to the stock ACL, which equals the combined total ACLs from both sectors. Revise the sector allocation to 65% recreational, 35% commercial, using average landings from 1986 – 2005, but using SRFS recreational landings data for the private recreational vessel fleet and MRIP-FES for all other recreational landings data. The catch limits in lb gw are rounded down to the nearest thousand pounds to ensure the sum of the sector ACLs does not exceed the ABC; the recreational ACL is informed by SRFS for private recreational vessels, by MRIP-FES data for the for-hire and shore modes, and by the Southeast Region Headboat Survey for headboats, and are as follows for each rebuilding timeline option:

**Option 3a**: The minimum time to rebuild ($T_{Min}$) in the absence of direct fishing pressure (F = 0) is equal to 11 years. This option does not include dead discards.

| F = $F_{40\%SPR}$ | OFL | ABC/ Stock ACL | Rec ACL | Com ACL |
|---|---|---|---|---|
| **Year** | **mp gw** | **mp gw** | **mp gw** | **mp gw** |
| **2024** | 0.591 | 0 | 0 | 0 |
| **2025** | 0.805 | 0 | 0 | 0 |
| **2026** | 0.991 | 0 | 0 | 0 |
| **2027** | 1.200 | 0 | 0 | 0 |
| **2028** | 1.454 | 0 | 0 | 0 |

**Option 3b**: 75% of $F_{40\%SPR}$, which would rebuild the stock in 18 years.

| F = $F_{40\%SPR}$ | OFL | ABC | Rec ACL | Com ACL |
|---|---|---|---|---|
| **Year** | **mp gw** | **mp gw** | **mp gw** | **mp gw** |
| **2024** | 0.591 | 0.444 | 0.288 | 0.155 |
| **2025** | 0.805 | 0.615 | 0.399 | 0.215 |
| **2026** | 0.991 | 0.769 | 0.499 | 0.269 |
| **2027** | 1.200 | 0.943 | 0.613 | 0.330 |
| **2028** | 1.454 | 1.156 | 0.751 | 0.404 |

**Option 3c**: $T_{Min}$ * 2, which would rebuild the stock in 22 years.

| F = $F_{40\%SPR}$ | OFL | ABC | Rec ACL | Com ACL |
|---|---|---|---|---|
| **Year** | **mp gw** | **mp gw** | **mp gw** | **mp gw** |
| **2024** | 0.591 | 0.537 | 0.349 | 0.188 |
| **2025** | 0.805 | 0.736 | 0.478 | 0.257 |
| **2026** | 0.991 | 0.911 | 0.592 | 0.319 |
| **2027** | 1.200 | 1.109 | 0.720 | 0.388 |
| **2028** | 1.454 | 1.349 | 0.876 | 0.472 |

**Discussion:**

This action would modify Gulf gag catch limits to end overfishing of gag and rebuild the stock. The alternatives in this action include rebuilding timelines based on the amount of time estimated to be required to rebuild the gag stock from its current overfished condition. SEDAR 72 (2022) estimated that the SSB for gag is below the MSST, or 50% of the $B_{MSY}$. The minimum time to rebuild the stock, or $T_{Min}$, was estimated to be 11 years, assuming an $F_{MSY}$ proxy of the yield when fishing at $F_{40\%SPR}$, and assuming no fishing mortality (F = 0). In practice, closing all directed harvest of gag would not be expected to eliminate all fishing mortality, as some gag would still be expected to be discarded and die as fishermen continue fishing for other species that live in similar habitats as gag. Thus, the estimation of 11 years to rebuild the stock under

$T_{Min}$, assuming no fishing mortality, should be viewed as the minimum time to rebuild, and not accounting for dead discards related to fishing activity targeting other species. Similarly, for all rebuilding timelines presented in Action 2, the actual time to rebuild the stock is expected to be dependent on multiple factors besides just directed fishing mortality. Changes in fishing effort which change the frequency of gag dead discards, the frequency episodic mortality events like red tide harmful algal blooms, and fluctuations in reproduction and recruitment, can all result in changes to the year in which gag would be rebuilt.

**Alternative 1** would retain the current catch limits which are based in part on MRIP-CHTS data, and is no longer considered consistent with the best scientific information available. These catch limits have remained in place since 2015, due in large part to the uncertainty expressed by the SSC when reviewing in the SEDAR 33 Update (2016) stock assessment. SEDAR 33 Update detailed a low proportion of males in the SSB, which the SSC thought may have a negative effect on the stock's reproductive ability. The SSC's uncertainty about the potential effects of a low proportion of males in the SSB on the stock's reproductive capacity was acknowledged by the Council, which decided not to increase the catch limits for gag following SEDAR 33 Update. Combined with current fishing mortality, it is expected that **Alternative 1** would result in removals in excess of those projected to be sustainable by the SEDAR 72 (2022) stock assessment. Therefore, **Alternative 1** is not considered viable because it would not end overfishing, and would allow harvest in excess of that projected to allow the stock to rebuild under any of the rebuilding timelines allowed under the Magnuson-Stevens Fishery Conservation and Management Act (Magnuson-Stevens Act). As such, **Alternative 1** will not be discussed further in this section.

*Interim Rule – Catch Limits*

NMFS and the Council have proposed an interim rule to reduce overfishing of gag for the 2023 fishing year, while this amendment is being developed. There are two actions in this proposed interim rule, the first of which would set the ABC equal to the ACL for gag (661,901 lb gw), based on the projections from the first version of SEDAR 72 (2021), which used MRIP-FES for recreational landings and discards for private anglers and state charter vessels. The SEDAR 72 2022 update using SRFS was not yet available when work on this proposed interim rule began. The interim rule does not modify the sector allocation from that specified in Reef Fish Amendment 30B (GMFMC 2008a), but it does use a modified $F_{MSY}$ proxy of $F_{30\%SPR}$. This modification was supported at the time by the Council's SSC based on the susceptibility of gag to episodic mortality from red tide, consistent fishing pressure, and low recruitment since the late 2000s. This proposed interim rule has not yet been implemented. According to the Magnuson-Stevens Act, an interim rule may be implemented for 180 days, and may be reauthorized for an additional 186 days, for a maximum effective time period of 366 days

*Multi-Use Individual Fishing Quota (IFQ) Shares*

Under both **Alternative 2** and **Alternative 3**, gag would be under a rebuilding plan. Amendment 32 to the Reef Fish FMP (GMFMC 2011b) established provisions for multi-use IFQ shares for gag and red grouper. At the time the commercial quota for gag or red grouper is

distributed to IFQ shareholders, a percentage of each shareholder's initial gag and/or red grouper allocation will be converted to multi-use allocation. This multi-use allocation, determined annually, is based on the following formula:

Red Grouper:
Red Grouper multi-use allocation (in %) = 100 * [Gag ACL—Gag commercial quota]/Red grouper commercial quota

Gag:
Gag multi-use allocation (in %) = 100 * [Red grouper ACL—Red grouper commercial quota]/Gag commercial quota

However, if gag is under a rebuilding plan, the percentage of red grouper multi-use allocation is set equal to zero. Red grouper multi-use allocation may be used to possess, land, or sell red grouper only after an IFQ account holder's (shareholder and vessel accounts) red grouper allocation has been landed and sold, or transferred; and to possess, land, or sell gag, only after both gag and gag multi-use allocation have been landed and sold, or transferred. Thus, so long as gag is in a rebuilding plan, zero percent of a shareholder's initial red grouper allocation will be converted to multi-use allocation. However, the amount of gag multi-use allocation would differ under both **Alternative 2** and **Alternative 3**, since red grouper is not in a rebuilding plan and because the gag commercial quota would differ annually from 2024 – 2028.

Both **Alternative 2** and **Alternative 3** modify the catch limits for gag by using SRFS data for the Florida private recreational vessel landings and MRIP-FES data for all other recreational landings for both the setting and monitoring of catch limits, based on an SSC-recommended $F_{MSY}$ proxy of the yield when fishing at $F_{40\%SPR}$. During its August 2022 meeting, Council staff used the SRFS-calibrated historical landings from six different historical reference periods of landings based on the 1986 – 2019 SRFS landings estimates to examine the effects on the sector allocation. These options were shown to differ by less than 1% up to less than 4%. Because the options were so similar, the Council determined that the options presented (**Alternatives 2** and **3**) were sufficient for further consideration, and that additional options considering more recent years of landings data were unnecessary. The catch limits specified for each of these alternatives, however, are reliant on two other key decisions embedded in each alternative. For both **Alternative 2** and **Alternative 3**, the ABC is equal to the stock ACL, which equals the combined total ACLs from both sectors.

The first key decision point is with respect to the sector allocation between the commercial and recreational fishing sectors. **Alternative 2** uses a sector allocation of 61% recreational, 39% commercial, using the average landings from 1986 – 2005, as specified in Reef Fish Amendment 30B (GMFMC 2008a). This sector allocation uses historical landings data calibrated to MRIP-CHTS, which the SSC no longer supports as being consistent with the best scientific information available. The sector allocation ratio in **Alternative 2** results in a *de facto* reallocation to the commercial sector of approximately 4%. This is because the historical landings from the same 1986 – 2005 time period, when calibrated to SRFS, indicate slightly higher historical recreational fishing effort when compared to MRIP-CHTS, upon which the status quo sector allocation was determined. This difference is evident in the sector allocation ratio in **Alternative 3**, which

results in a sector allocation of 65% recreational, 35% commercial. Selecting **Alternative 2** would thus reallocate to the commercial sector; whereas, selecting **Alternative 3** would adjust the sector allocation to reflect the historical landings from the reference period (1986 – 2005) calibrated to SRFS units (as supplemented by MRIP-FES, see Section 1.1). **Alternative 2** would be expected to result in comparatively greater yields for the commercial sector due to this de facto reallocation in the change from MRIP to SRFS, and lower yields for the recreational sector compared to the status quo in **Alternative 1**. Conversely, **Alternative 3** would be expected to result in a comparatively similar allocation of the stock ACL for both the commercial and recreational sectors compared to the status quo in **Alternative 1**.

The second key decision is with respect to the rebuilding time. The Magnuson-Stevens Act requires that the rebuilding time period be as short as possible, taking into consideration several factors, including the status and biology of the overfished stock and the needs of fishing communities.[6] The rebuilding time options in **Alternative 2** and **Alternative 3** include $T_{Min}$, which is 11 years, and two time periods based on the alternative methods to determine $T_{Max}$ specified in the National Standard 1 Guidelines (50 CFR 600.310(j)(3)(i)(B)(*2*)), for stocks for which $T_{Min}$ is greater than 10 years. Generally, the longer the rebuilding timeline, the greater the catch limits are in the earlier part of the projections; however, all of the rebuilding timelines rebuild the stock to a similar measure of total SSB. **Option a** for both alternatives would set the rebuilding timeline based on $T_{Min}$, or 11 years, which is contingent on the fishing mortality being set at zero. This would equate to an ABC of 0 lb gw for 2024 – 2028 and subsequent years, until the stock is rebuilt. **Option b** would set the rebuilding timeline based on the amount of time the stock or stock complex is expected to take to rebuild if fished at 75% of the yield at $F_{40\%SPR}$. This equates to an 18-year rebuilding period. **Option c** would set the rebuilding timeline based on twice the minimum time to rebuild or $T_{Min} * 2$, which equates to a 22-year rebuilding period.[7]

As more of the stock ACL is allocated to the recreational sector, an increase in discards for that sector is accounted for to consider the proportion of those discards that are expected to die. This increase in regulatory discards, stemming from regulations like minimum size and retention limits, and closed season discards, results in a decrease in allowable harvest compared to the status quo. Overall, the rebuilding timeline options in **Alternative 2** result in higher catch limits than those in **Alternative 3**, because of the lower total sector allocation to the recreational sector in **Alternative 2**. Excluding **Option a** ($T_{Min}$ at F = 0; ABC = 0 lb gw for 11 years) for both **Alternative 2** and **Alternative 3**, the largest catch limits come from **Option 2c** of **Alternative 2**, and the smallest catch limits come from **Option 3b** of **Alternative 3**.

[6] 16 U.S.C. § 1854(e)(4).

[7] At its January 2023 meeting, the Council determined that a rebuilding timeline of $T_{Min}$ plus one generation time (8 years for gag), which resulted in a total rebuilding period of 19 years, was not dissimilar from Option 2b/3b herein (18 years, respectively). The Council moved this option in Alternatives 2 and 3 in Action 2 to the Considered but Rejected Appendix.

## 2.3 Action 3: Modify the Gulf Gag Sector Annual Catch Targets (ACT) Based on the Catch Limits and Sector Allocation Selected in Action 2

Action 2 establishes the sector allocation, sets the ACLs for the recreational and commercial sector, and sets the rebuilding period for Gulf gag. Action 3 specifically addresses the ACTs for the recreational (Sub-Action 3.1) and commercial (Sub-Action 3.2) sectors, and the commercial quota for the Gag IFQ Program. The ACTs are used to account for additional management uncertainty, to ensure that a sector's landings in a fishing year do not exceed that sector's ACL for that year. The use of an ACT for managing a sector's landings is discretionary and the prerogative of the Council (recreational and commercial ACTs are currently used in managing gag). Typically, the buffer between a sector ACL and sector ACT accounts for uncertainty in the precision of fishing season duration projections, especially for fishing season durations that are only a few months or less.

### 2.3.1 Sub-Action 3.1: Modify the Recreational ACT

**Alternative 1:** No Action. Retain the current buffer between the recreational ACL and ACT. The recreational ACL is equal to 61% of the ABC. The recreational ACT is set equal to the yield at 75% of $F_{MAX}$, as specified in Amendment 30B to the Reef Fish FMP. This resulted in the recreational ACT being set at 89.75% of the recreational ACL.

Under Alternative 1 of Action 2, these catch limits in lb gw are as follows, with the recreational ACL and ACT in MRIP-CHTS units:

| | |
|---|---|
| OFL | 4,180,000 |
| ABC | 3,120,000 |
| Stock ACL | 3,120,000 |
| Recreational ACL (61% of Stock ACL) | 1,903,000 |
| **Recreational ACT** | 1,708,000 |

The Council requested interim measures to reduce overfishing for the 2023 fishing year. If implemented as expected by May 2023, these interim measures would be effective for up to 366 days. Catch limits are in MRIP-FES data units and in lb gw as follows:

| | |
|---|---|
| OFL | 4,180,000 |
| ABC | 3,120,000 |
| Stock ACL | 661,901 |
| Recreational ACL (61% of Stock ACL) | 403,759 |
| **Recreational ACT** | 362,374 |

**Alternative 2:** Revise the recreational ACT using the Council's ACL/ACT Control Rule, based on the 2018 – 2021 recreational fishing years, using MRIP-CHTS data units so as to properly

compare the landings in those fishing years with the ACLs for the same years, which were defined using MRIP-CHTS. This calculation is demonstrated in Appendix D and results in a 10% buffer between the recreational ACL and recreational ACT. The recreational ACT would be determined based on the recreational ACL chosen in Action 2.

**Discussion:**

**Alternative 1** (No action) would retain the current buffers between the recreational sector ACLs and ACTs for Gulf gag. The recreational sector's ACL is equal to that sector's allocation of the ABC, based on the alternative and option selected in Action 2. Under **Alternative 1**, the recreational ACT is set equal to the yield at 75% of $F_{MAX}$, as specified in Amendment 30B (GMFMC 2008a). As noted in Chapter 1, following the review of SEDAR 72 (2021), the Council's SSC no longer supported the use of $F_{MAX}$ as a proxy for $F_{MSY}$, as it allowed for setting catch limits based on the maximum yield per recruit. Given the current low proportion of male gag (approximately 1 male per 50 females; SEDAR 72 2021), hermaphroditism, and the stock's susceptibility to red tide, the SSC thought $F_{MAX}$ was too aggressive and not sustainable. Following the SSC's initial review of SEDAR 72 (2021), the SSC recommended a revised $F_{MSY}$ proxy equal to the yield at $F_{30\%SPR}$, which the Council incorporated in its request for interim measures for gag (See Chapter 1). Later, following its review of the SEDAR 72 run using SRFS for the private angling component of the recreational sector (SEDAR 72 2022), the SSC recommended revising the $F_{MSY}$ proxy equal to the yield at $F_{40\%SPR}$. Thus, $F_{MAX}$ no longer represents the best scientific information available, making **Alternative 1** a non-viable alternative. Further, under **Alternative 1**, the recreational ACT is determined using a moving average, whereby the recreational ACT is defined as follows after a change in the catch limits: the recreational ACT equals the yield at 75% of $F_{MAX}$ in the first year; the average of the ACTs in the first and second years for the second year; and, the average of the most recent three years in all subsequent years. The recreational AMs are triggered based on the most recent three-year average of the recreational landings compared to the most recent three-year average of the recreational ACLs (GMFMC 2008a). This method predates the Generic ACL/AM Amendment (GMFMC 2011a) and the creation of the Council's ACL/ACT Control Rule (see **Alternative 2** below).

**Alternative 2** would revise the recreational ACT using the Council's ACL/ACT Control Rule, based on the 2018 – 2021 recreational fishing years. The Council's ACL/ACT Control Rule was established in the Generic ACL/AM Amendment (GMFMC 2011a), and examines a combination of a sector's landings history relative to the sector ACL, the precision of the landings data, the type of in-season AM, and the stock status to create a weighted buffer between the sector ACL and sector ACT. The fishing years used in **Alternative 2** represent the most recent four full years of finalized recreational landings data at the time of publishing. These calculations in the ACL/ACT Control Rule use MRIP-CHTS data units to compare the landings as collected in those fishing years with the ACLs for the same years, which were also defined using MRIP-CHTS data units. This calculation is demonstrated in Appendix D, and results in a 10% buffer between the recreational ACL and recreational ACT. The resultant recreational ACTs are demonstrated relative to the recreational ACLs in Table 2.3.1. The determination of whether the recreational AMs are triggered will be based on the recreational landings in a fishing year

relative to that year's recreational ACL. **Alternative 2** differs from **Alternative 1** in that it does not specify the recreational ACT relative to $F_{MSY}$ or its proxy, but rather relative to the recreational ACL, as is typical of other federally managed species in the Gulf since the creation of the ACL/ACT Control Rule in 2011.

### 2.3.2 Sub-Action 3.2: Modify the Commercial ACT and Quota

**Alternative 1:** No Action. Retain the current buffer between the commercial ACL and ACT. The commercial ACL is equal to 39% of the ABC. The commercial ACT is set equal to the yield at 75% of $F_{MAX}$, as specified in Amendment 30B to the Reef Fish FMP, which results in a commercial ACT that is 8.85% below the commercial ACL. The commercial quota is set at 86% of the commercial ACT, as specified in Amendment 32 to the Reef Fish FMP. This results in a commercial quota that is approximately 77% of the commercial ACL. For the commercial sector, the IFQ program serves as the AM.

Under Alternative 1 of Action 2, these catch limits in pounds (lb) gutted weight (gw) are as follows:

| | |
|---|---|
| OFL | 4,180,000 |
| ABC | 3,120,000 |
| Stock ACL | 3,120,000 |
| Commercial ACL (39% of Stock ACL) | 1,217,000 |
| **Commercial ACT** | 1,091,860 |
| **Commercial Quota** | 939,000 |

The Council requested interim measures to reduce overfishing for the 2023 fishing year. If implemented as expected by May 2023, these interim measures would be effective for up to 366 days. The interim measures specified the commercial quota as 77% of the commercial ACL. Catch limits in lb gw are as follows:

| | |
|---|---|
| OFL | 4,180,000 |
| ABC | 3,120,000 |
| Stock ACL | 661,901 |
| Commercial ACL (39% of Stock ACL) | 258,000 |
| **Commercial ACT** | *Not Specified* |
| **Commercial Quota** | 199,000 |

**Alternative 2:** Set the commercial quota for the gag IFQ program equal to the commercial ACT. The commercial ACT will be fixed at 86% of the commercial ACL. The IFQ program functions as the AM for the commercial sector for gag.

**Alternative 3:** Set the commercial quota for the gag IFQ program equal the commercial ACT. The commercial ACT will be fixed at 95% of the commercial ACL. The IFQ program functions as the AM for the commercial sector for gag.

**Discussion:**

Under **Alternative 1**, the commercial quota is set at 86% of the commercial ACT, as specified in Amendment 32 (GMFMC 2011b). Therein, the Council determined that reductions in the gag quota under that rebuilding plan assumed a proportional reduction in dead discards of gag. However, due to the limited amount of gag IFQ allocation available in the initial years of that rebuilding plan, gag bycatch and discards from fishermen targeting red grouper or other fish were predicted to be higher than assumed in the assessment projections. Data to inform the effects of changes to commercial dead discards were sparse or lacking when Amendment 32 was developed. The Council decided to explicitly account for dead discards in the commercial sector that are not accounted for in the assessment analyses by reducing the gag commercial quota to 86% of the commercial ACT to compensate for dead discards not being reduced sufficiently to projected levels needed to achieve 100% of the commercial ACT. For the commercial sector, the IFQ program serves as the AM (Amendment 29; GMFMC 2008b). As with Alternative 1 in Sub-Action 3.1, **Alternative 1** in Sub-Action 3.2 is a non-viable alternative, since it uses $F_{MAX}$, which is no longer consistent with the best scientific information available.

**Alternative 2** and **Alternative 3** would both set the commercial quota for gag equal to the commercial ACT. The commercial ACT would be set at a fixed percentage below the commercial ACL, as either 86% (**Alternative 2**) or 95% (**Alternative 3**) of the commercial ACL. The resultant commercial ACTs are demonstrated relative to the commercial ACLs in Table 2.3.1. The gag IFQ program serves as the AM for the commercial sector for both of these alternatives. Setting the commercial quota equal to the commercial ACT is consistent with the treatment of the ACT/quota relationship used in other IFQ program species in the Gulf (e.g., red grouper, shallow-water grouper). **Alternative 2** takes the current buffer between the commercial ACT and commercial quota, as specified in **Alternative 1**, and applies it as the buffer between the commercial ACT and commercial ACL. The logic for this 14% buffer comes from the 2011 gag interim rule (NMFS 2011) and Amendment 32 (GMFMC 2011b). At the February 2011 Council meeting, NMFS presented an analysis of best case and worst case scenarios regarding reduction of commercial gag bycatch in proportion to the reduction in gag commercial quota under the temporary rule to set the 2011 quota. It was unknown at the time how commercial fishermen would behave under the newly implemented IFQ program. If commercial fishermen with little or no gag allocation actively sought to avoid gag while fishing for red grouper and other shallow-water grouper, then dead discards of gag would be reduced approximately in proportion to the reduction in quota. However, if fishermen maintained their pre-IFQ fishing patterns, then dead discards of gag would not be reduced and could increase. Under the best case scenario in the 2011 analysis, no adjustment for dead discards would be necessary, and the quota could remain at 100% of the commercial allocation. Under the worst case scenario in the 2011 analysis, the quota would need to be reduced to 47% of the unadjusted allocation in order to achieve the necessary reduction in total removals after accounting for dead discards to stay in line with the rebuilding plan. The Council thought the true scenario would be between the best and worst case scenarios, but likely closer to the best case. The Council ultimately decided to place the adjustment at the 75th percentile between the worst and best case. This was calculated to be 86% of the unadjusted allocation, or a 14% reduction. This adjustment was applied in the 2011 temporary rule, and in Amendment 32.

**Alternative 3** would reduce the buffer between the commercial ACT and commercial ACL to 5%. Since the analysis that resulted in the management decisions in Amendment 32, considerable improvements in the estimation of commercial landings and discards have occurred (SEDAR 72 2022). Commercial landings are considered to be known with greater precision, and are modeled with a coefficient of variation in the stock assessment model of 0.01. Commercial discards and the fraction of commercial catch that is discarded are also included in the model and are factored into the yield projections that inform catch limit recommendations from the SSC. Further, the fraction of gag discarded compared to the total number of gag caught has remained low, especially for the commercial longline fleet (NMFS 2022b).

**Table 2.3.1.** Recreational and commercial ACLs and ACTs based on alternatives and options in Action 3 compared to viable alternatives in Action 2. Catch limits are expressed in mp gw.

| | | | Action 3 Alternatives | | | | |
|---|---|---|---|---|---|---|---|
| | | | Sub-Action 3.1 | | Sub-Action 3.2 | | |
| | | | Alternative 2 | | | Alternative 2 | Alternative 3 |
| Year | Action 2 Alternatives | Action 2 Options | Rec ACL | Rec ACT | Com ACL | Com ACT/ Quota | Com ACT/ Quota |
| **2024** | Alternative 2 | Option 2a | 0 | 0 | 0 | 0 | 0 |
| | | Option 2b | 0.276 | 0.248 | 0.176 | 0.151 | 0.167 |
| | | Option 2c | 0.333 | 0.299 | 0.213 | 0.183 | 0.202 |
| | Alternative 3 | Option 3a | 0 | 0 | 0 | 0 | 0 |
| | | Option 3b | 0.288 | 0.259 | 0.155 | 0.133 | 0.147 |
| | | Option 3c | 0.349 | 0.314 | 0.188 | 0.161 | 0.178 |
| **2025** | Alternative 2 | Option 2a | 0 | 0 | 0 | 0 | 0 |
| | | Option 2b | 0.382 | 0.344 | 0.244 | 0.209 | 0.231 |
| | | Option 2c | 0.456 | 0.410 | 0.292 | 0.251 | 0.277 |
| | Alternative 3 | Option 3a | 0 | 0 | 0 | 0 | 0 |
| | | Option 3b | 0.399 | 0.359 | 0.215 | 0.184 | 0.204 |
| | | Option 3c | 0.478 | 0.430 | 0.257 | 0.221 | 0.244 |
| **2026** | Alternative 2 | Option 2a | 0 | 0 | 0 | 0 | 0 |
| | | Option 2b | 0.477 | 0.429 | 0.305 | 0.262 | 0.290 |
| | | Option 2c | 0.564 | 0.507 | 0.361 | 0.310 | 0.343 |
| | Alternative 3 | Option 3a | 0 | 0 | 0 | 0 | 0 |
| | | Option 3b | 0.499 | 0.449 | 0.269 | 0.231 | 0.255 |
| | | Option 3c | 0.592 | 0.532 | 0.319 | 0.274 | 0.303 |
| **2027** | Alternative 2 | Option 2a | 0 | 0 | 0 | 0 | 0 |
| | | Option 2b | 0.586 | 0.527 | 0.374 | 0.321 | 0.355 |
| | | Option 2c | 0.687 | 0.618 | 0.439 | 0.377 | 0.417 |
| | Alternative 3 | Option 3a | 0 | 0 | 0 | 0 | 0 |
| | | Option 3b | 0.613 | 0.551 | 0.330 | 0.283 | 0.313 |
| | | Option 3c | 0.720 | 0.648 | 0.388 | 0.333 | 0.368 |
| **2028** | Alternative 2 | Option 2a | 0 | 0 | 0 | 0 | 0 |
| | | Option 2b | 0.718 | 0.646 | 0.459 | 0.394 | 0.436 |
| | | Option 2c | 0.836 | 0.752 | 0.534 | 0.459 | 0.507 |
| | Alternative 3 | Option 3a | 0 | 0 | 0 | 0 | 0 |
| | | Option 3b | 0.751 | 0.675 | 0.404 | 0.347 | 0.383 |
| | | Option 3c | 0.876 | 0.788 | 0.472 | 0.405 | 0.448 |

## 2.4 Action 4: Modification of Gulf Gag Recreational Fishing Season Start Date and Accountability Measures (AMs)

**Alternative 1:** No Action. Retain the current June 1 recreational fishing season opening for gag and the requirement that NMFS prohibit harvest when the recreational ACL is projected to be met. In addition, if recreational landings exceed the recreational ACL, NMFS will maintain the recreational ACT for the following fishing year at the level of the prior year's ACT, unless the best scientific information available determines that maintaining the prior year's ACT is unnecessary.

**Alternative 2:** Retain the current June 1 recreational fishing season opening for gag. Modify the AMs to direct to NMFS prohibit harvest when the recreational ACT is projected to be met. In addition, remove the provision that requires NMFS to maintain the prior year's ACT if the ACL is exceeded in the previous year.

**Alternative 3:** The federal recreational fishing season for Gulf gag would open on 12:01 am local time on September 1. Modify the AMs to direct to NMFS prohibit harvest when the recreational ACT is projected to be met. In addition, remove the provision that requires NMFS to maintain the prior year's ACT if the ACL is exceeded in the previous year.

**Alternative 4:** The federal recreational fishing season for Gulf gag would open on 12:01 am local time on October 1. Modify the AMs to direct to NMFS prohibit harvest when the recreational ACT is projected to be met. In addition, remove the provision that requires NMFS to maintain the prior year's ACT if the ACL is exceeded in the previous year.

**Discussion:**

This action would modify the start date for the Gulf federal gag recreational fishing season and modify the AMs. Action 3 in this document contains only one viable alternative for modifying the recreational ACT, which results in a 10% buffer between the recreational ACT and recreational ACL. That buffer is assumed in the recreational fishing season duration analyses for Action 4 and in Appendix B. The intent of this action is to balance the number of days the season would be open with the necessity to reduce the overall mortality of gag, with special attention paid to reducing fishing mortality on male gag, which make up a historically unprecedented low proportion of the exploitable biomass (less than 2%, SEDAR 72 2022). Each of these alternatives, in concert with whichever alternatives are selected as preferred in Action 2 and Action 3, Sub-Action 3.1, constitutes a shorter fishing season duration compared to past fishing seasons, which have been open from June 1 – December 31 since 2018 (note that the 2023 temporary rule will reduce the recreation gag season to 70 days). Because the season opening dates proposed in **Alternatives 3** and **4** would be in the fall, there would not be sufficient time for NMFS to receive landings data to analyze in-season or prior to the end of the fishing year. Thus, the season duration would be based solely on NMFS projecting the season length initial projection without any possibility of re-opening. As such, the uncertainty in the

recreational fishing season duration projections for all of the alternatives is expected to be substantial until additional years of daily catch and effort data are available based on the season opening date selected. However, under **Alternatives 1** and **2**, if any portion of the recreational ACL or ACT, respectively, was not landed by the conclusion of the projected fishing season, NMFS could reopen the recreational fishing at some point before the end of the fishing year on December 31 after landings became available to determine if the catch limit had been met. Alternative 1 in Action 2 would not reduce overfishing, and Alternative 1 in Sub-action 3.1 of Action 3 are not consistent with the best scientific information available; therefore, neither is included in the discussion of Action 4 alternatives.

The compressed fishing season durations projected in Action 4 are not without an inherent risk of exceeding the recreational ACL. For the recreational sector, the current post-season AM, which would be employed in **Alternative 1**, is intended to prevent successive overages of the recreational ACL. The AM states that if gag is overfished and the recreational ACL is exceeded in a fishing year, then in the following fishing year, the amount of the overage will be deducted from the following fishing year's recreational ACL. Further, the recreational ACT from the previous season will be maintained, as reduced by the amount of the ACL overage from the previous year, and the fishing season duration will be set based on the revised recreational ACT. **Alternatives 2**, **3**, and **4** would modify the AMs to direct to NMFS prohibit harvest when the recreational ACT is projected to be met. In addition, **Alternatives 2**, **3**, and **4** would remove the provision that requires NMFS to maintain the prior year's ACT if the ACL is exceeded in the previous year.

The fishing season durations projected in Action 4 were determined from dividing the monthly landings for 2019 – 2021 by the number of days per month to determine the daily catch rates applicable to the season opening. An important caveat to these data is that daily landings estimates are assumed to be the same for both weekends and weekdays. Landings data for private vessels were informed by SRFS; recreational shore and charter for-hire landings were informed by MRIP-FES; and, headboat landings were informed by the Southeast Region Headboat Survey.

Modifications to when the fishing season begins within the fishing year are expected to have positive or negative consequences depending on the time of year when fishing effort occurs. Several other reef fish species are open to recreational harvest in federal waters in the Gulf during June (e.g., red snapper, red grouper, gray snapper, hogfish, vermilion snapper), and gag may be caught during fishing activity directed at these species. Thus, having a recreational fishing season for gag co-occurring during this peak in recreational reef fish fishing may reduce regulatory dead discards of gag during the overlapping season. Also, during the summer months (i.e., June through September), water temperatures along the west Florida Shelf are typically considerably warmer than in October through December. Fishermen have often reported that gag feed more aggressively when water temperatures are cooler, and particularly when nearshore waters (less than 20 meters depth) are cooler (public testimony at Council meetings). Further, studies on other reef fish describe variable discard mortality rates relative to the time of year when a fish is captured, noting that discard mortality has been observed to be lower when fish are caught and released into cool surface water compared to warm surface water (e.g., Campbell et al. 2014; Bohaboy et al. 2019, Pulver 2017). Thus, fishing for gag during summer months,

especially from deeper water (greater than 20 meters depth) where barotrauma becomes an increasingly influential factor on discard mortality for gag (Lazarre et al. 2021), may result in increased discard mortality compared to fishing for gag during comparatively cooler fall and/or winter months.

Recreational fishing season durations for the alternatives proposed in Action 4 are detailed in Table 2.4.1, and in further detail in Appendix B. **Alternative 1** would maintain the June 1 season start date and would maintain the current AM (i.e. managing to the ACL, and to the ACT in the year following an ACL overage). Under **Alternatives 2-4**, NMFS would close harvest for gag when the recreational ACT is projected to be met. Based on the fishing season duration projections, a season starting June 1 is projected to last 27 – 37 days depending on the alternative chosen in Action 3, and the duration would increase to 130 – 159 days by 2028. **Alternative 2** would maintain the June 1 season start date, but manage to the ACT rather than the ACL. Based on the fishing season duration projections, a season starting June 1 is projected to last 24 – 31 days depending on the alternative chosen in Action 3, and the duration would increase to 111 – 145 days by 2028. Because the recreational gag fishing season has traditionally started on June 1, the estimated season duration for both **Alternatives 1** and **2** may be less uncertain relative to **Alternatives 3** and **4**, and thus may more likely constrain landings to the ACL or ACT. However, because the season would be compressed from the June 1 – December 31 fishing season to which recreational anglers have grown accustomed, the shorter fishing season under **Alternatives 1** and **2** may increase or compress effort and make accurately predicting the season duration problematic compared to previous fishing years. Unlike the **Alternatives 3** and **4**, under **Alternative 1 and 2**, if landings (when received after the season closure) were found to be substantially below the gag recreational ACL (or ACT for **Alternative 2**), NMFS could reopen the fishing season prior to the end of the fishing year, allowing for harvest of the remaining recreational ACL.

**Table 2.4.1.** Season duration, start date, and projected end date for Action 4 alternatives, excluding Option a from Alternatives 2 and 3 in Action 2 (TMin at F = 0). The recreational catch limits shown in the table represent the proposed catch limits for the 2024 – 2028 fishing years under Alternative 2 of Sub-Action 3.1 in Action 3. The range of dates listed under the projected season closure date for 2024 represent the predicted margin of error in the projections, based on the landings data (catch and effort) from 2019 – 2021. Note: This table is identical to Table B2 in Appendix B.

| **Action 2, Alternative 1 (No Action): 39% commercial \| 61% recreational** | | | | | | |
|---|---|---|---|---|---|---|
| **Action 2 Alternatives** | Rec ACL (lb gw) | Action 4, Alt 1: Jun 1 | Rec ACT (lb gw) | Action 4, Alt 2: Jun 1 | Action 4, Alt 3: Sep 1 | Action 4, Alt 4: Oct 1 |
| **No Action** | 1,903,000 | No Closure | 1,708,000 | | No Closure | |
| **Action 2, Alternative 2: 39% commercial \| 61% recreational** | | | | | | |
| **Alt 2a: $T_{Min}$ @ F=0** | 0 | **No Season** | 0 | **No Season** | **No Season** | **No Season** |
| **Alt 2b: 75% of $F_{40\%SPR}$** | | | | | | |
| **2024** | 276,000 | **Jun 27 Jun 25 – Jun 30** (27 days) | 248,000 | **Jun 24 Jun 23 – Jun 27** (24 days) | **Nov 1 Oct 10 – Dec 28** (62 days) | **Nov 13 Oct 24 – None** (44 days) |
| **2025** | 382,000 | **Jul 13** | 344,000 | **Jul 6** | **Nov 13** | **Nov 25** |

| | | | | | | |
|---|---|---|---|---|---|---|
| | | (43 days) | | (36 days) | (74 days) | (56 days) |
| **2026** | 477,000 | **Jul 29** (59 days) | 429,000 | **Jul 21** (51 days) | **Nov 24** (85 days) | **Dec 5** (66 days) |
| **2027** | 586,000 | **Aug 31** (92 days) | 527,000 | **Aug 12** (73 days) | **Dec 5** (96 days) | **Dec 15** (76 days) |
| **2028** | 718,000 | **Oct 8** (130 days) | 646,000 | **Sep 19** (111 days) | **Dec 18** (109 days) | **Dec 28** (89 days) |
| **Alt 2c: $T_{Min}$*2** | | | | | | |
| **2024** | 333,000 | **July 4**<br>**Jun 30 – Jul 12** (34 days) | 300,000 | **Jun 29**<br>**Jun 27 – Jul 4** (29 days) | **Nov 7**<br>**Oct 15 – None** (68 days) | **Nov 19**<br>**Oct 29 – None** (50 days) |
| **2025** | 456,000 | **Jul 26** (56 days) | 411,000 | **Jul 18** (48 days) | **Nov 21** (82 days) | **Dec 3** (64 days) |
| **2026** | 564,000 | **Aug 24** (85 days) | 508,000 | **Aug 6** (67 days) | **Dec 3** ( 94 days) | **Dec 13** (74 days) |
| **2027** | 687,000 | **Oct 1** (123 days) | 619,000 | **Sep 10** (102 days) | **Dec 15** (106 days) | **Dec 25** (86 days) |
| **2028** | 836,000 | **Nov 1** (154 days) | 752,000 | **Oct 15** (137 days) | **Dec 29** (120 days) | No Closure |
| **Action 2, Alternative 3: 35% commercial \| 65% recreational** | | | | | | |
| **Alt 3a: $T_{Min}$ @ F=0** | 0 | **No Season** | 0 | **No Season** | **No Season** | **No Season** |
| **Alt 3b: 75% of $F_{40\%SPR}$** | | | | | | |
| **2024** | 288,000 | **Jun 28**<br>**Jun 26 – Jul 1** (28 days) | 259,000 | **Jun 25**<br>**Jun 23 – Jun 28** (25 days) | **Nov 2**<br>**Oct 11 – None** (63 days) | **Nov 14**<br>**Oct 25 – None** (45 days) |
| **2025** | 399,000 | **Jul 16** (46 days) | 359,000 | **Jul 9** (39 days) | **Nov 15** (76 days) | **Nov 27** (58 days) |
| **2026** | 499,000 | **Aug 3** (64 days) | 449,000 | **Jul 24** (54 days) | **Nov 26** (87 days) | **Dec 7** (68 days) |
| **2027** | 613,000 | **Sep 8** (100 days) | 551,000 | **Aug 20** (81 days) | **Dec 8** (99 days) | **Dec 18** (79 days) |
| **2028** | 751,000 | **Oct 15** (137 days) | 676,000 | **Sep 28** (120 days) | **Dec 21** (112 days) | No Closure |
| **Alt 3c: $T_{Min}$*2** | | | | | | |
| **2024** | 349,000 | **Jul 7**<br>**Jul 2 – Jul 16** (37 days) | 314,000 | **Jul 1**<br>**Jun 28 – Jul 7** (31 days) | **Nov 9**<br>**Oct 16 – None** (70 days) | **Nov 21**<br>**Oct 30 – None** (52 days) |
| **2025** | 478,000 | **Jul 29** (59 days) | 430,000 | **Jul 21** (51 days) | **Nov 24** (85 days) | **Dec 5** (66 days) |
| **2026** | 592,000 | **Sep 2** (94 days) | 533,000 | **Aug 14** (75 days) | **Dec 6** (97 days) | **Dec 16** (77 days) |
| **2027** | 720,000 | **Oct 8** (130 days) | 648,000 | **Sep 20** (112 days) | **Dec 18** (109 days) | **Dec 28** (89 days) |
| **2028** | 876,000 | **Nov 6** (159 days) | 789,000 | **Oct 23** (145 days) | No Closure | No Closure |

**Alternative 3** would modify the start date for the gag recreational fishing season to September 1. A season starting September 1 is projected to last 62 – 70 days in 2024, depending on the alternatives chosen in Actions 2 and 3, and the duration would increase to 109 – 122 days (no closure by December 31) by 2028. Thus, it is projected under one Alternative 3 options that the 2028 catch limit would not be fully harvested. Also, because the recreational gag season has never opened on September 1, there is substantial uncertainty associated with effort and catch rates under **Alternative 3**. Because the gag season has traditionally already been open for three months by September 1, these projected harvest rates may underestimate effort and catch for a season that opens on September 1. This is because there may be increased fishing pressure by anglers who can no longer target gag in June, and could shift that effort to the new season. An Interim Rule is being developed that would start the recreational season for gag on September 1, 2023,which is expected to provide better estimates of catch rates for 2024 and later years than are currently available for alternatives with later season start dates including **Alternatives 3** and **4**.

**Alternative 4** would modify the start date for the gag recreational fishing season to October 1. It is projected that the season would last 44 – 52 days in 2024, depending on the alternatives chosen in Actions 2 and 3, and the duration would increase to 89 – 92 days (no closure) by 2028. Thus, it is projected under most Alternative 4 options that the 2028 catch limit would not be fully harvested. Like **Alternative 3**, because the recreational gag season has never opened on October 1, there is substantial uncertainty associated with effort and catch rates under **Alternative 4**. Because the gag season has traditionally already been open for four months (for an October 1 opening), this projected harvest rate may underestimate effort and catch for these proposed recreational fishing seasons. This is because there may be increased fishing pressure by anglers that can no longer target gag beginning on June 1, and could shift that effort to the new season. **Alternative 4** proposes a maximum season of 52 days in 2024 (i.e., November 21); thus, there would be no data available to analyze in-season to verify whether landings will exceed the ACL. Like **Alternative 3**, landings under **Alternative 4** would not be expected to be available for analysis until after the end of the fishing year.

