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Red Grouper Allocations and Annual Catch Levels and Targets

Amendment 53

to the Fishery Management Plan for the Reef Fish Resources of the Gulf of Mexico

Revised Draft

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DRAFT AMENDMENT 53 TO THE FISHERY MANAGEMENT PLAN FOR THE REEF FISH FISHERY IN THE GULF OF MEXICO DRAFT ENVIRONMENTAL IMPACT STATEMENT (DEIS)

Abstract: This Draft DEIS is prepared pursuant to the National Environmental Policy Act to assess the environmental impacts associated with a reasonable range of alternatives intended to modify the sector allocation, overfishing limit, acceptable biological catch, annual catch limits, and annual catch targets of red grouper in the Gulf of Mexico.

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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
BiOp	biological opinion
BLL	bottom longline
CHTS	Coastal Household Telephone Survey
COI	certificate of inspection
Council	Gulf of Mexico Fishery Management Council
CS	consumer surplus
DLMTool	Data Limited Methods Tool
DPS	distinct population segment
DWG	deep water grouper
ELMRP	Estuarine Living Marine Resources Program
EEZ	exclusive economic zone
EJ	environmental justice
ESA	Endangered Species Act
F	fishing mortality rate
FES	Fishing Effort Survey
FMP	fishery management plan
FWCC	Florida Fish and Wildlife Conservation Commission
FWRI	Florida Fish and Wildlife Research Institute
GG	gag grouper
GGM	gag grouper multi-use
Gulf	Gulf of Mexico
gw	gutted weight
HCR	harvest control rule
IFQ	individual fishing quota
Magnuson-Stevens Act	Magnuson-Stevens Fishery Conservation and Management Act
MMPA	Marine Mammal Protection Act
mp	million pounds
MRIP	Marine Recreational Information Program
MRFSS	Marine Recreational Fisheries Statistics Survey
MSST	minimum stock size threshold
NMFS	National Marine Fisheries Service
NOAA	National Oceanic and Atmospheric Administration
NOS	National Ocean Service
OFL	overfishing limit
OY	optimum yield
PAH	polycyclic aromatic hydrocarbons
PDF	probability distribution function

PS	producer surplus
PSE	proportional standard error
RG	red grouper
RGM	red grouper multi-use
rq	regional quotient
RS	red snapper
Secretary	Secretary of Commerce
SEDAR	Southeast Data, Assessment and Review
SEFSC	Southeast Fisheries Science Center
SOI	Segments of Interest
SPR	spawning potential ratio
SSB	spawning stock biomass
SSC	Scientific and Statistical Committee
SWG	shallow-water grouper
TAC	total allowable catch
TF	tilefish
USCG	United States Coast Guard
ww	whole weight

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CHAPTER 1. INTRODUCTION

1.1 Background

Amendment 53 to the Fishery Management Plan for Reef Fish Resources of the Gulf of Mexico (Reef Fish FMP) is being developed by the Gulf of Mexico Fishery Management Council (Council) to address the results of the Southeast Data Assessment and Review (SEDAR) 61 (2019) stock assessment and subsequent overfishing limit (OFL) and acceptable biological catch (ABC) recommendations from the Council's Scientific and Statistical Committee (SSC). Amendment 53 revises the red grouper allocation between the commercial and recreational sectors and modifies the OFL, ABC, and the total and sector annual catch limits (ACLs).

In October 2000, the National Marine Fisheries Service (NMFS) determined that the Gulf of Mexico (Gulf) red grouper stock was overfished and undergoing overfishing. This determination was based on the results of a 1999 red grouper stock assessment (Schirripa et al. 1999), which assessed the status of the stock as of 1997, and several subsequent analyses by the NMFS Southeast Fisheries Science Center (SEFSC) and the Council's Reef Fish Stock Assessment Panel. Secretarial Amendment 1 established a 10-year rebuilding plan for red grouper, based on a 3-year interval rebuilding strategy, with the initial ABC set for 2003-2005 at 6.56 million pounds (mp) gutted weight (gw).

Although Secretarial Amendment 1 set the initial ABC for 2003-2005, the recreational sector experienced large increases in red grouper catch in 2004, and so the total catch was held at 6.56 mp gw, with new regulations to control recreational harvest implemented in 2005 and 2006. In 2007, NMFS determined that the red grouper stock was rebuilt, in part due to higher than average recruitment and modifications to how natural mortality is calculated (SEDAR 12 2006). Consistent with the statutory requirement to achieve optimum yield (OY) from each fishery, Reef Fish Amendment 30B (GMFMC 2008c) set the red grouper total allowable catch (TAC) [1] at 7.57 mp gw, which was the constant catch level corresponding to fishing at equilibrium OY.

Allocation of Red Grouper

For grouper species in aggregate, an initial allocation between the commercial and recreational sectors was established in 1990 through Amendment 1 (GMFMC 1989) to the Reef Fish FMP. The amendment specified a framework procedure for setting the TAC to allow for annual management changes. A part of that specification was to establish a species' allocation, which were based on the percentage of total landings during the reference period of 1979-1987. For grouper in aggregate, the commercial sector landed 65% and the recreational sector landed 35% over the reference period.

Noting that allocation procedures should be regularly reviewed, the Council examined the red grouper allocation in 2007. Because grouper was not identified to the species level in

[1] The Generic ACL/Accountability Measures (AM) Amendment (GMFMC 2011a) established a mechanism for specifying annual catch limits, which replaced the use of TACs.

commercial landings until 1986, the new red grouper allocation was based on the percentage of total grouper landings from 1986 through 2005. This resulted in a 76% commercial: 24% recreational allocation, which was set through the final rule for Reef Fish Amendment 30B (GMFMC 2008c) and remains in effect. This was considered an interim allocation that would be in effect until the Council could implement a separate amendment to allocate grouper resources between recreational and commercial sectors, based on the recommendations of the Ad Hoc Allocation Committee.

Commercial Management Measures

Reef Fish Amendment 29 (GMFMC 2008a) established an individual fishing quota (IFQ) program for grouper harvested by the commercial sector, which began January 1, 2010. The IFQ program shifted away from a traditional command and control approach that resulted in an overcapitalized commercial grouper fishery. Under the IFQ program, red grouper allocation is distributed on January 1 of each year those who hold red grouper shares. The amount of allocation distributed is based on the annual quota and the amount of shares possessed in each shareholder account (expressed as a percent of the quota). In addition, the IFQ program provides flexibility to accommodate the multi-species nature of the grouper fishery and to reduce bycatch. As discussed in more detail in Section 2.2, both the red grouper and gag share categories have a multi-use provision that allows a portion of the red grouper quota to be harvested under the gag allocation, and vice versa.

For more information on the IFQ program, see the NMFS's Southeast Regional Office webpage on limited access programs at http://portal.southeast.fisheries.noaa.gov/cs/main.html.

Overview of Stock Assessments and Stock Status

Red grouper in the Gulf has been assessed several times through the SEDAR process: SEDAR 12 in 2006, SEDAR 12 Update in 2009, SEDAR 42 in 2015, and most recently SEDAR 61 in 2019. The current OFL and ABC are based on the results of SEDAR 42. The SSC reviewed the assessment results at its January 2016 meeting and agreed with the determination that red grouper was not overfished or experiencing overfishing. However, the OFL and ABC recommendations from the 2015 stock assessment (Table 1.1.1) would have increased catch limits in excess of the observed harvest levels over the management history of this species, and were largely driven by a computation error later identified in SEDAR 61 (2019). The projected yields from SEDAR 42 (2015) assumed recruitment levels equivalent to the long-term average; however, red grouper recruitment spikes are sporadic, and recent annual recruitment has been generally lower than that suggested by the long-term average (SEDAR 42 2015; NMFS 2018a).

Table 1.1.1. SEDAR 42 (2015) yield projections for red grouper at a constant catch level, averaged over the 2016-2020 time series, using MRIP CHTS data. OFL and ABC values are in mp gw.

Year	OFL (mp gw)	ABC (mp gw)
2015	8.10	7.93
2016-2020(+)	14.16	13.92

Fishermen expressed their concern about the health of the stock because they were unable to harvest the allowable quota based on the outcomes of SEDAR 42 (2015), suggesting that the stock size may be smaller than anticipated. In addition, 2017 landings were the second lowest since 2004, and a severe red tide occurred in 2018. The Council requested that the SEFSC conduct an interim analysis for developing updated harvest advice for 2019 (NMFS 2018a). The SSC reviewed this analysis at its October 2018 meeting and recommended a 2019 ACL of 4.6 mp gw that would remain in place until the next stock assessment. The Council began work on a framework action to reduce the red grouper ACL and requested that NMFS implement an emergency rule to specify a red grouper ACL for 2019 of 4.6 mp gw or the 2017 total (commercial and recreational) landings, whichever was lower, while the framework action was being developed. The 2017 total landings were 4.16 mp gw; therefore, the 2019 red grouper stock ACL was temporarily set at 4.16 mp gw through the emergency rule and resulted in a commercial ACL and ACT of 3.16 mp gw and 3.00 mp gw, respectively, and a recreational ACL and ACT of 1.00 mp gw and 0.92 mp gw, respectively. These values from the emergency rule were formally adopted through a framework action implemented in the fall of 2019 (GMFMC 2019a).

Red Grouper Recreational Data and Recalibration

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

The MRIP Access Point Angler Intercept Survey (APAIS) began incorporating a new survey design in 2013. This new design addressed concerns regarding the validity of the survey approach, specifically that trips recorded during a given time period are representative of trips for a full day (Foster et al. 2018). The more complete temporal coverage with the new survey design provides for consistent increases or decreases in APAIS angler catch rate statistics, which are used in stock assessments and management, for at least some species (NOAA Fisheries 2019).

MRIP also transitioned from the legacy Coastal Household Telephone Survey (CHTS) to a new mail survey (Fishing Effort Survey [FES]) beginning in 2015, and in 2018, the FES replaced the CHTS. Both survey methods collect data needed to estimate marine recreational fishing effort (number of fishing trips) by shore and private/rental boat anglers on the Atlantic and Gulf coasts. The CHTS used random-digit dialing of homes in coastal counties to contact anglers. The new mail-based FES uses angler license and registration information as one way to identify and contact anglers (supplemented with data from the U.S. Postal Service, which includes virtually all U.S. households). Because the FES and CHTS are so different, NMFS conducted side-by-side testing of the two methods from 2015 to 2017 to develop a calibration model.

In general, total recreational fishing effort estimates generated from the FES are higher — and in some cases substantially higher — than the CHTS estimates (NOAA Fisheries 2019). This is because the FES is designed to more accurately measure fishing activity than the CHTS, not because there was a sudden rise in fishing effort. NMFS developed a calibration model to adjust historic effort estimates so that they can be accurately compared to new estimates from the FES. The new effort estimates alone do not lead to definitive conclusions about stock size or status in the past or currently.

Following the completion of SEDAR 61 (2019), an update to the weight estimation metrics for red grouper for the recreational sector was finalized. This data update modifies the recreational data from what was used in SEDAR 61 (2019) but has no impact on the assessment results because the assessment model input recreational landings and discards as numbers of fish, not as weights. Weight is estimated internally in the model, after the model results for the recreational sector are generated in numbers of fish. This means that stock status is determined before the application of this weight estimation procedure. In SEDAR 61 (2019; SEDAR 42 2015), the shore mode was excluded from recreational analyses in the assessment because of very sporadic landings throughout the time series combined with the exceptionally low probability of harvesting a legal size (20 inches total length) red grouper via that mode. As such, the SEFSC has determined that the best scientific information available for updating sector allocations are the Accumulated Landings System/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.

Red Grouper Most Recent Stock Assessment (SEDAR 61 2019)

The SEDAR 61 (2019) assessment was completed in September 2019 and used updated recreational data from the MRIP APAIS and FES, which collectively estimate larger than previously calculated catch and effort data for the recreational sector.

The assessment concluded that red grouper in the Gulf is not overfished and overfishing is not occurring, but the stock remained below the spawning stock biomass (SSB) at 30% of the spawning potential ratio (SPR) in 2017, where SPR is the ratio of SSB to its unfished state. Because of the unknown impacts of the 2018 algal bloom attributable to red tide (*Karenia brevis*) occurring off the west Florida shelf in summer and fall, SEDAR 61 (2019) provided

projections for retained yield and associated depletion under assumed conditions (e.g., recent average recruitment and catch allocations of 76% commercial and 24% recreational) for five red tide scenarios (red tide-associated "fishing mortality" noted in parentheses): a) no red tide mortality in 2018; b) half 2014 magnitude (0.1285); c) same as 2014 (0.257); d) same as 2005 (0.339); and e) double 2005 magnitude (0.678). The assessment indicated that maintaining landings at the levels observed in 2017 (and in the 2019 emergency action) resulted in a low probability of overfishing in 2020–2024 under all red tide scenarios with the exception of the most severe simulation of double the 2005 red tide mortality, which resulted in an 83% chance of overfishing.

After reviewing the full report at its September 2019 meeting, the SSC decided to treat the 2018 red tide event as similar to the red tide event observed in 2005 for the purpose of the projections. The SSC reviewed the assessment and the analyses of the 2018 red tide event at its September 2019 meeting. The SSC accepted SEDAR 61 (2019) as the best scientific information available and indicated that the stock is not overfished and is not experiencing overfishing as of 2017 (Table 1.1.2). The SSC further agreed that the 2018 red tide event (which persisted from November 2017 through February 2019) was equivalent in severity to the event in 2005, and adjusted projections of future harvest accordingly (see Section 2.2). A December 2019 interim analysis of red grouper abundance (SEFSC 2019), reviewed by the SSC in January 2020, provided support for the assumption that the 2018 red tide event was severe, and likely similar to the 2005 red tide event (outlined in "scenario d" above). The SSC recommended an OFL of 5.35 mp gw and an ABC of 4.9 mp gw, but recommended that the decision table from the stock assessment presentation be conveyed to the Council to illustrate the probabilistic risk of a given catch level, based on various assumptions about the severity of the 2018 red tide. This catch level recommendation assumed status quo sector allocations for red grouper, which were based on MRFSS data from 1986-2005. At its October 2019 meeting, the Council reviewed the SSC's recommendations and requested that the SSC examine alternative sector allocation scenarios using MRIP FES data and the resulting catch level projections. The SSC reviewed these alternative sector allocation scenarios in January 2020 and, after affirming that the MRIP FES recreational landings represented the best scientific information available, recommended the projections in Table 1.1.3 as scientifically valid estimates of OFL and ABC.

This amendment considers alternatives that would modify the allocation of red grouper between the recreational and commercial sectors based on updated historical recreational harvest data. Based on the allocation decision made in Action 1 (Section 2.1), this amendment further proposes modifications to the OFLs, ABCs, ACLs, and ACTs for red grouper based on the stock assessment results and the resultant yield projections, considering the severity of the 2018 red tide event.

Table 1.1.2. Status determination criteria and stock status of red grouper based on SEDAR 61 (2019) and Amendment 44 (2017).

Criteria	Definitions	SEDAR 61 Values	Status
M	Avg M for Fully Selected Ages	0.144	
Steepness		0.99	
Virgin Recruitment	1,000s	20,443	
SSB Unfished	Numbers of fish	2,494,130	
Mortality Rate Criteria			
F_{MSY} or proxy	$F_{SPR30\%}$	0.259	
MFMT*	$F_{SPR30\%}$	0.259	
$F_{CURRENT}$	geometric mean ($F_{2015-2017}$)	0.203	
$F_{CURRENT}$/MFMT		0.784	No overfishing
Biomass Criteria			
SSB_{MSY} or proxy (relative # of eggs)	$SSB_{SPR30\%}$	748,241	
MSST (relative # of eggs) @ (1-M)	(1-M)*$SSB_{SPR30\%}$	640,494	
MSST (relative # of eggs) @ 50%	0.50*$SSB_{SPR30\%}$	374,120	
$SSB_{CURRENT}$ (relative # of eggs)	SSB_{2017}	613,517	
$SSB_{CURRENT}$/$SSB_{SPR30\%}$	SSB_{2017}	0.82	
$SSB_{CURRENT}$/MSST @ 50%	MSST = 0.50* $SSB_{SPR30\%}$	1.64	Not overfished

*Maximum fishing mortality threshold (MFMT); fishing mortality (F); maximum sustainable yield (MSY); minimum stock size threshold (MSST).

