Modification of Gulf of Mexico Red Grouper Catch Limits

Draft Framework Action to the Fishery Management Plan for the Reef Fish Resources in the Gulf of Mexico

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ENVIRONMENTAL ASSESSMENT COVER SHEET

Name of Action

Framework Action to the Fishery Management Plan for Reef Fish Resources in the Gulf of Mexico: Modification of Gulf of Mexico Red Grouper Catch Limits including Environmental Assessment, Regulatory Impact Review, and Regulatory Flexibility Act Analysis.

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This Environmental Assessment is being prepared using the 2020 CEQ NEPA Regulations. The effective date of the 2020 CEQ NEPA Regulations was September 14, 2020, and reviews begun after this date are required to apply the 2020 regulations unless there is a clear and fundamental conflict with an applicable statute. 85 Fed. Reg. at 43372-73 (§§ 1506.13, 1507.3(a)). This Environmental Assessment began on October 7, 2021, and accordingly proceeds under the 2020 regulations.

ABBREVIATIONS USED IN THIS DOCUMENT

ABC ..... acceptable biological catch
ACL .....Annual Catch Limit
ACT ..... Annual Catch Target
AM……...…….accountability measure
APAIS……..……. Access Point Angler Intercept Survey
BSIA…….best scientific information available
Council…….Gulf of Mexico Fishery Management Council
FMP…… Fishery Management Plan
Gulf…….. Gulf of Mexico
GMFMC ..... Gulf of Mexico Fishery Management Council
gw……...…….gutted weight
IA……..……interim analysis
lbs…….….pounds
mp……..million pounds
MRIP……...…….. Marine Recreational Information Program
NMFS .....National Marine Fisheries Service
NOAA ..... National Oceanic and Atmospheric Administration
OFL…….overfishing limit
SEDAR……. Southeast Data Assessment and Review
SEFSC……Southeast Fisheries Science Center
SSC…….……. Scientific and Statistical Committee

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CHAPTER 1. INTRODUCTION

1.1 Background

Gulf of Mexico (Gulf) red grouper is managed under the Fishery Management Plan (FMP) for Reef Fish Resources in the Gulf of Mexico (Reef Fish FMP). This framework action to modify the Gulf red grouper overfishing limit (OFL), acceptable biological catch (ABC), annual catch limits (ACL), and annual catch targets (ACT) is being developed by the Gulf Fishery Management Council (Council) based on the interim analysis the Southeast Fisheries Science Center (SEFSC) conducted for Gulf red grouper and presented to the Gulf Scientific and Statistical Committee (SSC) at its August 2021 meeting. The interim analysis was based on an OFL that included an adjustment to the recreational landings in weight projected by the Southeast Data Assessment and Review (SEDAR) 61 assessment model. Recreational landings in weight projected by the SEDAR 61 assessment model from 2020 through 2024 were multiplied by a mean weight scalar, which was defined as the ratio of mean weight of recreationally harvested red grouper from the ACL monitoring dataset to the assessment predicted mean weight of landed red grouper for 2019.

The most recent SEDAR for red grouper (SEDAR 61, 2019) was completed in September 2019 and used updated recreational data from the Marine Recreational Information Program (MRIP) Access Point Angler Intercept Survey (APAIS) and Fishing Effort Survey (FES), which collectively estimate larger than previously calculated catch and effort data for the recreational sector. The full SEDAR 61 stock assessment can be found at http://sedarweb.org/sedar-61.

Reef Fish Amendment 53

Amendment 53 to the Gulf Reef Fish FMP (GMFMC 2021) was developed by the Council to address the results of SEDAR 61 for red grouper and subsequent OFL and ABC recommendations from the SSC. The purposes of Amendment 53 were to revise the red grouper allocation between the commercial and recreational sectors using the best scientific information available and to modify the allowable harvest of red grouper based on results of the recent stock assessment and subsequent OFL and ABC recommendations from the SSC.

Amendment 53 would revise the red grouper allocation between commercial and recreational sectors based on the Accumulated Landings System/Individual Fishing Quota (IFQ) program data for the commercial landings and the FES-adjusted MRIP data, excluding the shore mode, for recreational landings. These datasets are also used to monitor the quotas for all stocks, including red grouper, and are therefore referred to as the ACL monitoring datasets. At their June 2021 meeting, the Council approved an alternative that sets the commercial and recreational allocations at 59.3% and 40.7% respectively, and sets the buffer between the commercial ACL and ACT at 5% and the buffer between the recreational ACL and ACT at 9%. Amendment 53 also modifies the OFL, ABC, total and sector ACLs, and sector ACTs as outlined in Table 1.1.1.

Table 1.1.1. Red Grouper Commercial and Recreational Catch Limits Approved in Amendment 53

	OFL*	ABC	Total ACL	Comm ACL	Comm ACT	Rec ACL	Rec ACT
Preferred Alternative 3 (59.3% commercial: 40.7% recreational)	4.66	4.26	4.26	2.53	2.40	1.73	1.57

*All values are in million pounds (mp) gutted weight (gw).

The Council approved Reef Fish Amendment 53 at its June 2021 meeting, but as of this time, NMFS has not approved and implemented the amendment. Actions taken in this framework are contingent on the approval and implementation of Amendment 53. The two analyses conducted by the SEFSC (Analysis 1: weight adjustment to SEDAR 61 assessment-predicted recreational landings during projections; Analysis 2: Interim Analysis using results of Analysis 1) and discussed in this framework action rely on the sector allocations (59.3% commercial: 40.7% recreational) selected by the Council in Amendment 53.

Weight Adjustment to SEDAR 61 Assessment-Predicted Recreational Landings - August 2021

In August 2021, the SEFSC provided an adjustment to the SEDAR 61 projection methodology by applying a mean weight per fish scalar for recreationally harvested fish during projections. The SEDAR 61 stock assessment analyzed red grouper recreational landings in numbers of fish. Gulf assessments have traditionally fit to recreational landings in numbers of fish because numbers (rather than weight) have consistently been recorded in recreational monitoring surveys. The SEDAR 61 assessment model used the mean weight of landed red grouper (based on lengths) to convert recreational landings in numbers into weight. A comparison between mean weight of landed red grouper predicted by the assessment model and the ACL Monitoring Dataset revealed that the assessment model underpredicted the weight of landed red grouper. Since red grouper are monitored in terms of weight for management, the August 2021 SEFSC mean weight analysis adjusted the assessment-predicted recreational landings in weight for the projections from 2020 through 2024 using a mean weight per fish scalar:

$$Scalar = \frac{2019\ mean\ weight\ of\ red\ grouper\ from\ ACL\ monitoring\ dataset}{2019\ projected\ mean\ weight\ of\ red\ grouper\ by\ SEDAR61\ assessment\ model}$$

Mean weight for 2019 was considered the most representative dataset, and was thus used to adjust the assessment-predicted recreational landings in weight during projections. Mean weight of red grouper in 2018 was not considered representative due to concerns over how the 2018 red tide event impacted the size and age structure of the population. Mean weight in 2020 was also not considered representative due to sampling issues experienced due to COVID-19, including concessions in sample coverage and sampling intensity during MRIP waves 2 (March and April) and 3 (May and June) to comply with federal, state, and local COVID-19 protocols.

The SEDAR 61 assessment model predicted a mean weight of approximately 4 pounds (lbs) gw per red grouper landed by the recreational sector, which is considerably lower than the mean weight of approximately 6.1 lbs gw for recreationally landed red grouper based on the ACL Monitoring Dataset (Figure 1.1.1). No adjustments were necessary for the commercial sector.

The underestimation of the mean weight of recreationally landed red grouper used in the projections ultimately comes from the growth curve (which was externally fit and fixed in the assessment model) and the assumed distribution regarding the variability-at-length (i.e., the coefficient of variation). The assessment model inferred the mean weight of landed red grouper each year, which were lower than observed in the ACL Monitoring Dataset. The assessment-predicted recreational landings in weight for 2020 through 2024 were adjusted by a mean weight scalar of 1.597, and projections for the SEDAR 61 assessment were rerun using the 59.3% commercial: 40.7% recreational allocation as defined in Reef Fish Amendment 53 to determine OFL and ABC. The updated projections resulted in an OFL of 5.99 mp gw and an ABC of 5.57 mp gw. A full description of the mean weight per fish adjustment to SEDAR 61 predicted recreational landings and updated projections can be found in Appendix B. During the August 2021 Gulf SSC meeting, the SSC determined that this mean weight adjustment methodology for assessment-predicted recreational landings in weight, and the subsequent projections for red grouper, constituted the best scientific information available (BSIA).

Use of the mean weight scalar to adjust recreational landings in weight predicted by the assessment model does not affect the sector allocations determined for the preferred alternative in Reef Fish Amendment 53, as the allocations were based on recreational landings in weight obtained from the ACL Monitoring Dataset. The ACL Monitoring Dataset landings still represent BSIA for setting the red grouper sector allocations and monitoring the catch limits.

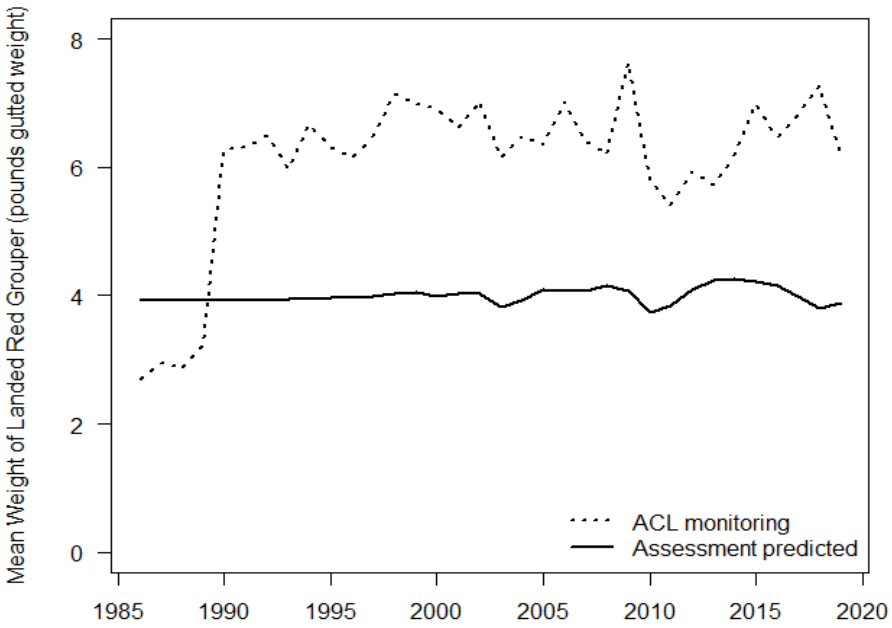

Figure 1.1.1. Comparison of mean weight of Gulf red grouper landed by the recreational sector based on the SEDAR 61 assessment model predicted landings and the ACL monitoring dataset.

Updated Interim Analysis for Gulf Red Grouper - August 2021

Since 2018, interim analyses have been conducted annually to more closely monitor the stock condition of red grouper than is possible with stock assessments, which typically are only

conducted every four to five years for red grouper. In May 2021, an IA was presented to the SSC that indicated harvest levels could be increased. However, this result was considered preliminary as catch levels are dependent upon the sector allocations that were being evaluated as part of Reef Fish Amendment 53. The Council requested an updated interim analysis based on the allocations selected in Amendment 53 at its June 2021 meeting. In response, the SEFSC prepared an IA that incorporated the mean weight adjustment to SEDAR 61 assessment-predicted recreational landings in weight during projections and used the general methodology proposed by Huynh et al. (2020) that is superior to the approach that was used previously.

Adjustments to the SEDAR 61-adjusted ABC of 5.57 mp gw (i.e. ABC following the mean weight adjustment to SEDAR 61 assessment-predicted recreational landings in weight during projections) were made in the IA using two separate moving average periods of 3- or 5- years. The moving average uses a reference period (3-year average from 2017-2019; 5-year 2015-2019) to compare to the recent period (3-year 2018-2020; 5-year 2016-2020). A standardized index was employed using a fishery-independent index (i.e., NMFS Bottom Longline Survey data) and delta-lognormal generalized linear model methods described in Pollack (2021). In 2020, a new index was created where the data were limited to those stations completed in the eastern Gulf (east of 87° W and south of 28.5° N) and at depths less than 118 m (387 feet) through the entire time series. Recent index values were slightly below the reference index values for both the 3-year and 5-year scenarios, with index ratios of 0.89 and 0.91, respectively. Multiplying each index ratio by the reference catch resulted in adjusted catch recommendations from 5.57 million pounds gutted weight to 4.96 million pounds gutted weight using the 3-year average and 5.07 million pounds gutted weight using the 5-year average. Implementing either of the presented IA variations would reduce the ABC from its reference value, but would be higher than the ABC of 4.26 million pounds gutted weight proposed in Amendment 53, which was prior to adjusting the ABC for SEDAR 61 assessment-predicted recreational weight estimates (SEFSC 2021). A full description of the methods used in the 2021 red grouper IA can be found in Appendix C.

August 2021 Scientific and Statistical Committee Meeting

At its August 2021 meeting, the Gulf Council's SSC accepted the new mean weight adjustment methodology for recreationally caught grouper for the purpose of adjusting the SEDAR 61 assessment-predicted recreational landings in weight during projections. The SSC also accepted the updated methodology and interim analysis results for red grouper. The SSC recommended an OFL of 5.99 mp gw and an ABC of 4.96 mp gw. The ABC was based on the 3-year moving average relative to the OFL. The SSC chose to use the 3-year moving index average because it was slightly more conservative and thought to be more representative of recent population trends than the 5-year index average and because of uncertainty regarding the impacts of the 2021 red tide event in Florida.

1.2 Purpose and Need

The purpose is to modify the OFL, ABC, ACLs, and ACTs for Gulf red grouper based on the results of the new stock analyses for Gulf red grouper.

The need is to revise the OFL, ABC, ACLs, and ACTs consistent with the best available science for Gulf red grouper, and to continue to achieve optimum yield (OY) consistent with the

requirements of the Magnuson-Stevens Fishery Conservation and Management Act (Magnuson-Stevens Act).

1.3 History of Management

The following summary describes management actions that affect the management of red grouper in the Reef Fish FMP. More information on the Reef Fish FMP can be obtained from the Council[1] A history of red grouper management through 2019 is presented in Reef Fish Amendment 53.[2]

Amendments to the Reef Fish FMP

Amendment 1 was implemented in January 1990. It set a 20-inch total length (TL) minimum size limit on red grouper; set a five-grouper recreational daily bag limit; set an 11.0 mp ww commercial quota for grouper, with the commercial quota divided into a 9.2 mp ww shallow-water grouper quota and a 1.8 mp ww deep-water grouper quota; and defined shallow-water grouper as black grouper, gag, red grouper, Nassau grouper, yellowfin grouper, yellowmouth grouper, rock hind, red hind, speckled hind, and scamp; and defined deep-water grouper as misty grouper, snowy grouper, warsaw grouper, and yellowedge grouper. The amendment also allowed a two-day possession limit for charter vessels and headboats on trips that extended beyond 24 hours, provided the vessel has two licensed operators aboard as required by the United States Coast Guard (USCG), and each passenger can provide a receipt to verify the length of the trip. In addition, the amendment limited fishermen fishing under a bag limit to a single day limit; 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 longlines and buoy gear was prohibited, and limited the retention of reef fish captured incidentally in other longline operations (e.g., shark) to the recreational daily bag limit; limited trawl vessels to the recreational size and daily bag limits of reef fish; established fish trap permits, allowing a maximum of 100 fish traps per permit holder; prohibited the use of entangling nets for directed harvest of reef fish; limited retention of reef fish caught in entangling nets for other fisheries to the recreational daily bag limit; established the fishing year to be January 1 through December 31; and established a commercial reef fish vessel permit (GMFMC 1989).

Amendment 30B was implemented in May 2009. It set an interim allocation of red grouper between the recreational and commercial sectors; made adjustments to the red grouper total allowable catch (TAC); established ACLs and AMs for the commercial and recreational red grouper sectors and the commercial aggregate shallow-water grouper fishery; adjusted recreational grouper bag limits and seasons; adjusted commercial grouper quotas; reduced the red grouper commercial minimum size limit; replaced the one-month commercial grouper closed season with a four-month seasonal area closure at the Edges; eliminated the end date for Madison-Swanson and Steamboat Lumps marine protected areas; and required that vessels with

[1] http://www.gulfcouncil.org/fishery_management_plans/index.php.
[2] https://gulfcouncil.org/wp-content/uploads/B-5d-RF-AM-53-Red-Grouper_6_16_2021.pdf

a federal charter vessel/headboat permit for Gulf reef fish must comply with the more restrictive of state or federal reef fish regulations when fishing in state waters (GMFMC 2008a).

Amendment 29 was implemented in January 2010 and established an IFQ program for the commercial harvest of grouper and tilefish species in the reef fish fishery (GMFMC 2008b).

Generic ACL/AM Amendment, largely implemented in January 2012 with other elements implemented later in the same year, established in-season and post-season AMs for all stocks that did not already have such measures defined. The AM states that if an ACL is exceeded, in subsequent years an in-season AM will be implemented that will close all shallow-water grouper fishing when the ACL is reached or projected to be reached (GMFMC 2011a).

Amendment 32 was implemented in March 2012. It set the red grouper commercial ACL at 6.03 mp gw and the recreational ACL at 1.90 mp gw; modified grouper IFQ multi-use allocations; added an overage adjustment and in-season measures to the red grouper recreational AMs to avoid exceeding the ACL; and added an AM for the red grouper bag limit that would reduce the four red grouper bag limit in the future to three red grouper, and then to two red grouper, if the red grouper recreational ACL is exceeded (GMFMC 2011c).

An **emergency rule**, implemented in May 2019, reduced the red grouper commercial and recreational ACLs and ACTs consistent with a stock ACL of 4.16 mp gw, to provide a temporary reduction in harvest levels while a framework action was developed to reduce catch limits on a long-term basis. The commercial ACL is 3.16 mp gw; the commercial quota is 3.00 mp gw. The recreational ACL is 1.00 mp gw; the recreational ACT is 0.92 mp gw (GMFMC 2019a).

An **April 2019 framework action**, implemented in October 2019, reduced the catch limits for red grouper consistent with the May 2019 emergency rule (GMFMC 2019b).

Amendment 53, if approved and implemented, will modify the commercial and recreational sector allocations of red grouper to 59.3% and 40.7%, respectively, based on landings from 1986-2005 in MRIP-FES units. It will also set the OFL at 4.66 mp gw, the ABC at 4.26 mp gw, and the total ACL at 4.26 mp gw. The commercial ACL will be 2.53 mp gw; the recreational ACL will be 2.40 mp gw. The commercial ACL/ACT buffer will be retained at 5%; the recreational ACL/ACT buffer will increase from 8% to 9%. The commercial ACT will be 1.73 mp gw; the recreational ACT will be 1.59 mp gw (GMFMC 2021).

CHAPTER 2. MANAGEMENT ALTERNATIVES

2.1 Action - Modify the Gulf of Mexico (Gulf) Red Grouper Overfishing Limit (OFL), Acceptable Biological Catch (ABC), Annual Catch Limits (ACL), and Annual Catch Targets (ACT)

Alternative 1: No Action. Retain the red grouper OFL, ABC, ACLs, and ACTs established in Reef Fish Amendment 53, as shown in the table below. The commercial and recreational sector allocations are, respectively, 59.3% and 40.7%. The commercial buffer between the ACL and ACT is 5%; the recreational buffer is 9%.

OFL	ABC	Total ACL	Comm ACL	Rec ACL	Comm ACT/Quota	Rec ACT
4.66	4.26	4.26	2.53	1.73	2.40	1.57

* Values are in million pounds (mp) gutted weight (gw).

Preferred Alternative 2: Modify the red grouper OFL, ABC, ACLs, and ACTs based on the recommendation of the Scientific and Statistical Committee (SSC), as determined from the 2021 red grouper stock analyses provided by the Southeast Fisheries Science Center and using the sector allocations as well as the ACL and ACT buffers for red grouper set forth in Reef Fish Amendment 53.

OFL	ABC	Total ACL	Comm ACL	Rec ACL	Comm ACT/Quota	Rec ACT
5.99	4.96	4.96	2.94	2.02	2.79	1.84

* Values are in mp gw.

Discussion:

Alternative 1 (No Action) would maintain the OFL, ABC, ACLs, and ACTs established in Amendment 53 and is contingent upon Amendment 53 being implemented. The values from Amendment 53 are used in **Alternative 1** since the Southeast Fisheries Science Center's (SEFSC) analyses for determining the OFL and ABC in **Preferred Alternative 2** are contingent upon the 59.3% commercial and 40.7% recreational sector allocations established in Amendment 53. Commercial and recreational landings for red grouper in mp gw are displayed in Table 2.1.1.

Preferred Alternative 2, which is also contingent upon implementation of Amendment 53, would increase the OFL, ABC, ACLs, and ACTs and are determined from the 2021 red grouper stock analyses provided by the SEFSC. The OFL and ABC would increase by 1.33 and 0.70 mp gw, respectively, compared with **Alternative 1**. The SSC recommended the OFL and ABC values at its August 2021 meeting. The SEFSC presented two options for determining the ABC,

based on a 3-year moving average and on a 5-year moving average.[3] The SSC recommended use of a 3-year moving average and therefore a more conservative level for the ABC, because it is thought to be more representative of recent population trends than the 5-year moving average and because of uncertainty about the 2021 red tide event in Florida. The stock ACL is set equal to the stock ABC as was done in Amendment 53. The commercial ACL and recreational ACL are set using the 59.3% commercial and 40.7% recreational allocations established in Amendment 53 and would increase by 0.41 and 0.29 mp gw, respectively, compared with **Alternative 1**. The commercial ACT and recreational ACT are set using the 5% commercial ACL/ACT buffer and 9% recreational ACL/ACT buffer established in Amendment 53 and would increase the ACTs by 0.39 mp gw and 0.27 mp gw, respectively, compared with **Alternative 1**. If recreational landings exceed the red grouper ACL in a fishing year, the post-season accountability measures requires NMFS to shorten the length of the following fishing year by the amount necessary to ensure landings do not exceed the ACT. These buffers were established from landings from 2016-2019 and were not updated for this framework action with 2020 landings for either sector for the following reasons. In 2020, dockside and observer sampling efforts were negatively affected across the Gulf as state and federal samplers adhered to changing health advisories in the wake of the COVID-19 pandemic, which resulted in gaps in sample coverage which varied in space and time, but were primarily constrained to MRIP waves 2 and 3 (March-April and May-June). To resolve these sampling gaps, data from previous fishing years were used to impute the missing data in 2020. Within the commercial sector, both the red grouper and gag share categories have a multi-use provision, as described in Amendment 53 (2021) that allows a portion of the red grouper quota to be harvested under the gag allocation, and vice versa; as a result, no change is being considered within the current framework action. Due to these several factors, the 2016-2019 fishing years have been used in the Council's ACL/ACT Control Rule for red grouper to determine the sector-specific buffers between the ACL and the ACT. These years constitute finalized and complete catch and effort data for both fishing sectors at this time.

[3] A detailed description of the equations for a 3-year and a 5-year moving average is in Appendix C. Briefly, the approach of considering a three- or five-year moving average allows for an accounting of the most recent interannual variability in the representative index of relative abundance, which by proxy is also considerate of recent changes in fishery management.

Table 2.1.1. Commercial and recreational landings for red grouper in pounds gw from the SEFSC ACL Monitoring Datasets (MRIP-FES).

Year	SEFSC ACL Monitoring Landings	
-	Commercial	Recreational
1986	6,222,162	3,348,897
1987	6,567,225	2,495,130
1988	4,559,441	4,652,818
1989	7,270,424	7,632,792
1990	4,744,711	3,565,320
1991	5,071,083	3,755,576
1992	4,456,473	6,046,978
1993	6,364,065	4,057,934
1994	4,890,106	3,827,267
1995	4,652,487	3,496,544
1996	4,336,214	910,313
1997	4,673,786	1,142,958
1998	3,703,816	1,513,890
1999	5,800,592	3,428,553
2000	5,702,622	4,242,231
2001	5,802,442	2,435,456
2002	5,791,795	3,172,348
2003	4,832,294	2,201,496
2004	5,635,577	7,983,239
2005	5,380,603	3,081,979
2006	5,109,824	2,655,065
2007	3,650,777	2,031,867
2008	4,748,224	1,604,398
2009	3,698,227	1,600,063
2010	2,910,970	1,963,762
2011	4,783,668	1,534,113
2012	5,219,133	4,131,722
2013	4,599,001	4,990,310
2014	5,601,905	5,368,575
2015	4,798,007	3,790,614
2016	4,497,582	2,632,907
2017	3,328,271	1,692,513
2018	2,363,280	2,053,526
2019	2,037,046	1,638,076

Source: 1986-2009 landings, SEFSC Commercial ACL dataset (11/15/19) and 2010-2019 landings, the IFQ database (accessed 5/20/20). SEFSC MRIP-FES Recreational dataset (5/18/20).

Changes in the recreational sector ACLs are predicted to impact the recreational sector's season length.[4] Landings data for Gulf red grouper were obtained from the SEFSC recreational ACL dataset obtained in May of 2020. The current ACT is being tracked using Marine Recreation Information Program (MRIP) Coastal Household Telephone Survey (CHTS) equivalent landings. However, this analysis uses MRIP Fishing Effort Survey (FES) data to match the same units as the most recent assessment (SEDAR 61). Future landings were predicted by taking a three-year average of the three most recent years of complete MRIP-FES data, as the most recent data are assumed to be the best approximation of future harvest. Additionally, the current 2-red grouper per angler bag limit became effective on May 7, 2015, precluding using landings prior to 2016 without adjusting for the previously higher bag limits. Recreational landings are collected in two-month increments called waves (e.g., January and February = wave 1, March and April = wave 2, etc.). Landings from 2017 through 2019 and a prediction of future landings (average landings from 2017-2019) by wave are shown in Figure 2.1.1. Season lengths were projected with upper and lower 95% confidence intervals for each recreational ACL and ACT being considered in the framework action. The predicted closure dates for the sector ACL options span from December 19 to no closure (Table 2.1.2) and span from November 16 to no closure (Tables 2.1.3) for the sector ACT options. There is considerable uncertainty in the predictions since the confidence intervals range from mid-August (based on the ACL) or late July (based on the ACT) to no closure needed (Table 2.1.2; Table 2.1.3; Figure 2.1.2). The in-season accountability measure for red grouper requires NMFS to close the recreational sector when red grouper landings reach or are projected to reach the ACL, as was the recent case for the September 15, 2021, recreational closure.

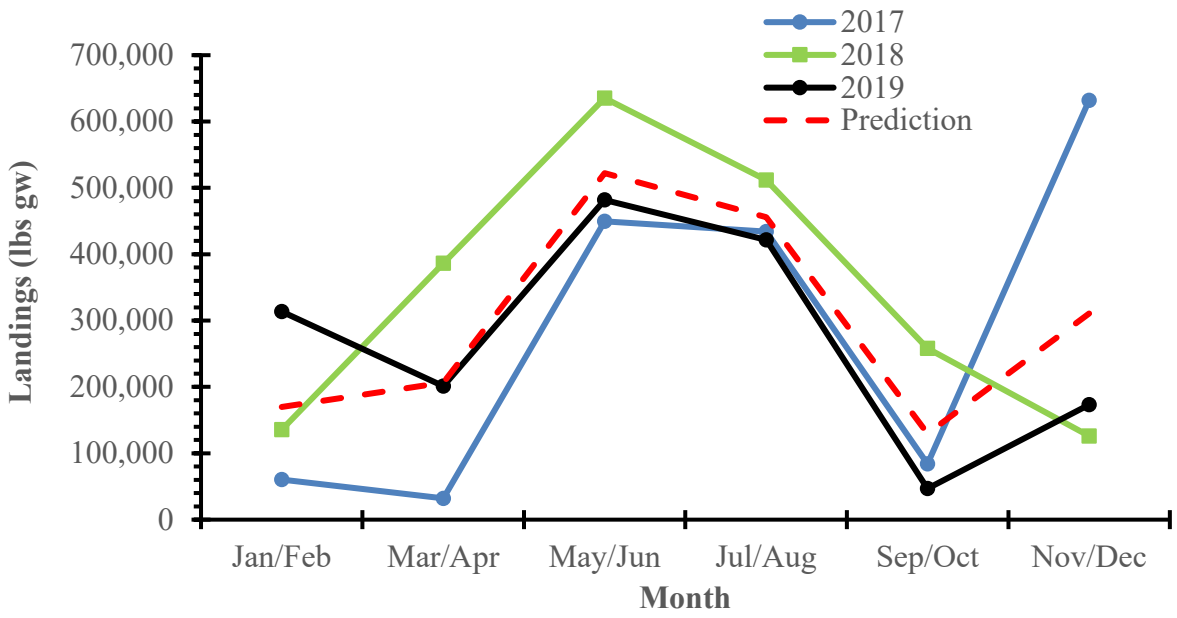

Figure 2.1.1. Gulf of Mexico recreational landings by two-month wave and predicted future landings.
Source: SEFSC MRIP FES Recreational ACL Dataset (May 8, 2020).

[4] This information is also displayed in Appendix D

Table 2.1.2. The predicted closure dates for each recreational ACL (mp gw) currently in the framework amendment generated from predicted landings with 95% confidence intervals.

Alternative	ACL	Predicted Closure Date	Season Length (95% Confidence Interval)
Alt 1	1.73	December 19	August 15 – No Closure
Preferred Alt 2	2.02	No Closure	October 6 – No Closure

Source: SEFSC MRIP FES Recreational ACL Dataset (May 8, 2020).

Table 2.1.3. The predicted closure dates for each recreational ACT (mp gw) currently in the framework amendment generated from predicted landings with 95% confidence intervals.

Alternative	ACT	Predicted Closure Date	Season Length (95% Confidence Interval)
Alt 1	1.57	November 16	July 26 – No Closure
Preferred Alt 2	1.84	No Closure	August 28 – No Closure

Source: SEFSC MRIP FES Recreational ACL Dataset (May 8, 2020).

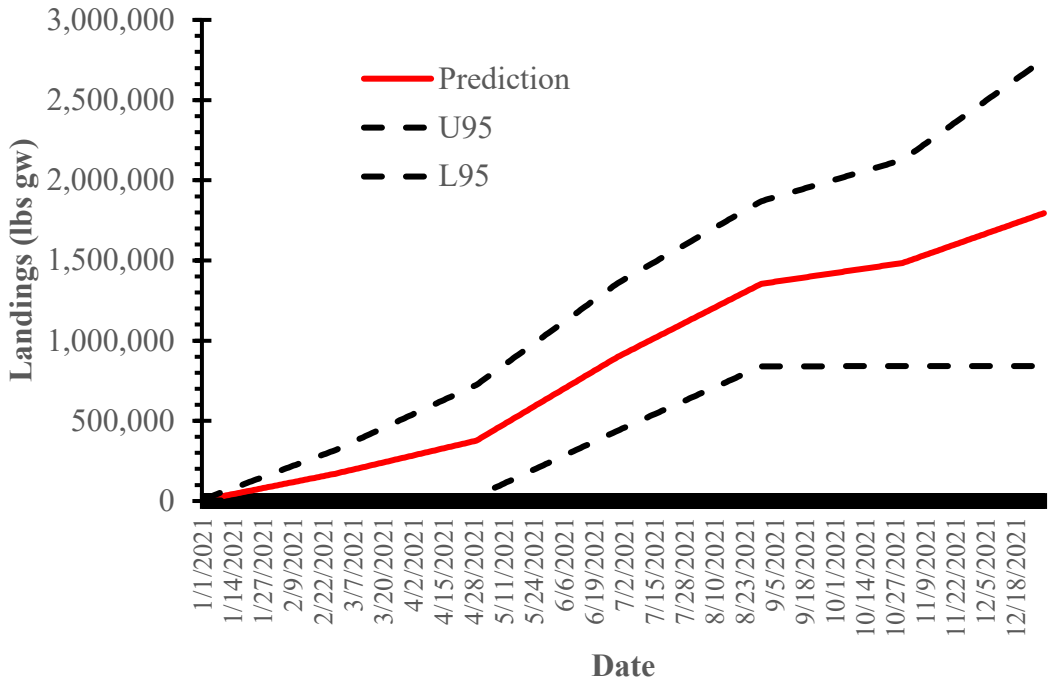

Figure 2.1.2. Cumulative predicted Gulf of Mexico red grouper recreational landings with 95% confidence interval (dashed lines).
Source: SEFSC MRIP FES Recreational ACL Dataset (May 8, 2020).

As with most predictions, the reliability of the results is dependent upon the accuracy of their underlying data and input assumptions. The analyses have attempted to create a realistic baseline as a foundation for comparisons, under the assumption that projected future landings will accurately reflect actual future landings. Uncertainty exists in this projection, as economic conditions, weather and red tide events, changes in catch-per-unit effort, fisher response to management regulations, and a variety of other factors may cause departures from this assumption.