**Alternative 3** is projected to result in the longest possible fishing season in 2024 (70 days) of the alternatives, followed by **Alternative 4** (52 days), **Alternative 1** (37 Days) and then **Alternative 2** (31 days). However, the duration of the fishing season would change in successive years. **Alternative 1** and **Alternative 3** are projected to have approximately the same number of fishing days (94 vs. 97, respectively) by 2026, as would **Alternatives 2** (75 days) and **4** (77 days). By 2028, **Alternative 1** would have the longest fishing season (159 days), followed by **Alternative 2** (145 days), **Alternative 3** (122 days), and **Alternative 4** (92 days). In addition, **Alternatives 1** and **2** are expected to fully harvest the gag quota in each year from 2024-2028, while **Alternatives 3** and **4** are not expected to fully harvest the quota under some options. Unlike **Alternatives 1** and **2, Alternatives 3** and **4** would not allow fishing until the fall. If the ACT was projected to be met and harvest was closed, it could not be reopened before the end of the year because landings would not be available to determine if the ACT had been met. **Alternative 1** and **2** have similar levels of uncertainty, as the only difference is whether the landings are managed to the ACL or the ACT. Catch limits are less likely to be exceeded under **Alternatives 2, 3,** and **4** because fishing would be constrained to the recreational ACT, which provides for a buffer below the ACL. Compared to **Alternative 1** and **2**, the other alternatives

there is greater uncertainty in projecting when the recreational ACT would be met because the season has never started at the beginning of September (**Alternative 3**), or October (**Alternative 4**), although a season starting September 1 would take place in 2023 under the interim measures. However, given the reduction in the recreational ACL required to reduce overfishing under Action 2, it is uncertain how fishing behavior may change even with a June 1 (**Alternative 1 and 2**) start date. Under any of the alternatives, NMFS would have to evaluate available information and consider uncertainty when estimating closure projections. Under each of the alternatives in Action 4, the projected recreational fishing season durations are expected to increase in successive years as the recreational ACL and ACT increase.

# CHAPTER 3. AFFECTED ENVIRONMENT

## 3.1 Description of the Physical Environment

**General Description of the Physical Environment**

The physical environment for Gulf of Mexico (Gulf) reef fish is detailed in the Environmental Impact Statement for the Generic Essential Fish Habitat (EFH) Amendment (GMFMC 2004), Generic EFH Amendment 3 (GMFMC 2005), and the Generic Annual Catch Limit/Accountability Measure (ACL/AM) Amendment (GMFMC 2011a), which are hereby incorporated by reference and summarized below.

The Gulf has a total area of approximately 600,000 square miles (1.5 million $km^2$), including state waters (Gore 1992). It is a semi-enclosed, oceanic basin connected to the Atlantic Ocean by the Straits of Florida and to the Caribbean Sea by the Yucatan Channel (Figure 3.1.1).

Oceanographic conditions are affected by the Loop Current, discharge of freshwater into the northern Gulf, and a semi-permanent, anti-cyclonic gyre in the western Gulf. The Gulf includes both temperate and tropical waters (McEachran and Fechhelm 2005). Gulf water temperatures range from 54º F to 84º F (12º C to 29º C) depending on time of year and depth of water. Mean annual sea surface temperatures ranged from 73º F through 83º F (23-28º C) including bays and bayous (Figure 3.1.1) between 1982 and 2009, according to satellite-derived measurements (NODC 2011).[8] In general, mean sea surface temperature increases from north to south with large seasonal variations in shallow waters.

[8] http://accession.nodc.noaa.gov/0072888

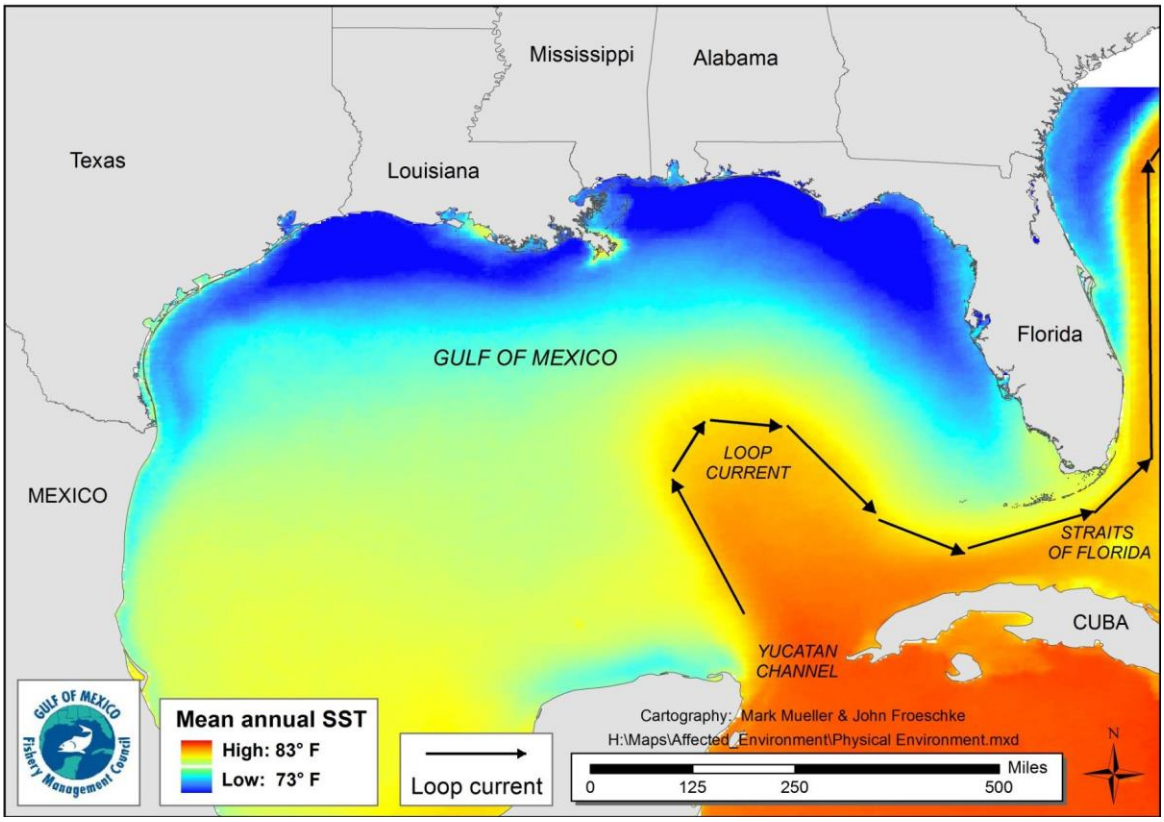


**Figure 3.1.1.** Mean annual sea surface temperature derived from the Advanced Very High-Resolution Radiometer Pathfinder Version 5 sea surface temperature data set.[9]

**General Description of the Reef Fish Physical Environment**

In general, reef fish are widely distributed in the Gulf, occupying both pelagic and benthic habitats during their life cycle. They generally have a planktonic larval stage that lives in the water column and feeds on zooplankton and phytoplankton (GMFMC 2004). Juvenile and adult reef fish are typically demersal and usually associated with bottom topographies on the continental shelf (less than 100 m) which have high relief, i.e., coral reefs, artificial reefs, rocky hard-bottom substrates, ledges and caves, sloping soft-bottom areas, and limestone outcroppings. However, several species are found over sand and soft-bottom substrates. For example, some juvenile snapper (e.g., mutton, gray, red, dog, lane, and yellowtail snappers) and grouper (e.g., goliath, red, gag, and yellowfin groupers) are associated with inshore seagrass beds, mangrove estuaries, lagoons, and larger bay systems.

Gag are primarily caught on the west coast of Florida from Lee County north into the Florida Panhandle, and very occasionally off Alabama (Schirripa and Goodyear 1994). Newly settled juveniles are estuarine dependent, occurring in shallow seagrass beds during late spring and summer (Koenig and Coleman 1998; Strelcheck et al. 2003). At the onset of the first winter,

[9] http://pathfinder.nodc.noaa.gov

juvenile gag begins to migrate out of inshore nursery habitats, although some juvenile gag may remain in inshore waters during winter (Heinisch and Fable 1999). After female gag reach sexual maturity (50% are sexually mature by approximately 24 inches total length; SEDAR 72 2022), they may move to deeper, offshore waters to spawn. Adults can be found in and around structure from bays and nearshore waters out to offshore habitats in excess of 100 meters depth (Lindberg et al. 2006; Collins and Barbieri 2017; Grüss et al. 2017). After leaving inshore nursery habitat, adult gag demonstrate relatively strong site fidelity (Lindberg et al. 2006; Collins and Barbieri 2017). Adult males are usually only found in regions of the West Florida Shelf to the South of Apalachicola in bottom depths exceeding 60 m (including the Madison-Swanson and Steamboat Lumps marine protected areas), and may rarely be captured on the continental shelf of LA and TX. Adult males are generally found at an average depth of 93 m (Grüss et al. 2017).

**Habitat Areas of Particular Concern (HAPC) and Environmental Sites of Special Interest**

Detailed information pertaining to HAPCs is provided in Generic Amendment 3 (GMFMC 2005) and Amendment 9 to the Fishery Management Plan for the Coral and Coral Reefs of the Gulf of Mexico, U.S. Waters (GMFMC 2018). Detailed information pertaining to the Gulf area closures and marine reserves is provided in Amendment 32 to the Fishery Management Plan for the Reef Fish Resources in the Gulf of Mexico (Reef Fish FMP; GMFMC 2011b). There are environmental sites of special interest that are discussed in the Generic EFH Amendment (GMFMC 2004) that are relevant to Reef Fish management. These documents are hereby incorporated by reference.

**Northern Gulf of Mexico Hypoxic Zone**

Every summer in the northern Gulf, a large hypoxic zone forms. It is the result of allochthonous materials and runoff from agricultural lands resulting in increasing nutrient inputs to multiple rivers. These tributaries feed in to the Mississippi River, which disperses to the Gulf, and creates a temperature and salinity dependent layering of waters. The nutrient rich fresh waters from the Mississippi create seasonal, large algal blooms at the surface that eventually die, sink to the bottom, and decompose. This creates the oxygen-poor, hypoxic, bottom water layer unless front or storm events occur, which allows for mixing of the layers (Rabalais and Turner 2019). Mapping of the hypoxic zone began in 1985. For 2021, the extent of the hypoxic area was 6,334 square miles, almost triple what it was in 2020 (2,116 square miles), but still less than the extent of the 2017 hypoxic area (8,776 square miles). The changes in hypoxic area can be attributed to changing amounts of river discharge and its associated nutrient load and storm events. The major factor for the reduced size in 2020 was the active storm season with Hurricane Hanna passing right over the zone, allowing for mixing of the waters. The 2021 hypoxia area was higher than the 5-year hypoxic area average (5,408 square miles) and much larger than the 1,930 square mile goal set by the Interagency Mississippi River and Gulf of Mexico Hypoxia Task Force to be reached by 2035.[10] The hypoxic conditions in the northern Gulf directly impact less

[10] http://gulfhypoxia.net

mobile benthic macroinvertebrates (e.g., polychaetes) by influencing density, species richness, and community composition (Baustian and Rabalais 2009; Breitburg et al. 2018). However, more mobile macroinvertebrates and demersal fishes, such as gag, are able to detect lower dissolved oxygen levels and move away from hypoxic conditions. Therefore, these organisms are indirectly affected by limited prey availability and constrained available habitat (Baustian and Rabalais 2009; Craig 2012).

**Greenhouse Gases**

The Intergovernmental Panel on Climate Change (IPCC) has indicated greenhouse gas emissions are one of the most important drivers of recent changes in climate. Perez (2017) inventoried the sources of greenhouse gases in the Gulf from sources associated with oil platforms and those associated with other activities such as fishing. A summary of the results of the inventory are shown in Table 3.1.1 with respect to total emissions and fishing. Commercial fishing and recreational vessels make up a small percentage of the total estimated greenhouse gas emissions from the Gulf (2.04% and 1.67%, respectively).

**Table 3.1.1.** Total Gulf greenhouse gas 2014 emissions estimates (in tons per year) from oil platform and non-oil platform sources, commercial fishing, and percent greenhouse gas emissions from commercial fishing vessels of the total emissions*.

| Emission source | $CO_2$ | Greenhouse $CH_4$ | Gas $N_2O$ | Total $CO_{2e}$** |
|---|---|---|---|---|
| **Oil platform** | 5,940,330 | 225,667 | 98 | 11,611,272 |
| **Non-platform** | 14,017,962 | 1,999 | 2,646 | 14,856,307 |
| **Total** | **19,958,292** | **227,665** | **2,743** | **26,467,578** |
| **Commercial fishing** | 531,190 | 3 | 25 | 538,842 |
| **Recreational fishing** | 435,327 | 3 | 21 | 441,559 |
| **Percent commercial fishing** | 2.66% | >0.01% | 0.91% | 2.04% |
| **Percent recreational fishing** | 2.18% | >0.01% | 0.77% | 1.67% |

*Compiled from Tables 6–11, 6–12, and 6–13 in Perez (2017). **The $CO_2$ equivalent ($CO_{2e}$) emission estimates represent the number of tons of $CO_2$ emissions with the same global warming potential as one ton of another greenhouse gas (e.g., $CH_4$ and $N_2O$). Conversion factors to $CO_{2e}$ are 21 for $CH_4$ and 310 for $N_2O$.

## 3.2 Description of the Biological/Ecological Environment

The biological environment of the Gulf, including for gag, is described in detail in the Generic EFH Amendment (GMFMC 2004), Generic ACL/AM Amendment (GMFMC 2011a), and Reef Fish Amendments 30A (GMFMC 2008) and 35 (GMFMC 2012) which are hereby incorporated by reference and summarized below.

**Gag Life History and Biology**

Newly settled gag juveniles are estuarine dependent and are usually found in shallow seagrass beds during late spring and summer (Koenig and Coleman 1998; Strelcheck et al. 2003). As gag

matures, it moves to deeper, offshore waters to spawn. Gag is protogynous, transitioning from female to male at older ages. Age and size at which 50% of females undergo sexual transition is approximately 11.5 years and 43 inches total length (TL; 110 cm TL: Lowerre-Barbieri et al. 2021). Maximum age is estimated to be 33 years (SEDAR 72 2022), and 50% of females are mature by 3.7 years of age and 23 inches TL (58.5 cm TL; Fitzhugh et al. 2006). Gag forms spawning aggregations at depths ranging from 160-400 feet (Coleman et al. 1996). In the eastern Gulf, the spawning season is estimated to extend from late January to mid-April, with a peak in March (Fitzhugh et al 2006). Often, immature female gag are found with spawning aggregations (Coleman et al. 1996). Gag can reach a maximum length and weight of 54 inches (138 cm TL) and 68 lb (31 kg) (Lombardi et al 2006).

**Status of the Gag Stock**

See Chapter 1.1: Background, for more information. In summary, according to SEDAR 72 (2022), gag is overfished and undergoing overfishing as of 2019.

**Bycatch**

Details of bycatch in the gag portion of the reef fish fishery can be found in Chapter 7 (Bycatch Practicability Analysis [BPA]) of Amendment 38 (GMFMC 2012b) to the Reef Fish FMP and in Chapter 4 (BPA) to Amendment 30B to the Reef Fish FMP (GMFMC 2005), and is hereby incorporated by reference.

Gag is part of the reef fish complex, and may be captured incidentally while fishing for other species, especially other groupers and snappers which are also known to be captured while targeting gag. Several reef species are undergoing overfishing including gag, greater amberjack, cubera snapper, the jacks complex, and the mid-water snapper complex, while both gag and greater amberjack are also overfished. The overfished status deep-water groupers is unknown (National Marine Fisheries Service [NMFS] 4th quarter 2022 Update Summary of Stock Status for non-Federal Strategic Sourcing Initiative [FSSI] stocks).[11] Minimum size limits are estimated to be the greatest source of regulatory discards for the majority of reef fish species. Both fishing sectors are currently constrained to a 24-inch fork length (FL) minimum size limit for gag. The bag limit (2 gag per person as part of a 4-total grouper recreational bag limit) can also contribute to bycatch, although not as substantial a role as minimum size limits. Because gag habitat and fishing grounds overlap with many other commonly targeted reef fish species, catch (and potentially discards) of gag while targeting other species, and vice versa, may occur frequently. Interactions with other species such as sea turtles and sea birds are known to occur, but are minimal (see next section).

This assessment considers measures that are expected to affect gag discard mortality due to reducing allowable catch and shortening and potentially moving the starting date of the gag recreational fishing season. However, there is some biological benefit to the managed species

[11] https://www.fisheries.noaa.gov/national/population-assessments/fishery-stock-status-updates

that outweigh any increases in discards by allowing more fish to remain in the water due to the reduced catch limit and change in the open fishing season duration. Discard mortality rates for reef fish have been positively correlated with warmer water temperatures (Pulver 2017), and Alternatives 2 and 3 in Action 4 correspond to a recreational season that is closed when water temperatures are warmest. However, even under Action 4 Alternatives 2 and 3, there may be an increase in discards during warmer water months because any gag captured while fishing for other species (especially red snapper, which experiences peak fishing pressure in June and July) would be required to be released. Ultimately, overall mortality of Gulf gag would be expected to be substantially lower under this rule due to the changes in the recreational fishing season and the reduced catch limits.

**Protected Species and Protected Species Bycatch**

NMFS manages marine protected species in the Southeast region under the Endangered Species Act (ESA) and the Marine Mammal Protection Act (MMPA). A brief summary of these two laws and more information is available on NMFS Office of Protected Resources website.[12] ESA-listed species or Distinct Population Segments (DPS) of marine mammals, sea turtles, fish, and corals occur in the exclusive economic zone (EEZ) of the Gulf. There are numerous stocks of marine mammals managed within the Southeast region. All marine mammals in U.S. waters are protected under the MMPA.

The five whale species that may be present in the Gulf (blue, sperm, sei, fin, and Rice's[13]) are listed as endangered under the ESA. Rice's whales are the only resident baleen whales in the Gulf. Manatees, listed as threatened under the ESA, also occur in the Gulf and are the only marine mammal species in this area managed by the U.S. Fish and Wildlife Service.

Sea turtles, fish, and corals that are listed as threatened or endangered under the ESA occur in the Gulf. These include the following: six species of sea turtles (Kemp's ridley, loggerhead (Northwest Atlantic Ocean DPS), green (North Atlantic and South Atlantic DPSs), leatherback, and hawksbill); five species of fish (Gulf sturgeon, smalltooth sawfish, Nassau grouper, oceanic whitetip shark, and giant manta ray); and six species of coral (elkhorn, staghorn, lobed star, mountainous star, boulder star, and rough cactus). Critical habitat designated under the ESA for smalltooth sawfish, Gulf sturgeon, and the Northwest Atlantic Ocean DPS of loggerhead sea turtles occur in the Gulf, though only loggerhead critical habitat occurs in federal waters.

The most recent biological opinion (BiOp) for the FMP was completed on September 30, 2011. The BiOp determined the operation of the Gulf reef fish fishery managed under the Reef Fish FMP is not likely to adversely affect ESA-listed marine mammals or coral, and was not likely to jeopardize the continued existence of sea turtles (loggerhead, Kemp's ridley, green, hawksbill,

[12] https://www.fisheries.noaa.gov/about/office-protected-resources

[13] The Rice's whale (*Balaenoptera ricei*) was previously classified as the Gulf of Mexico Bryde's whale but was later identified as morphologically and genetically distinct from other whales under the Bryde's whale complex, warranting classification as a new species of baleen whale living in the Gulf of Mexico.

and leatherback) or smalltooth sawfish. Since issuing the opinion, in memoranda dated September 16, 2014, and October 7, 2014, NMFS concluded that the activities associated with the Reef Fish FMP are not likely to adversely affect critical habitat for the Northwest Atlantic Ocean loggerhead sea turtle DPS and four species of corals (lobed star, mountainous star, boulder star, and rough cactus).

On April 6, 2016, NMFS and the U.S. Fish and Wildlife Service published a final rule (81 FR 20057) removing the range-wide and breeding population ESA-listings of the green sea turtle and listing eight DPSs as threatened and three DPSs as endangered. Two of the green sea turtle DPSs, the North Atlantic DPS and the South Atlantic DPS, occur in the Gulf and are listed as threatened. In addition, on June 29, 2016, NMFS published a final rule (81 FR 42268) listing Nassau grouper as threatened under the ESA. NMFS has reinitiated consultation on the FMP to address these listings. In a memorandum dated September 29, 2016, NMFS determined that fishing under the Reef Fish FMP during the re-initiation period is not likely to jeopardize the continued existence of the North Atlantic and South Atlantic DPSs of green sea turtles or Nassau grouper.

On January 22, 2018, NMFS published a final rule (83 FR 2916) listing the giant manta ray as threatened under the ESA. On January 30, 2018, NMFS published a final rule (83 FR 4153) listing the oceanic whitetip shark as threatened under the ESA. In a memorandum dated March 6, 2018, NMFS revised the request for re-initiation of consultation on the Reef Fish FMP to address the listings of the giant manta and oceanic whitetip. In that memorandum, NMFS also determined that fishing under the Reef Fish FMP during the extended re-initiation period will not jeopardize the continued existence of the giant manta ray, oceanic whitetip shark, Nassau grouper, or the North Atlantic and South Atlantic DPSs of green sea turtles.

NMFS published a final rule on April 15, 2019, listing the Gulf Bryde's whale (now Rice's whale, see footnote 12 above) as endangered. In a memorandum dated June 20, 2019, NMFS revised the re-initiation request to include the Gulf Bryde's whale (Rice's whale) and determined that fishing under the Reef Fish FMP during the re-initiation period will not jeopardize the continued existence of any of the newly listed species discussed above.[14]

There is no information to indicate marine mammals and birds rely on gag for food, and they are not generally caught by fishermen harvesting gag. The primary gear in the Gulf Reef Fish fishery used to harvest gag is hook-and-line, and they are occasionally captured on bottom longlines and with spearfishing gear. These gear types are classified in the 2023 Marine Mammal Protection Act List of Fisheries as a Category III fishery (88 FR 1689988 FR 16899), meaning the annual mortality and serious injury of a marine mammal resulting from the fishery is less than or equal to 1% of the maximum number of animals, not including natural mortalities, that may be removed from a marine mammal stock while allowing that stock to reach or maintain its optimum sustainable population. Additionally, there is no evidence that the Gulf

[14] The official change to the name has no effect on NMFS's conclusion that the activities associated with the Reef Fish FMP will not jeopardize the continued existence of the species during the revised reinitiation period

gag portion of the reef fish fishery as a whole is adversely affecting seabirds. Dolphins are the only species documented as interacting with the reef fish fishery. Bottlenose dolphin prey upon bait, catch, and/or discarded fish from the reef fish fishery.

### *Deepwater Horizon* MC252 Oil Spill

The presence of polycyclic aromatic hydrocarbons (PAH), which are highly toxic chemicals that tend to persist in the environment for long periods of time, in marine environments can have detrimental impacts on marine finfish, especially during the more vulnerable larval stage of development (Whitehead et al. 2012). The future reproductive success of fish species may be negatively affected by episodic events resulting in high-mortality years or low recruitment. These episodic events could leave gaps in the age structure of the population, thereby affecting future reproductive output (Mendelssohn et al. 2012). Other studies have described the vulnerabilities of various marine finfish species, with morphological and/or life history characteristics similar to species found in the Gulf, to oil spills and dispersants (Hose et al. 1996; Carls et al. 1999; Heintz et al. 1999; Short 2003).

In addition to the crude oil, over a million gallons of the dispersant, Corexit 9500A®, was applied to the ocean surface and an additional hundreds of thousands of gallons of dispersant was pumped to the mile-deep wellhead (National Commission 2010). No large-scale applications of dispersants in deep water had been conducted until the *Deepwater Horizon* MC252 oil spill. Thus, no data exist on the environmental fate of dispersants in deep water. Twenty-first century dispersant applications are thought to be less harmful than their predecessors. However, the combination of oil and dispersants has proven to be more toxic to marine fishes than either dispersants or crude oil alone. Marine fish which are more active (e.g. a pelagic species versus a demersal species) appear to be more susceptible to negative effects from interactions with weathered oil/dispersant emulsions. These effects can include mobility impairment and inhibited respiration (Swedmark et al. 1973). The effect of oil, dispersants, and the combination of oil and dispersants on fishes of the Gulf remains an area of concern. More information about the *Deepwater Horizon* MC252 oil spill is available on the NOAA Southeast Regional Office website.[15]

### Climate Change

Climate change projections predict increases in sea-surface temperature and sea level; decreases in sea-ice cover; and changes in salinity, wave climate, and ocean circulation (IPCC).[16] These changes are likely to affect plankton biomass and fish larvae abundance that could adversely impact fish, marine mammals, seabirds, and ocean biodiversity. Kennedy et al. (2002) and

[15] https://www.fisheries.noaa.gov/news/deepwater-horizon-10-years-later-10-questions
[16] http://www.ipcc.ch/

Osgood (2008) have suggested global climate change could affect temperature changes in coastal and marine ecosystems that can influence organism metabolism and alter ecological processes such as productivity and species interactions; change precipitation patterns and cause a rise in sea level which could change the water balance of coastal ecosystems; altering patterns of wind and water circulation in the ocean environment; and influence the productivity of critical coastal ecosystems such as wetlands, estuaries, and coral reefs. The National Oceanic and Atmospheric Association (NOAA) Climate Change Web Portal[17] predicts the average sea surface temperature in the Gulf and South Atlantic will increase by 2-4ºF (1–3ºC) for 2010–2070 compared to the average over the years 1950–2010. For reef fishes and snapper-grouper species, Burton (2008) and Morley et al. (2018) speculated climate change could cause shifts in spawning seasons, changes in migration patterns, and changes to basic life history parameters such as growth rates.

The distribution of native and exotic species may change with increased water temperature, as may the prevalence of disease in keystone animals such as corals and the occurrence and intensity of toxic algae blooms (Sokolow 2009; Hollowed et al. 2013; Maynard et al. 2015; Wells et al. 2015; Gobler 2020). Some stocks have already shown increases in abundance in the northern Gulf (Fodrie et al. 2010) and Texas estuaries (Tolan and Fisher 2009). Integrating the potential effects of climate change into the fisheries assessment process is currently difficult due to the assessment rarely projecting through a time span that would include detectable climate change effects (Hollowed et al. 2013). However, there are ecosystem models available or being developed that incorporate future, potential, climate change effects (King and McFarlane 2006; Pinsky and Mantua 2014; Grüss et al. 2017b; Chagaris et al. 2019). While complex, this information may need to be incorporate into stock assessments where possible. Better planning and collaboration with managers are currently being pursued to include this type of data into the assessment process.

The Southeast Fisheries Science Center (SEFSC) has developed climate vulnerability analyses (CVA)[18] that can be used to determine the vulnerability of gag to climate change stressors. According to the SEFSC CVA, Gulf gag vulnerabilities are summarized as follows and in Table 3.2.1.

- High overall vulnerability, trait-based sensitivity (life history), and climate exposure (environmental factors) scores. This is out of four categories: Low, Moderate, High, and Very High.
- The highest sensitivity scores (nominal range from 1 to 4) were in Population Growth Rate (3.2), Spawning Cycle (2.9), Stock size/status (2.8), and Early Life History Survival and Settlement (2.6).
- The highest exposure scores were Temperature (4.0) and Ocean Acidification (4.0). These two were followed by Salinity (2.9), Sea Level Rise (2.4), and Hypoxia (2.2).
- Gag had Low Potential for Distributional Change (this is the worst out of the four rankings). When combined with the High overall climate vulnerability, it points to a difficulty in moving to offset the impacts of climate change.

[17] https://www.esrl.noaa.gov/psd/ipcc/
[18] https://www.fisheries.noaa.gov/national/climate/climate-vulnerability-assessments

Generally, the Gulf is projected by the SEFSC models used (CMIP5) to become warmer, saltier, less oxygenated, and more acidic everywhere during the current fifty years. Conditions will have similar, but amplified, patterns in the 2056–2099 period (Quinlan et al., in press).

| *Mycteroperca microlepis* | | Attribute Mean | Data Quality | Expert Scores Plots (tallies by bin) |
|---|---|---|---|---|
| Sensitivity Attributes | Habitat Specificity | 2.8 | 3 | |
| | Prey Specificity | 1.8 | 2.6 | |
| | Adult Mobility | 2.6 | 3 | |
| | Dispersal of Early Life Stages | 2.1 | 2.2 | |
| | Early Life History Survival and Settlement Requirements | 2.6 | 2 | |
| | Complexity in Reproductive Strategy | 3 | 3 | |
| | Spawning Cycle | 2.9 | 3 | |
| | Sensitivity to Temperature | 2 | 2.8 | |
| | Sensitivity to Ocean Acidification | 2 | 2 | |
| | Population Growth Rate | 3.2 | 3 | |
| | Stock Size/Status | 2.8 | 2.6 | |
| | Other Stressors | 2.3 | 2 | |
| | Sensitivity Score | High | | |
| Exposure Factors | Air Temperature | 1 | 0 | |
| | Hypoxia | 2.2 | 1.6 | |
| | Ocean Acidification | 4 | 2 | |
| | Precipitation | 1 | 0 | |
| | Primary Productivity | 1.6 | 2 | |
| | Salinity | 2.9 | 3 | |
| | Sea Level Rise | 2.4 | 2.4 | |
| | Sea Surface Temperature | 4 | 3 | |
| | Exposure Score | High | | |
| Overall Vulnerability Rank | | High | | |

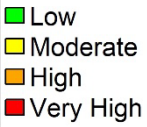


**Figure 3.2.1.** Gag biological processes analyzed for climate change sensitivities.

## 3.3 Description of the Economic Environment

Detailed descriptions of the gag component of the Gulf Reef Fish FMP can be found in Amendments 38 (GMFMC 2012b) and 44 (GMFMC 2017a). Additionally, this section and Section 3.4 provide information on the respective economic and social environments of the fishery.

### 3.3.1 Commercial Sector

Any fishing vessel that harvests and sells any of the reef fish species managed under the Reef Fish FMP from the Gulf EEZ, including gag, must have a valid Gulf commercial reef fish permit. The commercial sector of the reef fish fishery has been managed under a limited access program since 1992, which in turn capped the number of commercial reef fish permits. Therefore, new entrants must buy a permit in order to participate in the commercial sector. The introduction of the IFQ program in 2010 further limited participation in harvesting gag. To harvest gag, commercial fishermen must have both the limited access permit and sufficient allocation to account for all harvested gag. As shown in Table 3.3.1.1, the number of permits that were valid or renewable in a given year has continually decreased in the years after the red snapper (RS)-individual fishing quota (IFQ) program was implemented in 2007. This decline has continued since the grouper-tilefish (GT)-IFQ program was implemented in 2010, but at a slower rate. As of July 8, 2021, there were 825 valid or renewable commercial reef fish permits, 748 of which were valid. A renewable permit is an expired limited access permit that cannot be actively fished, but can be renewed for up to one year after expiration.

**Table 3.3.1.1.** Number of valid or renewable Gulf commercial reef fish permits, 2009-2020.

| Year | Number of Permits |
|---|---|
| **2009** | 998 |
| **2010** | 969 |
| **2011** | 952 |
| **2012** | 917 |
| **2013** | 895 |
| **2014** | 882 |
| **2015** | 868 |
| **2016** | 852 |
| **2017** | 850 |
| **2018** | 845 |
| **2019** | 842 |
| **2020** | 837 |

Source: NMFS SERO Sustainable Fisheries (SF) Access permits database

A single permit is attached to a single vessel and many businesses only own one vessel. However, some businesses hold or own multiple permits and vessels. Multiple vessels owned by a single business are often referred to as a "fleet." Although each vessel is often legally organized under an individual corporate or other business name, for economic purposes, the fleet is treated as a single business because the same, or mostly the same, individuals are determining

how those vessels operate. A single business may include other types of operations that possess shares in addition to fishing vessels.

As illustrated in Table 3.3.1.2, as of July 8, 2021, 93 businesses owned two or more valid or renewable reef fish permits. Although these businesses represented only 14.9% of the businesses with permits; they held 36.0% of the permits, which illustrates some degree of concentration in the ownership of permitted vessels. The maximum number of permitted vessels held by a single business was 17.

**Table 3.3.1.2.** Vessels and businesses with a commercial reef fish permit end as of July 8, 2021.

| No. of Vessels Owned by a Business | No. of Businesses | No. of Total Permitted Vessels | % of Businesses | % of Permitted Vessels |
|---|---|---|---|---|
| **1** | 531 | 531 | 85.1% | 64.4% |
| **2** | 63 | 126 | 10.1% | 15.3% |
| **3** | 13 | 39 | 2.1% | 4.7% |
| **4** | 2 | 8 | 0.3% | 1.0% |
| **5-7** | 8 | 42 | 1.3% | 5.1% |
| **8-10** | 4 | 36 | 0.6% | 4.4% |
| **11-17** | 3 | 43 | 0.5% | 5.2% |
| **Total** | **624** | **825** | **100%** | **100.0%** |

Source: NMFS SERO permits and IFQ databases, July 8, 2021.

Although all permitted vessels may harvest non-IFQ reef fish species (e.g., vermilion snapper), not all permitted vessels are eligible to harvest gag (GG). A permitted vessel must be linked to an active IFQ account in order to be eligible to harvest GG and other IFQ species.[19] Thus, because some vessels are not linked to an active IFQ account, fewer permitted vessels are eligible to harvest IFQ species and, in turn, fewer businesses may accrue revenue from the harvest of IFQ species.

[19] The vessel account must have a valid permit and be linked to an active IFQ account. The vessel account must also have annual allocation in it in order for the permitted vessel to harvest IFQ species. Vessel accounts are considered active when a permit is valid. A renewable permit status is not an active status. An IFQ account status is active if the account holder submitted an affirmative answer to the bi-annual citizenship requirement

**Table 3.3.1.3.** IFQ eligible vessels and businesses with a Gulf reef fish permit.

| No. of Vessels Owned by a Business | No. of Businesses | No. of Total Permitted Vessels | % of Businesses | % of Permitted Vessels |
|---|---|---|---|---|
| **1** | 445 | 445 | 83.0% | 60.5% |
| **2** | 61 | 122 | 11.4% | 16.6% |
| **3** | 13 | 39 | 2.4% | 5.3% |
| **4** | 2 | 8 | 0.4% | 1.1% |
| **5-7** | 8 | 42 | 1.5% | 5.7% |
| **8-10** | 4 | 36 | 0.7% | 4.9% |
| **11-17** | 3 | 43 | 0.6% | 5.9% |
| **Total** | **536** | **735** | **100%** | **100.0%** |

Source: NMFS SERO permits and IFQ databases, July 8, 2021.

Table 3.3.1.3 shows that as of July 8, 2021, only 735 permitted vessels were linked to an IFQ account, and these vessels were owned by 536 businesses. Thus, 90 permitted vessels were not eligible to harvest IFQ species and 88 businesses with reef fish permits could not accrue revenue from the harvest of IFQ species. The degree of concentration among IFQ-eligible permitted vessels is slightly greater than with all permitted vessels, as businesses owning multiple IFQ-eligible vessels represent only 17.0% of the businesses but hold 39.5% of the permitted vessels that can harvest IFQ species.

**IFQ Accounts with GG Shares**

As of July 8, 2021, there were 672 IFQ accounts with shares in one or more share categories. Of these accounts, 506 held gag (GG) shares. The total percentage of GG shares held by accounts with GG shares does not sum to 100% in Table 3.3.1.4 because a small percentage of GG shares were reclaimed under Reef Fish Amendment 36A.[20] The total percentages for other share categories also do not sum to 100% because some accounts with GG shares do not possess shares in other categories, though a small amount of shares in the other categories were also reclaimed under Reef Fish Amendment 36A.

On average (mean), each of these 506 accounts holds just under 0.2% of the GG shares. However, as discussed in Reef Fish Amendment 36A, the distribution of shares within the GG share category, and in fact all categories, is highly skewed. In other words, some accounts have a relatively high percentage of the shares in a category while others have no or a very low percentage of the shares. For accounts that hold GG shares, the largest or maximum percent of shares held by a single account in each category ranges from 2.33% for GG to 4.27 % for red

[20] Shares were reclaimed from accounts that had never been activated since the start of the GT-IFQ program

grouper (RG), 3.65% for RS, 4.44% for shallow water grouper (SWG), 8.23% for deep water grouper (DWG), and 9.95% for Tilefish (TF).

The account that has the highest percentages of GG shares is near the share cap of 2.349%. The account that has the highest percentage of RG shares was 98% of the total 4.331% share cap for RG. The account that has the highest percentage of TF shares was 81% of the total 12.211% share cap for TF. Thus, in percentage terms, these estimates indicate there are some relatively large shareholders in the GG, RG, and TF categories in particular. Even though the concentration of shares is relatively high for RG and TF, concentration levels across all categories, as well as combined categories are still considered to be "unconcentrated" and thus quota share markets are considered to be competitive (i.e., no business or other entity has the ability to exercise market power by controlling an "excessive" amount of the shares and thereby share prices).[21]

**Table 3.3.1.4.** Quota share statistics (in percent) for accounts with GG shares, July 8, 2021.

| Statistic | DWG Shares | RG Shares | GG Shares | SWG Shares | TF Shares | RS Shares |
|---|---|---|---|---|---|---|
| **Max** | 8.219 | 4.265 | 2.330 | 4.433 | 9.945 | 3.648 |
| **Sum** | 72.735 | 90.685 | 99.659 | 93.877 | 68.212 | 66.513 |
| **Average** | 0.144 | 0.179 | 0.197 | 0.186 | 0.135 | 0.131 |

Source: NMFS SERO IFQ database accessed 7/8/2021.

As with permitted vessels, although it is common for a single IFQ account with shares to be held by a single business, some businesses have multiple IFQ accounts with shares. The 507 IFQ accounts with GG shares are owned by 455 businesses. Further, although some IFQ accounts with GG shares are linked to a single permitted vessel, others are linked to multiple permitted vessels or are not linked to a permitted vessel at all. The latter accounts are held by businesses that are likely to sell their annual allocation rather than harvest it. Of the 507 IFQ accounts with GG shares, 354 accounts were linked to one or more permitted vessels, while 152 accounts were not linked to a permitted vessel. The 354 accounts were linked to 468 permitted vessels and these accounts and vessels were owned by 307 businesses. Most businesses only own one or two accounts and permitted vessels. However, one business has 12 accounts, and 3 businesses own

[21] These conclusions hold regardless of the measure of concentration (e.g., the Herfindahl-Hirschman Index (HHI), C5, or C3) or the unit of analysis (e.g., IFQ account, lowest known entity (LKE), and affiliated accounts/businesses). The Horizontal Merger Guidelines from the US Department of Justice and the Federal Trade Commission identify markets with an HHI below 1,500 to be Unconcentrated (no concerns over the exercise of market power), HHI between 1,500 and 2,500 to be Moderately Concentrated (possible concern with market power being exercised given a sufficient increase in concentration), and above 2,500 to be Highly Concentrated (exercise of market power is likely, particularly if concentration increases further).

10 or more permitted vessels. The 152 accounts that were not linked to a vessel were owned by 148 businesses and 3 businesses held two or more accounts with GG shares.

As shown in Table 3.3.1.5, the 307 businesses that own GG shares and permitted vessels hold the vast majority of shares held by businesses that own GG shares in all share categories, ranging from a low of just over 55% of the RS shares to a high of over 77% of the GG shares. On average, these 307 businesses own between 0.16% and 0.23% of the shares in each category. The maximum percentage of shares owned by a business varies considerably, ranging from about 3.64% of the RS shares to 9.9% of the TF shares.[22]

As shown in Table 3.3.1.6, the 148 businesses that own GG shares, but do not own permitted vessels, own less shares in total compared to the businesses that own permitted vessels. Specifically, these businesses own slightly more than 17% of the RG shares and slightly more than 15% of the SWG shares. These businesses own between 0.1% and 0.2% of the shares in each category on average. The maximum percentage of shares owned by one of these businesses varies somewhat, ranging from about 1.62% of the SWG shares to 4.48% of the TF shares.

In general, the information in Tables 3.3.1.5 and 3.3.1.6 can be used to determine the distribution of annual allocation, the market value of shares, the market value of annual allocation, and the potential ex-vessel value of annual allocation if used for harvesting between businesses with GG shares that own permitted vessels and businesses with GG shares that do not own permitted vessels. However, ex-vessel value would not accrue to businesses that do not possess a permit because a permit is needed to harvest IFQ species, including GG.

**Table 3.3.1.5.** Quota share statistics (in percent) for businesses with GG shares and permitted vessels, July 8, 2021.

| Statistic | DWG Shares | RG Shares | GG Shares | SWG Shares | TF Shares | RS Shares |
|---|---|---|---|---|---|---|
| **Max** | 8.219 | 3.662 | 2.279 | 4.433 | 9.945 | 3.648 |
| **Sum** | 61.569 | 67.045 | 77.484 | 77.032 | 55.796 | 54.703 |
| **Average** | 0.182 | 0.198 | 0.229 | 0.227 | 0.165 | 0.161 |

Source: NMFS SERO IFQ database (accessed 07/08/2021).

**Table 3.3.1.6** Quota share statistics (in percent) for businesses with GG shares and no permitted vessels, July 8, 2021.

| Statistic | DWG Shares | RG Shares | GG Shares | SWG Shares | TF Shares | RS Shares |
|---|---|---|---|---|---|---|
| **Max** | 2.317 | 3.494 | 2.330 | 1.621 | 4.481 | 2.332 |
| **Sum** | 8.908 | 17.596 | 19.515 | 15.012 | 11.459 | 11.343 |
| **Average** | 0.110 | 0.217 | 0.241 | 0.185 | 0.141 | 0.140 |

Source: NMFS SERO IFQ database (accessed 07/08/2021).