Table 1.1.3. Alternative constant catch yield projections accepted as scientifically valid by the SSC at its January 2020 meeting. Recreational data used to create these projections include MRIP FES, which informs both the sector allocations and resulting yields.

Landings Time Series	Comm %	Rec %	Million pounds gutted weight	
			OFL (P*=0.5)	ABC (P*=0.3)
1986-2005	59.3	40.7	4.66	4.26
1986-2009	60.5	39.5	4.70	4.30
1986-2018	59.7	40.3	4.67	4.28

1.2 Objectives of the Reef Fish Fishery Management Plan

At its August 2019 meeting, the Council last modified the objectives of the Reef Fish FMP. Through Reef Fish Amendment 51 (GMFMC 2019b), the Council adopted the updated objectives as shown below. Any allocation or reallocation must be consistent with the Reef Fish FMP objectives.

The overall goal of the Reef Fish FMP is:

To manage the reef fish fishery of the United States within the waters of the Gulf of Mexico Fishery Management Council jurisdiction to attain the greatest overall benefit to the nation with particular reference to food production and recreational opportunities on the basis of the maximum sustainable yield as reduced by relevant ecological, economic, or social factors.

The new Reef Fish FMP objectives are as follows:

1. To prevent overfishing and rebuild overfished stocks.
2. To achieve robust fishery reporting and data collection systems across all sectors for monitoring the reef fish fishery, which minimizes scientific, management, and risk uncertainty.
3. To conserve and protect reef fish habitat.
4. To minimize conflicts between user groups.
5. To minimize and reduce dead discards.
6. To manage Gulf stocks at OY as defined in MSA.
7. To revise the definitions of the fishery management unit and fishery to reflect the current species composition of the reef fish fishery.
8. To encourage and periodically review research on the efficacy of artificial reefs for management purposes.
9. To promote stability in the fishery by allowing for enhanced fisher flexibility and increasing fishing opportunities to the extent practicable.
10. To avoid to the extent practicable the "derby" type fishing season.
11. To provide for cost-effective and enforceable management of the fishery.
12. To promote and maintain accountability in the reef fish fishery.

1.3 Purpose and Need

The purposes are to revise the red grouper allocation between the commercial and recreational sectors using the best scientific information available and to modify the total and sector ACLs based on results of the recent stock assessment (SEDAR 61 2019) and subsequent OFL and ABC recommendations from the SSC.

The need is to use the best scientific information available to establish Gulf red grouper sector allocations and ACLs, ensuring that the historical participation by the recreational and commercial sectors is accurately reflected by the sector ACLs, and that recreational ACL is consistent with the data used to monitor recreational landings and trigger accountability measures (AM).

1.4 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 at http://www.gulfcouncil.org/fishery_management_plans/index.php.

Amendments to the Reef Fish FMP

Amendment 1 was implemented in January 1990. It set a 20-inch total length 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.

A **July 1991 regulatory amendment**, implemented in November 1991, provided a one-time increase in the 1991 quota for shallow-water grouper from 9.2 mp ww to 9.9 mp ww to provide the commercial fishery an opportunity to harvest 0.7 mp ww that was not harvested in 1990.

A **November 1991 regulatory amendment**, implemented in June 1992, raised the 1992 commercial quota for shallow-water grouper to 9.8 mp ww after a red grouper stock assessment indicated that the red grouper SPR was well above the Council's minimum target of 20%.

An **August 1999 regulatory amendment**, implemented in June 2000, prohibited commercial sale of red grouper each year from February 15 to March 15 (during the peak gag spawning season) and established two marine reserves (Steamboat Lumps and Madison-Swanson) that are closed year-round to fishing for all species under the Council's jurisdiction.

Generic Sustainable Fisheries Act Amendment was partially approved and implemented in November 1999. This amendment set the MFMT for most reef fish stocks at a fishing mortality rate (F) corresponding to $F_{30\%\ SPR}$.

Amendment 19, also known as Generic Essential Fish Habitat Amendment 2, was implemented in August 2002. This amendment established two marine reserves off the Dry Tortugas where fishing for any species and anchoring by fishing vessels is prohibited.

Amendment 21 was implemented in July 2003, and continued the Steamboat Lumps and Madison-Swanson reserves for an additional 6 years, until June 2010.

Secretarial Amendment 1 was implemented in July 2004. It established a rebuilding plan for red grouper with a 5.31 mp gw commercial quota and a 1.25 mp gw recreational target catch level; reduced the commercial quota for shallow-water grouper from 9.35 to 8.80 mp gw; reduced the commercial quota for deep-water grouper from 1.35 to 1.02 mp gw; and reduced the red grouper recreational bag limit to two fish per person per day.

An **emergency rule**, published in February 2005, established a series of trip limit reductions for the commercial grouper fishery to extend the commercial fishing season. The trip limit was initially set at 10,000 lbs gw. By August 1, if the fishery had landed more than 50% of either the shallow-water or red grouper quotas, then a 7,500-lb gw trip limit would take effect; and if by October 1, if more than 75% of either the shallow-water or red grouper quotas had been landed, then a 5,500-lb gw trip limit would take effect.

An **interim rule**, published in July 2005, established a temporary reduction in the red grouper recreational bag limit from two to one fish per person per day. The approved measure was subsequently extended through July 22, 2006.

An **October 2005 regulatory amendment**, implemented in January 2006, established a 6,000-lb gw aggregate deep-water grouper and shallow-water grouper trip limit for the commercial sector.

A **March 2006 regulatory amendment**, implemented in July 2006, established a red grouper recreational bag limit of one fish per person per day as part of the five grouper per person aggregate bag limit; prohibited for-hire vessel captains and crews from retaining bag limits of any grouper while under charter; and established an annual recreational closed season for red grouper from February 15 to March 15, beginning with the 2007 season.

Amendment 18A was implemented in September 2006. It prohibited vessels from retaining reef fish caught under recreational bag/possession limits when commercial quantities of Gulf reef fish are aboard; adjusted the maximum crew size on charter vessels that also have a commercial reef fish permit and a USCG certificate of inspection (COI) to allow the minimum crew size specified by the COI when the vessel is fishing commercially for more than 12 hours; prohibited the use of reef fish for bait except for sand perch or dwarf sand perch; required devices for the safe release of endangered sea turtles and smalltooth sawfish; changed the permit application process to an annual procedure and simplified income qualification documentation requirements; and required electronic vessel monitoring systems aboard vessels with federal reef fish commercial and charter vessel permits (implemented May 6, 2007).

The majority of the regulatory actions in **Amendment 27** were implemented in February 2008. However, the regulatory actions which addressed the use of non-stainless-steel circle hooks when using natural baits to fish for Gulf reef fish and also required the use of venting tools and dehooking devices when participating in the commercial or recreational reef fish fisheries were effective June 1, 2008.

An **emergency rule** was implemented in May 2009 through October 2009 prohibiting the use of bottom longline (BLL) gear to harvest reef fish east of 85°30′ W longitude shoreward of the 50-fathom (91.4 m) contour as long as the 2009 deep-water grouper and tilefish quotas are unfilled. After the quotas have been filled, the use of BLL gear to harvest reef fish in water of all depths east of 85°30′ W longitude was prohibited.

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 TACs; 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 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.

An **emergency rule under the Endangered Species Act** was implemented in October 2009 that prohibited bottom longlining for Gulf reef fish east of 85º30'W longitude (near Cape San Blas, Florida) shoreward of a line approximating the 35-fathom depth contour. It restricted the number of hooks on board to 1,000 hooks per vessel with no more than 750 hooks being fished or rigged for fishing at any given time.

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.

Amendment 31 was implemented in May 2010. It prohibited the use of BLL gear shoreward of a line approximating the 35-fathom contour from June through August; reduced the number of longline vessels operating in the fishery through an endorsement provided only to vessel permits with a history of landings, on average of at least 40,000 lbs of reef fish annually with fish traps or longline gear during 1999-2007; and restricted the total number of hooks that may be possessed onboard each reef fish BLL vessel to 1,000, only 750 of which may be rigged for fishing.

An **emergency rule**, implemented in May 2010, temporarily closed a portion of the Gulf exclusive economic zone (EEZ) to all fishing in response to the *Deepwater Horizon* oil spill. The initial closed area extended from approximately the mouth of the Mississippi River to south of Pensacola, Florida and covered an area of 6,817 square statute miles. The coordinates of the closed area were subsequently modified periodically in response to changes in the size and location of the area affected by the spill. At its largest size on June 1, 2010, the closed area covered 88,522 square statute miles, or approximately 37% of the Gulf EEZ. The size of the closed area was subsequently reduced in stages, and on April 19, 2011, all remaining waters that had been closed were reopened.

An **August 2010 regulatory amendment**, implemented in January 2011, reduced TAC for red grouper from 7.57 mp gw to 5.68 mp gw, based on the projections from the 2009 red grouper

update assessment. Based on the 76:24 commercial and recreational allocation of red grouper, the commercial quota was reduced from 5.75 to 4.32 mp gw, and the recreational allocation was reduced from 1.82 to 1.36 mp gw.

An **interim rule** was published in December 2010, suspending the use of red grouper multi-use IFQ allocation so it could not be used to harvest gag; and continuing the suspension of red grouper multi-use IFQ allocation from June 1, 2011, through November 27, 2011, and subsequently extended through June 12, 2012.

An **August 2011 regulatory amendment**, implemented in November 2011, increased the 2011 red grouper TAC to 6.88 mp gw with subsequent increases each year from 2012 to 2015; and increased the red grouper bag limit to four fish per person.

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.

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.

A **December 2012 framework action**, implemented in July 2013, eliminated the February 1 through March 31 recreational shallow-water grouper closed season shoreward of 20 fathoms (except for gag). However, the closed season remained in effect beyond 20 fathoms to protect spawning aggregations of gag and other species that spawn offshore during that time.

Amendment 38 was implemented in March 2013. It revised the post-season recreational AM to reduce the recreational season of only the species for which the ACL was exceeded; and modified the reef fish framework procedure to include the addition of AMs to the list of items that can be changed through the standard framework procedure.

A **December 2014 framework action**, implemented in May 2015, reduced the red grouper bag limit from four fish to two fish per person per day and eliminated the bag limit reduction AM.

A **June 2016 framework action**, implemented in October 2016, increased the commercial ACL to 8.19 mp gw and the commercial quota to 7.78 mp gw. The recreational ACL was increased to 2.58 mp gw; and the recreational ACT to 2.37 mp gw.

Amendment 44, implemented in December 2017, standardized the MSST for certain reef fish species, including red grouper, to 50% of the biomass at MSY.

A **June 2017 framework action**, implemented in February 2018, removed the 1,000 total hook limit per BLL vessel, while maintaining the limit of 750 hooks which may be rigged for fishing.

Amendment 36A returned shares from non-activated accounts and provided the Regional Administrator the authority to withhold the amount of red snapper or grouper-tilefish allocation before distribution at the beginning of a year in which a commercial quota reduction is expected to occur. Withheld red snapper and grouper-tilefish annual allocation will be distributed to shareholders if the effective date of the final rule implementing the quota reduction has not occurred by June 1. These actions were implemented in July 2018. The amendment also implemented a requirement that all reef fish permitted vessels make an advance landing notification, which was implemented in January 2019.

A **December 2018 temporary rule**, implemented in January 2019, withheld a portion of the Gulf red grouper commercial quota from the IFQ for 2019 as a result of a proposed commercial quota reduction. NMFS withheld 59.4% of the red grouper IFQ allocation (4.78 mp gw) in anticipation of the reduction.

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.

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

CHAPTER 2. MANAGEMENT ALTERNATIVES

2.1 Action 1 – Modify the Sector Allocations, OFL, ABC, and ACLs for Red Grouper

Note: This action considers modifying the overfishing limit (OFL), acceptable biological catch (ABC), and annual catch limits (ACLs) for red grouper in the Gulf of Mexico (Gulf).

Alternative 1: No Action – Maintain the sector allocations of the total ACL for red grouper between the commercial and recreational sectors. The allocations for red grouper are 76% commercial and 24% recreational. The allocation was derived from the average landings using Marine Recreational Fisheries Statistics Survey (MRFSS) data from the years 1986 through 2005, established in Reef Fish Amendment 30B. Maintain the current OFL, ABC, and ACLs.

Alternative 2: Maintain the sector allocations of the total ACL as 76% commercial and 24% recreational, but revise the OFL and ABC as recommended by the Scientific and Statistical Committee (SSC) based on Southeast Data Assessment and Review (SEDAR) 61 (2019). Set the stock ACL equal to the stock ABC.

Alternative 3: Revise the sector allocations of the total ACL between the recreational and commercial sectors, as the average landings using Fishing Effort Survey (FES)-adjusted Marine Recreational Information Program (MRIP FES) data during the years 1986 through 2005, based on the Southeast Fisheries Science Center (SEFSC) ACL monitoring datasets. The allocations for red grouper are 59.3% commercial and 40.7% recreational. Revise the OFL and ABC as recommended by the SSC based on SEDAR 61 (2019). Set the stock ACL equal to the stock ABC.

Alternative 4: Revise the sector allocations of the total ACL between the recreational and commercial sectors, as the average landings using MRIP FES data during the years 1986 through 2009, based on the SEFSC ACL monitoring datasets. The allocations for red grouper are 60.5% commercial and 39.5% recreational. Revise the OFL and ABC as recommended by the SSC based on SEDAR 61 (2019). Set the stock ACL equal to the stock ABC.

Alternative 5: Revise the sector allocations of the total ACL between the recreational and commercial sectors, as the average landings using MRIP FES data during the years 1986 through 2018, based on the SEFSC ACL monitoring datasets. The allocations for red grouper are 59.7% commercial and 40.3% recreational. Revise the OFL and ABC as recommended by the SSC based on SEDAR 61 (2019). Set the stock ACL equal to the stock ABC.

	OFL*	ABC	Total ACL	Comm ACL	Rec ACL
Alternative 1**	14.16	13.92	4.16	3.16	1.00
MRIP FES equivalent			(5.26)		(2.10)

	OFL*	ABC	Total ACL	Comm ACL	Rec ACL
Alternative 2* **	5.35	4.90	4.90	3.72	1.18
Alternative 3* **	4.66	4.26	4.26	2.53	1.73
Alternative 4* **	4.70	4.30	4.30	2.60	1.70
Alternative 5* **	4.67	4.28	4.28	2.56	1.72

*Values for OFL, ACB, total ACL, commercial ACL, and recreational ACL are in millions of pounds (mp) gutted weight (gw).
**The recreational portion of the current OFL, ABC, and ACLs are based on MRIP CHTS data.
***The recreational sector ACL is in MRIP FES currency.