CHAPTER 3. AFFECTED ENVIRONMENT

The action considered in this framework action with environmental assessment would affect fishing for red grouper in the Gulf of Mexico (Gulf). Descriptions of the physical, biological, economic, social, and administrative environments were completed in the environmental impact statements for the following amendments to the Fishery Management Plan (FMP) for Reef Fish Resources in the Gulf of Mexico (Reef Fish FMP): Amendment 27/Shrimp Amendment 14 (GMFMC 2007), 30A (GMFMC 2008c), 30B (GMFMC 2008a), 32 (GMFMC 2011b), 40 (GMFMC 2014), 28 (GMFMC 2015a), the Generic Essential Fish Habitat (EFH) Amendment (GMFMC 2004a), and the Generic Annual Catch Limits/Accountability Measures (ACL/AM) Amendment (GMFMC 2011a). Also, descriptions of the physical, biological, economic, social, and administrative environments can be found in an environmental impact statement for draft Amendment 53 (Red Grouper Allocations and Catch Levels) to the Reef Fish FMP (GMFMC 2021). [5] Below, information on each of these environments is summarized or updated, as appropriate.

3.1 Description of the Physical Environment

The physical environment for Gulf reef fish and red drum is detailed in the Environmental Impact Statement for the Generic Essential Fish Habitat (EFH) Amendment (GMFMC 2004b), Generic EFH Amendment 3 (GMFMC 2005b), the Generic ACL/AM Amendment (GMFMC 2011a), and in draft reef fish Amendment 53 (GMFMC 2021), which are hereby incorporated by reference.

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)[6]. In general, mean sea surface temperature increases from north to south with large seasonal variations in shallow waters.

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. A description of the general life history of gulf reef fish can be found in draft Reef Fish Amendment 53 (GMFMC 2021).

[5] https://www.fisheries.noaa.gov/action/amendment-53-red-grouper-allocations-and-catch-levels
[6] NODC 2011: http://accession.nodc.noaa.gov/0072888

Red grouper is primarily found in the eastern Gulf (Pollack et al. 2018) and are known to alter the offshore hard bottom areas (Coleman et al. 2010). They remove sand and other debris from limestone solution holes using their mouths and fins. The removal of the sediment creates sites for organisms such as sponges and corals to colonize, which in turn provides shelter for small sessile creatures like shrimp and small fish. Coleman et al. (2010) labeled red grouper as ecological engineers as their habitat modification increases biodiversity around the holes and depressions with which they associate.

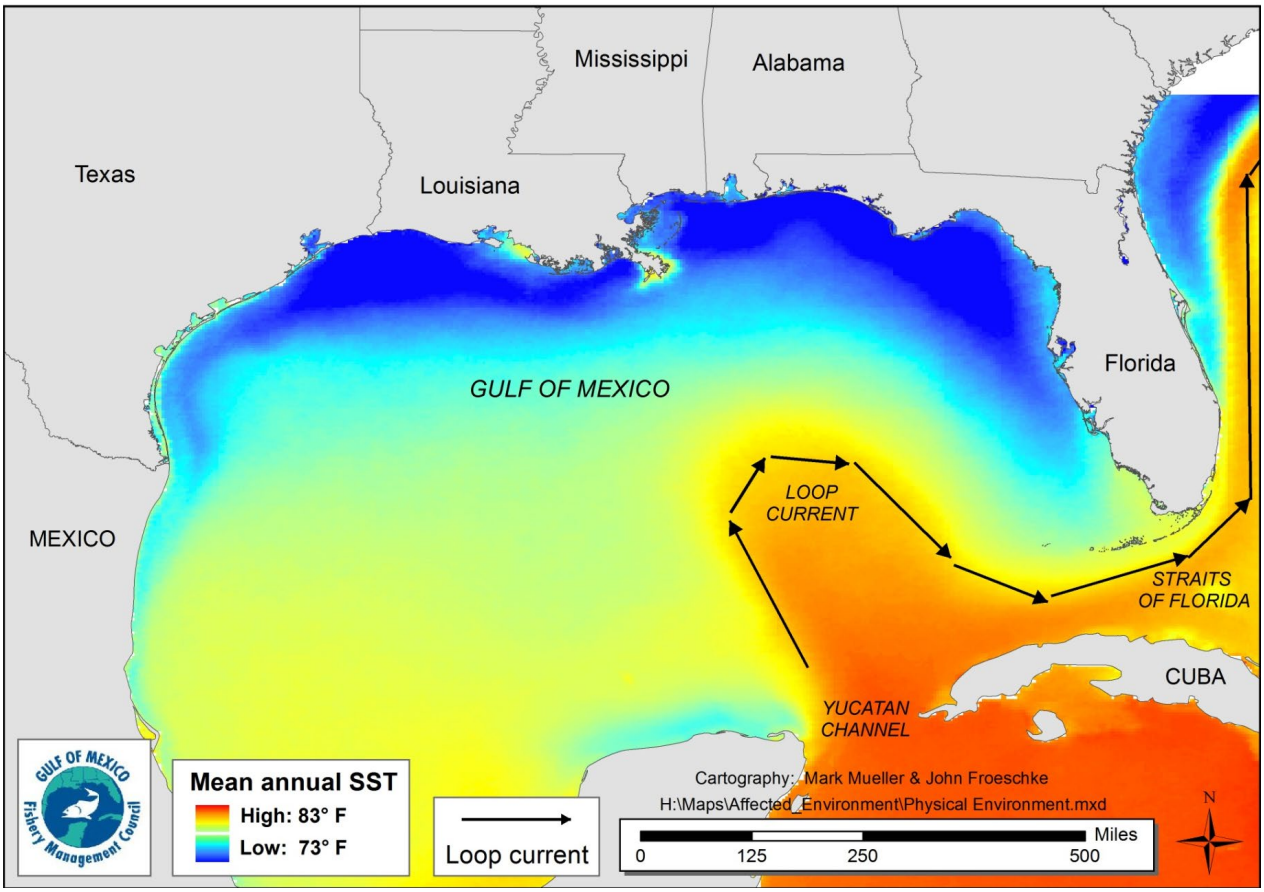

Figure 3.1.1. Physical environment of the Gulf, including major feature names and mean annual sea surface temperature as derived from the Advanced Very High-Resolution Radiometer Pathfinder Version 5 sea surface temperature data set (http://accession.nodc.noaa.gov/0072888).

Environmental Sites of Special Interest Relevant to Red Grouper

Below is a list of sites of special interest relevant to red grouper. For more information, please see draft Reef Fish Amendment 53 (GMFMC 2021).

- Longline/Buoy Gear Area Closure - Permanent closure to use of these gear types for reef fish harvest.
- Madison/Swanson and Steamboat Lumps Marine Reserves - No-take marine reserves.

- The Edges – No-take area closure from January 1 to April 30.

- Tortugas North and South Marine Reserves - No-take marine reserves cooperatively implemented by the state of Florida, National Ocean Service (NOS), the Council, and the National Park Service (see jurisdiction on chart) (185 square nautical miles).

Additionally, Generic Amendment 3 for addressing Essential Fish Habitat requirements establishes an education program on the protection of coral reefs when using various fishing gear in coral reef areas for recreational and commercial fishermen.

- Individual reef areas and bank HAPCs of the northwestern Gulf including: East and West Flower Garden Banks, Stetson Bank, Sonnier Bank, MacNeil Bank, 29 Fathom, Rankin Bright Bank, Geyer Bank, McGrail Bank, Bouma Bank, Rezak Sidner Bank, Alderice Bank, and Jakkula Bank - Pristine coral areas protected by preventing use of some fishing gear that interacts with the bottom (263.2 square nautical miles).
- Florida Middle Grounds HAPC - Pristine soft coral area protected from use of any fishing gear interfacing with bottom (348 square nautical miles).
- Pulley Ridge HAPC - A portion of the HAPC where deep-water hermatypic coral reefs are found.
- Stressed Areas for Reef Fish - Permanent closure Gulf-wide of the near shore waters to use of fish traps, power heads, and roller trawls.
- Alabama Special Management Zone - Gear restricted area.

Historic Places

With respect to the National Register of Historic Places, there is one site listed in the Gulf. This is the wreck of the *U.S.S. Hatteras*, located in federal waters off Texas. Historical research indicates that over 2,000 ships have sunk on the Federal Outer Continental Shelf in the Gulf 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[7].

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 by rivers to the Gulf, increasing nutrient inputs from the Mississippi River, and a seasonal layering of waters in the Gulf. The layering of the water is temperature and salinity dependent and prevents the mixing of higher oxygen content surface water with oxygen-poor bottom water. For 2019, the extent of the hypoxic area was estimated to be 6,952 square miles and ranks as the eighth largest event over the past 33 years the area has been mapped.[8] The hypoxic conditions in the northern Gulf directly affect less mobile benthic macroinvertebrates (e.g., polychaetes) by influencing density, species richness, and community

[7] http://www.boem.gov/Environmental-Stewardship/Archaeology/Shipwrecks.aspx.
[8] http://gulfhypoxia.net

composition (Baustian and Rabalais 2009). However, more mobile macroinvertebrates and demersal fishes (e.g., gray snapper) are able to detect lower dissolved oxygen levels and move away from hypoxic conditions. Therefore, although not directly affected, these organisms are indirectly affected by limited prey availability and constrained available habitat (Baustian and Rabalais 2009; Craig 2012). As mentioned above, red grouper is primarily distributed in the eastern Gulf and so is not generally affected by this hypoxic zone; however, some localized hypoxic conditions do arise (Alcock 2007 and Gravinese et al. 2020). For example, red tide blooms in the eastern Gulf may cause fish kills and the decomposing biomass can result in the rapid depletion of dissolved oxygen in coastal and estuarine waters.

Greenhouse Gases

The Intergovernmental Panel on Climate Change[9] has indicated greenhouse gas emissions are one of the most important drivers of recent changes in climate. Wilson et al. (2014) inventoried the sources of greenhouse gases in the Gulf from sources associated with oil platforms and those associated with other activities such as 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). Please see Amendment 53 for more information on fishery related greenhouse gas emissions.

3.2 Description of the Biological/Ecological Environment

The biological environment of the Gulf, including the species addressed in this amendment, is described in detail in the Generic EFH Amendment (GMFMC 2004b), Generic ACL/AM Amendment (GMFMC 2011a), Reef Fish Amendments 30B (GMFMC 2008c) and 32 (GMFMC 2011b), and in draft Reef Fish Amendment 53 (GMFMC 2021), and is incorporated here by reference and further summarized below.

Red Grouper Life History and Biology

Larval red grouper are found in the plankton across the west-Florida shelf (SEDAR 42 2015). Juvenile red grouper are generally found in shallow waters around structures and patch reefs. When juveniles reach approximately 16 inches (40 cm), after they have become sexually mature, they move offshore (Moe 1969). Red grouper reach a maximum length and weight of 43 inches (110 cm TL) and 50.7 pounds. (23 kg) (Robins et al. 1986). Maximum age of red grouper in the Gulf has been estimated at 29 years (SEDAR 61 2019). Clear determinations of size and age of maturity have been difficult for red grouper (Fitzhugh et al. 2006 and references cited therein). Fitzhugh et al. (2006) estimated the size and age at 50% maturity was 11 inches (279 mm fork length [FL]) and approximately age-2 fish. For SEDAR 42 2015, the values were approximated at 11.5 inches (292 mm FL) and 2.8 years following the addition of samples collected from the west Florida Shelf by Florida Fish and Wildlife Conservation Commission (FWC)/Fish and Wildlife Research Institute (FWRI) (Lowerre-Barbieri et al. 2014): however, the inclusion of 2014-2017 data led to a slightly younger age of 2.2 years in SEDAR 61 (2019).

[9] https://www.ipcc.ch/srocc/

Red grouper spawn from February until mid-July, with peak spawning occurring in the eastern Gulf during March through May (Fitzhugh et al. 2006). Red grouper are protogynous hermaphrodites, transitioning from females to males at older ages (7-14 years), and form harems for spawning (Dormeier and Colin 1997). Age and size at sexual transition is approximately 10.5 years and 30 inches TL (76.5 cm TL) (Fitzhugh et al. 2006). Size and age at sexual transition was re-estimated both for SEDAR 42 (2015) and SEDAR 61 (2019) at 11.2 and 11.4 years and 707 and 708-mm TL, respectively. Over the last 25-30 years, there has been little change in the sex ratio of red grouper (Lowerre-Barbieri et al 2014), likely because they do not aggregate (Coleman et al. 1996). Red grouper are also known as "habitat engineers" because they create and maintain excavations in the bottom substrate. These excavations also support other species that use them for food and shelter (Coleman et al 2010).

Red grouper are susceptible to red tide as outlined in Chagaris and Sinnickson (2018) and Coleman and Koenig (2010). Chagaris and Sinnickson (2018) found the percent of total biomass of red grouper killed by red tides has been relatively low since 2002 with the exception of the severe red tide bloom that occurred in 2005 (note that this manuscript did not include the 2017-2018 red tide event). They suggest that in general, severe red tide blooms occur at specific locations, not over the whole area where red grouper are found.

Status of the Red Grouper Stock

A summary of the red grouper benchmark stock assessment (SEDAR 12 2006) and 2009 update stock assessment (SEDAR 12 Update 2009) can be found in GMFMC (2010a) and is incorporated here by reference. These assessments showed that the red grouper stock was neither overfished nor undergoing overfishing. The 2009 update stock assessment did suggest the stock had declined since 2005, much of which was attributed to an episodic mortality event in 2005 (most likely associated with red tide). In late 2010, the assessment was revised to incorporate new information on historical discards in the commercial sector and updated projections considering the reduction in the commercial size limit from 20 inches to 18 inches TL (Walter 2011). Given these changes, the assessment rerun resulted in a slightly improved estimate of the stock status for the last year of the assessment (2008) and indicated the total allowable catch in the near term could be substantially increased. Therefore, the SSC recommended that the overfishing limit (OFL) for red grouper be set at 8.10 million pounds (the equilibrium yield at the fishing mortality rate associated with harvesting the equilibrium maximum sustainable yield) and the ABC be set at 7.93 million pounds (the equilibrium yield at the fishing mortality rate associated with harvesting the equilibrium optimum sustainable yield).

SEDAR 42 Assessment

In October 2015, the SEDAR 42 2015 stock assessment for red grouper was completed using the Stock Synthesis model. SEDAR 42 2015 found the red grouper stock was not undergoing overfishing and was not overfished. Given this determination (as of 2013), SSC members determined that it was appropriate to provide OFL and ABC recommendations for a 5-year period beginning in 2016. However, a decision was needed on how to handle landings for the years 2014-2015, which were not in the assessment. For 2014, final landings were available and

used, but for 2015, the SSC recommended that the assessment group use landings estimates based on the current quotas and ACLs.

The SSC recommended that the annual OFL for Gulf red grouper for years 2016-2020 be set at the 50th percentile of the OFL probability distribution function (PDF), assuming estimated landings for 2014 and 2015 fishing years. This value was 14.16 million pounds (mp) gutted weight (gw). The annual ABC for years 2016-2020 was computed as the 43rd percentile of the OFL PDF, which was 13.92 mp gw.

2018 Red Grouper Interim Analysis

Interim analyses (IA) are designed to occur between regular stock assessments conducted through the SEDAR process to provide the opportunity to adjust harvest recommendations based on current stock conditions. For example, unpredictable events can occur such as a change in recruitment (e.g., pulse or failure), environmental disasters (e.g., red tides or hurricanes) or man-made disasters (e.g., Deepwater Horizon). The SEFSC conducted an interim analysis on red grouper to assist the Council in developing harvest advice for 2019 because red grouper was between assessments (NMFS 2018a). The interim analysis prepared by the SEFSC developed a harvest control rule (HCR), which uses an index from a fishery-independent survey to compare where the stock seems to be now (observed index value) with where the stock should be (forecast index value). The chosen HCR adjusts the ABC recommendation based on variation between projected and observed index values. The SEFSC found that the fishery-independent bottom longline index was the best index for use in the HCR.

The SSC reviewed the SEFSC's interim analysis at its October 2018 meeting and concluded it was suitable for interim catch advice. However, because the method had not been fully tested and required a number of assumptions, the SSC considered this method inappropriate to rely on to provide an ABC recommendation. The SSC did determine the analysis could support a recommendation that the Council reduce the 2019 stock ACL to 4.6 mp gw.

SEDAR 61 Assessment

Similar to SEDAR 42 2015, SEDAR 61 2019 was completed using the Stock Synthesis model. The base model time series began in 1986 with 2017 as the terminal year and length-based selectivity was modeled for fishing fleets and fishery-independent surveys. Age composition data began in 1991. Model fits to input data streams were similar to the SEDAR 42 2015 model, with some, such as commercial and recreational discard data, fitting better. Recruitment remains highly variable for red grouper with strong recruitment events observed in 1995, 1998, 2001, 2005, and 2013. In reviewing the assessment, the SSC noted that as of the end of 2017, the stock is not overfished (SSB_{2017}/ minimum stock size threshold (MSST) = 1.64; $MSST = 0.5*B_{MSY}$) and is not undergoing overfishing ($F_{Current\ (2015\text{-}2017)}$/maximum fishing mortality threshold (MFMT) = 0.784; $MFMT = F_{30\%SPR}$). However, this determination does not account for the 2018 red tide episodic mortality event, which was known to be a significant mortality event in the eastern Gulf. In the assessment, red tide mortality was estimated in 2005 and 2014, years for which severe red tide events occurred based on indices of red tide severity (Chagaris and Sinnickson 2018; Sagarese et al. 2018). The SSC also noted that under the old definition of MSST ($1\text{-}M*B_{MSY}$), the stock would have been considered overfished as of 2017 ($SSB_{2017}/MSST_{OLD} = 0.96$).

Mean Weight Adjustments to SEDAR 61 Assessment-Predicted Recreational Landings- August, 2021

In August 2021, the SEFSC provided an adjustment to SEDAR 61 that used a mean weight scalar for recreational landings during projections. The SEDAR 61 stock assessment analyzed red grouper recreational landings in numbers of fish. Gulf assessments have traditionally fit to recreational landings in numbers of fish because numbers (rather than weights) are the native units of recreational monitoring surveys and therefore consistently reported throughout the time series. The assessment model used the mean weight of landed red grouper (based on lengths) to convert recreational landings into weight. A comparison between mean weight of landed red grouper predicted by the assessment model and the ACL monitoring dataset revealed that the assessment model underpredicted the mean weight of landed red grouper. Since red grouper are monitored in terms of weights for management, the August 2021 SEFSC report adjusted the assessment predicted recreational landings in weight for 2020 through 2024 using a mean weight scalar. Mean weight in 2019 was considered representative and was used in the scalar.

The assessment model predicted a mean weight of about 4 pounds gutted weight compared to about 6.1 pounds gutted weight based on the ACL monitoring dataset. The assessment model ultimately inferred the weights, which were lower than observed in the ACL monitoring dataset. The assessment predicted recreational landings in weight for 2020 through 2024 were adjusted by a mean weight scalar of 1.597. This analysis calculated an OFL of 5.99 million pounds gutted weight and an ABC of 5.57 million pounds gutted weight. More information on the mean weight adjustments to SEDAR 61 assessment-predicted recreational landings in weight can be found in Appendix B.

Updated Interim Analysis for Gulf Red Grouper- August, 2021

A 2021 interim analysis was conducted by SEFSC. Concerns had been raised by both the commercial and recreational fishermen because in 2019 and 2020, each only harvested about 80% of their quotas.

Adjustments to the SEDAR 61-adjusted ABC of 5.57 mp gw (i.e. mean weight adjustment to SEDAR 61 assessment-predicted recreational landings in weight during projections) were made using two separate moving average periods of 3- or 5- years. Recent index values were slightly below the reference index values for both the 3-year and 5-year scenarios, with index ratios of 0.89 and 0.91, respectively. Multiplying each index ratio by the reference catch resulted in adjusted catch recommendations from 5.57 million pounds gutted weight to 4.96 million pounds gutted weight using the 3-yr average and 5.07 million pounds gutted weight using the 5-yr average. More information can be found on the 2021 red grouper IA in Appendix C.

August 2021 Scientific and Statistical Committee Meeting

At its August 2021 meeting, the Gulf Council's SSC accepted the new mean weight adjustment methodology for recreationally caught red grouper, for the purpose of adjusting the SEDAR 61 assessment-predicted recreational landings in weight during projections. The SSC also accepted

the updated methodology and interim analysis results for red grouper. The SSC recommended an OFL of 5.99 mp gw and an ABC of 4.96 mp gw.

General Information on Reef Fish Species

The National Ocean Service (NOS) collaborated with NMFS and the Council to develop distributions of reef fish (and other species) in the Gulf (SEA 1998). Reef fish are widely distributed in the Gulf, occupying both pelagic and benthic habitats during their life cycle. Habitat types and life history stages can be found in more detail in GMFMC (2004a). In general, both eggs and larval stages are planktonic. Larvae feed on zooplankton and phytoplankton. Juvenile and adult reef fish are typically demersal, and are usually associated with bottom topographies on the continental shelf (less than 328 feet; less than 100 m) which have high relief reef structure. However, several species are found over sand and soft-bottom substrates. More detail on hard bottom substrate and coral can be found in the FMP for Corals and Coral Reefs (GMFMC and SAFMC 1982).

Status of Reef Fish Stocks

The Reef Fish FMP currently encompasses 31 species. Eleven other species were removed from the FMP in 2012 through the Generic ACL/AM Amendment (GMFMC 2011a).
The NMFS Office of Sustainable Fisheries updates its Status of U.S. Fisheries Report to Congress[10] on a quarterly basis utilizing the most current stock assessment information. Stock assessments and status determinations have been conducted and designated for 14 stocks and can be found on the Council[11] and SEDAR[12] websites. Of the 14 stocks for which stock assessments have been conducted and accepted by the SSC, the fourth quarter report of the 2020 Status of U.S. Fisheries classifies only one as overfished (greater amberjack) and two stocks undergoing overfishing (cobia and lane snapper).

A stock assessment was conducted for Atlantic goliath grouper (SEDAR 47 2016). The SSC accepted the assessment's general findings that the stock was not overfished nor experiencing overfishing. Although the SSC determined Atlantic goliath grouper to not be experiencing overfishing based on annual harvest remaining below the OFL, the SSC deemed the assessment not suitable for stock status determination and management advice.

Stock assessments were conducted for seven reef fish stocks using the Data Limited Methods Tool (DLMTool; SEDAR 49 2016). This method allows the setting of OFL and ABC based on limited data and life history information, but does not provide assessment-based status determinations. Data were requested for almaco jack, lesser amberjack, snowy grouper, speckled hind, yellowmouth grouper, and wenchman but it was determined not enough information was available to complete an assessment. These stocks are not experiencing overfishing, but no overfished status determination has been made. Lane snapper was the only stock with adequate

[10] https://www.fisheries.noaa.gov/national/population-assessments/fishery-stock-status-updates
[11] www.gulfcouncil.org
[12] http://sedarweb.org/

data to be assessed using the DLMTool methods resulting in OFL and ABC recommendations by the SSC.

The remaining species within the Reef Fish FMP have not been assessed at this time. Therefore, their stock status is unknown. For those species that are listed as not undergoing overfishing, that determination has been made based on the annual harvest remaining below the OFL. Scamp is undergoing a research track assessment at this time. For more complete information on the status of Gulf reef fish stocks, please see Amendment 53 (GMFMC 2021).

Bycatch of Managed Finfish Species

Many of the reef fish species co-occur with each other and can be incidentally caught when fishermen target certain species. In some cases, these fish may be discarded for regulatory reasons and thus are considered bycatch. Bycatch practicability analyses have been completed for red snapper (GMFMC 2004c, GMFMC 2007, GMFMC 2014, GMFMC 2015a), grouper (GMFMC 2008a, GMFMC 20010b, GMFMC 2011a, GMFMC 2011b, GMFMC 2012a), vermilion snapper (GMFMC 2004d, GMFMC 2017a), greater amberjack (GMFMC 2008b, GMFMC 2012b, GMFMC 2015b), gray triggerfish (GMFMC 2012c), hogfish (GMFMC 2016a) and most recently in red grouper draft Amendment 53 (GMFMC 2021). These analyses examined the effects of fishing on these species. In general, these analyses have found that reducing bycatch provides biological benefits to managed species, as well as benefits to the fishery through less waste, higher yields, and less forgone yield. However, in some cases, actions are approved that can increase bycatch through regulatory discards, such as increased minimum sizes and closed seasons. Under these circumstances, there is some biological benefit to the managed species that outweigh any increases in discards from the action.

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 very brief summary of these two laws and more information is available on NMFS Office of Protected Resources website[13]. There are 21 ESA-listed species of marine mammals, sea turtles, fish, and corals that may occur in the EEZ of the Gulf. There are 91 stocks of marine mammals managed within the Southeast region, plus the addition of the stocks such as North Atlantic right whales, humpback, sei, fin, minke, and blue whales, that regularly or sometimes occur in Southeast region managed waters for a portion of the year (Hayes et al. 2018). All marine mammals in U.S. waters are protected under the MMPA.

Of the four marine mammals that may be present in the Gulf (sperm, sei, fin, and Gulf Bryde's), the sperm, sei, and Gulf of Mexico Bryde's whale are listed as endangered under the ESA. Bryde'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.

[13] https://www.fisheries.noaa.gov/topic/laws-policies#endangered-species-act

The gear used by the Gulf reef fish fishery is classified in the MMPA 2021 List of Fisheries as a Category III fishery (86 FR 3028). This classification indicates the annual mortality and serious injury of a marine mammal stock resulting from any 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. Dolphins are the only species documented as interacting with the reef fish fishery. Bottlenose dolphins prey upon bait, catch, and/or released discards of fish from the reef fish fishery. They are also a common predator around reef fish vessels, feeding on the discards. Marine Mammal Stock Assessment Reports and additional information are available on the NMFS Office of Protected Species website.[14]

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 distinct population segment (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, 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 September 29, 2016, NMFS requested re-initiation of Section 7 consultation on the operation of reef fish fishing managed by the Reef Fish FMP because new species (i.e., Nassau grouper [81 FR 42268] and green sea turtle North Atlantic and South Atlantic DPSs [81 FR 20057]) were listed under the ESA that may be affected by the proposed action. NMFS documented a determination that the operation of the fishery to continue during the re-initiation period is not likely to adversely affect these species.

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.

[14] https://www.fisheries.noaa.gov/topic/marine-mammal-protection

NMFS published a final rule on April 15, 2019, listing the Gulf Bryde's whale as endangered. In a memorandum dated June 20, 2019, NMFS revised the re-initiation request to include the Gulf Bryde'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.

Red Tide

Red tide is a common name for harmful algal blooms (HAB) caused by species of dinoflagellates and other organisms that cause the water to appear to be red. Red tide blooms occur in the Gulf almost every year, generally in late summer or early fall. They are most common off the central and southwestern coasts of Florida between Clearwater and Sanibel Island, but may occur anywhere in the Gulf. More than 50 species capable of causing red tides occur in the Gulf, but one of the best-known species is *Karenia brevis*. This organism produces toxins capable of killing fish, birds and marine animals.[15] The factors causing red tide blooms are complex (Alcock 2007). Blooms are thought to begin to develop offshore at depth. When oceanic or wind currents push the bloom to the coast where nutrient levels increase, blooms are able to increase in size. The source of the coastal nutrients can come from natural or man-made sources. Optimum water temperature for *K. brevis* growth occurs between 72˚F and 82˚F (22˚C and 28˚C) and optimal salinities occur between 31 and 37 ppt. Although climate change has been predicted to increase likelihood of blooms of other HABs, the effects on *K. brevis* are less known. On one hand, increasing water temperatures may increase above the optimal range, hindering growth, but increased temperatures in conjunction with higher levels of CO_2 may promote growth causing higher concentrations of *K. brevis* in blooms (Errera et al. 2014)

The effects of red tide on fish stocks have been well established. After *K. brevis* cells die, they release brevetoxins. When these are absorbed through the gills or ingested, they affect the nervous and respiratory functions of fish and cause mortality. It is unknown whether mortality occurs via absorption of the brevetoxins across gill membranes (Abbott et al. 1975, Baden 1988), ingestion of toxic biota (Landsberg 2002), or from some indirect effect of red tide such as hypoxia (Walter et al. 2013). During severe *K. brevis* blooms, large fish kills can occur (e.g, Flaherty and Landsberg 2011, Smith 1975, Steidinger and Ingle 1972). This can add to fish mortality as the decaying biomass from the blooms create hypoxic conditions. In 2005, a severe red tide event occurred in the Gulf along with an associated large decline in multiple abundance indices for red grouper, gag, red drum, and other species thought to be susceptible to mortality from *K. brevis* bloom events. In 2018, a severe red tide event occurred off the southwest coast of Florida from Monroe County to Sarasota County that persisted for more than 10 months; the impacts on fish stocks will likely be considered in future stock assessments.

Climate Change

Climate change projections predict increases in sea-surface temperature and sea level; decreases in sea-ice cover; ocean acidification; increases in HABs; and changes in salinity, wave climate,

[15] http://myfwc.com/research/redtide/general/about/

and ocean circulation.[16] These changes are likely to affect plankton biomass and fish larvae abundance that could adversely affect fish, marine mammals, seabirds, and ocean biodiversity. Kennedy et al. (2002) and 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. For reef fishes, Burton (2008) speculated climate change could cause shifts in spawning seasons, changes in migration patterns, and changes to basic life history parameters such as growth rates. In addition, Coleman and Koenig (2010) suggested that for red grouper and other ecosystem engineers, the main effects from climate change on stocks would come from sea level rise and rising water temperatures. For a more complete discussion of climate change impacts on the biological environment, please see draft Reef Fish Amendment 53 (GMFMC 2021).

***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). For more discussion on the impacts of the Deepwater Horizon Oil Spill, please see draft Reef Fish Amendment 53 (GMFMC 2021).

3.3 Description of the Economic Environment

A description of the red grouper stock affected by the actions considered in this amendment is provided in Section 3.2. Additional details on the economic environment of the recreational and commercial sectors of the red grouper component of the Gulf reef fish fishery are provided in the Framework Action to Modify Red Grouper Annual Catch Limits and Annual Catch Targets (GMFMC 2019b), Reef Fish Amendment 36A (GMFMC 2017b) and the Framework Action to Adjust Red Grouper Allowable Harvest (2016b).

Sections 3.3.1 and 3.3.2 contain additional information on the economic environment of the commercial sector and the for-hire and private recreational components of the recreational sector in the Gulf reef fish fishery, with a specific focus on the red grouper portion of the fishery. This framework action contains management measures that would directly or indirectly affect Gulf red grouper dealers, and thus additional details on the economic environment of that component of the commercial sector are also provided.

[16] http://www.ipcc.ch/

3.3.1 Commercial Sector

Permits

Any fishing vessel that harvests and sells any of the reef fish species, including red grouper, managed under the Reef Fish FMP from the Gulf EEZ 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. 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)-IFQ program was implemented in 2007. This decline has continued since the gray triggerfish (GT)-IFQ program was implemented in 2010, but at a slower rate. As of February 27, 2020, there were 834 valid or renewable commercial reef fish permits, 763 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 commercial reef fish permits, 2008-2019.

Year	Number of Permits
2008	1,099
2009	998
2010	969
2011	952
2012	917
2013	895
2014	882
2015	868
2016	852
2017	850
2018	845
2019	842

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, at the end of 2018, which is essentially equivalent to Jan. 1, 2019, 94 businesses owned two or more valid or renewable reef fish permits. Although these businesses represented only 14.8% of the businesses with permits, they held 35.5% 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 16.

Table 3.3.1.2. Vessels and businesses with a commercial reef fish permit, end of year (EOY) 2018.

No. of Vessels Owned by a Business	No. of Businesses	No. of Total Permitted Vessels	% of Businesses	% of Permitted Vessels
1	543	543	85.2%	64.5%
2	60	120	9.4%	14.3%
3	15	45	2.4%	5.3%
4	8	32	1.3%	3.8%
5-6	3	17	.5%	2.0%
7-10	6	53	.9%	6.3%
15-16	2	32	.3%	3.8%
Total	**637**	**842**	**100%**	**100.0%**

Source: NMFS SERO permits and IFQ databases, March 23, 2020.

Although all permitted vessels may harvest non-IFQ reef fish species (e.g., vermilion snapper), not all permitted vessels are eligible to harvest red grouper (RG). A permitted vessel must be linked to an active IFQ account in order to be eligible to harvest RG and IFQ species.[17] 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.

Table 3.3.1.3. IFQ eligible vessels and businesses with a Gulf reef fish permit, EOY 2018.

No. of Vessels Owned by a Business	No. of Businesses	No. of Total Permitted Vessels	% of Businesses	% of Permitted Vessels
1	450	450	84.6%	63.1%
2	52	104	9.8%	14.6%
3	13	39	2.4%	5.5%
4	6	24	1.1%	3.4%
5-6	3	17	.6%	2.4%
7-10	6	48	1.1%	6.7%
15-16	2	31	.4%	4.3%
Total	**532**	**713**	**100%**	**100.0%**

Source: NMFS SERO permits and IFQ databases, March 23, 2020.