[22] Share caps are applied at the IFQ account and LKE levels, but not at the business level as defined here. Thus, it is possible for a business to control a share percentage above the cap.

The amount of annual allocation (quota pounds) that an account holder receives each year is not only conditional on the percentage of shares held in a category, but also the commercial quota applicable to that category. The 2021 quotas for each share category were as follows: 6,937,838 pounds (lb) gutted weight (gw) for RS, 3,000,000 lb gw for RG, 1,024,000 lb gw for DWG, 582,000 lb gw for TF, and 525,000 lb gw for SWG. Table 3.3.1.7 presents statistics regarding annual allocation to IFQ accounts based on the share statistics in Table 3.3.1.4 and these quotas. Based on this information, the average account holder with GG shares received 2,171 lb gw of GG allocation in 2021, while the largest account holder received almost 22,000 lb gw. Across all categories, the average account holder with GG shares received about 23,000 lb gw of allocation in 2021 (Table 3.3.1.7).

**Table 3.3.1.7** Annual allocation (lb gw) statistics for accounts with GG shares, July 8, 2021.

| Statistic | DWG Allocation | RG Allocation | GG Allocation | SWG Allocation | TF Allocation | RS Allocation |
|---|---|---|---|---|---|---|
| **Max** | 84,164 | 109,868 | 21,879 | 23,275 | 57,880 | 253,078 |
| **Sum** | 721,680 | 2,538,948 | 909,722 | 483,167 | 391,420 | 4,582,151 |
| **Average** | 1,722 | 6,060 | 2,171 | 1,153 | 934 | 10,936 |

Source: NMFS SERO IFQ database (accessed 07/08/2021).

Table 3.3.1.8 provides statistics regarding the amount of allocation held by the 307 businesses that possess GG shares and at least one permit. Information in this table reflects that these businesses control just over 75% of the GG allocation, or around 728,000 lb gw. The largest amount of GG allocation controlled by a single business with GG shares and a permit is almost 22,000 lb gw. The average amount of GG allocation held by a business with a permit is about 2,200 lb gw.

Table 3.3.1.9 provides statistics regarding the amount of allocation held by the 87 businesses that possess shares but are not associated with a permit. Information in this table reflects that these businesses control almost 20% of the GG allocation, or around 183,250 lb gw. The largest amount of allocation controlled by a single business with GG shares but without a permit is slightly less than 22,000 lb gw. The average amount of GG allocation held by a business without a permit is almost 2,300 lb gw.

**Table 3.3.1.8.** Annual allocation (lb gw) statistics for businesses with GG shares and permitted vessels, July 8, 2021.

| Statistic | DWG Shares | RG Shares | GG Shares | SWG Shares | TF Shares | RS Shares |
|---|---|---|---|---|---|---|
| **Max** | 84,164 | 109,868 | 21,400 | 23,275 | 57,880 | 253,078 |
| **Sum** | 630,470 | 2,011,354 | 727,570 | 404,419 | 324,731 | 3,795,201 |
| **Average** | 1,860 | 5,933 | 2,146 | 1,193 | 958 | 11,195 |

Source: NMFS SERO IFQ database (accessed 07/08/2021).

**Table 3.3.1.9.** Annual allocation (lb gw) statistics for businesses with GG shares and no permitted vessels, July 8, 2021.

| Statistic | DWG Shares | RG Shares | GG Shares | SWG Shares | TF Shares | RS Shares |
|---|---|---|---|---|---|---|
| **Max** | 23,729 | 104,808 | 21,879 | 8,512 | 26,080 | 161,774 |
| **Sum** | 91,217 | 527,876 | 183,248 | 78,813 | 66,689 | 786,950 |
| **Average** | 1,126 | 6,517 | 2,262 | 973 | 823 | 9,715 |

Source: NMFS SERO IFQ database (accessed 07/08/2021).

Quota shares have value in multiple ways. First, shares have value because they are an asset. The asset value of each account's shares is determined by the market price of the shares and the amount of shares it contains. Statistics regarding the value of the shares held by accounts with GG shares are in Table 3.3.1.10. The total value of all shares held by accounts with GG shares is just under $246 million (2021 dollars)[23], with the bulk of that value coming from ownership of RS shares, which accounts for more than 85% of the combined total value. This is also true for the average account that holds GG shares. The average value of an account that holds GG shares is about $587,000, though only about 3% of that value is based on GG shares. The account with the largest asset value of shares is worth about $11.6 million, with RS shares representing the bulk of that value (99%).

**Table 3.3.1.10.** Quota share value statistics for accounts with GG shares (2021 dollars).

| Statistic | DWG | RG | GG | SWG | TF | RS | All |
|---|---|---|---|---|---|---|---|
| **Max** | $937,587 | $703,157 | $179,189 | $130,804 | $531,340 | $11,482,169 | $13,964,247 |
| **Sum** | $8,039,514 | $16,249,270 | $7,450,622 | $2,715,400 | $3,593,237 | $207,892,189 | $245,940,231 |
| **Average** | $19,187 | $38,781 | $17,782 | $6,481 | $8,576 | $496,163 | $586,970 |

Note: Share value estimates are based on average 2021 share prices per pound.
Source: NMFS SERO IFQ database (accessed 07/08/2021).

The information in Table 3.3.1.10 reflects the asset value of shares based on 2021 share prices. As illustrated in Table 3.3.1.11, average share prices have fluctuated greatly across the share categories. Specifically, RS was the only share category to have a continuous increase in the average share price. The average RS share price increased 19% in 2021 relative to 2017. GG share prices declined continuously from 2017-2021 falling by 20%. RG share prices have been relatively steady, after experiencing a decline in 2018. Compared to conditions in 2017, GG shares currently represent a far smaller percentage of a GG share account holder's IFQ asset portfolio, which was around 29% at that time. The same is true for the other GT share categories, with RS shares now dominating that portfolio.

[23]Converted to 2021 dollars using the annual, not seasonally adjusted GDP implicit price deflator provided by the U.S. Bureau of Economic Analysis.

**Table 3.3.1.11.** Average share prices by share category, 2017-2021 (2021 dollars).

| Year | DWG | RG | GG | SWG | TF | RS |
|---|---|---|---|---|---|---|
| 2017 | $13.88 | $5.68 | $17.45 | $9.55 | $9.56 | $38.23 |
| 2018 | $11.72 | $4.40 | $10.49 | $5.23 | $11.48 | $38.91 |
| 2019 | $9.63 | $6.00 | $10.07 | $5.92 | $10.01 | $40.37 |
| 2020 | $14.54 | $6.43 | $9.19 | $5.29 | $8.83 | $41.26 |
| 2021 | $11.14 | $6.40 | $8.19 | $5.62 | $9.18 | $45.37 |
| **Average** | **$12.18** | **$5.78** | **$11.08** | **$6.32** | **$9.81** | **$40.83** |

Source: SERO Catch Share Database (July 2022)

Table 3.3.1.12 provides statistics regarding the value of the shares held by the 307 businesses that possess GG shares and at least one permit. Information in this table again reflects that these businesses control just over 77% of the total GG share value. The largest GG share value controlled by a single business with a permit a little over $175,000, while the average value of GG shares held by a business with a permit is just over $17,500. GG shares only represent about 3% of the total share value held by these businesses, while RS shares represent about 85% of the total share value held by these businesses.

**Table 3.3.1.12.** Quota share value statistics for businesses with GG shares and permitted vessels, July 8, 2021 (2021 dollars).

| Statistic | DWG | RG | GG | SWG | TF | RS |
|---|---|---|---|---|---|---|
| **Max** | $937,587 | $703,157 | $175,267 | $130,804 | $531,340 | $11,482,169 |
| **Sum** | $7,023,441 | $12,872,666 | $5,958,801 | $2,272,836 | $2,981,029 | $172,188,251 |
| **Average** | $20,718 | $37,972 | $17,578 | $6,705 | $8,794 | $507,930 |

Note: Share value estimates are based on average 2021 share prices per pound from SERO Catch Share Database (July 2022)
Source: NMFS SERO IFQ database (accessed 07/08/2021).

Table 3.3.1.13 provides statistics regarding the value of the shares held by the 87 businesses that possess GG shares but are not associated with a permit. Information in this table again reflects that these businesses control about 19.5% of the total GG share value. The largest GG share value controlled by a single business without a permit is about $179,000, while the average value of shares held by a business with GG shares but without a permit is just over $18,500. GG shares only represent about 3% of the total share value held by these businesses, while RS shares represent almost 84% of the total share value held by these businesses.

**Table 3.3.1.13.** Quota share value statistics for businesses with GG shares but no permitted vessels, July 8, 2021 (2021 dollars).

| Statistic | DWG | RG | GG | SWG | TF | RS |
|---|---|---|---|---|---|---|
| **Max** | $264,336 | $670,774 | $179,189 | $47,838 | $239,415 | $7,339,687 |
| **Sum** | $1,016,156 | $3,378,407 | $1,500,804 | $442,929 | $612,208 | $35,703,938 |
| **Average** | $12,545 | $41,709 | $18,528 | $5,468 | $7,558 | $440,789 |

Note: Share value estimates are based on average 2021 share prices per pound from SERO Catch Share Database (July 2022)
Source: NMFS SERO IFQ database (accessed 07/08/2021).

In addition to their asset value, shares have value because they result in annual allocation, which can either be sold or used for harvesting purposes (i.e., landings). Annual allocation that is sold results in revenue for the business holding the allocation. This revenue likely represents an equivalent amount of profit as the business does not pay cost recovery fees when selling allocation and any other monetary costs associated with selling allocation are likely trivial. Statistics regarding the potential market value associated with the annual allocation for each account with GG shares are provided in Table 3.3.1.14.

The average market value of annual allocation should approximate the expected net revenue or economic profit of the annual allocation in the short-term (i.e., in a given year). Thus, if the annual allocation held by accounts with GG shares was harvested, economic profits from those landings would be expected to be about $21.1 million, with the bulk of those profits (83%) arising from the harvest of RS, while GG would only account for about 3%. Although one account would be expected to earn about $1.19 million in short-term profits, if the account holders with GG shares retain their initial annual allocations, the average short-term profit per account would only be expected to be around $50,000.[24] Realized value in the form of actual annual revenue and profits is likely less from GG allocation and other allocation in the GT-IFQ program as quota utilization for those species is typically well below 100% in those categories (67% for GG in 2021). Thus, annual profit from the sale of GG allocation is more likely to be around $488,000 in total and $1,164 per business on average.

**Table 3.3.1.14.** Potential market value of annual allocation in 2022 for all accounts with GG shares (2021 dollars).

| Statistic | DWG | RG | GG | SWG | TF | RS | All |
|---|---|---|---|---|---|---|---|
| **Max** | $87,531 | $71,414 | $17,503 | $13,732 | $36,465 | $964,229 | $1,190,874 |
| **Sum** | $750,547 | $1,650,316 | $727,778 | $285,069 | $246,595 | $17,457,995 | $21,118,300 |
| **Average** | $1,791 | $3,939 | $1,737 | $680 | $589 | $41,666 | $50,402 |

Note: Annual allocation market value estimates are based on average 2021 allocation prices from SERO Catch Share Database (July 2022).
Source: NMFS SERO IFQ database (accessed 07/08/2021).

The information in Table 3.3.1.14 reflects the potential market value of allocation based on 2021 allocation prices and commercial quotas. However, with the exception of RS allocation and RG somewhat, allocation prices for other share categories have declined over the past 5 years, as illustrated in Table 3.3.1.15. Specifically, GG allocation prices have declined by 50% during

[24] "Accounts" do not actually harvest landings and thus do not earn profits per se; rather, vessels and the businesses that own them do. Further, annual allocation is often transferred, so the actual distribution of short-term profits would likely differ from the potential distribution based on the distribution of annual allocation at the beginning of the year. The purpose of these estimates is to characterize the distribution of annual allocation and its value across accounts in the short-term.

this time. The declines for DWG and TF allocation prices have been less, but are still noticeable. If these trends continue, then the estimates in Table 3.3.1.14 may overestimate the market value of these allocations in 2022[25]. Conversely, RS allocation price has increased by 4%. Thus, if the upward trend in the RS allocation price continues, the estimated market value of RS allocation in Table 3.3.1.14 may underestimate actual market value in 2022. Compared to conditions in 2017, GG allocation currently represent an even smaller percentage of a GG share account holder's allocation portfolio, which was around 5% at that time. The same is true for the other GT-IFQ share categories, with RS allocation now dominating that portfolio.

**Table 3.3.1.15.** Average allocation prices by share category, 2017-2021 (2021 dollars).

| Year | DWG | RG | GG | SWG | TF | RS |
|---|---|---|---|---|---|---|
| **2017** | $1.29 | $0.46 | $1.59 | $0.63 | $0.79 | $3.65 |
| **2018** | $1.06 | $0.34 | $1.09 | $0.57 | $0.77 | $3.65 |
| **2019** | $1.10 | $0.62 | $0.90 | $0.62 | $0.76 | $3.88 |
| **2020** | $1.09 | $0.49 | $0.76 | $0.59 | $0.65 | $3.80 |
| **2021** | $1.04 | $0.65 | $0.80 | $0.59 | $0.63 | $3.81 |
| **Average** | **$1.12** | **$0.51** | **$1.03** | **$0.60** | **$0.72** | **$3.76** |

Source: 2021 Gulf of Mexico Grouper-Tilefish Individual Fishing Quota Report and 2021 Red Snapper Individual Fishing Quota Report

Similar to shares, annual allocation tends to be "unconcentrated" across accounts. According to NMFS (2022), RS, RG, and SWG as well as the aggregate quantity of all species groups have always been unconcentrated. However, there does exist a more consistent pattern of concentration for TF. Notably, the allocation market for TF starts out unconcentrated at the beginning of each year and becomes more concentrated during the year. These concentration patterns occur with a mixture of different suppliers in different years, and appear to be more consistent with a small number of harvesters chasing a relatively small amount of fish that likely is not by itself a relevant market, rather than an attempt to exercise market power (NMFS).

Table 3.3.1.16 provides statistics regarding the value of the allocation held by the 307 businesses that possess GG shares and at least one permit. Information in this table again reflects that these businesses control just about 80% of the total value of GG allocation. The largest value of GG allocation controlled by a single business with a permit is worth almost $17,200, while the average value of GG allocation held by a business with a permit is just over $1,700. Realized value in the form of actual annual revenue and profits is likely less from GG allocation as quota utilization is typically well below 100% (67% in 2021). Thus, annual profit for these businesses from the sale of GG allocation is more likely to be around $390,000 in total and $1,150 per business on average.

[25] It should be noted that gag allocation price is 1.04 in early 2022 per: https://noaa-sero.s3.amazonaws.com/drop-files/cs/Issue8.pdf. This indicates a higher rate of harvest for GG in 2022.

**Table 3.3.1.16.** Allocation value statistics for businesses with GG shares and permitted vessels, July 8, 2021 (2021 dollars).

| Statistic | DWG | RG | GG | SWG | TF | RS |
|---|---|---|---|---|---|---|
| **Max** | $87,531 | $71,414 | $17,120 | $13,732 | $36,465 | $964,229 |
| **Sum** | $655,689 | $1,307,380 | $582,056 | $238,607 | $204,580 | $14,459,714 |
| **Average** | $1,934 | $3,857 | $1,717 | $704 | $603 | $42,654 |

Table 3.3.1.17 provides statistics regarding the value of the allocation held by the 87 businesses that possess shares but are not associated with a permit. Information in this table again reflects that these businesses control about 20% of the total value of GG allocation. The largest value of GG allocation controlled by a single business without a permit is worth approximately $17,500, while the average value of allocation held by a business without a permit is approximately $1,800. Again, realized value in the form of actual annual revenue and profits is likely less from RG allocation, as quota utilization is typically well below 100% (67% in 2021). Thus, annual profit for these businesses from the sale of GG allocation is more likely to be around $98,000 in total and $1,200 per business on average.

**Table 3.3.1.17.** Allocation value statistics for businesses with GG shares but no permitted vessels, July 8, 2021 (2021 dollars).

| Statistic | DWG | RG | GG | SWG | TF | RS |
|---|---|---|---|---|---|---|
| **Max** | $24,678 | $68,125 | $17,503 | $5,022 | $16,430 | $616,359 |
| **Sum** | $94,866 | $343,119 | $146,599 | $46,500 | $42,014 | $2,998,281 |
| **Average** | $1,171 | $4,236 | $1,810 | $574 | $519 | $37,016 |

Note: Annual allocation market value estimates are based on average 2021 allocation prices.
Source: NMFS SERO IFQ database (accessed 07/08/2021).

These same general findings regarding the market value of annual allocation also apply to the potential ex-vessel value of that annual allocation. The markets for landed product largely have the same characteristics as the markets for annual allocation (i.e., unconcentrated overall and for most categories, except landings of TF which are "moderately concentrated"). Thus, markets for landed product of IFQ species are thought to be competitive. Even if market power is not detected in these markets, the Council may have distributional or "fairness" concerns, as the distributions of shares, allocation, landings, and revenue in the Gulf IFQ programs are highly unequal. In fact, they are the most unequal of any catch share program in the U.S. (GMFMC and NMFS, 2018).

**Table 3.3.1.18.** Potential ex-vessel value of annual allocation in 2022 for accounts with GG shares (2021 dollars).

| Statistic | DWG | RG | GG | SWG | TF | RS | All |
|---|---|---|---|---|---|---|---|
| **Max** | $478,893 | $574,611 | $135,212 | $137,787 | $178,850 | $1,353,970 | $2,859,323 |
| **Sum** | $4,106,358 | $13,278,700 | $5,622,081 | $2,860,350 | $1,209,488 | $24,514,508 | $51,591,486 |
| **Average** | $9,800 | $34,479 | $12,354 | $6,561 | $5,315 | $62,225 | $130,735 |

Source: NMFS SERO IFQ database (accessed 07/08/2021).

The information in Table 3.3.1.18 reflects the potential ex-vessel value of allocations in 2022 based on 2021 ex-vessel prices and commercial quotas in 2021. Again, realized ex-vessel value

will likely be less for GG and other species in the GT-IFQ program as quota utilization rates are typically well below 100%. Only businesses with IFQ accounts that are linked to a permit are allowed to harvest IFQ species. Therefore, estimates of ex-vessel value are not germane to businesses that do not possess permits.

As illustrated in Table 3.3.1.19, ex-vessel prices at the share category level have fluctuated from 2017 through 2021. With the exception of TF, and to a more minor extent RS, ex-vessel prices have increased in 2021, relative to 2017. Ex-vessel prices for DWG, RG, GG, and SWG have increased by 9%, 12%, 7%, and 13%, respectively. Although not shown here, this increase is also seen at the individual species level within the DWG, SWG, RG, and TF categories, with the exception golden tilefish in the TF category, which declined by 3.0%. The ex-vessel price for all species in the TF category decreased by 2.0% in 2021, relative to 2017. The ex-vessel price for SWG and RG has increased by 11.5 and 13.2%, respectively. These trends are nearly the opposite of the trends for allocation prices, suggesting that it is likely becoming relatively more profitable for those with shares to harvest their allocation rather than sell it, all other things being equal[26].

**Table 3.3.1.19.** Average ex-vessel prices by share category, 2017-2021 (2021 dollars).

| Year | DWG | RG | GG | SWG | TF | RS |
|---|---|---|---|---|---|---|
| **2017** | $5.20 | $4.69 | $5.77 | $5.23 | $3.26 | $5.46 |
| **2018** | $5.45 | $5.10 | $6.07 | $5.59 | $3.03 | $5.47 |
| **2019** | $5.91 | $5.60 | $6.37 | $5.86 | $3.04 | $5.57 |
| **2020** | $5.48 | $5.29 | $6.13 | $5.76 | $2.91 | $5.28 |
| **2021** | $5.69 | $5.23 | $6.18 | $5.92 | $3.09 | $5.35 |
| **Average** | **$5.55** | **$5.18** | **$6.10** | **$5.67** | **$3.07** | **$5.43** |

Source: 2021 Gulf of Mexico Grouper-Tilefish Individual Fishing Quota Report and 2021 Red Snapper Individual Fishing Quota Report.

**Vessels**

The information in Table 3.3.1.20 describes the landings and revenue for vessels that harvested GG in each year from 2017 through 2021, as well as their revenue from other IFQ species, Gulf non-IFQ fisheries, and South Atlantic non-IFQ fisheries. Although a majority of these vessels' gross revenue came from harvesting IFQ species (93%), a significant portion came from harvesting non-IFQ species in the Gulf (6%), with a minor amount coming from harvests in the South Atlantic (1%).

Some important trends can be seen in Table 3.3.1.20. In general, vessel participation in the IFQ programs tends to be very fluid. However, the number of vessels that harvested GG in each year from 2017 through 2021 declined each year. The number of vessels that harvested GG declined

[26] GG ex-vessel price increased to $6.86 in yearly 2022 per: https://noaa-sero.s3.amazonaws.com/drop-files/cs/Issue8.pdf .

by 16% in 2021, relative to 2017. GG landings and revenue have increased from 2017 through 2021, with landings rising by 13% and revenue increasing by 23%. Revenue from other Gulf IFQ species increased by 7% in 2021 relative to 2017. Revenues from non-IFQ species in the Gulf, and South Atlantic Non-IFQ species fell by 28% respectively in 2021, relative to 2017. As a result, total revenue for these vessels increased by 5% in 2021 relative to 2017. From 2017-2021, GG represented about 6% of these vessels' total revenue on average, suggesting relatively little dependency on GG.

**Table 3.3.1.20.** Landings and revenue statistics for vessels harvesting GG by year, 2017-2021 (2021$).

| Year | Number of Vessels | Statistic | GG Landings (gw) | GG Revenue | Other IFQ Revenue | Gulf Non-IFQ Revenue | South Atlantic Revenue | Total Revenue |
|---|---|---|---|---|---|---|---|---|
| **2017** | 372 | Max | 24,341 | $140,249 | $2,466,119 | $134,418 | $139,837 | $2,466,589 |
| | | Total | 490,852 | $2,823,234 | $44,364,374 | $3,828,885 | $400,008 | $51,416,502 |
| | | Mean | 1,319 | $7,589 | $119,259 | $10,293 | $1,075 | $138,216 |
| | | | | | | | | |
| **2018** | 368 | Max | 24,776 | $159,121 | $2,205,352 | $140,585 | $113,430 | $2,208,890 |
| | | Total | 490,321 | $2,967,651 | $41,989,573 | $3,468,418 | $443,296 | $48,868,939 |
| | | Mean | 1,332 | $8,064 | $114,102 | $9,425 | $1,205 | $132,796 |
| | | | | | | | | |
| **2019** | 348 | Max | 29,339 | $197,608 | $2,495,692 | $173,143 | $79,845 | $2,496,834 |
| | | Total | 530,261 | $3,380,275 | $46,292,243 | $3,116,128 | $334,854 | $53,123,501 |
| | | Mean | 1,524 | $9,713 | $133,024 | $8,954 | $962 | $152,654 |
| | | | | | | | | |
| **2020** | 343 | Max | 18,742 | $123,052 | $3,244,241 | $116,619 | $34,676 | $3,251,599 |
| | | Total | 474,200 | $2,919,021 | $39,805,002 | $2,439,928 | $106,588 | $45,270,539 |
| | | Mean | 1,383 | $8,510 | $116,050 | $7,113 | $311 | $131,984 |
| | | | | | | | | |
| **2021** | 314 | Max | 24,701 | $148,206 | $3,086,989 | $135,769 | $109,472 | $3,091,171 |
| | | Total | 556,054 | $3,472,685 | $47,310,772 | $2,755,834 | $286,826 | $53,826,117 |
| | | Mean | 1,771 | $11,060 | $150,671 | $8,777 | $913 | $171,421 |

Source: NMFS SERO IFQ database accessed 01/18/2023 and SEFSC Socioeconomic Panel (Jan22 Version).

These estimates reflect the interdependency between species harvested in the commercial sector of the reef fish fishery (i.e., biological or economic factors that affect the commercial harvest of one species can and often do affect the commercial harvest of other species). The GG commercial quota has remained constant for the past seven years, as have DWG, SWG, and TF. However, the RG commercial quota has changed multiple times from 2016-2020. In late 2016, based on a stock assessment, the RG quota increased from 5.72 mp to 7.78 mp gw, and remained

at this level through the end of 2018. Updated projections reduced the RG quota to 3.0 mp gw in 2019. On June 1, 2022, Amendment 53 to the Fishery Management Plan for the Reef Fish Resources of the Gulf of Mexico set the commercial ACL at 2.53 mp gw, and the commercial quota at 2.4 mp gw. Later in 2022, the Modification of Gulf of Mexico Red Grouper Catch Limits Framework action set the quota to 2.79 mp gw (NMFS 2022). In addition, the RS commercial quota increased from approximately 6.097 mp gw in 2016 to 6.937 mp gw in 2019, and remained at that level through 2021

The maximum annual gross revenue earned by a single vessel during this time was about $3.25 million (2021 dollars) in 2020, though the average gross revenue per vessel was only about $132,000 that year. Similar to the trends in total revenue for GG vessels, these values had increased to $171,000 by 2021, representing a 30% increase in total revenue per vessel. Average gag landings and revenue per vessel also increased from 1,319 lb gw and $7,589 to 1,771 lb gw and $11,060 per vessel or by about 13% and 23%, respectively (Table 3.3.1.20).

**Economic Value**

Changes in commercial gag landings may result in economic effects because of potential changes in ex-vessel prices due to less (or more) domestic gag being available in markets. In turn, if the ex-vessel price is expected to change, gross revenue and thus consumer surplus (CS) would also be expected to change. The potential effects on ex-vessel price, gross revenue, and CS can be estimated utilizing the work by Keithly and Tabarestani (2018). According to the results of their Habit Formation model, they estimated an own-price flexibility for "other groupers," inclusive of gag, of -0.386. The own-price flexibility is the percentage change in a product's price relative to the percentage change of a product's quantity sold, and thus estimates the responsiveness of a product's price to the quantity being sold. The own-price flexibility estimate in Keithly and Tabarestani (2018) is not compensated for income. An income compensated estimate would likely be lower, which would in turn yield smaller changes in the ex-vessel price and thus smaller changes in gross revenue and PS. Thus, any estimates based on their analysis should be considered maximum expected changes in ex-vessel price, gross revenue, and CS in the commercial sector.

Estimates of economic returns have not been available historically for the commercial sector of the Gulf reef fish fishery. Reports such as Overstreet et al (2017); Overstreet and Liese (2018a); and Overstreet and Liese (2018b) provided the first such estimates. Liese (pers. comm. 2022) recently provided average estimates of economic returns across 2014-2018 for vessels that caught gag. These estimates are the most useful for current purposes, and thus findings from that report are summarized below. Given the declines in landings and revenue for GG vessels discussed above, it is quite likely that economic returns were different by 2020 than they were in 2018, and thus the estimates below should be used with some caution. However, some of the findings for 2014-2018 seem to be consistent with the results above for 2016-2020.

Estimates in these reports are based on a combination of Southeast Coastal Logbook data, a supplemental economic add-on survey to the logbooks, and an annual economic survey at the vessel level. The economic surveys collect data on gross revenue, variable costs, fixed costs, as well as some auxiliary economic variables (e.g., market value of the vessel). The report provides

estimates of critical economic variables for the commercial sector of the Gulf reef fish fishery as a whole, but also provides estimates by "subsets" within this sector. These subsets are referred to as Segments of Interest (SOI). SOIs are generally defined at the individual species (e.g., red snapper) or species group (e.g., Jacks). In addition, estimates are provided at the trip level and the annual vessel level for each SOI. For current purposes, the most important results are those for vessels that harvested GG.

From an economic returns perspective, two of the most critical results at the trip level are the estimates of trip net cash flow and trip net revenue. Trip net cash flow is trip revenue minus the costs for fuel, bait, ice, groceries, miscellaneous, hired crew, and purchases of annual allocation from other allocation holders. Thus, this estimate represents the amount of cash generated by a typical reef fish trip over and above the cash cost of taking the trip (i.e., variable costs of the trip) and is a proxy for producer surplus[27] (PS) at the trip level. Trip net revenue is trip revenue minus the costs for fuel, bait, ice, groceries, miscellaneous, hired crew, and the opportunity cost of owner's time as captain. By including opportunity cost of the owner's time and excluding purchases of annual allocation, trip net revenue is a measure of the commercial fishing trip's economic profit.

Table 3.3.1.21 illustrates the economic "margins" generated on gag trips, i.e., trip net cash flow and trip net revenue as a percentage of trip revenue. As shown in this table, 29.8%, 6.1%, and 16.5% (or 52.4% in total) of the average revenues generated on RG trips were used to pay for crew costs, fuel/supplies costs, and purchases of annual allocation, while the remaining 35% was net cash flow back to the owner(s). The margin associated with trip net revenue was higher at 45%. Thus, trip cash flow and trip net revenue were both positive on average from 2014 through 2018, generally indicating that gag trips were profitable during this time.

Table 3.3.1.22 provides estimates of the important economic variables at the annual level for all vessels that had GG landings from 2014 through 2018. Similar to the trip level, three of the most important estimates of economic returns are net cash flow, net revenue from operations,[28] and economic return on asset value. Of these measures, net revenue from operations most closely represents economic profits to the owner(s). Net revenue from operations is total annual revenue minus the costs for fuel, other supplies, hired crew, vessel repair and maintenance, insurance, overhead, and the opportunity cost of an owner's time as captain as well as the vessel's depreciation. Net cash flow is total annual revenue minus the costs for fuel, other supplies, hired crew, vessel repair and maintenance, insurance, overhead, loan payments, and purchases of annual allocation. Economic return on asset value is calculated by dividing the net revenue from operations by the vessel value. Net cash flow and net revenue from operations at the annual vessel level were both positive from 2014-2018, generally indicating that GG vessels in the commercial sector were profitable, though some vessels earned much greater profits than others

[27] Producer surplus is the difference between the amount a producer is paid for a unit of a good and the minimum amount the producer would accept to supply that unit (i.e., marginal cost).

[28] Net revenue from operations accrues to the vessel owner and, when applicable, the IFQ shareholder, who may not be the same entity.

did. Net cash flow and net revenue from operations averaged 26% and 32%, respectively, while the economic return on asset value was approximately 46.3% during this time.

In general, producer surplus (PS) is the difference between total annual revenue and variable costs. PS is a measure of net economic benefits to producers. Overstreet and Liese (2018b) state that "sale of IFQ allocation or shares is also not accounted for, as these transactions cannot be associated with a vessel." If revenue from the sale of allocation is not accounted for, then the cost of buying allocation should also not be considered in the calculation of PS. Therefore, a more accurate estimate of PS in percentage terms would be 50% of gross revenue based on estimates of variable costs in Table 3.3.1.22.[29]

[29] PS =TR%-(Labor%+Fuel&Supplies%)

**Table 3.3.1.21.** Economic characteristics of GG trips 2014-2018 (2021$).

| | 2014 | 2015 | 2016 | 2017 | 2018 | Average |
|---|---|---|---|---|---|---|
| Number of Observations | 667 | 771 | 992 | 819 | 676 | |
| Response Rate (%) | 80% | 84% | 95% | 94% | 93% | |
| **Trips** | | | | | | |
| Owner-Operated | 66% | 58% | 61% | 52% | 64% | 60% |
| Fuel Used per Day at Sea (gallons/day) | 44 | 42 | 37 | 44 | 43 | 42 |
| **Total Revenue** | 100% | 100% | 100% | 100% | 100% | 100% |
| **Costs (% of Revenue)** | | | | | | |
| Fuel | 7.3% | 5.8% | 4.4% | 5.7% | 7.2% | 6.1% |
| Bait | 3.5% | 3.9% | 3.9% | 4.6% | 5.1% | 4.2% |
| Ice | 1.5% | 1.6% | 1.7% | 1.8% | 2.0% | 1.7% |
| Groceries | 2.9% | 3.0% | 3.7% | 4.2% | 3.7% | 3.5% |
| Miscellaneous | 2.3% | 3.1% | 3.5% | 2.3% | 3.6% | 3.0% |
| Hired Crew | 29.9% | 32.0% | 30.0% | 30.2% | 27.1% | 29.8% |
| IFQ Purchase | 14.1% | 19.8% | 17.2% | 14.3% | 17.1% | 16.5% |
| Owner-Captain Time | 6.8% | 6.2% | 6.7% | 5.2% | 9.2% | 6.8% |
| **Trip Net Cash Flow** | 39.0% | 30.8% | 35.7% | 36.9% | 34.2% | 35.0% |
| **Trip Net Revenue** | 46% | 44% | 46% | 46% | 42% | 45% |
| Labor - Hired & Owner | 37% | 38.2% | 36.7% | 35.4% | 36.3% | 36.7% |
| Fuel & Supplies | 17% | 17.4% | 17.1% | 18.6% | 21.6% | 18% |
| **Input Prices** | | | | | | |
| Fuel Price (per gallon) | $3.99 | $2.88 | $2.26 | $2.51 | $2.91 | $2.91 |
| Hire Crew Wage (per crew-day) | $332 | $317 | $284 | $261 | $240 | $286 |
| **Productivity Measures** | | | | | | |
| Landings/Fuel Use (lb/gallon) | 12.7 | 11.2 | 11.2 | 9.8 | 8.7 | 11.0 |
| Landings/Labor Use (lb/crew-day) | 198 | 176 | 159 | 156 | 144 | 167 |

**Table 3.3.1.22.** Economic characteristics of GG vessels 2014-2018 (2021$).

| | 2014 | 2015 | 2016 | 2017 | 2018 | Average |
|---|---|---|---|---|---|---|
| Number of Observations | 64 | 81 | 96 | 94 | 80 | |
| Response Rate (%) | 65% | 79% | 85% | 80% | 79% | |
| **Vessels** | | | | | | |
| Owner-Operated | 73% | 63% | 74% | 62% | 87% | 68% |
| For-Hire Active | 5% | 19% | 13% | 19% | 10% | 13% |
| Vessel Value | $144,262 | $116,207 | $100,982 | $120,250 | $111,028 | $118,546 |
| **Total Revenue** | 100% | 100% | 100% | 100% | 100% | 100% |
| **Costs (% of Revenue)** | | | | | | |
| Fuel | 7.6% | 7.1% | 6.1% | 6.4% | 7.6% | 7.0% |
| Other Supplies | 10.4% | 10.8% | 10.9% | 11.6% | 12.8% | 11.3% |
| Hired Crew | 28.3% | 29.9% | 24.9% | 25.5% | 24.6% | 26.6% |
| Vessel Repair & Maintenance | 7.0% | 8.0% | 7.9% | 9.9% | 10.2% | 8.6% |
| Insurance | 0.6% | 1.0% | 0.9% | 1.2% | 0.8% | 0.9% |
| Overhead | 3.9% | 5.7% | 4.5% | 5.8% | 3.3% | 4.6% |
| Loan Payment | 0.4% | 1.6% | 1.4% | 1.4% | 1.3% | 1.2% |
| IFQ Purchase | 11.9% | 14.3% | 13.6% | 11.3% | 16.5% | 13.5% |
| Owner-Captain Time | 5.4% | 5.0% | 5.6% | 4.9% | 5.8% | 5.3% |
| **Net Cash Flow** | 30.0% | 21.6% | 29.9% | 26.9% | 22.9% | 26.0% |
| **Net Revenue for Operations** | 33.0% | 29.2% | 36.3% | 31.2% | 30.8% | 32.0% |
| Depreciation | 3.6% | 3.4% | 3.0% | 3.5% | 4.1% | 3.5% |
| Fixed Costs | 12.0% | 14.7% | 13.3% | 16.9% | 14.2% | 14.0% |
| Labor - Hired & Owner | 34.0% | 34.8% | 30.4% | 30.4% | 30.5% | 32.0% |
| Fuel & Supplies | 18.0% | 17.9% | 17.0% | 18.0% | 20.4% | 18.0% |
| **Economic Return (on asset value)** | 45.9% | 43.1% | 61.2% | 44.0% | 37.3% | 46.3% |

**Dealers**

The information in Table 3.3.1.23 illustrates the purchasing activities of dealers that bought GG landings from vessels from 2017 through 2021.[30] Like vessels, dealer participation in the GG component of the GT-IFQ program is fluid and not all dealers purchased GG in each year during this time. Similar to the number of vessels harvesting GG during this time, the number of dealers that purchased GG fluctuated over this time, but decreased by 8% in 2021 relative to 2017. The average number of dealers purchasing GG from 2017-2021 was 89.

Trends in purchases of GG landings by dealers mimics the trend in GG vessel revenues, as do the trends in purchases of other IFQ species and Gulf non-IFQ species. For example, purchases of GG landings in the Gulf by dealers increased significantly (23%) in 2021, relative to 2017. Further, purchases of other-IFQ species in the Gulf also increased by 7% during this time.

South Atlantic purchases by dealers who purchased Gulf GG landings do not mirror the trends for Gulf gag vessels South Atlantic landings. Purchases of South Atlantic non-IFQ landings by dealers who purchased Gulf GG declined overall from 2017-2021 (5%), but less so than landings of South Atlantic non-IFQ species by Gulf gag vessels (28%). GG dealers have a greater diversity their purchasing portfolios which in allowed them to be more flexible and adaptive to changes in the GG component of the GT-IFQ program. In combination with the decrease in the number of GG dealers, the average value of purchases per GG dealer increased by 35% from 2017 through 2021.

On average, purchases of GG represented approximately 3% of all seafood purchases by GG dealers during this time, which suggests a low dependency on GG purchases, and a lower percentage of revenue GG represents for commercial vessels (6%). In addition, federally permitted dealers' ability to change which species they purchase is greater than commercial vessels' ability to change which species they harvest. Unlike commercial vessel permits, dealer permits do not restrict which species dealers can purchase.

Keithly and Wang (2018) estimated the mark-ups between the ex-vessel price and dealer sales price for GG and certain other grouper and tilefish species. However, those estimates are insufficient to estimate PS or profit for GG dealers, or changes to such as a result of regulatory changes, in part because costs other than the raw fish costs (which are equivalent to the ex-vessel value) are not considered. NMFS does not have estimates of those other costs for GG dealers or seafood dealers more broadly, and thus does not have estimates of net cash flow or net revenue from operations for GG dealers comparable to those in the commercial harvesting sector. Thus, while it is likely that the harvest of GG generates some PS and profit for GG dealers, NMFS does not possess the data to estimate PS and profit. Additionally, because of federal dealers' ability to switch to purchasing other species, changes to those values as a result of the

[30] The estimates in this table are based on Accumulated Landings System (ALS) data, which tends to produce slightly different estimates of ex-vessel landings and value for GG compared to the IFQ data due to waterbody code assignment issues in the Keys.

management measures considered in this amendment are likely to be relatively small. Similarly, any additional PS and profit generated from GG sales further up the distribution chain to wholesalers/distributors, grocers, and restaurants is likely minimal, given the vast number of seafood and other products they handle and their even greater ability to shift to purchasing other products.

**Table 3.3.1.23.** Dealer statistics for dealers that purchased GG landings by year, 2017-2021. All dollar estimates are in 2021$.

| Year | Number Dealers | Statistic | GG Purchases | Other IFQ Purchases | Gulf Non-IFQ Purchases | South Atlantic Purchases | Total Purchases |
|---|---|---|---|---|---|---|---|
| **2017** | 89 | Max | $446,099 | $8,509,150 | $3,042,988 | $4,278,206 | $9,226,879 |
| | | Total | $2,825,949 | $50,797,298 | $35,447,356 | $10,874,757 | $96,803,871 |
| | | Mean | $31,752 | $570,756 | $398,285 | $776,768 | $1,087,684 |
| | | | | | | | |
| **2018** | 93 | Max | $599,503 | $8,388,953 | $6,586,587 | $4,642,310 | $9,046,163 |
| | | Total | $2,982,685 | $49,184,609 | $46,672,970 | $16,883,677 | $112,217,160 |
| | | Mean | $32,072 | $528,867 | $501,860 | $993,157 | $1,206,636 |
| | | | | | | | |
| **2019** | 92 | Max | $790,426 | $10,310,210 | $2,730,464 | $3,957,741 | $10,957,197 |
| | | Total | $3,398,657 | $51,596,311 | $33,108,434 | $9,674,529 | $93,960,527 |
| | | Mean | $36,942 | $560,829 | $376,232 | $744,195 | $1,021,310 |
| | | | | | | | |
| **2020** | 88 | Max | $395,751 | $9,321,697 | $3,101,034 | $4,388,604 | $9,821,705 |
| | | Total | $2,944,594 | $48,788,162 | $27,939,525 | $10,129,230 | $86,311,382 |
| | | Mean | $33,461 | $554,411 | $324,878 | $723,516 | $980,811 |
| | | | | | | | |
| **2021** | 82 | Max | $468,438 | $9,413,980 | $3,982,918 | $4,800,599 | $9,976,041 |
| | | Total | $3,521,103 | $53,720,409 | $34,085,450 | $9,189,172 | $96,524,277 |
| | | Mean | $42,940 | $655,127 | $431,461 | $706,859 | $1,177,125 |

Source: SEFSC Fishing Communities Web Query Tool, Version 1.

**Imports**

Imports of foreign seafood products compete in the domestic seafood market and have in fact dominated many segments of the domestic seafood market. Imports aid in determining the price for domestic seafood products and tend to set the price in the market segments in which they dominate. Seafood imports can have downstream effects on the local fish market. At the harvest level, imports can affect the returns to fishermen through the ex-vessel prices they receive for their landings. As substitutes to domestic production, imports tend to cushion the adverse economic effects on consumers resulting from a reduction in domestic landings. The following

describes the imports of fish products that directly compete with domestic harvest of snapper grouper species including the species in this amendment.