Discussion:

At its October 2019 meeting, the Gulf of Mexico Fishery Management Council (Council) discussed the implications of the FES-adjusted MRIP recreational data on allocation. Given that Amendment 30B to the Fishery Management Plan (FMP) for Reef Fish Resources in the Gulf of Mexico (Reef Fish FMP; GMFMC 2008c) used SEDAR 12 (2006) and the MRFSS data for the recreational sector in determining the sector allocations, the Council requested that the SSC review red grouper projections for the OFL and ABC using the best available landings data. The Council also directed staff to begin work on a plan amendment to update the red grouper allocation and establish catch levels based on the best available landings data. At the January 2020 SSC meeting, the SEFSC presented estimates of OFL and ABC associated with the time series of 1986-2005, 1986-2009, and 1986-2018; the SSC determined that those time series yield scientifically valid estimates of OFL and ABC as shown in Table 1.1.3.[2] The time series chosen directly affects the resulting sector allocations, which affects the yield projections for OFL and ABC. As more of the fishery is allocated to the recreational sector, the proportion of discards by that sector increases. Even though recreational discards are assumed to be lower than commercial discards, the magnitude of recreational discards is considerably greater than commercial discards, resulting in additional removals and a lower annual projected yield.[3]

Alternative 1 (No Action) would maintain the sector allocations established in Amendment 30B (GMFMC 2008c), with commercial and recreational allocation of the red grouper stock ACL divided 76% and 24%, respectively. **Alternative 1** used MRFSS landings data from SEDAR 12 (2006) to set the allocation. When Amendment 30B was developed, the resulting sector allocations were based on all available years during which grouper were identified by species and also on the longest and most robust time series for landings at the time (1986-2005). A long time series reduces the influence of short-term shifts in landings resulting from changes in recruitment or regulations. **Alternative 1** would also maintain the current OFL, ABC, and ACLs. The stock ACL in **Alternative 1** was set by the Council in 2019 through an emergency rule and subsequent framework action discussed in Chapter 1, and is equivalent to the landings from the 2017 fishing year (GMFMC 2019a). The framework action did not change the OFL

[2] The OFL and ABC associated with Alternative 2 was recommended at the September 2019 meeting; the OFLs and ABCs associated with Alternatives 3-5 were recommended at the January 2020 meeting, based on timeframes from a Council motion in October 2020. http://gulfcouncil.org/meetings/ssc/archive/
[3] See SEDAR 61 (2019) for more information on the sector discard mortality rates and estimated sector discards.

and ABC, so those values provided in **Alternative 1** are based on recommendations by the SSC after reviewing the SEDAR 42 2015 stock assessment of red grouper. The recreational portion of the current OFL, ABC, and ACLs are based on MRIP CHTS data, and the current recreational ACL of 1.00 million pounds in MRIP CHTS units is equivalent to 2.10 million pounds in MRIP FES units. **Alternative 1** is not legally viable because it is not based on the best scientific information available, and would retain the current OFL and ABC, which are above the values produced by the SEDAR 61 stock assessment and recommended by the SSC.

As in **Alternative 1**, **Alternative 2** would maintain the allocation established in Amendment 30B (GMFMC 2008c), with commercial and recreational allocation of the red grouper stock ACL divided 76% and 24%, respectively. However, **Alternative 2** would revise the OFL and ABC based on SEDAR 61 (2019) and SSC recommendations. The stock ACL is equal to the stock ABC.

While the allocations in **Alternatives 1-2** reflect recreational landings estimated using MRFSS, the allocations in **Alternatives 3-5** reflect recreational landings estimated using MRIP FES from the SEFSC ACL monitoring datasets. To compare recreational landings to the current recreational ACL and annual catch target (ACT) the SEFSC converts the MRIP FES estimates into MRIP CHTS units. After the implementation of this Amendment, the MRIP FES units will be used to compare recreational landings to the recreational ACL and ACT. Therefore, although **Alternative 2** retains the current percentage allocation, it would result in a decrease in the recreational ACL when compared to the MRIP FES equivalent of 2.10 million pounds in **Alternative 1,** and an increase in the commercial ACL. In effect, because the recreational ACL would decrease compared to its MRIP FES equivalent, and because the increase in estimated stock productivity is attributable to historic estimates of recreational catch and effort, not reallocating using the MRIP FES data results in a *de facto* reallocation to the commercial sector.

Alternative 3 would base the commercial and recreational sector allocations of red grouper on landings from the same timeframe as used in Amendment 30B (GMFMC 2008c), 1986 through 2005, but would use MRIP FES landings from the SEFSC ACL monitoring dataset,[4] which is considered the best scientific information available (Table 2.1.1). By using the SEFSC ACL monitoring dataset, **Alternative 3** best reflects the landings from each sector from 1986-2005. The resulting allocations are 59.3% commercial and 40.7% recreational. **Alternative 3** would revise the OFL and ABC based on SEDAR 61 (2019) and then set the stock ACL equal to the stock ABC.

Alternative 4 would base the commercial and recreational sector allocations on landings from the timeframe 1986 through 2009 (Table 2.1.1), ending the time series upon implementation of the commercial grouper-tilefish individual fishing quota (IFQ) program, which includes management of red grouper (GMFMC 2008a). Beginning in 2010, the IFQ program has constrained the commercial sector from exceeding its red grouper quota, as a commercial vessel must have a sufficient amount of allocation before landing. In contrast, the recreational sector could exceed its quota, which would trigger accountability measures, as landings are monitored in-season and it may not be possible to close the fishing season before the quota is met. The resulting allocations are 60.5% commercial and 39.5% recreational. **Alternative 4** would revise

[4] Dates for when data sources were accessed are noted in Table 2.1.1.

the OFL and ABC based on SEDAR 61 (2019) and then set the stock ACL equal to the stock ABC.

Alternative 5 would base the commercial and recreational allocations on landings from the timeframe 1986 through 2018, which incorporates the longest time period of landings currently available (Table 2.1.1). The *Deepwater Horizon* MC252 oil spill began in April 2010 and resulted in extensive fishery closures; therefore, landings from 2010 should be viewed with caution. This timeframe also includes landings after implementation of the grouper-tilefish commercial IFQ program discussed in **Alternative 4**. The resulting allocations are 59.7% commercial and 40.3% recreational. **Alternative 5** would revise the OFL and ABC based on the stock assessment and then set the stock ACL equal to the stock ABC.

Although the commercial and recreational allocations were in effect for the timeframe 2010-2018, the commercial ACL has never been exceeded and the recreational ACL has only been exceeded in 2013, and was subject to in-season closures in 2014 and 2015. The various time series under consideration in **Alternatives 3-5** have relatively small differences in sector allocations (at most 1.2%; Table 2.1.1). The difference in the commercial and recreational allocations when **Alternatives 1-2** are compared to **Alternatives 3-5** is, at most, 16.7%, shifting allocation from the commercial sector to the recreational sector to account for an increase in the estimated historical harvests attributable to the recreational sector.

In comparison to the MRIP FES equivalent total ACL of 5.26 mp gw under **Alternative 1**, **Alternatives 2-5** would result in a decrease of the total ACL. In comparison to **Alternative 1**, **Alternative 2** would result in an increase of the commercial sector ACL; **Alternatives 3-5** would result in a decrease of the commercial sector ACL. In comparison to the MRIP FES equivalent recreational sector ACL of 2.10 mp gw under **Alternative 1**, **Alternatives 2-5** would result in a decrease of the recreational sector ACL. The MRIP FES equivalent of total ACL and recreational sector ACL under **Alternative 1** is used for comparison with **Alternatives 2-5** in order to have equivalent currency.

Table 2.1.1. Commercial and recreational landings for red grouper in pounds gutted weight (gw) from SEDAR 12 (MRFSS) and the SEFSC ACL monitoring datasets (MRIP FES) used to calculate sector allocations.

Year	SEDAR 12 Landings		SEFSC ACL Monitoring Landings	
-	Comm	Rec	Comm	Rec
1986	6,312,986	2,400,380	6,222,162	3,348,897
1987	6,717,890	1,464,710	6,567,225	2,495,130
1988	4,742,496	2,476,070	4,559,441	4,652,818
1989	7,367,911	2,761,150	7,270,424	7,632,792
1990	4,809,282	1,131,710	4,744,711	3,565,320
1991	5,094,501	1,775,110	5,071,083	3,755,576
1992	4,463,277	2,658,180	4,456,473	6,046,978
1993	5,379,626	2,091,160	6,364,065	4,057,934
1994	4,902,862	1,808,240	4,890,106	3,827,267

Year	SEDAR 12 Landings		SEFSC ACL Monitoring Landings	
1995	4,746,140	1,862,570	4,652,487	3,496,544
1996	4,454,146	893,755	4,336,214	910,313
1997	4,848,486	562,328	4,673,786	1,142,958
1998	3,948,566	643,058	3,703,816	1,513,890
1999	5,974,706	1,152,810	5,800,592	3,428,553
2000	5,838,300	2,107,730	5,702,622	4,242,231
2001	5,964,506	1,327,770	5,802,442	2,435,456
2002	5,907,248	1,611,110	5,791,795	3,172,348
2003	4,937,970	1,275,830	4,832,294	2,201,496
2004	5,749,039	3,000,140	5,635,577	7,983,239
2005	5,410,594	1,630,140	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
Alternatives 1 and 2 (1986-2005)	76%	24%		
Alternative 3 (1986-2005)			59.3%	40.7%
Alternative 4 (1986-2009)			60.5%	39.5%
Alternative 5 (1986-2018)			59.7%	40.3%

Source: SEDAR 12 (2006) (http://sedarweb.org/sedar-12). 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).

2.2 Action 2 – Modify the Gulf Red Grouper Annual Catch Targets (ACTs)

Alternative 1: No Action – Maintain the current buffer between the ACL and ACT for each sector. The commercial buffer is 5%, and the recreational buffer is 8%.

Alternative 2: Apply the ACL/ACT Control Rule to revise the buffer between the ACL and ACT for each sector. The commercial buffer is 0%, and the recreational buffer is 9%.

Alternative 3: Maintain the current buffer between the ACL and ACT for the commercial sector, and apply the ACL/ACT Control Rule to revise the buffer between the ACL and ACT for the recreational sector. The commercial buffer is 5%, and the recreational buffer is 9%.

Discussion:

Alternative 1 (No Action) would maintain the current buffer between the ACL and ACT for the commercial and recreational sectors set in the April 2019 framework action (GMFMC 2019a). The application of the ACL/ACT Control Rule was used to set the buffer between the sector ACLs and ACTs. The recreational buffer in **Alternative 1** used MRFSS data, which is no longer in use for quota monitoring. Data from the IFQ program for red grouper were used for the commercial sector. Normally, a sector managed using an IFQ program without a quota overage during its reference period would yield a 0% buffer from the ACL/ACT Control Rule; however, this tool is advisory only and does not account for the overage allowance or gag multi-use provisions in the IFQ program. As such, following the SEDAR 42 (2015) stock assessment, the Council set the buffer for the recreational sector using the ACL/ACT Control Rule at 8% and the commercial sector's buffer at 5%, which accounts for the multi-use provision for the gag quota under the commercial IFQ program (GMFMC 2016a). Both the red grouper and gag share categories have a multi-use provision that allows a portion of the red grouper quota to be harvested under the gag allocation, and vice versa. Each year, the program assigns a portion of each shareholder's red grouper and gag as a multi-use allocation category. The intent of the multi-use provision is to provide for allocation if either gag or red grouper are landed as incidental catch. The formulas for determining red grouper multi-use (RGM) and gag multi-use (GGM) allocation is as follows:

$$RGM\ allocation = 100 * \frac{(Gag\ ACL - Gag\ Commercial\ Quota)}{Red\ Grouper\ Commercial\ Quota}$$

$$GGM\ allocation = 100 * \frac{(Red\ Grouper\ ACL - Red\ Grouper\ Commercial\ Quota)}{Gag\ Commercial\ Quota}$$

The Council's ACL/ACT Control Rule is used to determine the buffer (if any) between the ACL and the ACT, using a 4-year reference period of recent landings from each sector. The reference period selected for **Alternatives 2** and **3** was 2016 – 2019, with 2019 landings for the recreational sector still considered preliminary by the National Marine Fisheries Service. The ACL/ACT Control rule adjusts the buffer between the ACL and ACT based on a number of factors, including the number and magnitude of quota overages in the reference period, accountability measures in place to account for any quota overages, and the method by which the quota is monitored. Considering that the SEFSC ACL monitoring dataset using MRIP FES data more than doubles the MRIP CHTS landings estimates, increases in the ACT of greater than 50% may be necessary to allow the fishery to continue at current effort and catch levels.

Alternative 2 would use a buffer between the commercial ACL and ACT of 0%, and a buffer between the recreational ACL and ACT of 9%, based on the application of the Council's ACL/ACT Control Rule following SEDAR 61 in 2019. The data used by year for applying the ACL/ACT Control Rule for **Alternative 2** are shown in Table 2.2.1, and the tool as applied to

each fishing sector is shown in Appendices A (recreational) and B (commercial). **Alternative 2** represents a strict application of the ACL/ACT Control Rule for the prescribed reference period, and does not account for multi-use provisions in the commercial gag IFQ program. With a commercial buffer of 0%, the gag multi-use allocation would be zero, and therefore, only gag could be landed with gag allocation. Table 2.2.2 displays the percentage of multi-use landings used for red grouper and for gag with the gag multi-use allocation from 2010 to 2019. From 2016 to 2018, 0.3% to 2% of the GGM was used to land red grouper; however, the preliminary 2019 data show an increase to 19% of the GGM being used for landing red grouper.

Table 2.2.1. ACL/ACT Control Rule data inputs for Alternative 2 of Action 2.

Year	Sector	Landings (lbs gw)*	PSE**	ACL	Exceeded ACL?	Buffer	Data Used
2016	Commercial	4,497,582	0 - IFQ	7,780,000	No	0%	IFQ
2017	Commercial	3,328,271	0 - IFQ	7,780,000	No		IFQ
2018	Commercial	2,363,280	0 - IFQ	7,780,000	No		IFQ
2019	Commercial	2,037,046	0 - IFQ	3,000,000	No		IFQ
Year	**Sector**	**Landings (lbs gw)***	**PSE****	**ACL**	**Exceeded ACL?**	**Buffer**	**Data Used**
2016	Recreational	1,373,337	21.6	2,580,000	No	9%	MRIP CHTS
2017	Recreational	739,073	21	2,580,000	No		MRIP CHTS
2018	Recreational	913,978	21.5	2,580,000	No		MRIP CHTS
2019***	Recreational	725,105	21.6	1,000,000	No		MRIP CHTS

Source: SERO ACL Monitoring dataset and SEFSC Commercial ACL dataset, retrieved 8 May 2020.
*2019 recreational data are preliminary.
*Pounds (lbs) gutted weight (gw).
**"PSE" stands for proportional standard error, which is a measure of the precision of the estimated landings for a given year.
***2019 recreational data are preliminary.

Table 2.2.2. Percentage (and weight in pounds [lbs]) of multi-use allocations used by fishermen for landing red grouper and gag.

Year	RGM		GGM	
-	Red Grouper (lbs)	Gag (lbs)	Red Grouper	Gag
2010	73% (13,833)	27% (5,091)	28% (2,203)	72% (5,654)
2011	NA*	NA	14% (1,474)	86% (8,700)
2012	NA	NA	6% (1,928)	94% (32,230)
2013	NA	NA	1% (4,329)	99% (376,528)
2014	NA	NA	35% (103,151)	65% (188,950)
2015	82% (98,466)	18% (20,998)	26% (33,165)	74% (92,661)
2016	8% (11,441)	92% (135,471)	1% (1,665)	99% (220,088)
2017	11% (6,145)	89% (51,137)	2% (2,198)	98% (116,163)
2018	4% (1,656)	96% (41,364)	0.3% (344)	99.7% (114,984)
2019	38% (43,610)	62% (71,349)	19% (9,209)	81% (39,266)

*2011-2014 did not have an RGM allocation because gag was under a rebuilding plan.
Sources: NMFS 2020.

Alternative 3 would use a buffer between the commercial ACL and ACT of 5% to account for the multi-use provision in the gag commercial IFQ program, and a buffer between the recreational ACL and ACT of 9%, based on the application of the Council's ACL/ACT Control Rule following SEDAR 61 in 2019. **Alternative 3** uses the same recreational buffer described in **Alternative 2,** but maintains the current commercial buffer as described in **Alternative 1**.

The commercial and recreational sector ACTs resulting from alternatives selected in Actions 1 and 2 are displayed in Table 2.2.3. The commercial buffer under **Alternative 2** of Action 2 would result in greater commercial ACTs than with the commercial buffers under **Alternatives 1** and **3**, for the corresponding alternative under Action 1 (across a given row in Table 2.2.3). The current recreational buffer under **Alternative 1** would result in greater recreational ACTs than with the recreational buffers under **Alternatives 2** and **3**, for the corresponding alternative under Action 1 (across a given row in Table 2.2.3).

Table 2.2.3. Commercial and recreational sector ACTs resulting from alternatives selected in Actions 1 and 2.