Table 3.3.1.3 shows that, at the end of 2018, only 713 permitted vessels were linked to an IFQ account, and these vessels were owned by 532 businesses. Thus, 129 permitted vessels were not

[17] 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.

eligible to harvest IFQ species and 105 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 15.4% of the businesses, but hold 36.9% of the permitted vessels that can harvest IFQ species.

IFQ Accounts with RG Shares

As of February 19, 2020, there were 684 IFQ accounts with shares in one or more share categories. Of these accounts, 495 held red grouper shares. The total percentage of RG shares held by accounts with RG shares does not sum to 100% in Table 3.3.1.4 because a small percentage of RG shares were reclaimed under Reef Fish Amendment 36A.[18] The total percentages for other share categories also do not sum to 100% because some accounts with RG 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 495 accounts holds just over 0.2% of the RG shares. However, as discussed in Reef Fish Amendment 36A, the distribution of shares within the RG 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 RG shares, the largest or maximum percent of shares held by a single account in each category ranges from 2.33% for gag grouper (GG) to 4.265% for RG, 4.433% for other shallow-water grouper (SWG), 4.139% for RS, 12.212% for tilefish (TF), and 14.704% for deep water grouper (DWG). The account that has the highest percentages of DWG and TF shares are at the share cap for those categories. The account that has the highest percentage of RG shares is near the 4.331% share cap for RG. Thus, in percentage terms, these estimates indicate there are some relatively large shareholders in the DWG and TF categories in particular. This finding is consistent with findings in GMFMC (2018) which indicate the concentration of shares is greatest in the TF and DWG categories and least in the GG category. Even though the concentration of shares is relatively high for TF and DWG, concentration levels in those and other categories, as well as for all categories combined, 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).[19]

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

[19] 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).

Table 3.3.1.4. Quota share statistics (in percent) for accounts with RG shares, Feb. 19, 2020.

Statistic	DWG Shares	RG Shares	GG Shares	SWG Shares	TF Shares	RS Shares
Maximum	14.704	4.265	2.330	4.433	12.212	4.139
Total	88.587	99.900	93.519	90.852	83.187	59.887
Mean	0.179	0.202	0.189	0.184	0.168	0.121

Source: NMFS SERO IFQ database accessed 2/19/2020.

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 495 IFQ accounts with RG shares are owned by 436 businesses.

Further, although some IFQ accounts with RG 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 495 IFQ accounts with RG shares, 290 accounts were linked to one or more permitted vessels, while 205 accounts were not linked to a permitted vessel. The 290 accounts were linked to a total of 365 permitted vessels and these accounts and vessels were owned by 260 businesses. Most businesses only own one or two accounts and permitted vessels. But, one business has 12 accounts and 3 businesses own 10 or more permitted vessels. The 205 accounts that were not linked to a vessel were owned by 176 businesses and all of these businesses only held one or two accounts with RG shares.

As shown in Table 3.3.1.5, the 260 businesses that own RG shares and permitted vessels hold the vast majority of shares held by businesses that own RG shares in all share categories, ranging from a low of just over 50% of the RS shares to a high of over 84% of the RG shares. On average, these 260 businesses own between 0.19% and 0.32% of the shares in each category. The maximum percentage of shares owned by a business varies considerably, ranging from about 3.86% of the GG shares to 19.7% of the DWG shares.[20]

As shown in Table 3.3.1.6, the 176 businesses that own RG 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 4% of the TF shares but just above 17% of the DWG shares. These businesses own between 0.02% and 0.1% of the shares in each category on average. The maximum percentage of shares owned by one of these businesses varies somewhat, ranging from about 1.14% of the TF shares to 2.33% of the GG 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 RG shares that own permitted vessels and businesses with RG 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 RG.

[20] 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.

Table 3.3.1.5. Quota share statistics (in percent) for businesses with RG shares and permitted vessels, Feb. 19, 2020.

Statistic	DWG Shares	RG Shares	GG Shares	SWG Shares	TF Shares	RS Shares
Maximum	19.719	6.262	3.857	5.136	14.743	5.076
Total	78.536	84.166	76.507	77.175	79.155	50.204
Mean	0.302	0.324	0.294	0.297	0.304	0.193

Source: NMFS SERO IFQ database accessed 2/19/2020.

Table 3.3.1.6. Quota share statistics (in percent) for businesses with RG shares and no permitted vessels, Feb. 19, 2020.

Statistic	DWG Shares	RG Shares	GG Shares	SWG Shares	TF Shares	RS Shares
Maximum	1.991	1.745	2.330	1.536	1.136	2.346
Total	10.051	15.734	17.012	13.677	4.032	9.683
Mean	0.057	0.089	0.097	0.078	0.023	0.055

Source: NMFS SERO IFQ database accessed 2/19/2020.

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 2019 quotas for each share category were as follows: 6,937,838 lbs gw for RS, 3 mp gw for RG, 1.024 mp gw for DWG, 582,000 lbs gw for TF, and 525,000 lbs 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 RG shares received 6,055 lbs gw of RG allocation in 2019, while the largest account holder received almost 128,000 lbs gw. Across all categories, the average account holder with RG shares received about 20,000 lbs gw of allocation in 2019.

Table 3.3.1.7. Annual allocation (lb gw) statistics for accounts with RG shares, Feb. 19, 2020.

Statistic	DWG Allocation	RG Allocation	GG Allocation	SWG Allocation	TF Allocation	RS Allocation
Maximum	150,572	127,945	21,879	23,275	71,076	287,124
Total	907,132	2,996,996	878,139	476,974	484,149	4,154,869
Mean	1,833	6,055	1,774	964	978	8,394

Source: NMFS SERO IFQ database accessed 2/19/2020.

Table 3.3.1.8 provides statistics regarding the amount of allocation held by the 260 businesses that possess RG shares and at least one permit. Information in this table reflects that these businesses control just over 84% of the RS allocation, or around 2.54 mp gw. The largest amount of RG allocation controlled by a single business with RG shares and a permit is almost 180,000 lb gw, while the average amount of RG allocation held by a business with a permit is about 9,700 lb gw.

Table 3.3.1.9 provides statistics regarding the amount of allocation held by the 176 businesses that possess shares but are not associated with a permit. Information in this table reflects that

these businesses control almost 16% of the RG allocation, or around 472,000 lb gw. The largest amount of allocation controlled by a single business with RG shares but without a permit is slightly more than 52,300 lb gw, while the average amount of RG allocation held by a business without a permit is almost 2,700 lb gw.

Table 3.3.1.8. Annual allocation (lb gw) statistics for businesses with RG shares and permitted vessels, February 19, 2020.

Statistic	DWG	RG	GG	SWG	TF	RS
Maximum	201,920	187,868	36,216	26,965	85,803	352,131
Total	804,209	2,524,968	718,400	405,168	460,681	3,483,095
Mean	3,093	9,711	2,763	1,558	1,772	13,397

Source: NMFS SERO IFQ database accessed 2/19/2020).

Table 3.3.1.9. Annual allocation (lb gw) statistics for businesses with RG shares and no permitted vessels, February 19, 2020.

Statistic	DWG	RG	GG	SWG	TF	RS
Maximum	20,386	52,359	21,879	8,064	6,613	162,774
Total	102,923	472,028	159,739	71,806	23,468	671,773
Mean	585	2,682	908	408	133	3,817

Source: NMFS SERO IFQ database accessed 2/19/2020).

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 RG shares are in Table 3.3.1.10. The total value of all shares held by accounts with RG shares is just over $212 million (2019$), with the bulk of that value coming from ownership of RS shares, which accounts for more than 80% of the combined total value. This is also true for the average account that holds RG shares. The average value of an account that holds RG shares is about $428,000, though only about 8% of that value is based on RG shares. The account with the largest asset value of shares is worth about $12.1 million, with RS shares representing the bulk of that value (98%).

Table 3.3.1.10. Quota share value statistics for accounts with RG shares (2019$).

Statistic	DWG	RG	GG	SWG	TF	RS	All
Maximum	$1,376,230	$728,007	$208,945	$130,804	$675,221	$11,820,887	$12,100,160
Total	$8,291,186	$17,052,906	$8,386,229	$2,680,593	$4,599,417	$171,055,937	$212,066,267
Mean	$16,750	$34,450	$16,942	$5,415	$9,292	$345,568	$428,417

Note: Share value estimates are based on average 2019 share prices per pound.
Source: NMFS SERO IFQ database accessed 2/11/2020.

The information in Table 3.3.1.10 reflects the asset value of shares based on 2019 share prices. However, with the exception of RS shares, and TF shares to a lesser extent, average share prices for other share categories have continuously declined over the past 5 years, as illustrated in Table 3.3.1.11. Specifically, RG and GG share prices have declined by 59% during this time. The declines for DWG and TF prices have been less, but are still noticeable. TF share prices have been relatively steady, while RS share prices have increased by more than 14%. Compared to

conditions in 2015, RG shares currently represent a far smaller percentage of an RG 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.

Table 3.3.1.11. Average share prices by share category, 2015-2019 (2019$).

Share category	2015	2016	2017	2018	2019
RS	$36.07	$32.56	$36.27	$36.90	$41.17
RG	$13.80	$10.74	$5.39	$4.17	$5.69
GG	$23.58	$15.18	$16.55	$9.95	$9.55
DWG	$13.67	$13.25	$13.16	$11.11	$9.14
SWG	$7.23	$6.20	$9.06	$4.96	$5.62
TF	$9.85	$10.64	$9.07	$10.89	$9.50

Source: IFQ database accessed 2/11/2020.

Table 3.3.1.12 provides statistics regarding the value of the shares held by the 260 businesses that possess RG shares and at least one permit. Information in this table again reflects that these businesses control just over 84% of the total RG share value. The largest RG share value controlled by a single business with a permit is almost $1.07 million, while the average value of RG shares held by a business with a permit is just over $55,200. RG shares only represent about 8% of the total share value held by these businesses, while RS shares represent about 80% of the total share value held by these businesses.

Table 3.3.1.12. Quota share value statistics for businesses with RG shares and permitted vessels, February 19, 2020 (2019$).

Statistic	DWG	RG	GG	SWG	TF	RS	All
Maximum	$1,845,546	$1,068,972	$345,865	$151,544	$815,125	$14,497,248	$18,724,299
Total	$7,350,467	$14,367,067	$6,860,720	$2,277,046	$4,376,474	$143,399,025	$178,630,799
Mean	$28,271	$55,258	$26,387	$8,758	$16,833	$551,535	$687,042

Note: Share value estimates are based on average 2019 share prices per pound.
Source: NMFS SERO IFQ database accessed 2/19/2020.

Table 3.3.1.13 provides statistics regarding the value of the shares held by the 176 businesses that possess RG shares but are not associated with a permit. Information in this table again reflects that these businesses control about 16% of the total RG share value. The largest RG share value controlled by a single business without a permit is about $298,000, while the average value of shares held by a business with RG shares but without a permit is just over $15,200. RG shares only represent about 8% of the total share value held by these businesses, while RS shares represent almost 83% of the total share value held by these businesses.

Table 3.3.1.13. Quota share value statistics for businesses with RG shares but no permitted vessels, February 19, 2020 (2019$).

Statistic	DWG	RG	GG	SWG	TF	RS	All
Maximum	$186,331	$297,923	$208,945	$45,319	$62,823	$6,701,407	$7,502,747
Total	$940,718	$2,685,839	$1,525,509	$403,547	$222,943	$27,656,913	$33,435,468
Mean	$5,345	$15,260	$8,668	$2,293	$1,267	$157,142	$189,974

Note: Share value estimates are based on average 2019 share prices per pound.
Source: NMFS SERO IFQ database accessed 2/19/2020).

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 RG 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 RG shares was harvested, economic profits from those landings would be expected to be about $19.4 million, with the bulk of those profits (79%) arising from the harvest of RS while RG would only account for about 9%. Although one account would be expected to earn about $1.1 million in short-term profits, if the account holders with RG shares retain their initial annual allocations, the average short-term profit per account would only be expected to be around $39,000.[21] Realized value in the form of actual annual

[21] "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.

revenue and profits is likely less from RG allocation and other allocation in the GT-IFQ program as quota utilization for those species is typically well below 100% in those categories (68% for RG in 2019). Thus, annual profit from the sale of RG allocation is more likely to be around $1.24 million in total and $2,500 per business on average.

Table 3.3.1.14. Potential market value of annual allocation in 2020 for all accounts with RG shares (2019$).

Statistic	DWG	RG	GG	SWG	TF	RS	All
Maximum	$158,101	$75,488	$18,597	$51,175	$13,732	$1,059,487	$1,089,420
Total	$952,488	$1,768,227	$746,418	$348,587	$281,415	$15,331,465	$19,428,601
Mean	$1,924	$3,572	$1,508	$704	$569	$30,973	$39,250

Note: Annual allocation market value estimates are based on average 2019 allocation prices.
Source: NMFS SERO IFQ database accessed 2/11/2020)

The information in Table 3.3.1.14 reflects the potential market value of allocation based on 2019 allocation prices and commercial quotas. However, with the exception of RS allocation, allocation prices for other share categories have declined over the past 5 years, as illustrated in Table 3.3.1.15. Specifically, RG and GG allocation prices have declined by 49% and 58% during this time. The decline in the RG allocation price is most likely due to the significant commercial quota increase in late 2016. The declines for DWG and TF allocation prices have been less, but are still noticeable. If these trends continue, then the estimate in Table 3.3.1.14 may overestimate the market value of these allocations in 2020. Conversely, RS allocation price has increased by more than 14%. 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 2020. Compared to conditions in 2015, RG allocation currently represent a far smaller percentage of an RG share account holder's allocation portfolio, which was around 29% 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, 2015-2019 (2019$).

Share category	2015	2016	2017	2018	2019
RS	$3.31	$3.41	$3.46	$3.46	$3.69
RG	$1.15	$0.95	$0.44	$0.33	$0.59
GG	$2.03	$1.47	$1.51	$1.03	$0.85
DWG	$1.26	$1.23	$1.23	$1.01	$1.05
SWG	$0.64	$0.59	$0.60	$0.54	$0.59
TF	$0.83	$0.71	$0.75	$0.73	$0.72

Source: IFQ database accessed 2/11/2020.

Similar to shares, annual allocation tends to be "unconcentrated" across accounts. According to GMFMC (2018), concentration is low across all share categories combined and for most share categories, with the exception of TF which is typically "moderately concentrated." Also, concentration of annual allocation is the lowest at the beginning of each year, when it is based on the distribution of shares. Concentration in all categories is seasonal and increases as the year progresses or stabilizes in the 3rd or 4th quarter, but the markets are still largely "unconcentrated"

with the exception of TF. But even at moderate levels of concentration, there is no evidence of market power being exercised in any of the markets for annual allocation (i.e., markets for annual allocation are competitive).

Table 3.3.1.16 provides statistics regarding the value of the allocation held by the 260 businesses that possess RG shares and at least one permit. Information in this table again reflects that these businesses control just over 84% of the total value of RG allocation. The largest RG allocation value controlled by a single business with a permit is worth almost $111,000, while the average value of RG allocation held by a business with a permit is just over $5,700. 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% (70% in 2019). Thus, annual profit for these businesses from the sale of RG allocation is more likely to be around $1.04 million in total and $4,000 per business on average.

Table 3.3.1.16. Allocation value statistics for businesses with RG shares and permitted vessels, February 19, 2020 (2019$).

Statistic	DWG	RG	GG	SWG	TF	RS	All
Maximum	$212,016	$110,842	$30,784	$15,909	$61,778	$1,299,365	$1,334,171
Total	$844,419	$1,489,731	$610,640	$239,049	$331,691	$12,852,621	$16,368,151
Mean	$3,248	$5,730	$2,349	$919	$1,276	$49,433	$62,954

Note: Allocation value estimates are based on average 2019 allocation prices per pound.
Source: NMFS SERO IFQ database accessed 2/19/2020.

Table 3.3.1.17 provides statistics regarding the value of the allocation held by the 176 businesses that possess shares but are not associated with a permit. Information in this table again reflects that these businesses control about 16% of the total value of RG allocation. The largest allocation value controlled by a single business without a permit is worth almost $278,500, while the average value of allocation held by a business without a permit is almost $1,600. 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% (70% in 2019). Thus, annual profit for these businesses from the sale of RG allocation is more likely to be around $195,000 in total and $1,100 per business on average.

Table 3.3.1.17. Allocation value statistics for businesses with RG shares but no permitted vessels, February 19, 2020 (2019$).

Statistic	DWG	RG	GG	SWG	TF	RS	All
Maximum	$21,406	$30,892	$18,597	$4,758	$4,761	$600,636	$603,859
Total	$108,069	$278,496	$135,778	$42,365	$16,897	$2,478,844	$3,060,450
Mean	$614	$1,582	$771	$241	$96	$14,084	$17,389

Note: Allocation value estimates are based on average 2019 allocation prices per pound.
Source: NMFS SERO IFQ database accessed 2/19/2020.

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, 2018).

Table 3.3.1.18. Potential ex-vessel value of annual allocation in 2020 for accounts with RG shares (2019$).

Statistic	DWG	RG	GG	SWG	TF	RS	All
Maximum	$844,710	$675,549	$132,149	$129,408	$204,699	$1,516,014	$2,057,576
Total	$5,089,010	$15,824,137	$5,303,960	$2,651,974	$1,394,349	$21,937,706	$52,201,137
Mean	$10,281	$31,968	$10,715	$5,358	$2,817	$44,319	$105,457

Note: Potential ex-vessel value estimates are based on 2019 average ex-vessel prices.
Source: NMFS SERO IFQ database accessed 2/11/2020).

The information in Table 3.3.1.18 reflects the potential ex-vessel value of allocations in 2020 based on 2019 ex-vessel prices and commercial quotas in 2020. Again, realized ex-vessel value will likely be less for RG 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, with the exception of TF, and RS to some extent, ex-vessel prices at the share category level have steadily increased from 2015 through 2019. For example, ex-vessel prices for gag, SWG, DWG, and TF have increased by 11%, 12%, 13%, and 13%, respectively. Although not shown here, this increase is also seen at the individual species level within the DWG, SWG, and TF categories, with the exception of yellowmouth grouper in the SWG category, which declined by 9%, and goldface tilefish in the TF category, which declined by 10%. The ex-vessel price for RS has only increased by 2%, and that increase almost entirely occurred in 2019. The ex-vessel price for RG has increased by almost 26%. 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.[22]

[22] Preliminary information suggests that the recent pandemic has caused ex-vessel prices for most IFQ species to decline, thus reversing the previous trend. As effects on allocation prices have not yet been determined, whether it is currently more profitable for IFQ account holders to sell or use allocation for landings purposes is unknown.

Table 3.3.1.19. Average ex-vessel prices by share category, 2015-2019 (2019$).

Share category	2015	2016	2017	2018	2019
RS	$5.18	$5.17	$5.18	$5.19	$5.28
RG	$4.23	$4.26	$4.45	$4.83	$5.31
GG	$5.44	$5.45	$5.47	$5.76	$6.04
DWG	$4.96	$4.91	$4.93	$5.17	$5.61
SWG	$4.95	$4.92	$4.96	$5.30	$5.56
TF	$3.11	$3.12	$3.10	$2.87	$2.88

Source: IFQ database accessed 2/11/2020.

Vessels

The information in Table 3.3.1.20 describes the landings and revenue for vessels that harvested RG in each year from 2014 through 2018, 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, a significant portion came from harvesting non-IFQ species in the Gulf, with a minor amount coming from harvests in the South Atlantic.

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 RG in each year from 2015 through 2018 was relatively stable, ranging between 374 and 384 vessels, with only a small decrease occurring from 2015 to 2016. Contrary to the upward trends for the IFQ fisheries as a whole from 2011 through 2015 (GMFMC 2017b), RG landings and revenue have decreased significantly from 2014 through 2018, with landings falling by 57% and revenue decreasing by 49%. The revenue decrease was slightly less because of the increase in ex-vessel price that occurred during this time. However, not only did revenue from RG landings decrease, so did revenue from other IFQ species and even from non-IFQ species in the Gulf, which declined by about 23% and 26%, respectively. As a result, total revenue for these vessels declined by almost 35% from 2015 through 2018. From 2014 through 2018, RG represented about 46% of these vessels' total revenue on average, suggesting they are relatively dependent on RG.

Table 3.3.1.20. Landings and revenue statistics for vessels harvesting RG by year, 2014-2018 (2019$).

Year	Number of Vessels	Statistic	RG Landings (gw)	RG Revenue	Other IFQ Revenue	Gulf Non-IFQ Revenue	South Atlantic Revenue	Total Revenue
2014	384	Maximum	149,013	$612,691	$2,384,847	$300,104	$120,440	$2,387,842
		Total	5,497,993	$22,461,241	$24,116,831	$7,903,415	$581,764	$55,063,252
		Mean	14,318	$58,493	$62,804	$20,582	$1,515	$143,394
2015	376	Maximum	102,900	$430,908	$900,697	$287,607	$112,904	$949,740
		Total	4,665,528	$19,690,531	$21,836,770	$6,111,639	$530,598	$48,169,538
		Mean	12,408	$52,368	$58,077	$16,254	$1,411	$128,110

Year	Number of Vessels	Statistic	RG Landings (gw)	RG Revenue	Other IFQ Revenue	Gulf Non-IFQ Revenue	South Atlantic Revenue	Total Revenue
2016	375	Maximum	113,282	$471,797	$1,070,173	$242,494	$99,390	$1,081,789
		Total	4,484,476	$18,899,691	$21,676,244	$7,403,384	$568,194	$48,547,514
		Mean	11,959	$50,399	$57,803	$19,742	$1,515	$129,460
2017	374	Maximum	92,586	$416,127	$1,024,611	$216,904	$149,465	$1,031,572
		Total	3,319,928	$14,675,817	$18,159,067	$6,717,016	$606,509	$40,158,409
		Mean	8,877	$39,240	$48,554	$17,960	$1,622	$107,375
2018	376	Maximum	64,498	$312,486	$1,033,603	$190,863	$107,512	$1,038,980
		Total	2,361,280	$11,367,060	$18,456,902	$5,809,073	$440,279	$36,073,314
		Mean	6,280	$30,232	$49,088	$15,450	$1,171	$95,940

Source: NMFS SERO IFQ database accessed 2/19/2020 and SEFSC Socioeconomic Panel (Version 10).

It is counterintuitive that the fleet size would remain stable given such declines, and this result deserves further research. Nonetheless, these findings 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). Further, these declines occurred even though the RG commercial quota increased from 5.63 mp in 2014 to 7.78 mp by late 2016, and remained at that level through 2018. Also, the RS commercial quota increased from approximately 5.054 mp gw in 2014 to 6.312 mp gw through mid-2017, and remained at that level through 2018. Landings and revenue would be expected to increase, likely significantly, with such increases under stable biological and economic conditions. Thus, it is clear that biological and/or economic conditions for red grouper, and the reef fish fishery as a whole, are not stable.

The maximum annual gross revenue earned by a single vessel during this time was about $2.39 million (2019$) in 2015, though the average gross revenue per vessel was only about $143,000 that year. Similar to the trends in total revenue for RG vessels, these values had decreased to $1.04 million and about $96,000 by 2018, representing a 33% decline in total revenue per vessel. Average red grouper landings and revenue per vessel also decreased from 14,318 lbs and $58,493 to 6,280 lbs and $30,232 per vessel or by about 56% and 45%, respectively.

Estimates of economic returns have not been available historically for the commercial sector of the Gulf reef fish fishery. Recent reports (Overstreet, Perruso, and Liese 2017, Overstreet and Liese 2018a, and Overstreet and Liese 2018b) provided the first such estimates. These estimates are specific to economic performance in 2014, 2015 and 2016, respectively. Overstreet and Liese (2018b) also provides average estimates of economic returns across 2014-2016, which are the most useful for current purposes, and thus findings from that report are summarized below. Given the declines in landings and revenue for RG vessels discussed above, it is quite likely that economic returns were likely different by 2018 than they were in 2016, and thus the estimates below should be used with some caution. However, some of the findings for 2014-2016 seem to be consistent with the results above for 2014-2016.

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), species group (e.g., Jacks), and/or gear-level (e.g., longline). 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 RG.

From an economic returns perspective, the two 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[23] (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 red grouper trips, i.e., trip net cash flow and trip net revenue as a percentage of trip revenue. As shown in this table, 30%, 18%, and 18% (or 67% 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 33% was net cash flow back to the owner(s). The margin associated with trip net revenue was higher at 44%. Thus, trip cash flow and trip net revenue were both positive on average from 2014 through 2016, generally indicating that red grouper 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 RG landings from 2014 through 2016. Similar to the trip level, the three most important estimates of economic returns are net cash flow, net revenue from operations,[24] and economic return on asset value. Of these measures, net revenue from operations most closely represents economic profits to the owner(s). 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. 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

[23] 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). Total PS in a market or industry is measured by the difference between total gross revenue and total variable costs. PS is a measure of net economic benefits to producers.

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

vessel's depreciation. Economic return on asset value is calculated by dividing the net revenue from operations by the vessel value.

Table 3.3.1.21. Economic characteristics of RG trips 2014-2016 (2019$).

	2014	2015	2016	Average
Number of Observations	829	1,066	1,228	
Response Rate (%)	78%	85%	94%	
SOI Trip				
Owner-Operated	68%	62%	64%	64.7%
Fuel Used per Day at Sea (gallons/day)	41	39	37	39
Total Revenue	100%	100%	100%	100%
Costs (% of Revenue)				
Fuel	8%	6.3%	5.1%	6.5%
Bait	3.7%	4%	4.1%	3.9%
Ice	1.5%	1.6%	1.7%	1.6%
Groceries	3%	3.2%	4.1%	3.4%
Miscellaneous	2.2%	3%	3.5%	2.9%
Hired Crew	30%	31%	30%	30.3%
IFQ Purchase	15.4%	21.8%	17.7%	18.3%
OC Owner-Captain Time	7.5%	6.9%	8.1%	7.5%
Trip Net Cash Flow	36%	29%	34%	33%
Trip Net Revenue	44%	44%	43%	44%
Labor - Hired & Owner	37%	38%	38%	37.7%
Fuel & Supplies	18%	18%	19%	18%
Input Prices				
Fuel Price (per gallon)	$4.06	$2.93	$2.28	$3.10
Hire Crew Wage (per crew-day)	$313	$292	$257	$288
Productivity Measures				
Landings/Fuel Use (lbs./gallon)	11.9	10.5	9.7	11
Landings/Labor Use (lbs./crew-day)	183	160	140	161

Net cash flow and net revenue from operations at the annual vessel level were both positive from 2014-2016, generally indicating that RG vessels in the commercial sector were profitable, though some vessels earned much greater profits than others. More specifically, net cash flow and net revenue from operations averaged 24% and 39%, respectively, while the economic return on asset value was approximately 40% during this time.

Overstreet and Liese (2018b) only provide estimates of economic returns from 2014 through 2016, and thus it cannot be used to assess how economic returns and related measures have changed since the implementation of the IFQ programs. However, Liese (SEFSC, pers. comm., 2017) has conducted an analysis that compares economic returns and related measures in 2006 and 2014, and thus examines how they have changed since the implementation of the GT and RS-IFQ programs. Because of the years chosen, the changes in economic performance indicated by these results can only, at best, be attributed to the combination of the two IFQ programs as opposed to one or the other. Also, these results apply to all trips that landed Gulf reef fish species as opposed to landings of species managed under one or both of the IFQ programs. Further, as these results are preliminary, only a generally qualitative overview can be provided.

Table 3.3.1.22. Economic characteristics of RG vessels from 2014-2016 (2019$).

	2014	2015	2016	Average
Number of Observations	66	81	97	
Response Rate (%)	65%	78%	84%	
SOI Vessel				
Owner-Operated	75%	66%	79%	73%
For-Hire Active	6%	19%	11%	12%
Vessel Value	$135,478	$105,527	$80.428	$107,144
Total Revenue	100%	100%	100%	100%
Costs (% of Revenue)				
Fuel	8.2%	7.6%	6.8%	7.5%
Other Supplies	10.6%	11.1%	13.2%	11.6%
Hired Crew	26.5%	29.4%	26.5%	27.5%
Vessel Repair & Maintenance	7.2%	8.6%	9.1%	8.3%
Insurance	0.5%	1.1%	0.9%	0.8%
Overhead	4.2%	6.3%	5.8%	5.4%
Loan Payment	0.9%	1.8%	1.3%	1.3%
IFQ Purchase	11.4%	15.4%	14.9%	13.9%
OC Owner-Captain Time	5.6%	5.6%	7.1%	6.1%
Net Cash Flow	30%	19%	22%	24%
Net Revenue for Operations	33%	27%	27%	29%
Depreciation	3.8%	3.7%	3.3%	3.6%
Fixed Costs	12%	16%	16%	15%
Labor - Hired & Owner	32%	35%	34%	34%
Fuel & Supplies	19%	19%	20%	19%
Economic Return (on asset value)	44.2%	36%	41%	40.4%

First, effort in the commercial sector of the fishery has decreased significantly according to multiple measures. Specifically, the number of vessels, trips, and days at sea decreased by 31%, 38%, and 28%, respectively, between 2006 and 2014. At the same time, landings of Gulf reef fish were relatively unchanged, decreasing by about 4% during that time. Thus, output per unit of input (one measure of productivity) has increased significantly since the IFQ programs were implemented. Further, even though landings have remained about the same, the average ex-vessel price of Gulf reef fish landings increased by 20% during this time, resulting in a 16% increase in total annual revenues from these landings.

Because productivity increased, costs decreased. Specifically, crew costs decreased by 6%, other variable costs (supplies, fuel, etc.) decreased by 33%, and fixed costs decreased by 19%. The decrease in crew costs was driven by a decrease in crew days of 26%, as crew compensation per day actually increased by 24% (i.e., the amount of labor used decreased somewhat significantly, but "wages" increased somewhat significantly as well). Similarly, even though fuel prices increased by 25%, a 49% decrease in fuel usage was the primary driver of the decline in other variable costs. In addition, the opportunity costs associated with the owner's labor time and capital invested in the vessel decreased by 16% and 31%, respectively.

Because costs decreased, significantly lower percentages of the total revenues had to be used to cover these costs, in turn resulting in much higher economic returns and margins. Net cash flow to the owner(s) increased by more than 300% while net revenue from operations increased by more than 400%. Trip net revenue as a percentage of total trip revenue increased by 94% while, at the vessel level, net revenue from operations as a percentage of total revenues increased by 180%. While such increases may appear to be exorbitant, it must be kept in mind that, in 2006, net cash flows were only slightly above the break-even point and net revenues from operations were negative (i.e., commercial reef fish levels were earning economic losses on average).

Dealers

The information in Table 3.3.1.23 illustrates the purchasing activities of dealers that bought RG landings from vessels from 2014 through 2018.[25] Like vessels, dealer participation in the RG component of the GT-IFQ program is fluid and not all dealers purchased RG in each year during this time. Unlike the number of vessels harvesting RG during this time, the number of dealers that purchased RG landings steadily decreased from 110 in 2014 to 89 in 2018, or by 19%, with an average of 101 dealers purchasing RG landings each year.

Table 3.3.1.23. Dealer statistics for dealers that purchased RG landings by year, 2014-2018. All dollar estimates are in 2019$.

Year	Number Dealers	Statistic	RG Purchases	Other IFQ Purchases	Gulf Non-IFQ Purchases	South Atlantic Purchases	Total Purchases
2014	110	Maximum	$4,194,263	$3,522,317	$4,122,768	$4,128,319	$7,400,909
		Total	$22,771,884	$22,999,036	$39,753,737	$16,730,832	$102,255,489
		Mean	$207,017	$209,082	$361,398	$152,098	$929,595
2015	107	Maximum	$3,342,217	$7,737,791	$3,651,599	$3,406,249	$8,412,438
		Total	$20,133,195	$29,815,086	$38,083,517	$12,362,712	$100,394,510
		Mean	$188,161	$278,646	$355,921	$115,539	$938,266
2016	101	Maximum	$3,717,521	$9,873,515	$8,079,619	$3,848,256	$10,541,374
		Total	$18,874,947	$32,555,979	$44,293,742	$16,839,568	$112,564,236
		Mean	$186,881	$322,336	$438,552	$166,728	$1,114,497
2017	96	Maximum	$2,794,976	$8,060,687	$6,374,817	$5,151,898	$8,741,043
		Total	$14,655,988	$26,557,008	$41,215,887	$23,485,925	$105,914,808
		Mean	$152,667	$276,635	$429,332	$244,645	$1,103,279
2018	89	Maximum	$1,615,223	$2,592,992	$6,247,425	$4,403,264	$8,219,395
		Total	$11,343,604	$19,471,016	$42,731,861	$20,120,140	$93,666,621
		Mean	$127,456	$218,775	$480,133	$226,069	$1,052,434

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

In addition, although the trend in purchases of RG landings by dealers necessarily mimics the trend in RG vessel revenues, the trends in purchases of other IFQ species as well non-IFQ species in the Gulf and South Atlantic do not mirror the trends for vessels. For example,

[25] 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 RG compared to the IFQ data due to waterbody code assignment issues in the Keys.

purchases of other IFQ landings in the Gulf by RG dealers increased significantly (over 41%) from 2014 through 2016. Further, purchases of non-IFQ species in the Gulf also increased by 11% during this time. These increases generally reflect increases in the commercial quotas for other species. Thus, even though purchases of RG were declining, the value of all the RG dealers' purchases increased.