*Snappers*

According to NMFS' foreign trade data, snapper are not exported from the U.S. to other countries. Thus, the following describes the imports of fresh and frozen snapper products, which directly compete with domestic harvest of snapper species. All monetary estimates are in 2021 dollars. As shown in Table 3.3.1.24, imports of fresh snapper products were 31.2 million lb product weight (pw) in 2017. They peaked at 36.0 million lb pw in 2021, an increase of 15% relative to 2017. Total revenue from snapper imports increased from $99.0 million (2021 dollars) in 2017 to a five-year high of $148.6 million in 2021. The average price per pound for fresh snapper products was $3.54 from 2017-2021 and has been steadily increasing reaching the highest price per pound in 2021. Imports of fresh snapper products primarily originated in Mexico or Central America and primarily entered the U.S. through the port of Miami.

**Table 3.3.1.24.** Annual pounds and value of fresh snapper imports and share of imports by country, 2017-2021.

| | 2017 | 2018 | 2019 | 2020 | 2021 |
|---|---|---|---|---|---|
| **Pounds of fresh snapper imports (product weight, million pounds)** | 31.2 | 30.5 | 32.8 | 32.4 | 36.0 |
| **Value of fresh snapper imports (millions $, 2021$)** | 99.0 | 103.5 | 115.3 | 113.4 | 148.6 |
| **Average price per lb (2021$)** | $3.17 | $3.39 | $3.52 | $3.50 | $4.13 |
| **Share of Imports by Country** | | | | | |
| **Mexico** | 35.8 | 32.5 | 34.9 | 40.4 | 32.8 |
| **Nicaragua** | 15.4 | 17.0 | 14.6 | 15.1 | 13.3 |
| **Panama** | 14.8 | 16.6 | 13.9 | 11.0 | 14.0 |
| **All others** | 33.9 | 33.9 | 36.6 | 33.5 | 39.9 |

Source: NOAA Foreign Trade Query Tool, accessed 11/16/22

As shown in Table 3.3.1.25, imports of frozen snapper products were 12.8 million lb pw in 2017. They peaked at 18.2 million lb pw in 2021, an increase of 42% relative to 2017. Total revenue from frozen snapper imports increased from $38.2 million (2021 dollars) in 2017 to a five-year high of $66.6 million in 2021. The average price per pound for frozen snapper products was $3.20 from 2017-2021, but has been increasing in recent years . Imports of frozen snapper products primarily originated in Brazil or South America and primarily entered the U.S. through the port of Miami.

**Table 3.3.1.25**. Annual pounds and value of frozen snapper imports and share of imports by country, 2017-2021.

| | 2017 | 2018 | 2019 | 2020 | 2021 |
|---|---|---|---|---|---|
| **Pounds of frozen snapper imports (product weight, million pounds)** | 12.8 | 12.2 | 11.4 | 15.9 | 18.2 |
| **Value of frozen snapper imports (millions $, 2021$)** | 38.2 | 37.6 | 36.7 | 48.4 | 66.6 |
| **Average price per lb (2021$)** | $2.98 | $3.08 | $3.22 | $3.05 | $3.65 |
| **Share of Imports by Country** | | | | | |
| **Brazil** | 61.0 | 63.8 | 54.6 | 55.4 | 58.6 |
| **Indonesia** | 11.0 | 11.3 | 6.8 | 5.4 | 3.9 |
| **Suriname** | 7.9 | 6.9 | 13.5 | 10.3 | 10.5 |
| **All others** | 20.1 | 17.9 | 25.0 | 28.9 | 27.0 |

Source: NOAA Foreign Trade Query Tool, accessed 11/16/22

*Groupers*

According to NMFS' foreign trade data,[31] grouper are not exported from the U.S. to other countries. Thus, the following describes the imports of fresh and frozen grouper products, which directly compete with domestic harvest of reef fish species. As shown in Table 3.3.1.26, imports of fresh grouper products were 12.3 million lb. pw in 2017. They peaked at 12.4.million lb. pw in 2018, but declined to 10.4 .million lb. pw by 2020. Total revenue from fresh grouper imports decreased from 2018 to 2020, but in 2021 remained the same as in 2016 at 55.7 million dollars. The average price per pound for fresh grouper products was $4.49 from 2017-2021, with a large decrease coming in 2020. Imports of fresh grouper products primarily originated in Mexico, Panama, and Brazil.

[31] https://www.fisheries.noaa.gov/foss/

**Table 3.3.1.26.** Annual pounds and value of fresh grouper imports and share of imports by country, 2017-2021.

| | 2017 | 2018 | 2019 | 2020 | 2021 |
|---|---|---|---|---|---|
| **Pounds of fresh Grouper imports (product weight, million pounds)** | 12.3 | 12.4 | 11.3 | 10.4 | 12.2 |
| **Value of fresh Grouper imports (millions $, 2021$)** | 55.7 | 57.2 | 53.0 | 40.6 | 57.7 |
| **Average price per lb (2021$)** | $4.54 | $4.61 | $4.68 | $3.89 | $4.73 |
| **Share of Imports by Country** | | | | | |
| **Mexico** | 58.8 | 58.0 | 57.9 | 67.6 | 53.8 |
| **Panama** | 12.2 | 9.0 | 8.1 | 8.0 | 12.0 |
| **Brazil** | 10.1 | 15.9 | 16.9 | 12.3 | 17.7 |
| **All others** | 19.0 | 17.1 | 17.0 | 12.2 | 16.5 |

Source: NOAA Foreign Trade Query Tool, accessed 01/25/23

As shown in Table 3.3.1.27, imports of frozen grouper products were 1.4 million lb. pw in 2017. They peaked at 4.6.million lb. pw in 2018, but declined to 2.2 million lb. pw by 2021. Total revenue from frozen grouper increased from $2.0 million (2021 dollars) in 2017 to $6.2 million in 2018, but subsequently declined to $5.1 million in 2021. The average price per pound for frozen grouper products was $1.67 from 2017-2021, and increased by 60% in 2021 relative to 2017. Imports of frozen grouper products primarily originated in Mexico, India, and Indonesia.

**Table 3.3.1.27.** Annual pounds and value of frozen grouper imports and share of imports by country, 2017-2021.

| | 2017 | 2018 | 2019 | 2020 | 2021 |
|---|---|---|---|---|---|
| **Pounds of frozen Grouper imports (product weight, million pounds)** | 1.4 | 4.6 | 3.5 | 0.8 | 2.2 |
| **Value of frozen Grouper imports (millions $, 2021$)** | 2.0 | 6.2 | 4.8 | 1.5 | 5.1 |
| **Average price per lb (2021$)** | $1.46 | $1.34 | $1.37 | $1.85 | $2.33 |
| **Share of Imports by Country** | | | | | |
| **Mexico** | 47.2 | 79.2 | 79.2 | 33.7 | 54.3 |
| **India** | 29.3 | 11.2 | 11.2 | 25.9 | 18.1 |
| **Indonesia** | 16.3 | 4.0 | 3.0 | 1.1 | 10.9 |
| **All others** | 7.2 | 5.5 | 6.5 | 39.3 | 16.7 |

Source: NOAA Foreign Trade Query Tool, accessed 05/14/22

**Economic Impacts**

The commercial harvest and subsequent sales and consumption of fish generates business activity as fishermen expend funds to harvest the fish and consumers spend money on goods and services, such as red grouper purchased at a local fish market and served during restaurant visits. These expenditures spur additional business activity in the region(s) where the harvest and

purchases are made, such as jobs in local fish markets, grocers, restaurants, and fishing supply establishments. In the absence of the availability of a given species for purchase, consumers would spend their money on substitute goods and services. As a result, the analysis presented below represents a distributional analysis only; that is, it only shows how economic impacts may be distributed through regional markets and should not be interpreted to represent the impacts if these species are not available for harvest or purchase.

In addition to these types of impacts, economic impact models can be used to determine the sources of the impacts. Each impact can be broken down into direct, indirect, and induced economic impacts. "Direct" economic impacts are the results of the money initially spent in the study area (e.g., country, region, state, or community) by the fishery or industry being studied. This includes money spent to pay for labor, supplies, raw materials, and operating expenses. The direct economic impacts from the initial spending create additional activity in the local economy, i.e., "indirect" economic impacts. Indirect economic impacts are the results of business-to-business transactions indirectly caused by the direct impacts. For example, businesses initially benefiting from the direct impacts will subsequently increase spending at other local businesses. The indirect economic impact is a measure of this increase in business-to-business activity, excluding the initial round of spending which is included in the estimate of direct impacts. "Induced" economic impacts are the results of increased personal income caused by the direct and indirect economic impacts. For example, businesses experiencing increased revenue from the direct and indirect impacts will subsequently increase spending on labor by hiring more employees, increasing work hours, raising salaries/wage rates, etc. In turn, households will increase spending at local businesses. The induced impact is a measure of this increase in household-to-business activity.

Estimates of the U.S. average annual business activity associated with the commercial harvest of gag in the Gulf were derived using the model[32] developed for and applied in NMFS (2022) and are provided in Table 3.3.1.28. Specifically, these impact estimates reflect the expected impacts from average annual gross revenues generated by landings of Gulf red grouper from 2016 through 2020. This business activity is characterized as jobs (full- and part-time), income impacts (wages, salaries, and self-employed income), value-added impacts (the difference between the value of goods and the cost of materials or supplies), and output impacts (gross business sales). Income impacts should not be added to output (sales) impacts because this would result in double counting.

The results provided should be interpreted with caution and demonstrate the limitations of these types of assessments. These results are based on average relationships developed through the analysis of many fishing operations that harvest many different species; specifically reef fish in this case. Separate models for individual species such as gag are not available. Between 2016 and 2020, landings of Gulf gag resulted in approximately $3.45 million (2021 dollars) in gross revenue on average. In turn, this revenue generated employment, income, value-added, and

[32] A detailed description of the input/output model is provided in NMFS (2011). "A Users Guide to the National and Coastal State I/O Model." www.st.nmfs.noaa.gov/documents/commercial_seafood_impacts_2007-2009.pdf

output impacts of 413 jobs, $12.6 million, $17.8 million, and $34.3 million per year, respectively, on average.

**Table 3.3.1.28.** Average annual economic impacts of gag in the commercial sector of the Gulf reef fish fishery. All monetary estimates are in thousands of 2021 dollars and employment is measured in full-time equivalent jobs.

| Harvesters | Direct | Indirect | Induced | Total |
|---|---|---|---|---|
| Employment impacts | 72 | 11 | 15 | 98 |
| Income impacts | 1,865 | 346 | 837 | 3,049 |
| Total value-added impacts | 1,988 | 1,247 | 1,433 | 4,667 |
| Output Impacts | 3,454 | 2,810 | 2,781 | 9,046 |
| **Primary dealers/processors** | | | | |
| Employment impacts | 15 | 6 | 10 | 31 |
| Income impacts | 609 | 561 | 530 | 1,700 |
| Total value-added impacts | 649 | 716 | 999 | 2,363 |
| Output impacts | 1,959 | 1,475 | 1,952 | 5,386 |
| **Secondary wholesalers/distributors** | | | | |
| Employment impacts | 7 | 2 | 7 | 15 |
| Income impacts | 363 | 108 | 381 | 852 |
| Total value-added impacts | 386 | 181 | 651 | 1,219 |
| Output impacts | 971 | 354 | 1,267 | 2,592 |
| **Grocers** | | | | |
| Employment impacts | 30 | 3 | 7 | 40 |
| Income impacts | 746 | 248 | 374 | 1,368 |
| Total value-added impacts | 795 | 399 | 634 | 1,828 |
| Output impacts | 1,274 | 648 | 1,244 | 3,167 |
| **Restaurants** | | | | |
| Employment impacts | 186 | 12 | 30 | 229 |
| Income impacts | 2,991 | 907 | 1,713 | 5,612 |
| Total value-added impacts | 3,189 | 1,622 | 2,887 | 7,697 |
| Output impacts | 5,831 | 2,538 | 5,697 | 14,065 |
| **Harvesters and seafood industry** | | | | |
| Employment impacts | 310 | 34 | 69 | 413 |
| Income impacts | 6,573 | 2,170 | 3,837 | 12,580 |
| Total value-added impacts | 7,007 | 4,164 | 6,603 | 17,774 |
| Output impacts | 13,489 | 7,826 | 12,941 | 34,255 |

### 3.3.2 Recreational Sector

The Gulf recreational sector is comprised of the private and for-hire modes. The private mode includes anglers fishing from shore (all land-based structures) and private/rental boats. The for-hire mode is composed of charter boats and headboats (also called party boats). Charter boats generally carry fewer passengers and charge a fee on an entire vessel basis, whereas headboats carry more passengers and payment is per person. The type of service, from a vessel- or passenger-size perspective, affects the flexibility to search different fishing locations during the course of a trip and target different species since larger concentrations of fish are required to satisfy larger groups of anglers.

**Landings**

Recreational landings presented in this section are derived from multiple sources. Landings from private vessels are come from Florida Fish and Wildlife Commissions' State Reef Fish Survey (SRFS). Landings from charter and shore modes are derived from MRIP Survey Data. Finally, headboat landings are derived from the Southeast Regional Headboat Survey (SRHS). Private vessels accounted for the majority of gag grouper landings on average (2017 through 2021), followed by charter vessels, then headboats, and with some recorded landings from shore (Table 3.3.2.1). Although not shown in the table, approximately 99.4% of gag landings on average were recorded in the state of Florida. As a result, landings in some states may be confidential and landings by state and mode outside of Florida are confidential in most instances. Therefore, landings by state or by state and mode are not presented.

**Table 3.3.2.1**. Recreational landings (lb gw) and percent distribution of gag across all states by mode for 2017-2021.

| | Landings (pounds ww) | | | | | Percent Distribution | | | |
|---|---|---|---|---|---|---|---|---|---|
| | **Charter vessel** | **Headboat (SRHS)** | **Private** | **Shore** | **Total** | **Charter vessel** | **Headboat (SRHS)** | **Private** | **Shore** |
| **2017** | 213,183 | 24,703 | 764,068 | 0 | 1,001,954 | 21% | 2% | 76% | 0% |
| **2018** | 186,724 | 27,644 | 716,961 | 32,700 | 964,029 | 19% | 3% | 74% | 3% |
| **2019** | 239,667 | 21,908 | 841,751 | 17,820 | 1,121,147 | 21% | 2% | 75% | 2% |
| **2020** | 320,879 | 24,255 | 1,213,729 | 12,904 | 1,571,767 | 20% | 2% | 77% | 1% |
| **2021** | 475,262 | 31,659 | 1,135,040 | 25,138 | 1,667,099 | 29% | 2% | 68% | 2% |
| **AVG** | **287,143** | **26,034** | **934,310** | **17,712** | **1,265,199** | **22%** | **2%** | **74%** | **1%** |

Source: SEFSC MRIP FES and SHRS Recreational ACL Data (accessed October 25, 2022) and FWC SRFS Data (accessed January, 2023).

**Angler Effort**

Recreational effort presented in this section is derived from MRIP Survey Data, Texas Parks and Wildlife Department's Marine Sport-Harvest Monitoring Program, and the Louisiana Department of Wildlife and Fisheries' Recreational Creel Survey. Although SRFS is the data source for private recreational vessel landings of gag in this amendment, SRFS data cannot be

used to estimate private recreational vessel effort because the SRFS does not directly estimate the number of trips targeting or number of trips catching specific species, nor does it distinguish black grouper and gag grouper on its survey instrument. Therefore, the effort estimates presented in this section for the charter, private and shore modes are based on MRIP-FES data.

Recreational effort derived from the MRIP database can be characterized in terms of the number of angler trips as follows:

• Target effort - The number of individual angler trips, regardless of duration, where the intercepted angler indicated that the species or a species in the species group was targeted as either the first or the second primary target for the trip. The species did not have to be caught.
• Catch effort - The number of individual angler trips, regardless of duration and target intent, where the individual species or a species in the species group was caught. The fish did not have to be kept.
• Total recreational trips - The total estimated number of recreational trips in the Gulf, regardless of target intent or catch success.

Other measures of effort are possible, such as directed trips (the number of individual angler trips that either targeted or caught a particular species). All of the estimated target trips and almost all of the estimated catch trips for Gulf gag grouper occurred in Florida from 2017 through 2021 (Table 3.3.2.2 and Table 3.3.2.3). The majority of estimated target and catch effort came from the private angling mode, followed by charter vessels. A small number of gag target and catch trips were recorded for the shore mode. The trends in total target effort were more variable from 2017-2021 than landings. Target effort increased by 68% in 2019, but declined by 27% in 2020 relative to 2017. However, target effort in the shore mode increased dramatically in 2019 and declined in 2020 and 2021. Catch effort also decreased in total and by mode from 2017 through 2021, but increased in the charter mode in 2018-2020. Thus, the reduction in catch effort (22%) was relatively less than the reduction in target effort from 2017 through 2021, though catch effort in the charter mode rose by 62%. Estimates of gag target or catch effort for additional years, and other measures of directed effort, are available on the NOAA website.[33]

[33] https://www.st.nmfs.noaa.gov/recreational-fisheries/data-and-documentation/queries/index

**Table 3.3.2.2.** Number of gag recreational target trips, by mode and state, 2017-2021.*

| Mode | Year | Florida | Alabama | Louisiana | Total |
|---|---|---|---|---|---|
| **Shore** | 2017 | 147,837 | 0 | 0 | 147,837 |
| | 2018 | 172,821 | 0 | 0 | 172,821 |
| | 2019 | 665,579 | 0 | 0 | 665,579 |
| | 2020 | 349,279 | 0 | 0 | 349,279 |
| | 2021 | 137,519 | 0 | 0 | 137,519 |
| | Average | 294,607 | 0 | 0 | 294,607 |
| | | | | | |
| **Charter** | 2017 | 23,806 | 0 | 62 | 23,868 |
| | 2018 | 20,580 | 0 | 0 | 20,580 |
| | 2019 | 24,818 | 0 | 0 | 24,818 |
| | 2020 | 29,190 | 0 | 0 | 29,190 |
| | 2021 | 48,186 | 0 | 0 | 48,186 |
| | Average | 29,316 | 0 | 12 | 29,328 |
| | | | | | |
| **Private/Rental** | 2017 | 576,300 | 0 | 201 | 576,501 |
| | 2018 | 611,440 | 0 | 0 | 611,440 |
| | 2019 | 659,232 | 0 | 0 | 659,232 |
| | 2020 | 603,857 | 2,491 | 0 | 606,348 |
| | 2021 | 578,616 | 2,183 | 0 | 580,799 |
| | Average | 605,889 | 935 | 40 | 606,864 |
| | | | | | |
| **All** | 2017 | 747,943 | 0 | 263 | 748,206 |
| | 2018 | 804,841 | 0 | 0 | 804,841 |
| | 2019 | 1,349,629 | 0 | 0 | 1,349,629 |
| | 2020 | 982,326 | 2,491 | 0 | 984,817 |
| | 2021 | 764,321 | 2,183 | 0 | 766,504 |
| | Average | 929,812 | 935 | 53 | 930,799 |

Sources: MRIP Survey Data available at https://www.fisheries.noaa.gov/recreational-fishing-data/recreationalfishing-data-downloads. Louisiana recreational effort estimates came from the Louisiana Department of Wildlife and Fisheries Recreational Creel Survey. Target effort estimates for most reef fish species in Texas are unavailable.

*No target effort occurred in Texas or Mississippi.

**Table 3.3.2.3.** Number of gag recreational catch trips, by mode and state, 2017-2021.*

| Mode | Year | Florida | Alabama/Mississippi | Louisiana | Texas | Total |
|---|---|---|---|---|---|---|
| **Shore** | 2017 | 207,541 | 0 | 0 | 0 | 207,541 |
| | 2018 | 192,167 | 0 | 0 | 0 | 192,167 |
| | 2019 | 376,527 | 0 | 0 | 0 | 376,527 |
| | 2020 | 341,205 | 0 | 0 | 0 | 341,205 |
| | 2021 | 271,620 | 0 | 0 | 0 | 271,620 |
| | Average | 277,812 | 0 | 0 | 0 | 277,812 |
| | | | | | | |
| **Charter** | 2017 | 74,695 | 945 | 61 | 0 | 75,701 |
| | 2018 | 76,276 | 433 | 84 | 0 | 76,793 |
| | 2019 | 76,918 | 1,498 | 776 | 0 | 79,192 |
| | 2020 | 153,209 | 670 | 40 | 82 | 154,001 |
| | 2021 | 121,909 | 347 | 163 | 0 | 122,419 |
| | Average | 100,601 | 779 | 225 | 16 | 101,621 |
| | | | | | | |
| **Private/Rental** | 2017 | 1,131,723 | 6,051 | 318 | 86 | 1,138,178 |
| | 2018 | 978,690 | 1,802 | 1,020 | 182 | 981,694 |
| | 2019 | 746,334 | 5,523 | 1,410 | 76 | 753,343 |
| | 2020 | 1,015,776 | 3,984 | 590 | 0 | 1,020,350 |
| | 2021 | 718,557 | 0 | 2,981 | 23 | 721,561 |
| | Average | 918,216 | 3,472 | 1,264 | 73 | 923,025 |
| | | | | | | |
| **All** | 2017 | 1,413,959 | 6,996 | 379 | 86 | 1,421,420 |
| | 2018 | 1,247,133 | 2,235 | 1,104 | 182 | 1,250,654 |
| | 2019 | 1,199,779 | 7,021 | 2,186 | 76 | 1,209,062 |
| | 2020 | 1,510,190 | 4,654 | 630 | 82 | 1,515,556 |
| | 2021 | 1,112,086 | 347 | 3,144 | 23 | 1,115,600 |
| | Average | 1,296,629 | 4,251 | 1,489 | 90 | 1,302,458 |

Sources: MRIP Survey Data available at https://www.fisheries.noaa.gov/recreational-fishing-data/recreationalfishing-data-downloads. Catch effort estimates for Texas are from the Texas Parks and Wildlife Department's Marine Sport-Harvest Monitoring Program and assumed equivalent to MRIP-FES estimates. Louisiana recreational catch effort estimates came from the Louisiana Department of Wildlife and Fisheries Recreational Creel Survey.

As shown in tables 3.3.2.4 and 3.3.2.5, across all modes, target and catch effort was the highest in wave 3 (May-June) and wave 6 (Nov-Dec). Target effort is the lowest in wave 1 (Jan-Feb) and wave 5 (Sept-Oct) while catch effort is the lowest in wave 1 (Jan-Feb) across all modes. For the private mode, target effort was highest in wave 6 and lowest in wave 1. For the charter mode, target effort was highest in wave 3 and lowest in wave 1.

**Table 3.3.2.4**. Number of gag target trips by wave and mode, 2017 – 2021.*

| | 1 (Jan-Feb) | 2 (Mar-Apr) | 3 (May-Jun) | 4 (Jul-Aug) | 5 (Sep-Oct) | 6 (Nov-Dec) | Total |
|---|---|---|---|---|---|---|---|
| | **Shore** | | | | | | |
| **2017** | 2,080 | 0 | 62,306 | 23,197 | 10,505 | 49,749 | 147,837 |
| **2018** | 0 | 8,434 | 23,153 | 55,429 | 4,027 | 81,777 | 172,820 |
| **2019** | 0 | 15,543 | 270,766 | 68,574 | 123,507 | 187,189 | 665,579 |
| **2020** | 23,477 | 8,254 | 17,130 | 118,217 | 114,371 | 67,830 | 349,279 |
| **2021** | 10,562 | 0 | 58,293 | 11,318 | 48,295 | 9,052 | 137,520 |
| **Average** | 7,224 | 6,446 | 86,330 | 55,347 | 60,141 | 79,119 | 294,607 |
| | **Charter** | | | | | | |
| **2017** | 0 | 0 | 6,437 | 1,017 | 1,338 | 15,075 | 23,867 |
| **2018** | 0 | 186 | 11,776 | 90 | 480 | 8,047 | 20,579 |
| **2019** | 0 | 423 | 5,956 | 3,462 | 3,496 | 11,481 | 24,818 |
| **2020** | 0 | 217 | 18,376 | 4,281 | 3,213 | 3,104 | 29,191 |
| **2021** | 660 | 951 | 10,570 | 14,586 | 7,784 | 13,635 | 48,186 |
| **Average** | 132 | 355 | 10,623 | 4,687 | 3,262 | 10,268 | 29,328 |
| | **Private/Rental** | | | | | | |
| **2017** | 31,044 | 34,829 | 104,600 | 53,528 | 69,255 | 283,245 | 576,501 |
| **2018** | 2,479 | 27,577 | 116,860 | 182,120 | 108,835 | 173,567 | 611,438 |
| **2019** | 14,242 | 1,158 | 204,431 | 163,052 | 86,504 | 189,845 | 659,232 |
| **2020** | 0 | 37,953 | 130,089 | 111,866 | 96,393 | 230,048 | 606,349 |
| **2021** | 11,546 | 12,199 | 85,538 | 135,785 | 59,714 | 276,017 | 580,799 |
| **Average** | 11,862 | 22,743 | 128,304 | 129,270 | 84,140 | 230,544 | 606,864 |
| | **All** | | | | | | |
| **2017** | 33,124 | 34,829 | 173,343 | 77,742 | 81,098 | 348,069 | 748,205 |
| **2018** | 2,479 | 36,197 | 151,789 | 237,639 | 113,342 | 263,391 | 804,837 |
| **2019** | 14,242 | 17,124 | 481,153 | 235,088 | 213,507 | 388,515 | 1,349,629 |
| **2020** | 23,477 | 46,424 | 165,595 | 234,364 | 213,977 | 300,982 | 984,819 |
| **2021** | 22,768 | 13,150 | 154,401 | 161,689 | 115,793 | 298,704 | 766,505 |
| **Average** | 19,218 | 29,545 | 225,256 | 189,304 | 147,543 | 319,932 | 930,799 |

Sources: MRIP Survey Data available at https://www.fisheries.noaa.gov/recreational-fishing-data/recreationalfishing-data-downloads. Target effort estimates for most reef fish species in Texas are unavailable. Louisiana recreational effort estimates came from the Louisiana Department of Wildlife and Fisheries Recreational Creel Survey

**Table 3.3.2.5**. Number of gag catch trips by wave and mode, 2017 – 2021.

| | 1 (Jan-Feb) | 2 (Mar-Apr) | 3 (May-Jun) | 4 (Jul-Aug) | 5 (Sep-Oct) | 6 (Nov-Dec) | Total |
|---|---|---|---|---|---|---|---|
| | **Shore** | | | | | | |
| **2017** | 58,763 | 28,848 | 21,972 | 29,963 | 15,246 | 52,749 | 207,541 |
| **2018** | 5,237 | 101,349 | 59,987 | 3,596 | - | 21,998 | 192,167 |
| **2019** | 27,879 | 4,202 | 21,383 | 129,013 | 102,216 | 91,835 | 376,528 |
| **2020** | 22,199 | 3,793 | 18,574 | 27,141 | 242,776 | 26,722 | 341,205 |
| **2021** | 23,356 | 181,055 | 35,331 | 13,207 | 14,951 | 3,720 | 271,620 |
| **Average** | 27,487 | 63,849 | 31,449 | 40,584 | 75,038 | 39,405 | 277,812 |
| | **Charter** | | | | | | |
| **2017** | 11,539 | 8,099 | 17,387 | 5,240 | 8,904 | 24,533 | 75,702 |
| **2018** | 15,741 | 4,641 | 30,000 | 10,346 | 2,584 | 13,482 | 76,794 |
| **2019** | 7,830 | 2,564 | 25,516 | 14,297 | 7,281 | 21,704 | 79,192 |
| **2020** | 28,924 | 3,366 | 53,136 | 45,577 | 9,492 | 13,505 | 154,000 |
| **2021** | 7,403 | 19,617 | 40,826 | 19,310 | 17,901 | 17,361 | 122,418 |
| **Average** | 14,287 | 7,657 | 33,373 | 18,954 | 9,232 | 18,117 | 101,621 |
| | **Private/Rental** | | | | | | |
| **2017** | 102,082 | 104,272 | 322,571 | 144,839 | 129,625 | 334,790 | 1,138,179 |
| **2018** | 84,656 | 150,466 | 322,509 | 215,708 | 109,792 | 98,563 | 981,694 |
| **2019** | 27,235 | 35,730 | 252,973 | 171,185 | 86,813 | 179,406 | 753,342 |
| **2020** | 111,037 | 96,258 | 187,558 | 136,675 | 263,073 | 225,748 | 1,020,349 |
| **2021** | 111,332 | 65,169 | 182,116 | 126,882 | 41,046 | 195,016 | 721,561 |
| **Average** | 87,268 | 90,379 | 253,545 | 159,058 | 126,070 | 206,705 | 923,025 |
| | **All** | | | | | | |
| **2017** | 172,384 | 141,219 | 361,930 | 180,042 | 153,775 | 412,072 | 1,421,422 |
| **2018** | 105,634 | 256,456 | 412,496 | 229,650 | 112,376 | 134,043 | 1,250,655 |
| **2019** | 62,944 | 42,496 | 299,872 | 314,495 | 196,310 | 292,945 | 1,209,062 |
| **2020** | 162,160 | 103,417 | 259,268 | 209,393 | 515,341 | 265,975 | 1,515,554 |
| **2021** | 142,091 | 265,841 | 258,273 | 159,399 | 73,898 | 216,097 | 1,115,599 |
| **Average** | 129,043 | 161,886 | 318,368 | 218,596 | 210,340 | 264,226 | 1,302,458 |

Sources: MRIP Survey Data available at https://www.fisheries.noaa.gov/recreational-fishing-data/recreationalfishing-data-downloads. Effort estimates for Texas are from the Texas Parks and Wildlife Department's Marine Sport-Harvest Monitoring Program and assumed equivalent to MRIP-FES estimates. Louisiana recreational effort estimates came from the Louisiana Department of Wildlife and Fisheries Recreational Creel Survey.

**Permits**

There are no specific federal permitting requirements for recreational anglers to fish for or harvest reef fish, including gag. Instead, private anglers are required to either possess a state recreational fishing permit that authorizes saltwater fishing in general, or be registered in the federal National Saltwater Angler Registry system, subject to appropriate exemptions. As a result, it is not possible to identify with available data how many individual anglers would be expected to be affected by the actions in this amendment.

A federal charter/headboat (for-hire) vessel permit is required for fishing from a for-hire vessel in federal waters for Gulf reef fish. Gulf reef fish for-hire permits are limited access permits. From a historical perspective, the number of permits that were valid in a given year has continually decreased over the past several years, as illustrated in Table 3.3.2.6. However, the rate of attrition with for-hire reef fish permits has been relatively slow and far less compared to commercial reef fish permits.

As of July 8, 2021, there were 1,286 valid or renewable for-hire reef fish permits, 1,179 of which were valid. A renewable permit is an expired limited access permit that cannot be actively fished, but is renewable for up to one year after expiration. Although the for-hire permit application collects information on the primary method of operation,[34] the permit itself does not identify the permitted vessel as either a headboat or a charter vessel and vessels may operate in both capacities. However, if a vessel meets the selection criteria used by the SRHS and is selected to report by the Science Research Director of the SEFSC, it is determined to operate primarily as a headboat and is required to submit harvest and effort information to the SRHS.

Information on Gulf charter vessel and headboat operating characteristics is included in Savolainen et al. (2012) and is incorporated herein by reference. The average charter vessel operation took 46 full-day (9 hours) and 55 half-day (5 hours) trips per year, carried 4.8 and 4.6 passengers per trip type, respectively, targeted reef fish species on 64% of all trips, and took 68% of all trips in the EEZ. The average headboat operation took 83 full-day (10 hours) and 37 half-day (6 hours) trips per year, carried 13.1 and 14.6 passengers per trip type, respectively, targeted reef fish species on 84% of all trips, and took 81% of all trips in the EEZ.

[34] In 2020, of the 1,289 vessels with valid for-hire permits, 87 were primarily used for commercial fishing, 79 were primarily used as headboats, and 1,122 were primarily used as charter vessels.

**Table 3.3.2.6.** Number of valid or renewable for-hire Gulf reef fish permits, 2009-2020.

| Year | Number of Permits |
|---|---|
| **2009** | 1417 |
| **2010** | 1385 |
| **2011** | 1353 |
| **2012** | 1336 |
| **2013** | 1323 |
| **2014** | 1310 |
| **2015** | 1294 |
| **2016** | 1282 |
| **2017** | 1280 |
| **2018** | 1279 |
| **2019** | 1277 |
| **2020** | 1289 |

The number of federally permitted Gulf headboats in the SRHS has been slightly variable from 2016-2020. In 2016, there were 69 federally permitted Gulf headboats in the SRHS. In 2017, the number of federally permitted Gulf headboats increased to 73, but subsequently declined to 69 in 2020. Souza and Liese (2019) estimate that approximately 10% of all permitted Southeast (Gulf and South Atlantic) for-hire vessels determined to be headboats were not actively fishing in 2017.[35] Further, of those that were active, 14% were not active in offshore waters. Thus, approximately 23% of the permitted Southeast headboats were likely not active in the EEZ. With respect to permitted Gulf charter vessels, they estimate that 24% were not active in 2017, while 10% of those that were active were not active in offshore waters. Thus, approximately 34% of the permitted Gulf charter vessels were likely not active in the EEZ in 2017. Similar analysis of recreational effort is not possible for the headboat mode in the Gulf because headboat data are not collected at the angler level. Estimates of effort by the headboat mode are provided in terms of angler days, or the number of standardized 12-hour fishing days that account for the different half-, three-quarter-, and full-day fishing trips by headboats. The stationary "fishing for demersal (bottom-dwelling) species" nature of headboat fishing, as opposed to trolling, suggests that most, if not all, headboat trips and, hence, angler days, are demersal or snapper grouper trips by intent.

Headboat angler days declined overall across the Gulf States from 2018 through 2020, but increased by about 9% in 2021, relative to 2018 (Table 3.3.2.7). Texas, however, saw little

[35] Sample sizes were too small to generate reliable estimates for Gulf and South Atlantic headboats separately.

decline in headboat angler days from 2018-2020, and had a significant increase in 2021. On average (2018 through 2021), Florida accounted for the majority of headboat angler days reported, followed by Texas and Alabama; whereas, Mississippi and Louisiana combined, accounted for only a small percentage (Table 3.3.2.8). Headboat effort in terms of angler days for the entire Gulf was concentrated most heavily during the summer months of June through August on average (2018 through 2021; Table 3.3.2.8).

**Table 3.3.2.7**. Gulf headboat angler days and percent distribution by state (2017 through 2021).

| | Angler Days | | | | Percent Distribution | | | |
|---|---|---|---|---|---|---|---|---|
| | **FL** | **AL** | **MS-LA*** | **TX** | **FL** | **AL** | **MS-LA*** | **TX** |
| **2017** | 178,814 | 17,839 | 3,186 | 51,570 | 71.1% | 7.1% | 1.3% | 20.5% |
| **2018** | 171,996 | 19,851 | 3,235 | 52,160 | 69.6% | 8.0% | 1.3% | 21.1% |
| **2019** | 161,564 | 18,607 | 2,632 | 52,456 | 68.7% | 7.9% | 1.1% | 22.3% |
| **2020** | 126,794 | 13,091 | 1,728 | 51,498 | 65.7% | 6.8% | 0.9% | 26.7% |
| **2021** | 181,632 | 13,844 | 3,197 | 71,344 | 67.3% | 5.1% | 1.2% | 26.4% |
| **Average** | 160,497 | 16,348 | 2,698 | 56,865 | 67.8% | 7.0% | 1.1% | 24.1% |

**Source:** NMFS Southeast Regional Headboat Survey (SRHS) (February, 2022).
*headboat data from Mississippi and Louisiana are combined for confidentiality purposes.

**Table 3.3.2.8.** Gulf headboat angler days and percent distribution by month (2018 – 2021).

| | **Jan** | **Feb** | **Mar** | **Apr** | **May** | **Jun** | **Jul** | **Aug** | **Sep** | **Oct** | **Nov** | **Dec** |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | **Headboat Angler Days** | | | | | | | | | | | |
| **2017** | 8,998 | 14,007 | 21,032 | 19,383 | 19,186 | 47,673 | 54,028 | 22,984 | 10,289 | 11,054 | 11,299 | 11,488 |
| **2018** | 5,524 | 13,694 | 20,762 | 17,584 | 16,876 | 54,251 | 53,304 | 24,819 | 13,235 | 10,633 | 8,183 | 8,377 |
| **2019** | 2,330 | 12,819 | 21,796 | 16,299 | 18,271 | 46,046 | 47,594 | 24,212 | 11,369 | 13,687 | 10,389 | 10,447 |
| **2020** | 8,147 | 10,906 | 11,426 | 385 | 11,130 | 43,930 | 42,021 | 20,647 | 12,190 | 14,497 | 8,710 | 9,122 |
| **2021** | 6,871 | 8,584 | 21,301 | 17,746 | 22,019 | 51,773 | 55,201 | 24,978 | 15,768 | 20,446 | 12,117 | 13,213 |
| **Avg** | 5,718 | 11,501 | 18,821 | 13,004 | 17,074 | 49,000 | 49,530 | 23,664 | 13,141 | 14,816 | 9,850 | 10,290 |
| | **Percent Distribution** | | | | | | | | | | | |
| **2017** | 3.6% | 5.6% | 8.4% | 7.7% | 7.6% | 19.0% | 21.5% | 9.1% | 4.1% | 4.4% | 4.5% | 4.6% |
| **2018** | 2.2% | 5.5% | 8.4% | 7.1% | 6.8% | 21.9% | 21.6% | 10.0% | 5.4% | 4.3% | 3.3% | 3.4% |
| **2019** | 1.0% | 5.4% | 9.3% | 6.9% | 7.8% | 19.6% | 20.2% | 10.3% | 4.8% | 5.8% | 4.4% | 4.4% |
| **2020** | 4.2% | 5.6% | 5.9% | 0.2% | 5.8% | 22.7% | 21.8% | 10.7% | 6.3% | 7.5% | 4.5% | 4.7% |
| **2021** | 2.5% | 3.2% | 7.9% | 6.6% | 8.2% | 19.2% | 20.4% | 9.3% | 5.8% | 7.6% | 4.5% | 4.9% |
| **Avg** | 2.4% | 4.9% | 8.0% | 5.5% | 7.2% | 20.7% | 21.0% | 10.0% | 5.6% | 6.3% | 4.2% | 4.4% |

**Source:** NMFS SRHS (Feb, 2022).

**Economic Value**

Participation, effort, and harvest are indicators of the value of saltwater recreational fishing. However, a more specific indicator of value is the satisfaction that anglers experience over and above their costs of fishing. The economic value of this satisfaction is referred to as consumer surplus (CS). The value or benefit derived from the recreational experience is dependent on several quality determinants, which include fish size, catch success rate, and the number of fish kept (bag limit). These variables help determine the value of a fishing trip and influence total demand for recreational fishing trips. The two most recent publications with estimates of angler willingness-to-pay for gag bag limits used data from a survey of Gulf of Mexico anglers in 2013. Table 2 in Carter et al. (2020) shows that anglers fishing from a private boat were willing to pay $92.80 (2021$) on average to keep 2 gag instead of zero (closed season). Similarly, Table 3 in Carter et al. (2022) reports that anglers fishing from a charter boat were willing to pay $72.90 (2021$) on average to keep 2 gag instead of zero. There is no estimate available for anglers fishing from the shore mode. In general, the estimate for private boat anglers can be used for aggregate analyses over all anglers (D. Carter, SEFSC, personal comm. 2022).

Estimates of average annual gross revenue for charter vessels in 2009 are provided in Savolainen et al. (2012). According to Savolainen et al. (2012), the average annual gross revenue for a Gulf headboat is $286,500, while the average annual gross revenue for a Gulf charter vessel is $94,552 (2021 dollars) More recent estimates of average annual gross revenue for Gulf headboats are provided in Abbott and Willard (2017) and D. Carter (SEFSC, pers. comm., 2018). Abbott and Willard (2017) suggest that Savolainen et al.'s (2012) estimate of average annual gross revenue for headboats may be an underestimate as data in the former suggest that average gross revenue in 2009 for the vessels in their sample was about $505,972 (2021 dollars). Further, their data suggests average annual gross revenue per vessel had increased to about $611,383 (2021$) by 2014. However, Abbott and Willard's estimates are based on a sample of 17 headboats that chose to participate in the Headboat Collaborative Program in 2014, while Savolainen et al.'s (2012) are based on a random sample of 20 headboats. The headboats that participated in the Collaborative may be economic highliners, in which case Abbott and Willard's (2017) estimates would overestimate average annual gross revenue for Gulf headboats. D. Carter (SEFSC, pers. comm., 2018) estimated that average annual gross revenue for Gulf headboats was approximately $450,737 (2021 dollars) in 2017, while the maximum gross revenue for a single headboat was about $1.45 million. This estimate is likely the best current estimate of annual gross revenue for Gulf headboats as it is based on a relatively large sample of 63 boats, or more than 90% of the active fleet, and is more recent.

However, gross revenues overstate the annual economic value and profits generated by for-hire vessels. Economic value for for-hire vessels can be measured by annual producer surplus (PS). In general, PS is the amount of money a vessel owner earns in excess of variable (trip) costs. Economic profit is the amount of money a vessel owner earns in excess of variable and fixed costs, inclusive of all implicit costs, such as the value of a vessel owner's time as captain and as entrepreneur, and the cost of using physical capital (i.e., depreciation of the vessel and gear). In 2021$, Savolainen et al. (2012) estimated the annual PS for Gulf headboats and charter vessels

was approximately $200,456 and $62,181, respectively[36]. Their best estimates of economic profit were $83,632 and $27,948 (2021$), respectively. Estimates of PS and economic profit for headboats is not available from Abbott and Willard (2017) or D. Carter (SEFSC, pers. comm., 2018) as they did not collect comprehensive cost data at the vessel level.[37]

With regard to for-hire trips, economic value can be measured by PS per angler trip, which represents the amount of money that a vessel owner earns in excess of the cost of providing the trip. Estimates of revenue, costs, and trip net revenue trips taken by headboats and charter vessels in 2017 are available from Souza and Liese (2019). They also provide estimates of trip net cash flow per angler trip, which are approximates of PS per angler trip. As shown in Table 3.3.2.9, after accounting for transactions fees, supply costs, and labor costs, net revenue per trip was 42% of revenue for Gulf charter vessels and 54% of revenue for Southeast headboats, or $824and $1,912 (2021$), respectively. Given the respective average number of anglers per trip for each fleet, PS per trip is estimated to be $150 for charter vessels and $68 for headboats.