		Action 2					
		Alt 1		Alt 2		Alt 3	
		Comm	Rec	Comm	Rec	Comm	Rec
Action 1	Alt 1	3.00	0.92** (1.93)	N/A	N/A	N/A	N/A
	Alt 2	3.53	1.09	3.72	1.07	3.53	1.07
	Alt 3	2.40	1.59	2.53	1.57	2.40	1.57
	Alt 4	2.47	1.56	2.60	1.55	2.47	1.55
	Alt 5	2.43	1.58	2.56	1.57	2.43	1.57

* Values are in millions of pounds, gutted weight and in MRIP FES currency.
**The recreational sector ACT for Action 1, Alternative 1 is in CHTS currency; the recreational sector ACT in MRIP FES currency is in parentheses.

Changes in the recreational sector ACTs are predicted to impact the recreational sector's season length.[5] Landings data for Gulf red grouper obtained from the SEFSC recreational ACL dataset obtained in May of 2020 were used to model the resulting recreational sector's season length. The current ACT is being tracked using MRIP CHTS equivalent landings. However, this analysis uses MRIP FES data to match the same currency (MRIP FES) as the most recent assessment (SEDAR 61 2019). 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 2.2.1. Season lengths were projected with upper and lower 95% confidence intervals for each recreational ACT being considered in Amendment 53 (Table 2.2.4). The predicted closure dates span from July 23 to no closure

[5] This information is also displayed in Appendix D, which was provided at the June 2020 Council meeting.

(Table 2.2.4). There is considerable uncertainty in the predictions since the confidence intervals range from early June to no closure needed (Table 2.2.4; Figure 2.2.2).

Figure 2.2.1. Gulf recreational landings by two-month wave and predicted future landings.
Source: SEFSC MRIP FES Recreational ACL Dataset (May 8, 2020).

Table 2.2.4. The predicted closure dates for each recreational ACT (mp gw) currently in Amendment 53 generated from predicted landings and also predicted landings upper and lower 95% confidence intervals.

Alternatives (Action 2 – Action 1)	ACL	Buffer	ACT	Predicted Closure Date	Season Length (95% Confidence Interval)
1-1	2.10	8%	1.93	No Closure	259—365 Days
1-2	1.18	8%	1.09	July 26	157—365 Days
2-2; 3-2	1.18	9%	1.07	July 23	155—365 Days
1-3	1.73	8%	1.59	November 20	211—365 Days
2-3; 3-3	1.73	9%	1.57	November 16	208—365 Days
1-4	1.70	8%	1.56	November 14	207—365 Days
2-4; 3-4	1.70	9%	1.55	November 12	206—365 Days
1-5	1.72	8%	1.58	November 18	209—365 Days
2-5; 3-5	1.72	9%	1.57	November 16	208—365 Days

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

Figure 2.2.2. Cumulative predicted 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.

Although SERO monitors the sector ACTs through MRIP FES, the Council requested, at its June 2020 meeting, that the red grouper private mode landings from Florida be provided in three currencies: Gulf Reef Fish Survey (GRFS), MRIP CHTS, and MRIP FES. The request was based on the concept that the majority of private recreational landings of red grouper occur in Florida and that all landings data currencies should be considered to inform decisions on stock sustainability. These landings are displayed in Table 2.2.5. GRFS is conducted by the Florida Fish and Wildlife Conservation Commission, and is a catch and fishing effort monitoring program for 13 Gulf reef fish species (mutton snapper, yellowtail snapper, hogfish, red snapper, vermilion snapper, gag, red grouper, black grouper, greater amberjack, lesser amberjack, banded rudderfish, almaco jack, and gray triggerfish). The program was certified by NOAA Fisheries, indicating that the methodologies proposed for use by the program to monitor catch and effort were statistically appropriate, and has been in use since 2015. GRFS uses dockside intercepts to monitor catch, and a mail survey to measure fishing effort, with the former augmenting APAIS and the latter FES. GRFS is considered a supplemental survey to MRIP, increasing spatiotemporal sample coverage of catch and effort for the subject reef fish species. GRFS was replaced on July 1, 2020, by the FWC's State Reef Fish Survey, which expanded the coverage area of GRFS to include the east coast of Florida. The first full year of data from GRFS sampling was 2016, so MRIP landings (CHTS and FES) from 2016-2019 are included for comparison.

Table 2.2.5. Red grouper private mode Florida landings (pounds whole weight) from GRFS, MRIP CHTS, and MRIP FES surveys.

Year	GRFS	MRIP CHTS	MRIP FES
2016	907,291	962,299	2,273,809
2017	497,239	385,577	1,377,751
2018	747,082	548,205	1,736,801
2019	679,529	421,351	1,378,144

*Landings exclude Monroe County and are in lbs gw.
Source: GRFS data provided July 6, 2020; SEFSC MRIP CHTS recreational ACL file (5/18/20); SEFSC MRIP FES recreational ACL file (6/22/20).

CHAPTER 3. AFFECTED ENVIRONMENT

3.1 Description of the Fishery

Detailed descriptions of the red grouper component of the Gulf of Mexico (Gulf) reef fish fishery can be found in Reef Fish Amendments 38 (GMFMC 2012a) and 44 (GMFMC 2017c) to the Fishery Management Plan (FMP) for the Reef Fish Resources in the Gulf of Mexico (Reef Fish FMP). Additionally, Sections 3.4 and 3.5 provide information on the respective economic and social environments of the fishery. Management of the commercial and recreational sectors fishing for reef fish in federal waters began in 1984 with the implementation of the Reef Fish FMP. This FMP has been continuously updated through plan amendments and framework actions (also known as regulatory amendments). Resultant regulatory measures are codified at 50 CFR 622. A summary of reef fish management actions can be found on the Gulf of Mexico Fishery Management Council's (Council) web page at http://gulfcouncil.org/fishery-management/. Management actions associated with red grouper can also be found in this document in Section 1.3.

The allocation between the commercial and recreational sector in the red grouper fishery is 76% and 24%, respectively. Total landings of red grouper have ranged from 4.4 to 13.6 million pounds (mp) gutted weight (gw) between 2001 and 2018 (Marine Recreational Information Program – Fishing Effort Survey [MRIP FES] data; Table 2.1.1).[6] The years with the lowest landings occurred in 2010 (4.9 mp gw - likely associated with the Deepwater Horizon oil spill) and 2018 (4.4 mp gw – likely associated with the large red tide event). The highest landings in this series occurred in 2004 at approximately 13.6 mp gw. In general, annual landings have been between 5 and 10 mp gw (MRIP FES data).

Historically, relative spawning biomass (i.e. spawning potential ratio [SPR]) of red grouper was below the 30% management target from 1990 through 1996, gradually increased as the 1998 cohort matured, but declined considerably in 2005 following a severe red tide event that killed an estimated 29.5% of the red grouper population. The spawning stock biomass (SSB) increased from 2006 and peaked in 2012, likely due to the large 2005 cohort moving through the population in combination with effective management measures (e.g., a reduction in the commercial size limit in 2009, implementation of the commercial individual fishing quota (IFQ) program in 2010, etc.). Relative spawning biomass has been decreasing since 2012, and reached a low of 0.246 in 2017. This decrease is due at least in part to the severe 2014 red tide event that killed an estimated 21.3% of the population (Southeast Data Assessment and Review [SEDAR] 61 Executive Summary 2019).

[6] Prior to 2013, red grouper recreational landings data were collected and monitored in Marine Recreational Fisheries Statistics Survey (MRFSS) currency. Data referenced here have been converted to MRIP FES currency for consistency and to match current collection and monitoring protocols.

Landings in both 2017 (~5.0 mp gw) and 2018 (~4.4 mp gw), were among the lowest in the time series presented in Table 2.1.1, and there was other evidence of declining Gulf red grouper stocks. Some fishermen testified to the Council in 2018 that red grouper were harder to catch and stated that the current acceptable biological catch (ABC) of 13.92 mp gw was too high. They expressed concern that the stock condition may be declining, citing an apparent lack of legal-size and larger individuals throughout the species' range on the West Florida shelf. In addition, there were severe red tide conditions that occurred in summer and fall of 2014 and 2018 off the Florida west coast that could have adversely affected the red grouper stock. Both the SEDAR 12 Update 2009 and SEDAR 42 2015 found that the large 2005 red tide event (likely similar in scope to the red tide events in 2014 and 2018) depressed the red grouper spawning stock biomass (SSB).

At present, it is not yet clear whether or to what extent the 2018 red tide event affected the red grouper stock, or why harvests have declined in recent years. The Council requested the National Marine Fisheries Service (NMFS) take emergency action in 2019 to reduce the annual catch limit (ACL) and annual catch target (ACT) for both the recreational and commercial red grouper fisheries. Based on the Council request, NMFS withheld distribution of the amount of IFQ allocation equal to the amount of anticipated reduction of the commercial quota (83 FR 64480). In May 2019, NMFS issued an emergency rule (84 FR 22389) temporarily reducing the stock ACL until a final rule could be implemented. In October 2019, NMFS implemented a framework action (84 FR 52036) setting the stock ACL at 4.16 mp gw -- equal to the 2017 combined red grouper commercial and recreational landings.

Commercial Sector

For the commercial sector, red grouper harvest is managed under an IFQ program administered through the Southeast Regional Office (SERO) of NMFS. Under the IFQ program, allocation is distributed annually on January 1 to IFQ shareholders with red grouper shares. The amount of allocation distributed is based on the annual quota and shares possessed by an entity (expressed as a percent of the quota). To harvest IFQ species, a vessel permit must be linked to an IFQ account and possess sufficient allocation for the species to be harvested. IFQ accounts can be opened and valid permits can be linked to IFQ accounts at any time during the year. Eligible vessels can receive allocation from other IFQ participants. For more information on the IFQ program, see the SERO webpage on limited access programs at http://portal.southeast.fisheries.noaa.gov/cs/main.html.

Commercial operators harvesting reef fish from the Gulf exclusive economic zone (EEZ) must have a Gulf reef fish permit, which is a limited access permit. In 2018, a total of 845 vessels held Gulf commercial reef fish permits. Over 99% of those permits have the mailing recipient in a Gulf state (Table 3.1.1). These vessels combine to make up the federal Gulf reef fish fleet, and any vessel in the fleet must have a vessel monitoring system onboard.

Table 3.1.1. Number and percentage of vessels with a Gulf reef fish permit by state, final totals for 2018.

State	Gulf Reef Fish Permits	
	Number	Percent
AL	38	4.5%
FL	677	80.1%
LA	43	5.1%
MS	7	0.8%
TX	74	8.8%
Subtotal	839	99.3%
Other	6	0.07%
Total	**845**	**100.0%**

Source: NMFS SERO PIMS.

The commercial red grouper fishery is open throughout the year to fishermen with Gulf commercial reef fish permits and red grouper allocation. The minimum commercial size limit is 18 inches total length, and there are no trip limits. Primary commercial gear types used to harvest red grouper include vertical lines (handlines and bandit gear) and BLLs (GMFMC 2016a). Traps are no longer a legally acceptable method for red grouper harvest.

Vessels fishing with BLLs off the coast of Florida generally target red grouper in shallower waters and yellowedge grouper, tilefish, and sharks in deeper waters. Vessels that use BLL gear in the Gulf EEZ east of 85º30'W must have a valid Eastern Gulf longline endorsement in addition to their valid Gulf reef fish permit. In 2018, 62 permit holders held the longline endorsement (61 valid and one renewable/transferrable), and all but one of the endorsement holders had a mailing address in Florida (1 in Texas).

Table 3.1.2. Red grouper landings in pounds gutted weight for the commercial sector.

Year	Landings	Quota	Percent of Quota
2000	5,702,622	N/A	N/A
2001	5,802,442	N/A	N/A
2002	5,791,795	N/A	N/A
2003	4,832,294	N/A	N/A
2004	5,635,577	5,310,000	106.1
2005	5,380,603	5,310,000	101.3
2006	5,109,824	5,310,000	96.2
2007	3,650,777	5,310,000	68.8
2008	4,748,224	5,310,000	89.4
2009	3,698,227	5,750,000	64.3
2010	2,910,970	5,750,000	50.6
2011	4,783,668	5,230,000	91.5
2012	5,219,133	5,370,000	97.2
2013	4,599,001	5,530,000	83.2
2014	5,601,905	5,630,000	99.5
2015	4,798,007	5,720,000	83.9
2016	4,497,582	7,780,000	57.8
2017	3,328,271	7,780,000	42.8
2018	2,363,280	7,780,000	30.4

Source. 2000 -2009: SEFSC Commercial ACL dataset (11/15/19) and, 2010-2019: IFQ database (accessed 8/19/19).

Current regulations prohibit a longline vessel from having more than 750 hooks rigged for fishing at any given time. In addition, longline vessels must abide by seasonal prohibitions as follows: 1) From June through August each year, bottom longlining for Gulf reef fish is prohibited in the portion of the Gulf EEZ east of 85°30' W longitude that is shoreward of rhumb lines as specified in 50 CFR 622.35(b)(1); 2) A person aboard a vessel that uses longline or buoy gear in the reef *longline and buoy gear restricted area* (as specified in Table 1 of Appendix B to §622) is limited on that trip to the bag limits for Gulf reef fish specified in §622.38(b) and, for Gulf reef fish for which no bag limit is specified in §622.38(b), the vessel is limited to 5 percent, by weight, of all fish on board or landed.

Estimates for longline sector characteristics and catch are based on a 2011 study of observer data (Scott-Denton et al., 2011). Average BLL trips in the Gulf are estimated to last 11.7 days. Longline vessels are estimated on average to set 5.6 nautical miles of mainline, and fish at a depth of 92 m (309 ft), with a soak time of 5.1 hours. Sets generally occur over rocky bottoms during daylight hours.

Data from Scott-Denton et al. indicate that approximately 46% of the BLL fish catch is kept, while the rest is discarded. Of the catch that is released alive, about 42% exhibit signs of stress including barotrauma symptoms (airbladder expansion and/or eyes protruding), while 46% exhibit a normal appearance. In all, it is estimated that the immediate mortality for red grouper

is approximately 20% in the longline sector. The most recent red grouper stock assessment (SEDAR 61 2019) assumed discard mortality for red grouper captured on BLLs at 41.4% prior to IFQ, and 44.1% post-IFQ.

The species predominantly caught in the longline fishery include red grouper (56% of catch), yellowedge grouper (10%), and blueline tilefish (5%). Red grouper, yellowedge grouper, golden tilefish, and blueline tilefish are the species most commonly kept (82% of total), while red grouper, Atlantic sharpnose shark, smooth dogfish, and red snapper are the most common species released alive (83%). Red grouper, blueline tilefish, Atlantic sharpnose shark, and red snapper comprise about 81% of the catch that is discarded dead, and red grouper comprise 77% of the fish released in unknown condition (Scott-Denton et al., 2011).

The longline component's catch of red grouper is largely indiscriminant of size, ranging from below 10 to above 35 inches, with a mode of 18 inches. Approximately 32% of red grouper captured are below the legal size limit of 18 inches. Of the 68% of red grouper catch that is of legal size, 62% is kept (Scott-Denton et al., 2011).

Red grouper are also a primary target species in the commercial vertical line sector. Effort and catch in the red grouper vertical line sector are highest in the eastern Gulf. Scott-Denton et al. found that 71% of the individual fish captured in the vertical line component are kept, with red snapper ranked highest in catch composition (31% of catch), followed by vermilion snapper (29%) and red grouper (16%). Vermilion snapper, red snapper, red grouper, and red porgy comprise an estimated 86% of kept individuals. Of fish that are released alive, approximately 35% exhibit visual signs of stress, including barotrauma. Red snapper, vermilion snapper, and red grouper comprise 87% of the fish that are discarded dead, and the immediate mortality rate for red grouper for vertical line fishery is estimated at 11% (Scott-Denton et al., 2011). The two most recent stock assessments assumed discard mortality for red grouper in the commercial vertical line sector at 19.0% (SEDAR 42 2015; SEDAR 61 2019).