However, these trends did not continue after 2016 as purchases of other IFQ and non-IFQ species in the Gulf declined in addition to the continuing decline of RG purchases. Greater purchases of landings from the South Atlantic partially offset these declines, but the total value of the RG dealers' purchases declined by 17% from 2016 through 2018. Still, this decline is less than the decline in revenues experienced by RG vessels, reflecting the greater diversity in the purchasing portfolios of RG dealers, which in turn allowed them to be more flexible and adaptive to changes in the RG component of the GT-IFQ program. In combination with the decline in the number of RG dealers, the average value of purchases per RG dealer actually increased by 13% from 2014 through 2018, unlike the RG vessels which experienced a noticeable decline in their average total revenue per vessel during this time.

On average, purchases of RG represented approximately 17% of all seafood purchases by RG dealers during this time, which suggests some dependency on RG purchases but is far less than the percentage of revenue RG represents for commercial vessels (46%). Further, their dependency on RG purchases steadily declined from 2014 through 2018, as RG purchases accounted for 22% of their total seafood purchases in 2014 but only 12% of their total seafood purchases in 2018. This decline in dependence occurred before the commercial quota reduction in 2019, which likely decreased their dependence on RG purchases even more. In addition, as suggested above, 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. Also, although Keithly and Wang (2018) estimate the mark-ups between the ex-vessel price and dealer sales price for RG and certain other grouper and tilefish species, those estimates are insufficient to estimate PS or profit for RG 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 taken into account. NMFS does not have estimates of those other costs for RG dealers, or seafood dealers more broadly, and thus does not have estimates of net cash flow or net revenue from operations for RG dealers comparable to those in the commercial harvesting sector. Thus, while it is likely that the harvest of RG generates some PS and profit for RG dealers, NMFS does not possess the data to estimate PS and profit and, because of their ability to switch to purchasing other species, changes to those values as a result of the management measures considered in this amendment are likely to be relatively small. Similarly, any additional PS and profit generated from RG 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.

Imports

Imports of seafood products compete in the domestic seafood market and have in fact dominated many segments of the 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 have downstream effects on the local fish market. At the harvest level for red grouper, imports affect the returns to fishermen through the ex-vessel prices they receive for their landings. As substitutes to domestic production of reef fish, 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 which directly compete with domestic harvest of red grouper. All monetary estimates are in 2019 dollars.

Total imports of snapper increased significantly (36%) from 2014 through 2016, increasing from about 33 mp product weight (pw) to 45 mp pw during this time. However, snapper imports declined slightly thereafter to about 43 mp pw in 2018. Revenue from snapper imports followed a similar pattern, increasing from almost $105 million in 2014 to $136 million in 2016, but then falling to about $134 million in 2018. Although the average price per pound fluctuated somewhat between 2014 and 2018, moving inversely to volume, it generally vacillated around $3.05/lbs. Imports of fresh snapper increased steadily from 23.6 mp pw in 2014 to 31.2 mp pw in 2017, before declining slightly to 31.2 mp pw in 2018. Total revenue from fresh snapper imports increased from $78 million in 2014 to an all-time high of $98.5 million in 2018. The average price decreased from $3.32/lbs. to $3/lbs between 2014 and 2017 as volume increased, but rose to $3.21/lbs in 2018 when volume declined. Imports of fresh snappers primarily originated in Mexico, Panama, and Nicaragua, and entered the U.S. through the port of Miami. Imports of frozen snapper were substantially less than imports of fresh snapper from 2014 through 2018. Frozen snapper imports ranged from 9.3 mp pw worth $26.5 million in 2014 to 14.4 mp pw worth $40.2 million in 2018. The average price fluctuated around $2.85/lbs during this time. Imports of frozen snapper primarily originated in Brazil. The majority of frozen snapper imports entered the U.S. through the ports of Miami and New York.

Total imports of grouper increased significantly (64%) from 10.4 mp pw in 2014 to 17.1 mp pw in 2018. Total revenue from grouper imports also increased significantly (43%) from $42.3 million to $60.3 million during this time period. Revenue from grouper imports did not increase as significantly as the volume due to a 15% decrease in the average price per pound of grouper imports. Imports of frozen grouper were minimal from 2014 through 2016, decreasing from 1.75 mp pw in 2014 to only 0.81 mp pw in 2016. However, frozen grouper imports increased significantly in 2018, up to 4.6 mp pw. As a result, frozen grouper composed 27% of total grouper imports in 2018 compared to only 17% in 2014. Further, the average price per pound of frozen imports decreased significantly, from $2.67/lbs to only $1.27/lbs between 2015 and 2018. Similarly, total revenue from frozen grouper decreased from $3.8 million to $1.5 million from 2014 to 2016, but then increased to $5.8 million in 2018. The decline in the average price of frozen grouper in combination with frozen product making up a higher proportion of total imports explains why revenue from grouper imports, frozen and in total, did not increase as significantly as volume from 2014 through 2018. The volume and revenue from fresh grouper imports also increased from 2014 through 2018, increasing from 8.6 mp pw and $38.5 million in 2014 to 12.5 mp pw and $54.5 million in 2018, respectively. Average price was relatively stable

at around $4.38/lbs. Thus, the price premium attached to fresh grouper relative to frozen grouper is much greater than the premium attached to fresh snapper compared to frozen snapper. The bulk of fresh and frozen grouper imports originated in Mexico and entered the U.S. through Miami and Tampa.

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.

Table 3.3.1.24. Average annual economic impacts of red grouper in the commercial sector of the Gulf reef fish fishery. All monetary estimates are in thousands of 2019 dollars and employment is measured in full-time equivalent jobs.

Harvesters	Direct	Indirect	Induced	Total
Employment impacts	382	59	79	520
Income impacts	$9,405	$1,746	$4,222	$15,373
Total value-added impacts	$10,025	$6,286	$7,224	$23,535
Output Impacts	$17,419	$14,172	$14,025	$45,615
Primary dealers/processors	**Direct**	**Indirect**	**Induced**	**Total**
Employment impacts	80	32	55	167
Income impacts	$3,069	$2,828	$2,675	$8,571
Total value-added impacts	$3,271	$3,608	$5,036	$11,915
Output impacts	$9,876	$7,439	$9,843	$27,159
Secondary wholesalers/distributors	**Direct**	**Indirect**	**Induced**	**Total**
Employment impacts	37	8	36	81
Income impacts	$1,828	$544	$1,923	$ 4,294
Total value-added impacts	$1,949	$912	$3,284	$ 6,145
Output impacts	$4,896	$1,785	$6,387	$13,068
Grocers	**Direct**	**Indirect**	**Induced**	**Total**
Employment impacts	158	18	35	211
Income impacts	$3,760	$1,249	$1,887	$6,897
Total value-added impacts	$4,008	$2,013	$3,195	$9,217
Output impacts	$6,427	$3,270	$6,273	$15,970
Restaurants	**Direct**	**Indirect**	**Induced**	**Total**
Employment impacts	986	66	161	1,213
Income impacts	$15,085	$4,575	$8,641	$28,300
Total value-added impacts	$16,080	$8,178	$14,558	$38,816
Output impacts	$29,402	$12,797	$28,728	$70,927
Harvesters and seafood industry	**Direct**	**Indirect**	**Induced**	**Total**
Employment impacts	1,643	183	366	2,191
Income impacts	$33,146	$10,942	$19,348	$63,436
Total value-added impacts	$35,332	$20,998	$33,298	$89,628
Output impacts	$68,020	$39,463	$65,256	$172,740

Estimates of the U.S. average annual business activity associated with the commercial harvest of red grouper in the Gulf were derived using the model developed for and applied in NMFS (2018b)[26] and are provided in Table 3.3.1.24. Specifically, these impact estimates reflect the expected impacts from average annual gross revenues generated by landings of Gulf red grouper from 2014 through 2018. 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.

[26] A detailed description of the input/output model is provided in NMFS (2011).

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 red grouper are not available. Between 2014 and 2018, landings of Gulf red grouper resulted in approximately $17.42 million (2019$) in gross revenue on average. In turn, this revenue generated employment, income, value-added, and output impacts of 2,191 jobs, $63.4 million, $89.6 million, and $172.7 million per year, respectively, on average.

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

Private vessels accounted for the majority of red grouper landings on average (2014 through 2018), followed by charter vessels and headboats, with no recorded landings from shore (Table 3.3.2.1). Charter vessels were responsible for an increasingly higher percentage of red grouper landings during this period, accounting for only 11% of the landings in 2014 but 20% and 18% of the landings in 2017 and 2018, respectively. Although not shown in the table, approximately 99.7% of red grouper landings on average were recorded in the state of Florida.[27] 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.

Landings in the recreational sector largely mirror the downward trend seen in the commercial sector from 2014-2018, with the exception of a relatively small increase (21%) in 2018. However, landings in 2018 were still 62% below their level in 2014, which is very similar to the reduction in the commercial sector. Significant reductions were experienced in all modes, though the largest reduction in absolute and percentage terms was in the private angling mode (65%). A portion of the decrease in landings over this time is due to the reduction in the bag limit from four fish to two fish per person per day in May 2015, but the at least some of the decrease is likely due to the declining health of the stock.

[27] Prior to 2013, Northwest Florida and Alabama headboat landings were reported together so it is not possible to disaggregate them.

Table 3.3.2.1. Recreational landings (lbs gw) and percent distribution of red grouper across all states by mode for 2014-2018.

	Landings (pounds gw)					Percent Distribution			
	Charter vessel	**Headboat**	**Private**	**Shore**	**Total**	**Charter vessel**	**Headboat**	**Private**	**Shore**
2014	586,714	45,107	4,737,128	0	5,368,949	11%	1%	88%	0%
2015	500,305	50,621	3,239,928	0	3,790,853	13%	1%	85%	0%
2016	406,088	56,851	2,169,801	0	2,632,740	15%	2%	82%	0%
2017	342,871	21,423	1,328,134	0	1,692,428	20%	1%	78%	0%
2018	362,101	22,310	1,669,115	0	2,053,526	18%	1%	81%	0%
AVG	**439,616**	**39,262**	**2,628,821**	**0**	**3,107,699**	**14%**	**1%**	**85%**	**0%**

Source: Southeast Fisheries Science Center MRIP-FES recreational ACL dataset (1/2/2020) and LA Creel.

Angler Effort

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 red grouper occurred in Florida from 2014 through 2018 (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. Although there were a small number of red grouper target and catch trips estimated for the shore mode, there were no actual landings reported from 2014 through 2018, suggesting only discards were encountered. The trend in total target effort was very similar to the trend in total landings, decreasing by 44% from 2014 through 2018. However, target effort in the charter mode only fell by about 13%. Catch effort also consistently decreased in total and by mode from 2014 through 2016, but increased in the private angling mode in 2017 and 2018. Thus, the reduction in catch effort was relatively less (21%) from 2014 through 2018, though catch effort in the charter mode fell by 36%. Estimates of red grouper target or catch

effort for additional years, and other measures of directed effort, are available on the NOAA website.[28]

Table 3.3.2.2. Number of red grouper recreational target trips, by mode and state, 2014-2018.*

Mode	Year	Alabama	Florida	Total
Shore	2014	0	79,563	79,563
	2015	0	0	0
	2016	0	22,513	22,513
	2017	0	0	0
	2018	0	44,346	44,346
	Average	0	29,284	29,284
Charter	2014	0	40,144	40,144
	2015	0	44,460	44,460
	2016	0	51,275	51,275
	2017	0	33,915	33,915
	2018	0	34,797	34,797
	Average	0	40,918	40,918
Private	2014	0	703,390	703,390
	2015	0	493,326	493,326
	2016	0	443,244	443,244
	2017	1,470	281,783	283,253
	2018	0	380,124	380,124
	Average	294	460,373	460,677
All	2014	0	823,098	823,098
	2015	0	537,786	537,786
	2016	0	517,032	517,032
	2017	1,470	315,699	317,169
	2018	0	459,267	459,267
	Average	294	530,576	530,870

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

* Headboat information is unavailable. Louisiana 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.

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

Table 3.3.2.3. Number of red grouper recreational catch trips, by mode and state, 2014-2018.*

Mode	Year	Alabama	Florida	Total
Shore	2014	0	12,246	12,246
	2015	0	33,439	33,439
	2016	0	18,563	18,563
	2017	0	38,470	38,470
	2018	0	15,177	15,177
	Average	0	23,579	23,579
Charter	2014	124	134,904	135,028
	2015	2,083	125,388	127,471
	2016	2,053	141,114	143,167
	2017	1,762	102,737	104,499
	2018	187	86,800	86,987
	Average	1,242	118,189	119,430
Private	2014	5,182	1,201,577	1,206,759
	2015	2,169	894,001	896,170
	2016	0	751,858	751,858
	2017	3,666	754,646	758,312
	2018	7,723	957,299	965,022
	Average	3,748	911,876	915,624
All	2014	5,306	1,348,727	1,354,033
	2015	4,252	1,052,828	1,057,080
	2016	2,053	911,535	913,588
	2017	5,428	895,853	901,281
	2018	7,910	1,059,276	1,067,186
	Average	4,990	1,025,421	1,058,625

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

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

As shown in Tables 3.3.2.4 and 3.3.2.5, across all modes, target and catch effort was the highest in the 4th (July-Aug) and 3rd (May-June) waves. Target effort is the lowest in wave 6 (Nov-Dec) 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 4 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 red grouper target trips by wave and mode, 2014 – 2018.*

	1 (Jan-Feb)	2 (Mar-Apr)	3 (May-Jun)	4 (Jul-Aug)	5 (Sep-Oct)	6 (Nov Dec)	Total
	Shore						
2014	0	32,901	8,659	38,003	0	0	79,563
2015	0	0	0	0	0	0	0
2016	0	0	0	0	0	22,513	22,513
2017	0	0	0	0	0	0	0
2018	0	0	0	44,346	0	0	44,346
Average	0	6,580	1,732	16,470	0	4,503	29,285
	Charter						
2014	6,266	5,440	8,317	9,776	9,607	736	40,144
2015	6,926	10,765	14,007	10,016	2,277	469	44,460
2016	11,488	7,134	15,384	7,302	3,329	6,639	51,275
2017	5,826	3,155	9,327	8,646	1,615	5,345	33,915
2018	6,529	3,783	17,217	1,907	2,957	2,404	34,797
Average	7,407	6,055	12,850	7,530	3,957	3,119	40,918
	Private/Rental						
2014	40,458	68,852	155,561	342,796	52,558	43,165	703,390
2015	73,196	47,748	135,343	181,621	40,374	15,044	493,326
2016	78,235	54,576	89,379	101,146	72,121	47,787	443,244
2017	15,120	33,740	59,038	86,551	30,233	58,570	283,253
2018	39,119	67,214	70,317	98,735	50,903	53,837	380,124
Average	49,226	54,426	101,928	162,170	49,238	43,681	460,668
	All						
2014	46,725	107,193	172,538	390,575	62,166	43,901	823,098
2015	80,122	58,513	149,350	191,637	42,651	15,513	537,786
2016	89,722	61,710	104,763	108,448	75,450	76,939	517,032
2017	20,947	36,895	68,366	95,198	31,848	63,915	317,169
2018	45,648	70,996	87,535	144,988	53,859	56,241	459,267
Average	56,633	67,062	116,510	186,169	53,195	51,302	530,870

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

* Texas and headboat information unavailable. Louisiana effort estimates are not currently available. However, landings were negligible and thus target effort is likely zero.

Table 3.3.2.5. Number of red grouper catch trips by wave and mode, 2014 – 2018.*

	1 (Jan-Feb)	2 (Mar-Apr)	3 (May-Jun)	4 (Jul-Aug)	5 (Sep-Oct)	6 (Nov Dec)	Total
	Shore						
2014	0	2,585	0	0	0	9,661	12,246
2015	0	24,580	5,230	0	3,629	0	33,439
2016	0	0	16,658	0	1,906	0	18,563
2017	0	4,921	0	26,137	0	7,806	38,865
2018	0	15,177	0	0	0	0	15,177
Average	0	9,453	4,378	5,227	1,107	3,493	23,658
	Charter						
2014	15,529	23,143	36,296	37,648	13,643	8,769	135,028
2015	10,565	37,494	36,151	28,297	8,560	6,405	127,471
2016	22,832	19,559	51,443	26,243	11,157	11,934	143,168
2017	22,274	12,394	24,913	17,482	5,243	22,193	104,499
2018	18,346	11,500	39,557	8,645	3,223	5,717	86,987
Average	17,909	20,818	37,672	23,663	8,365	11,004	119,431
	Private/Rental						
2014	44,011	181,549	215,978	519,085	72,589	173,548	1,206,760
2015	93,354	75,375	178,400	272,836	142,895	133,309	896,170
2016	91,774	57,198	199,822	212,818	88,587	101,660	751,858
2017	48,708	84,566	222,760	157,890	45,657	198,293	757,874
2018	73,295	129,137	278,331	233,233	178,261	72,764	965,022
Average	70,228	105,565	219,058	279,172	105,598	135,915	915,537
	All						
2014	59,540	207,277	252,274	556,733	86,232	191,978	1,354,034
2015	103,919	137,449	219,781	301,133	155,084	139,714	1,057,080
2016	114,606	76,757	267,923	239,061	101,650	113,594	913,589
2017	70,982	101,881	247,673	201,509	50,900	228,292	901,238
2018	91,641	155,814	317,888	241,878	181,484	78,481	1,067,186
Average	88,138	135,836	261,108	308,063	115,070	150,412	1,058,625

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

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

Similar analysis of recreational effort is not possible for the headboat mode 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 reef fish trips by intent.

Headboat angler days were fairly stable across the Gulf states from 2014 through 2018 (Table 3.3.2.6). There was, however, a noticeable peak in reported angler days in Florida in 2016 and modest fluctuations elsewhere. On average (2014 through 2018), 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 3.3.2.6. Gulf headboat angler days and percent distribution by state (2014-2018).

	Angler Days				Percent Distribution			
	FL	**AL**	**MS-LA****	**TX**	**FL**	**AL**	**MS-LA**	**TX**
2014	174,599	16,766	3,257	51,231	71.0%	6.8%	1.3%	20.8%
2015	176,375	18,008	3,587	55,135	69.7%	7.1%	1.4%	21.8%
2016	183,147	16,831	2,955	54,083	71.3%	6.5%	1.1%	21.0%
2017	178,816	17,841	3,189	51,575	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%
Average	176,987	17,859	3,245	52,837	70.5%	7.1%	1.3%	21.1%

Source: NMFS Southeast Region Headboat Survey.
**Headboat data from Mississippi and Louisiana are combined for confidentiality purposes.

Permits

There are no specific federal permitting requirements for recreational anglers to fish for or harvest reef fish, including red grouper. Instead, private anglers are required to possess either 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 3.3.2.5. 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 February 27, 2020, there were 1,270 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,[29] 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 Southeast Region Headboat Survey (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.

Table 3.3.2.7. Number of valid or renewable for-hire Gulf reef fish permits, 2008-2019.

Year	Number of Permits
2008	1,458
2009	1,417
2010	1,385
2011	1,353
2012	1,336
2013	1,323
2014	1,310
2015	1,294
2016	1,282
2017	1,280
2018	1,279
2019	1,277

Source: NMFS SERO SF Access Permits Database.

The number of federally permitted Gulf headboats in the SRHS ranged from 68 in 2014 and 2015 to 72 in 2018 (K. Fitzpatrick, SEFSC, pers. comm.). 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.[30] 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.

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.

[29] In 2019, of the 1,277 vessels with valid for-hire permits, 90 were primarily used for commercial fihsish, 83 were primarily used as headboats, and 1,104 were primarily used as charter vessels.
[30] Sample sizes were too small to generate reliable estimates for Gulf and South Atlantic headboats separately.

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. These variables help determine the value of a fishing trip and influence total demand for recreational fishing trips. For example, the estimated value of the CS for catching and keeping a second red snapper[31] on an angler trip is approximately $85 (2019$), and decreases thereafter (approximately $57 for a third red snapper, $42 for a fourth red snapper, and $34 for a fifth red snapper) (Carter and Liese 2012). In comparison, the estimated value of the CS for catching and keeping a grouper is approximately $110 for the second fish, $73 for the third fish, $54 for the fourth fish, and $43 for the fifth fish (Carter and Liese 2012).

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 $271,794 while the average annual gross revenue for a Gulf charter vessel is $89,670 (2019$). 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 $480,000 (2019$). Further, their data suggests average annual gross revenue per vessel had increased to about $580,000 (2019$) 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) recently estimated that average annual gross revenue for Gulf headboats was approximately $427,600 (2019$) in 2017, while the maximum gross revenue for a single headboat was about $1.38 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 2019$, Savolainen et al. (2012) estimated the annual PS for Gulf headboats and charter vessels was approximately $190,167 and $58,990, respectively. Their best estimates of economic profit

[31] The study only considered trips with at least one fish caught and kept in its experimental design; thus, an estimate for the first caught and kept fish is not available.

were $79,340 and $26,514 (2019$), respectively.[32] 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.[33]

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 3.3.2.8, 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 $780 and $1,812 (2019$), respectively. Given the respective average number of anglers per trip for each fleet, PS per trip is estimated to be $141 for charter vessels and $64 for headboats.

Table 3.3.2.8. Trip economics for offshore trips by Gulf charter vessels and Southeast headboats in 2017 (2019$).

	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	$780	$1,812
Average # of Anglers per Trip	5.5	28.2
Trip Net Cash Flow per Angler Trip	$141	$64

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. In the absence of the opportunity to fish, the income would likely 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 economic impacts (business activity) associated with recreational angling for Gulf reef fish were calculated using average trip-level impact coefficients derived from the 2016 Fisheries Economics of the U.S. report (NMFS 2018b)[34] and underlying data provided by the

[32] 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.
[33] 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.
[34] A detailed description of the input/output model is provided in Lovell, S. S. Steinback, and J. Hilger (2013).

NOAA Office of Science and Technology. Economic impact estimates were adjusted to 2018 dollars using the annual, not seasonally adjusted gross domestic product implicit price deflator provided by the U.S. Bureau of Economic Analysis.

Recreational fishing generates economic impacts (business activity). 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 red grouper target effort by mode and state (2014 through 2018) and the associated business activity are provided in Table 3.3.2.9.

Table 3.3.2.9. Estimated economic impacts from average annual Gulf red grouper recreational target trips by state and mode (2014-2018), using state-level multipliers. All monetary estimates are in thousands of 2019$ and employment is in full-time equivalent jobs.*

Mode		FL	AL
Shore	Target Trips	29,284	0
	Value Added Impacts	$1,060	$0
	Sales Impacts	$1,657	$0
	Income Impacts	$558	$0
	Employment (Jobs)	15	0
Charter	Target Trips	40,918	0
	Value Added Impacts	$14,145	$0
	Sales Impacts	$23,754	$0
	Income Impacts	$8,266	$0
	Employment (Jobs)	221	0
Private	Target Trips	460,373	294
	Value Added Impacts	$16,399	$13
	Sales Impacts	$25,418	$20
	Income Impacts	$8,605	$5
	Employment (Jobs)	235	0
All	Target Trips	530,576	294
	Value Added Impacts	$31,605	$13
	Sales Impacts	$50,829	$20
	Income Impacts	$17,430	$5
	Employment (Jobs)	472	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 3.3.2.9 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 2014 and 2018, and using national-level multipliers, red grouper target effort generated employment, income, value-added, and output (sales) impacts of 571 jobs, $27.5 million, $48.6 million, and $85.5 billion per year, respectively, on average. These estimates are considerably less than the economic impacts in GMFMC (2016) based on target effort from 2011-2015, which reflects the significant decline in red grouper target effort after 2015.

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 section provides community background and current descriptions of red grouper fishing for which the proposed actions will be evaluated in Chapter 4. The following description focuses on both the commercial and recreational sector fishing communities that can be identified as having some relationship to the red grouper fishery. Recent amendments, Reef Fish Amendment 36A (GMFMC 2017c) and the Framework Action to Adjust Red Grouper Allowable Harvest (2016), include additional detailed descriptions of both sectors.

3.4.1 Commercial Sector

As mentioned earlier, red grouper is one species in a multispecies IFQ program established through Amendment 29 to the reef fish management plan (GMFMC 2008b) which means that commercial red grouper is required to be landed through IFQ dealers only. The commercial fishing community description is predicated on landings by vessel homeport which provide one perspective on the importance of the species within a community. As mentioned, information on commercial fishing communities was included in the Reef Fish Amendment 36A (GMFMC 2017c) that includes community demographics and discussions of historic participation with the red grouper component of the reef fish fishery.

Another important factor in the harvest of commercial red grouper is the longline endorsement (Reef Fish Amendment 31, 2010a) which requires reef fish bottom longline fishing to be restricted to outside the 35-fathom depth contour from June – August without an endorsement. Some vessels switched gear types to use bandit reels to fish within the restricted area while others either sought to purchase the limited access endorsements or fished further offshore (see GMFMC 2010a for discussion of impacts). Since most red grouper is harvested off the west coast of Florida, the majority of communities that are involved in the fishery are located there and will be discussed in the following description of the commercial sector.

Another recent factor that has affected red grouper harvest are the red tide events that have occurred over the past few years, with red tide affecting the Middle Grounds in 2015 and Southwest Florida in 2018. According to interviews conducted with fishermen (Karnauskas et al., 2019) red tide events seemed shorter and patchier in their appearance from year to year in the past. More recently these events seem to be more widespread and occur for longer periods of time. These events seem to affect red grouper more than other species and have forced fishermen to change fishing behavior by switching to other species or changing their fishing location.

Vessels

As mentioned earlier, the majority of red grouper landings are along the west coast of Florida. That is reflected in Table 3.4.1.1 where the top ten counties with vessels having red grouper landings in 2018 are all in Florida. Pinellas County has the most vessels with landings, while Bay County is second with less than half the number of vessels in Pinellas. Lee County is third, with Franklin County fourth, followed by Manatee County.

Table 3.4.1.1. Number of vessels landing red grouper by top 10 county homeports.

State	County	Vessels
FL	Pinellas	94
FL	Bay	43
FL	Lee	28
FL	Franklin	21
FL	Manatee	17
FL	Monroe	16
FL	Okaloosa	14
FL	Wakulla	13
FL	Citrus	10
FL	Collier	9

Source: IFQ database accessed 2/20/2020 NOAA Fisheries, NMFS, SERO.

The number of vessels with red grouper landings by community (Table 3.4.1.2) shows that Panama City has the most vessels, with Madeira Beach second. Tarpon Springs is third, with Apalachicola fourth, and Key West follows within the top five communities.

Table 3.4.1.2. Number of vessels landing red grouper by top 10 community homeports.

State	Community	Vessels
FL	Panama City	37
FL	Madeira Beach	23
FL	Tarpon Springs	18
FL	Apalachicola	14
FL	Key West	14
FL	Cortez	12
FL	Destin	10
FL	Panacea	8
FL	Fort Myers	8
FL	Crystal River	8

Source: IFQ database accessed 2/20/2020 NOAA Fisheries, NMFS, SERO.

In Figure 3.4.1.1 the regional quotient (RQ) for pounds of red grouper landed is provided for 2018 by county homeport. The RQ is the amount of red grouper landed within a particular geographical location out of all red grouper landed within the region. All of the top ten counties are in Florida as would be expected, in fact the top twenty counties are all in Florida. Pinellas County remains the top county and has been throughout the recent history of the fishery. Manatee County follows in second, with Lee County third, and Franklin and Sarasota rounding out the top five counties.

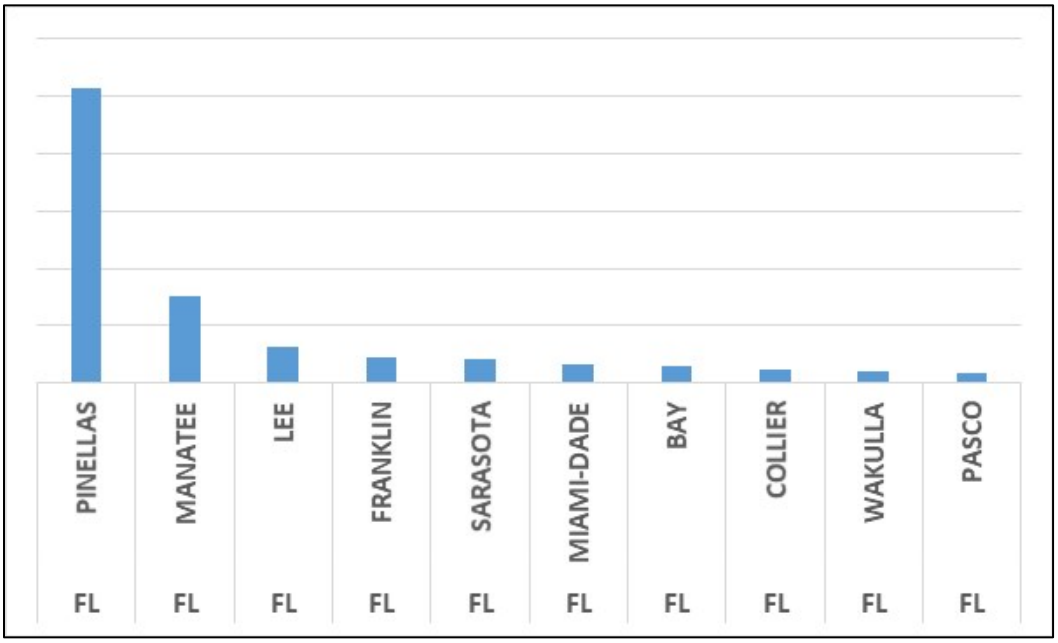

Figure 3.4.1.1. Red grouper regional quotient by top 10 homeport counties.
Source: IFQ database accessed 2/20/2020 NOAA Fisheries, NMFS, SERO.

Madeira Beach and Cortez are the leading communities in terms of RQ for red grouper (Figure 3.4.1.2). The communities of Largo, Redington Shores, and Tarpon Springs are next in terms of RQ with nearly equal amounts. The difference in terms of RQ and the number of vessels within

a homeport is likely due to differences in predominant gear type used by the vessels within a community, e.g. bandit reel vs bottom longline. The community of Cortez has fewer vessels and ranks sixth in number of vessels landing red grouper, but ranks second in terms of regional quotient. This is likely due to the fact that most vessels in Cortez are bottom longline vessels which make longer trips and land more red grouper per trip. Other ports may have a mix of vessel types.

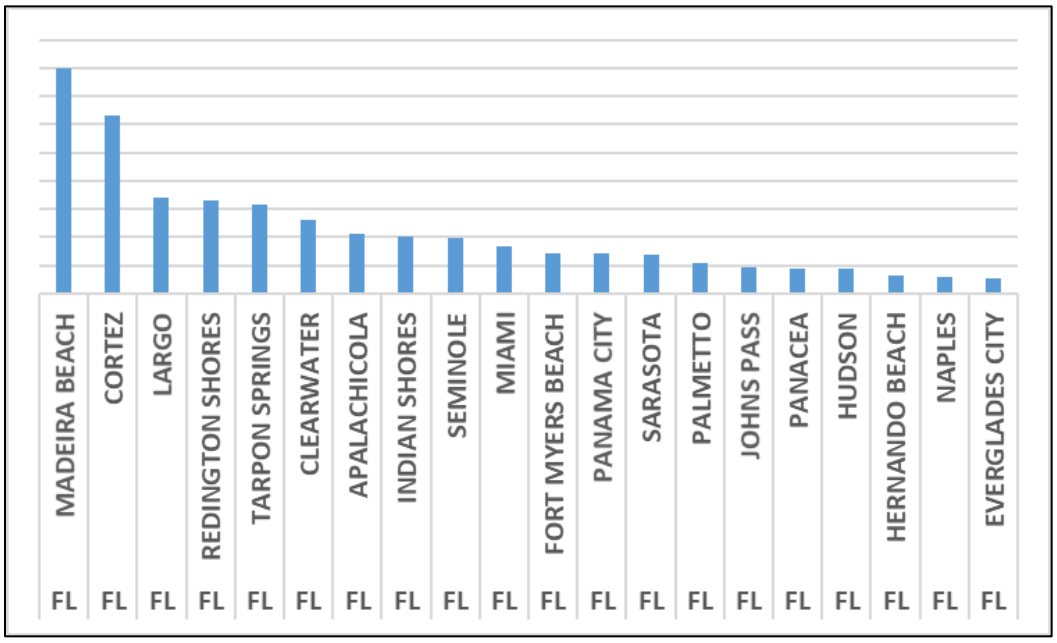

Figure 3.4.1.2. Red grouper regional quotient by top 20 homeport communities.
Source: IFQ database accessed 2/20/2020 NOAA Fisheries, NMFS, SERO.