**Table 3.3.2.9.** Trip economics for offshore trips by Gulf charter vessels and Southeast headboats in 2017 (2021$).

| | Gulf Charter Vessels | Southeast Headboats |
|---|---|---|
| **Revenue** | 100% | 100% |
| **Transaction Fees (% of revenue)** | 3% | 6% |
| **Supply Costs (% of revenue)** | 27% | 19% |
| **Labor Costs (% of revenue)** | 27% | 22% |
| **Net Revenue per trip including Labor costs (% of revenue)** | 42% | 54% |
| **Net Revenue per Trip** | $824 | $1,912 |
| **Average # of Anglers per Trip** | 5.5 | 28.2 |
| **Trip Net Cash Flow per Angler Trip** | $150 | $68 |

Source: Souza and Liese (2019)

**Economic Impacts**

The desire for recreational fishing generates economic activity as consumers spend their income on various goods and services needed for recreational fishing. This spurs economic activity in the region where recreational fishing occurs. It should be clearly noted that, in the absence of the

[36] Although Savolainen, et al. (2012) account for all explicit variable and fixed costs, they do not account for implicit costs, and thus they over-estimate actual economic profits for these vessels.

[37] Abbott and Willard (2017) do report revenue net of fuel costs, but this ignores important costs such as processing fees, commissions, ice, bait, tackle, and labor.

opportunity to fish, the income would presumably be spent on other goods and services and these expenditures would similarly generate economic activity in the region where the expenditure occurs. As such, the analysis below represents a distributional analysis only.
Estimates of the business activity (economic impacts) associated with recreational angling for Gulf gag were calculated using average trip-level impact coefficients derived from the 2019 Fisheries Economics of the U.S. report (NMFS 2022)[38] and underlying data provided by the National Oceanic and Atmospheric Administration (NOAA) Office of Science and Technology. Economic impact estimates in 2018 dollars were adjusted to 2021 dollars using the annual, not seasonally adjusted gross domestic product (GDP) implicit price deflator provided by the U.S. Bureau of Economic Analysis.

Business activity for the recreational sector is characterized in the form of jobs (full- and part-time), income impacts (wages, salaries, and self-employed income), value-added impacts (the difference between the value of goods and the cost of materials or supplies), and output impacts (gross business sales). Estimates of the average gag target effort by mode and state (2017 through 2021) and the associated business activity are provided in Table 3.3.2.10.

[38] A detailed description of the input/output model is provided in Lovell, S. S. Steinback, and J. Hilger (2013).

**Table 3.3.2.10.** Estimated economic impacts from average annual Gulf gag recreational target trips by state and mode (2017-2021), using state-level multipliers. All monetary estimates are in thousands of 2021$ and employment is in full-time equivalent jobs.*

| | FL | AL | LA |
|---|---|---|---|
| **Charter Mode** | | | |
| Target Trips | $29,316 | $0 | $12 |
| Value Added Impacts | $10,257 | $0 | $6 |
| Sales Impacts | $17,224 | $0 | $11 |
| Income Impacts | $5,994 | $0 | $3 |
| Employment (Jobs) | $158 | $0 | $0 |
| **Private/Rental Mode** | | | |
| Target Trips | $605,889 | $0 | $40 |
| Value Added Impacts | $21,843 | $0 | $6 |
| Sales Impacts | $33,855 | $0 | $10 |
| Income Impacts | $11,462 | $0 | $3 |
| Employment (Jobs) | $310 | $0 | $0 |
| **Shore** | | | |
| Target Trips | $294,607 | $935 | $0 |
| Value Added Impacts | $10,792 | $66 | $0 |
| Sales Impacts | $16,866 | $114 | $0 |
| Income Impacts | $5,685 | $34 | $0 |
| Employment (Jobs) | $155 | $1 | $0 |
| **All Modes** | | | |
| Target Trips | $929,812 | $935 | $52 |
| Value Added Impacts | $42,892 | $66 | $12 |
| Sales Impacts | $67,944 | $114 | $21 |
| Income Impacts | $23,140 | $34 | $7 |
| Employment (Jobs) | $623 | $1 | $0 |

Source: MRIP Survey Data available at https://www.fisheries.noaa.gov/recreational-fishing-data/recreational-fishing-data-downloads.

* Headboat information is unavailable. LA effort estimates are not currently available. However, landings were negligible and thus target effort is likely zero. No target effort occurred in Mississippi or Texas.

The estimates provided in Table 3.3.2.10 use state-level multipliers and thus only apply at the state-level. For example, estimates of business activity in Florida represent business activity in Florida only and not to other states (for e.g., a good purchased in Florida may have been manufactured in a neighboring state) or the nation as a whole. The same holds true for each of the other states. Income impacts should not be added to output (sales) impacts because this would result in double counting. The results provided should be interpreted with caution and

demonstrate the limitations of these types of assessments. These results are based on average relationships developed through the analysis of many fishing operations that harvest many different species.

Addition of the state-level estimates to produce a regional (or national) total may underestimate the actual amount of total business activity because state-level impact multipliers do not account for interstate and interregional trading. National-level multipliers must be used to account for interstate and interregional trading. Between 2017 and 2021, and using national-level multipliers, gag target effort generated employment, income, value-added, and output (sales) impacts of 193 jobs, $9.2 million, $16.3 million, and $28.8 million per year, respectively, on average.

Estimates of the economic impacts resulting from headboat target effort for reef fish are not available. Headboat vessels are not covered in MRIP so, in addition to the absence of estimates of target effort, estimates of the appropriate business activity coefficients for headboat effort have not been generated.

## 3.4 Description of the Social Environment

This amendment primarily affects commercial and recreational management of gag in the Gulf and therefore the following section focuses on gag. However, commercial red grouper is impacted to a lesser extent because of IFQ multi-use rules and the social description of the Red Grouper Framework (NMFS 2022) is incorporated by reference herein. The following description includes permits related to the commercial and recreational reef fish fishing by state in order to provide a geographic distribution of fishing involvement. Top communities based on the number of permits are presented. Commercial and recreational landings by state are included to provide information on the geographic distribution of fishing involvement. Descriptions of GG-IFQ accounts with shares, GG-IFQ accounts with allocation but without shares, and GG-IFQ dealers are included at the state and community level. The top communities in the Gulf by commercial landings are identified, commercial engagement and reliance are described, and the local quotient for these communities are included. Descriptions of the top communities based on recreational engagement are also included. Community level data are presented in order to meet the requirements of National Standard 8 of the Magnuson-Stevens Fishery Conservation and Management Act (Magnuson-Stevens Act), which requires the consideration of the importance of fishery resources to human communities when changes to fishing regulations are considered. Lastly, social vulnerability data are presented to assess the potential for environmental justice concerns.

Additional detailed information about communities in the following analysis can be found on NMFS' Southeast Regional Office (SERO) Community Snapshots website.[39]

[39] https://www.fisheries.noaa.gov/southeast/socioeconomics/snapshots-human-communities-and-fisheries-gulf-mexico-and-south-atlantic

### 3.4.1 Gag Commercial Sector

**Permits**

Gulf reef fish permits are issued to individuals in Florida (81.4% of Gulf reef fish vessels), Texas (7.8%), Alabama (4.5%), Louisiana (3.8%), and Mississippi (0.9%) (SERO permit office, July 8, 2021). Residents of other states (Arkansas, Georgia, Illinois, Maryland, Missouri, North Carolina, New York, Oklahoma, and South Carolina) also hold commercial reef fish permits, but these states represent a smaller percentage of the total number of issued permits.

Gulf reef fish permits are held by individuals with mailing addresses in 232 communities (SERO permit office, July 8, 2021). Communities with the most commercial reef fish permits are located in Florida and Texas (Table 3.4.1.1). The communities with the most reef fish permits are Panama City, Florida (9.1% of reef fish permits), Key West, Florida (4.8%), and St. Petersburg, Florida (3.3%).

**Table 3.4.1.1.** Top communities by number of Gulf reef fish permits.

| State | Community | Reef Fish Permits (RR) |
|---|---|---|
| **FL** | Panama City | 82 |
| **FL** | Key West | 43 |
| **FL** | St. Petersburg | 30 |
| **FL** | Largo | 26 |
| **TX** | Galveston | 22 |
| **FL** | Destin | 22 |
| **FL** | Cortez | 21 |
| **FL** | Pensacola | 21 |
| **FL** | Seminole | 20 |
| **FL** | Clearwater | 16 |
| **FL** | Tampa | 16 |
| **FL** | Lynn Haven | 13 |
| **FL** | Naples | 13 |
| **FL** | Steinhatchee | 13 |
| **FL** | Apalachicola | 11 |
| **FL** | Tarpon Springs | 11 |

Source: SERO permit office, July 8, 2021.

**Landings**

Nearly all the commercial gag catch is landed along the west coast of Florida (average of 99.2% from 2017-2021), followed by Louisiana (0.5%), Texas (0.2%), and Alabama and Mississippi (0.2%, NMFS SERO IFQ database accessed 2/16/23).

**IFQ Accounts**

To land IFQ-managed species, such as gag, fishermen need a permitted vessel and sufficient IFQ allocation in the vessel's account to land the fish. Some accounts are held in the name of an individual, or more than one individual, while others form business entities and open accounts in the name of the business. This makes it more difficult to talk about the social environment, because we don't always know who is behind the account, and whether the holders of an account reside in the same area. In the following analysis, accounts are described at the state and community level based on the mailing address of the individual; business; or primary entity which equates to the primary individual listed on the account, if the account is held by more than one individual.

Also called shareholder accounts, an IFQ account is required to hold shares and allocation. The number of accounts is used here as a proxy to represent the number of participants.

*Shareholders*

As of July 8, 2021, a total of 506 IFQ accounts held shares of GG-IFQ (IFQ database; includes active and suspended accounts). The majority of accounts with GG-IFQ shares have a mailing address in Florida (81.4% of accounts with GG-IFQ shares, Table 3.4.1.2), followed by Texas (6.1%), Alabama (4.5%), and Louisiana (3.8%). Accounts with mailing addresses in Mississippi and in other states (Arkansas, Georgia, Michigan, North Carolina, New York, South Carolina, Tennessee, Utah, and Wyoming) also hold GG-IFQ shares, but these states represent a smaller percentage of the total number of accounts with shares.

The greatest proportion of GG-IFQ shares are held in accounts with mailing addresses in Florida, followed by Texas (Table 3.4.1.2). Accounts in Alabama, Louisiana, Mississippi, and other states also hold GG-IFQ shares, but these states represent a smaller percentage of shares.

**Table 3.4.1.2.** Number of IFQ accounts with gag grouper shares by state, including the percentage of shares by state by share category.

| State | Accounts | GG Shares (%) |
|---|---|---|
| **AL** | 23 | 1.632 |
| **FL** | 412 | 88.602 |
| **LA** | 19 | 1.047 |
| **MS** | 5 | 0.181 |
| **TX** | 31 | 4.380 |
| **Other** | 16 | 3.817 |
| **Total** | **506** | **99.659** |

Source: NMFS SERO IFQ database accessed 7/8/21.
Note: Includes active and suspended accounts.

Accounts with GG-IFQ shares are held by people with mailing addresses in a total of 180 communities (IFQ database accessed 7/8/21). Communities with the most accounts with GG-IFQ shares are located in Florida and Texas (Table 3.4.1.3). The community with the most accounts with GG-IFQ shares is Panama City, Florida (8.3% of accounts with shares), followed by Key West, Florida (4.7%), Largo, Florida (3.4%), and St. Petersburg, Florida (3%).

**Table 3.4.1.3.** Top communities by number of IFQ accounts with gag grouper shares, including the percentage of shares by community by share category.

| State | Community | Accounts | GG Shares (%) |
|---|---|---|---|
| **FL** | Panama City | 42 | 18.343 |
| **FL** | Key West | 24 | 0.372 |
| **FL** | Largo | 17 | 5.778 |
| **FL** | St. Petersburg | 15 | 2.597 |
| **FL** | Destin | 14 | 1.084 |
| **FL** | Cortez | 13 | 1.714 |
| **FL** | Pensacola | 12 | 0.577 |
| **FL** | Steinhatchee | 10 | 2.796 |
| **FL** | Tampa | 10 | 1.004 |
| **FL** | Clearwater | 9 | 4.353 |
| **FL** | Seminole | 9 | 1.761 |
| **FL** | Tarpon Springs | 9 | 2.644 |
| **FL** | Apalachicola | 8 | 6.347 |
| **FL** | Tallahassee | 8 | 1.227 |
| **TX** | Galveston | 8 | 0.795 |

Source: NMFS SERO IFQ database accessed 7/8/21.

The largest or maximum percent of GG-IFQ shares held in a community is 18.343% in Panama City, Florida (IFQ database accessed 7/8/21). The percentage of shares by community varies widely and a large number of accounts with shares may not necessarily correlate to a large percentage of shares in a particular category (Table 3.4.1.3). Some communities with a relatively smaller number of accounts may have a larger percentage of shares in a particular share category or categories.

*Allocation Holders without Shares*

In 2021, a total of 221 IFQ accounts held GG-IFQ allocation without GG-IFQ shares (IFQ database accessed 2/25/22). However, these accounts may be related to accounts with gag shares. The majority of accounts with GG-IFQ allocation, but without GG-IFQ shares have mailing addresses in Florida (86.9% of accounts with gag allocation, but without gag shares, Table 3.4.1.4), followed by Texas (5.9%), Louisiana (2.7%), and Alabama (1.8%). Account holders with gag allocation, but without gag shares also have mailing addresses in other states (Georgia, Illinois, Massachusetts, North Carolina, New York, Ohio, and South Carolina), but

these states represent a smaller percentage of the total number of accounts with gag allocation, but without gag shares.

**Table 3.4.1.4.** Number of IFQ accounts with gag grouper allocation, but without gag grouper shares by state, 2021.

| State | Accounts |
|---|---|
| **AL** | 4 |
| **FL** | 192 |
| **LA** | 6 |
| **MS** | 0 |
| **TX** | 13 |
| **Other** | 6 |
| **Total** | **221** |

Source: NMFS SERO IFQ database accessed 2/25/22.

IFQ accounts with GG-IFQ allocation, but without GG-IFQ shares have mailing addresses in a total of 98 communities (IFQ database accessed 2/25/22). Communities with the most accounts with allocation, but without shares are located in Florida and Texas (Table 3.4.1.5). The community with the most accounts with allocation, but without shares is Panama City, Florida (8.1% of accounts with allocation, but without shares, Table 3.4.1.5), followed by Largo, Florida and St. Petersburg, Florida (each with 5.4%).

**Table 3.4.1.5.** Top communities by number of IFQ accounts with gag grouper allocation, but without gag grouper shares, 2021.

| State | Community | Accounts |
|---|---|---|
| **FL** | Panama City | 18 |
| **FL** | Largo | 12 |
| **FL** | St. Petersburg | 12 |
| **FL** | Seminole | 8 |
| **FL** | Madeira Beach | 7 |
| **TX** | Galveston | 7 |
| **FL** | Cortez | 5 |
| **FL** | Key West | 5 |

Source: NMFS SERO IFQ database accessed 2/25/22.

**Dealers**

The majority of dealer facilities with GG-IFQ landings are located in Florida (average of 87.9% of Gulf gag IFQ dealer facilities for 2017-2021, Table 3.4.1.6), followed by Louisiana and Texas (7.6%), and Alabama and Mississippi (4.5%).

**Table 3.4.1.6.** Number of Gulf gag IFQ dealer facilities by state for 2017-2021.

| Year | AL/MS | FL | LA/TX |
|---|---|---|---|
| **2017** | 7 | 100 | 8 |
| **2018** | 5 | 103 | 11 |
| **2019** | 6 | 94 | 9 |
| **2020** | 4 | 96 | 8 |
| **2021** | 4 | 119 | 8 |

Source: NMFS SERO IFQ database accessed 2/16/23.

Gulf GG-IFQ dealers are located in a total 84 communities (IFQ database accessed 2/16/23, includes Gulf GG-IFQ dealers with gag landings 2017-2021). Communities with the most Gulf GG-IFQ dealer facilities are located in Florida and Louisiana (Table 3.4.1.7). The community with the most Gulf GG-IFQ dealer facilities is Key West, Florida (5.3% of Gulf GG-IFQ dealer facilities, Table 3.4.1.7), followed by Madeira Beach, Florida (4.7%).

**Table 3.4.1.7.** Top communities by number of Gulf gag IFQ dealer facilities with gag grouper landings during 2017-2021.

| State | Community | *Dealer Facilities |
|---|---|---|
| FL | Key West | 9 |
| FL | Madeira Beach | 8 |
| FL | Destin | 6 |
| FL | Panama City | 6 |
| FL | St. Petersburg | 6 |
| FL | Bokeelia | 5 |
| FL | Panacea | 5 |
| FL | Steinhatchee | 5 |
| LA | Golden Meadow | 5 |

Source: NMFS SERO IFQ database accessed 2/16/23.
*Multiple dealers can use the same facility and a dealer can operate at multiple facilities.

**Regional Quotient**

Regional Quotient (RQ) is the proportion of IFQ gag landed within a community out of the total amount of IFQ gag landed within the Southeast region. It is an indicator of the percent contribution in pounds or value of IFQ gag landed within that community relative to the regional fishery. The RQ is reported individually only for the top 10 communities by total landings for the years of 2017 through 2021. All other communities that landed IFQ gag are grouped as "Other." Figure 3.4.1.1 shows the RQ in percentage of pounds from 2017 to 2021. The dominant communities for IFQ gag pounds landed included the communities of Madeira Beach, Florida; Apalachicola, Florida; and Panama City, Florida (Figure 3.4.1.1). Several of the top 10 communities are located in Pinellas County (Madeira Beach, Indian Shores, Tarpon Springs, and Redington Shores) and are within close proximity to each other. Indian Shores and Redington

Shores are in particularly close geographic proximity as they border each other, but are separate towns and therefore are included as separate communities.

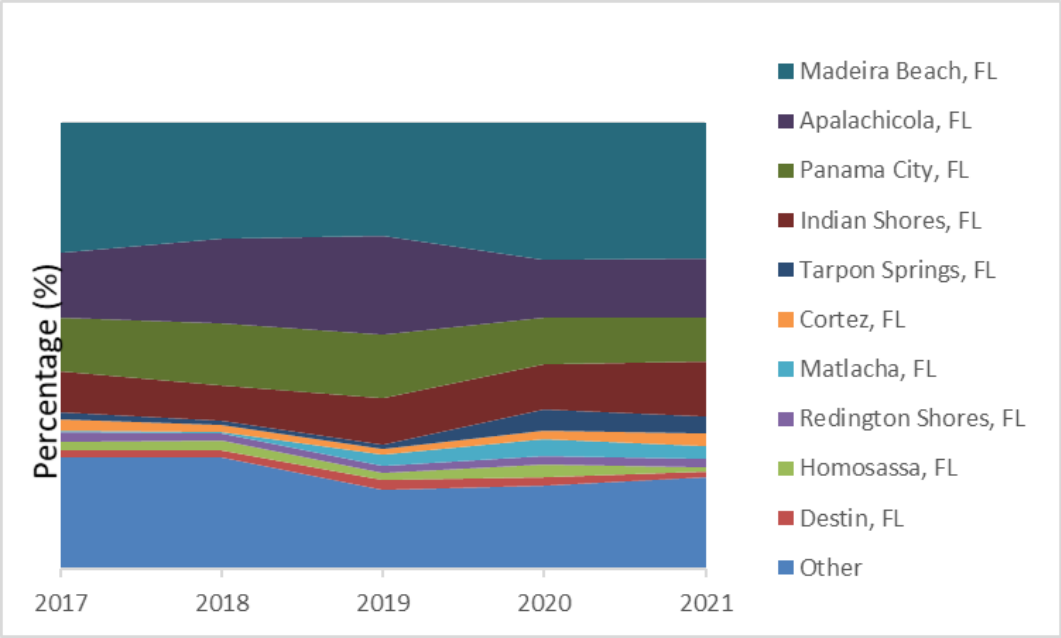


**Figure 3.4.1.1.** Regional Quotient (pounds) for top communities by landings in the Gulf of Mexico GG-IFQ Program from 2017 through 2021.
Source: IFQ database accessed 2/16/23.

### Local Quotient

The community Local Quotient (LQ) is the proportion of Gulf gag landings out of the total landings for all species for the community and that year, and is a relative measure. It is an indicator of the contribution in pounds or value of IFQ gag to the overall landings in a community. The LQ is reported individually only for communities with the greatest commercial landings of gag as depicted in Figure 3.4.1.1. Indian Shores, Florida is not included because data are not available. Figure 3.4.1.2 shows the LQ in both pounds and value for 2021. The community of Redington Shores, Florida ranks first for LQ pounds and includes the greatest proportion of gag landings out of the total landings for that community. Apalachicola, Florida ranks second for LQ pounds, but first for LQ value of gag. This suggests that although a greater proportion of the total pounds landed in Apalachicola is made up by other species, gag grouper is important to Apalachicola in terms of total value. Gag ranks third for proportion of total value for Apalachicola, behind red snapper and red grouper (SERO Community ALS 2021).

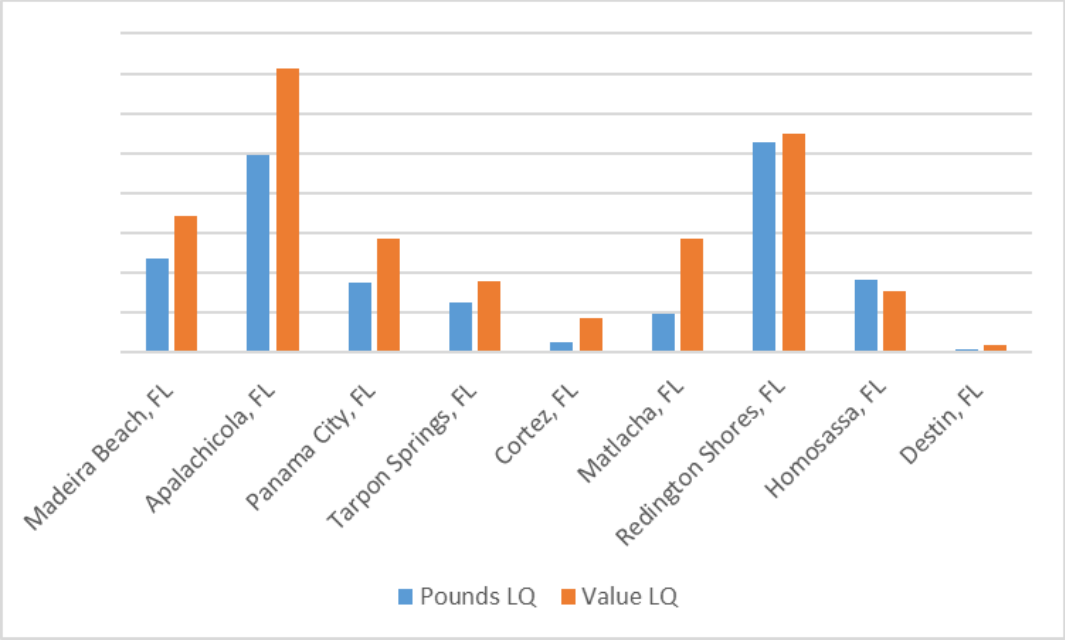


**Figure 3.4.1.2.** Local Quotient for top communities by landings in the Gulf of Mexico GG-IFQ Program.
Source: SERO, Community ALS 2021.

**Engagement and Reliance**

In addition to examining the RQs and LQs to understand how Gulf communities are engaged and reliant on fishing, indices were created using secondary data from permit and landings information for the commercial sector (Jepson and Colburn 2013, Jacob et al. 2013). Fishing engagement is primarily based on the absolute numbers of permits, landings, and value. The analysis used the number of vessels designated commercial by homeport and owner address, value of landings, and total number of commercial permits for each community. Fishing reliance includes the same variables as fishing engagement divided by population to give an indication of the per capita influence of this activity.

Taking the communities with the highest RQs, factor scores of both engagement and reliance for commercial fishing were plotted. Two thresholds of one and one-half standard deviation above the mean are plotted onto the graphs to help determine a threshold for significance. The factor scores are standardized; therefore, a score above one is also above one standard deviation. A score above one-half standard deviation is considered engaged or reliant, with anything above one standard deviation to be very engaged or reliant.

Figure 3.4.1.3 is an overall measure of a community's commercial fishing engagement and reliance and includes the communities with the strongest relationship to the commercial sector for gag grouper as depicted in Figure 3.4.1.1. Several communities in Figure 3.4.1.3 would be considered to be highly engaged in commercial fishing, as several are at or above one standard deviation of the mean factor score. Indian Shores, Florida shows the least amount of engagement in commercial fishing overall. Apalachicola and Matlacha, Florida demonstrate a moderate level of commercial reliance.

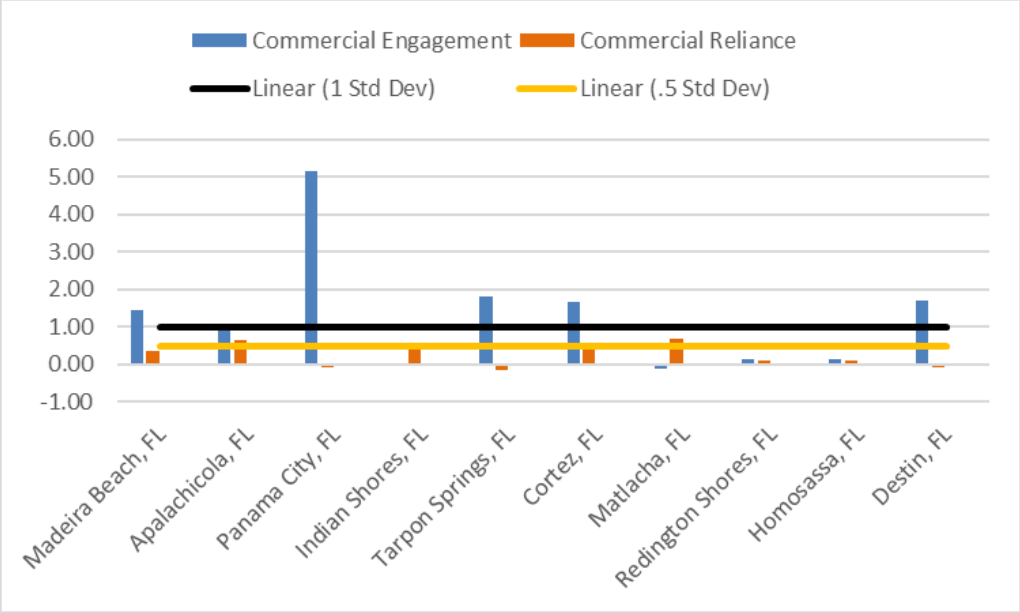


**Figure 3.4.1.3.** Commercial fishing engagement and reliance for top gag communities.
Source: SERO Community Social Vulnerability Indicators Database 2019.

## 3.4.2 Gag Recreational Sector

**Permits**

Charter/headboat for reef fish permits are issued to individuals in Florida (60% of charter/headboat for reef fish vessels), Texas (15.7%), Alabama (10.6%), Louisiana (7.4%), and Mississippi (2.6%, SERO permit office, July 8, 2021). Residents of other states (Arkansas, Arizona, California, Colorado, Georgia, Illinois, Michigan, Missouri, Montana, North Carolina, New Jersey, New York, Ohio, Oklahoma, Tennessee, Virginia, and Wisconsin) also hold charter/headboat permits, but these states represent a smaller percentage of the total number of issued permits.

Charter/headboat for reef fish permits are held by individuals with mailing addresses in 355 communities (SERO permit office, July 8, 2021). Communities with the most charter/headboat for reef fish permits are located in Florida, Alabama, and Texas (Table 3.4.2.1). The communities with the most charter/headboat permits are Panama City, Florida (4.6% of charter/headboat permits), Destin, Florida (4.4%), and Orange Beach, Alabama (4.1%).

**Table 3.4.2.1.** Top communities by number of Gulf charter/headboat for reef fish permits.

| State | Community | Charter/Headboat for Reef Fish Permits (RCG) |
|---|---|---|
| **FL** | Panama City | 65 |
| **FL** | Destin | 62 |
| **AL** | Orange Beach | 57 |
| **FL** | Naples | 45 |
| **FL** | Key West | 43 |
| **FL** | Pensacola | 30 |
| **FL** | Sarasota | 27 |
| **FL** | St. Petersburg | 23 |
| **TX** | Galveston | 21 |
| **FL** | Panama City Beach | 19 |
| **TX** | Corpus Christi | 19 |
| **FL** | Cape Coral | 18 |
| **FL** | Clearwater | 18 |
| **FL** | Fort Myers | 18 |
| **FL** | Crystal River | 16 |
| **FL** | Tampa | 16 |
| **FL** | Gulf Breeze | 14 |

Source: SERO permit office, July 8, 2021.

**Landings**

Nearly all recreational gag landings are from the waters adjacent to the west coast of Florida (average of 98.8%% from 2017-2021), followed by Alabama (0.8%), Louisiana (0.3%), and Texas (0.1%, SEFSC MRIP-FES Recreational ACL Dataset, LA Creel, and FWC SRFS).

**Engagement and Reliance**

Landings for the recreational sector are not available by species at the community level, making it difficult to identify communities as dependent on recreational fishing for gag. Because limited data are available concerning how communities are engaged and reliant on specific species in the recreational sector, indices were created using secondary data from permit and infrastructure information for the southeast recreational fishing sector at the community level (Jepson and Colburn 2013, Jacob et al. 2013). Recreational fishing engagement is represented by the number of recreational permits and vessels designated as "recreational" by homeport and owners address. Fishing reliance includes the same variables as fishing engagement, divided by population. Factor scores of both engagement and reliance were plotted by community.

Figure 3.4.2.1 identifies the Gulf communities located in Florida that are the top communities by engagement upon recreational fishing in general. Two thresholds of one and one-half standard

deviation above the mean were plotted to help determine a threshold for significance. Communities are presented in ranked order by fishing engagement and all included communities demonstrate high levels of recreational engagement, although this is not specific to fishing for gag. Because the analysis used discrete geo-political boundaries, Panama City and Panama City Beach had separate values for the associated variables. Calculated independently, each still ranked high enough to appear in the top list, suggesting a greater importance for recreational fishing in that area. The communities of Tavernier and Islamorada, Florida demonstrate the highest reliance on recreational fishing. The communities of Marathon, Crystal River, Destin, Crystal River, and Port Saint Joe, Florida demonstrate a moderate to high reliance.

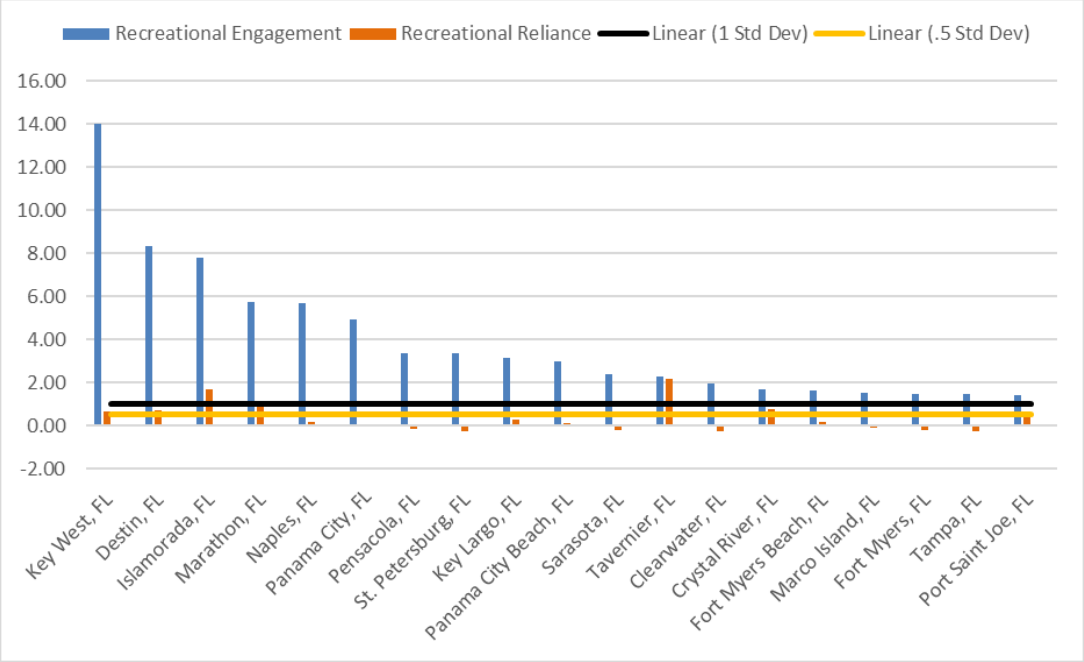


**Figure 3.4.2.1.** Recreational fishing engagement and reliance for top Florida communities.
Source: SERO, Community Social Vulnerability Indicators Database 2019.

The description of fishing activities presented here highlights which communities may be most involved in Gulf gag fishing. It is expected that the impacts from the regulatory action in this amendment, whether positive or negative, will most likely affect those communities identified above.

## 3.4.3 Environmental Justice, Equity, and Underserved Communities

Federal agencies are required to consider the impacts and/or address the inequalities of their policies on minority populations, low-income populations, disadvantaged communities, and/or underserved communities. These requirements are outlined in the following Executive Orders (E.O.).

E.O. 12898 requires federal agencies conduct their programs, policies, and activities in a manner to ensure individuals or populations are not excluded from participation in, or denied the benefits of, or subjected to discrimination because of their race, color, or national origin. In addition, and

specifically with respect to subsistence consumption of fish and wildlife, federal agencies are required to collect, maintain, and analyze information on the consumption patterns of populations who principally rely on fish and/or wildlife for subsistence. The main focus of E.O. 12898 is to consider "the disproportionately high and adverse human health or environmental effects of its programs, policies, and activities on minority populations and low-income populations in the United States and its territories…" This E.O. is generally referred to as environmental justice (EJ).

E.O. 13985 requires federal agencies to recognize and work to redress inequalities in their policies and programs that serve as barriers to equal opportunity, including pursuing a comprehensive approach to advancing equity for all, including people of color and others who have been historically underserved, marginalized, and adversely affected by persistent poverty and inequality. Federal agencies must assess how programs and policies perpetuate systemic barriers to opportunities and benefits to people of color and other underserved groups in order to equip agencies to develop policies and programs that deliver resources and benefits equitably to all.

E.O. 13985 provides definitions for equity and underserved communities, which expand the definition of a community from being geographically situated, or place-based, as defined through the Magnuson-Stevens Act, to also include communities that share a particular characteristic (e.g., crew of commercial gag grouper fishing vessels). Equity means the consistent and systematic fair, just, and impartial treatment of all individuals, including individuals who belong to underserved communities that have been denied such treatment, such as Black, Latino, and Indigenous and Native American persons, Asian Americans and Pacific Islanders and other persons of color; members of religious minorities; lesbian, gay, bisexual, transgender, and queer (LGBTQ+) persons; persons with disabilities; persons who live in rural areas; and persons otherwise adversely affected by persistent poverty or inequality. The term ''underserved communities'' refers to populations sharing a particular characteristic, as well as geographic communities, that have been systematically denied a full opportunity to participate in aspects of economic, social, and civic life, as exemplified by the list in the preceding definition of ''equity.''

E.O. 14008 calls on agencies to make achieving EJ part of their missions "by developing programs, policies, and activities to address the disproportionately high and adverse human health, environmental, climate-related and other cumulative impacts on disadvantaged communities, as well as the accompanying economic challenges of such impacts." Census data are available to examine the status of communities with regard to minorities and low-income populations. These data describe geographically based communities (e.g., Panama City, Florida) and are descriptive of the total population, not limited to the fishing components of the community. Information is not available at this time to examine the status of underserved populations engaged in Gulf fisheries. To help assess whether EJ concerns may be present within regional place-based communities, a suite of indices were created using census data to examine the social vulnerability of coastal communities within the region. The three indices are poverty, population composition, and personal disruption. The variables included in each of these indices have been identified through the literature as being important components that contribute to a community's vulnerability. Poverty includes poverty rates for different groups;

population composition includes more single female-headed households, households with children under the age of five, minority populations, and those that speak English less than well; and personal disruption includes disruptions such as higher separation rates, higher crime rates, and unemployment. Increased rates in the indicators are signs of populations experiencing vulnerabilities. Again, for those communities that exceed the threshold it would be expected that they would exhibit vulnerabilities to sudden changes or social disruption that might accrue from regulatory change.

Figures 3.4.3.1 and 3.4.3.2 provide social vulnerability rankings for place-based communities identified in Section 3.4 as important to commercial and recreational fishing for gag specifically or fishing for reef fish in general. Several communities exceed the threshold of one standard deviation above the mean for at least one of the indices (Bokeelia, Florida; Crystal River, Florida; and Panacea, Florida). These communities would be the most likely to exhibit vulnerabilities to social or economic disruption resulting from regulatory change.

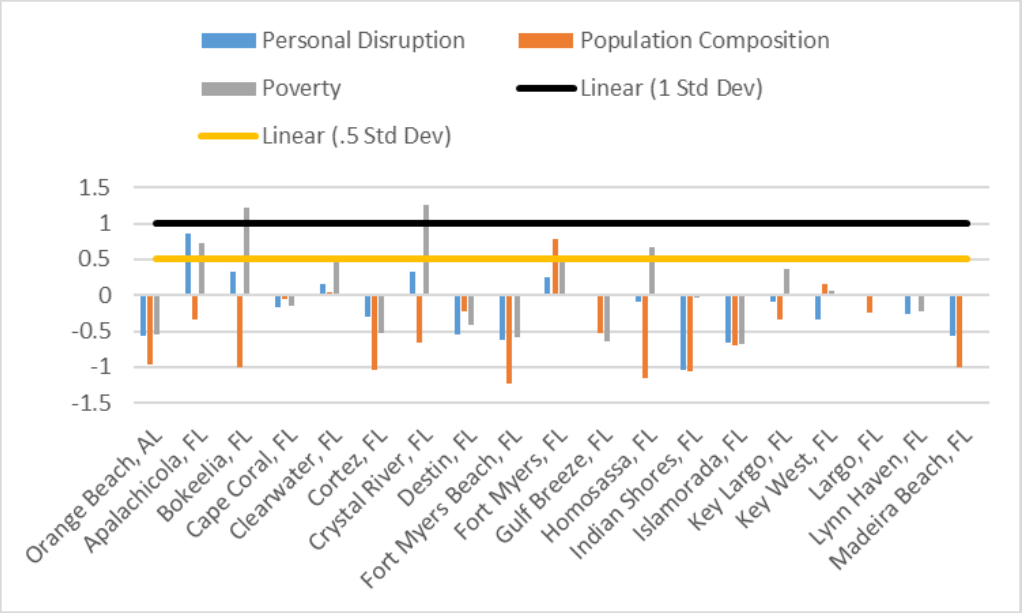


**Figure 3.4.3.1.** Social vulnerability indices for top commercial and recreational reef fish and gag communities.
Source: SERO, Community Social Vulnerability Indicators Database 2020.

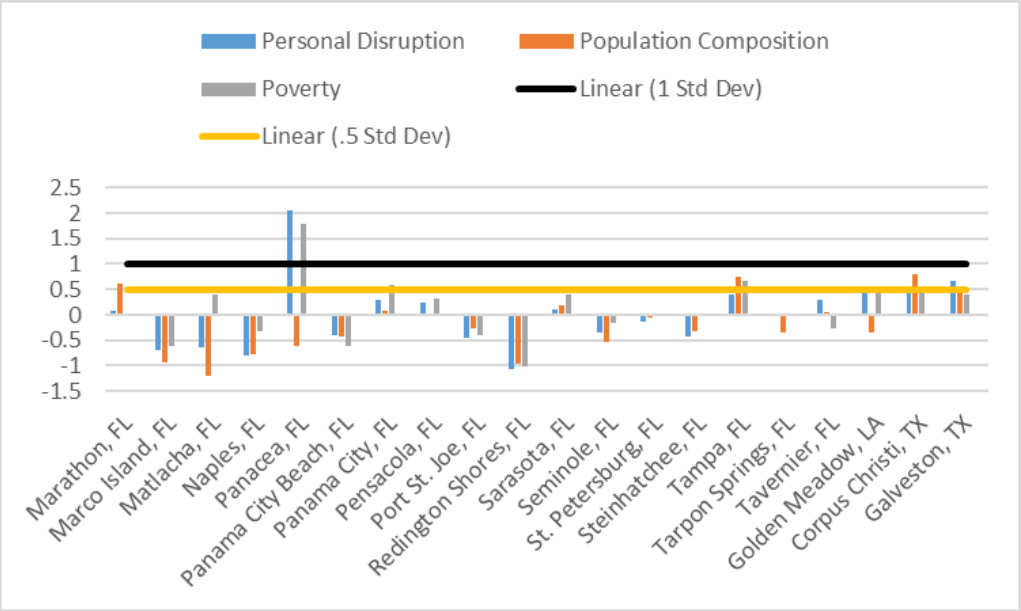


**Figure 3.4.3.2.** Social vulnerability indices for top commercial and recreational reef fish and gag communities continued.
Source: SERO, Community Social Vulnerability Indicators Database 2020.