Gauging the scope of discarding of captured fish is a vital element in predicting overall fishery impacts on the red grouper population. Red grouper commercial dead discards were estimated beginning in 1990 with the implementation of federal minimum size limits. SEDAR 61 2019 assumed discard mortality rates of 41.4% for the pre-IFQ commercial BLL fleet, 44.1% for the post-IFQ commercial longline fleet, 19.0% for the commercial vertical line fleet, and 10.0% for the trap fishery (no longer operational). Commercial longline fleet discards averaged about 465,000 fish from 1993-2017, with a low of 153,000 fish in 2009 and a peak of 878,000 fish in 1997. Commercial vertical line fleet discards of red grouper averaged about 134,000 fish from 1993-2017, with a low of about 49,000 fish in 1995 and a peak of over 290,000 fish in 2011 (Table 3.1.3). Pulver and Stephen (2018) found that nearly 95 percent of reported red grouper discards were because of the minimum size limit.

Table 3.1.3. Red grouper commercial discards (number of fish) by gear.

Year	Vertical Line	Longline
1993	79,662	514,033
1994	94,368	668,159
1995	49,123	302,219
1996	112,944	667,938
1997	132,132	878,497
1998	127,683	718,051
1999	140,955	754,469
2000	142,683	633,778
2001	146,668	652,257
2002	151,052	579,902
2003	158,908	596,105
2004	151,788	567,853
2005	133,793	440,858
2006	146,203	506,568
2007	150,881	405,702
2008	127,661	480,530
2009	219,006	153,431
2010	198,729	177,525
2011	290,423	346,979
2012	178,703	402,936
2013	96,399	209,867
2014	59,449	324,659
2015	86,568	195,727
2016	96,899	242,272
2017	71,658	216,046

Source: SEDAR 61 Final Report (NMFS 2019)

Recreational Sector

For the recreational sector, red grouper harvest is managed with ACLs, ACTs, AMs, season/area closures, a minimum size limit, and a bag limit. The primary gear type in the recreational sector is vertical line gear (rod-and-reel). During the months of February and March, the possession of red grouper caught in waters beyond the 20 fathom (120 feet) contour is prohibited. This closure is to protect red grouper and other grouper species that are in spawning condition. Red grouper have a 20-inch total length recreational minimum size limit and are a part of the four-grouper aggregate recreational bag limit. However, only two of the fish in that aggregate bag limit can be red grouper. Private recreational fishing vessels are not required to have a federal permit to harvest individual species or species complexes in the reef fish fishery from the Gulf EEZ. Anglers aboard these vessels, however, must either be federally registered or licensed in states that have a system to provide complete information on that state's saltwater anglers to the national registry. Any for-hire fishing vessel that takes anglers into the Gulf EEZ to harvest species or complexes in the reef fish fishery must have a limited-access charter vessel/headboat (for-hire) permit for reef fish that is specifically assigned to that vessel. State regulations are

different from federal regulations in some cases. In those circumstances (e.g., red grouper closed season outside 20 fathom contour), private anglers must obey the regulations for the waters they are fishing in. For charter vessels and headboats, if federal regulations for Gulf reef fish are more restrictive than state regulations, operators must comply with those federal regulations regardless of where the fish are harvested. For federal waters, if landings meet or are projected to meet the red grouper ACL, then the season will be closed.

In 2018, there were 1,312 for-hire fishing vessels with a valid or renewable/transferrable for-hire permit for reef fish: 1,279 vessels with a for-hire permit and another 33 with a historical captain for-hire permit (Table 3.1.4). Approximately 61% (806) of the 1,312 for-hire vessel reef fish permits have mailing recipients in Florida. Texas recipients hold the second highest number of permits, with 16%. Collectively, approximately 99% of the permits have mailing recipients in one of the Gulf States.

Table 3.1.4. Number and percentage of for-hire reef fish permits by state of mailing recipient (of permit).

State	For-Hire Reef Fish Permits by State of Recipient	
	Number	Percentage
Alabama	137	10.4%
Florida	806	61.4%
Louisiana	121	9.2%
Mississippi	32	2.4%
Texas	206	15.7%
Other	10	0.8%
Total	1,312	100.0%

Source: Permit Information Management System (PIMS) final data for 2018.

Recreational total red grouper landings (Table 3.1.5) peaked in the Gulf in 2004 (8.0 mp), but were also high in 2013 (5.0 mp) and 2014 (5.4 mp). Recreational catch was low from 2007-2011 (range 1.6 mp – 2.1 mp) and again in 2017 (1.7 mp) and 2018 (2.1 mp). From 2001-2018, private anglers landed 85.9% of the total recreational landings, while charter boats landed 12.6%, and headboats 1.4% (Table 3.1.5).

Table 3.1.5. Red grouper landings in pounds gutted weight for recreational fleets.

Year	Charter	Headboat	Private	Total
2001	334,963	30,181	2,070,312	2,435,456
2002	268,079	23,508	2,880,760	3,172,348
2003	269,853	38,489	1,893,154	2,201,496
2004	519,621	65,145	7,398,473	7,983,239
2005	513,070	75,009	2,493,900	3,081,979
2006	262,350	25,479	2,367,236	2,655,065
2007	145,391	24,674	1,861,802	2,031,867
2008	293,645	37,604	1,273,149	1,604,398
2009	193,864	29,583	1,376,617	1,609,247

Year	Charter	Headboat	Private	Total
2010	326,603	26,064	1,611,095	1,963,762
2011	244,092	36,697	1,253,324	1,534,113
2012	575,589	83,324	3,472,809	4,131,722
2013	796,929	77,542	4,115,840	4,990,310
2014	586,680	45,107	4,737,128	5,368,916
2015	500,305	50,621	3,239,928	3,790,853
2016	406,066	56,851	2,169,801	2,632,718
2017	342,871	21,423	1,328,134	1,692,428
2018	362,021	22,310	1,669,115	2,053,446

Source. SEFSC MRIP FES (Fishing Effort Survey) Recreational dataset (11/26/19).

Red grouper recreational discards were derived from MRIP estimates of live released fish between 1993 and 2017 and self-reported discards in the Southeast Region Headboat Survey (SRHS) logbook since 2007. Red grouper discards from headboats for years prior to 2007 in Florida were estimated using the MRIP Charter: SRHS discard ratio as a proxy. SEDAR 61 2019 assumed recreational discard mortality at 11.6%. Red grouper recreational discard estimates averaged 4.25 million fish from 1993 to 2017, with a low of 1.53 million fish in 1996 and a peak of 8.10 million fish in 2004 (Table 3.1.8).

Table 3.1.6. Red grouper recreational discards (number of fish).

Year	Charter	Headboat	Private	Total
1993	86,379	78,702	3,158,040	3,323,121
1994	146,510	84,039	3,236,051	3,466,600
1995	236,720	107,149	3,835,677	4,179,546
1996	114,829	163,725	1,246,516	1,525,070
1997	127,887	78,504	2,014,957	2,221,348
1998	202,616	83,492	3,337,806	3,623,914
1999	375,157	180,087	5,405,117	5,960,361
2000	471,536	98,791	4,227,094	4,797,421
2001	272,157	72,878	3,502,720	3,847,755
2002	228,016	63,624	3,909,476	4,201,116
2003	343,210	136,745	3,752,560	4,232,515
2004	423,964	160,995	7,512,527	8,097,486
2005	248,419	92,489	2,701,327	3,042,235
2006	123,352	32,695	2,220,260	2,376,307
2007	111,913	17,365	1,599,693	1,728,971
2008	367,994	89,615	6,294,612	6,752,221
2009	398,022	153,829	6,276,296	6,828,147
2010	497,987	117,879	5,379,955	5,995,821
2011	433,964	134,114	6,021,306	6,589,384
2012	464,256	117,809	4,392,740	4,974,805

Year	Charter	Headboat	Private	Total
2013	620,479	112,266	4,895,361	5,628,106
2014	435,470	84,237	4,293,342	4,813,049
2015	326,901	74,376	2,550,817	2,952,094
2016	322,165	79,409	2,164,044	2,565,618
2017	299,920	73,658	2,202,611	2,576,189

Source: SEDAR 61 Final Report (NMFS 2019)

3.2 Description of the Physical Environment

General 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 2004a), Generic Amendment 3 (GMFMC 2005), and the Generic ACL/Accountability Measures (AM) Amendment (GMFMC 2011a), 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 3.2.1). 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 73 º 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)[7]. 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 planktonic larval stage lives in the water column and feeds on zooplankton and phytoplankton (GMFMC 2004a). Juvenile and adult reef fish are typically demersal and usually associated with bottom topographies on the continental shelf (less than 100 m) which have high relief, i.e., coral reefs, artificial reefs, rocky hard-bottom substrates, ledges and caves, sloping soft-bottom areas, and limestone outcroppings. However, several species are found over sand and soft-bottom substrates. For example, juvenile red snapper are common on mud bottoms in the northern Gulf, particularly off Texas through Alabama. Also, some juvenile snapper (e.g., mutton, gray, red, dog, lane, and yellowtail snappers) and grouper (e.g., goliath, red, gag, and yellowfin groupers) are associated with inshore seagrass beds, mangrove estuaries, lagoons, and larger bay systems.

[7] NODC 2011: http://accession.nodc.noaa.gov/0072888

Red grouper are known to alter the offshore hard bottom areas. 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 they associate with.

Figure 3.2.1. 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)

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. Further information can be found at: http://www.boem.gov/Environmental-Stewardship/Archaeology/Shipwrecks.aspx.

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 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).

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. A summary of the results of the inventory are shown in Table 3.2.1 with respect to total emissions and from fishing. Commercial fishing and recreational vessels make up a small percentage of the total estimated greenhouse gas emissions from the Gulf (2.04% and 1.67%, respectively).

Table 3.2.1. Total Gulf greenhouse gas emissions estimates (tons per year) from oil platform and non-oil platform sources, commercial fishing, and percent greenhouse gas emissions from commercial fishing vessels of the total emissions*. Data are for 2011 only.

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

*Compiled from Tables 6-11, 6-12, and 6-13 in Wilson et al. (2014). **The CO_2 equivalent (CO_2e) emission estimates represent the number of tons of CO_2 emissions with the same global warming potential as one ton of another greenhouse gas (e.g., CH_4 and N_2O). Conversion factors to CO_{2e} are 21 for CH_4 and 310 for N_2O.

[8] http://gulfhypoxia.net
[9] https://www.ipcc.ch/srocc/

3.3 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 2004a), Generic ACL/AM Amendment (GMFMC 2011a), and Reef Fish Amendments 30B (GMFMC 2008c), 31 (2010a), 32 (GMFMC 2011b) and a 2019 framework action (GMFMC 2019a) are 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 total length) and 50.7 pounds. (23 kg) (Robins et al. 1986). Maximum age of red grouper in the Gulf of Mexico 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 (27 cm fork length [FL]) and age 2. 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 (FWCC)/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 2016. Red grouper are protogynous hermaphrodites, transitioning from females to males at older ages, and form harems for spawning (Dormeier and Colin 1997). Age and size at sexual transition is approximately 10.5 years and 30 inches total length (76.5 cm total length) (Fitzhugh et al. 2006). Size and age at sexual transition was re-estimated both for SEDAR 42 2015 and SEDAR 61 2019. These were estimated at 11.2 and 11.4 years and 707- and 708-mm FL, respectively. Red grouper spawn from February until mid-July with peak spawning occurring in the eastern Gulf of Mexico during March through May (Fitzhugh et al. 2006). Over the last 25-30 years, there has been little change in the sex ratio of red grouper, likely because they do not aggregate (Coleman et al. 1996).

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 taking into account the reduction in the commercial size limit from 20 inches to 18 inches total length (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 mp (the equilibrium yield at the fishing mortality rate associated with harvesting the equilibrium maximum sustainable yield) and the ABC be set at 7.93 mp (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 that the red grouper stock is neither overfished nor experiencing overfishing (as of 2013), SSC members determined 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 mp gw. The annual ABC for years 2016-2020 was computed as the 43rd percentile of the OFL PDF, which was 13.92 mp.

2018 Red Grouper Interim Analysis

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). This analysis is described in more detail in Section 1.1. 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 BLL 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 an ABC recommendation. The SSC did determine the analysis could support a recommendation that the Council reduce the 2019 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 ($SSB_{2017}/MSST = 1.64$; $MSST = 0.5*B_{MSY}$) and is not undergoing overfishing

($F_{Current\ (2015\text{-}2017)}$/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. The SSC also noted that under the old definition of minimum stock size threshold (MSST) (1-M*B_{MSY}), the stock would have been considered overfished as of 2017 ($SSB_{2017}/MSST_{OLD}$ = 0.96). Although, the SSC noted the stock has decreased to almost 50% of B_{MSY} in the past, which is near the current definition of MSST.

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). The NOS obtained fishery-independent data sets for the Gulf, including Southeast Area Monitoring and Assessment Program and state trawl surveys. Data from the Estuarine Living Marine Resources Program (ELMRP) contain information on the relative abundance of specific species (highly abundant, abundant, common, rare, not found, and no data) for a series of estuaries, by five life stages (adult, spawning, egg, larvae, and juvenile) and month for five seasonal salinity zones (0-0.5, 0.5-5, 5-15, 15-25, and greater than 25 parts per thousand). NOS staff analyzed these data to determine relative abundance of the mapped species by estuary, salinity zone, and month. For some species not in the ELMRP database, distribution was classified as only observed or not observed for adult, juvenile, and spawning stages.

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. Exceptions to these generalizations include gray triggerfish, which lay their eggs in depressions in the sandy bottom (Simmons and Szedlmayer 2012), and gray snapper whose larvae are found around submerged aquatic vegetation. 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, i.e., coral reefs, artificial reefs, rocky hard-bottom substrates, ledges and caves, sloping soft-bottom areas, and limestone outcroppings. However, several species are found over sand and soft-bottom substrates. Juvenile red snapper are common on mud bottoms in the northern Gulf, particularly from Texas to Alabama. Also, some juvenile snappers (e.g., mutton, gray, red, dog, lane, and yellowtail snappers) and groupers (e.g., goliath grouper, red, gag, and yellowfin groupers) have been documented in inshore seagrass beds, mangrove estuaries, lagoons, and larger bay systems (GMFMC 1981). 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 (Table 3.3.1). 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

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

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 2019 Status of U.S. Fisheries classifies only one as overfished (greater amberjack) and two are undergoing overfishing (greater amberjack and gray triggerfish). The status of both assessed and unassessed stocks, as of the writing of this amendment is provided in Table 3.3.1. However, it should be noted that although gray triggerfish and red snapper are not overfished, these stocks are under rebuilding plans.

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). SEDAR 49 is listed in Table 3.3.1 and identifies these stocks. This method allows the setting of OFL and acceptable biological catch (ABC) based on limited data and life history information, but does not provide assessment-based status determinations. Data were requested for these stocks but it was determined not enough information was available to complete an assessment even using the DLMTool. These stocks are not experiencing overfishing based on annual harvest remaining below the OFL, but no overfished status determination has been made (Table 3.3.1). Lane snapper was the only stock with adequate 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 overfished status is unknown (Table 3.3.1). 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.

[11] www.gulfcouncil.org
[12] http://sedarweb.org/

Table 3.3.1. Status of species in the Reef Fish FMP grouped by family.