Commercial fishing engagement

Figure 3.4.1.3 is an overall measure of a community's commercial fishing engagement. Most communities in Figure 3.4.1.3 would be considered to be highly or moderately engaged in commercial fishing as many are at or above 1 standard deviation of the mean factor score and all have been at ½ standard deviation at one point in time. Redington Shores, Indian Shores, and Palmetto show the least amount of engagement in commercial fishing overall, while most of the others are highly engaged, having engagement scores over 1 standard deviation if not over ½ standard deviation. Few communities are highly reliant, although communities like Panacea, Apalachicola and Cortez seem to exhibit fairly high reliance with moderate to high engagement.

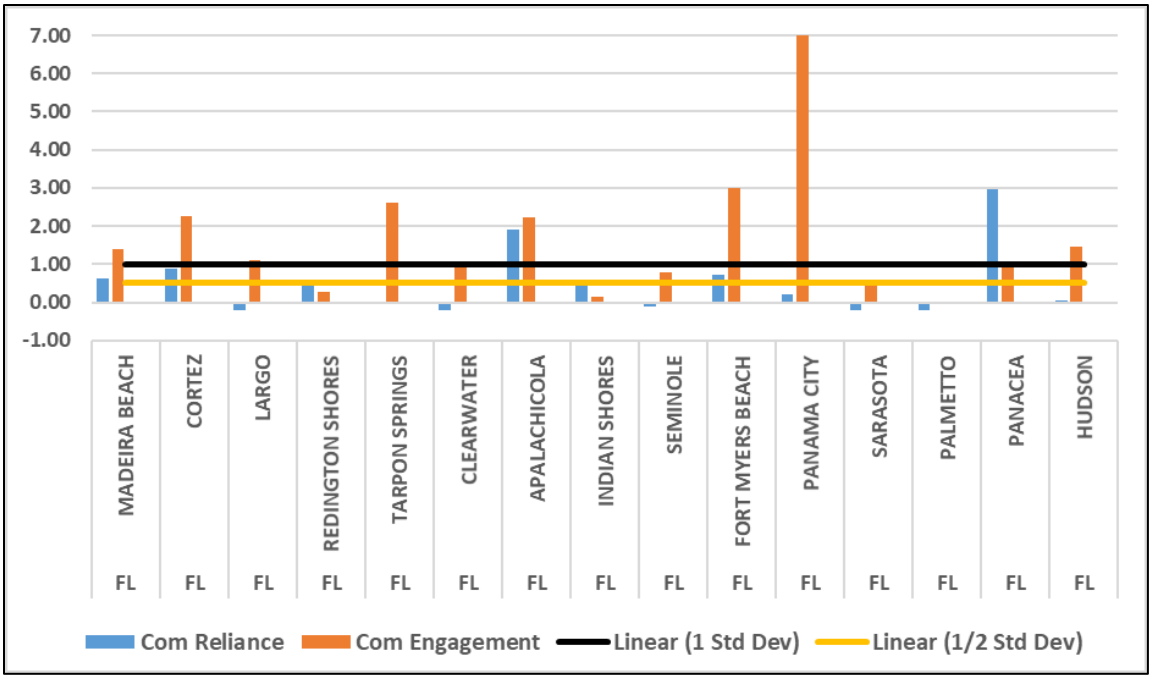

Figure 3.4.1.3. Commercial fishing engagement and reliance of the top 15 red grouper homeports for 2017.

Source: Social Indicators Database, NOAA Fisheries, NMFS, SERO.

3.4.2 Recreational Sector

Although we do not have data that would allow for a recreational RQ, we do have an overall measure of recreational fishing engagement and reliance for communities along Florida's west coast. The communities were chosen because of their location and likely participation in the red grouper component of the reef fish fishery. These engagement and reliance measures consist of recreational permit and infrastructure counts (boat ramps and marinas) within a community to gauge absolute recreational fishing activity and relative to its population. These measures are not specific to red grouper, but a measure of overall recreational fishing. Figure 3.4.2.1 indicates that most of these communities have a high engagement in recreational fishing, as most are at or above the 1 standard deviation threshold, with Destin having the highest engagement score and high reliance. Cedar Key demonstrates high reliance on recreational fishing. This is likely due to its small population and probably a small amount of infrastructure related to recreational fishing, but substantial enough for a small community to depend on it for a good portion of its local economy. Other smaller communities like Apalachicola, Carrabelle, Crystal River, Everglades City, Port St. Joe and Panacea also demonstrate high reliance on recreational fishing.

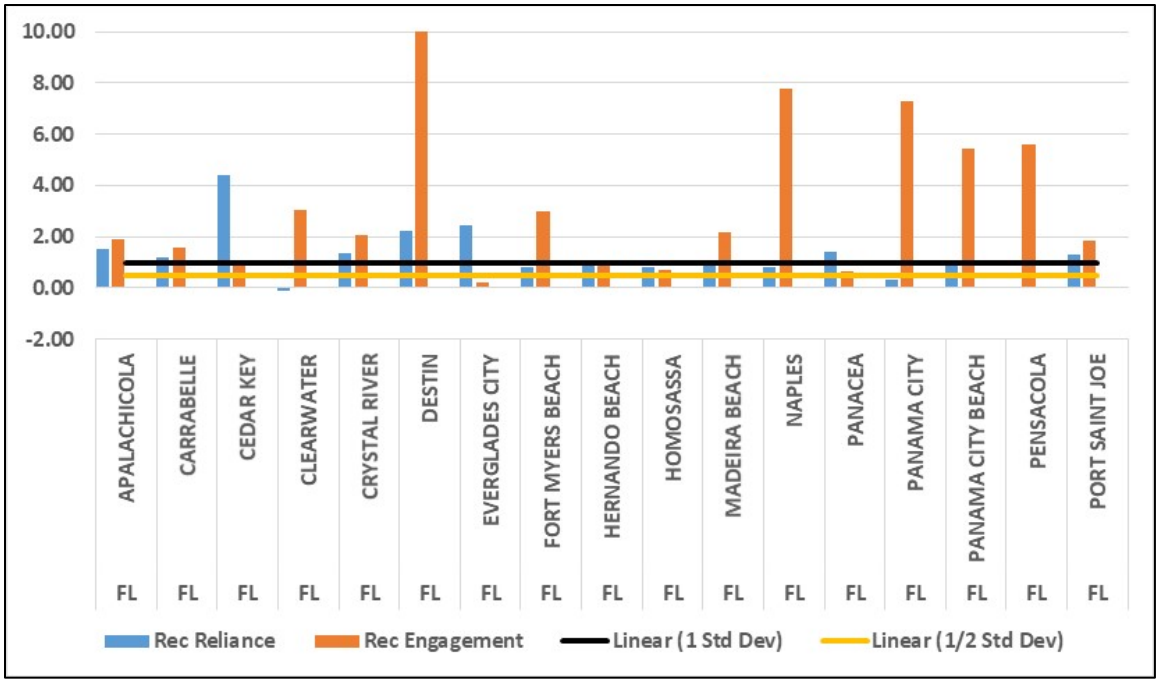

Figure 3.4.2.1. Recreational fishing engagement and reliance for communities on Florida's west coast for 2017.
Source: Social Indicators Database 2017, NOAA Fisheries, NMFS, SERO.

The brief description of fishing activities presented here highlights which communities may be most involved in red grouper 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. At this time, it is not possible to provide a more detailed description of vessel involvement at the community level. It is likely that certain vessels within a community are more dependent upon red grouper than others, as are particular households. Until those types of data become accessible, the impacts upon either vessels or households within communities cannot be determined.

3.4.3 Environmental Justice Considerations

Executive Order 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. This executive order is generally referred to as environmental justice (EJ).

Commercial and recreational anglers and associated industries could be impacted by the proposed actions. However, information on the race and income status for groups at the different participation levels is not available. Although information is available concerning a community's overall status with regard to minorities and poverty (e.g., census data), such

information is not available specific to anglers and those involved in the industries and activities, themselves. To help assess whether any EJ concerns arise from the actions in this amendment, a suite of indices was created to examine the social vulnerability of coastal communities. The three indices are poverty, population composition, and personal disruptions. 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. Indicators such as increased poverty rates for different groups, more single female-headed households and households with children under the age of five, disruptions such as higher separation rates, higher crime rates, and unemployment all 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.

Figure 3.4.3.1 provides the social vulnerability index scores of the top commercial and recreational communities that have been identified as having some association with red grouper. Some communities appear in both figures to allow comparison with other communities included in that sector. The communities of Carrabelle and Crystal River both exceed the threshold of 1 standard deviation for poverty, with Cedar Key close to that threshold, demonstrating some vulnerability when combined with other index scores. Several communities exceed the threshold of 1/2 standard deviation above the mean for more than one index (Carrabelle, Crystal River and Panama City). These fishing communities would be the most likely to exhibit vulnerabilities to social or economic disruption due to regulatory change. Most communities on Florida's west coast exhibit few vulnerabilities.

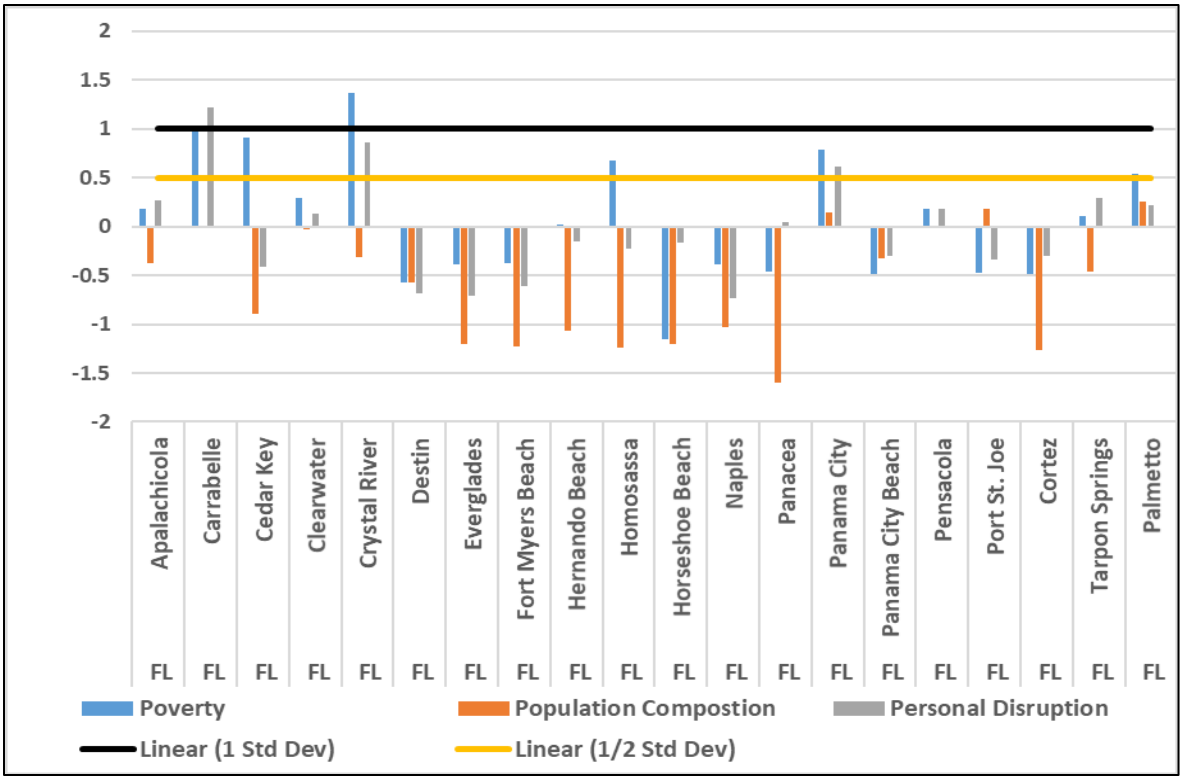

Figure 3.4.3.1. Community social vulnerability indices for communities on Florida's west coast.

Source: Social Indicators Database 2020 (ACS 2016), NOAA Fisheries, SERO.

Although no EJ issues have been identified or are expected to arise, information on the race and income status for groups at the different participation levels (for-hire captains and crew, and employees of associated support industries, etc.) is not available. There is no known subsistence consumption of red grouper, nor are there any claims to customary subsistence consumption of red grouper by any indigenous or tribal group in the Gulf. One aspect that should be noted is that the community of Cortez, Florida is recognized as being on the National Register of historic places. The working waterfront where many fish houses and boat yards are located are within that historic district.

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 Fishery Conservation and Management Act (Magnuson-Stevens Act) (16 U.S.C. 1801 *et seq*.). It was 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, an area extending 200 nautical miles from the seaward

boundary of each of the coastal states, and authority over U.S. anadromous species and continental shelf resources that occur beyond the EEZ.

Responsibility for federal fishery management is shared by 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 Appendix A. In most cases, the Secretary has delegated this authority to NMFS.

The Council is responsible for fishery resources in federal waters of the Gulf. These waters extend to 200 nautical miles offshore from the seaward boundaries of the Gulf States 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 of 770 miles along its Gulf coast, followed by Louisiana (397 miles), Texas (361 miles), Alabama (53 miles), and Mississippi (44 miles).

The 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 through participation on advisory panels and through Council meetings that, with few exceptions for discussing personnel matters, are open to the public. The regulatory process is also in accordance with the Administrative Procedures Act, in the form of "notice and comment" rulemaking, which provides extensive opportunity for public scrutiny and comment, and requires consideration of and response to those comments. Regulations contained within FMPs are enforced through actions of NOAA's Office of Law Enforcement, the United States Coast Guard, and various state authorities. To better coordinate enforcement activities, federal and state enforcement agencies have developed cooperative agreements to enforce the Magnuson-Stevens Act. These activities are being coordinated by the Council's Law Enforcement Technical Committee and the Gulf States Marine Fisheries Commission's Law Enforcement Committee, which have developed joint enforcement agreements and cooperative enforcement programs.[35]

Reef fish stocks are assessed through the SEDAR process. As species are assessed, stock condition and acceptable biological catch levels are evaluated. As a result, periodic adjustments to stock ACLs and other management measures are deemed necessary to prevent overfishing. Management measures are implemented through plan or regulatory amendments.

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

[35] www.gsmfc.org

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 Gulf States exercises legislative and regulatory authority over their respective state's 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 3.5.2.1).

Table 3.5.2.1. Gulf 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: Modify the Gulf of Mexico (Gulf) Red Grouper Overfishing Limit (OFL), Acceptable Biological Catch (ABC), Annual Catch Limits (ACL), and Annual Catch Targets (ACT)

Implementation of this action is contingent upon the implementation of Amendment 53 to the Reef Fish FMP. Amendment 53 would modify the allocation between the commercial and recreational sector for Gulf red grouper, and would also modify catch limits. Because this framework action uses Amendment 53, including the allocation modification and the new catch limits, as a baseline for comparison for impacts and consequences, its implementation is necessary prior to or at the same time as implementation of this action.

4.1.1 Direct and Indirect Effects on the Physical Environment

Modifying the red grouper catch limits may affect the physical environment by allowing an increase in harvest. Effects on the physical environment from fishing are associated with gear coming into contact with bottom. Different gear types have different levels of impact. Commercial and recreational red grouper fishing uses vertical line gear (rod and reel, bandit gear for commercial vessels), most frequently rod-and-reel that can interact with and affect bottom habitat. Commercial red grouper fishing also employs longline fishing gear, which interacts with bottom habitat over the length of the deployed gear. Anchor damage is also associated with vertical line fishing vessels, particularly by the recreational sector where anglers may repeatedly visit well-marked fishing locations. Preferred fishing sites, like reefs, are targeted and revisited multiple times (Bohnsack 2000). Effects from fishing on the physical environment are generally tied to fishing effort. The greater the fishing effort, the more gear interacts with the bottom. Fouled fishing gear may entangle and harm deep-water coral habitats, and may also contribute to algal growth on and adjacent to fouled gear (Bohnsack 2000).

Alternative 1 (No Action,) would not change the current catch limits, and therefore would not result in change in effects to the physical environment. **Alternative 2** would increase the catch limits and therefore increase the amount of fishing activity, resulting in possible negative effects to the physical environment. However, any negative effects under **Alternative 2** are expected to be minimal because no significant change in overall fishing effort is expected. Fishing for reef fish species in the Gulf of Mexico is historically a multi-species endeavor for both commercial and recreational fishermen, and especially so for the latter. Therefore, minor changes in effort targeting a specific species are not expected to change the overall universe of fishing effort in general for reef fish species in the Gulf.

4.1.2 Direct and Indirect Effects on the Biological Environment

Alternative 1 (No Action) would maintain lower catch limits than those recommended by the SSC, and would therefore result in direct positive effects to the red grouper stock. From the point of implementation of the proposed revised catch limits forward in time, **Alternative 2** would provide a higher harvest limit (with an increase of 700,000 lbs gutted weight [gw] per year for the ACL) compared to **Alternative 1**. This higher limit would increase the removal of red grouper from the stock more so than **Alternative 1**. Thus, **Alternative 2** would have a greater adverse effect on the red grouper stock compared to **Alternative 1** through greater removals over the years for which the catch limits under **Alternative 2** remain in effect. These increased effects are not expected to be significant because the harvest limits specified in **Alternative 2** are consistent with the recommended red grouper catch limits from the Council's SSC and will not result in any significant change to overall harvest under the Reef Fish FMP.

Red tide is a harmful algal bloom which has been shown to result in episodic natural mortality of red grouper (SEDAR 61 2019). In May 2021, a red tide event on the West Florida Shelf was detected by the Florida Fish and Wildlife Conservation Commission[36] which, depending on its spatial extent, duration, and severity, may have deleterious effects on the red grouper population present in the affected areas. As of the publication of this framework action, this 2021 red tide event continues to be present on the West Florida Shelf. An accounting of the potential additional episodic natural mortality from this red tide event is not included in the SSC's recommended catch limits under **Alternative 2**, nor in the catch limits demonstrated in **Alternative 1**. Therefore, depending on the spatial extent, duration, and severity of the 2021 red tide event, either alternative may represent a harvest level that could result in negative biological effects for the red grouper stock. However, without conducting an interim analysis or other population assessment with data through 2021 to determine the health of the red grouper stock, these effects are not estimable.

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 red grouper abundance. However, the relationships between red grouper and non-target species caught on trips where red grouper are directly targeted are not fully understood. Further, changes in the prosecution of the reef fish fishery are not expected from this action, so no additional effects to non-target species or protected resources are anticipated.

[36] https://myfwc.com/research/redtide/statewide/

4.1.3 Direct and Indirect Effects on the Economic Environment

Commercial Sector

Alternative 1 (No Action) would maintain the current commercial ACT, or commercial quota, of 2.40 mp gw. Therefore, changes in economic value would not be expected to result from this alternative.

The 5-year average (2015-2019) of commercial landings is 3.40 mp gw, which exceeds the current commercial ACT from **Alternative 1** with the current 5% buffer between the ACL and ACT, so this analysis assumes the commercial sector will land the entire allocated commercial ACT. Changes in red grouper harvests, as a result of the change in ACT, could result in additional economic effects because of the potential effects on ex-vessel prices due to less (or more) red grouper on the markets. The potential effects to the consumer surplus are based on price flexibility estimates by Keithly and Tabarestani (2018).[37] An average dockside price of $5.34 is used as the baseline price in this analysis. This estimate is based on the average price change ($0.51/lb) from the preferred alternatives added to the average dockside price from 2018 of $4.83 in Reef Fish Amendment 53. The average price from the preferred alternatives in Reef Fish Amendment 53 is used here since **Alternative 1** of this framework action is based on those preferred alternatives. An own-price flexibility of -0.533 is used from the Habit Formation model (Keithly and Tabarestani 2018) to derive the average price change and change in CS for **Preferred Alternative 2** as seen in Table 4.1.3.1.[38]

Table 4.1.3.1. Proposed change in the red grouper commercial sector ACT from **Preferred Alternative 2** (relative to **Alternative 1**) and associated estimated average price change ($/lb) and change in CS.

Alternative	Change in ACT (mp gw)	Expected average price change ($/lb)	Expected change in CS (2019 dollars)
Preferred Alt 2	0.39	-$0.46	$1,290,405

Under **Preferred Alternative 2**, the red grouper commercial ACT would increase by 0.39 mp gw, compared to **Alternative 1**. As a result, the CS would increase by $1,290,405 million under **Preferred Alternative 2**, compared to **Alternative 1**.

[37] The own-price elasticity of demand is the percentage change in the quantity demanded of a good or service divided by the percentage change in the price. This shows the responsiveness of the quantity demanded to a change in price. 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, the estimates used in this analysis should be considered maximum expected changes in ex-vessel price, gross revenue, and PS in the commercial harvesting sector.

[38] The expected change in CS is calculated by multiplying the ACT (2,790,000 lbs gw) by the expected average price change (rounded to -$0.46). Due to an outward shift in the supply curve that is reflective of the increase in commercial ACT, the price per pound would decrease.

The expected average price of $4.88 under **Preferred Alternative 2** is multiplied by the new ACT of 2,790,000 lbs gw to calculate the expected revenue under **Preferred Alternative 2**. The average dockside price of $5.34 is multiplied by the ACT of 2,400,000 lbs gw to calculate the expected revenue under **Alternative 1**. The difference in expected revenues from the two alternatives is displayed as the expected change in revenue in Table 4.1.3.2. PS is derived as 24% of the expected change in revenue, based on the estimate for average net cash flow from 2014-2016 in Table 3.3.1.22.

Table 4.1.3.2. Expected change in landings for the red grouper commercial sector, expected change in revenue, and expected change in PS for **Preferred Alternative 2** relative to **Alternative 1**.

Alternative	Expected change in landings (mp gw)	Expected change in revenue	Expected change in PS (2019 dollars)
Preferred Alt 2	0.39	$792,195	$190,127

Compared to **Alternative 1**, **Preferred Alternative 2** would be expected to result in an increase in revenue of $792,195 and in an increase in PS of $190,127, due to the increase in ACT. The expected change in revenue in Table 4.1.3.2 also reflects the expected change in Gulf red grouper purchases by dealers. The expected change in revenue with **Preferred Alternative 2** would be expected to result in an increase of 6.18% of the average annual red grouper purchases, compared with **Alternative 1**.

The proposed increase in the ACT with **Preferred Alternative 2** would increase the availability of annual individual fishing quota (IFQ) allocation for sale, compared with **Alternative 1**. As the supply of annual IFQ allocation increases, the allocation price would be expected to decrease.[39] As shares reflect the expected supply of annual allocation available in the future, **Preferred Alternative 2** would be expected to result in a decrease in red grouper share price.

The total expected change in net economic benefits for the commercial sector from **Preferred Alternative 2**, relative to **Alternative 1**, is displayed in Table 4.1.3.3. These changes are the addition of the expected change in CS from Table 4.1.3.1 to the expected change in PS from Table 4.1.3.2.

Table 4.1.3.3. Total Expected Change in Net Economic Benefits for the Commercial Sector from **Preferred Alternative 2** relative to **Alternative 1**.

Alternative	Total Expected Change in Net Economic Benefits (2019 dollars)
Preferred Alt 2	$1,480,532

Recreational Sector

Alternative 1 (No Action) would maintain a recreational sector ACL of 1.73 mp gw. Therefore, changes in economic value would not be expected to result from this alternative.

[39] Due to an outward shift in the supply curve that is reflective of the increase in annual IFQ allocation, the allocation price would decrease.

The economic impacts expected to result from **Preferred Alternative 2** are primarily analyzed as a function of the ACL. The evaluation of changes in economic value expected to result from ACL changes for the recreational sector is based on work by Carter and Liese (2012). The CS value per fish for a second red grouper kept is estimated at $110.00 (2019 dollars).[40] A conversion factor of 1.05 between gutted weight and whole weight of red grouper is used (SEDAR 42 2015). Estimated increases in economic value are approximated by dividing the change in ACL by 6.51 lbs ww, which is the average weight of a Gulf recreationally landed red grouper from 2015-2017 (SEFSC Southeast Region Headboat Survey [SRHS]) data, accessed March 2018; MRIP Intercept data)[41], to obtain the increase in number of red grouper, which is then multiplied by the CS value per fish of $110.00. The proposed changes in the recreational sector ACL and estimates of associated annual changes in economic values for **Preferred Alternative 2** are provided in Table 4.1.3.4.

Table 4.1.3.4. Proposed change in the red grouper recreational sector ACL from **Preferred Alternative 2** (relative to **Alternative 1**) and associated estimated annual change in CS.

Alternative	Change in ACL (mp gw)	Expected annual change in CS (2019 dollars)
Preferred Alt 2	0.29	$5,145,161

Under **Preferred Alternative 2**, the red grouper recreational sector ACL would increase by 0.29 mp gw, compared to **Alternative 1**. As a result, the CS would be expected to increase by $5.145 million (in 2019 dollars) under **Alternative 2**, compared to **Alternative 1**.

The PS of the for-hire component of the recreational sector, being comprised of charter vessels and headboats, would be impacted by a change in the number of targeted trips. In the long run, factors of production such as labor and capital can be used elsewhere in the economy, and so only short-term changes to PS are expected. In the Gulf, headboat trips take a diverse set of anglers on a single vessel, generally advertising a diverse range of species to be caught. Therefore, an assumption that no headboat trips would be lost due to a change in ACL would be reasonable. However, charter vessel trips that are targeting red grouper may be subject to cancellation by anglers and are the focus of the recreational sector PS analysis.

The following analysis is based on point estimates of the predicted closure dates for the recreational ACL under each alternative as seen in Table 2.1.2. Charter vessel trips by 2-month wave from 2014-2018 targeting red grouper are seen in Table 3.3.2.4. Based on the predicted closure dates, **Alternative 1** would close in the 6th wave (November/December), and **Preferred Alternative 2** would have no closure. The number of additional trips, compared to **Alternative 1**, that would occur is shown in Table 4.1.3.5. The number of additional trips under **Preferred Alternative 2** is calculated using a ratio of the number of additional open days in the wave and the total number of days in the 2-month wave, multiplied by the average trips for that wave from Table 3.3.2.4. This assumes that trips within a 2-month wave are evenly distributed among days.

[40] The current recreational bag limit for red grouper is 2 fish per day within the 4-fish aggregate grouper bag limit. Therefore, using the value per fish for a second red grouper kept is an appropriate measurement for economic value.
[41] https://www.st.nmfs.noaa.gov/st1/recreational/MRIP_Survey_Data/

Table 4.1.3.5. Predicted closure date, wave in which predicted closure date occurs, and total additional charter trips under the recreational ACL for **Preferred Alternative 2**.

Alternative	Predicted Closure Date	Interrupted Wave	Total Additional Charter Trips	Short-term change in PS (2019 dollars)
Alt 1	Dec. 19	6	N/A	N/A
Preferred Alt 2	No closure	No closure	665	$93,723

The Net Cash Flow per Angler Trip (CFpA) from Souza and Liese (2019) of $136 (2017 dollars) is used to derive an upper bound for the short-term change in PS for charter vessels; Table 3.3.2.8 updates that estimate to $141 (2019 dollars). The CFpA accounts for the lost revenue, while recognizing that canceled trips do not have certain expenditures such as fuel, trip supplies, and labor. The short-term change in PS is displayed in Table 4.1.3.5. **Preferred Alternative 2** is expected to result in a positive short-term change in PS of $93,723.

The total expected change in net economic benefits for the recreational sector from **Preferred Alternative 2**, relative to **Alternative 1**, is displayed in Table 4.1.3.6. These changes are the addition of the expected annual change in CS from Table 4.1.3.4 to the short-term change in PS from Table 4.1.3.5.

Table 4.1.3.6. Total Expected Change in Net Economic Benefits for the Recreational Sector Managed to the Recreational ACL under **Preferred Alternative 2** relative to **Alternative 1**.

Alternative	Total Expected Change in Net Economic Benefits (2019 dollars)
Preferred Alt 2	$5,238,885

The total expected change in net economic benefits for both the commercial and recreational sectors are displayed in Table 4.1.3.7.

Table 4.1.3.7. Combined Total Expected Change in Net Economic Benefits for both the Commercial and Recreational Sectors under **Preferred Alternative 2** relative to **Alternative 1**.

Alternative	Total Expected Change in Net Economic Benefits (2019 dollars)
Preferred Alt 2	$6,719,417

The following analysis of the recreational ACT assumes (1) that the recreational sector's post-season AM is triggered and (2) that the recreational sector will land the entire recreational ACT if the post-season AM is triggered, as the recreational ACTs under **Alternative 1** and **Preferred Alternative 2** fall below the 5-year average (2015-2019) of recreational landings. In a situation where the recreational sector is monitored to its ACT instead of its ACL, the analysis below replaces the analysis of the recreational sector under its ACL. **Alternative 1** (No Action) would maintain a recreational sector ACT of 1.57 mp gw.

The economic impacts expected to result from **Preferred Alternative 2** are primarily analyzed as a function of the ACT. The proposed changes in the recreational sector ACT and estimates of

associated annual changes in economic values for **Preferred Alternative 2** are provided in Table 4.1.3.8.

Table 4.1.3.8. Proposed change in the red grouper recreational sector ACL from **Preferred Alternative 2** (relative to **Alternative 1**) and associated estimated annual change in CS.

Alternative	Change in ACT (mp gw)	Expected annual change in CS (2019 dollars)
Preferred Alt 2	0.27	$4,790,323

Under **Preferred Alternative 2**, the red grouper recreational sector ACT would increase by 0.27 mp gw, compared to **Alternative 1**. As a result, the CS would be expected to increase by $4.790 million (in 2019 dollars) under **Alternative 2**, compared to **Alternative 1**.

The following analysis is based on point estimates of the predicted closure dates for the recreational ACT under each alternative as seen in Table 2.1.3. Charter vessel trips by 2-month wave from 2014-2018 targeting red grouper are seen in Table 3.3.2.4. Based on the predicted closure dates, **Alternative 1** would close in the 6th wave (November/December), and **Preferred Alternative 2** would have no closure. The number of additional trips, compared to **Alternative 1**, that would occur is shown in Table 4.1.3.9.

Table 4.1.3.9. Predicted closure date, wave in which predicted closure date occurs, and total additional charter trips under the recreational ACT for **Preferred Alternative 2**.

Alternative	Predicted Closure Date	Interrupted Wave	Total Additional Charter Trips	Short-term change in PS (2019 dollars)
Alt 1	Nov. 16	6	N/A	N/A
Preferred Alt 2	No closure	No closure	2,352	$331,637

The short-term change in PS is displayed in Table 4.1.3.9. **Preferred Alternative 2** is expected to result in a positive short-term change in PS of $331,637.

The total expected change in net economic benefits for the recreational sector from **Preferred Alternative 2**, relative to **Alternative 1**, is displayed in Table 4.1.3.10. These changes are the addition of the expected annual change in CS from Table 4.1.3.8 to the short-term change in PS from Table 4.1.3.9.

Table 4.1.3.10. Total Expected Change in Net Economic Benefits for the Recreational Sector Managed to the Recreational ACT under **Preferred Alternative 2** relative to **Alternative 1**.

Alternative	Total Expected Change in Net Economic Benefits (2019 dollars)
Preferred Alt 2	$5,121,959

4.1.4 Direct and Indirect Effects on the Social Environment

Usually, additional effects would not be expected from **Alternative 1** (No Action); however, the catch limits under **Alternative 1** have not been implemented and the effects have yet to occur.

The effects expected from **Alternative 1** would reflect those discussed for the preferred alternative in Amendment 53. To summarize, negative effects are expected from **Alternative 1**, as the catch levels will be reduced for both the commercial and recreational sectors (Table 4.1.4.1). These expected effects on each sector would be related inversely to one another: among the alternatives considered in Amendment 53, the selected catch levels would have the greatest negative effects on the commercial sector (0.60 mp gw reduction to its ACT) and the least negative effects on the recreational sector (0.36 mp gw reduction to its ACT).

Table 4.1.4.1. Comparison of proposed catch levels with those currently in place (i.e., pre-Amendment 53 implementation). The amount of the reduction to each catch level from the current catch level is in parentheses.

	Total ACL	Comm ACL	Rec ACL	Comm ACT/Quota	Rec ACT
No Action in Amendment 53	[5.26]	3.16	[2.10]	3.00	[1.93]
Alternative 1	4.26 (-1.00)	2.53 (-0.63)	1.73 (-0.37)	2.40 (-0.60)	1.57 (-0.36)
Preferred Alternative 2	4.96 (-0.30)	2.94 (-0.22)	2.02 (-0.08)	2.79 (-0.21)	1.84 (-0.09)

Notes: The Alternative 1 (No Action) in Amendment 53 catch levels were established in MRIP-CHTS units. The table provides the MRIP-FES equivalents for those catch levels in brackets. Values are in millions of pounds, gutted weight.