People in these communities may be affected by fishing regulations in two ways: participation and employment. Although the place-based communities identified in Figures 3.4.3.1 and 3.4.3.2 may have the greatest potential for EJ concerns, complete data are not available on the race and income status for those involved in the local fishing industry (employment), or for their dependence on gag specifically (participation). The potential effects of the actions on place based communities and non-place based communities, such as such as commercial fishermen and recreational stakeholders are discussed in Sections 4.1.4 and 4.2.4. There are no known populations that rely on the consumption of gag for subsistence. Although no EJ issues have been identified, the absence of potential EJ concerns cannot be assumed.

## 3.5 Description of the Administrative Environment

### 3.5.1 Federal Fishery Management

Federal fishery management is conducted under the authority of the Magnuson-Stevens Act (16 U.S.C. 1801 *et seq.*), originally enacted in 1976 as the Fishery Conservation and Management Act. The Magnuson-Stevens Act claims sovereign rights and exclusive fishery management authority over most fishery resources within the EEZ. The EEZ is defined as an area extending 200 nautical miles from the seaward boundary of each of the coastal states. The Magnuson-Stevens Act also claims authority over U.S. anadromous species and continental shelf resources that occur beyond the EEZ.

Responsibility for federal fishery management decision-making is divided between the Secretary of Commerce (Secretary) and eight regional fishery management councils that represent the

expertise and interests of constituent states. Regional councils are responsible for preparing, monitoring, and revising management plans for fisheries needing management within their jurisdiction. The Secretary is responsible for promulgating regulations to implement proposed plans and amendments after ensuring management measures are consistent with the Magnuson-Stevens Act and with other applicable laws summarized in the Other Applicable Law Appendix. In most cases, the Secretary has delegated this authority to NMFS.

The Gulf Council is responsible for fishery resources in federal waters of the Gulf. These waters extend 200 nautical miles offshore from the seaward boundaries of Alabama, Florida, Louisiana, Mississippi, and Texas, as those boundaries have been defined by law. The length of the Gulf coastline is approximately 1,631 miles. Florida has the longest coastline extending 770 miles along its Gulf coast, followed by Louisiana (397 miles), Texas (361 miles), Alabama (53 miles), and Mississippi (44 miles).

The Gulf Council consists of seventeen voting members: 11 public members appointed by the Secretary; one each from the fishery agencies of Texas, Louisiana, Mississippi, Alabama, and Florida; and one from NMFS. The public is also involved in the fishery management process.

### 3.5.2 State Fishery Management

The purpose of state representation at the Council level is to ensure state participation in federal fishery management decision-making and to promote the development of compatible regulations in state and federal waters. The state governments of Texas, Louisiana, Mississippi, Alabama, and Florida have the authority to manage their respective state fisheries. Each of the five states exercises legislative and regulatory authority over their states' natural resources through discrete administrative units. Although each agency is the primary administrative body with respect to the states' natural resources, all states cooperate with numerous state and federal regulatory agencies when managing marine resources. A more detailed description of each state's primary regulatory agency for marine resources is provided on their respective web pages (Table 3.6.1.1).

**Table 3.5.2.1.** State marine resource agencies and web pages.

| State Marine Resource Agency | Web Page |
|---|---|
| Alabama Marine Resources Division | http://www.outdooralabama.com/ |
| Florida Fish and Wildlife Conservation Commission | http://myfwc.com/ |
| Louisiana Department of Wildlife and Fisheries | http://www.wlf.louisiana.gov/ |
| Mississippi Department of Marine Resources | http://www.dmr.ms.gov/ |
| Texas Parks and Wildlife Department | http://tpwd.texas.gov/ |

# CHAPTER 4. ENVIRONMENTAL CONSEQUENCES

## 4.1 Action 1: Modification of Gulf of Mexico (Gulf) Gag Status Determination Criteria (SDC)

### 4.1.1 Direct and Indirect Effects on the Physical Environment

The alternative to the status quo in this action establishes a new proxy for maximum sustainable yield (MSY) for gag, and by association, redefines the maximum fishing mortality threshold (MFMT), the minimum stock size threshold (MSST), and optimum yield (OY). This action would haves no direct impact on the physical environment. However, when there is a stock assessment, the $F_{MSY}$ proxy is used to establish the overfishing limit (OFL), acceptable biological catch (ABC), annual catch limits (ACLs), and annual catch targets (ACTs). $F_{MSY}$ proxies that allow larger catch levels may result in greater fishing activity, which would increase potential effects.

The commercial sector of the reef fish fishery is conducted using vertical line (i.e., electric reel, bandit rig, hook-and-line, and trolling) and longline gear. The recreational sector (headboat, charter, private vessels, and shore modes) primarily uses vertical line gear (hook-and-line). Reef fish are also harvested by spearfishing in both the commercial and recreational sectors. In the Gulf, a majority of the landings reported indicated that hook-and-line fishing was the predominant gear used.

Commercial harvesting for reef fish using longline gear occurs over hard bottom habitats using weights to keep the gear in direct contact with the bottom. The potential for this gear to adversely impact the bottom depends on the type of habitat it is set on, the presence or absence of currents and the behavior of fish after being hooked. In addition, this gear, upon retrieval, can abrade, snag, and dislodge smaller rocks, corals, and sessile invertebrates (Hamilton 2000; Barnette 2001). Direct underwater observations of longline gear in the Pacific halibut fishery by High (1998) noted that the gear could sweep across the bottom. A study that directly observed deployed longline gear (Atlantic tilefish portion of the snapper-grouper fishery) found no evidence that the gear shifted significantly, even when set in currents (Grimes et al. 1982). Lack of gear shifting even in strong currents was attributed to setting anchors at either end of the longline to prevent movement, which is the standard in the longline component of the commercial sector of the reef fish fishery. Based on direct observations, it is logical to assume that bottom longline gear would have a minor impact on sandy or muddy habitat areas. However, due to the vertical relief that hard bottom and coral reef habitats provide, it would be expected that bottom longline gear may become entangled, resulting in potential negative effects to habitat (Barnette 2001).

The abundance of many managed reef fish species, including gag, are higher on hard bottom areas than on sand or mud bottoms; thus, fishing with vertical line gear generally occurs over hard bottom areas. Vertical line gear include multi-hook lines known as bandit gear, handlines,

and rod-and-reels. Vertical line gear is less likely to contact the bottom than longline gear, but still has the potential to snag and entangle bottom structures and cause attached organisms such as soft corals and sponges to tear off or be abraded (Barnette 2001). In using bandit gear, a weighted line is lowered to the bottom, and then the weighted line is raised slightly off the bottom (Siebenaler and Brady 1952). The gear is in direct contact with the bottom for only a short period of time. Barnette (2001) suggests that physical impacts may include entanglement and minor degradation of benthic species from line abrasion and the use of weights (sinkers).

Anchor damage is also associated with vertical line fishing vessels, particularly by the recreational sector, where fishermen may repeatedly visit well marked or known fishing locations. Hamilton (2000) pointed out that "favorite" fishing areas such as reefs are targeted and revisited multiple times, particularly with the advent of GPS technology. The cumulative effects of repeated anchoring could damage the hard bottom areas where reef fish fishing occurs, as well as repeated drops of weighted fishing rigs onto the reef. Recreational and commercial vessels that use vertical line gear are typically known to anchor more frequently over reef sites.

Spears are used by both the recreational and commercial sector to harvest reef fish, but represent a relatively minor component of both. Barnette (2001) summarized a previous study that concluded spearfishing on reef habitat may result in some coral breakage. In addition, there could be some impacts from divers touching coral with their hands or from re-suspension of sediment by fins (Barnette 2001).

**Alternative 1** (No Action) would retain the current $F_{MSY}$ proxy for gag, which is currently defined as the fishing mortality rate (F) corresponding to the maximum yield per recruit ($F_{MAX}$). By default, this F proxy defines the MFMT, and the MSST is summarily defined as 50% of the biomass at $F_{MAX}$ ($B_{MAX}$). OY is defined as 75% of the yield at $F_{MAX}$. The Gulf of Mexico Fishery Management Council's (Council) Scientific and Statistical Committee (SSC) determined that the use of $F_{MAX}$ as a proxy for gag was inappropriate (see Section 2.1). As such, **Alternative 1** is not a viable alternative. **Alternative 2** would revise the SDC for gag based on the results of the SEDAR 72 updated 2022 stock assessment, as reviewed by the SSC in July 2022. $F_{MSY}$ would be defined as the yield when fishing at the $F_{40\%SPR}$ where SPR is the spawning potential ratio. This F also defines the MFMT. The MSST is defined as 50% of the biomass at $F_{40\%SPR}$. The OY would be conditional on stock status, which is a departure from how OY has been previously defined for gag (**Alternative 1**).

Under **Alternative 1**, there would be no change to the fishing effort or direct effects on the physical environment. **Alternative 2** would define the $F_{MSY}$ proxy for gag as $F_{40\%SPR}$. Because of the multispecies nature of the reef fish fishery for the commercial and recreational sectors, and because fishing effort may shift to other species and away from gag specifically, modifying the SDC for gag in **Alternative 2** is not expected to result in measurable effects to the physical environment compared to **Alternative 1**.

The National Marine Fisheries Service (NMFS) has developed, at the Council's request, interim measures to reduce the catch limits for gag based on a previous stock assessment model run of SEDAR 72 (2021). This model run used recreational landings data informed by the Marine Recreational Information Program's (MRIP) Fishing Effort Survey (FES), and produced yield

projections using an $F_{MSY}$ proxy of $F_{30\%SPR}$. This model run was reviewed by the SSC in September 2021, and projections were finalized with the SSC in November 2021, with the SSC considering those results as consistent with the best scientific information available (at the time). These interim measures rely on the $F_{MSY}$ proxy ($F_{30\%SPR}$) and catch limit recommendations from this previous model, are expected to be implemented in the spring of 2023, and can remain in effect for up to 366 days. The purpose of these interim measures is to reduce overfishing of gag while this amendment (Amendment 56) is being developed.

### 4.1.2 Direct and Indirect Effects on the Biological and Ecological Environment

Direct and indirect effects from fishery management actions as they relate to gag have been discussed in detail in past Reef Fish FMP Amendments (e.g., GMFMC 2008a, 2008b, 2011a, 2011b, 2012a, 2012b, 2016, 2017a, 2017b) and are incorporated here by reference. Management actions that affect the biological and ecological environments primarily relate to the impacts of fishing on a species' population size, life history, and the role of the species within its habitat. Removal of fish from a population through fishing reduces the overall population size. Fishing gear types have different selectivity patterns, which refer to a fishing method's ability to target and capture a species by size (length) and age. Selectivity patterns also include discards, which are mostly comprised of sublegal sized fish or fish caught during seasonal closures, and the mortality associated with releasing these fish. Potential impacts of the 2010 *Deepwater Horizon* MC252 oil spill on the biological/ecological environment are discussed in Section 3.2 and in the *Deepwater Horizon* Programmatic Damage Assessment and Restoration Plan (DWH Trustees 2016) and are also incorporated here by reference. These impacts include recruitment failure and reduced fish health.

Fishing can affect life history characteristics of reef fish, such as growth and maturation rates. For example, Lombardi-Carlson et al. (2006) found that the mean size of gag at age was larger pre-1990 than in post-1990 years, and suggested this change was due to fishing. Grouper reproduction may also have been impacted by fishing. Fitzhugh et al. (2006,) reported the size at which 50% of females are sexually mature, and the size at which 50% of females transition to males, was smaller in their studies compared to earlier years. In addition, for hermaphroditic species (like gag), fishing pressure has been suggested as influential to changes in sex ratios. The proportion of male gag in the population has decreased from historical levels of 17% (Hood and Schlieder 1992) to 2-10% in the 1990s (Coleman et al. 1996), to approximately 2% in 2020 (SEDAR 72 2022). This decrease in the fraction of males has led to concerns by the Council's SSC of a negative effect on the gag stock's reproductive potential. It has been previously suggested the resulting reduction in the number of males is a consequence of males being more aggressive feeders than females. Thus, hook-and-line fishing on gag spawning aggregations tends to selectively remove males before females (Gilmore and Jones 1992; Koenig et al. 1996). A decline in the ratio of male to female gag in the Gulf has been an ongoing source of concern. Furthermore, for species that aggregate, such as gag, the species is particularly vulnerable to fishing because they are concentrated at specific locations. This problem is magnified because of the depth at which gag spawn (from 27-66 fathoms, but concentrated around 44 fathoms;

Koenig et al. 1996). At these depths, gag are vulnerable to mortality from barotrauma when hooked at depth and then reeled to the surface.

Bycatch does occur within the reef fish fishery. If fish are released due to catch limits, seasons, or other regulatory measures, these fish are considered bycatch. Bycatch practicability analyses have previously been completed for gag (GMFMC 2008a, 2011b, 2012a). In general, these analyses have found that reducing bycatch provides biological benefits to managed species as well as benefits to the reef fish fishery through less waste, higher yields, and thus less forgone yield. In some cases, actions are approved that can increase bycatch through regulatory discards such as increased minimum sizes and closed seasons. Under these circumstances, biological benefit to the managed species outweighs any increases in discards from the action.

The reef fish fishery can also affect species outside the reef fish complex. Specifically, sea turtles have been observed to be directly affected by the longline component of the Gulf reef fish fishery. These effects occur when sea turtles interact with fishing gear and result in an incidental capture injury or mortality and are summarized in GMFMC (2010). However, the most recent biological opinion (NMFS 2011a) for the Reef Fish FMP and reinitiation memos concluded that the operation of the fishery is not likely to jeopardize the continued existence of sea turtles, and other species listed under the Endangered Species Act (ESA). This fishery is also not expected to adversely affect marine mammals; the primary gear types used by the commercial sector (longline and hook-and-line) were classified in the 2023 List of Fisheries (88 FR 16899) as a Category III fishery with regard to marine mammal species, indicating the gear has little effect on these populations.

Action 1 revises the $F_{MSY}$ proxy for gag. **Alternative 1** (No Action) would retain the current $F_{MSY}$ proxy ($F_{MAX}$), which the SSC found to not be consistent with the best scientific information available. **Alternative 2** would redefine the $F_{MSY}$ proxy for gag as $F_{40\%SPR}$, in keeping with the justifications provided by the SSC in July 2022 (see Chapter 1, and section 4.1.1 above). Lower SPR proxies, like $F_{MAX}$, correspond to higher MSYs and may allow for higher levels of fishing effort, producing potentially greater adverse effects of the biological/ecological environment. Thus, for gag, $F_{MAX}$ (**Alternative 1**) could have the greatest adverse impacts, with fewer adverse impacts for $F_{40\%SPR}$ (**Alternative 2**). Under **Alternative 2**, establishing an $F_{MSY}$ proxy of $F_{40\%SPR}$ for gag would be consistent with the guidance provided by Harford et al. (2019), and that of the SSC (see Sections 1.1 and 2.1). Therefore, **Alternative 2** would be expected to result in positive direct effects to the biological environment for gag compared to **Alternative 1**, which would be expected to maintain the negative biological effects currently being observed for the stock.

### 4.1.3 Direct and Indirect Effects on the Economic Environment

**Alternative 1** (No Action) would maintain current status determination criteria (SDC) definitions. Therefore, **Alternative 1** would not be expected to result in economic effects. However, **Alternative 1** is not a viable alternative because current SDC definitions, which are

based on $F_{MAX}$, are no longer deemed sustainable by the SSC and are therefore not consistent with the best scientific information available.

**Alternative 2** would redefine SDC based on the best scientific information available as indicated by the SSC following its review of the latest gag stock assessment (SEDAR 72). Therefore, under **Alternative 2,** future determinations of the status of the gag stock would be expected to be more accurate. Although the magnitude of the economic effects cannot be quantified at this time, **Alternative 2** would be expected to result in positive economic effects in the long run because management measures based on the best scientific information available are designed to achieve OY on a continuing basis, and thus would be expected to be more appropriate and effective.

### 4.1.4 Direct and Indirect Effects on the Social Environment

Modifying the SDC values does not directly affect fishing behavior. Catch levels are derived from the SDC, meaning that modifying the SDC values, including the point at which a stock is considered to be overfished (MSST) and undergoing overfishing (MFMT), may result in indirect effects. In general, more biologically conservative SDC values would be expected to result in the setting of lower catch limits. Lower catch limits would result in fewer fishing opportunities in the short term, which would be expected to result in indirect negative effects. At the same time, more biologically conservative SDC values would also be expected to reduce the risk of overharvest and therefore would be expected to result in indirect positive effects in the long term.

Although additional effects are not usually expected from retaining **Alternative 1** (No Action), the current stock SDC do not represent the best scientific information available. **Alternative 2** would revise the MSY, MFMT, MSST, and OY for gag based on the recent stock assessment update (SEDAR 72 2022). The SDC under **Alternative 2** are more biologically conservative than under **Alternative 1**, and would be expected to result in indirect negative effects in the short-term. These negative effects would be expected to be mitigated over the long term as the revised SDC are more appropriate for the gag stock to rebuild, resulting in indirect positive effects.

### 4.1.5 Direct and Indirect Effects on the Administrative Environment

Because the alternatives in this action would not result in added regulations, there would not be any immediate effect on the administrative environment from rulemaking.

**Alternative 1** would result in retaining the current $F_{MSY}$ proxy for gag; however, because $F_{MAX}$ is not considered by the Council's SSC or NMFS to be consistent with the best scientific information available, **Alternative 1** is not a viable alternative. **Alternative 2** would redefine the $F_{MSY}$ proxy for gag as $F_{40\%SPR}$. When compared to **Alternative 1**, **Alternative 2** is administratively advantageous because it results in a metric assisting to assure that harvest levels are set to reduce the likelihood that overfishing or stock depletion would occur, even indirectly accounting for episodic mortality from events like red tide blooms. An SPR proxy (like $F_{40\%SPR}$ in **Alternative 2**) that allows for a higher $F_{MSY}$ target would likely have less adverse effects on

the administrative environment as described because they would allow a lower, and predictably more sustainable, rate of harvest, reducing the likelihood that overfishing or a stock depletion could occur.

Actions to control harvest by the Council and NMFS are mostly routine and conducted through the Council process as established by the Magnuson-Stevens Fishery Conservation and Management Act. Additionally, through the use of ACLs and accountability measures (AMs), the Council and NMFS can determine if overfishing is occurring annually and take measures to reduce the likelihood of the gag stock becoming overfished. This minimizes the risk that the gag stock would be depleted, triggering further management action.

## 4.2 Action 2: Modification of Gulf Gag Catch Limits, Sector Allocation, and Rebuilding Timeline

### 4.2.1 Direct and Indirect Effects on the Physical Environment

General effects on the physical environment from fishing are described in Section 4.1.1.

Establishing a rebuilding time and modifying the sector allocation and catch limits are not expected to result in significant effects on the physical environment as both sectors are not expected to change current practices they respectively use in the multi-species reef fish fishery. The catch limits proposed in **Alternatives 2** and **3** would result in a substantial reduction in gag harvest, and presumably fewer available days to fish recreationally for them. Gag is targeted by both sectors and fishing occurs for other reef fish species when recreational fishing for gag is closed, or when a commercial vessel does not have sufficient gag individual fishing quota (IFQ) allocation available to retain and land gag. Thus, the effects on the physical environment of **Alternatives 2** and **3** are not expected to be measurably different from **Alternative 1** as fishing would continue to occur regardless if gag is open for harvest. However, there could be a slight positive effect on the physical environment due to the reduced number of direct target trips when recreational gag harvest is closed or vessels have used all their IFQ allocation. This may be negated though by the co-occurrence of gag with other popular reef fish species, like other snappers and groupers, and the regulatory requirement for fishermen to discard gag when they cannot be retained. Any impacts to the physical environment are expected to be minor because modifications to the sector allocation and catch limits would not change the fishing methods used or alter the execution of the reef fish fishery as a whole. It is assumed reef fish fishermen would continue to take trips and harvest other species when the harvest of gag is not permitted. Therefore, the effects to the physical environment under the options in **Alternatives 2** and **3** are expected to be similar to **Alternative 1**.

### 4.2.2 Direct and Indirect Effects on the Biological and Ecological Environment

Direct and indirect effects from fishery management actions as they relate to gag have been discussed in detail Section 4.1.2.

Decreasing the catch limits reduces the amount of fish that can be harvested. In the case of gag, a decrease in the catch limits is necessary to end overfishing and rebuild the stock from its current overfished condition. Decreasing the catch limits for gag may also cause an increase in regulatory discards if some gag are caught while targeting other reef fish species. The 2022 SEDAR 72 stock assessment characterized the nature of commercial and recreational discards of gag. Commercial discards make up a considerably smaller fraction of the total discards compared to recreational discards, such that despite the higher estimated discard mortality by the commercial fleets (25%, versus 12% for recreational fleets; SEDAR 72 2022), the effect of discard mortality by the recreational fleets is greater. This is because the number of recreational discards in any given historical fishing year is one to two orders of magnitude greater than the commercial discards. As discussed in 4.1.2, the commercial and recreational reef fish fisheries in the Gulf target multiple species throughout the year; thus, regulatory discards of gag would be expected to be inversely related to the catch limits (lower catch limits would be expected to correlate to a larger number of regulatory discards). Further, male gag are almost exclusively found in waters greater than 40 meters (131 feet) in depth (SEDAR 72 2022, and references therein). Regulatory discards of gag from these deeper depths would be expected to be subject to greater barotrauma-related mortality. However, commercial discards of gag associated with decreased catch limits may be reduced by the ability of many commercial fishermen to target or avoid gag when they cannot retain any, such as when the fishermen lack sufficient IFQ allocation to land gag (public testimony from commercial fishermen at Council meetings; see also information on discards in NMFS 2022b). Recreational discards by for-hire fishermen are expected to remain the same due to the expectation that their current fishing practices would continue, which include generally avoiding species that cannot be retained (public testimony from commercial fishermen at Council meetings). Recreational discards by the private vessel and shore modes may increase to the extent to which those fishermen do not modify where or how they fish to avoid catching and discarding gag when the fishing season is closed. Even so, recreational fishing is classically a multispecies activity, and directed fishing effort on a species closed to harvest may be redirected to another species which may be harvested.

Any modification to the sector allocation is not expected to significantly affect the biological environment. Any effect of moving allocation from one sector to another, as it relates to depth fished and any resultant mortality, would be highly uncertain. Further, both sectors primarily use the same gear types and practices (hook and line, natural bait), have the same minimum size limits (24 inches total length), and are constrained with AMs. The minimum size limit corresponds to the length at which 50% of females are estimated to be sexually mature. Further, the reductions in the catch limits associated with **Alternatives 2** and **3** are projected to provide the greatest positive effect on the stock and allow rebuilding consistent with whichever rebuilding timeline is selected under either alternative. Catch limits under **Alternative 1** would not allow the stock to rebuild, resulting in a negative biological effect. Under **Alternatives 2**

and **3**, all of the OFLs and ABCs are based on projections from the 2022 SEDAR 72 stock assessment update, and the recommendations from the Council's SSC for an OFL with an $F_{MSY}$ proxy of $F_{40\%SPR}$, when fishing at $F_{Rebuild}$ (the fishing mortality rate that will rebuild the stock under $F_{40\%SPR}$, relative to the specified rebuilding timeline). Thus, each of the options under **Alternatives 2** and **3** would result in the same stock size at the end of the specified rebuilding timeline. The difference in total landings among **Alternatives 2** and **3** and the associated options results from differences in the magnitude of discards and associated discard mortality rates, and the length composition landed by each sector. Because **Alternative 3** would allocate a greater percentage of the total ACL to the recreational sector compared to **Alternative 2**, a modest reduction of total allowable annual harvest is reflected in **Alternative 3**. However, the overall mortality of gag is expected to be the same between **Alternatives 2** and **3**. The difference in effects between the reduced total ACLs under **Alternatives 2** and **3** is minimal within the projection period of 2024 – 2028. Therefore, the effects under **Alternatives 2** and **3** on the biological environment are not expected to be measurably different from each other, but provide a substantial benefit to the gag stock over **Alternative 1**.

For the commercial sector, the IFQ program constrains commercial landings to the quota. For the recreational sector, the buffer between the ACL and ACT (Action 3) reduces the likelihood that the recreational ACL would be exceeded. If the recreational ACL is exceeded, the requirement to pay back the overage is expected to mitigate the negative impacts of that overage on the stock. The catch limits under **Alternative 1** are based on the MRIP Coastal Household Telephone Survey (CHTS) and SEDAR 33 (2014). MRIP-CHTS and SEDAR 33 are no longer considered consistent with the best scientific information available, would allow for landings that continue allowing overfishing to occur, and would not rebuild the stock's SSB to a level commensurate with SSB at MSY; all of these points are expected to result in negative effects to the gag stock. If the interim measures discussed in Chapter 1 and herein become effective in the spring of 2023 as expected, then **Alternative 1** would be based on SEDAR 72 2021, with landings informed by MRIP-FES. These catch limits are based on an $F_{MSY}$ proxy of $F_{30\%SPR}$. However, the interim catch limits can be in effect only for a maximum of 366 days. Therefore, **Alternative 1** would implement the required rebuilding plan or sufficiently reduce fishing mortality in the long term to end overfishing and rebuild the stock based. .

**Alternatives 2** and **3** are expected to have direct positive effects on the biological environment for the gag stock compared to **Alternative 1**, since they are expected to end overfishing and rebuild the stock. By reducing fishing mortality, the number of older, larger fish in the population is expected to increase and help the stock meet whichever rebuilding timeline is selected in **Options a – c** of **Alternatives 2** and **3**. Positive biological effects are expected under **Alternatives 2** and **3** due to rebuilding the gag stock. **Options 2a** and **3a** would rebuild the gag stock to $SSB_{40\%SPR}$ in 11 years, assuming no direct fishing mortality; **Options 2b** and **3b** would rebuild the stock in 18 years, while fishing at 75% of $F_{40\%SPR}$; **Options 2c** and **3c** would rebuild the stock in 22 years, or twice the minimum time to rebuild under no direct fishing mortality ($T_{Min}$). It is important to note that **Options 2a** and **3a** cannot account for effects on the gag stock relative to regulatory dead discards from a gag closure; however, the magnitude of dead discards under this scenario would be expected to be highest out of the options in **Alternatives 2** and **3**. **Options 2b** and **3b** and **Options 2c** and **3c** would all to rebuild the gag stock to the same biomass size at $SSB_{40\%SPR}$, albeit at different time durations (18 years versus 22 years). The

longer the rebuilding period is for gag, the greater the likelihood that the rebuilding stock would be subject to both direct fishing pressure and episodic mortality from red tide as discussed in Sections 1.1 and 2.2. However, by rebuilding the gag stock to $SSB_{40\%SPR}$, the SSC expects that the stock would be more resilient to both sources of mortality over the long-term.

The relationships among species in marine ecosystems are complex and poorly understood, making the nature and magnitude of ecological effects difficult to predict with any accuracy. It is possible that forage species and competitor species could increase or decrease in abundance in response to a decrease or increase in gag abundance. However, the relationships between gag and non-target species caught on trips where gag are directly targeted are not fully understood. Overall, any effects to the ecological environment of the Gulf by reducing gag catch limits are not expected to be significant because the overall prosecution of the reef fish fishery is not expected to change. In most cases, multiple species are targeted on reef fish trips. For this same reason, no additional impacts to ESA-listed species or introduction of invasive species are anticipated as a result of this action.

### 4.2.3 Direct and Indirect Effects on the Economic Environment

**Alternative 1** (No Action) would maintain the current OFL, ABC, and the recreational and commercial ACLs and ACTs for gag. Therefore, **Alternative 1** would not be expected to change fishing practices or recreational and commercial gag harvests and would not be expected to result in economic effects. However, **Alternative 1** is not a viable alternative because it is not consistent with the best scientific information available and would not end overfishing. **Alternatives 2** and **3** would revise the catch limits and establish a rebuilding time for the gag stock. **Alternative 2** would maintain the existing allocation between the recreational and commercial sectors (61% recreational, 39% commercial). **Alternative 3** would allocate 65% and 35% to the recreational and commercial sectors, respectively.

For the commercial sector, because gag are currently managed under an IFQ program, short term economic effects expected to result from changes to the commercial gag quota can be measured by changes in the value of annual IFQ allocation. Between 2017 and 2021, annual allocation transfer prices per pound (lb) gutted weight (gw) averaged $1.03 ($2021) (Table 3.3.1.15). For each alternative and option, commercial gag quotas corresponding the ACLs, and estimated changes in quota and annual allocation value relative to **Alternative 1** are provided in Table 4.1.3.1.

**Table 4.1.3.1.** Commercial gag quotas and changes in quota and in annual allocation ($2021) by alternative and option.

| Option 2a | | | |
|---|---|---|---|
| Year | Quota | Difference relative to **Alternative 1** | |
| | | Quota | Annual Allocation |
| **2024** | 0 | -939,000 | -$967,170 |
| **2025** | 0 | -939,000 | -$967,170 |
| **2026** | 0 | -939,000 | -$967,170 |
| **2027** | 0 | -939,000 | -$967,170 |
| **2028** | 0 | -939,000 | -$967,170 |
| **Total** | 0 | -4,695,000 | -$4,835,850 |
| **Option 2b** | | | |
| **2024** | 135,796 | -803,204 | -827,300 |
| **2025** | 188,263 | -750,737 | -773,259 |
| **2026** | 235,329 | -703,671 | -724,781 |
| **2027** | 288,567 | -650,433 | -669,946 |
| **2028** | 354,150 | -584,850 | -602,395 |
| **Total** | 1,202,105 | -3,492,895 | -$3,597,682 |
| **Option 2c** | | | |
| **2024** | 164,344 | -774,656 | -797,895 |
| **2025** | 225,298 | -713,702 | -735,113 |
| **2026** | 278,537 | -660,463 | -680,277 |
| **2027** | 338,719 | -600,281 | -618,289 |
| **2028** | 412,018 | -526,982 | -542,791 |
| **Total** | 1,418,916 | -3,276,084 | -$3,374,366 |

| Option 3a | | | |
|---|---|---|---|
| Year | Quota | Difference relative to **Alternative 1** | |
| | | Quota | Annual Allocation |
| **2024** | 0 | -939,000 | -$967,170 |
| **2025** | 0 | -939,000 | -$967,170 |
| **2026** | 0 | -939,000 | -$967,170 |
| **2027** | 0 | -939,000 | -$967,170 |
| **2028** | 0 | -939,000 | -$967,170 |
| **Total** | | -4,695,000 | -$4,835,850 |
| **Option 3b** | | | |
| **2024** | 119,593 | -819,407 | -843,989 |
| **2025** | 165,887 | -773,113 | -796,306 |
| **2026** | 207,552 | -731,448 | -753,391 |
| **2027** | 254,618 | -684,382 | -704,914 |
| **2028** | 311,714 | -627,286 | -646,105 |
| **Total** | 1,059,365 | -3,635,635 | -$3,744,704 |
| **Option 3c** | | | |
| **2024** | 145,055 | -793,945 | -817,763 |
| **2025** | 198,293 | -740,707 | -762,928 |
| **2026** | 246,131 | -692,869 | -713,655 |
| **2027** | 299,369 | -639,631 | -658,820 |
| **2028** | 364,181 | -574,819 | -592,064 |
| **Total** | 1,253,029 | -3,441,971 | -$3,545,230 |

Between 2024 and 2027, **Alternatives 2** and **3** would decrease the commercial gag quota by at least 3.28 million pound (mp) gw (**Option 2c**) and at most 4.70 mp gw (**Options 2a and 3a**). Associated losses in annual allocation value are estimated to range from $3.37 million ($2021) (**Option 2c**) to $4.84 million ($2021) (**Options 2a and 3a**). Gag IFQ annual allocation prices are also expected to increase due to the reduced supply of annual allocation that would result from the decreases in quota proposed in this action.

In addition to decreases in IFQ annual allocation values, **Alternatives 2** and **3** would modify the percentages of multi-use shares distributed to IFQ shareholders. **Alternatives 2** and **3** would set the red grouper multi-use allocation equal to zero, and are therefore expected to lessen the catch-quota flexibility of IFQ shareholders.

Expected reductions in commercial gag landings, which would result from decreases in gag commercial quotas considered in **Alternative 2** and **Alternative 3,** would lead to decreased gag availability in the markets. The diminished availability of commercially-caught gag to consumers, which would be associated with an increase in market prices, is expected to result in

consumer surplus (CS) losses relative to **Alternative 1** (No Action). Expected landings reductions are estimated by subtracting 2017-2021 average commercial gag landings from the commercial quotas proposed in **Alternative 2** and **Alternative 3**. Average commercial gag landings between 2017 and 2021 are estimated at 511,121 lb gw (Table 1.1.1.). Expected price increases were derived based on a price flexibility estimate provided by Keithly and Tabarestani (2018) and an average ex-vessel price for gag. Keithly and Tabarestani (2018) estimated an own price flexibility of -0.396 for groupers, including gag. Between 2017 and 2021, ex-vessel prices for gag averaged $6.10 per lb gw ($2021) (Table 3.3.1.19). Estimated changes in commercial gag landings, in average ex-vessel prices and associated changes in CS are provided in Table 4.1.3.2.

**Table 4.1.3.2.** Changes in commercial gag landings and in average ex-vessel prices and consumer surplus in $2021.

| **Option 2a** | | | |
|---|---|---|---|
| **Year** | Changes relative to **Alternative 1** | | |
| | Landings | Price | Consumer Surplus |
| **2024** | -511,121 | $2.20 | -$561,211 |
| **2025** | -511,121 | $2.20 | -$561,211 |
| **2026** | -511,121 | $2.20 | -$561,211 |
| **2027** | -511,121 | $2.20 | -$561,211 |
| **2028** | -511,121 | $2.20 | -$561,211 |
| **Total** | -2,555,607 | | -$2,806,056 |
| **Option 2b** | | | |
| **2024** | -375,325 | $1.61 | -$521,597 |
| **2025** | -322,858 | $1.39 | -$485,072 |
| **2026** | -275,793 | $1.18 | -$442,244 |
| **2027** | -222,554 | $0.96 | -$382,327 |
| **2028** | -156,971 | $0.67 | -$291,777 |
| **Total** | -1,353,502 | | -$2,123,017 |
| **Option 2c** | | | |
| **2024** | -346,777 | $1.49 | -$503,190 |
| **2025** | -285,823 | $1.23 | -$452,169 |
| **2026** | -232,585 | $1.00 | -$394,547 |
| **2027** | -172,402 | $0.74 | -$314,745 |
| **2028** | -99,103 | $0.43 | -$196,532 |
| **Total** | -1,136,691 | | -$1,861,184 |

| **Option 3a** | | | |
|---|---|---|---|
| **Year** | Changes relative to **Alternative 1** | | |
| | Landings | Price | Consumer Surplus |
| **2024** | -511,121 | $2.20 | -$561,211 |
| **2025** | -511,121 | $2.20 | -$561,211 |
| **2026** | -511,121 | $2.20 | -$561,211 |
| **2027** | -511,121 | $2.20 | -$561,211 |
| **2028** | -511,121 | $2.20 | -$561,211 |
| **Total** | -2,555,607 | | -$2,806,056 |
| **Option 3b** | | | |
| **2024** | -391,528 | $1.68 | -$530,486 |
| **2025** | -345,234 | $1.48 | -$502,095 |
| **2026** | -303,569 | $1.30 | -$468,671 |
| **2027** | -256,503 | $1.10 | -$421,942 |
| **2028** | -199,407 | $0.86 | -$352,478 |
| **Total** | -1,496,242 | | -$2,275,672 |
| **Option 3c** | | | |
| **2024** | -366,066 | $1.57 | -$516,011 |
| **2025** | -312,828 | $1.34 | -$476,743 |
| **2026** | -264,991 | $1.14 | -$431,072 |
| **2027** | -211,752 | $0.91 | -$368,684 |
| **2028** | -146,941 | $0.63 | -$276,298 |
| **Total** | -1,302,578 | | -$2,068,808 |

Relative to **Alternative 1**, changes in CS ($2021) expected to result from the decreased availability of gag to consumers are estimated to range from -$497,585 (**Alternative 2-Option 2c**) to -$2.81 million (**Alternative 2-Option 2a** and **Alternative 3-Option 3a**).

Estimated average price changes expected to result from decreases in commercial gag landings and a 2017-2021 average ex-vessel price of $6.10 per lb gw ($2021) (Table 3.3.1.19) are used to estimate expected changes in commercial revenues. As discussed in Section 3.3.1., changes in producer surplus (PS) were estimated at 50% of the revenues. Changes in commercial gag landings, revenue, and associated changes in PS are provided in Table 4.1.3.3.

**Table 4.1.3.3.** Expected Changes in commercial gag landings, revenue, and producer surplus.

| **Option 2a** | | | |
|---|---|---|---|
| **Year** | Changes relative to Alternative 1 | | |
| | Landings | Revenue | Producer Surplus |
| **2024** | -511,121 | -$3,117,841 | -$1,558,920 |
| **2025** | -511,121 | -$3,117,841 | -$1,558,920 |
| **2026** | -511,121 | -$3,117,841 | -$1,558,920 |
| **2027** | -511,121 | -$3,117,841 | -$1,558,920 |
| **2028** | -511,121 | -$3,117,841 | -$1,558,920 |
| **Total** | -2,555,607 | -$15,589,203 | -$7,794,601 |
| **Option 2b** | | | |
| **2024** | -375,325 | -$2,289,484 | -$1,144,742 |
| **2025** | -322,858 | -$1,969,437 | -$984,718 |
| **2026** | -275,793 | -$1,682,336 | -$841,168 |
| **2027** | -222,554 | -$1,357,582 | -$678,791 |
| **2028** | -156,971 | -$957,523 | -$478,762 |
| **Total** | -1,353,502 | -$8,256,361 | -$4,128,181 |
| **Option 2c** | | | |
| **2024** | -346,777 | -$2,115,340 | -$1,057,670 |
| **2025** | -285,823 | -$1,743,521 | -$871,761 |
| **2026** | -232,585 | -$1,418,767 | -$709,384 |
| **2027** | -172,402 | -$1,051,655 | -$525,827 |
| **2028** | -99,103 | -$604,530 | -$302,265 |
| **Total** | -1,136,691 | -$6,933,814 | -$3,466,907 |

| **Option 3a** | | | |
|---|---|---|---|
| **Year** | Changes relative to Alternative 1 | | |
| | Landings | Revenue | Producer Surplus |
| **2024** | -511,121 | -$3,117,841 | -$1,558,920 |
| **2025** | -511,121 | -$3,117,841 | -$1,558,920 |
| **2026** | -511,121 | -$3,117,841 | -$1,558,920 |
| **2027** | -511,121 | -$3,117,841 | -$1,558,920 |
| **2028** | -511,121 | -$3,117,841 | -$1,558,920 |
| **Total** | -2,555,607 | -$15,589,203 | -$7,794,601 |
| **Option 3b** | | | |
| **2024** | -391,528 | -$2,388,322 | -$1,194,161 |
| **2025** | -345,234 | -$2,105,927 | -$1,052,964 |
| **2026** | -303,569 | -$1,851,772 | -$925,886 |
| **2027** | -256,503 | -$1,564,671 | -$782,336 |
| **2028** | -199,407 | -$1,216,385 | -$608,192 |
| **Total** | -1,496,242 | -$9,127,077 | -$4,563,539 |
| **Option 3c** | | | |
| **2024** | -366,066 | -$2,233,005 | -$1,116,502 |
| **2025** | -312,828 | -$1,908,251 | -$954,126 |
| **2026** | -264,991 | -$1,616,444 | -$808,222 |
| **2027** | -211,752 | -$1,291,690 | -$645,845 |
| **2028** | -146,941 | -$896,338 | -$448,169 |
| **Total** | -1,302,578 | -$7,945,727 | -$3,972,864 |

Between 2024 and 2028, expected changes in commercial revenues relative to **Alternative 1** are estimated to range from -$6.93 million (**Alternative 2-Option 2c**) to -$15.59 million (**Alternative 2-Option 2a** and **Alternative 3-Option 3a**). Between 2024 and 2028, expected changes in producer surplus relative to **Alternative 1** are estimated to range from -$3.47 million (**Alternative 2-Option 2c**) to -$7.80 million (**Alternative 2-Option 2a** and **Alternative 3-Option 3a**).

The sizeable decreases in the commercial gag landings expected from **Alternative 2** and **Alternative 3** would be expected to result in the reduction of gag available for purchase by dealers. Commercial gag landings would be eliminated under **Alternative 2-Option 2a** and **Alternative 3-Option 3a**. However, gag purchases represent a relatively small proportion of total dealer purchases. Between 2016 and 2020, gag purchases accounted for 3.74% of total dealer purchases. Therefore, adverse economic effects to dealers due to the reduced availability of gag for purchase are expected to be limited.

For the recreational sector, the economic effects expected to result from **Alternatives 2** and **3** were measured in changes in economic value, i.e., changes in consumer surplus (CS) for anglers. Changes in CS provided in this section are evaluated based on differences between ACTs considered in **Alternatives 2** and **3** and 2017-2021 average recreational gag landings.

CS per additional fish kept during a trip is defined as the amount of money an angler would be willing to pay for a fish in excess of the cost to harvest the fish. Changes in CS expected to result from ACT decreases considered in **Alternatives 2** and **3** were based on an estimated CS per gag and on the expected decreases in recreational gag landings relative to the status quo alternative (**Alternative 1**). Expected decreases in recreational gag landings were determined by subtracting 2017-2021 average recreational gag landings from recreational ACTs proposed in **Alternatives 2** and **3.** As provided in Table 1.1., recreational gag landings averaged 1,265,199 lb gw between 2017 and 2021. Based on information provided in Section 3.3.2, a CS of $92.80 ($2021) per two gag is used. Expected changes in recreational gag landings were converted into numbers of fish based on a 2017-2021 average weight of 8.88 lb ww per gag (M. Larkin, pers. comm., 2022). For **Alternatives 2** and **3**, expected changes in recreational gag landings expressed in lb gw and in number of fish, and associated expected changes in economic value are provided in Table 4.1.3.4.