Common Name	Scientific Name	Stock Status		Most recent assessment or SSC workshop**
		Overfishing	Overfished	
Family Balistidae – Triggerfishes				
gray triggerfish	*Balistes capriscus*	Y	N	SEDAR 43
Family Carangidae – Jacks				
greater amberjack	*Seriola dumerili*	Y	N	SEDAR 33 Update
lesser amberjack	*Seriola fasciata*	N	Unknown	SEDAR 49
almaco jack	*Seriola rivoliana*	N	Unknown	SEDAR 49
banded rudderfish	*Seriola zonata*	N	Unknown	
Family Labridae – Wrasses				
hogfish	*Lachnolaimus maximus*	N	N	SEDAR 37
Family Malacanthidae – Tilefishes				
tilefish (golden)	*Lopholatilus chamaeleonticeps*	N	N	SEDAR 22
blueline tilefish	*Caulolatilus microps*	N	Unknown	
goldface tilefish	*Caulolatilus chrysops*	N	Unknown	
Family Serranidae – Groupers				
gag	*Mycteroperca microlepis*	N	N	SEDAR 33 Update
red grouper	*Epinephelus morio*	N	N	SEDAR 42
Scamp	*Mycteroperca phenax*	Unknown	Unknown	
black grouper	*Mycteroperca bonaci*	N	N	SEDAR 19
yellowedge grouper	*Hyporthodus flavolimbatus*	N	N	SEDAR 22
snowy grouper	*Hyporthodus niveatus*	N	Unknown	SEDAR 49
speckled hind	*Epinephelus drummondhayi*	N	Unknown	SEDAR 49
yellowmouth grouper	*Mycteroperca interstitialis*	N	Unknown	SEDAR 49
yellowfin grouper	*Mycteroperca venenosa*	Unknown	Unknown	
warsaw grouper	*Hyporthodus nigritus*	N	Unknown	
**Atlantic goliath grouper	*Epinephelus itajara*	N	Unknown	SEDAR 47
Family Lutjanidae – Snappers				
queen snapper	*Etelis oculatus*	N	Unknown	
mutton snapper	*Lutjanus analis*	N	N	SEDAR 15A Update
blackfin snapper	*Lutjanus buccanella*	N	Unknown	
red snapper	*Lutjanus campechanus*	N	N	SEDAR 52
cubera snapper	*Lutjanus cyanopterus*	N	Unknown	
gray snapper	*Lutjanus griseus*	N	N	
lane snapper	*Lutjanus synagris*	N	Unknown	SEDAR 49
silk snapper	*Lutjanus vivanus*	N	Unknown	
yellowtail snapper	*Ocyurus chrysurus*	N	N	SEDAR 27A
vermilion snapper	*Rhomboplites aurorubens*	N	N	SEDAR 45
Wenchman	*Pristipomoides aquilonaris*	N	Unknown	SEDAR 49

Note: **Atlantic goliath grouper is a protected grouper (i.e., ACL is set at zero) and benchmarks do not reflect appropriate stock dynamics.
** Southeast Data, Assessment, Review (SEDAR) may be viewed at http://sedarweb.org/.

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 2004b, GMFMC 2007, GMFMC 2014a, GMFMC 2015), grouper

(GMFMC 2008a, GMFMC 20010b, GMFMC 2011a, GMFMC 2011b, GMFMC 2012a), vermilion snapper (GMFMC 2004c, GMFMC 2017a), greater amberjack (GMFMC 2008b, GMFMC 2012b, GMFMC 2015b), gray triggerfish (GMFMC 2012c), and hogfish (GMFMC 2016b). 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

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' Laws and Policies 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.

The gear used by the Gulf reef fish fishery is classified in the MMPA 2019 List of Fisheries as a Category III fishery (84 FR 22051). 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

[13] https://www.fisheries.noaa.gov/topic/laws-policies
[14] https://www.fisheries.noaa.gov/protecting-marine-life

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.

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.

Climate Change

Climate change projections predict increases in sea-surface temperature and sea level; decreases in sea-ice cover; and changes in salinity, wave climate, and ocean circulation.[15] 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.

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

This could change the water balance of coastal ecosystems; altering patterns of wind and water circulation in the ocean environment; and influence the productivity of critical coastal ecosystems such as wetlands, estuaries, and coral reefs. The National Oceanic and Atmospheric Association (NOAA) Climate Change Web Portal[16] predicts the average sea surface temperature in the Gulf will increase by 1-3ºC for 2010-2070 compared to the average over the years 1950-2010. 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. The smooth puffer and common snook are examples of species for which there has been a distributional trend to the north in the Gulf. For other species, such as red snapper and the dwarf sand perch, there has been a distributional trend towards deeper waters. For other fish species, such as the dwarf goatfish, there has been a distributional trend both to the north and to deeper waters. These changes in distributions have been hypothesized as a response to environmental factors, such as increases in temperature.

The distribution of native and exotic species may change with increased water temperature, as may the prevalence of disease in keystone animals such as corals and the occurrence and intensity of toxic algae blooms. Hollowed et al. (2013) provided a review of projected effects of climate change on the marine fisheries and dependent communities. Integrating the potential effects of climate change into the fisheries assessment is currently difficult due to the time scale differences (Hollowed et al. 2013). The fisheries stock assessments rarely project through a time span that would include detectable climate change effects. However, some stocks have shown increases in abundance in the northern Gulf (Fodrie et al. 2010). This may be a result of increasing water temperatures in coastal environments.

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). When exposed to realistic, yet toxic levels of PAHs (1–15 μg/L), greater amberjack larvae develop cardiac abnormalities and physiological defects (Incardona et al. 2014). The future reproductive success of long-lived species, including red drum and many reef fish species, may be negatively affected by episodic events resulting in high-mortality years or low recruitment. These episodic events could leave gaps in the age structure of the population, thereby affecting future reproductive output (Mendelssohn et al. 2012). Other studies have described the vulnerabilities of various marine finfish species, with morphological and/or life history characteristics similar to species found in the Gulf, to oil spills and dispersants (Hose et al. 1996; Carls et al. 1999; Heintz et al. 1999; Short 2003).

Increases in histopathological lesions were found in red snapper in the area affected by the oil, but Murawski et al. (2014) found that the incidence of lesions had declined between 2011 and 2012. The occurrence of such lesions in marine fish is not uncommon (Sindermann 1979; Haensly et al. 1982; Solangi and Overstreet 1982; Khan and Kiceniuk 1984, 1988; Kiceniuk and Khan 1987; Khan 1990). Red snapper diet was also affected after the spill. A decrease in zooplankton consumed, especially by adults (greater than 400 mm total length) over natural and

[16] https://www.esrl.noaa.gov/psd/ipcc/

artificial substrates may have contributed to an increase in the consumption of fish and invertebrate prey – more so at artificial reefs than natural reefs (Tarnecki and Patterson 2015).

In addition to the crude oil, over a million gallons of the dispersant, Corexit 9500A®, was applied to the ocean surface and an additional hundreds of thousands of gallons of dispersant was pumped to the mile-deep wellhead (National Commission 2010). No large-scale applications of dispersants in deep water had been conducted until the *Deepwater Horizon* MC252 oil spill. Thus, no data exist on the environmental fate of dispersants in deep water. The effect of oil, dispersants, and the combination of oil and dispersants on fishes of the Gulf remains an area of concern.

Red Tide

Red tide is a common name for harmful algal blooms 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 other marine animals.[17]

The effects of red tide on fish stocks have been well established. 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 red tide events. It is unknown whether mortality occurs via absorption of toxins 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). 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.

3.4 Description of the Economic Environment

A description of the red grouper stock affected by the actions considered in this amendment is provided in Section 3.3. 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 (2016a).

This amendment 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. Sections 3.4.1 and 3.4.2 contain additional information

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

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.

3.4.1 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. As shown in Table 3.4.1.1, the number of permits that were valid or renewable in a given year has continually decreased in the years after the red snapper IFQ program was implemented in 2007. This decline has continued since the grouper-tilefish 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 3.4.1. 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.

Although a single permit is attached to a single vessel and many businesses own one vessel, some businesses hold or own multiple permits and vessels. Multiple vessels owned by a single business are often referred to as a "fleet." As illustrated in Table 3.4.1.2, 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 3.4.1.2. 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 RG. A permitted vessel must be linked to a "current" IFQ account in order to be eligible to harvest RG and IFQ species.[18] Thus, because some vessels are not linked to a current 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 3.4.1.3. 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 3.4.1.3 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 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

[18] The linked account must have annual allocation in it in order for the permitted vessel to actually harvest IFQ species. A "current" account is an account that has not been closed or suspended.

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 674 IFQ accounts with shares in one or more share categories. Of these accounts, 495 held red grouper shares. The total percentage of red grouper (RG) shares held by accounts with RG shares does not sum to 100% in Table 3.4.1.4 because a small percentage of RG shares were reclaimed under Reef Fish Amendment 36A.[19] 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 red snapper (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).[20]

Table 3.4.1.4. 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

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

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 million lbs gw for DWG, 582,000 lbs gw for TF, and 525,000 lbs gw for SWG. Table 3.4.1.5 presents statistics regarding annual allocation to shareholder accounts based on the share statistics in Table 3.4.1.4 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 shareholder 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 3.4.1.5. Annual allocation 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

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 3.4.1.6. 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 3.4.1.6. 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 (IFQ database accessed 2/11/2020).

The information in Table 3.4.1.6 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 3.4.1.7. 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 3.4.1.7. 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.

In addition to their asset value, shares have value because they result in annual allocation, which can either be leased or used for harvesting purposes (i.e., landings). Statistics regarding the potential lease value associated with the annual allocation for each account with RG shares are provided in Table 3.4.1.8.

The average lease 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]

Table 3.4.1.8. Potential lease 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 lease value estimates are based on average 2019 allocation prices (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

[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.

market power being exercised in any of the markets for annual allocation (i.e., markets for annual allocation are competitive).

The information in Table 3.4.1.8 reflects the lease value of allocation based on 2019 allocation prices. However, with the exception of RS allocation, allocation prices for other share categories have declined over the past 5 years, as illustrated in Table 3.4.1.9. 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 3.4.1.8 may overestimate the lease 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 lease value of RS allocation in Table 3.4.1.8 may underestimate actual lease 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 share categories, with RS allocation now dominating that portfolio.

Table 3.4.1.9. 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.

These same general findings regarding the lease 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 3.4.1.10. 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 (IFQ database accessed 2/11/2020).

The information in Table 3.4.1.10 reflects the potential ex-vessel value of allocations in 2020 based on 2019 ex-vessel prices and commercial quotas in 2020. As illustrated in Table 3.4.1.11, with the exception of TF, and RS to some extent, these estimates may understate the actual ex-vessel value associated with these allocations as ex-vessel prices have steadily increased from 2015 through 2019. For example, ex-vessel prices for GG, SWG and DWG have increased by 11%, 12%, and 13%, respectively. 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%, while the ex-vessel price for TF has decreased by about 7%.[22] 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 lease it, all other things being equal.

Table 3.4.1.11. 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 3.4.1.12 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 3.4.1.112. 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), red grouper 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.

[22] The ex-vessel price for TF likely decreased due to a shift in the distribution of landings from golden tilefish to blueline tilefish as the former typically obtains a higher ex-vessel price compared to the latter.

Table 3.4.1.12. 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
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 (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 3.4.1.13 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 3.4.1.14 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,[23] and

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

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

Table 3.4.1.13. 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 (pers. communication, Nov. 22, 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 3.4.1.14. 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 3.4.1.15 illustrates the purchasing activities of dealers that bought RG landings from vessels from 2014 through 2018.[24] 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 3.4.1.15. 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.

[24] 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 due to waterbody code assignment issues in the Keys.

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, 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.

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 3.4.1.16. Average annual economic impacts of red grouper in the commercial sector of the Gulf reef fish fishery. All monetary estimates are in thousands of 2018 dollars[25] and employment is measured in full-time equivalent jobs.

Harvesters	**Direct**	**Indirect**	**Induced**	**Total**
Employment impacts	382	59	79	520
Income impacts	$9,241	$1,716	$4,149	$15,106
Total value-added impacts	$9,850	$6,177	$7,099	$23,126
Output Impacts	$17,116	$13,925	$13,781	$44,822
Primary dealers/processors	**Direct**	**Indirect**	**Induced**	**Total**
Employment impacts	80	32	55	167
Income impacts	$3,015	$2,779	$2,628	$8,422
Total value-added impacts	$3,214	$3,546	$4,948	$11,708
Output impacts	$9,705	$7,310	$9,672	$26,687
Secondary wholesalers/distributors	**Direct**	**Indirect**	**Induced**	**Total**
Employment impacts	37	8	36	81
Income impacts	$1,796	$534	$1,889	$4,220
Total value-added impacts	$1,915	$896	$3,227	$6,038
Output impacts	$4,811	$1,754	$6,276	$12,841
Grocers	**Direct**	**Indirect**	**Induced**	**Total**
Employment impacts	158	18	35	211
Income impacts	$3,695	$1,228	$1,855	$6,777
Total value-added impacts	$3,939	$1,978	$3,140	$9,057
Output impacts	$6,315	$3,213	$6,164	$15,693
Restaurants	**Direct**	**Indirect**	**Induced**	**Total**
Employment impacts	986	66	161	1,213
Income impacts	$14,822	$4,495	$8,490	$27,808
Total value-added impacts	$15,800	$8,036	$14,305	$38,141
Output impacts	$28,890	$12,574	$28,228	$69,693
Harvesters and seafood industry	**Direct**	**Indirect**	**Induced**	**Total**
Employment impacts	1,643	183	366	2,191
Income impacts	$32,570	$10,752	$19,011	$62,333
Total value-added impacts	$34,718	$20,632	$32,719	$88,069
Output impacts	$66,837	$38,777	$64,121	$169,735

[25] The commercial economic impact model has not been updated yet to produce estimates in 2019$.

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 (2018)[26] and are provided in Table 3.4.1.16. 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.

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 $17.12 million (2018$) in gross revenue on average. In turn, this revenue generated employment, income, value-added, and output impacts of 2,191 jobs, $62.3 million, $88.1 million, and $169.7 million per year, respectively, on average.

3.4.2 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 3.4.2.1). 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.

[26] A detailed description of the input/output model is provided in NMFS (2011).
[27] Prior to 2013, Northwest Florida and Alabama headboat landings were reported together so it is not possible to disaggregate them.

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%). At least some of the decrease in landings over this time may be due to the reduction in the bag limit from four fish to two fish per person per day in May 2015.

Table 3.4.2.1. 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 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 3.4.2.2 and Table 3.4.2.3). 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 no keepers 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 at https://www.st.nmfs.noaa.gov/recreational-fisheries/data-and-documentation/queries/index

Table 3.4.2.2. 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	1,446	282,165	283,611
	2018	0	380,124	380,124
	Average	0	460,450	460,739
All	2014	0	823,098	823,098
	2015	0	537,786	537,786
	2016	0	517,032	517,032
	2017	1,446	317,526	318,972
	2018	0	459,267	459,267
	Average	289	530,942	531,231

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.

Permits

There are no specific federal permitting requirements for recreational anglers to fish for or

harvest reef fish. 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.

Table 3.4.2.3. 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	770,421	772,474
	2017	5,428	895,853	901,281
	2018	7,910	1,059,276	1,067,186
	Average	4,990	1,025,421	1,030,411

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 catch effort is likely negligible. No catch effort occurred in Mississippi or Texas.

A federal charter/headboat (for-hire) vessel permit is required for fishing 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 3.4.2.4. However, the rate of attrition with for-hire reef fish permits has been relatively slow and far less compared to commercial reef fish permits.

Table 3.4.2.4. 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.

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, the permit itself does not identify the permitted vessel as either a headboat or a charter vessel and vessels may operate in both capacities. However, if a vessel meets the selection criteria used by the SRHS and is selected to report by the Science Research Director of the SEFSC, it is determined to operate primarily as a headboat and is required to submit harvest and effort information to the SRHS.

The number of federally permitted Gulf headboats in the SRHS ranged from 68 in 2014 and 2015 to 72 in 2018 (K. Fitzpatrick, NMFS 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.[28] 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.

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

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.

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[29] 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 (pers. comm., March 15, 2018). Abbott and Willard (2017) suggest that Savolainen, et al.'s 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 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 estimates would overestimate average annual gross revenue for Gulf headboats. D. Carter (2018) recently estimated that average annual gross revenue for Gulf headboats were approximately $427,600 (2019$) in 2017. 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 PS. In general, PS is the amount of money a vessel owner earns in excess of variable (trip) costs. Economic profit is

[29] 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.

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 were $79,340 and $26,514 (2019$), respectively.[30] Estimates of PS and economic profit for headboats is not available from Abbott and Willard (2017) or D. Carter (2018) as they did not collect comprehensive cost data at the vessel level.[31]

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 3.4.2.5, 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 3.4.2.5. 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.

[30] 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.
[31] 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.

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) and underlying data provided by the 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.[32]

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 3.4.2.6.

The estimates provided in Table 3.4.2.6 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 570 jobs, $27 million, $47.7 million, and $83.9 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.