Preferred Alternative 2 provides an increase of 700,000 lbs gw to the total ACL resulting in positive effects for both sectors compared to **Alternative 1**. For the commercial sector, **Preferred Alternative 2** would reduce the commercial quota by 0.21 mp gw rather than 0.60 mp gw, as would happen upon implementation of Amendment 53 (Table 4.1.4.1). If commercial landings remain similar to recent years (Table 2.1.3 in Amendment 53; GMFMC 2021), **Preferred Alternative 2** would not be expected to constrain commercial landings. However, commercial fishermen are reporting increased abundance of the stock and expect landings to increase. It is also difficult to predict how the market for red grouper allocation would be affected. For the recreational sector, **Preferred Alternative 2** would result in a reduction to the recreational ACT of 90,000 lbs gw compared to pre-implementation of Amendment 53, and a fishing closure would not be expected to result based on either the ACL or ACT. Thus, the negative effects that were possible under **Alternative 1** are no longer expected to occur.

4.1.5 Direct and Indirect Effects on the Administrative Environment

This action would affect the administrative environment by implementing an ACT that reduces the likelihood of exceeding the overall and recreational ABC/ACL and overfishing of the Gulf red grouper stock. Because the Gulf commercial red grouper sector operates under an individual fishing quota system, commercial fishermen are not subject to fishery closures. Closure of the recreational red grouper sector would have a minor effect on the administrative environment, while overfishing could have effects that are more substantial. However, with the increased ABC/ACL proposed in this action, the likelihood of overfishing is lower, especially given the use of an ACT to constrain landings in years following an ACL overage.

In the commercial sector, there is no risk of an in-season closure and little risk of exceeding the ACL. The IFQ system that is in place for regulating commercial landings is designed to prevent ACL overages by allocating quota to individual entities, and holding them accountable to stay under that catch limit. The intent of the commercial buffer (5% below the ACL) is to allow for gag multi-use, which allows red grouper to be harvested incidentally when targeting gag.

In comparison to no action **Alternative 1**, **Preferred Alternative 2** would increase the ABC/ACL and ACT. Thus, retaining the lower ACL and ACT in **Alternative 1** in the recreational sector is more likely to result in exceeding the recreational and overall ACL (and potentially the OFL) because the increased ACL and ACT in **Alternative 2 are less likely to be met or exceeded.** In spite of a difference of over 15% between the ACT for **Alternative 1** and **Preferred Alternative 2**, it may only have minimal effect on exceeding the ACT. Given the constraints associated with monitoring recreational data to relatively small values, the decreased chance of exceeding recreational component ACL is expected to be minimal. This is due to the time lags associated with receiving recreational data, as well as difficulty in making these estimates based on limited data.

Although the alternatives have different effects on the administrative environment, these effects are likely minor. Assessing the effects of management decisions on stock status are routine endeavors by NMFS. Actions to control harvest by the Council and NMFS are mostly routine and conducted through the Council system established by the Magnuson-Stevens Fishery Conservation and Management Act (Magnuson-Stevens Act).

4.2 Cumulative Effects Analysis

While this environmental assessment (EA) is being prepared using the 2020 Council on Environmental Quality (CEQ) National Environmental Policy Act (NEPA) Regulations, the cumulative effects discussed in this section meet the two-part standard for "reasonable foreseeability" and "reasonably close causal connection" required by the new definition of effects or impacts. Below is our 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 this proposed action encompasses the state and federal waters of the Gulf as well as Gulf communities that are dependent on reef fish fishing. Most relevant to this proposed action is red grouper 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 action would modify the red grouper ACLs and ACTs. The environmental consequences of the proposed action are analyzed in detail in Section 4.1. Modifying the ACLs and ACTs should have very little effect on the physical and biological/ecological environment because the action

is not expected to alter the manner in which the red grouper portion of the reef fish fishery is prosecuted and landings are only slightly greater than the proposed ACLs (Sections 4.1.1 and 4.1.2). This action would likely have positive effects on the social and economic environments in the near future (Sections 4.1.3 and 4.1.4). The action is not expected to significantly affect the administrative environment, either adversely or beneficially (Section 4.1.5).

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 going on in the Gulf annually. Many of these activities are expected to have impacts associated with them. Below is a discussion those actions that have the potential to combine with the proposed action to result in cumulative effects.

Other Fishery related actions - The cumulative effects associated with modifying red grouper ACLs and ACTs were analyzed in the environmental impact statements (EISs) 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 2008a), Amendment 30A (GMFMC 2008b), Amendment 30B (GMFMC 2008c), Amendment 31 (GMFMC 2009), Amendment 40 (GMFMC 2014), and Amendment 28 (GMFMC 2015a). 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 Fishery Management Plan for the Reef Fish Resources of the Gulf of Mexico or implemented by National Marine Fisheries Service (NMFS), which could affect reef fish stocks. These include Reef Fish Amendment 53, which must be implemented before this framework action may be implemented. Amendment 53 updates allocation between the commercial and recreation red grouper sectors, and modifies the OFL, ABC, ACLs and ACTs. Other actions include Amendment 36B, which would revise the red snapper and grouper-tilefish commercial (IFQ) programs, and Amendment 48, which would establish status determination criteria for many reef fish stocks, including red grouper. Several framework actions also are being developed to address red snapper, greater amberjack, vermillion snapper, and yellowtail snapper. An additional action the merits mention is the 2021 closure of the recreational red grouper fishery due to meeting/exceeding their quota (86 FR 51276; September 15, 2021). Descriptions of these actions can be found on the Council's Web page at http://gulfcouncil.org/.

Non-fishery related actions - Actions affecting the reef fish fishery have been described in previous cumulative effect analyses (e.g., Amendment 40). Three important events include impacts of the *Deepwater Horizon* MC252 oil spill, the Northern Gulf Hypoxic Zone, and climate change (See Section 3.1). Reef fish species are mobile and are able to avoid hypoxic conditions, so any effects from the Northern Gulf Hypoxic Zone on reef fish species are likely minimal regardless of this action, particularly red grouper that are found primarily on the west Florida Shelf. Impacts from the *Deepwater Horizon* MC252 oil spill are still being examined; however, as indicated in Section 3.1, the oil spill had some adverse effects on fish species. However, it is unlikely that the oil spill in conjunction with setting ACLs and ACTs would have any significant cumulative effect given the red grouper are not commonly found in the

areas most affected by the oil spill. Because red grouper are primarily found in the eastern Gulf, oil and gas development are unlikely to affect this stock.

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 Intergovernmental Panel on Climate Change (IPCC) has numerous reports addressing their assessments of climate change (http://www.ipcc.ch/publications_and_data/publications_and_data.shtml). Global climate changes could affect the Gulf fisheries as discussed in Section 3.1. However, the extent of these effects cannot be quantified at this time. The proposed action is 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).

Red tide is a common occurrence in the Gulf, and when concentrations are high, can negatively affect fish populations. In 2005, 2014, and in 2017-2018, severe red tide events are thought to have negatively affected red grouper populations. These red tide events are most common off the central and southwestern coasts of Florida where red grouper are primarily found. For 2020, the Florida Fish and Wildlife Conservation Commission (FWC) did not report any severe red tide events through September. In the summer of 2021, there is a red tide event off the west coast of Florida from Sarasota to Pinellas Counties including Tampa Bay; however, the severity of this red tide event has yet to be determined.[42] The effects of red tide on fish are discussed in Section 3.2.

4. The impacts or expected impacts from these other actions - The cumulative effects from managing the reef fish fishery have been analyzed in other actions as listed in part three of this section. They include detailed analysis of the reef fish fishery, cumulative effects on non-target species, protected species, and habitats in the Gulf. In general, the effects of these actions are positive as they ultimately act to restore/maintain the stocks at a level that will allow the maximum benefits in yield and recreational fishing opportunities to be achieved. However, some short-term negative impacts on the fisheries' socioeconomic environment may occur due to the need to limit directed harvest and reduce bycatch mortality. These negative impacts can be minimized by using combinations of management measures that provide the least disruption to the fishery while holding harvest to sustainable levels.

5. *The overall impact that can be expected if the individual impacts are allowed to accumulate:* This action, combined with other past actions, present actions, and RFFAs, is not expected to have significant beneficial or adverse effects on the physical and biological/ecological environments because this action is not expected to alter current fishing practices (Sections 4.1.1 and 4.1.2). For the social and economic environments, positive effects are expected and could result in economic benefits to fishing communities (Sections 4.1.3 and 4.1.4) relative to current conditions. These positive impacts of the proposed action

[42] https://myfwc.com/research/redtide/

are part of a sustainable management plan for the reef fish FMP that, along with other past actions, present actions, and RFFAs, are not expected to alter the manner in which the fishery is prosecuted and are designed to promote maximum sustainable yield, which will promote economic benefits to fishing communities. Because it is unlikely there would be any changes in how the fishery is prosecuted, this action, combined with past actions, present actions, and RFFAs, is not expected to have significant adverse effects on public health or safety.

6. Summary: The proposed action is expected to have negligible or positive individual effects to the biological, physical, economic, and social environments. Any negative 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 action are, and will continue to be, monitored through collection of landings data by NMFS, stock assessments and stock assessment updates, life history studies, economic and social analyses, and other scientific observations. Landings data for the recreational sector in the Gulf are collected through Marine Recreational Information Program, the Southeast Region Headboat Survey, the Texas Marine Recreational Fishing Survey, and the Louisiana Department of Wildlife and Fisheries' LA Creel Program. In addition, the Alabama Department of Conservation and Natural Resources, Mississippi Department of Marine Resources, and Florida Fish and Wildlife Conservation Commission have instituted programs to collect information on reef fish, and in particular, red snapper recreational landings information. Commercial data are collected through trip ticket programs, port samplers, and logbook programs, as well as dealer reporting through the individual fishing quota program.

CHAPTER 5. REGULATORY IMPACT REVIEW

5.1 Introduction

The National Marine Fisheries Service (NMFS) requires a Regulatory Impact Review (RIR) for all regulatory actions that are of public interest. The RIR does three things: 1) it provides a comprehensive review of the level and incidence of impacts associated with a proposed or final regulatory action; 2) it provides a review of the problems and policy objectives prompting the regulatory proposals and an evaluation of the major alternatives that could be used to solve the problem; and, 3) it ensures that the regulatory agency systematically and comprehensively considers all available alternatives so that the public welfare can be enhanced in the most efficient and cost-effective way. The RIR also serves as the basis for determining whether the regulations are a "significant regulatory action" under the criteria provided in Executive Order (E.O.) 12866. This RIR analyzes the impacts this action would be expected to have on the red grouper component of the Gulf of Mexico (Gulf) reef fish fishery.

5.2 Problems and Objectives

The problems and objectives addressed by this action are discussed in Section 1.2.

5.3 Description of Fisheries

A description of the red grouper component of the Gulf reef fish fishery is provided in Section 3.4.

5.4 Impacts of Management Measures

5.4.1 Action: Modify the Gulf of Mexico (Gulf) Red Grouper Overfishing Limit (OFL), Acceptable Biological Catch (ABC), Annual Catch Limits (ACL), and Annual Catch Targets (ACT)

A detailed analysis of the economic effects expected to result from this action is provided in Section 4.1.3. The following discussion analyzes the expected economic effects of the preferred alternative relative to the No Action alternative.

Under **Preferred Alternative 2**, the red grouper commercial ACL and ACT would increase by 0.41 million pounds (mp) gutted weight (gw) and 0.39 mp gw, respectively. Changes in red grouper harvests, as a result of the change in ACT, could result in additional economic effects because of the potential effects on ex-vessel prices due to additional red grouper on the markets. The potential effects to the consumer surplus (CS) are based on work on price flexibilities by Keithly and Tabarestani (2018). The increase in commercial ACT under **Preferred Alternative**

2 is expected to result in a negative average price change (-$0.46/lb) and an increase in CS of $1,290,405.[43]

An average dockside price of $5.34 is used in the analysis; this is based on the average price change ($0.51/lb) from the preferred alternatives in Reef Fish Amendment 53 added to the average dockside price from 2018 of $4.83 (2019 dollars). The average price change from the preferred alternatives in Reef Fish Amendment 53 is used here since **Alternative 1** of this framework action is based on those preferred alternatives.

Using an average dockside price of $5.34 in conjunction with the expected average price change of -$0.46 ($/lb), the expected change in revenue would be $792,195. Applying the average net cash flow from 2014-2016 of 24% to the expected change in revenue provides the expected change in producer surplus (PS); for **Preferred Alternative 2**, the expected change in producer surplus (PS) would be $190,127. The expected change in revenue also reflects the expected change in red grouper purchases by dealers. The expected change in revenue from **Preferred Alternative 2** would be an increase of 6.18% compared to the average of the annual red grouper purchases under **Alternative 1** (with an expected revenue of $12,816,000). In addition, the proposed increase in the ACT with **Preferred Alternative 2** would increase the availability of annual individual fishing quota (IFQ) allocation for sale, compared with **Alternative 1**, and the allocation price would be expected to decrease in response. **Preferred Alternative 2** would also be expected to result in a decrease in red grouper share price, to reflect the expected supply of annual allocation available in the future.

Summing the annual changes in CS and PS for the commercial sector provides the net economic benefits for that sector in a given year. Net economic benefits for the commercial sector from **Preferred Alternative 2**, relative to **Alternative 1**, would be expected to increase by $1,480,532 in 2022.

Under **Preferred Alternative 2**, the red grouper recreational ACL would increase by 0.29 mp gw. The evaluation of changes in economic value expected to result from ACL changes for the recreational sector is based on work by Carter and Liese (2012). The CS value per fish for a second red grouper kept is estimated at $110.00 (2019 dollars). A conversion factor of 1.05 between gutted weight and whole weight of red grouper is used (SEDAR 42 2015). Estimated increases in economic value are approximated by dividing the change in ACL by 6.51 lbs ww, which is the average weight of a Gulf recreationally landed red grouper from 2015-2017 (SEFSC SRHS data, accessed March 2018; MRIP Intercept data)[44], to obtain the increase in number of red grouper, which is then multiplied by the CS value per fish of $110.00. The CS would be expected to increase by $5,145,161 (2019 dollars) under **Preferred Alternative 2**, relative to **Alternative 1**.

The PS of the for-hire component of the recreational sector, being comprised of charter vessels and headboats, would be impacted by a change in the number of targeted trips. In the long run,

[43] Due to an outward shift in the supply curve that is reflective of the increase in commercial ACT, the price per pound would decrease.
[44] https://www.st.nmfs.noaa.gov/st1/recreational/MRIP_Survey_Data/

factors of production such as labor and capital can be used elsewhere in the economy, and so only short-term changes to PS are expected. In the Gulf, headboat trips take a diverse set of anglers on a single vessel, generally advertising a diverse range of species to be caught. Therefore, an assumption that no headboat trips would be lost due to a change in ACL is reasonable. However, charter vessel trips that are targeting red grouper may be subject to cancellation by anglers and are the focus of the recreational sector PS analysis. Using the predicated closure date based on the recreational ACL seen in Table 2.1.2 and the charter vessel trips by 2-month wave from 2014-2018 target red grouper in Table 3.3.2.4, **Preferred Alternative 2** would be expected to result in 665 additional charter trips. The Net Cash Flow per Angler Trip (CFpA) from Souza and Liese (2019) of $136 (2017 dollars) is used to derive an upper bound for the short-term change in PS for charter vessels; Table 3.3.2.8 updates that estimate to $141 (2019 dollars). The short-term change in PS expected to result from **Preferred Alternative 2** would be $93,723.

The following analysis of the recreational ACT assumes (1) that the recreational sector's post-season AM is triggered and (2) that the recreational sector will land the entire recreational ACT if the post-season AM is triggered, as the recreational ACTs under **Alternative 1** and **Preferred Alternative 2** fall below the 5-year average (2015-2019) of recreational landings. In a situation where the recreational sector is monitored to its ACT instead of its ACL, the analysis below replaces the analysis of the recreational sector under its ACL. Under **Preferred Alternative 2**, the red grouper recreational ACT would increase by 0.27 mp gw. The CS would be expected to increase by $4,790,323 (2019 dollars) under **Preferred Alternative 2**, relative to **Alternative 1**.

The PS of the for-hire component of the recreational sector, being comprised of charter vessels and headboats, would be impacted by a change in the number of targeted trips. Using the predicated closure date based on the recreational ACL seen in Table 2.1.3 and the charter vessel trips by 2-month wave from 2014-2018 target red grouper in Table 3.3.2.4, **Preferred Alternative 2** would be expected to result in 2,352 additional charter trips. The short-term change in PS expected to result from **Preferred Alternative 2** would be $331,637.

Summing the annual changes in CS and PS for the recreational sector provides the net economic benefits for that sector in a given year. When managed to the recreational ACL, net economic benefits for the recreational sector from **Preferred Alternative 2**, relative to **Alternative 1**, would be expected to increase by $5,238,885 in 2022. When managed to the recreational ACT, net economic benefits for the recreational sector from **Preferred Alternative 2**, relative to **Alternative 1**, would be expected to increase by $5,121,959 in 2022. The recreational sector is expected to be managed to the recreational sector in 2022, given the post-season accountability measure triggered by the September 15, 2021, recreational season closure due to the recreational ACL being exceeded.

If the recreational sector were to be managed to its recreational ACL in 2022, net economic benefits from the commercial and recreational sectors combined from **Preferred Alternative 2**, relative to **Alternative 1**, would be expected to increase by $6,719417. Since the recreational sector is expected to be managed to its recreational ACT in 2022, net economic benefits from the commercial and recreational sectors combined from **Preferred Alternative 2**, relative to **Alternative 1**, would be expected to increase by $6,602,491. Assuming the recreational sector is

only managed to its recreational ACT in 2022, the expected change in the discounted net present value of economic benefits to both sectors, over a five-year timeframe of 2022-2026, would be $31,579,225 using a 3% discount rate and $29,362,576 using a 7% discount rate. As an average annual net present value, these expected changes would be $6,315,845 and $5,872,515 with a 3% and 7% discount rate, respectively. If the recreational sector continues to be managed to its recreational ACT in 2022 and beyond, the expected change in the discounted net present value of economic benefits to both sectors, over a five-year timeframe of 2022-2026, would be $31,144,600 using a 3% discount rate and $28,966,523 using a 7% discount rate. As an average annual net present value, these expected changes would be $6,228,920 and $5,793,305 with a 3% and 7% discount rate, respectively. This analysis uses a five-year timeframe given that a full red grouper stock assessment is to be completed in 2024, with 2025 being the earliest that the Council would begin consideration of modifications of catch limits, and implementation of any new regulation might not occur until well within 2026.

In addition to the cost-benefit analysis, **Preferred Alternative 2** is expected to increase gross revenues in the commercial sector, which would be expected to increase economic impacts in the onshore sector (e.g., dealers and processors) and related industries (e.g., grocers and restaurants). More specifically, **Preferred Alternative 2** is expected to increase annual gross revenue by $792,195 in the Gulf of Mexico harvesting sector in 2019$. Based on the model used to estimate the average annual economic impacts of the commercial sector for red grouper, as illustrated in Table 3.3.1.24, the expected increase in annual gross revenue in the commercial sector is expected to increase employment, income, total value added, and output by 100 jobs, $2.89 million, $4.08 million, and $7.86 million in 2019$, respectively.

Preferred Alternative 2 is also expected to increase target trips for red grouper by charter vessels, which would be expected to increase spending on various goods and services needed to conduct charter fishing trips and increase the economic impacts resulting from those expenditures. **Preferred Alternative 2** is expected to result 665 additional red grouper target trips by charter vessels. Based on the model used to estimate the average annual economic impacts of the recreational sector for red grouper, as illustrated in Table 3.3.2.9, the expected increase in red grouper target trips by charter vessels is expected to increase employment, income, total value added, and output by 4 jobs, $134,000, $230,000, and $386,000 in 2019$, respectively. All of these impacts are expected to occur in Florida.

5.5 Public and Private Costs of Regulations

The preparation, implementation, enforcement, and monitoring of this or any federal action involves the expenditure of public and private resources which can be expressed as costs associated with the regulations. Costs to the private sector are discussed in Section 5.4. Estimated public costs associated with this action include:

Council costs of document preparation, meetings, public hearings, and information dissemination……$19,321

NMFS administrative costs of document

preparation, meetings and review ….....$13,488

TOTAL ….....$32,809

This action is not expected to result in any changes in law enforcement costs. Any enforcement duties associated with this action would be expected to be covered under routine enforcement costs rather than an expenditure of new funds. Council and NMFS administrative costs directly attributable to this amendment and the rulemaking process will be incurred prior to the effective date of the final rule implementing this amendment.

5.6 Net Benefits of the Regulatory Action

It is important to specify the time period being considered when evaluating benefits and costs. According to the Office of Management and Budget's Frequently Asked Questions regarding Circular A-4,[45] "When choosing the appropriate time horizon for estimating costs and benefits, agencies should consider how long the regulation being analyzed is likely to have resulting effects. The time horizon begins when the regulatory action is implemented and ends when those effects are expected to cease. Ideally, analysis should include all future costs and benefits. Here as elsewhere, however, a 'rule of reason' is appropriate, and the agency should consider for how long it can reasonably predict the future and limit its analysis to this time period. Thus, if a regulation has no predetermined sunset provision, the agency will need to choose the endpoint of its analysis on the basis of a judgment about the foreseeable future. For most agencies, a standard time period of analysis is 10 to 20 years."

For current purposes, the reasonably "foreseeable future" is considered to be the next 5 years (2022-2026). The reason that this analysis uses a five-year timeframe is that a full red grouper stock assessment is to be completed in 2024, with 2025 being the earliest that the Council would begin consideration of modifications of catch limits, and implementation of any new regulation might not occur until well within 2026.

Since the recreational sector is expected to be managed to its recreational ACT in 2022, net economic benefits from the commercial and recreational sectors combined from **Preferred Alternative 2**, relative to **Alternative 1**, would be expected to increase by $6,719,417. If the recreational sector were to be managed to its recreational ACL beginning in 2023, net economic benefits from the commercial and recreational sectors combined from **Preferred Alternative 2**, relative to **Alternative 1**, would be expected to increase by an annual, discounted amount of $6,602,491. Assuming the recreational sector is only managed to its recreational ACT in 2022, the expected change in the discounted net present value of economic benefits to both sectors, over a five-year timeframe of 2022-2026, would be $31,579,225 using a 3% discount rate and $29,362,576 using a 7% discount rate. As an average annual net present value, these expected changes would be $6,315,845 and $5,872515 with a 3% and 7% discount rate, respectively.

[45] See p. 4 at https://obamawhitehouse.archives.gov/sites/default/files/omb/assets/OMB/circulars/a004/a-4_FAQ.pdf

The non-discounted public costs resulting from the regulation are $32,809. The $32,809 in costs resulting from the amendment and the associated rulemaking process should not be discounted as they will be incurred prior to the effective date of the final rule.

Based on this information, this regulatory action is expected to increase net benefits to the Nation.

5.7 Determination of Significant Regulatory Action

Pursuant to E.O. 12866, a regulation is considered a "significant regulatory action" if it is likely to result in: 1) an annual effect of $100 million or more or adversely affect in a material way the economy, a sector of the economy, productivity, competition, jobs, the environment, public health or safety, or state, local, or tribal governments or communities; 2) create a serious inconsistency or otherwise interfere with an action taken or planned by another agency; 3) materially alter the budgetary impact of entitlements, grants, user fees, or loan programs or the rights or obligations of recipients thereof; or 4) raise novel legal or policy issues arising out of legal mandates, the President's priorities, or the principles set forth in this executive order (E.O). Based on the information in Sections 5.4-5.5, the costs and benefits resulting from this regulatory action are expected to be between $6,635,300 and $6,752,226 $XYZ and therefore are not expected to meet or exceed the $100 million threshold. Thus, this action has been determined to not be economically significant for the purposes of E.O. 12866.

CHAPTER 6. REGULATORY FLEXIBILITY ACT ANALYSIS

6.1 Introduction

The purpose of the Regulatory Flexibility Act (RFA) is to establish a principle of regulatory issuance that agencies shall endeavor, consistent with the objectives of the rule and of applicable statutes to fit regulatory and informational requirements to the scale of businesses, organizations, and governmental jurisdictions subject to regulation. To achieve this principle, agencies are required to solicit and consider flexible regulatory proposals and to explain the rationale for their actions to assure such proposals are given serious consideration. The RFA does not contain any decision criteria; instead the purpose of the RFA is to inform the agency, as well as the public, of the expected economic effects of various alternatives contained in the regulatory action and to ensure the agency considers alternatives that minimize the expected economic effects on small entities while meeting the goals and objectives of the applicable statutes (e.g., the Magnuson-Stevens Fishery Conservation and Management Act (Magnuson-Stevens Act)).

With certain exceptions, the RFA requires agencies to conduct an initial regulatory flexibility analysis (IRFA) for each proposed rule. The IRFA is designed to assess the effects various regulatory alternatives would have on small entities, including small businesses, and to determine ways to minimize those effects. An IRFA is primarily conducted to determine whether the proposed regulatory action would have a significant economic effect on a substantial number of small entities. In addition to analyses conducted for the Regulatory Impact Review (RIR), the IRFA provides: 1) a description of the reasons why action by the agency is being considered; 2) a succinct statement of the objectives of, and legal basis for, the proposed regulatory action; 3) a description and, where feasible, an estimate of the number of small entities to which the proposed regulatory action will apply; 4) a description of the projected reporting, record-keeping, and other compliance requirements of the proposed regulatory action, including an estimate of the classes of small entities which will be subject to the requirements of the report or record; 5) an identification, to the extent practicable, of all relevant federal rules, which may duplicate, overlap, or conflict with the proposed rule; and 6) a description of any significant alternatives to the proposed regulatory action which accomplish the stated objectives of applicable statutes and would minimize any significant economic effects of the proposed regulatory action on small entities.

In addition to the information provided in this section, additional information on the expected economic effects of the proposed action is included in the RIR.

6.2 Statement of the need for, objectives of, and legal basis for the rule

A discussion of the reasons why action by the agency is being considered is provided in Section 1.1. The purpose of this proposed regulatory action is to modify the overfishing limit (OFL), acceptable biological catch (ABC), annual catch limits (ACL), and annual catch targets (ACT) for Gulf red grouper based on the results of the new stock analyses for Gulf red grouper. The objectives of this proposed regulatory action are to revise the OFL, ABC, ACLs, and ACTs consistent with the best available science for Gulf red grouper, and achieve optimum yield (OY) consistent with the requirements of the Magnuson-Stevens Fishery Conservation and Management Act (Magnuson-Stevens Act). The Magnuson-Stevens Act serves as the legal basis for the proposed regulatory action. All monetary estimates in the following analysis are in 2019 dollars.

6.3 Description and estimate of the number of small entities to which the proposed action would apply

Gulf Reef Fish Amendment 53 set the OFL, ABC, total ACL, commercial ACL, recreational ACL, commercial ACT (quota) and recreational ACT at the following values: 4.66 million pounds (mp) gutted weight (gw), 4.26 mp gw, 4.26 mp gw, 2.53 mp gw, 1.73 mp gw, 2.40 mp gw, and 1.57 mp gw, respectively. This proposed regulatory action would revise those values to 5.99 mp gw, 4.96 mp gw, 4.96 mp gw, 2.94 mp gw, 2.02 mp gw, 2.79 mp gw, and 1.84 mp gw, respectively. As a result, this proposed regulatory action is expected to directly regulate commercial fishing businesses that possess Gulf red grouper (RG) shares in the Grouper-Tilefish (GT) Individual Fishing Quota (IFQ) program and for-hire fishing businesses that target red grouper.

The commercial red grouper quota is allocated annually based on the percentage of RG shares in each IFQ account (e.g., if an account possesses 1% of the RG shares and the commercial quota is 1 mp, then that account would receive 10,000 pounds of commercial red grouper quota). Although it is common for a single IFQ account with RG shares to be held by a single business, some businesses have multiple IFQ accounts with RG shares. As of February 19, 2020, 495 IFQ accounts held RG shares. These accounts and RG shares were owned by 436 businesses. Thus, it is assumed this proposed regulatory action would directly regulate 436 commercial fishing businesses.

A valid charter-headboat (for-hire) Gulf reef fish vessel permit is required to legally harvest red grouper in the Gulf of Mexico (Gulf). NMFS does not possess complete ownership data regarding businesses that hold charter-headboat (for-hire) Gulf reef fish vessel permits, and thus potentially harvest red grouper. Therefore, it is not currently feasible to accurately determine affiliations between vessels and the businesses that own them. As a result, for purposes of this analysis, it is assumed each for-hire vessel is independently owned by a single business, which is expected to result in an overestimate of the actual number of for-hire fishing businesses directly regulated by this proposed regulatory action.

NMFS also does not have data indicating how many for-hire vessels take passengers to harvest Gulf red grouper in a given year. However, in 2019, there were 1,277 vessels with valid charter-headboat Gulf reef fish vessel permits. Of these 1,277 vessels, 90 vessels are used primarily for commercial fishing purposes and thus are not considered for-hire fishing businesses in this analysis. Further, Gulf red grouper is only targeted and almost entirely harvested in waters off the west coast of Florida. Of the 1,277 vessels with valid charter-headboat Gulf reef fish vessel permits, 799 were homeported in Florida. Of these 799 permitted vessels, 60 are primarily used for commercial fishing rather than for-hire fishing purposes and thus are not considered for-hire fishing businesses. In addition, 48 of these 799 permitted vessels are considered headboats. Headboats take a relatively large, diverse set of anglers to harvest a diverse range of species on a trip, and therefore do not typically take trips to target a particular species. Therefore, it is assumed that no headboat trips would be canceled, and thus no headboats would be directly affected as a result of this proposed regulatory action. However, charter vessels often take passengers to target red grouper. Of the 799 vessels with valid charter-headboat Gulf reef fish vessel permits that are homeported in Florida, the remaining 691 vessels are charter vessels. Souza and Liese (2019) reported that 76% of charter vessels with valid charter-headboat permits in the Gulf were active in 2017 (i.e., 24% were not used for fishing). A charter vessel would only be directly affected by this proposed regulatory action if it were used for fishing. Given this information, our best estimate of the number of charter vessels that are likely to be used to harvest Gulf red grouper in a given year is 525, and thus this proposed regulatory action is estimated to directly regulate 525 for-hire fishing businesses.

For Regulatory Flexibility Act purposes, NMFS has established a small business size standard for businesses, including their affiliates, whose primary industry is commercial fishing (50 CFR 200.2). A business primarily involved in the commercial fishing industry is classified as a small business if it is independently owned and operated, is not dominant in its field of operation (including its affiliates), and its combined annual receipts (revenue) are not in excess of $11 million for all of its affiliated operations worldwide. NMFS does not collect revenue data specific to commercial fishing businesses that have IFQ accounts; rather, revenue data is collected for commercial fishing vessels. It is not possible to assign revenues earned by commercial fishing vessels back to specific IFQ accounts and the businesses that possess them because quota is often transferred across many IFQ accounts before it is used by a vessel for harvesting purposes, and specific units of quota cannot be tracked. However, from 2014 through 2018, the maximum annual gross revenue earned by a single vessel during this time was about $2.39 million in 2015. The average gross revenue per vessel was about $143,000 in that year. By 2018, the maximum and average gross revenue per vessel had decreased to about $1.04 million and $96,000, respectively. Based on this information, all commercial fishing businesses directly regulated by this proposed regulatory action are determined to be small entities for the purpose of this analysis.

For other industries, the Small Business Administration (SBA) has established size standards for all major industry sectors in the U.S., including for-hire businesses (NAICS code 487210). A business primarily involved in for-hire fishing is classified as a small business if it is independently owned and operated, is not dominant in its field of operation (including its affiliates), and has annual receipts (revenue) not in excess of $8 million for all its affiliated operations worldwide. The maximum annual gross revenue for a single headboat in the Gulf was

about $1.38 million in 2017 (D. Carter, SEFSC, pers. comm., 2018). According to Savolainen, et al. (2012), on average, annual gross revenue for headboats in the Gulf is about three times greater than annual gross revenue for charter vessels, reflecting the fact that businesses that own charter vessels are typically smaller than businesses that own headboats. Based on this information, all for-hire fishing businesses directly regulated by this proposed regulatory action are determined to be small businesses for the purpose of this analysis.

6.4 Description of the projected reporting, record-keeping and other compliance requirements of the proposed rule, including an estimate of the classes of small entities which will be subject to the requirement and the type of professional skills necessary for the preparation of the report or records

This proposed regulatory action would not establish any new reporting or record-keeping requirements.

6.5 Identification of all relevant federal rules, which may duplicate, overlap or conflict with the proposed rule

No duplicative, overlapping, or conflicting federal rules have been identified.

6.6 Significance of economic effects on small entities

Substantial number criterion

If implemented, this proposed regulatory action is expected to directly regulate 436 of the 532 businesses with IFQ accounts, or approximately 82% of those commercial fishing businesses. Further, this proposed regulatory action is expected to directly regulate 525 of the 1,187 for-hire fishing businesses valid charter/headboat permits in the Gulf reef fish fishery, or approximately 44% of those for-hire fishing businesses. All directly regulated commercial and for-hire fishing businesses have been determined, for the purpose of this analysis, to be small entities. Based on this information, the proposed regulatory action is expected to affect a substantial number of small businesses.