**Table 4.1.3.4.** Changes in gag recreational landings, number of fish, and in economic value (CS) ($2021).

| **Option 2a** | | | |
|---|---|---|---|
| **Year** | Difference relative to Alternative 1 | | |
| | Landings | Fish | Consumer Surplus |
| **2024** | -1,265,199 | -143,773 | -$6,613,541 |
| **2025** | -1,265,199 | -143,773 | -$6,613,541 |
| **2026** | -1,265,199 | -143,773 | -$6,613,541 |
| **2027** | -1,265,199 | -143,773 | -$6,613,541 |
| **2028** | -1,265,199 | -143,773 | -$6,613,541 |
| **Total** | -6,325,996 | -718,863 | -$33,067,706 |
| **Option 2b** | | | |
| **2024** | -1,017,481 | -115,623 | -$5,318,650 |
| **2025** | -922,343 | -104,812 | -$4,821,337 |
| **2026** | -837,077 | -95,122 | -$4,375,631 |
| **2027** | -739,246 | -84,005 | -$3,864,243 |
| **2028** | -620,773 | -70,542 | -$3,244,947 |
| **Total** | -4,136,920 | -470,105 | -$21,624,808 |
| **Option 2c** | | | |
| **2024** | -966,322 | -109,809 | -$5,051,227 |
| **2025** | -855,925 | -97,264 | -$4,474,156 |
| **2026** | -758,992 | -86,249 | -$3,967,459 |
| **2027** | -648,596 | -73,704 | -$3,390,388 |
| **2028** | -514,864 | -58,507 | -$2,691,334 |
| **Total** | -3,744,699 | -425,534 | -$19,574,563 |

| **Option 3a** | | | |
|---|---|---|---|
| **Year** | Difference relative to Alternative 1 | | |
| | Landings | Fish | Consumer Surplus |
| **2024** | -1,265,199 | -143,773 | -$6,613,541 |
| **2025** | -1,265,199 | -143,773 | -$6,613,541 |
| **2026** | -1,265,199 | -143,773 | -$6,613,541 |
| **2027** | -1,265,199 | -143,773 | -$6,613,541 |
| **2028** | -1,265,199 | -143,773 | -$6,613,541 |
| **Total** | -6,325,996 | -718,863 | -$33,067,706 |
| **Option 3b** | | | |
| **2024** | -1,006,710 | -114,399 | -$5,262,350 |
| **2025** | -907,085 | -103,078 | -$4,741,579 |
| **2026** | -817,332 | -92,879 | -$4,272,415 |
| **2027** | -715,013 | -81,251 | -$3,737,569 |
| **2028** | -591,154 | -67,177 | -$3,090,123 |
| **Total** | -4,037,294 | -458,783 | -$21,104,037 |
| **Option 3c** | | | |
| **2024** | -951,961 | -108,177 | -$4,976,161 |
| **2025** | -836,180 | -95,020 | -$4,370,940 |
| **2026** | -733,861 | -83,393 | -$3,836,093 |
| **2027** | -618,977 | -70,338 | -$3,235,564 |
| **2028** | -478,963 | -54,428 | -$2,503,669 |
| **Total** | -3,619,942 | -411,357 | -$18,922,426 |

Between 2024 and 2028, cumulative decreases in recreational gag landings are estimated to range from 3.62 million lb gw (**Alternative 3-Option 3c**) to 6.33 million lb gw (**Alternative 2-Option 2a and Alternative 3-Option 3a)**. Associated decreases in consumer surplus are estimated to range from $18.92 million (**Alternative 3-Option 3c**) to $33.07 million (**Alternative 2-Option 2a and Alternative 3-Option 3a)**.

### 4.2.4 Direct and Indirect Effects on the Social Environment

This action would reduce the sector ACLs for gag based on the results of the recent stock assessment and subsequent recommendations by the SSC, adopt new units for the recreational sector's portion of the ACL, and revise the allocation between the commercial and recreational sectors; the stock is overfished and is undergoing overfishing as of 2019. In general, lower catch limits would be associated with direct negative effects in the short term as they allow for less fish to be landed. These negative effects would be expected to be mitigated over the long term as reduced harvest levels allow the stock to rebuild, leading to higher catch limits in the future. Related to the catch limit reduction, the most recent stock assessment used new data units for the recreational sector and the SSC determined that the State Reef Fish Survey (SRFS) dataset represented the best scientific information available. Updating the units for monitoring recreational landings and calibrating historical landings affects the allocation between the sectors when SRFS data are applied to the same time series used for the current allocation (**Alternative 3**). Thus, this action updates the MRIP-CHTS data with SRFS and MRIP-FES data, which impacts the sector allocations, either directly, if an alternative that revises the allocation percentages (**Alternatives 3**) is selected as preferred, or indirectly, if the alternative that retains the allocation percentages (**Alternative 2**) is selected as preferred, because SRFS estimates somewhat greater recreational landings than MRIP-CHTS.

Usually, additional effects would not be expected under **Alternative 1** as the catch limits for both sectors would remain at current levels, including the recreational portion of the catch levels set in MRIP-CHTS, and fishing practices would not be affected. However, this alternative is not based on the best scientific information available and is inconsistent with the need to end overfishing and rebuild the overfished stock. The Council has requested interim measures be put in place to reduce the harvest of gag in response to the stock status determination, however, these measures have not been implemented and are thus excluded from the analysis below.

**Alternatives 2** and **3** would reduce the catch levels substantially compared to **Alternative 1**, resulting in negative effects for both the recreational and commercial sectors as less fish is available to be landed. The magnitude of these effects in the short-term would be relative to the size of each sector's reduction from **Alternative 1**, as discussed below. At the same time the catch levels are reduced, **Alternatives 2** and **3** propose ACLs that use SRFS and MRIP-FES units for the recreational sector's portion of the stock ACL, indirectly affecting the allocation between the recreational and commercial sectors. In theory, there should be no effects under **Alternatives 2** and **Alternative 3** from converting the recreational sector's ACL from MRIP-CHTS units to MRIP-FES and SRFS units, as the change from MRIP-CHTS units is intended to be a conversion. However, applying the new units for the recreational sector produces somewhat

greater estimates of historical landings than MRIP-CHTS, indirectly affecting the sector allocation.

Tables 4.1.4.1 (recreational sector) and 4.1.4.2 (commercial sector) compare the catch level reductions under **Alternatives 2** and **3** for each sector. Currently, the recreational sector's season is closed when the ACL is estimated to be met, although this may be modified through Action 4. Because this action does not address the recreational ACT or modify the AMs, the proposed recreational ACLs are used for this analysis. For the recreational sector, the average landings for the most recent 5 years using SRFS data (2017-2021) was calculated from Table 1.1.1, for the purpose of comparing the catch limit reductions in the same units. The difference between the 5-year average (totaling 1,115,050 lb ww) and the proposed recreational ACLs under **Alternatives 2** and **3** is compared alongside the percent change for each proposed recreational ACL from the average recreational landings; the resulting recreational sector allocation is also provided. For the commercial sector, Table 4.1.4.2 compares the proposed commercial ACLs against the current commercial ACL of 1,217,000 lbs gw. Approximately 77% of the commercial ACL is distributed as pounds of annual allocation, representing the commercial quota. This action would modify the commercial ACL and not the quota, which may be modified through Action 3.2. For **Options 2a** and **3a**, a value for the sector allocation is specified for each alternative in the respective table, yet there is no applicable sector allocation for an ACL with a zero value.

**Table 4.1.4.1.** Comparison of the recreational ACLs under **Alternatives 2** and **3**, the difference from each proposed ACL and the average recreational landings (2017-2021), the percent change to the recreational ACL from the average recreational landings, and the resulting recreational sector allocation.

| Alter-native | Year | Rec ACL (lb gw) | Difference from Avg Landings (lb gw) | Change (%) from 5-yr Avg Landings | Rec Allocation (%) |
|---|---|---|---|---|---|
| 2a, 3a | 2024 | 0 | -1,115,050 | -100% | NA |
| | 2025 | 0 | -1,115,050 | -100% | NA |
| | 2026 | 0 | -1,115,050 | -100% | NA |
| | 2027 | 0 | -1,115,050 | -100% | NA |
| | 2028 | 0 | -1,115,050 | -100% | NA |
| 2b | 2024 | 276,000 | -839,050 | -75% | 61% |
| | 2025 | 382,000 | -733,050 | -66% | 61% |
| | 2026 | 477,000 | -638,050 | -57% | 61% |
| | 2027 | 586,000 | -529,050 | -47% | 61% |
| | 2028 | 718,000 | -397,050 | -36% | 61% |
| 2c | 2024 | 333,000 | -782,050 | -70% | 65% |
| | 2025 | 456,000 | -659,050 | -59% | 65% |
| | 2026 | 564,000 | -551,050 | -49% | 65% |
| | 2027 | 687,000 | -428,050 | -38% | 65% |
| | 2028 | 836,000 | -279,050 | -25% | 65% |
| 3b | 2024 | 288,000 | -827,050 | -74% | 61% |
| | 2025 | 399,000 | -716,050 | -64% | 61% |
| | 2026 | 499,000 | -616,050 | -55% | 61% |
| | 2027 | 613,000 | -502,050 | -45% | 61% |
| | 2028 | 751,000 | -364,050 | -33% | 61% |
| 3c | 2024 | 349,000 | -766,050 | -69% | 65% |
| | 2025 | 478,000 | -637,050 | -57% | 65% |
| | 2026 | 592,000 | -523,050 | -47% | 65% |
| | 2027 | 720,000 | -395,050 | -35% | 65% |
| | 2028 | 876,000 | -239,050 | -21% | 65% |

Note: The 5-year average landings were calculated for 2107-2021, based on the SRFS values in Table 1.1.1.

**Table 4.1.4.2.** Comparison of the commercial ACLs under Alternative 2 and **Alternative 3**, the difference from each proposed ACL and the current commercial ACL, the percent change between the commercial ACLs, and the resulting commercial sector allocation.

| Alter-native | Year | Com ACL (lb gw) | Difference from Current Com ACL (lb gw) | Change (%) from Current ACL | Com Allocation (%) |
|---|---|---|---|---|---|
| 2a, 3a | 2024 | 0 | -1,217,000 | -100% | NA |
| | 2025 | 0 | -1,217,000 | -100% | NA |
| | 2026 | 0 | -1,217,000 | -100% | NA |
| | 2027 | 0 | -1,217,000 | -100% | NA |
| | 2028 | 0 | -1,217,000 | -100% | NA |
| 2b | 2024 | 176,000 | -1,041,000 | -86% | 39% |
| | 2025 | 244,000 | -973,000 | -80% | 39% |
| | 2026 | 305,000 | -912,000 | -75% | 39% |
| | 2027 | 374,000 | -843,000 | -69% | 39% |
| | 2028 | 459,000 | -758,000 | -62% | 39% |
| 2c | 2024 | 213,000 | -1,004,000 | -82% | 35% |
| | 2025 | 292,000 | -925,000 | -76% | 35% |
| | 2026 | 361,000 | -856,000 | -70% | 35% |
| | 2027 | 439,000 | -778,000 | -64% | 35% |
| | 2028 | 534,000 | -683,000 | -56% | 35% |
| 3b | 2024 | 155,000 | -1,062,000 | -87% | 39% |
| | 2025 | 215,000 | -1,002,000 | -82% | 39% |
| | 2026 | 269,000 | -948,000 | -78% | 39% |
| | 2027 | 330,000 | -887,000 | -73% | 39% |
| | 2028 | 404,000 | -813,000 | -67% | 39% |
| 3c | 2024 | 188,000 | -1,029,000 | -85% | 35% |
| | 2025 | 257,000 | -960,000 | -79% | 35% |
| | 2026 | 319,000 | -898,000 | -74% | 35% |
| | 2027 | 388,000 | -829,000 | -68% | 35% |
| | 2028 | 472,000 | -745,000 | -61% | 35% |

The effects on each sector and under each alternative differ for the ACL reduction and the effect on the sector allocation from the SRFS conversion. With the increasing yield stream recommended by the SSC, the ACLs for each sector represent the greatest reduction from **Alternative 1** in 2024, then increase each year thereafter through 2028 allowing more fish to be caught. This should reduce the negative effects from lost harvest opportunities compared with the previous year of the yield stream. For both sectors, the greatest negative effects would be expected under **Options 2a** and **3a**, which would prohibit all harvest of gag and set each sector's ACL at zero. Following these options for the recreational sector, the next greatest negative

effects would be expected in order under **Option 2b, Option 3b**, **Option 2c,** and finally **Option 3c** with the least negative effects. For the commercial sector, the order from greatest to least negative effects would be expected from **Option 3b, Option 2b, Option 3c** and **Option 2c**. Thus, options representing a shorter rebuilding timeline (**Options 2b** and **3b**) would result in greater negative effects for both sectors compared to the longer rebuilding timeline (**Options 2c** and **3c**). However, for each alternative's options the effects for each sector are inversely related. The stock is expected to rebuild faster under the shorter rebuilding timeline (**Options 2b** and **3b**) compared to **Options 2c** and **3c**, mitigating the short-term negative effects through a return to greater catch limits if warranted.

A sector allocation is a policy designation of the rights to access the resource that also carries socio-cultural significance. The current 61% recreational to 39% commercial sector allocation reflects the greater historical engagement with the gag stock by the recreational sector compared to the commercial sector. Tables 4.1.4.1 and Table 4.1.4.2 provide each sector's respective allocation under **Alternatives 2** and **3**. **Alternative 2** would retain the existing sector allocation (61% recreational; 39% commercial) while adopting SRFS and MRIP-FES units for the recreational sector's portion of the stock ACL and keeping the same commercial ACL as under **Alternative 1**. By retaining the same allocation, additional effects would not be expected from **Alternative 2** in terms of a change to the sector allocation. However, as discussed in the section above on revising the catch limits, the sector ACLs underlying the allocation for **Alternative 2** reflect a change in the amount of fish that would go to each sector compared to **Alternative 1**, with more fish going to the commercial sector and less fish going to the recreational sector. Compared to **Alternatives 1** and **2**, **Alternative 3** would reallocate 4% of the stock ACL from the commercial sector to the recreational sector, resulting in negative effects for the commercial sector and positive effects for the recreational sector.

### 4.2.5 Direct and Indirect Effects on the Administrative Environment

Modifying the catch limits, sector allocation, and establishing a rebuilding timeline does not typically result in significant effects on the administrative environment. Aside from the fact that it is not viable because of its use of $F_{MAX}$, **Alternative 1** maintains the current sector allocation and catch limits, but it would have a greater administrative burden due to the need to convert landings back to MRIP-CHTS for management, and because it would allow overfishing of gag to continue. This assessment of **Alternative 1** would be true under the pending interim measures also, hence the necessity for this amendment. **Alternatives 2** and **3** would result in a short-term increased burden on the administrative environment due to the establishment of a revised sector allocation and its associated catch limits, corresponding to the rebuilding timeline selected in **Options a – c**, through rulemaking. However, engaging in rulemaking to implement this change in management is a routine function for NMFS and considered minimal. **Alternatives 2** and **3** would no longer require NMFS to convert landings from MRIP-FES to MRIP-CHTS. This conversion is model-derived, and becomes less precise with time as the amount of time between when both surveys ran concurrently and present day increases. **Alternatives 2** and **3** would also result in a decrease in the sector ACLs, which may increase the likelihood of needing to implement an in-season closure for the recreational sector; the commercial sector is managed under the Grouper-Tilefish IFQ program. However, in-season closures are routinely completed

for reef fish species. There is also no additional administrative burden for law enforcement, as law enforcement officers do not monitor catch limits, but would only continue to monitor compliance with any established recreational closed seasons. Some administrative burden is anticipated under **Alternatives 2** and **3** with respect to outreach as it relates to notifying stakeholders of the changes to the sector allocation and ACLs. None of the anticipated effects are expected to be significant.

## 4.3 Action 3: Modify the Gulf Gag Sector ACTs Based on the Catch Limits and Sector Allocation Selected in Action 2

**Sub-Action 3.1: Modify the Recreational ACT**
**Sub-Action 3.2: Modify the Commercial ACT**

### 4.3.1 Direct and Indirect Effects on the Physical Environment

General effects on the physical environment from fishing are described in Section 4.1.1, and general effects from modifying catch limits are described in Section 4.2.1. Modifications to the sector ACTs are expected to result in neutral effects on the physical environment as neither sector is expected to change current practices they respectively use in the multi-species reef fish fishery. The ACTs proposed in **Alternative 2** in Sub-Action 3.1, and **Alternative 2** and **3** in Sub-Action 3.2, result in further reductions in gag that can be harvested compared to the ACLs proposed in Action 2. Effects from these three alternatives would be dependent on the alternative selected in Action 2 and mirror those effects. Gag is targeted by both sectors, and fishing occurs for other reef fish species when recreational fishing for gag is closed, or when a commercial vessel does not have sufficient gag IFQ allocation available to retain and land gag. Thus, the effects on the physical environment of **Alternative 2** in Sub-Action 3.1 and **Alternative 2** and **3** in Sub-Action 3.2 are expected to be neutral compared to **Alternative 1** of both Sub-Actions.

### 4.3.2 Direct and Indirect Effects on the Biological and Ecological Environment

Direct and indirect effects on the biological and ecological environments from fishery management actions, and as they relate to modifying gag catch limits, have been discussed in detail in Sections 4.1.2 and 4.2.2. Decreasing the catch limits reduces the amount of fish that can be harvested. The buffers between the sector ACLs and ACTs in Action 3 reduce the likelihood that a sector's ACL would be exceeded. If the ACL is exceeded, the requirement to pay back the overage is expected to mitigate the negative impacts of that overage on the stock. The ACTs under **Alternative 1** in both Sub-Actions are based on MRIP-CHTS and SEDAR 33 (2014), using an $F_{MSY}$ proxy of $F_{MAX}$; none of these are considered to be consistent with the best scientific information available by NMFS or the Council's SSC. Thus, **Alternative 1** in both Sub-Actions are not viable alternatives. Further, the buffers between the ACLs and ACTs, and

between the commercial ACT and the commercial quota, were established prior to the implementation of the Generic ACL/AM Amendment (GMFMC 2012), which established a uniform method of determining these buffers through the ACL/ACT Control Rule (see the discussion in Section 2.3 for more information). If the interim measures discussed in Chapter 1 and herein become effective in the spring of 2023 as expected, then **Alternative 1** in both Sub-Actions would be based on the initial run of SEDAR 72 from 2021, with landings informed by MRIP-FES. The catch limits defined in the interim measures are based on an $F_{MSY}$ proxy of $F_{30\%SPR}$, and therefore are not expected to sufficiently reduce fishing mortality to end overfishing and rebuild the stock based on the best scientific information available, which presently corresponds with an $F_{MSY}$ proxy of $F_{40\%SPR}$.

**Alternative 2** in Sub-Action 3.1 and **Alternative 2** and **3** in Sub-Action 3.2 are expected to have direct positive effects on the biological and ecological environment, and in particular on the gag stock. Relative to **Alternative 1** in both Sub-Actions, the other alternatives all result in positive biological effects by reducing the sector ACT relative to the sector ACL relative to the $F_{MSY}$ proxy established in Action 1, consistent with the best scientific information available. In Sub-Action 3.1, **Alternative 2** results in positive biological effects compared to **Alternative 1**. In Sub-Action 3.2, **Alternative 2** results in greater positive biological effects compared to **Alternative 3** by further reducing harvest compared to the commercial ACL (14% reduction compared to 5%, respectively. However, so long as the sector ACLs selected as preferred in Action 2 are not exceeded, negative biological effects are expected to be negligible.

For the same reasons as stated in Section 4.2.2, no additional impacts to ESA-listed species or introduction of invasive species are anticipated as a result of this action.

### 4.3.3 Direct and Indirect Effects on the Economic Environment

**Sub-Action 3.1: Modify the Recreational ACT**

**Alternative 1** (No Action) would maintain the current buffer between the recreational ACL and ACT. The existing buffer between the ACL and ACT is approximately equal to 10.25%. **Alternative 1** would therefore not be expected to result in economic effects.

**Alternative 2** would use the Council's ACL/ACT Control Rule to set a 10% buffer between the recreational ACL and recreational ACT for gag. Relative to **Alternative 1**, **Alternative 2** would result in a small increase in the gag ACT. Economic effects expected to result from the adjustment to the buffer between the gag ACL and ACT are measured by cumulative changes between 2024 and 2028 in consumer surplus to anglers. Table 4.3.1.3.1. provides cumulative changes in the recreational gag ACT in pounds and number of fish and estimated changes in consumer surplus ($2021) for **Alternative 2**.

**Table 4.3.1.3.1.** 2024-2028 Changes in recreational gag ACT, in number of fish and consumer surplus for **Alternative 2.**

| Action 2 Options | Change relative to Alternative 1 | | |
|---|---|---|---|
| | ACT (lb gw) | Fish | Consumer Surplus |
| **Alternative 2 Option 2b** | 4,924 | 560 | $25,738 |
| **Alternative 2 Option 2c** | 4,703 | 534 | $24,584 |
| **Alternative 3 Option 3b** | 4,298 | 488 | $22,467 |
| **Alternative 3 Option 3c** | 5,946 | 676 | $31,083 |

Between 2024 and 2028, cumulative changes in the recreational gag ACT would range from 4,298 lb gw (**Alternative 3 -Option 3b**) to 5,946 lb gw (**Alternative 3 -Option 3c**). Associated changes in consumer surplus are estimated to range from $22,467 (**Alternative 3 -Option 3b**) to $31,083 (**Alternative 3 -Option 3c**).

**Sub-Action 3.2: Modify the Commercial Quota**

This action considers modifications to the commercial gag quota. **Alternative 1** (No Action) would continue to set the commercial gag quota at 86% of the commercial ACT, which makes the quota 77% below the commercial ACL. **Alternative 2** and **Alternative 3** would both set the commercial quota for gag equal to the commercial ACT. The commercial ACT would be set at either 86% (**Alternative 2**) or 95% (**Alternative 3**) of the commercial ACL. Therefore, both **Alternatives 2-3** would increase the commercial gag quota by setting a smaller buffer between the ACL and ACT (quota).

Economic effects expected to result from quota adjustments considered in **Alternatives 2** and **3** are measured by the 2024 -2028 cumulative changes in annual allocation value, revenue, and consumer and producer surplus, as provided in Table 4.3.2.1. Because **Alternative 2-Option 2a** and **Alternative 3-Option 3a** would set a gag quota equal to zero between 2024 and 2028, they are not expected to result in changes in Action 3 and are therefore not included in Table 4.3.2.1.

**Table 4.3.2.1.** 2024-2028 changes in commercial gag quota, annual allocation value, revenue, and consumer and producer surplus.

| Action 2 - Option 2b | | |
|---|---|---|
| **2024-2028 Cumulative Changes** | Action 3 **Alternative 2** | Action 3 **Alternative 3** |
| **Quota** | 134,895 | 276,895 |
| **Annual Allocation Value** | $138,942 | $285,202 |
| **Consumer Surplus** | $799,818 | $1,581,852 |
| **Revenue** | $822,858 | $1,689,058 |
| **Producer surplus** | $411,429 | $844,529.21 |
| **Action 2 - Option 2c** | | |
| **Landings** | 161,084 | 327,084 |
| **Annual Allocation Value** | $165,916 | $336,896 |
| **Consumer Surplus** | $944,659 | $1,919,617 |
| **Revenue** | $982,611 | $1,995,211 |
| **Producer surplus** | $491,306 | $997,605.63 |
| **Action 2 - Option 3b** | | |
| **Landings** | 118,635 | 242,635 |
| **Annual Allocation Value** | $122,194 | $249,914 |
| **Consumer Surplus** | $704,770 | $1,180,682 |
| **Revenue** | $723,675 | $1,480,075 |
| **Producer surplus** | $361,837 | $740,037.26 |
| **Action 2 - Option 3c** | | |
| **Landings** | 140,971 | 287,971 |
| **Annual Allocation Value** | $145,200 | $296,610 |
| **Consumer Surplus** | $833,814 | $1,718,328 |
| **Revenue** | $859,925 | $1,756,625 |
| **Producer surplus** | $429,962 | $878,312.28 |

## 4.3.4 Direct and Indirect Effects on the Social Environment

**Sub-Action 3.1 – Effects on the Social Environment – Recreational ACT**

Given the need to end overfishing, the ACT is a tool that can be used to slow the rate of harvest before the ACL is met. This action would modify the method for setting the recreational ACT, which would not be expected to result in effects. Modifying the size of the buffer between the ACL and ACT, and modifying the threshold against which the ACT is determined to have been met could result in indirect effects; those indirect effects would relate to the extent that the ACT is met sooner, affecting fishing behavior.

Although additional effects would not be expected from retaining the recreational ACT and its use alongside a 3-year moving average (**Alternative 1**), the recreational ACT is set and triggered based on outdated methods and is no longer considered the best scientific information available. **Alternative 2** would set the recreational ACT using the Council's ACL/ACT Control Rule based

on the 2018-2021 recreational fishing years, resulting in a 10% buffer between the ACL and ACT. This buffer approximates the buffer under **Alternative 1**, and the effects would be similar.

Changing how the threshold is calculated for meeting the ACT would result in some indirect effects related to when the ACT is met. A single year of higher landings that exceeds the ACL would trigger the AM under **Alternative 2**, but would be averaged with two other years under **Alternative 1**, making it less likely the AM is triggered. On the other hand, adopting the use of annual landings (**Alternative 2**) in place of the 3-year moving average (**Alternative 1**) is simpler and clearer for people to understand, conferring some small broad benefits.

**Sub-Action 3.2 – Effects on the Social Environment – Commercial ACT**

The commercial quota represents the amount of gag allocation that is distributed to shareholders at the beginning of each year. Although additional effects would not be expected from retaining the current methods for calculating the commercial ACT and quota **Alternative 1** relies on outdated methods and is no longer considered to be based on the best scientific information available.

Both **Alternatives 2** and **3** would set the commercial quota for gag equal to the commercial ACT. The commercial quota under **Alternative 1** was used as a buffer to account for discards from commercial vessels without gag allocation. A smaller buffer between the ACL and ACT would allow for more fish to be harvested as more allocation is distributed, resulting in positive effects. Thus, adopting a smaller buffer (5%) between the ACT and ACL under **Alternative 3** would be associated with greater benefits than retaining the larger buffer (14%) under **Alternative 2,** as more gag allocation would be distributed to IFQ shareholders and is ultimately landed by vessels.

### 4.3.5 Direct and Indirect Effects on the Administrative Environment

This action would affect the administrative environment mostly through in-season closures for the recreational sector that are more likely to be triggered than under current management under Sub-Action 3.1, **Alternative 1**. The commercial sector will not have a seasonal closure due to the use of the Grouper-Tilefish IFQ program for gag, and because no commercial seasonal closure is considered in this document. A closure of the recreational sector for gag would only have minor effects on the administrative environment as closures already occur for many reef fish species. Further, changing the ACT would increase the burden for NMFS, which would have to engage in rulemaking to implement this change in management, although this change is routine and considered minimal. **Alternative 1** in both Sub-Actions are not viable because they are based on the use of an $F_{MSY}$ proxy that is no longer considered consistent with the best scientific information available. **Alternative 2** in Sub-Action 3.1 would be projected to result in in-season closures for the recreational sector due to a reduced ACT, so effects are expected to be the same. A minor administrative burden would be expected under **Alternative 2** or **3** in Sub-Action 3.2 to notify commercial fishermen of the change in the manner in which the commercial quota is defined. There is no effect on the administrative burden for law enforcement as law enforcement officers do not monitor catch limits, but would only continue to monitor compliance

with any established closed season. Some administrative burden is anticipated with respect to outreach as it relates to notifying stakeholders of the changes to the ACT, and any in-season recreational closures that occur. None of the expected effects are expected to be significant.

## 4.4 Action 4: Modification of Gulf Gag Recreational Fishing Season Start Date and Accountability Measures (AMs)

### 4.4.1 Direct and Indirect Effects on the Physical Environment

General effects on the physical environment from fishing are described in Section 4.1.1. Modification of the recreational fishing season start date is not expected to result in significant effects on the physical environment as the recreational sector is not expected to change current practices they use in the multi-species recreational reef fish fishery. Fishing occurs for other reef fish species when recreational fishing for gag is closed. Thus, the effects on the physical environment of **Alternatives 2** and **3** are not expected to be measurably different from **Alternative 1** as fishing activity would continue to occur regardless if gag is open for recreational harvest.

### 4.4.2 Direct and Indirect Effects on the Biological and Ecological Environment

Direct and indirect effects on the biological and ecological environments from fishery management actions have been discussed in detail in Sections 4.1.2 and 4.2.2. Modifying the recreational fishing season start date may affect the selectivity at length, sex, and age of gag harvested and discarded by the recreational sector. As noted in Section 2.4, several other reef fish species are open to recreational harvest in federal waters in the Gulf during June, and gag may be caught during fishing activity directed at these and other species. Thus, having a recreational fishing season for gag co-occurring during this peak in recreational reef fish fishing (i.e., **Alternative 1** and **2**) may reduce regulatory dead discards of gag during this month (see Chagaris et al. 2019). Regulatory discards under **Alternative 1** and **2** would be expected to be higher in fall months. The recreational fishing season under **Alternative 2**, which has the shortest fishing season durations of the alternatives in Action 4, is only expected to be open for 24 days during 2024, and gradually increasing up to 111 days by 2028. It is plausible that as the season duration becomes longer over the rebuilding period and the gag season incorporates more of the red snapper and red grouper recreational seasons (the 2022 red snapper federal for-hire season closed August 19 and the 2022 red grouper recreational season closed August 30), it could reduce gag discards later in the year, since the seasons for these co-occurring species would likely also be closed and take fishing pressure off of gag. However, it is also known that regulatory discards into warmer surface waters during the summer months have been correlated with increased discard mortality rates in some reef fish species (e.g., Campbell et al. 2014; Bohaboy et al. 2019). This suggests the possibility of increased surface temperature-related discard mortality due to stress in the summer compared to the fall months. Fishermen giving public testimony at Council meetings have stated that gag feed more aggressively when water

temperatures are cooler. Thus, fishing for gag during summer months (i.e., **Alternative 1** and **2**) required fishermen to fish for gag in deeper water (greater than 30 meters depth) where barotrauma becomes an increasingly influential factor on discard mortality (Lazarre et al. 2021). Gag caught in these deeper waters have been observed to generally be larger and older than those from shallower waters (SEDAR 72 2022). Therefore, **Alternative 1** and **2** may result in increased directed fishing effort and associated regulatory discards compared to fishing during comparatively cooler fall and/or winter months (i.e., **Alternative 3**, and more so **Alternative 4**), especially on larger and older fish. Specific to male gag, males are not found in waters shallower than 30 meters (references herein, and fishermen during Council public testimony). The probability of discarding a male gag during fishing in summer months is expected to be greater than the same during fall and winter months by function of the depths being fished most by the recreational fleet.

Conversely, a recreational fishing season beginning September 1 (**Alternative 3**) or October 1 (**Alternative 4**) would be expected to shift fishing effort to those months. However, the recreational reef fish fishery is a multi-species fishery, and fishing does not cease on all species just because the harvest of one species is prohibited. Thus, regulatory discards of gag would still be expected outside the open recreational fishing season for either **Alternative 3** or **4**. If these discards originate from deeper waters, then barotrauma and its effect on discard mortality would be expected to exacerbate closed season discard mortality as a function of depth fished and whether measures such as release with a descending device is employed. However, during the open season, fishing effort would be expected to shift to shallower (less than 30 meters depth) and cooler waters as the season progresses, which would be expected to shift fishing effort to younger, smaller, and predominantly female gag. Therefore, **Alternative 3**, and more so **Alternative 4**, may reduce directed fishing mortality of male gag to the extent to which recreational fishermen avoid catching gag during the closed season.

In summary, the number of regulatory discards from deeper waters may be lower under **Alternative 1** and **2**; however, those discards may be subject to increased discard mortality rates due to barotrauma and releases into warmer surface waters (stress). Further, the probability of discarding a male gag is expected to be higher under **Alternative 1** and **2**. The number of regulatory discards may increase in the summer months under **Alternative 3** or **4** due to recreational fishing seasons with co-occurring species possibly being closed, but only to the degree to which gag are being caught with those other summer fisheries. However, the associated in-season discard mortality with fall season discards would be expected to be lower, as those gag are more likely to have been harvested in cooler, shallower waters. Also, discards under **Alternative 3** and **4** are expected to be primarily females, thereby reducing discard mortality on the male fraction of the SSB. Thus, tradeoffs in possible effects exist between these alternatives. **Alternative 1** and **2** may result in greater negative effects to the biological environment for gag due to increased discard mortality due to barotrauma and stress, and on male gag, resulting from directed recreational fishing effort in waters deeper than 30 meters. Large gag caught in these deeper waters in summer months would be expected to be retained, and others discarded; further, larger gag have a greater probability of being male (SEDAR 72 2022). **Alternative 3** and **4** may result in somewhat decreased negative biological effects on gag despite increased regulatory discards in summer months (some fraction of these fish would be

expected to survive release), with much lower discard mortality expected during directed fishing in fall months.

For the same reasons as stated in Section 4.2.2, no additional impacts to ESA-listed species or introduction of invasive species are anticipated as a result of this action.

### 4.4.3 Direct and Indirect Effects on the Economic Environment

**Alternative 1** (No Action) would maintain the current season structure and would therefore not be expected to result in economic effects. **Alternative 2** would retain the June 1 start of the recreational gag season but would close the season when the ACT is projected to be met. **Alternatives 3** and **4** would also close the recreational season when the ACT is projected to be met but would start the recreational season September 1 and October 1, respectively. Because losses in consumer surplus to recreational anglers were already accounted for in Action 2, additional economic effects to private anglers are not expected to occur due to changes in season structure. However, charter for-hire operators are expected to incur losses in producer surplus due to the sizeable reductions in number of trips that would result from the combined effects ACLs and ACTs reductions and season structure adjustments.

PS per angler trip is defined as the amount of money that a vessel owner earns in excess of the cost of providing the trip. As indicated in Section 3.3.2, PS per angler trip is estimated at $149 ($2021). Expected changes in charter trips targeting gag can be derived from projected closure dates for **Alternatives 2-4** provided in Table 2.4.1. and from the average distribution of gag target trips by wave and mode between 2017 and 2021 provided in Table 3.3.2.4. However, based on the multitude of Alternatives and options to consider, a qualitative discussion is provided here. A quantitative evaluation of options will be once the Council indicates preferred alternatives, e.g., preferred recreational ACLs/ACTs in Action 2. In general, it can be stated that, other things equal, shorter recreational seasons would result in fewer charter trips targeting gag and therefore would be associated with greater producer surplus losses to charter for-hire operators.

### 4.4.4 Direct and Indirect Effects on the Social Environment

This action assumes that Alternative 2 of Sub-action 3.1 is selected as preferred, which results in establishing a 10% buffer between the recreational ACT and recreational ACL. Although additional effects are not usually expected from retaining **Alternative 1**, without additional measures, it would be likely that the ACL would be exceeded by retaining both the June 1 start date for the recreational season opening for gag and the in-season closure based on the ACL. More stringent harvest restrictions could be required to end overfishing and rebuild the overfished stock if catch levels are continually exceeded.

To reduce the likelihood that the ACL is exceeded, **Alternatives 2-4** would modify the in-season closure to apply when the ACT is met rather than the ACL. This action assumes the action alternative is selected in Action 3.1 (Alternative 2), which would set the ACT 10% below the ACL. Thus, an in-season closure would occur sooner following the start date of the fishing

season selected in any of **Alternatives 2-4** compared to **Alternative 1**, resulting in negative effects in the short-term related to the extent of fishing opportunities that are lost before the end of the year. These negative effects are expected to be mitigated over the long term as overfishing ends and the overfished stock rebuilds.

**Alternatives 2-4** differ based on the fishing season start date. An in-season closure is expected to occur before December 31 under all three alternatives. Table 2.4.1 provides estimates of the season durations before an in-season closure is triggered due to the ACT being met for a season start date of June 1 (**Alternative 2**), September 1 (**Alternative 3**), and October 1 (**Alternative 4**). In general, a shorter fishing season duration would result in the greatest negative effects. Assuming Alternative 2 or 3 is selected in Action 2, retaining a June 1 season start date would provide the shortest estimated fishing season (**Alternative 2**) and thus the greatest negative effects would be expected. The longest season duration before an in-season closure set to the ACT is estimated for a September 1 season start date, providing the greatest benefits among **Alternatives 2-4**. Beginning the fishing season on October 1 (**Alternative 4**) would be expected to result in intermediary effects between **Alternatives 2** and **3**.

### 4.4.5 Direct and Indirect Effects on the Administrative Environment

This action would affect the administrative environment mostly through in-season closures for the recreational sector that are likely to be triggered under any of the current management alternatives. It is not until 2028 under Option 2c of Alternative 2 in Action 2 and **Alternative 3** of Action 4, and Option 3c of Alternative 3 in Action 2 and **Alternative 2** and **3** of Action 4, that a recreational fishing season closure is not expected. A closure is expected under all scenarios for **Alternative 1** of Action 4. A closure of the recreational sector for gag would only have minor effects on the administrative environment as closures already occur for many reef fish species. Further, changing the recreational fishing season start date would increase the burden for NMFS, which would have to engage in rulemaking to implement this change in management, although this change is routine and considered minimal. There is no effect on the administrative burden for law enforcement as law enforcement officers would continue to monitor compliance with any established closed season. Some administrative burden is anticipated under **Alternative 2** and **3** with respect to outreach as it relates to notifying stakeholders of the change to the recreational fishing season start date, and any in-season recreational closures that occur. None of the expected effects are expected to be significant.

## 4.5 Cumulative Effects

Cumulative effects are those effects that result from incremental impacts of a proposed action when added to other past, present, and reasonably foreseeable future actions (RFFA), regardless of which agency (federal or non-federal) or person undertakes such actions. Cumulative effects can result from individually minor but collectively significant actions that take place over a period of time (40 C.F.R. 1508.1(g)(3)). Below is the five-step cumulative effects analysis that identifies criteria that must be considered in an EA.

1. *The area in which the effects of the proposed action will occur* - The affected area of these proposed actions encompass the state and federal waters of the Gulf as well as Gulf communities that are dependent on reef fish fishing. Most relevant to these proposed actions are gag and those who fish for them. For more information about the area in which the effects of this proposed action will occur, please see Chapter 3, Affected Environment, which describes these important resources as well as other relevant features of the human environment.

2. *The impacts that are expected in that area from the proposed action* - The proposed actions would modify Gulf gag status determination criteria, the gag rebuilding timeline, catch limits, catch allocations between the recreational and commercial sectors, sector ACTs, and the recreational season opening date. The environmental consequences of the proposed actions are analyzed in Sections 4.1.1, 4.1.2, 4.2.1, 4.2.2, 4.3.1, 4.3.2, 4.4.1, and 4.4.2, and are not expected to be significant. The combined actions are not expected to have significant effects on the physical environment, as they are not expected to alter the manner in which the gag portion of the reef fish fishery is prosecuted (Sections 4.1.1, 4.2.1, 4.3.1, and 4.4.1). These measures are expected to have non-significant but positive effects on the biological environment because the actions would reduce gag harvest and mortality, end overfishing, and allow for rebuilding of the gag stock (Section 4.1.2, 4.2.2, and 4.3.2). Since gag is part of a multi-species fishery and fishermen can specifically target them, bycatch mortality is expected to be reduced due to reduced directed targeting of gag. However, regulatory discards are expected to increase because the gag recreational season duration would be reduced and thus gag must be discarded when caught while fishing for other species. In particular, the recreational red snapper fishing season previously overlapped completely with the gag recreational fishing season, allowing for harvest of gag caught while targeting red snapper. This would no longer be the case since the gag season would not completely overlap with the red snapper season, so legal-sized gag would be required to be released during any portion of the red snapper season that is open when the gag season is closed. Despite this change, overall gag mortality is expected to decrease. Further, changing fishing practices on one stock does not generally change overall fishing effort or fishing practices. Although it is likely that a short-term negative effect on the social and economic environments will occur due to the actions taken herein, as more harvest is allowed as the stock rebuilds, benefits to the economic (Sections 4.1.3, 4.2.3, 4.3.3, and 4.4.3) and social environments (Sections 4.1.4, 4.2.4, 4.3.4, and 4.4.4) are expected. The actions are not expected to significantly affect the administrative environment (Sections 4.1.5, 4.2.5, 4.3.5, and 4.4.5), adversely or beneficially.

3. *Other past, present and reasonably foreseeable future actions (RFFAs) that have or are expected to have impacts in the area* - There are numerous actions under development in the Gulf annually. Many of these activities are expected to have impacts associated with them and are listed below.