[32] The recreational economic impact model has not yet been updated to generate estimates in 2019$.

Table 3.4.2.6. 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 2018$ and employment is in full-time equivalent jobs.*

Mode		FL	AL
Shore	Target Trips	29,284	0
	Value Added Impacts	$1,040	$0
	Sales Impacts	$1,625	$0
	Income Impacts	$548	$0
	Employment (Jobs)	15	0
Charter	Target Trips	40,918	0
	Value Added Impacts	$13,879	$0
	Sales Impacts	$23,307	$0
	Income Impacts	$8,111	$0
	Employment (Jobs)	221	0
Private	Target Trips	460,450	289
	Value Added Impacts	$16,094	$13
	Sales Impacts	$24,944	$20
	Income Impacts	$8,445	$5
	Employment (Jobs)	235	0
All	Target Trips	530,942	289
	Value Added Impacts	$31,013	$13
	Sales Impacts	$49,877	$20
	Income Impacts	$17,103	$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.

3.5 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 2017b) and the Framework Action to Adjust Red Grouper Allowable Harvest (2016), include additional detailed descriptions of both sectors.

3.5.1 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 2008a) 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 2017b) 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, 2010) which requires reef fish BLL 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 3.5.1.1 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 3.5.1.1. 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 (Figure 3.5.1.2) 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 3.5.1.2. 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 3.5.1.1 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 3.5.1.1. 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 3.5.1.2). 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 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 longline vessels which make longer trips and land more red grouper per trip. Other ports may have a mix of vessel types.

Figure 3.5.1.2. Red grouper regional quotient by top 20 homeport communities.
Source: IFQ database accessed 2/20/2020 NOAA Fisheries, NMFS, SERO.

Commercial fishing engagement

Figure 3.5.1.3 is an overall measure of a community's commercial fishing engagement. Most communities in Figure 3.5.1.3 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 3.5.1.3. Commercial fishing engagement and reliance of the top 15 red grouper homeports for 2017.

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

3.5.2 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. This 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 3.5.2.1 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. Horseshoe Beach is not highly or moderately engaged but does demonstrate high reliance on recreational fishing. This is 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 St. Marks, Cedar Key, Apalachicola and Carrabelle also demonstrate high reliance on recreational fishing.

Figure 3.5.2.1. 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.

3.5.3 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 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 3.5.3.1 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 3.5.3.1. 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.

3.6 Description of the Administrative Environment

3.6.1 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. 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 (www.gsmfc.org).

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 needed to prevent overfishing. Management measures are implemented through plan or regulatory amendments.

3.6.2 State Fishery Management

The purpose of state representation at the Council level is to ensure state participation in federal fishery management decision-making and to promote the development of compatible regulations in state and federal waters. The state governments of Texas, Louisiana, Mississippi, Alabama, and Florida have the authority to manage their respective state fisheries. Each of the five 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 3.6.2.1).

Table 3.6.2.1. 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 1 – Modify the Sector Allocations, OFL, ABC, and ACLs for Gulf of Mexico (Gulf) Red Grouper

4.1.1 Direct and Indirect Effects on the Physical Environment

A brief summary of red grouper use of the physical environment is provided in Chapter 3.2. A more detailed description is included in the Generic Essential Fishery Habitat (EFH) Amendment (GMFMC 2004a) and Amendment 32 (GMFMC 2011b) which are incorporated by reference. The effects of fishing gears used in the reef fish fishery on the physical environment are also briefly described in Section 3.2 and in more detail in Amendment 32.

The degree to which a habitat is affected by fishing gear depends largely on the vulnerability of the affected habitat to disturbance, and on the rate that the habitat can recover from disturbance (Barnette 2001). For example, the complex structure and vertical growth pattern of coral reef species makes reef habitat more vulnerable to adverse impacts from fishing gear and slower to recover from such impacts than sand and mud bottom habitat (Barnette 2001). Red grouper is also associated with hard bottom habitat, but tends to prefer lower relief habitat than other grouper species such as gag.

The primary effects of grouper fishing on the physical environment generally result from fishing gear interactions with the sea floor. Most grouper are caught with hook-and-line fishing gear, although some spearfishing does occur. Fishing gear can damage or disturb bottom structures, and occasionally incidentally harvest such habitat.

Longlines

Commercial longline gear is deployed over hard bottom habitats when fishing for red grouper using weights to keep the gear in direct contact with the bottom. Its potential for adverse impact is dependent on the type of habitat it is set on, the presence or absence of currents, and the behavior of fish after being hooked. In addition, this gear upon retrieval can abrade, snag, and dislodge smaller rocks, corals, and sessile invertebrates (Bohnsack in Hamilton, 2000; Barnette 2001). Direct underwater observations of longline gear in the Pacific halibut fishery by High (1998) noted that the gear could sweep across the bottom. Some halibut were observed pulling portions of longlines 15 to 20 feet over the bottom. Although the gear was observed in contact with or snagged on a variety of objects including coral, sturdy flexible corals usually appeared unharmed while hard corals often had portions broken off. However, another study that directly observed deployed longline gear (Atlantic tilefish fishery) found no evidence that the gear shifted significantly, even when set in currents. This was attributed to anchors set at either end of the longline as well as sash weights along the line to prevent movement (Grimes et al. 1982). Based on the direct observations, it is logical to assume that bottom longline gear would have a minor impact on sandy or muddy habitat areas. However, due to the vertical relief that hard

bottom and coral reef habitats provide, it would be expected that bottom longline gear may become entangled, resulting in potential negative impacts to habitat (Barnette 2001).

Vertical lines

Concentrations of many managed reef fish species are higher on hard bottom areas than on sand or mud bottoms, thus vertical line gear fishing generally occurs over hard bottom areas (GMFMC 2004a). Vertical lines include multi-hook lines known as bandit gear, handlines, and rod-and-reels. Vertical-line gear is less likely to contact the bottom than longlines, but still has the potential to snag and entangle bottom structures and cause tear-offs or abrasions (Barnette 2001). In using bandit gear, a weighted line is lowered to the bottom, and then the lead is raised slightly off the bottom (Siebenaler and Brady 1952). The gear is in direct contact with the bottom for only a short period of time. Barnette (2001) suggests that physical impacts may include entanglement and minor degradation of benthic species from line abrasion and the use of weights (sinkers). Commercial or recreational fishing with rod-and-reel and handlines also puts gear on the bottom. The terminal part of the gear is either lifted off the bottom like fishing with bandit gear, or left contacting the bottom. Sometimes the fishing line can become entangled on coral and hard bottom outcroppings. The subsequent algal growth can foul and eventually kill the underlying coral (Barnette 2001). Researchers conducting studies in the Madison-Swanson Marine Protected Area reported seeing lost fishing line on the bottom, much of which appeared to be fairly old and covered with growth (A. David, pers comm), a clear indication that bottom fishing has had an impact on the physical environment prior to fishing being prohibited in the area (GMFMC 2003). The National Fish and Wildlife Foundation, in issuing grants to remove marine debris, established monofilament fishing line is a priority marine debris issue.

Anchor damage is also associated with vertical-line fishing vessels, particularly by the recreational sector where fishermen may repeatedly visit well marked fishing locations. Bohnsack in Hamilton (2000) showed that "favorite" fishing areas such as reefs are targeted and revisited multiple times, particularly with the advent of global positioning technology. The cumulative effects of repeated anchoring could damage the hard bottom areas where fishing for grouper occurs.

Spear and Powerhead

Spear guns and slings are used in both commercial and recreational grouper fishing but are a relatively minor component of both. Barnette (2001) cited a study by Gomez et al. (1987) that concluded that spearfishing on reef habitat may result in some coral breakage, but damage is probably negligible. In addition, there could be some impacts from divers touching coral with hands or from resuspension of sediment by fins (Barnette 2001). Such impacts should be negligible to non-existent for well-trained and experienced spear fishermen who stay in the water column and avoid contact with the bottom, but would be expected to occur among spear fisherman who are less experienced, which would include more recreational spear fishermen.

Effects

This action could affect the physical environment if changes in the allocation result in a shift in the use of fishing gear types used to harvest the stock annual catch limit (ACL). Under

Alternatives 2-5, all the yield streams that provide overfishing limits (OFLs) are based on a fixed level of fishing mortality ($F_{30\%SPR}$). The difference is that the application of the sector fishing selectivities to the different allocations yields different OFLs, and subsequent acceptable biological catches (ABCs).

In general, the effects from the recreational and commercial sectors on the physical environment would be opposite. Where commercial ACLs increase, recreational ACLs decrease. Thus, the effects from the sectors on this environment likely offset each other to a certain extent. Given longlines are a commercial gear type, where the commercial ACL is greater, the effects from longlines would be expected to be greater. The recreational sector primarily uses vertical gear, so where recreational ACLs are greater, effects on the physical environment from this gear type would also be expected to be greater.

For the commercial sector, **Alternative 2** would likely have the greatest effect on the physical environment given it has the highest ACL (3.72 million pounds gutted weight [mp gw]) as it would allow for the highest commercial effort. This alternative is then followed by **Alternative 1** (3.16 mp gw), **Alternative 4** (2.60 mp gw), **Alternative 5** (2.56 mp gw), and **Alternative 3** (2.53 mp gw) in descending order of ACLs and effects. Note that **Alternatives 3-5** have very similar ACLs (2.53-2.60 mp gw) and any effects would be expected to be very similar. For the recreational sector, Alternatives 2-5 would likely have reduced effects compared to **Alternative 1** (No Action). **Alternative 1** would have the greatest ACL (2.10 mp gw in Fishing Effort Survey-adjusted Marine Recreational Information Program [MRIP FES] equivalent units). This alternative is then followed by **Alternative 3** (1.73 mp gw), **Alternative 5** (1.72 mp gw), **Alternative 4** (1.70 mp gw), and **Alternative 2** (1.18 mp gw) in descending order of ACLs and effects. As with the commercial sector, **Alternatives 3-5** have very similar ACLs (1.70-1.73 mp gw) and any effects would be expected to be very similar.

4.1.2 Direct and Indirect Effects on the Biological Environment

Direct and indirect effects from fishery management actions have been discussed in detail in Amendments 30B (GMFMC 2008c) and 32 (GMFMC 2011b) as well as in several red grouper framework actions (GMFMC 2010b, 2012d, 2014b, 2016a, 2019a) and are incorporated here by reference. Potential impacts of the 2010 *Deepwater Horizon* MC252 oil spill and red tide on the biological/ecological environment are discussed in Section 3.3, the aforementioned references, and are incorporated here by reference. These impacts may include recruitment failure and reduced fish health. Management actions that affect this environment mostly relate to the impacts of fishing on a species' population size, life history, and the role of the species within its habitat. Removal of fish from the population through fishing reduces the overall population size. Fishing gears have different selectivity patterns which refer to a fishing method's ability to target and capture organisms by size and species. This would include the size distribution of fish caught by the gear as well as the number of discards, mostly sublegal fish or fish caught during seasonal closures, and the mortality associated with releasing these fish.

Fishing can affect life history characteristics of reef fish such as growth and maturation rates. For example, Lombardi-Carlson et al. (2006) found that the mean size of gag at age was larger

pre-1990 than in post-1990 years and suggests this decrease may be due to fishing. In red snapper, Fischer et al. (2004) and Nieland et al. (2007) found that the average size-at-age of red snapper had declined and associated this trend with fishing pressure. However, this trend has not been linked to fishing effort for Gulf red grouper (Lombardi-Carlson et al., 2008). The reef fish fishery can also affect species outside the reef fish complex. Section 3.3 discusses determinations by NFMS with how the fishery interacts listed and endangered species. Specifically, sea turtles have been observed to be directly affected by the longline component of the Gulf reef fish fishery resulting with some incidental captures and are summarized in GMFMC (2010a and 2019b). The last biological opinion by National Marine Fisheries Service (NMFS) concluded the Gulf reef fish fishery as managed by the Reef Fish FMP is not likely to jeopardize the continued existence of sea turtles, smalltooth sawfish, or table coral species (NMFS 2011). NMFS has requested a re-initiation of consultation on the Reef Fish FMP.

This action could affect the biological/ecological environment because changes in the allocation result in a shift in sector selectivity patterns, which could influence the resulting OFL. **Alternative 1**, no action, is not a viable alternative because it is not based on the best available scientific information. In addition, recreational ACL is based on the MRIP Coastal Household Survey rather than FRIP FES units and creates an inconsistency for any comparison between **Alternative 1** and **Alternatives 2-5**. The likelihood of overfishing under **Alternatives 2-5** would be similar as the management goal is the same. Under **Alternatives 2-5**, all the OFLs are based on a fixed level of fishing mortality ($F_{30\%SPR}$), and thus each of these alternatives would result in a similar stock size ($B_{30\%SPR}$). The difference in the alternatives is where more fish are allocated to the recreational sector, total landings have to be constrained more to account for the greater dead discards from recreational red grouper fishing. Alternatives 3-5 would be expected to increase the number of red grouper discards when compared to Alternative 2 because of different selectivity patterns between the commercial and recreational sectors. The recreational sector captures smaller fish than the commercial sector.

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, substantial changes in the prosecution of the reef fish fishery are not expected from this action because the fishery is comprised of many species and so fishermen have harvesting choices. As a result, no additional effects to non-target species or protected resources (see Section 3.3) are anticipated.

4.1.3 Direct and Indirect Effects on the Economic Environment

4.1.4 Direct and Indirect Effects on the Social Environment

4.1.5 Direct and Indirect Effects on the Administrative Environment

Under **Alternative 1**, sector allocations would remain the same as in current management (76% commercial / 24 % recreational), which uses data based on average landings from Coastal Household Telephone Survey-adjusted Marine Recreational Information Program (MRIP CHTS). **Alternative 1** would also retain the current OFL, ABC, and ACLs. Under **Alternatives 2-5**, sector allocations of the total ACL between the recreational and commercial sector would be revised based on average landings using Fishing Effort Survey-adjusted Marine Recreational Information Program (MRIP FES) data.

Three potential impacts on the administrative environment under Action 1 alternatives include; 1) through potentially managing recreational landings using MRIP FES data, which would preclude the need to convert landings back to MRIP CHTS for management; 2) through in-season closures of the recreational sector to fishing because of the decrease in recreational ACL that occurs under all of the action alternatives (Alts. 2-5); and 3); through allocating a greater percentage of the ACL to a sector that has more uncertainty in landings, which is more likely to result in overfishing/overfished of Gulf red grouper. Potential impacts 1 and 2 would have minor effects on the administrative environment, while implementation of a rebuilding plan would have major effects.

Alternative 1 would continue monitoring landings using MRIP CHTS currency. The Southeast Fisheries Science Center (SEFSC) currently provides data in both MRIP FES and MRIP CHTS currencies, and thus the choice of alternative under Action 1 would not result in any further administrative burden at this time. **Alternatives 2 - 5** would be monitored with the MRIP FES dataset. The SEFSC has determined that MRIP FES data are the best science available and should be used in management of all applicable fish species. If all species were to utilize MRIP FES data in management, it would negate the need to provide data in MRIP CHTS currency, and thus lessen the administrative burden. Thus, **Alternatives 2 – 5** would have long-term benefits to the administrative environment when compared to **Alternative 1**.

Alternative 1 is not legally viable because it is not based on the best scientific information available, and would retain the current OFL and ABC, which are above the values produced by the SEDAR 61 stock assessment and recommended by the SSC.

Alternative 2 would maintain the current allocation split between the sectors at 76 percent commercial and 24 percent recreational, but would update the OFL, ABC, and ACL using SSC recommendations based on SEDAR 61. **Alternative 2** has a relatively high commercial ACL compared to the other action alternatives. Because the commercial sector is an Individual Fishery Quota (IFQ) program that relies on individual catch limits and reported landings (rather than estimates/projections used in the recreational fishery), none of the alternatives are likely to result in exceeding the commercial red grouper ACL. The recreational ACL under **Alternative 2** is small relative to other alternatives, and that ACL is the most likely of the alternatives to be exceeded. There are constraints and difficulties in managing recreational data to small quotas. Because recreational landings are generated based on estimates of catch, they have substantial uncertainty associated with them. In addition, recreational landings are not timely, with lags often exceeding several months from when fishing effort takes place and landings estimates are

generated. Although overages of the ACL are possible under **Alternative 2**, they would be expected to be small in scope due to the small ACL value they are managed to. Even if the recreational ACL is exceeded, the risk of Alternative 2 resulting in an overfishing/overfished declaration is low very low, and would thus have a positive impact on the administrative environment.