Significant economic effects

The outcome of "significant economic impact" can be ascertained by examining two factors: disproportionality and profitability.

Disproportionality: Do the regulations place a substantial number of small entities at a significant competitive disadvantage to large entities?

All entities directly regulated by this regulatory action have been determined to be small entities. Thus, the issue of disproportionality does not arise in the present case.

Profitability: Do the regulations significantly reduce profits for a substantial number of small entities?

Because revenue and cost data are not directly collected for commercial fishing businesses that are expected to be directly regulated by this proposed regulatory action, direct estimates of their economic profits are not available. However, economic theory suggests that annual allocation (quota) prices should reflect expected annual economic profits, which allows economic profits to be estimated indirectly.

The 436 commercial fishing businesses that own RG shares, and therefore receive RG quota at the beginning of each calendar year, also own shares and receive quota in the other IFQ share categories i.e., red snapper (RS), gag grouper (GG), shallow water grouper (SWG), deep-water grouper (DWG), and tilefish (TF). These businesses earn economic profits because of their ownership of these shares as well their RG shares. However, economic profits are only realized if the quota allocated to these businesses with shares is actually used for harvesting purposes (i.e., no economic profits will accrue unless the quota results in the production and sale of seafood). Because the average annual commercial landings of RG from 2014-2018 and the proposed RG commercial quota are almost identical, it is assumed that all of the RG commercial quota will be harvested in the foreseeable future. Similarly, practically all of the commercial RS quota has been used for harvesting in recent years, and so it is assumed that all of the commercial RS quota allocated to these businesses will be harvested in the foreseeable future. However, based on 2015-2019 data, it is expected that only 84% of the DWG commercial quota, 50% of the GG commercial quota, 35% of the SWG commercial quota, and 78% of the TF commercial quota allocated to these businesses will be used for harvesting in the foreseeable future. Given these quota utilization rates in combination with average annual allocation prices in 2019 and annual commercial quotas in 2020 by share category (see Table 3.3.1.14), total economic profits for commercial fishing businesses with RG shares are estimated to be at least $18.61 million. This estimate does not account for any economic profits that may accrue to commercial fishing businesses that own RG shares and also harvest non-IFQ species. Such profits are likely to be small because harvest of IFQ species accounts for around 85% of commercial IFQ vessels' average annual gross revenue, and economic profits from the harvest of non-IFQ species tend to be much smaller than those from IFQ species (C. Liese, SEFSC, pers. comm., 2019). Given that there are 436 commercial fishing businesses that own RG shares, the average annual expected economic profit per commercial fishing business is at least $42,700.

However, most of these economic profits (82%) are the result of owning RS shares. Only approximately $1.77 million (or 9.5%) of their economic profits are due to the ownership of RG shares. This proposed regulatory action is only expected to affect economic profits from the ownership of RG shares. Specifically, the proposed regulatory action would increase the commercial red grouper ACT (quota) from 2.40 mp gw to 2.79 mp gw. Given an annual allocation price of $.59/lb in 2019 for RG, this increase in the commercial red grouper quota is expected to increase annual economic profits to these commercial fishing businesses by

$223,610, or about $513 per business per year. Thus, annual economic profit is expected to increase by about 1.2 % on average per commercial fishing business.

According to Savolainen, et al. (2012), which contains the most recent estimates of economic returns in the for-hire sector, average annual economic profits are $26,514 per charter vessel. The proposed regulatory action would increase the recreational ACL for Gulf red grouper from 1.73 mp gw to 2.02 mp gw. This increase in the recreational ACL is expected to increase the recreational season length by 12 days, and thereby cause the number of trips targeting red grouper on charter vessels to increase by 665 angler trips. Net Cash Flow per Angler Trip (CFpA) is the best available estimate of profit per angler trip by charter vessels. According to Souza and Liese (2019), CFpA on charter vessels is estimated to be $141 per angler trip. Thus, the estimated increase in charter vessel profits from this action is expected to be $93,723, or $179 per charter vessel, if the recreational sector is managed to its ACL.

The proposed regulatory action would also increase the recreational ACT from 1.57 mp gw to 1.84 mp gw. The ACT is only germane if the recreational sector exceeds its ACL in the future, as that would trigger the post-season accountability measure (AM), causing the recreational sector to be constrained to the recreational ACT rather than the recreational ACL. Average annual landings in the recreational sector from 2016 through 2019 are slightly below the proposed recreational ACL. However, the recreational sector for Gulf red grouper closed on September 15 in 2021. Therefore, it is possible that the post-season AM may be triggered in the future, causing the recreational sector, including the for-hire component, to be constrained to the ACT. If the post-season AM is triggered and the recreational sector is managed under the ACT, this proposed regulatory action would increase the recreational season length by 45 days, which would be expected to increase the number of trips targeting red grouper on charter vessels by 2,352 angler trips. Thus, if the post-season AM is triggered, the estimated increase in charter vessel profits from this action would be $331,637, or $632 per charter vessel.

6.7 Description of significant alternatives to the proposed action and discussion of how the alternatives attempt to minimize economic impacts on small entities

This proposed regulatory action, if implemented, is not expected to reduce the profits of any small entities directly regulated by this action. As a result, the issue of significant alternatives is not relevant.

CHAPTER 7. AGENCIES, ORGANIZATIONS AND PERSONS CONSULTED

The following have or will be consulted:

National Marine Fisheries Service
- Southeast Fisheries Science Center
- Southeast Regional Office
- Protected Resources
- Habitat Conservation
- Sustainable Fisheries

NOAA General Counsel
Environmental Protection Agency
United States Coast Guard

CHAPTER 8. LIST OF PREPARERS

PREPARERS

Name	Expertise	Responsibility	Agency
Matthew Freeman	Economist	Co-Team Lead – Amendment development, economic effects, Regulatory Impact Review, cumulative effects analysis	GMFMC
Daniel Luers	Fishery biologist	Co-Team Lead – Amendment development, biological environment, administrative environment, biological effects, administrative effects, cumulative effects analysis	SERO
Ava Lasseter	Anthropologist	Social effects	GMFMC
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Ryan Rindone	Fishery biologist	Review	GMFMC
Jennifer Lee	Protected resource specialist	Protected resources review	SERO
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GMFMC = Gulf of Mexico Fishery Management Council; NOAA GC = National Oceanic and Atmospheric Administration General Counsel; SEFSC = Southeast Fisheries Science Center; SERO = Southeast Regional Office of the National Marine Fisheries Service

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APPENDIX A. OTHER APPLICABLE LAW

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 (EEZ). 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. Proposed and final rules will be published before implementing the actions in this amendment.

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 the National Oceanic and Atmospheric Administration (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 required to provide a consistency determination to the relevant state agency at least 90 days before taking final action.

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 and amendments and the use of best available information is the second national standard under the Magnuson-Stevens Act. To be consistent with the Magnuson-Stevens Act, FMPs and amendments must be based on the best 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), 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

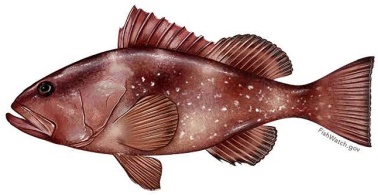
The E.O. on Federalism requires agencies in formulating and implementing policies, to be guided by the fundamental Federalism principles. The E.O. serves to guarantee the division of governmental responsibilities between the national government and the states that was intended by the framers of the Constitution. 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 and amendments 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 recreational harvest of greater amberjack. 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.

APPENDIX B. ADJUSTMENT OF SEDAR 61 GULF RED GROUPER PROJECTED CATCH STREAMS USING MEAN WEIGHT OF RECREATIONALLY LANDED FISH FROM ACL MONITORING



Adjustment of SEDAR61 Gulf Red Grouper Projected Catch Streams Using Mean Weight of Recreationally Landed Fish from ACL Monitoring

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NOAA Fisheries - Southeast Fisheries Science Center

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Keywords

Red Grouper, Gulf of Mexico, SEDAR61, Recreational Landings, Mean Weight, Catch Advice Adjustment

Abstract

This document describes the adjustment of SEDAR61 assessment expected recreational landings in weights using a mean weight scalar approach. The mean weight scalar is the ratio of the mean weight of Red Grouper landed by the recreational fishery (from the ACL monitoring dataset developed at the Southeast Fisheries Science Center), to the mean weight of Red Grouper expected by the SEDAR61 assessment model. Adjustments to projected yields streams are provided along with an adjusted OverFishing Limit and an adjusted Acceptable Biological Catch following the recommendations by the Gulf of Mexico Fishery Management Council's Scientific and Statistical Committee.

Introduction

The Standard SEDAR61 stock assessment (*http://sedarweb.org/sedar-61*) for Red Grouper fit to recreational landings in numbers of fish (see Figure 4.2 in Full SEDAR61 Stock Assessment Report). Gulf assessments have traditionally fit to recreational landings in numbers because numbers are the native units of recreational monitoring surveys. The assessment model used the mean weight of retained Red Grouper (based on lengths) to convert recreational landings into weights. A comparison between mean size of landed Red Grouper predicted by the assessment model and the ACL monitoring dataset revealed that the assessment model underpredicted the size of landed Red Grouper. Since Red Grouper are monitored in terms of weights for

management, we adjusted the assessment predicted recreational landings in weights using a mean weight scalar for Red Grouper discussed below.

Materials and Methods

ACL Monitoring Dataset

Recreational landings in numbers and weights were obtained from the Southeast Fisheries Science Center (SEFSC) Annual Catch Limits (ACL) monitoring dataset (**Table 1**). These data include landings estimates from the Marine Recreational Information Program (MRIP-Fishing Effort Survey [FES]-adjusted), formerly the Marine Recreational Fisheries Statistics Survey, and the Southeast Region Headboat Survey. Recreational landings derived from MRIP-FES were comprised of Red Grouper landed whole and observed by interviewers ("Type A") and Red Grouper reported as killed by the fishers ("Type B1"). Weight estimates were developed by the SEFSC and used the Marine Recreational Information Program (MRIP) sample data to obtain an average weight by strata using the following hierarchy (from coarsest to finest): species, region, year, state, mode, wave, and area (Matter and Rios 2013). Average weights were then multiplied by the landings estimates in numbers to obtain estimates of landings in weight and converted to gutted weights. Final estimates of landings were available through 2019.

Assessment Predicted Recreational Landings in Numbers

The SEDAR61 Red Grouper assessment model fit to recreational landings in numbers with considerable uncertainty (**Table 2**). An output of the assessment model was the predicted recreational landings in weights, which were obtained by taking the predicted catch-at-age and multiplying them by a weight derived from the growth curve, selectivity assumptions, and the length-weight conversion.

Assessment Projection Specifications

Retained yields were projected starting in 2020 under assumed conditions of recent average recruitment, catch allocations of 59.3% commercial and 40.7% recreational (GMFMC 2021), selectivity and retention similar to 2017, and assuming the 2018 red tide event had a similar impact on the population as the 2005 red tide event. Additional details on projection specifications are provided in Section 5.2 of the Full SEDAR61 Stock Assessment Report. For SEDAR61, the OverFishing Limit (OFL) was set as the average projected yield between 2020 and 2024 for the projection achieving 30% spawning potential ratio in equilibrium. Following the revised allocations specified above, this led to an OFL of 4.66 million pounds gutted weight and an Acceptable Biological Catch (ABC) of 4.26 million pounds gutted weight, which was based on a 30% probability of overfishing, as recommended by the Gulf of Mexico Fishery Management Council's Scientific and Statistical Committee (GMFMC SSC). The adjustments presented herein were based on updated projections for the SEDAR61 assessment model using the adjusted recreational catches to ensure that projected allocations from 2020 throughout the projection period remained at 59.3% commercial and 40.7% recreational (GMFMC 2021).

Mean Weight Scalar

The assessment predicted landings in weights for 2020 through 2024 were adjusted by a mean weight scalar. The mean weight scalar (MW Scalar) was determined as:

$$MW\ Scalar = \frac{2019\ mean\ weight\ from\ ACL\ monitoring\ dataset}{2019\ projected\ mean\ weight\ by\ SEDAR61\ assessment\ model}.$$

Mean weight in 2018 was not considered representative due to concerns over how the 2018 red tide event impacted the size and age structure of the Red Grouper population. Mean weight in 2020 was also not considered representative due to sampling issues experienced due to COVID-19.

Results and Discussion

Comparison of Mean Weight of Landed Red Grouper

The assessment model predicted a mean size of about 4 pounds gutted weight (range: 3.7-4.3) per Red Grouper landed, which is considerably lower than the mean weight of about 6.1 pounds gutted weight (range: 2.7-7.6) based on the ACL monitoring dataset (**Figure 1**). The underestimation was caused by the growth curve, which was externally fit and fixed in the assessment model, and the assumed distribution regarding the variability-at-length (i.e., the coefficient of variation). The assessment model ultimately inferred the weights, which were lower than observed in the ACL monitoring dataset. After adjusting for the mean weight of Red Grouper landed by the recreational fishery based on the ACL monitoring dataset, the recreational landings estimates are closer to the landings used to monitor ACLs (**Figure 2**).

Adjustment to Projected Yield Streams, OFL and ABC

The assessment predicted landings in weights for 2020 through 2024 were adjusted by a mean weight scalar of 1.597. Assuming the same decisions on how to specifty OFL and ABC would be made by the GMFMC SSC, this analysis results in an OFL of 5.99 million pounds gutted weight and an ABC of 5.57 million pounds gutted weight. These results can be considered for interim use until the next scheduled Red Grouper assessment.

References

Gulf of Mexico Fishery Management Council (GMFMC). 2021. Revised Draft Reef Fish Amendment 53. Red Grouper Allocations and Annual Catch Levels and Targets. National Marine Fisheries Service, NA15NMF4410011, Tampa, Florida.

Tables

Table 1. Recreational landings of Red Grouper in numbers and weights (pounds gutted weight) from the SEFSC ACL monitoring dataset accessed March 2021. The mean weight of landed Red Grouper (pounds gutted weight) was determined by dividing the estimates of weight by numbers.

Year	Number	Weight	Mean Weight
1986	1,253,263	3,361,932	2.683
1987	847,713	2,495,130	2.943
1988	1,638,290	4,717,002	2.879
1989	2,351,753	7,632,792	3.246
1990	639,378	4,014,324	6.278
1991	608,242	3,835,736	6.306
1992	974,795	6,338,446	6.502
1993	864,533	5,159,771	5.968
1994	580,434	3,868,766	6.665
1995	553,816	3,496,543	6.314
1996	147,678	910,312	6.164
1997	177,087	1,142,957	6.454
1998	211,812	1,513,889	7.147
1999	491,659	3,428,552	6.973
2000	612,808	4,242,230	6.923
2001	367,036	2,435,455	6.635
2002	451,178	3,172,347	7.031
2003	356,913	2,201,496	6.168
2004	1,233,846	7,983,238	6.470
2005	485,596	3,081,978	6.347
2006	377,438	2,655,064	7.034
2007	316,788	2,031,717	6.413
2008	258,027	1,604,325	6.218
2009	211,125	1,609,246	7.622
2010	338,182	1,963,762	5.807
2011	282,933	1,534,112	5.422
2012	696,535	4,131,722	5.932

Table 1 Continued. Recreational landings of Red Grouper in numbers and weights (pounds gutted weight) from the SEFSC ACL monitoring dataset accessed March 2021. The mean weight of landed Red Grouper (pounds gutted weight) was determined by dividing the estimates of weight by numbers.

Year	Number	Weight	Mean Weight
2013	872,842	4,990,310	5.717
2014	870,135	5,367,913	6.169
2015	542,994	3,790,613	6.981
2016	407,617	2,632,749	6.459
2017	248,270	1,692,513	6.817
2018	281,882	2,053,446	7.285
2019	263,461	1,638,047	6.217

Table 2. Input (with log-scale standard errors, SE) and expected (Exp) landings for the recreational fishery in weight (B, pounds gutted weight) and number (N) for Gulf of Mexico Red Grouper. The mean body weight (MW, pounds gutted weight) expected by the assessment model was determined by dividing the expected landings in weights by numbers of fish. The mean weight scalar (MW Scalar) is the ratio between the ACL monitoring mean weight (**Table 1**) and the assessment expected mean weight (Exp MW). Adjusted landings were determined by multiplying the assessment predicted biomass (Exp B) by the mean weight scalar (MW Scalar).

Year	SE	Input N	Exp N	Exp B	Exp MW	MW Scalar	Adjusted B
1986	0.05	1,248,540	1,187,050	4,676,991	3.940	0.6808	3,184,313
1987	0.3	847,710	401,954	1,579,246	3.929	0.7492	1,183,097
1988	0.3	1,617,440	903,609	3,547,850	3.926	0.7333	2,601,691
1989	0.3	2,351,750	1,763,040	6,907,361	3.918	0.8284	5,722,079
1990	0.3	565,315	453,855	1,782,873	3.928	1.5983	2,849,521
1991	0.3	595,541	530,945	2,083,650	3.924	1.6069	3,348,280
1992	0.3	930,369	648,226	2,550,943	3.935	1.6523	4,214,984
1993	0.3	677,700	478,096	1,884,941	3.943	1.5138	2,853,408
1994	0.3	574,165	491,749	1,941,829	3.949	1.6879	3,277,654
1995	0.3	553,818	580,187	2,298,184	3.961	1.5939	3,663,038
1996	0.3	147,679	166,297	660,867	3.974	1.5511	1,025,083
1997	0.3	177,087	229,529	916,211	3.992	1.6169	1,481,429
1998	0.3	211,813	331,708	1,334,851	4.024	1.7761	2,370,826

Table 2 Continued. Input (with log-scale standard errors, SE) and expected (Exp) landings for the recreational fishery in weight (B, pounds gutted weight) and number (N) for Gulf of Mexico Red Grouper. The mean body weight (MW, pounds gutted weight) expected by the assessment model was determined by dividing the expected landings in weights by numbers of fish. The mean weight scalar (MW Scalar) is the ratio between the ACL monitoring mean weight (**Table 1**) and the assessment expected mean weight (Exp MW). Adjusted landings were determined by multiplying the assessment predicted biomass (Exp B) by the mean weight scalar (MW Scalar). Gray shading identifies the first two projection years where input landings in numbers were fixed at 2018 final estimates (2019 assumed identical at the time of projection development for SEDAR61).

Year	SE	Input N	Exp N	Exp B	Exp MW	MW Scalar	Adjusted B
1999	0.3	491,657	629,023	2,548,893	4.052	1.7209	4,386,452
2000	0.3	612,857	582,334	2,320,450	3.985	1.7373	4,031,271
2001	0.3	367,038	391,870	1,576,488	4.023	1.6494	2,600,241
2002	0.3	451,176	400,263	1,617,359	4.041	1.7401	2,814,351
2003	0.3	356,915	374,211	1,428,267	3.817	1.6161	2,308,193
2004	0.3	1,234,420	1,074,320	4,211,970	3.921	1.6503	6,951,072
2005	0.3	485,616	452,022	1,853,677	4.101	1.5477	2,868,891
2006	0.3	377,453	351,907	1,434,909	4.078	1.7252	2,475,468
2007	0.3	316,790	273,017	1,114,475	4.082	1.5711	1,750,992
2008	0.3	258,029	432,713	1,799,607	4.159	1.4950	2,690,465
2009	0.3	209,833	317,532	1,290,077	4.063	1.8761	2,420,306
2010	0.3	338,181	399,218	1,495,779	3.747	1.5498	2,318,187
2011	0.3	282,933	530,875	2,042,620	3.848	1.4092	2,878,498
2012	0.3	696,535	860,610	3,520,403	4.091	1.4501	5,104,985
2013	0.3	872,840	1,068,150	4,535,763	4.246	1.3464	6,106,947
2014	0.3	870,134	924,319	3,946,710	4.270	1.4448	5,702,177
2015	0.3	542,995	506,343	2,140,311	4.227	1.6515	3,534,754
2016	0.3	407,616	327,821	1,360,958	4.152	1.5558	2,117,356
2017	0.3	248,199	218,995	872,581	3.984	1.7109	1,492,938
2018	NA	210,613	210,613	802,325	3.809	1.9123	1,534,267
2019	NA	210,613	210,613	819,843	3.893	1.5972	1,309,469

Table 3. Expected (Exp) landings for the recreational fishery in weight (B, pounds gutted weight) for Gulf of Mexico Red Grouper. The mean weight scalar (MW Scalar) is the ratio between the ACL monitoring mean weight and the assessment expected mean weight (Exp MW; **Table 2**). Adjusted recreational landings (Rec Adj B) were determined by multiplying the assessment predicted recreational weights (Rec Exp B) by the mean weight scalar (MW Scalar). Adjusted is the total catch stream after adjusting the SEDAR61 assessment predicted recreational landings in weights by the mean weight scalar (MW Scalar) and adding them to the projected commercial landings in weights.

Year	Rec Exp B	MW Scalar	Rec Adj B	Adjusted
2020	1,642,120	1.5972	2,622,826	6,443,770
2021	1,573,668	1.5972	2,513,494	6,175,135
2022	1,497,516	1.5972	2,391,863	5,876,300
2023	1,448,697	1.5972	2,313,888	5,684,655
2024	1,470,781	1.5972	2,349,161	5,771,170
Mean	1,526,556	1.5972	2,438,246	5,990,206

Table 4. Estimated probability of overfishing in 2020 through 2024 for Gulf of Mexico Red Grouper after adjusting recreational landings in weights. The probability of overfishing was determined by summing up the area under each probability density function (PDF) curve of retained yield (millions of pounds).

Value	Retained Yield	Probability of Overfishing
OFL	5.99	0.50
	5.84	0.43
	5.78	0.40
ABC	5.57	0.30

Figures

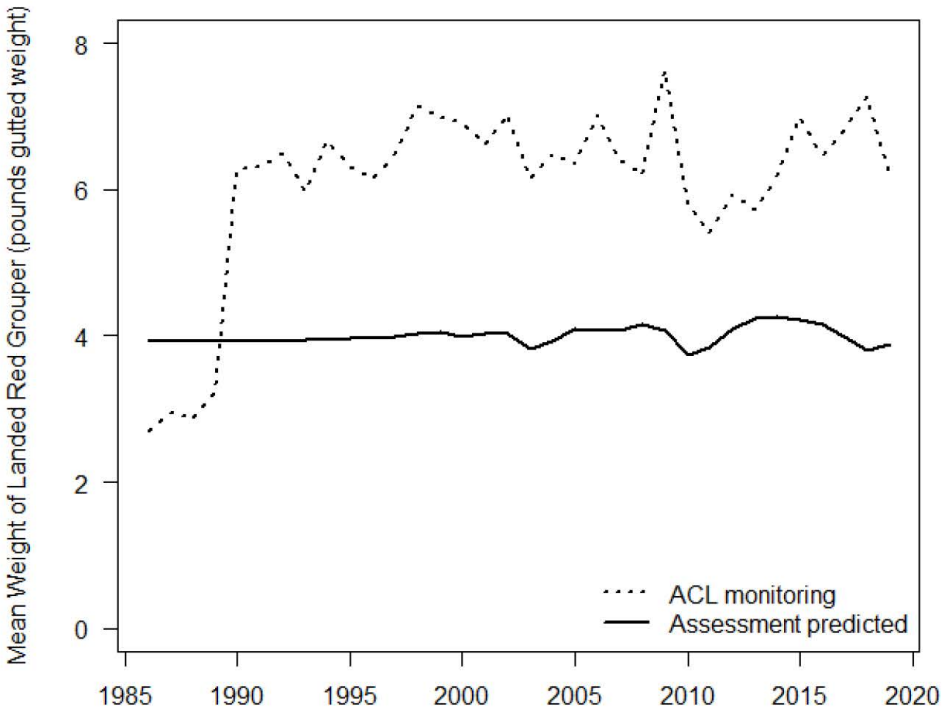


Figure 1. Comparison of mean weight of Gulf of Mexico Red Grouper landed by the recreational fishery based on the SEDAR61 assessment model predicted landings and the ACL monitoring dataset.

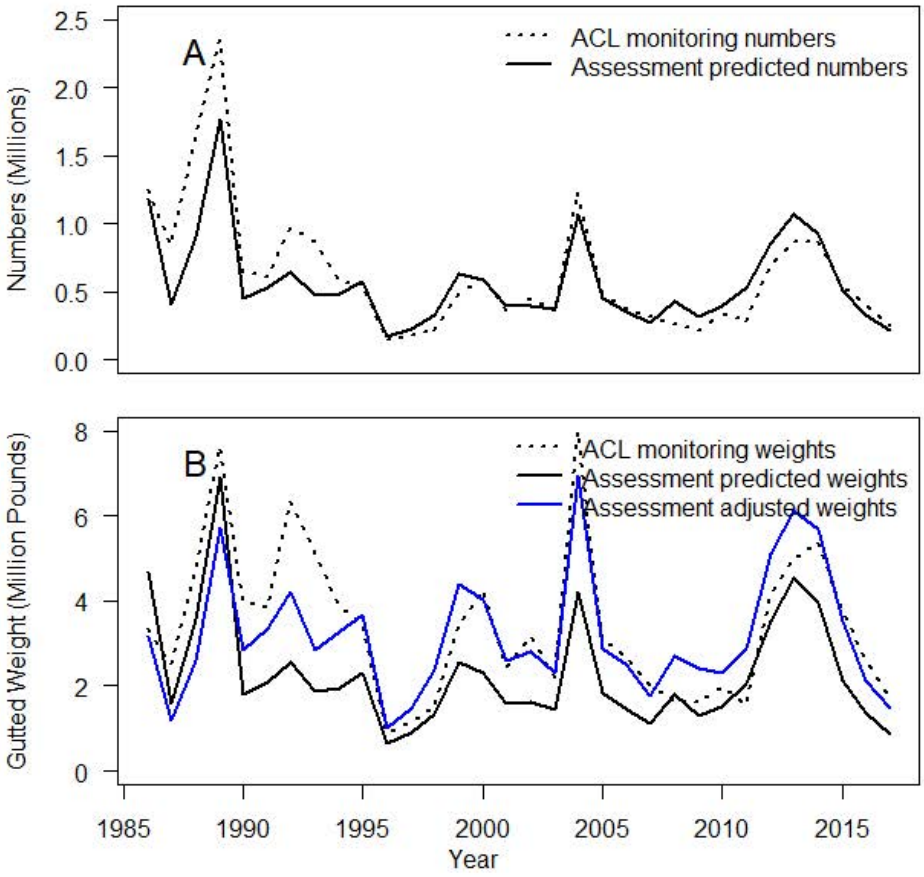


Figure 2. Comparison of Gulf of Mexico Red Grouper assessment predicted numbers (A) and gutted weights (B) compared to the ACL monitoring data. The blue line reflects the adjusted recreational weight estimates based on assessment predicted numbers and the mean weight from the ACL monitoring dataset.

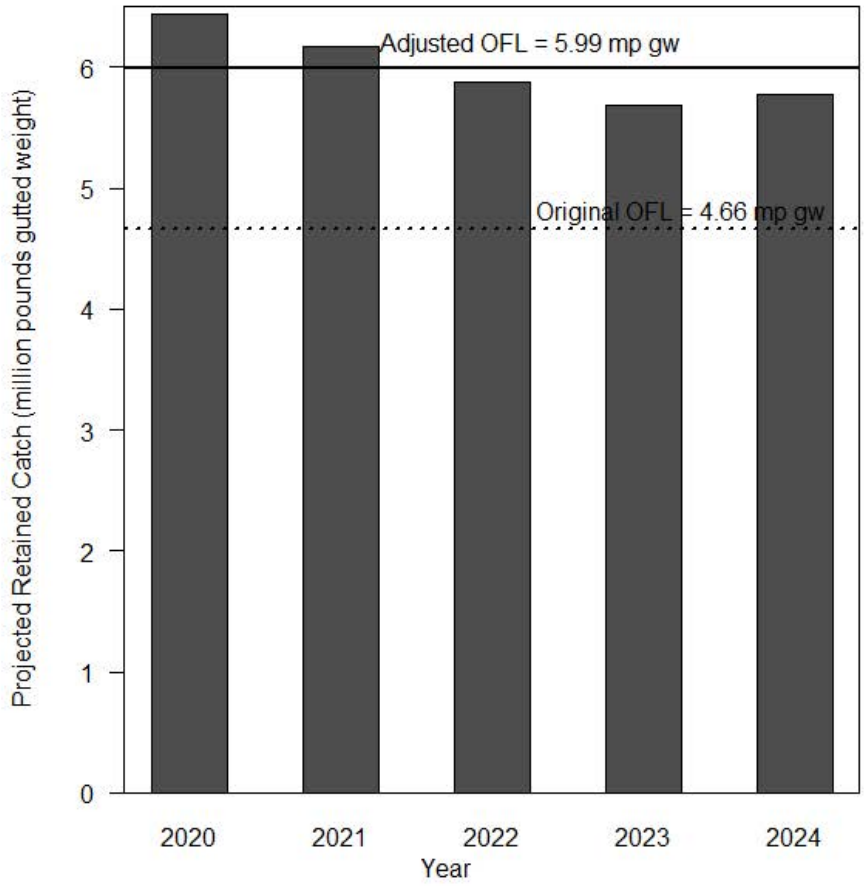
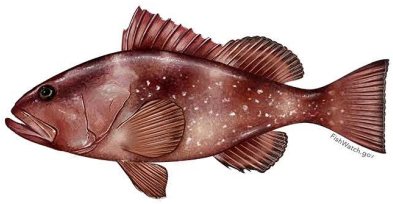


Figure 3. Projected yield streams for Gulf of Mexico Red Grouper after adjusting the recreational weight estimates based on the mean weight scalar. Original OFL refers to the OFL adopted by Amendment 53. The Adjusted OFL is the recommended adjustment following scaling of the recreational landings.

APPENDIX C. UPDATED INTERIM ANALYSIS FOR GULF OF MEXICO RED GROUPER



Updated Interim Analysis for Gulf of Mexico Red Grouper

Gulf Branch
Sustainable Fisheries Division
NOAA Fisheries - Southeast Fisheries Science Center

August 2, 2021

Keywords

Interim Analysis, Index of Abundance, Red Grouper, Gulf of Mexico, Reduced Spatial Area, Recreational Landings Weight-Adjusted ABC

Abstract

An Interim Analysis (IA) was conducted for Red Grouper following the Standard SEDAR61 stock assessment (*http://sedarweb.org/sedar-61*). This updated IA applies an index-based harvest control rule tested through simulation and recently implemented in the 2020 IAs for both Red Snapper and Gray Triggerfish. Data from the NMFS Bottom Longline Survey were used to produce an index of relative abundance updated through 2020 following the same methodology and approach described in Pollack et al. (2018), with the exception of reduced spatial coverage. The reduced spatial coverage index of abundance was ultimately utilized because the 2020 index value for the full spatial area index was considered an overestimate due to reduced spatial coverage from COVID, mechanical issues, and weather delays (SEFSC 2020a). Adjusted catch advice is presented and takes into account the allocations finalized in Amendment 53 and a post-SEDAR61 assessment adjustment to the Acceptable Biological Catch (ABC).

Introduction

Interim analyses (IA) are designed to occur between regular stock assessments conducted through the Southeast Data Assessment and Review process (SEDAR) to provide the opportunity to adjust harvest recommendations based on current stock conditions. For example, unpredictable events can occur such as a change in recruitment (e.g., pulse or failure), environmental disasters (e.g., red tides or hurricanes) or man-made disasters (e.g., Deepwater Horizon). The first IA for Red Grouper occurred in 2018. While IAs have been conducted regularly since the first application, none have been formally used to adjust catch advice (**Table 1**). Further, the projection-based approach applied for Red Grouper to date has not yet been simulation tested to ensure adequate performance.

Recently, support has grown for an index-based harvest control rule that relies solely on the observed index and uses the ratio between recent and reference time periods to adjust the catch advice. This approach has been simulation tested for Vermilion Snapper (Hunyh et al. 2020) and was formally accepted by the Gulf of Mexico Fishery Management Council's Scientific and Statistical Committee for the 2020 IAs for both Red Snapper and Gray Triggerfish. In addition to documenting acceptable performance for this index-based approach, Hunyh et al. (2020) showed that this approach performed well when circumstances arise that are not accounted for in projections, such as episodic natural mortality (e.g., red tide mortality). Therefore, this updated approach was preferred over the previously applied projection-based harvest control rule for Red Grouper, which compared the observed index of abundance to the index of abundance projected and expected by the SEDAR61 assessment model. The new approach removes the reliance on projected abundance from the SEDAR61 assessment model and its inherent assumptions (e.g., assumed red tide mortality in 2018 during the projection).

Concerns were raised over the status of Red Grouper in the Gulf of Mexico following the Standard SEDAR61 stock assessment (terminal year of) due to an inability to harvest quotas (**Figure 1**). In 2020, both the commercial and recreational fisheries harvested about 80% of their quotas.