<u>*Other fishery related actions*</u> - The cumulative effects associated with modifying gag ACLs, ACTs, and quotas were analyzed in the environmental impact statement (EIS) for Amendment 32 (GMFMC 2011b). In addition, cumulative effects relative to reef fish management have been analyzed in the EISs for Amendment 22 (GMFMC 2004b), Amendment 26 (GMFMC 2006), and Amendment 27/14 (GMFMC 2007), Amendment 29 (GMFMC 2008b), Amendment 30A (GMFMC 2008c), Amendment 30B (GMFMC 2008a), Amendment 31 (GMFMC 2010a),

Amendment 40 (GMFMC 2014), Amendment 28 (GMFMC 2015a), and Amendment 53 (GMFMC 2021). These cumulative effects analyses are incorporated here by reference. Other pertinent actions are summarized in the history of management (Section 1.3). Currently, there are several present and RFFAs that are being considered by the Council for the Reef Fish FMP or implemented by NMFS, which could affect reef fish stocks. These include: Amendment 55, which proposes to revise yellowtail snapper catch limits; and Amendment 36B, which would revise the red snapper and grouper-tilefish commercial IFQ programs. Several framework actions also are being developed including a framework that proposes to modify the vermilion snapper bag limit, a framework that would modify red snapper calibrations and gray snapper catch limits, a framework that would modify the greater amberjack recreational fixed closed season and commercial trip limit, a generic framework which would modify the Council's ABC Control Rule, and a generic framework that addresses essential fish habitat. Documents being considered for implementation by NMFS that could affect reef fish stocks include a framework that proposes to modify red snapper catch limits; a framework to modify vermilion snapper catch limits; Reef Fish Amendment 54, which would revise greater amberjack catch limits and sector allocations; and gray triggerfish fixed closed season and trip limit. Descriptions of these actions can be found on the Council's Web page.[40]

*Non-fishery related actions* - Actions affecting the Reef Fish fishery have been described in previous cumulative effects analyses. Three important events include impacts of the *Deepwater Horizon* MC252 oil spill, the Northern Gulf Hypoxic Zone, and climate change (See Sections 3.1 and 3.2). Impacts from the *Deepwater Horizon* MC252 oil spill are still being examined; however, as indicated in Section 3.2, the oil spill had some adverse effects on fish species. Further, the impacts on the food web from phytoplankton, to zooplankton, to mollusks, to top predators may be significant in the future. Impacts to gag from the oil spill may similarly affect other species that may be preyed upon by gag. However, since the majority of the spawning biomass for gag occurs outside the main areas affected by the *Deepwater Horizon* MC252 oil spill plume, it is less likely that a direct effect on this species will be detected. Gag is a mobile species and is able to avoid hypoxic conditions, so any effects from the Northern Gulf Hypoxic Zone on gag are likely to be minimal.

There is a large and growing body of literature on past, present, and future impacts of global climate change induced by human activities. Some of the likely effects commonly mentioned are sea level rise, increased frequency of severe weather events, and change in air and water temperatures. The Environmental Protection Agency's climate change web page provides basic background information on these and other measured or anticipated effects. In addition, the Intergovernmental Panel on Climate Change has numerous reports addressing their assessments of climate change.[41] Global climate changes could affect the Gulf fisheries as discussed in Sections 3.1 and 3.2. In addition, the distribution of native and exotic species may change with increased water temperature, as may the prevalence of disease in keystone animals such as corals and the occurrence and intensity of toxic algae blooms. Climate change may significantly

[40] http://gulfcouncil.org/
[41] https://archive.ipcc.ch/

impact Gulf Reef Fish species in the future, but the level of impacts cannot be quantified at this time, nor is the time frame known in which these impacts would occur. The actions herein are not expected to significantly contribute to climate change through the increase or decrease in the carbon footprint from fishing, as these actions should not change how the fishery is prosecuted. As described in Section 3.1, the contribution to greenhouse gas emissions from fishing is minor compared to other emission sources (e.g., oil platforms).

*4. The impacts or expected impacts from these other actions* - The cumulative effects from managing the Reef Fish fishery have been analyzed in multiple other actions.[42] They include a detailed analysis of the Reef Fish fishery, cumulative effects on non-target species, protected species, and habitats in the Gulf. Overall, bycatch of protected species in the gag portion of the Reef Fish fishery is negligible and effects to habitat are minimized due to the gear types used for harvest (Section 3.2). The effects of this action are positive, as they ultimately reduce overfishing and rebuild the gag stock, which is expected to result in increased fishing opportunities in the future. Short-term negative impacts on the social and economic environments are expected due shortened seasons and limited allowable harvest of gag. However, as more harvest is allowed as the stock rebuilds, benefits to the economic and social environments are expected. Furthermore, it is assumed that recreational fishing trips would occur regardless of whether gag is open for recreational harvest, as recreational fishing for gag is generally part of a multi-species fishing strategy and fishermen typically switch to targeting other species when gag harvest is closed.

5. *The overall impact that can be expected if the individual impacts are allowed to accumulate:* These actions, combined with other past actions, present actions, and RFFAs, are not expected to have significant beneficial or adverse effects on the physical and biological environments. Any effects are expected to be positive, but are not expected to substantially change the manner in which the reef fish fishery is prosecuted (Sections 4.1.1, 4.1.2, 4.2.1, 4.2.2, 4.3.1, 4.3.2, 4.4.1, and 4.4.2). For the social and economic environments, some negative short-term but positive long-term effects are expected to result for fishing communities from reducing allowable harvest and shortening/moving the fishing season (Sections 4.1.3, 4.1.4, 4.2.3, and 4.2.4). These effects are likely minimal, as the proposed action, along with other past actions, present actions, and RFFAs, are not expected to alter the manner in which the fishery is prosecuted. Because it is unlikely there would be any changes in how the fishery is prosecuted, these actions, combined with past actions, present actions, and RFFAs, are not expected to have significant adverse effects on public health or safety.

*6. Summary:* The proposed actions are not expected to have individual significant effects to the physical, biological, economic, or social environments. Any effects of the proposed action, when combined with other past actions, present actions, and RFFAs are not expected to be significant. The effects of the proposed actions are, and will continue to be, monitored through collection of landings data by NMFS, individual state programs, stock assessments and stock assessment updates, life history studies, economic and social analyses, and other scientific

[42] https://gulfcouncil.org/reef-fish/

observations. Landings data for the recreational sector in the Gulf are collected through MRIP, Louisiana Creel Survey, Southeast Regional Headboat Survey, the Southeast For-Hire Integrated Electronic Reporting Program, Florida's State Reef Fish Survey, and Texas Parks and Wildlife Department. The cumulative social and economic effects of past, present, and future amendments may be described as increasing fishing opportunities, resulting in positive social and economic impacts. The proposed actions in this environmental assessment are expected to result in important long-term benefits to the for-hire fishing fleets, fishing communities and associated businesses, and private recreational anglers. This analysis found positive effects on the biophysical and socioeconomic environments because it would rebuilds the Gulf gag stock while allowing the optimum benefits in yield as rebuilding is occurring.

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# APPENDIX A. LETTER REGARDING GULF GAG GROUPER INTERIM RULE MEASURES

Gulf of Mexico Fishery Management Council
*Managing Fishery Resources in the U.S. Federal Waters of the Gulf of Mexico*

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July 18, 2022

Mr. Andrew Strelcheck, Regional Administrator
Southeast Regional Office
National Marine Fisheries Service
263 13th Avenue South
St. Petersburg, Florida 33701

007050JUL2022

Dear Mr. Strelcheck:

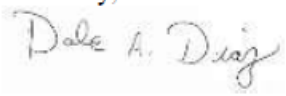
At its June 2022 meeting, the Gulf of Mexico (Gulf) Fishery Management Council (Council) discussed a proposed interim rule and corresponding proposed management measures for Gulf gag grouper. The stock assessment (SEDAR 72 2021) found gag grouper to be overfished and undergoing overfishing, and the National Marine Fisheries Service (NMFS) notified the Council of this stock status on January 26, 2022. Per the rebuilding guidelines defined in the Magnuson-Stevens Fishery Conservation and Management Act, the Council must develop and implement a rebuilding plan that ends overfishing within two years, or by January 26, 2024. However, the commercial sector is managed under the Grouper-Tilefish Individual Fishing Quota (IFQ) Program and the rebuilding plan will include reduced catch levels from status quo that will need to take effect prior to January 1, 2024, when the commercial quota for the 2024 fishing year is scheduled to be released. Likewise, for the 2023 fishing year which occurs in the interim between the present day and the deadline for implementing a rebuilding plan for gag, any interim rule to reduce or end overfishing will need to be implemented by January 1, 2023.

During the June 2022 meeting, the Council reviewed proposed management alternatives for the interim rule. The Council decided to recommend that NMFS adopt catch limits consistent with the current sector allocation of 61% recreational, 39% commercial, based on the rebuilding timeline of $T_{MIN}$*2, or twice the minimum time to rebuild the stock if fishing mortality were reduced to zero. This results in a stock ACL of 661,901 pounds gutted weight (lbs gw) in MRIP-FES currency, with a commercial annual catch limit of 258,142 lbs gw and a commercial quota of 199,147 lbs gw, and a recreational ACL of 403,759 lbs gw. The Council elected not to make any modifications to the commercial sector's IFQ multi-use provision for red and gag grouper. Further, the Council recommended that NMFS implement a revision to the fishing season closure for gag grouper, such that the recreational fishing season opens on September 1 and closes by November 10 for the 2023 fishing year.

The Council requests that NMFS implement these interim measures to reduce overfishing of gag as soon as practicable, with an effective date of January 1, 2023. These measures were expected to reduce or end overfishing of gag grouper for the 2023 fishing year, and are expected to aid in the pace of recovery of the stock while the Council works to develop the rebuilding plan via Reef Fish Amendment 56. During its August 2022 in Corpus Christi, Texas, the Council will be considering the SSC-approved catch limit recommendations based on

the requested SEDAR 72 alternative base model run using the State of Florida's State Reef Fish Survey for informing private angling landings and discards. If you have questions, please do not hesitate to contact Council staff.

Sincerely,



Dale Diaz
Council Chair

RR

cc: Council Members / Council Staff / John F. Walter, Ph.D. / Clay Porch, Ph.D. / Jack McGovern, Ph.D. / Peter Hood / Mara Levy / Dan Luers / Jim Nance, Ph.D. / Luiz Barbieri, Ph.D.

# APPENDIX B. RECREATIONAL FISHING SEASON DURATION PROJECTIONS

**Recreational Season Projection Analyses for Gulf of Mexico Gag**
Southeast Regional Office LAPP/DM Branch
February 2023

Gulf of Mexico gag are managed in federal waters under the Fishery Management Plan for the Reef Fish Resources of the Gulf of Mexico (Reef Fish FMP). In January 2022, there was notification that the stock was overfished and experiencing overfishing. To address this notification, Amendment 56 to the Reef Fish FMP proposes to adjust catch levels (annual catch limits), revise sector allocations, and revise recreational seasonal closures. This analysis predicts recreational season closures based on all management options being considered.

*Recreational landings data*

Gulf gag recreational landings were obtained from the Southeast Fisheries Science Center (SEFSC) recreational ACL files (accessed October 2022). The SEFSC recreational landings dataset includes landings from the Texas Parks and Wildlife recreational creel survey (TPWD), Louisiana Department of Wildlife and Fisheries creel survey (LA Creel), Southeast Region Headboat Survey (SRHS) and Marine Recreational Information Program (MRIP) Fishing Effort Survey (FES; Florida, Alabama and Mississippi). The MRIP FES files contain estimates from MRIP's Access Point Angler Intercept Survey (APAIS), FES (private angler effort estimates), and For-Hire Telephone Survey (FHS; for-hire effort estimates). For 2020 and 2021, imputed MRIP FES catch estimates are used to account for disruptions in the dockside sampling due to COVID.

The Florida Fish and Wildlife Conservation Commission's (FWC) State Reef Fish Survey (SRFS; accessed January 2023) provides private angling landings for red snapper, gag and several other reef fish species harvested in state and federal water of the west coast of Florida. FWC SRFS data were determined best available data by the Scientific and Statistical Committee (SSC) at the July 2022 meeting for reporting and analyzing Florida private recreational landings of gag. As a result, Florida private recreational landings of gag in the MRIP FES landings file were replaced with SRFS landings that are calibrated to MRIP FES to generate a SRFS informed recreational landings time series with which future landings could be projected. SRFS landings are reported in whole weight, but were converted to pounds gutted weight (lb gw) using a revised gutted to whole weight conversion factor of 1.05 (SEDAR 72 2021). All landings are reported in lb gw (**Table B1**).

A three-year average (2019-2021) of monthly landings were used to predict future landings (**Figure B1**). Since MRIP data are provided in two month waves (e.g., January and February = wave 1, March and April = wave 2, etc.), data from other sources are shown in waves. Monthly landings were estimated for MRIP, TPWD and LA Creel by assuming equal daily catch rates for months within a wave and then combined with SRHS and SRFS, which are provided monthly. Monthly recreational landings in January through April were minimal due to the seasonal closure

that runs January 1 through May 31. Landings for the month of May included those that were reported to SRHS and SRFS, while June landings were estimated by adding SRHS and SRFS landings for that month to all of the landings reported for wave 3 for the MRIP survey. Estimated monthly landings were then divided by the number of days in each month to provide a daily catch rate to project expected closure dates. Based on the cumulatively summed projected recreational landings of gag, the recreational sector can expect a fishing season between 0 and 71 days the first year following implementation depending on the management options selected (**Tables B2 and B3**). Season durations would be expected to increase in successive years. These results assume no effort shifting and that no landings are made during the spawning season closure.

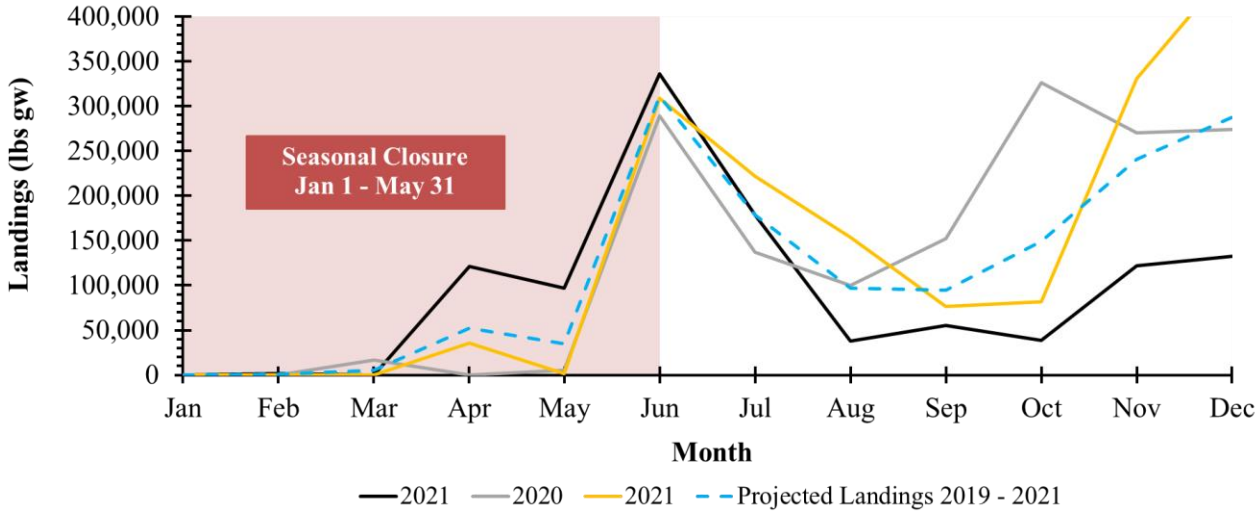



**Figure B1.** Gulf gag monthly recreational landings (lb gw) for 2019-2021, and projected landings from 2019-2021. Source: SEFSC Recreational MRIP FES ACL Dataset (October, 2022) and FWC SRFS Dataset (January, 2023)

**Table B1.** Recreational Gulf gag landings (lb gw) by two-month waves from 2017-2021.

| Year | Wave | MRIP FES | SRHS | Charter | Private and Shore (Excl. MRIP's Florida Priv) | SRFS (Florida Priv) | Combined MRIP/SRFS |
|---|---|---|---|---|---|---|---|
| 2017 | 1 | 389 | 25 | - | 364 | - | 389 |
| | 2 | 60,215 | 8 | - | 67 | 56,246 | 56,321 |
| | 3 | 834,210 | 6,318 | 52,307 | 208 | 252,589 | 311,422 |
| | 4 | 176,884 | 3,562 | 3,942 | 201 | 72,783 | 80,488 |
| | 5 | 142,703 | 3,986 | 2,784 | 549 | 174,344 | 181,663 |
| | 6 | 1,173,813 | 10,803 | 154,150 | - | 206,718 | 371,671 |
| 2018 | 1 | 18 | 18 | - | - | - | 18 |
| | 2 | 35,248 | 37 | - | - | 12,849 | 12,886 |
| | 3 | 705,215 | 10,133 | 120,683 | 578 | 202,756 | 334,150 |
| | 4 | 953,445 | 5,640 | 26,262 | 498 | 288,069 | 320,469 |
| | 5 | 212,119 | 3,672 | 2,089 | 281 | 87,343 | 93,385 |
| | 6 | 632,844 | 8,144 | 37,691 | 33,377 | 123,909 | 203,120 |
| 2019 | 1 | 55 | 55 | - | - | 1,469 | 1,524 |
| | 2 | 30 | 30 | - | - | 121,113 | 121,143 |
| | 3 | 856,819 | 6,137 | 109,544 | 6,943 | 310,582 | 433,206 |
| | 4 | 502,765 | 3,828 | 31,122 | 20,533 | 160,955 | 216,438 |
| | 5 | 80,670 | 2,033 | 7,066 | 157 | 84,552 | 93,808 |
| | 6 | 747,200 | 9,824 | 91,935 | 17,820 | 135,449 | 255,028 |
| 2020 | 1 | - | - | - | - | - | - |
| | 2 | 63,713 | 50 | - | - | 16,648 | 16,698 |
| | 3 | 387,745 | 6,540 | 126,397 | 16,645 | 145,293 | 294,875 |
| | 4 | 358,669 | 4,794 | 145,479 | 93 | 86,637 | 237,003 |
| | 5 | 922,407 | 2,935 | 9,002 | 3,454 | 463,384 | 478,776 |
| | 6 | 1,216,526 | 9,936 | 40,001 | 13,139 | 481,340 | 544,416 |
| 2021 | 1 | - | - | - | - | - | - |
| | 2 | 158,117 | 19 | - | - | 35,485 | 35,503 |
| | 3 | 478,507 | 7,513 | 155,734 | 16,232 | 130,701 | 310,181 |
| | 4 | 575,837 | 6,442 | 116,070 | 10,053 | 243,112 | 375,676 |
| | 5 | 98,857 | 5,530 | 32,995 | 10,952 | 109,237 | 158,714 |
| | 6 | 1,469,293 | 12,156 | 170,462 | - | 604,406 | 787,024 |

Source: SEFSC MRIP FES recreational ACL database [October, 2022], FWC SRFS database [January, 2023].
Notes: MRIP FES landings are presented as a reference and include all Gulf gag landings (TPWD, SRHS, LA Creel, MRIP FES). SRHS, Charter, Shore, Non-Florida Private, and SRFS landings are also presented separately. Combined MRIP/SRFS landings include MRIP FES landings with SRFS data in place of Florida private recreational landings.

**Table B2.** The projected Gulf of Mexico gag closure dates expected for the recreational sector with each proposed management option for **Action 3** and **Action 4**. Upper and lower 95% confidence intervals were also provided for 2024 Annual Catch Limits (ACL) and Annual Catch Targets (ACT). Source: SEFSC MRIP FES Recreational ACL Dataset (October, 2022); FWC SRFS (January, 2023)

| **Action 2, Alternative 1 (No Action): 39% commercial \| 61% recreational** | | | | | | |
|---|---|---|---|---|---|---|
| **Action 2 Alternatives** | Rec ACL (lb gw) | Action 4, Alt 1: Jun 1 | Rec ACT (lb gw) | Action 4, Alt 2: Jun 1 | Action 4, Alt 3: Sep 1 | Action 4, Alt 4: Oct 1 |
| **No Action** | 1,903,000 | No Closure | 1,708,000 | | No Closure | |
| **Action 2, Alternative 2: 39% commercial \| 61% recreational** | | | | | | |
| **Alt 2a: $T_{Min}$ @ F=0** | 0 | **No Season** | 0 | **No Season** | **No Season** | **No Season** |
| **Alt 2b: 75% of $F_{40\%SPR}$** | | | | | | |
| **2024** | 276,000 | **Jun 27**<br>**Jun 25 – Jun 30**<br>(27 days) | 248,000 | **Jun 24**<br>**Jun 23 – Jun 27**<br>(24 days) | **Nov 1**<br>**Oct 10 – Dec 28**<br>(62 days) | **Nov 13**<br>**Oct 24 – None**<br>(44 days) |
| **2025** | 382,000 | **Jul 13**<br>(43 days) | 344,000 | **Jul 6**<br>(36 days) | **Nov 13**<br>(74 days) | **Nov 25**<br>(56 days) |
| **2026** | 477,000 | **Jul 29**<br>(59 days) | 429,000 | **Jul 21**<br>(51 days) | **Nov 24**<br>(85 days) | **Dec 5**<br>(66 days) |
| **2027** | 586,000 | **Aug 31**<br>(92 days) | 527,000 | **Aug 12**<br>(73 days) | **Dec 5**<br>(96 days) | **Dec 15**<br>(76 days) |
| **2028** | 718,000 | **Oct 8**<br>(130 days) | 646,000 | **Sep 19**<br>(111 days) | **Dec 18**<br>(109 days) | **Dec 28**<br>(89 days) |
| **Alt 2c: $T_{Min}$*2** | | | | | | |
| **2024** | 333,000 | **July 4**<br>**Jun 30 – Jul 12**<br>(34 days) | 300,000 | **Jun 29**<br>**Jun 27 – Jul 4**<br>(29 days) | **Nov 7**<br>**Oct 15 – None**<br>(68 days) | **Nov 19**<br>**Oct 29 – None**<br>(50 days) |
| **2025** | 456,000 | **Jul 26**<br>(56 days) | 411,000 | **Jul 18**<br>(48 days) | **Nov 21**<br>(82 days) | **Dec 3**<br>(64 days) |
| **2026** | 564,000 | **Aug 24**<br>(85 days) | 508,000 | **Aug 6**<br>(67 days) | **Dec 3**<br>( 94 days) | **Dec 13**<br>(74 days) |
| **2027** | 687,000 | **Oct 1**<br>(123 days) | 619,000 | **Sep 10**<br>(102 days) | **Dec 15**<br>(106 days) | **Dec 25**<br>(86 days) |
| **2028** | 836,000 | **Nov 1**<br>(154 days) | 752,000 | **Oct 15**<br>(137 days) | **Dec 29**<br>(120 days) | No Closure |
| **Action 2, Alternative 3: 35% commercial \| 65% recreational** | | | | | | |
| **Alt 3a: $T_{Min}$ @ F=0** | 0 | **No Season** | 0 | **No Season** | **No Season** | **No Season** |
| **Alt 3b: 75% of $F_{40\%SPR}$** | | | | | | |
| **2024** | 288,000 | **Jun 28**<br>**Jun 26 – Jul 1**<br>(28 days) | 259,000 | **Jun 25**<br>**Jun 23 – Jun 28**<br>(25 days) | **Nov 2**<br>**Oct 11 – None**<br>(63 days) | **Nov 14**<br>**Oct 25 – None**<br>(45 days) |
| **2025** | 399,000 | **Jul 16**<br>(46 days) | 359,000 | **Jul 9**<br>(39 days) | **Nov 15**<br>(76 days) | **Nov 27**<br>(58 days) |
| **2026** | 499,000 | **Aug 3**<br>(64 days) | 449,000 | **Jul 24**<br>(54 days) | **Nov 26**<br>(87 days) | **Dec 7**<br>(68 days) |

| | | | | | | |
|---|---|---|---|---|---|---|
| **2027** | 613,000 | **Sep 8** (100 days) | 551,000 | **Aug 20** (81 days) | **Dec 8** (99 days) | **Dec 18** (79 days) |
| **2028** | 751,000 | **Oct 15** (137 days) | 676,000 | **Sep 28** (120 days) | **Dec 21** (112 days) | No Closure |
| **Alt 3c: $T_{Min}$*2** | | | | | | |
| **2024** | 349,000 | **Jul 7**<br>**Jul 2 – Jul 16**<br>(37 days) | 314,000 | **Jul 1**<br>**Jun 28 – Jul 7**<br>(31 days) | **Nov 9**<br>**Oct 16 – None**<br>(70 days) | **Nov 21**<br>**Oct 30 – None**<br>(52 days) |
| **2025** | 478,000 | **Jul 29** (59 days) | 430,000 | **Jul 21** (51 days) | **Nov 24** (85 days) | **Dec 5** (66 days) |
| **2026** | 592,000 | **Sep 2** (94 days) | 533,000 | **Aug 14** (75 days) | **Dec 6** (97 days) | **Dec 16** (77 days) |
| **2027** | 720,000 | **Oct 8** (130 days) | 648,000 | **Sep 20** (112 days) | **Dec 18** (109 days) | **Dec 28** (89 days) |
| **2028** | 876,000 | **Nov 6** (159 days) | 789,000 | **Oct 23** (145 days) | No Closure | No Closure |

The reliability of these results is dependent upon the accuracy of the underlying data and input assumptions. The analysis intends to create a realistic baseline as a foundation for comparisons, under the assumption that projected future landings will accurately reflect actual future landings. These closure dates are our best estimate, but uncertainty still exists as economic conditions, weather events, changes in catch-per-unit effort, fisher response to management regulations, and a variety of other factors may cause departures from any assumption.

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# APPENDIX C. CONSIDERED BUT REJECTED

**January 2023 Council Meeting:**

The Council chose to move Alternative 2, Option 2c and Alternative 3, Option 3c, to the Considered but Rejected Appendix. The Council determined that these options were not very different from Alternative 2, Option 2b and Alternative 3, Option 3b, and thus were not necessary for further consideration. The Council also recognized uncertainty in the estimation of generation time, especially given the concerns stated in Chapters 1 and 2 regarding the current reproductive capacity of the stock.

**Alternative 2:** Revise the catch limits for gag and establish a rebuilding time for the gag stock. The OFL, ABC, ACLs, and ACTs are based on an $F_{MSY}$ proxy of the fishing mortality at a 40% spawning potential ratio ($F_{40\%SPR}$), and are were derived, in part, using the State of Florida's State Reef Fish Survey (SRFS) data. The ABC equals the combined total ACLs from both sectors. Retain the current sector allocation percentages of 61% recreational, 39% commercial, which were derived in part using MRIP-CHTS recreational data. The catch limits in lb gw are rounded to the nearest thousand pounds, with the recreational ACL and ACT informed by SRFS for private recreational vessels, by MRIP's Fishing Effort Survey (FES) data for the for-hire and shore modes, and are as follows for each rebuilding timeline option:

**Option 2c**: $T_{Min}$ plus one generation time (8 years for gag), which would rebuild the stock in 19 years.

| **F = $F_{40\%SPR}$** | **OFL** | **ABC** | **Rec ACL** | **Rec ACT** | **Com ACL** | **Com ACT** |
|---|---|---|---|---|---|---|
| **Year** | **mp gw** | **mp gw** | **mp gw** | **mp gw** | **mp gw** | **mp gw** |
| 2024 | 0.603 | 0.497 | 0.303 | 0.272 | 0.193 | 0.162 |
| 2025 | 0.821 | 0.685 | 0.417 | 0.376 | 0.267 | 0.224 |
| 2026 | 1.009 | 0.851 | 0.519 | 0.467 | 0.331 | 0.278 |
| 2027 | 1.222 | 1.04 | 0.634 | 0.571 | 0.405 | 0.340 |
| 2028 | 1.48 | 1.27 | 0.774 | 0.697 | 0.495 | 0.416 |

**Alternative 3:** Revise the catch limits for gag and establish a rebuilding time for the gag stock. The OFL, ABC, ACLs, and ACTs are based on the $F_{MSY}$ proxy of $F_{40\%SPR}$, and were derived, in part, using the State of Florida's State Reef Fish Survey (SRFS) data. The combined ACLs from both sectors equal the ABC. Revise the sector allocation to 65% recreational, 35% commercial, using the SRFS recreational data in place of MRIP-FES for the private recreational vessel fleet only. The catch limits in lb gw are rounded to the nearest thousand pounds, with the recreational ACL and ACT in SRFS units for the private recreational vessel fleet, in MRIP-FES units for the recreational for-hire and shore modes, and are as follows for each rebuilding timeline option:

**Option 3c**: $T_{Min}$ plus one generation time (8 years for gag), which would rebuild the stock in 19 years.

| **F = $F_{40\%SPR}$** | **OFL** | **ABC** | **Rec ACL** | **Rec ACT** | **Com ACL** | **Com ACT** |
|---|---|---|---|---|---|---|
| **Year** | **mp gw** | **mp gw** | **mp gw** | **mp gw** | **mp gw** | **mp gw** |
| 2024 | 0.591 | 0.489 | 0.317 | 0.285 | 0.171 | 0.143 |
| 2025 | 0.805 | 0.674 | 0.438 | 0.394 | 0.235 | 0.198 |
| 2026 | 0.991 | 0.838 | 0.544 | 0.490 | 0.293 | 0.246 |
| 2027 | 1.200 | 1.024 | 0.665 | 0.599 | 0.358 | 0.301 |
| 2028 | 1.454 | 1.251 | 0.812 | 0.731 | 0.437 | 0.367 |

After hearing public testimony, the Council chose to move Alternative 4 in Action 2 to the Considered but Rejected Appendix. The Council determined that there was little to no public support for a recreational fishing season opening on November 1 and, with sufficient scope in management alternatives in the remaining options in Action 2, decided to not consider the November 1 date further.

**Alternative 4**: The federal recreational fishing season for Gulf gag would open on 12:01 am local time on November 1. NMFS would close harvest when the recreational ACL is projected to be met.

# APPENDIX D. ACL/ACT CONTROL RULE FOR THE RECREATIONAL SECTOR FOR GULF GAG

The Gulf of Mexico (Gulf) Fishery Management Council's Annual Catch Limit (ACL)/Annual Catch Target (ACT) Control Rule was applied for the recreational sector for Gulf gag, using recreational landings from the 2018 – 2021 fishing years:

| | | | | | |
|---|---|---|---|---|---|
| As of 02/10/2023 | | | | | **Gulf Gag** |
| **ACL/ACT Buffer Spreadsheet** | | | version 4.1 - April 2011 | | **Sector: Rec** |
| sum of points | 2 | | | | **Years: 2018-2021** |
| max points | 5.0 | | Buffer between ACL and ACT (or ABC and ACL) | Unweighted | 8 |
| **Min. Buffer** | **0** | **min. buffer** | User adjustable | Weighted | **10** |
| Max Unw.Buff | 19 | max unwt. Buff | | | |
| **Max Wt Buff** | **25** | **max wt. buffer** | User adjustable | | |

| | **Component** | **Element score** | **Element** | **Selection** | **Element result** |
|---|---|---|---|---|---|
| | Stock assemblage | 0 | This ACL/ACT is for a single stock. | x | 0 |
| | | 1 | This ACL/ACT is for a stock assemblage, or an indicator species for a stock assemblage | | |
| | Ability to Constrain Catch | 0 | Catch limit has been exceeded 0 or 1 times in last 4 years | x | 0 |
| | | 1 | Catch limit has been exceeded 2 or more times in last 4 years | | |
| | | | For the year with max. overage, add 0.5 pts. For every 10 percentage points (rounded up) above ACL | 0.0 | |
| | | | Not applicable (there is no catch limit) | | |
| | Precision of Landings Data Recreational | | **Apply this component to recreational fisheries** | | 2 |
| | | 0 | Method of absolute counting | | |
| | | 1 | MRIP proportional standard error (PSE) <= 20 | | |
| | | 2 | MRIP proportional standard error (PSE) > 20 | x | |
| | | | Not applicable (will not be included in buffer calculation) | | |
| | Timeliness | 0 | In-season accountability measures used or fishery is under an IFQ | x | 0 |
| | | 1 | In-season accountability measures not used | | |
| | **Weighting factor** | | | | |
| | | **Element weight** | **Element** | **Selection** | **Weighting** |
| | Overfished status | 0 | 1. Stock biomass is at or above $B_{OY}$ (or proxy). | | 0.3 |
| | | 0.1 | 2. Stock biomass is below $B_{OY}$ (or proxy) but at or above $B_{MSY}$ (or proxy). | | |
| | | 0.2 | 3. Stock biomass is below $B_{MSY}$ (or proxy) but at or above minimum stock size threshold (MSST). | | |
| | | 0.3 | 4. Stock is overfished, below MSST. | x | |
| | | 0.3 | 5. Status criterion is unknown. | | |

| Fishing Year | Rec Landings | Rec ACL | % Landed |
|---|---|---|---|
| **2018** | 1,008,468 | 1,903,000 | 53% |
| **2019** | 859,828 | 1,903,000 | 45% |
| **2020** | 909,703 | 1,903,000 | 48% |
| **2021** | 1,280,823 | 1,903,000 | 67% |

Source: SERO ACL Monitoring Database 2/10/2023

Note: Landings data are in MRIP-CHTS data units to be comparable with the current recreational ACL.

# APPENDIX E. OTHER APPLICABLE LAWS

The Magnuson-Stevens Fishery Conservation and Management Act (Magnuson-Stevens Act) (16 U.S.C. 1801 et seq.) provides the authority for management of stocks included in fishery management plans (FMP) in federal waters of the exclusive economic zone. However, management decision-making is also affected by a number of other federal statutes designed to protect the biological and human components of U.S. fisheries, as well as the ecosystems that support those fisheries. Major laws affecting federal fishery management decision-making include the Endangered Species Act (Section 3.3.3), E.O. 12866 (Regulatory Planning and Review, Chapter 5) and E.O. 12898 (Environmental Justice, Section 3.5). Other applicable laws are summarized below.

## Administrative Procedure Act

All federal rulemaking is governed under the provisions of the Administrative Procedure Act (5 U.S.C. Subchapter II), which establishes a "notice and comment" procedure to enable public participation in the rulemaking process. Under the Act, the National Marine Fisheries Service (NMFS) is required to publish notification of proposed rules in the *Federal Register* and to solicit, consider, and respond to public comment on those rules before they are finalized. The Act also establishes a 30-day waiting period from the time a final rule is published until it takes effect. Notice and comment, and the 30-day delay in effectiveness may be waived under specified circumstances.

## Coastal Zone Management Act

Section 307(c)(1) of the federal Coastal Zone Management Act of 1972 (CZMA), as amended, requires federal activities that affect any land or water use or natural resource of a state's coastal zone be conducted in a manner consistent, to the maximum extent practicable, with approved state coastal management programs. The requirements for such a consistency determination are set forth in NOAA regulations at 15 CFR part 930, subpart C. According to these regulations and CZMA Section 307(c)(1), when taking an action that affects any land or water use or natural resource of a state's coastal zone, NMFS is generally required to provide a consistency determination to the relevant state agency at least 90 days before taking final action.

Regulations at 15 CFR 930.32(b) state: "A federal agency may deviate from full consistency with an approved management program when such deviation is justified because of an emergency or other similar unforeseen circumstance ("exigent circumstance"), which presents the federal agency with a substantial obstacle that prevents complete adherence to the approved program." The dynamic circumstances supporting the request for the emergency rule, and the associated need to implement this emergency rule qualify as exigent circumstances.

Upon submission to the Secretary of Commerce, NMFS will determine if this plan amendment is consistent with the Coastal Zone Management programs of the states of Alabama, Florida, Louisiana, Mississippi, and Texas to the maximum extent possible. Their determination will then be submitted to the responsible state agencies under Section 307 of the CZMA

administering approved Coastal Zone Management programs for these states.

## Data Quality Act

The Data Quality Act (Public Law 106-443) effective October 1, 2002, requires the government to set standards for the quality of scientific information and statistics used and disseminated by federal agencies. Information includes any communication or representation of knowledge such as facts or data, in any medium or form, including textual, numerical, cartographic, narrative, or audiovisual forms (includes web dissemination, but not hyperlinks to information that others disseminate; does not include clearly stated opinions).

Specifically, the Act directs the Office of Management and Budget to issue government wide guidelines that "provide policy and procedural guidance to federal agencies for ensuring and maximizing the quality, objectivity, utility, and integrity of information disseminated by federal agencies." Such guidelines have been issued, directing all federal agencies to create and disseminate agency-specific standards to: (1 ensure information quality and develop a pre-dissemination review process; (2 establish administrative mechanisms allowing affected persons to seek and obtain correction of information; and (3 report periodically to Office of Management and Budget on the number and nature of complaints received.

Scientific information and data are key components of FMPs, amendments, and regulations, consistent with National Standard 2 of the Magnuson-Stevens Fishery Conservation and Management Act (Magnuson-Stevens Act), which requires the use of best scientific information available. They should also properly reference all supporting materials and data, and be reviewed by technically competent individuals. With respect to original data generated for FMPs and amendments, it is important to ensure that the data are collected according to documented procedures or in a manner that reflects standard practices accepted by the relevant scientific and technical communities. Data will also undergo quality control prior to being used by the agency and a pre-dissemination review.

## National Historic Preservation Act

The National Historic Preservation Act (NHPA) of 1966, (Public Law 89-665; 16 U.S.C. 470 *et seq.*) is intended to preserve historical and archaeological sites in the United States of America. Section 106 of the NHPA requires federal agencies to evaluate the impact of all federally funded or permitted projects for sites on listed on, or eligible for listing on, the National Register of Historic Places and aims to minimize damage to such places.

Historical research indicates that over 2,000 ships have sunk on the Federal Outer Continental Shelf between 1625 and 1951; thousands more have sunk closer to shore in state waters during the same period. Only a handful of these have been scientifically excavated by archaeologists for the benefit of generations to come. Further information can be found at: http://www.boem.gov/Environmental-Stewardship/Archaeology/Shipwrecks.aspx

The proposed action does not adversely affect districts, sites, highways, structures, or objects listed in or eligible for listing in the National Register of Historic Places nor is it expected to cause loss or destruction of significant scientific, cultural, or historical resources. In the Gulf of Mexico (Gulf), the *U.S.S. Hatteras*, located in federal waters off Texas, is listed in the National Register of Historic Places. Fishing activity already occurs in the vicinity of this site, but the proposed action would have no additional adverse impacts on listed historic resources, nor would they alter any regulations intended to protect them.

**Executive Orders (E.O.)**

**E.O. 12630: Takings**

The E.O. on Government Actions and Interference with Constitutionally Protected Property Rights that became effective March 18, 1988, requires each federal agency prepare a Takings Implication Assessment for any of its administrative, regulatory, and legislative policies and actions that affect, or may affect, the use of any real or personal property. Clearance of a regulatory action must include a takings statement and, if appropriate, a Takings Implication Assessment. The NOAA Office of General Counsel will determine whether a Taking Implication Assessment is necessary for this amendment.

**E.O. 12962: Recreational Fisheries**

This E.O. requires federal agencies, in cooperation with states and tribes, to improve the quantity, function, sustainable productivity, and distribution of U.S. aquatic resources for increased recreational fishing opportunities through a variety of methods including, but not limited to, developing joint partnerships; promoting the restoration of recreational fishing areas that are limited by water quality and habitat degradation; fostering sound aquatic conservation and restoration endeavors; and evaluating the effects of federally-funded, permitted, or authorized actions on aquatic systems and recreational fisheries, and documenting those effects. Additionally, it establishes a seven-member National Recreational Fisheries Coordination Council (NRFCC) responsible for, among other things, ensuring that social and economic values of healthy aquatic systems that support recreational fisheries are considered by federal agencies in the course of their actions, sharing the latest resource information and management technologies, and reducing duplicative and cost-inefficient programs among federal agencies involved in conserving or managing recreational fisheries. The NRFCC also is responsible for developing, in cooperation with federal agencies, States and Tribes, a Recreational Fishery Resource Conservation Plan - to include a five-year agenda. Finally, the E.O. requires NMFS and the United States Fish and Wildlife Service to develop a joint agency policy for administering the ESA.

**E.O. 13089: Coral Reef Protection**

The E.O. on Coral Reef Protection requires federal agencies whose actions may affect U.S. coral reef ecosystems to identify those actions, utilize their programs and authorities to protect and enhance the conditions of such ecosystems, and, to the extent permitted by law, ensure actions

that they authorize, fund, or carry out do not degrade the condition of that ecosystem. By definition, a U.S. coral reef ecosystem means those species, habitats, and other national resources associated with coral reefs in all maritime areas and zones subject to the jurisdiction or control of the United States (e.g., federal, state, territorial, or commonwealth waters).

Regulations are already in place to limit or reduce habitat impacts within the Flower Garden Banks National Marine Sanctuary. Additionally, NMFS approved and implemented Generic Amendment 3 for Essential Fish Habitat (GMFMC 2005) and Coral Amendment 9 (GMFMC 2018), which established additional habitat areas of particular concern (HAPCs) and gear restrictions to protect corals throughout the Gulf. There are no implications to coral reefs by the actions proposed in this amendment.

### E.O. 13132: Federalism

The E.O. on Federalism requires agencies in formulating and implementing policies, to be guided by the fundamental Federalism principles. The E.O. serves to guarantee the division of governmental responsibilities between the national government and the states that was intended by the framers of the Constitution. Federalism is rooted in the belief that issues not national in scope or significance are most appropriately addressed by the level of government closest to the people. This E.O. is relevant to FMPs, amendments, and regulations promulgated under the Magnuson-Stevens Act given the overlapping authorities of NMFS, the states, and local authorities in managing coastal resources, including fisheries, and the need for a clear definition of responsibilities. It is important to recognize those components of the ecosystem over which fishery managers have no direct control and to develop strategies to address them in conjunction with appropriate state, tribes and local entities (international too).

No Federalism issues were identified relative to the action to modify the management of the Gulf gag. Therefore, consultation with state officials under Executive Order 12612 was not necessary. Consequently, consultation with state officials under Executive Order 12612 remains unnecessary.

### E.O. 13158: Marine Protected Areas

This E.O. requires federal agencies to consider whether their proposed action(s) will affect any area of the marine environment that has been reserved by federal, state, territorial, tribal, or local laws or regulations to provide lasting protection for part or all of the natural or cultural resource within the protected area. There are several marine protected areas, HAPCs, and gear-restricted areas in the eastern and northwestern Gulf. The existing areas are entirely within federal waters of the Gulf. They do not affect any areas reserved by federal, state, territorial, tribal or local jurisdictions.