Alternatives 3-5 update the commercial and recreational allocations based on total landings in each sector in various reference time-periods using MRIP FES data. These alternatives vary only slightly among each other based on the data years used as the reference period. The OFL, ABC, and ACL among these three alternatives vary by a maximum of 1.2 percent, which is approximately equivalent to 40,000 lb. None of the alternatives are likely to result in exceeding the recreational or commercial ACL, and the risk of any of these alternatives resulting in an overfishing/overfished declaration is very low. Thus, all are expected to have a positive impact on the administrative environment.

Because the recreational ACL in **Alternative 2** is lower than in those for **Alternatives 3-5**, there is a greater risk of an in-season closure of the fishery, which would result in a slight negative impact to the administrative environment. The increased chances of a closure are due to the higher percentage of the landings coming from the recreational sector, where data are more uncertain and are based on estimates of catch. In order to prevent exceeding the recreational ACL, projections of recreational catch must often be made before data are available or verified. A low recreational ACL, like that in **Alternative 2**, requires that these projections be made when less data are available than for the other alternatives. However, because the recreational component of **Alternative 2** is lower than that in **Alternatives 3-5**, the overall ACL is less reliant on the more uncertain recreational data. Thus, in spite of higher catch levels and recreational closure risk in proposed **Alternative 2** when compared to **Alternatives 3-5**, there is negligible additional comparative risk of exceeding the recreational ACL. Therefore, there is expected difference in impact in the administrative environment when comparing **Alternative 2** to **Alternatives 3-5**.

4.2 Action 2 – Modify the Gulf Red Grouper Annual Catch Targets (ACTs)

4.2.1 Direct and Indirect Effects on the Physical Environment

Effects on the physical environment from fishing are described in Section 4.1.1, which describes how increasing fishing effort leads to increasing effects on this environment. Action 1 sets the overall OFL, ABC, and sector ACLs. This action sets the buffer between the ACL and annual catch target (ACT). Action 1 would maintain the buffers between the respective commercial and recreational ACLs and ACTs. For the commercial sector, this buffer allows for gag and red-grouper multi-use shares to be fished under the IFQ program. Thus, the buffer is not used to constrain harvest and consequently fishing effort, but likely maintains fishing effort similar to if there were no buffer. However, for the recreational sector, the buffer is used to account for management uncertainty and decrease the likelihood the recreational ACL is exceeded in years

following an overage of the ACL. Thus, the greater the buffer, the lower recreational fishing effort would be from the sector in a year following an overage. Under these circumstances, **Alternatives 2** and **3** would likely have similar effects because the recreational buffer is the same at 9%. The recreational buffer for **Alternative 1** is 8% and so would likely be slightly more adverse than the other two alternatives given it could allow for a minimal increase in effort in the year following an overage.

4.2.2 Direct and Indirect Effects on the Biological Environment

Effects on the physical biological/ecological environment from fishing are described in Section 4.1.2, which describes how increasing fishing effort leads to increasing effects on this environment. Action 1 sets the overall OFL, ABC, and sector ACLs. This action sets the buffer between the ACL and ACT. Action 1 would maintain the buffers between the respective commercial and recreational ACLs and ACTs. For the commercial sector, this buffer allows for gag and red-grouper multi-use shares to be fished under the IFQ program. It is the IFQ program that limits the commercial catch to the ACL through the distribution of allocation and allocation reporting that acts as an accountability measure to ensure the ACL is not exceeded. Thus, the buffer is not used to constrain harvest and consequently fishing, but likely maintains fishing levels similar to if there were no buffer and no multi-use shares (e.g., **Alternative 2**). However, for the recreational sector, the buffer is used to account for management uncertainty and decrease the likelihood the recreational ACL is exceeded in the year following an overage of the ACL. Thus, the greater the buffer, the lower recreational fishing effort would be from the sector in a year following an overage. Under these circumstances, **Alternatives 2** and **3** would likely have similar effects because the recreational buffer is the same at 9%. The recreational buffer for **Alternative 1** is 8% and so would likely be slightly more adverse than the other two alternatives given it could allow for a minimal increase in effort in the year following an overage.

4.2.3 Direct and Indirect Effects on the Economic Environment

4.2.4 Direct and Indirect Effects on the Social Environment

4.2.5 Direct and Indirect Effects on the Administrative Environment

Action 2 would affect the administrative environment in two ways: 1) through in-season closures of the recreational fishery resulting from implementing AMs that are more likely to be triggered than under current management, and 2) by implementing an ACT that changes the likelihood of Gulf red grouper stocks being declared as overfished, which would require development and implementation of a rebuilding plan. Closure of the recreation red grouper sector would have a minor effect on the administrative environment, while implementation of a rebuilding plan would have a major effect.

Each of the three alternatives in Action 2 would set ACTs which implement management buffers below the ACL ACL with the exception of the commercial ACT for **Alternative 2** where the buffer equals zero. These buffers include options for 0 percent and 5 percent for the commercial fishery, and 8 percent and 9 percent for the recreational fishery.

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 stay under that catch limit. The intent of the commercial buffer is to allow for gag multi-use, which allows red grouper to be harvested incidentally when targeting gag. Thus, the choice between a 0% and 5% buffer is not expected impact the likelihood of exceeding the ACL, or the chances of an overfishing/overfished declaration. Therefore, the commercial buffer is not likely to affect the administrative environment.

The recreational buffer under **Alternative 1** is the lowest of the alternatives. In the year following a year in which catch exceeded the ACL, Alternative 1 would be most likely to result in exceeding the recreational ACL. Recreational landings are generated based on estimates of catch, and they have substantial uncertainty associated with them. In addition, recreational landings are not timely, with lags often exceeding several months from when fishing takes place and landings estimates are generated. Thus, implementing the lower ACT/buffer in **Alternative 1** in the recreational sector is more likely to result in exceeding the recreational and overall ACL (and potentially the OFL) than the higher buffers in **Alternatives 2** and **3**. However, the difference between **Alternative 1** and **Alternatives 2** and **3** is only 1 percent of the ACL (11,800 lb to 17,300 lb depending on Action 1 decision). Given the constraints associated with monitoring recreational data to relatively small values, the increased chance of exceeding recreational component ACL is expected to be negligible. Thus, the recreational buffers proposed in the Action 2 alternatives are not likely to affect the administrative environment

Impact to the administrative environment associated with implementing a recreational fishery closure is higher under **Alternative 1** than under **Alternatives 2** or **3** due to the lower ACT in **Alternative 1**. However, due to the relatively minor differences in these values among the alternatives coupled with the difficulty in monitoring the recreational component to small values, it is expected that the effect on the administrative environment due to a recreational component closure will be negligible. 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 Management Act.

CHAPTER 5. REFERENCES

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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 in federal waters of the exclusive economic zone. However, management decision-making is also affected by a number of other federal statutes designed to protect the biological and human components of U.S. fisheries, as well as the ecosystems that support those fisheries. Major laws affecting federal fishery management decision-making include the Endangered Species Act and Marine Mammals Protection Act (Section 3.3), E.O. 12866 (Regulatory Planning and Review, Chapter 5) and E.O. 12898 (Environmental Justice, Section 3.5.2). 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.

Coastal Zone Management Act

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

Fish and Wildlife Coordination Act

Fish and Wildlife Coordination Act of 1934 (16 U.S.C. 661-667e) provides the basic authority for the USFWS's involvement in evaluating impacts to fish and wildlife from proposed water resource development projects. It also requires federal agencies that construct, license or permit water resource development projects to first consult with the Service (and NMFS in some instances) and State fish and wildlife agency regarding the impacts on fish and wildlife resources and measures to mitigate these impacts.

The fishery management actions in the Gulf of Mexico are not likely to affect wildlife resources pertaining to water resource development as the economic exclusive zone is from the state water boundary extending to 200 nm from shore.

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 listed on, or eligible for listing on, the National Register of Historic Places and aims to minimize damage to such places.

Typically, fishery management actions in the Gulf of Mexico are not likely to affect historic places with exception of the *U.S.S. Hatteras*, located in federal waters off Texas, which is listed in the National Register of Historic Places. Reef fish fishing does occur off Texas; therefore, the proposed actions are a part of the normal fishing activities that occur at this site. Thus, no additional impacts to the *U.S.S. Hatteras* would be expected.

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 USFWS 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 of Mexico. 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 mutton snapper and gag. Therefore, consultation with state officials under Executive Order 12612 was not necessary. Consequently, consultation with state officials under Executive Order 12612 remains unnecessary.

E.O. 13158: Marine Protected Areas

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

APPENDIX B. ACL/ACT CONTROL RULE FOR THE RECREATIONAL SECTOR

As of 05/21/2020				Red Grouper	
ACL/ACT Buffer Spreadsheet			version 4.1 - April 2011	Sector: Recreational	
sum of points	2			Data: 2016-2019	
max points	5.0		Buffer between ACL and ACT (or ABC and ACL)	Unweighted	8
Min. Buffer	0	**min. buffer**	User adjustable	Weighted	9
Max Unw.Buff	19	max unwt. Buff			
Max Wtd Buff	25	**max wtd. buffe**	User adjustable		

Component	Element score	Element	Selection	Element result
Stock assemblage	0	This ACL/ACT is for a single stock.	x	0
	1	This ACL/ACT is for a stock assemblage, or an indicator species for a stock assemblage		
Ability to Constrain Catch	0	Catch limit has been exceeded 0 or 1 times in last 4 years	x	0
	1	Catch limit has been exceeded 2 or more times in last 4 years		
		For the year with max. overage, add 0.5 pts. For every 10 percentage points (rounded up) above ACL	0.0	
		Not applicable (there is no catch limit)		
		Apply this component to recreational fisheries, not commercial or IFQ fisheries		
Precision of Landings Data Recreational	0	Method of absolute counting		2
	1	MRIP proportional standard error (PSE) <= 20		
	2	MRIP proportional standard error (PSE) > 20	x	
		Not applicable (will not be included in buffer calculation)		
		Apply this component to commercial fisheries or any fishery under an IFQ program		
Precision of Landings Data Commercial	0	Landings from IFQ program		not applicabl
	1	Landings based on dealer reporting		
	2	Landings based on other		
		Not applicable (will not be included in buffer calculation)	x	
Timeliness	0	In-season accountability measures used or fishery is under an IFQ	x	0
	1	In-season accountability measures not used		
			Sum	2

Weighting factor				
	Element weight	Element	Selection	Weighting
Overfished statu	0	1. Stock biomass is at or above B_{OY} (or proxy).		0.2
	0.1	2. Stock biomass is below B_{OY} (or proxy) but at or above B_{MSY} (or proxy).		
	0.2	3. Stock biomass is below B_{MSY} (or proxy) but at or above minimum stock size threshold (M	x	
	0.3	4. Stock is overfished, below MSST.		
	0.3	5. Status criterion is unknown.		

*2016-2019 landings data from NOAA Fisheries ACL Monitoring Dataset. Accessed May 8, 2020.

ACL/ACT Control Rule Data							
Year	**Sector**	**Landings**	**PSE**	**ACL**	**Exceeded ACL?**	**Buffer**	**Data Used**
2016	Recreational	1,373,337	21.6	2,580,000	No	9%	MRIP-APAIS
2017	Recreational	739,073	21	2,580,000	No		MRIP-APAIS
2018	Recreational	913,978	21.5	2,580,000	No		MRIP-APAIS
2019*	Recreational	725,105	21.6	1,000,000	No		MRIP-APAIS

Source: Source: SERO ACL Monitoring dataset, retrieved 8 May 2020 (recreational). *2019 recreational data are preliminary.

APPENDIX C. ACL/ACT CONTROL RULE FOR THE COMMERCIAL SECTOR

As of 05/21/2020				Red Grouper	
ACL/ACT Buffer Spreadsheet			version 4.1 - April 2011	Sector: Commercial	
sum of points	0			Data: 2016-2019	
max points	5.0		Buffer between ACL and ACT (or ABC and ACL)	Unweighted	0
Min. Buffer	**0**	**min. buffer**	User adjustable	Weighted	**0**
Max Unw.Buff	19	max unwt. Buff			
Max Wtd Buff	**25**	**max wtd. buffe**	User adjustable		

Component	Element score	Element	Selection	Element result
Stock assemblag	0	This ACL/ACT is for a single stock.	x	0
	1	This ACL/ACT is for a stock assemblage, or an indicator species for a stock assemblage		
Ability to Constrain Catch	0	Catch limit has been exceeded 0 or 1 times in last 4 years	x	0
	1	Catch limit has been exceeded 2 or more times in last 4 years		
		For the year with max. overage, add 0.5 pts. For every 10 percentage points (rounded up) above ACL	0.0	
		Not applicable (there is no catch limit)		
		Apply this component to recreational fisheries, not commercial or IFQ fisheries		
	0	Method of absolute counting		not applicabl
Precision of Landings Data Recreational	1	MRIP proportional standard error (PSE) <= 20		
	2	MRIP proportional standard error (PSE) > 20		
		Not applicable (will not be included in buffer calculation)	x	
		Apply this component to commercial fisheries or any fishery under an IFQ program		
Precision of Landings Data Commercial	0	Landings from IFQ program	x	0
	1	Landings based on dealer reporting		
	2	Landings based on other		
		Not applicable (will not be included in buffer calculation)		
Timeliness	0	In-season accountability measures used or fishery is under an IFQ	x	0
	1	In-season accountability measures not used		
			Sum	0

Weighting factor				
	Element weight	Element	Selection	Weighting
Overfished statu	0	1. Stock biomass is at or above B_{OY} (or proxy).		0.2
	0.1	2. Stock biomass is below B_{OY} (or proxy) but at or above B_{MSY} (or proxy).		
	0.2	3. Stock biomass is below B_{MSY} (or proxy) but at or above minimum stock size threshold (M	x	
	0.3	4. Stock is overfished, below MSST.		
	0.3	5. Status criterion is unknown.		

*2016-2019 landings data from NOAA Fisheries ACL Monitoring Dataset. Accessed May 8, 2020.

ACL/ACT Control Rule Data							
Year	**Sector**	**Landings**	**PSE**	**ACL**	**Exceeded ACL?**	**Buffer**	**Data Used**
2016	Commercial	4,497,582	0 - IFQ	7,780,000	No	0%	IFQ
2017	Commercial	3,328,271	0 - IFQ	7,780,000	No		IFQ
2018	Commercial	2,363,280	0 - IFQ	7,780,000	No		IFQ
2019	Commercial	2,037,046	0 - IFQ	3,000,000	No		IFQ

Source: SEFSC Commercial ACL dataset, retrieved 15 November 2019 (commercial).

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

Modification of Management for Red Grouper in the Gulf of Mexico: Amendment 53

Jeff Pulver; May 26, 2020
LAPP/DM Branch
Southeast Regional Office

Revise the Annual Catch Target for Red Grouper: 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 ACT being considered in Amendment 53 (Table 1). The predicted closure dates span from July 23 to no closure (Table 1). 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 ACT (mp gw) currently in Amendment 53 generated from predicted landings and also predicted landings upper and lower 95% confidence intervals. Source: SEFSC MRIP FES Recreational ACL Dataset (May 8, 2020).

Alternatives (Action 2—Action 1)	ACT	Predicted Closure Date	Season Length (95% Confidence Interval)
1—1	1.93	No Closure	259—365 Days
2—1	1.09	July 26	157—365 Days
2—2	1.59	November 20	211—365 Days
2—3	1.56	November 14	207—365 Days
2—4	1.58	November 18	209—365 Days
3—1, 4—1	1.07	July 23	155—365 Days
3—2, 3—4, 4—2, 4—4	1.57	November 16	208—365 Days
3—3, 4—3	1.55	November 12	206—365 Days

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.