Materials and Methods

Index Data Source

The NMFS Mississippi Laboratories have conducted standardized bottom longline surveys in the Gulf of Mexico, Caribbean, and Western North Atlantic since 1995. The objective of these surveys is to provide fisheries independent data for stock assessment purposes. These surveys are conducted annually and provide an important source of fisheries independent information on large coastal sharks, snappers and groupers from the GOM and Atlantic. In 2011, a Congressional Supplement Sampling Program was conducted where high levels of survey effort were maintained from April through October (Campbell et al. 2012). For this analysis of Red Grouper, only Congressional Supplement Sampling Program data collected during the same time period as the annual survey (August/September) were used to supplement missing data from the NMFS Bottom Longline Survey in 2011.

Index of Abundance

A standardized index was developed using NMFS Bottom Longline Survey data using delta-lognormal generalized linear model methods described in Pollack (2021) (at the end of this document). A new index was created where the data were limited to those stations completed in the eastern GOM (east of 87° W and south of 28.5° N) and at depths less than 118 m through the entire time series. The index computed by this method is a mathematical combination of yearly abundance estimates from two distinct generalized linear models: a binomial (logistic) model which describes proportion of positive abundance values (i.e. presence/absence) and a lognormal model which describes variability in only the nonzero abundance data (cf. Lo et al. 1992). Additional details on survey design, data filtering and exclusions and modeling approach are provided in Pollack et al. (2018) and Pollack (2021).

Interim Approach

This updated IA of Red Grouper sought to quantify a target ABC adjustment through the use of a harvest control rule that utilizes recent trends in observed indices of abundance following the general methodology proposed by Huynh et al. (2020). Following the 2020 IA for Red Snapper, the approach presented in Huynh et al. (2020) was modified to add an additional source of tolerance for changing the catch advice. The harvest control rule takes the following forms depending on the number of years used in the moving average:

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

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

where:

C_{y+1} = Adjusted catch recommendation for year $y+1$ (2021; considered for implementation starting in 2022)

C_{ref} = reference level catch level (5.57 million pounds gutted weight) to be adjusted. This ABC is based on finalized allocations of 59.3% commercial and 40.7% recreational from Amendment 53 (GMFMC 2021) and a post-SEDAR61 assessment adjustment to the Acceptable Biological Catch (ABC). This ABC adjustment adjusted the projected recreational landings in weights using a mean weight scalar. The mean weight scalar was obtained by dividing the mean weight of Red Grouper landed by the recreational fishery based on the ACL monitoring dataset to the mean weight expected by the SEDAR61 assessment model (SEFSC 2021). This IA assumes that this ABC would have been implemented a year after the 2017 terminal year of SEDAR61 (Y_{ref} = 2018).

I_k = average of the observed index values during the recent period (3-year 2018-2020 or 5-year 2016-2020) for the reduced spatial area.

I_{ref} = average of the observed index values during the reference period (3-year 2017-2019 or 5-year 2015-2019) for the reduced spatial area.

The time period of the moving average for I_{ref} and I_k was either 3 or 5 years to provide results with two ranges of tolerance for changes in catch advice.

Splitting the adjusted catch from the IA by sector was completed by using the allocation fractions listed above from Amendment 53 (GMFMC 2021).

Results

Index of Abundance

Figure 2 provides a comparison of the updated index for the reduced area of the Eastern Gulf of Mexico through 2020 to the SEDAR61 index with 95% confidence intervals. All updated index values fell within the confidence interval for the SEDAR61 index and the trends between indices were similar (**Figure 2**). For the reduced area index, relative abundance peaked in 2011 and was

lowest in 2008, but did not show as large of an increase in relative abundance in 2020 as compared to the full area index (SEFSC 2020a; Pollack 2020).

Interim Analysis

Adjustments to the SEDAR61-adjusted ABC (5.57 million pounds gutted weight; SEFSC 2021) were made using two separate moving average periods of 3- or 5- years. Recent index values were slightly below the reference index values for both the 3-year (**Figure 3**) and 5-year scenarios (**Figure 4**), with index ratios of 0.89 and 0.91, respectively (**Table 2**). Multiplying each index ratio by the reference catch resulted in adjusted catch recommendations from 5.57 million pounds gutted weight to 4.96 million pounds gutted weight using the 3-yr average and 5.07 million pounds gutted weight using the 5-yr average (**Table 3**). Implementing either of the presented IA variations will reduce the ABC from its reference value, but will be higher than the ABC of 4.26 million pounds gutted weight implemented by Amendment 53, which was prior to adjusting the ABC for recreational weight estimates (SEFSC 2021).

Discussion

This IA provides updated recommendations for Gulf of Mexico Red Grouper using an approach vetted through simulations and recently implemented for Red Snapper (SEFSC 2020b) and Gray Triggerfish (SEFSC 2020c). Prior IAs for Red Grouper applied a projection-based management procedure, however this approach was discontinued for numerous reasons. First, the simulation study by Hunyh et al. (2020) supported the application of this approach using vermilion snapper as an example species. Second, the results derived from the projection-based approach previously applied were strongly dependent upon assumptions made during the SEDAR61 assessment projections, such as the impact of the 2018 red tide event (assumed similar to the 2005 red tide event) and the catches input for 2019 (assumed removal of the commercial ACL in 2019 (realized catches were lower) and recreational landings similar to 2018 (realized 2019 catches were higher). Removing the reliance on projected abundance and instead comparing reference and recent index trends from the observed index is preferred because the observed index more accurately represents "real-time" trends in the population. Third, the projection-based approach applied previously used a static ABC projection but was designed to work off of projected ABC values (i.e., varying annually).

Future simulation work focused on Red Grouper can provide additional support for base index selection and harvest control rule parameterization decisions on output obtained from a Management Strategy Evaluation (MSE). In the southeast, these MSEs will be conducted using an extension to the Stock Synthesis (SS) assessment software being developed by the SSMSE research program (*https://github.com/nmfs-fish-tools/SSMSE*). The SSMSE tool is still under active development, which creates an opportunity for stakeholders to suggest specific performance metrics (e.g., probability of overfishing, average yield, catch stability, etc.) that would facilitate the process of selecting the index/harvest control rule combination that best achieves the desired management outcome for any species in the fisheries management plan. Many MSE tradeoffs are fundamentally about balancing varied and sometimes competing management goals while sustaining the natural resource, and thus necessitate the involvement of management stakeholders. In these situations, the fundamental tradeoff is usually between total yield and interannual stability of yield (Miller et al. 2019). Often, stakeholders prefer management procedures that result in greater stability (usually less than a 20% change in quota

from one period to the next) over the management procedures that give the highest potential yield due to preferring market stability and predictability. While we have not conducted a full stakeholder-inclusive MSE, as this requires an extended period of time, preferences for stability are generally universal.

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Southeast Fisheries Science Center (SEFSC). 2021. Adjustment of SEDAR61 Gulf Red Grouper Projected Catch Streams Using Mean Weight of Recreationally Landed Fish from ACL Monitoring. 10 pp.

Tables

Table 1. History of interim analyses (IA) conducted and outcomes for Gulf of Mexico Red Grouper.

Year	Outcome
18-Oct	Projection-based IA deemed suitable by SSC for interim catch advice but ultimately not used to set 2019 ACL in Emergency Rule or Framework Action (2017 landings used because they were lower)
19-Dec	Projection-based IA used as a health check by SSC to evaluate assumption of 2018 red tide on population but not used to set catch advice due to allocation decisions needed
20-Dec	Projection-based IA not recommended for use in setting catch advice by SSC due to concerns over the 2020 index value and allocation decisions needed
21-Mar	Projection-based IA using reduced area index not recommended for use in setting catch advice by SSC due to allocation decisions needed
21-Aug	IA using reduced area index and revised allocations undergoing review by SSC

Table 2. Index reference (I_{ref}), index recent (I_k), and index ratios (I_{ratio}) for the 2020 NMFS Bottom Longline Survey index averaged over 3- and 5-year time periods. The reference value I_{ref} was the average of index values from 2017-2019 or 2015-2019. The recent index value, I_k, was the average of index values for 2018-2020 or 2016-2020.

Value	3-year moving average	5-year moving average
I_{ref}	0.68	0.72
I_k	0.61	0.65
I_{ratio}	0.89	0.91

Table 3. 2021 Interim Assessment (IA) Acceptable Biological Catch (ABC) catch advice using the NMFS Bottom Longline Survey index for a reduced spatial area, with a 3-or 5-year moving average for reduced tolerance to changes in catch advice. Values presented are in millions of pounds gutted weight.

Value	3-year moving average	5-year moving average
ABC	4.96	5.07
Commercial	2.94	3.01
Recreational	2.02	2.06

Figures

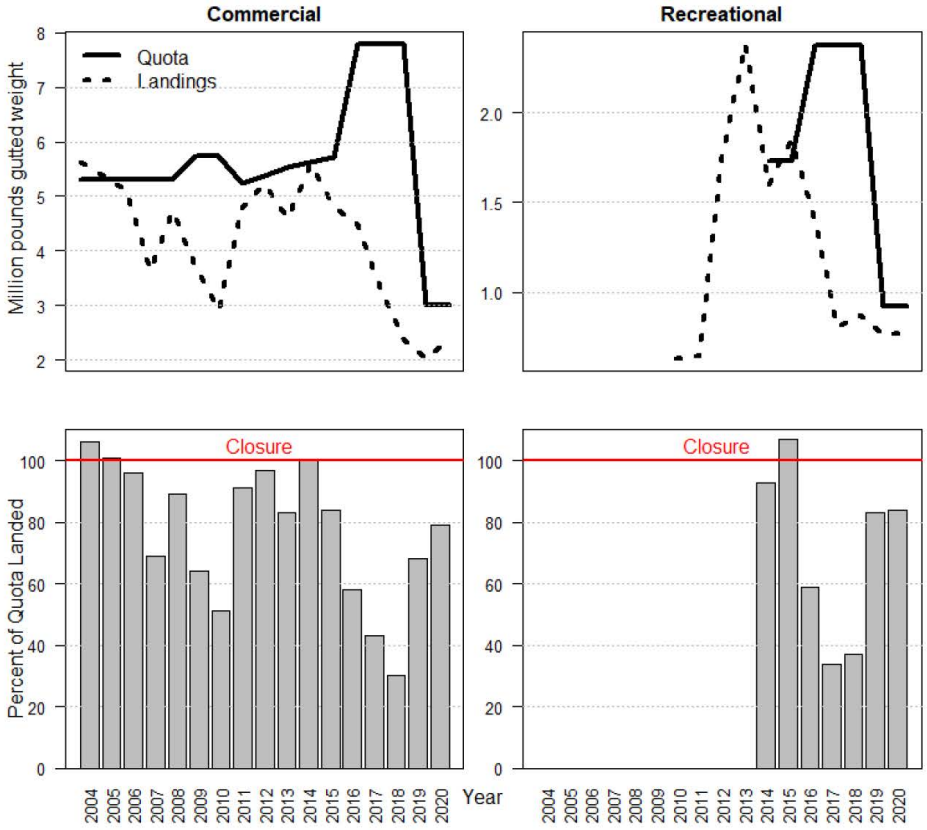

Figure 1. Commercial and recreational landings (dashed line) and quotas (thick line) for Red Grouper in the Gulf of Mexico. Bars represent the percent of quota landed, with the thick red line indicative of closures due to the quota being exceeded. Commercial data from 2010 were obtained from the Quotas and Catch Allowances, accessed June 30, 2021 (*https://secatchshares.fisheries.noaa.gov/additionalInformation* [select Commercial Quotas/Catch Allowances (all years)]), remaining years were obtained from the Gulf of Mexico Historical Commercial Landings and Annual Catch Limits (ACLs), updated October 23, 2020 (*https://www.fisheries.noaa.gov/southeast/gulf-mexico-historical-commercial-landings-and-annual-catch-limit-monitoring*). Recreational data from 2010 through 2019 were obtained from recreational historical landings, accessed June 23, 2021 (*https://www.fisheries.noaa.gov/southeast/recreational-fishing-data/gulf-mexico-historical-recreational-landings-and-annual-catch*), preliminary data from 2020 were obtained June 23, 2021 from *https://www.fisheries.noaa.gov/southeast/2020-and-2021-gulf-mexico-recreational-landings-and-annual-catch-limits-acls-and-annual*.

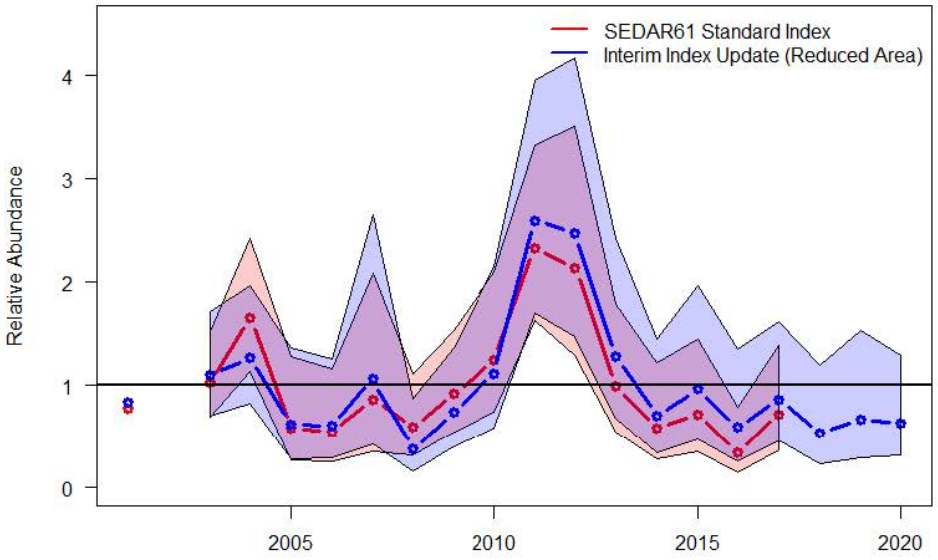

Figure 2. Comparison of NMFS Bottom Longline Survey index of abundance derived for Red Grouper in the Gulf of Mexico for SEDAR61 (full spatial area) compared to the index updated through 2020 for the reduced area in the Eastern Gulf of Mexico with confidence intervals. All indices have been standardized to a mean of 1.

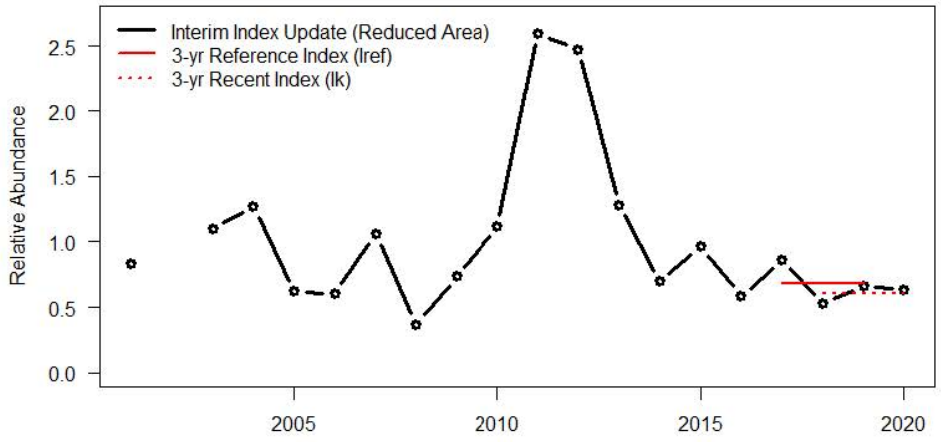

Figure 3. Comparison of the index of abundance derived for Red Grouper in the Gulf of Mexico through 2020 for the reduced area in the Eastern Gulf of Mexico with the reference index value (solid line) and recent index value (dashed line) using a 3-year moving average.

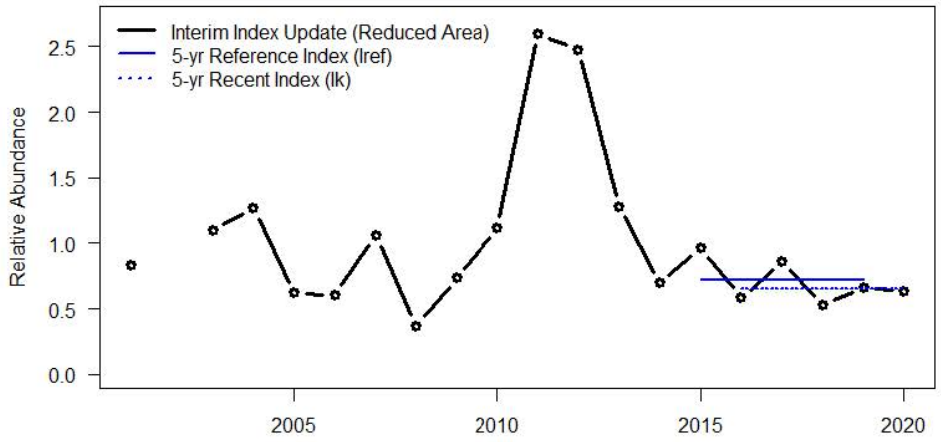

Figure 4. Comparison of the index of abundance derived for Red Grouper in the Gulf of Mexico through 2020 for the reduced area in the Eastern Gulf of Mexico with the reference index value (solid line) and recent index value (dashed line) using a 5-year moving average.

Appendix

An Updated Index of Relative Abundance for Red Grouper Captured During the NMFS Bottom Longline Survey from a Reduced Area in the Eastern Gulf of Mexico

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February 2021

This document serves to update the index of relative abundance for red grouper (*Epinephelus morio*) captured during the NMFS Bottom Longline Survey in the Gulf of Mexico (GOM) through 2020. As noted in the previous document, sampling in 2020 was limited to an area roughly south of 28.5° N in the eastern GOM due to complications from COVID-19, weather (i.e. hurricanes), and mechanical issues. A question was raised about how the index was affected by this limited coverage, considering the data typically extends further north to the Florida panhandle. Therefore, a new index was created where the data were limited to those stations completed in the eastern GOM (east of 87° W and south of 28.5° N) and at depths less than 118 m (Figure 1) through the entire time series. The analysis follows the same methodology (delta-lognormal model) as outlined in Pollack et al. (2018), except that the area variable was removed due to the reduced survey area.

The final delta-lognormal NMFS Bottom Longline Survey index of red grouper abundance retained year and depth in the binomial and lognormal submodels. The updated annual abundance index is shown in Table 1. Figure 2 shows the comparison between the updated index from the reduced spatial area and the indices from the previous 2020 Update and SEDAR 61. When examining the original 2020 Update index and the 2020 Update index from the reduced area, there does not appear to be any difference in the trends of red grouper abundance.

Literature Cited

Pollack, A.G., David S. Hanisko and G. Walter Ingram, Jr. 2018. An Index of Relative Abundance for Red Grouper Captured During the NMFS Bottom Longline Survey in the Northern Gulf of Mexico. SEDAR61-WP-02. SEDAR, North Charleston, SC. 19 pp.

Table 1. Index of red grouper abundance developed using the delta-lognormal (DL) model for 2001-2020 for the NMFS Bottom Longline Survey (reduced area). The nominal frequency of occurrence, the number of samples (*N*), the DL Index (number per 100 hook hour), the DL indices scaled to a mean of one for the time series, the coefficient of variation on the mean (CV), and lower and upper confidence limits (LCL and UCL) for the scaled index are listed.

Survey Year	Frequency	*N*	DL Index	Scaled Index	CV	LCL	UCL
2001	0.22222	54	1.12113	0.83603	0.36061	0.41545	1.68238
2002							
2003	0.39189	74	1.47565	1.10039	0.22531	0.70512	1.71725
2004	0.42647	68	1.70252	1.26958	0.22227	0.81831	1.96971
2005	0.27273	33	0.83131	0.61991	0.40836	0.28263	1.35969
2006	0.31429	35	0.81096	0.60474	0.37568	0.29239	1.25074
2007	0.26923	26	1.42127	1.05985	0.48346	0.42380	2.65046
2008	0.24242	33	0.49831	0.37159	0.44741	0.15814	0.87316
2009	0.35000	40	0.98529	0.73473	0.31744	0.39536	1.36541
2010	0.31707	41	1.49276	1.11316	0.33651	0.57819	2.14311
2011	0.44444	72	3.48325	2.59747	0.21226	1.70693	3.95263
2012	0.52941	34	3.32402	2.47873	0.26427	1.47417	4.16785
2013	0.42857	28	1.71615	1.27973	0.32803	0.67522	2.42545
2014	0.37037	27	0.93856	0.69989	0.37742	0.33733	1.45210
2015	0.35484	31	1.28871	0.96099	0.37050	0.46903	1.96899
2016	0.30769	26	0.78804	0.58764	0.43497	0.25559	1.35109
2017	0.43333	30	1.15140	0.85860	0.32492	0.45564	1.61796
2018	0.29630	27	0.70685	0.52710	0.42932	0.23155	1.19989
2019	0.29630	27	0.89194	0.66512	0.43571	0.28892	1.53119
2020	0.32353	34	0.85120	0.63474	0.36666	0.31196	1.29148

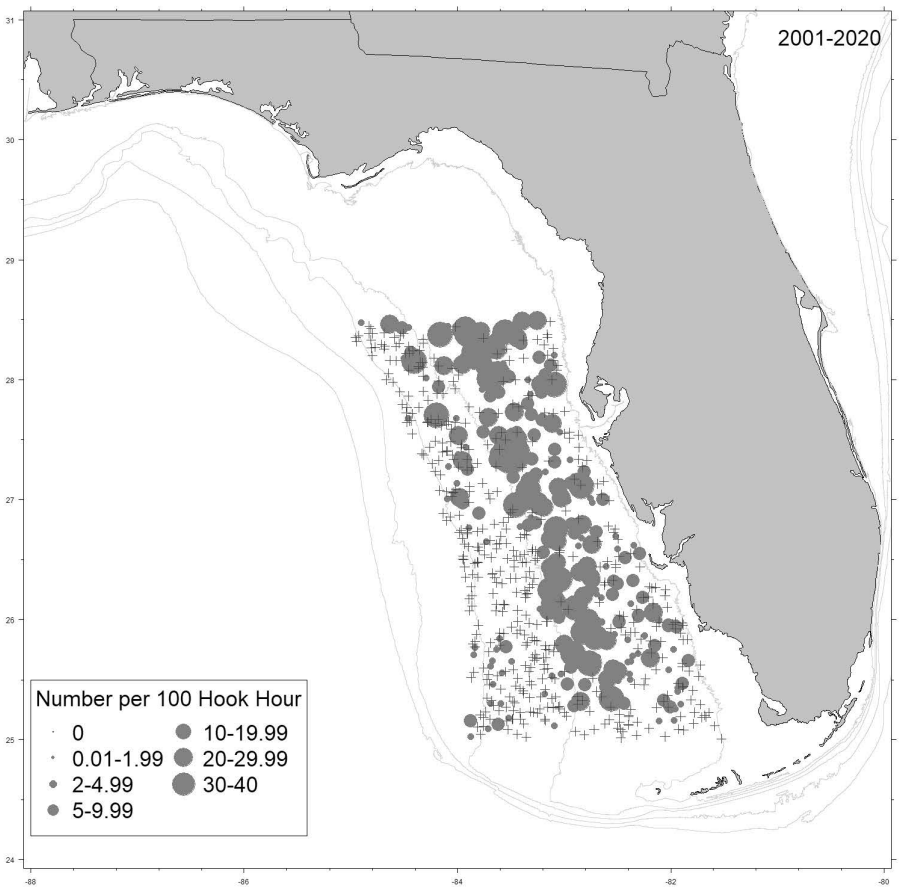

Figure 1. Stations sampled from 2001 to 2020 (limited to the area used for the index – reduced to match the sampling area covered in 2020) during the NMFS Bottom Longline Survey with the CPUE for red grouper.

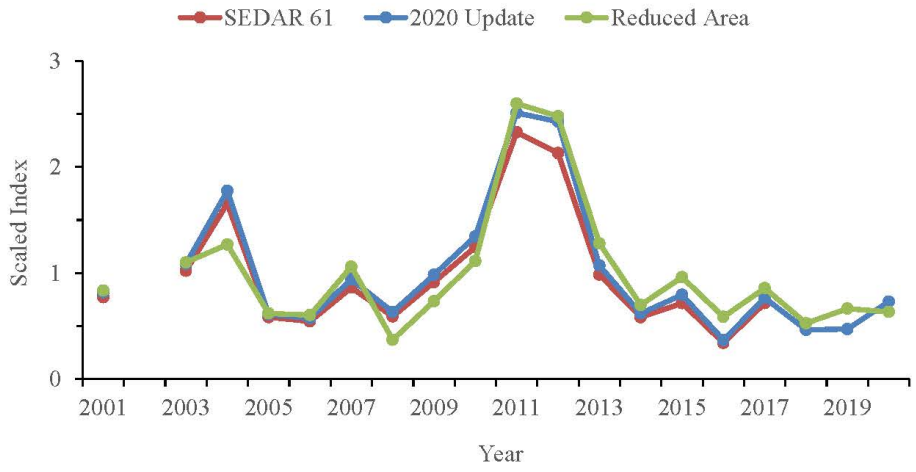

Figure 2. Annual index of abundance for red grouper from the NMFS Bottom Longline Survey from 2001 – 2020 from the reduced area compared to the indices of abundance submitted for the 2020 Update and SEDAR 61.

APPENDIX D. MODIFICATION OF MANAGEMENT FOR RED GROUPER IN THE GULF

Modification of Management for Red Grouper in the Gulf of Mexico Framework Amendment

Jeff Pulver; August 10, 2021
LAPP/DM Branch
Southeast Regional Office

Modeling Season Length for the Recreational Sector

Landings data for Gulf of Mexico red grouper were obtained from the Southeast Fisheries Science Center (SEFSC) recreational Annual Catch Limit (ACL) dataset obtained in May of 2020. The current ACT is being tracked using Marine Recreation Information Program (MRIP) Coastal Household Telephone Survey (CHTS) equivalent landings. However, this analysis uses MRIP Fishing Effort Survey (FES) data to match the same currency (MRIP FES) as the most recent assessment (SEDAR 61). Future landings were determined from taking a three-year average of the three most recent years of complete MRIP FES data, as the most recent data are assumed to be the best approximation of future harvest. Additionally, the current 2-red grouper per angler bag limit became effective on May 7, 2015 precluding using landings prior to 2016 without adjusting for the previously higher bag limits. Recreational landings are collected in two-month increments called waves (e.g., January and February = wave 1, March and April = wave 2, etc.). Landings from 2017 through 2019 and a prediction of future landings (average landings from 2017-2019) by wave are shown in Figure 1. Season lengths were projected with upper and lower 95% confidence intervals for each recreational ACL and annual catch target (ACT) being considered in the framework action. The predicted closure dates for the ACL and ACT options span from November 16 to no closure (Tables 1 and 2). There is considerable uncertainty in the predictions since the confidence intervals range from early June to no closure needed (Table 1; Figure 2).

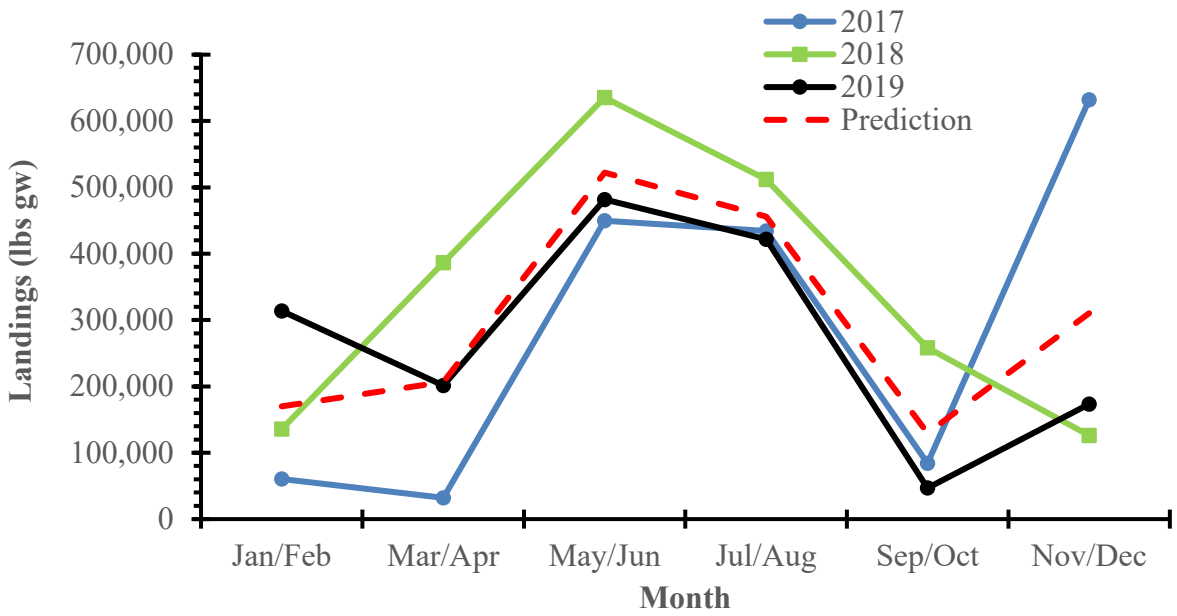

Figure 1. Gulf of Mexico recreational landings by two-month wave and predicted future landings. Source: SEFSC MRIP FES Recreational ACL Dataset (May 8, 2020).

Table 1. The predicted closure dates for each recreational ACL (mp gw) currently in the framework amendment from predicted landings with 95% confidence intervals.

ACL	Predicted Closure Date	Season Length (95% Confidence Interval)
1.73	December 19	August 15 - No Closure
2.02	No Closure	October 6 - No Closure
2.06	No Closure	October 16 - No Closure

Source: SEFSC MRIP FES Recreational ACL Dataset (May 8, 2020).

Table 2. The predicted closure dates for each recreational ACT (mp gw) currently in the framework amendment generated from predicted landings with 95% confidence intervals.

ACL	ACT	Predicted Closure Date	Season Length (95% Confidence Interval)
1.73	**1.57**	November 16	July 26 - No Closure
2.02	**1.84**	No Closure	August 28 - No Closure
2.06	**1.88**	No Closure	September 3 - No Closure

Source: SEFSC MRIP FES Recreational ACL Dataset (May 8, 2020).

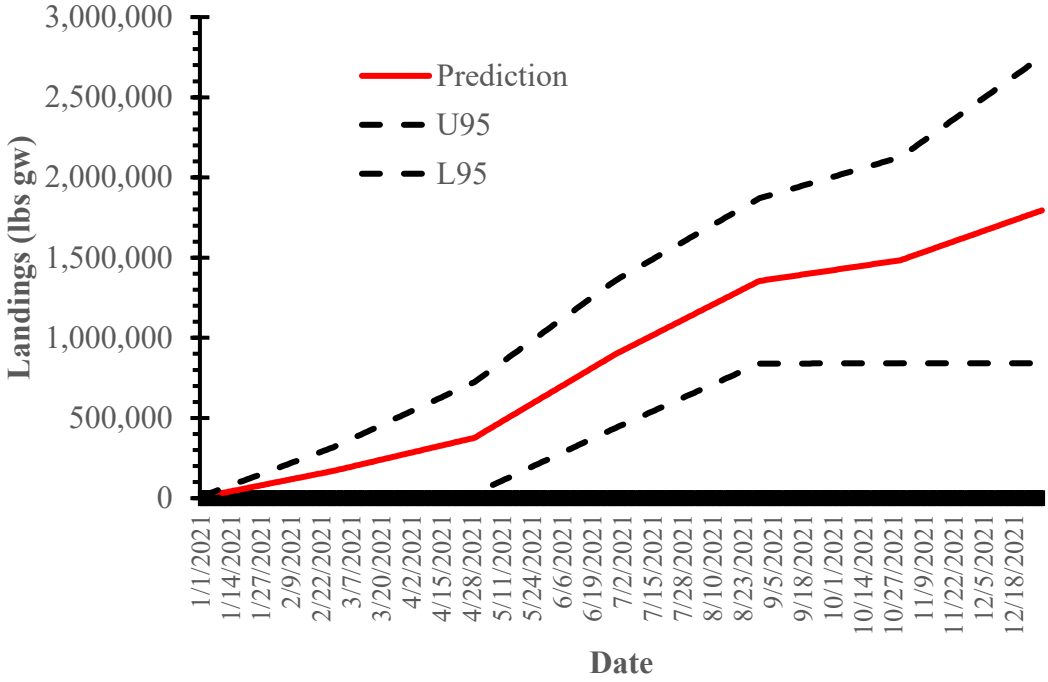

Figure 2. Cumulative predicted Gulf of Mexico red grouper recreational landings with 95% confidence interval (dashed lines). Source: SEFSC MRIP FES Recreational ACL Dataset (May 8, 2020).

As with most predictions, the reliability of the results is dependent upon the accuracy of their underlying data and input assumptions. We have attempted to create a realistic baseline as a foundation for comparisons, under the assumption that projected future landings will accurately reflect actual future landings. Uncertainty exists in this projection, 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 this assumption.