Modification of Annual Catch Limits for Gulf of Mexico Red Snapper

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

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ENVIRONMENTAL ASSESSMENT COVER SHEET

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

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Type of Action

( ) Administrative	( ) Legislative
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ABBREVIATIONS USED IN THIS DOCUMENT

ACL	annual catch limit
AM	accountability measure
AP	Advisory Panel
ATCA	Atlantic Tunas Convention Act
Atlantic HMS	Atlantic Highly Migratory Species Management Division
bandit	electric hook-and-line gear
BiOp	biological opinion
CFR	code of federal regulations
CHTS	Coastal Household Telephone Survey
CMP	coastal migratory pelagic
Council	Gulf of Mexico Fishery Management Council
DLMToolkit	Data Limited Methods Toolkit
DPS	distinct population segment
DWG	Deepwater grouper
EA	environmental assessment
EEZ	exclusive economic zone
EFH	essential fish habitat
EJ	environmental justice
E.O.	executive order
ELB	electronic logbook
ESA	Endangered Species Act
FHS	for-hire survey
FMP	Fishery Management Plan
FWC	Florida Fish and Wildlife Commission
GRSC	Great Red Snapper Count
Gulf	Gulf of Mexico
gw	gutted weight
HAPC	habitat area of particular concern
HMS	highly migratory species
ICCAT	International Commission for the Conservation of Atlantic Tunas
IFQ	individual fishing quota
IPCC	Intergovernmental Panel on Climate Change
KM	king mackerel
Magnuson-Stevens Act	Magnuson-Stevens Fishery Conservation and Management Act
MMPA	Marine Mammal Protection Act
mp	million pounds
MPA	marine protected area
MRIP	Marine Recreational Information Program
NMFS	National Marine Fisheries Service
NOAA	National Oceanic and Atmospheric Administration
OY	optimum yield
PAH	polycyclic aromatic hydrocarbons
Reef Fish FMP	Fishery Management Plan for Reef Fish Resources in the Gulf of Mexico

RFA	Regulatory Flexibility Act
RFFA	reasonably foreseeable future actions
RIR	regulatory impact review
RQ	regional quotient
SA	South Atlantic
SAFE	Stock Assessment and Fishery Evaluation
Secretary	Secretary of Commerce
SEDAR	Southeast Data and Review
SEFSC	Southeast Fisheries Science Center
SERO	Southeast Regional Office
SM	Spanish mackerel
SBREFA	Small Business Regulatory Enforcement Fairness Act
SPGM	Gulf of Mexico Shrimp Commercial Fishing Permit
SRHS	Southeast Region Headboat Survey
SSC	Scientific and Statistical Committee
SWG	shallow water grouper
tpy	tons per year
VOC	volatile organic compounds
VMS	vessel monitoring system

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CHAPTER 1. INTRODUCTION

1.1 Background

A Gulf of Mexico (Gulf) red snapper (SEDAR 52) stock assessment was completed in 2018 through the Southeast Data, Assessment, and Review (SEDAR) process. This assessment was reviewed by the Gulf of Mexico Fishery Management Council's (Council) Scientific and Statistical Committee (SSC) in May 2018. Based on the SEDAR 52 assessment, the SSC determined that the Gulf red snapper stock is not overfished or undergoing overfishing, and is on schedule to rebuild to 26% spawning potential ratio (SPR) by the 2032 target date. The current overfished threshold, adopted in Amendment 44 (GMFMC 2017d), is 50% of the biomass at maximum sustainable yield (B_{MSY}). The 2016 (terminal year of SEDAR 52) stock biomass was estimated to be 18% SPR Gulf-wide, an increase from the previous 14% SPR in 2014.

Based on the review of SEDAR 52, the SSC endorsed two possible choices for setting the overfishing limit (OFL) and acceptable biological catch (ABC) for 2019-2021: one, a declining yield stream and two, a constant catch approach using the average of the annual OFL and ABC values from 2019 through 2021. The SSC determined that the two methods of calculating OFL and ABC were equivalent within the considered 3-year period and the Council selected the constant catch approach for management (Table 1.1.1).

Table 1.1.1. SSC recommendations for OFL and ABC from the SEDAR 52 stock assessment of Gulf red snapper (a) declining yield stream or (b) constant catch. The Council selected the constant catch approach for management. Values are in millions of pounds, whole weight.

a. Declining Yield Stream		
Year	**OFL**	**ABC**
2019	16.6	16.0
2020	15.4	15.0
2021	14.6	14.3
b. Constant Catch		
Year	**OFL**	**ABC**
2019-2021	15.5	15.1

1.2 Great Red Snapper Count and SSC Review and Recommendations

At its March 2021 meeting, the SSC reviewed the results of the Great Red Snapper Count (GRSC),[1] which is a Gulf-wide collaborative research project to estimate absolute abundance of age-2 and older red snapper in the Gulf. Red snapper abundance sampling was stratified by habitat type, estimated using direct visual counts, acoustic surveys, depletion surveys, and a

[1] https://www.harte.org/snappercount

Gulf-wide tagging program. Absolute abundance estimates from the GRSC were derived for four regions and estimated (in numbers of fish) as: Texas, 23,000,000 fish; Louisiana, 29,000,000 fish; Mississippi and Alabama, 10,000,000 fish; and Florida, 48,000,000 fish. Of the total 110,000,000 fish estimated to be present (11% coefficient of variation [CV]), approximately 52% are thought to occur in the eastern Gulf (i.e., east of Mississippi river), and 48% in the western Gulf. Larger fish are still proportionately more abundant in the western Gulf. While no previous effort has been made to enumerate the absolute number of red snapper in the Gulf, the estimate from the GRSC is likely much larger than historical perceptions of abundance considered in previous stock assessments. The primary difference is that the GRSC surveyed uncharacterized bottom habitat (UCB) that is large by area, and is occupied by red snapper that largely were not considered in previous stock assessments. In general, UCB consists of soft bottom, low relief habitat that supports low densities of red snapper but the population is large given the total area of this habitat in the Gulf. The UCB also includes hard bottom or artificial structures that were previously unknown but function similar to other observed reefs. This new information could support changes in allowable harvest levels based on review and subsequent catch level recommendations by the Scientific and Statistical Committee (SSC).

The GRSC estimate of red snapper abundance is approximately three times greater than that estimated by the SEDAR 52 assessment suggesting that increases in allowable harvest may be appropriate. However, direct comparisons are difficult as the stock assessment estimates biomass whereas the GRSC provided numerical estimates but did not include a full sampling of the size composition of observed red snapper that could be used to convert the GRSC directly into a biomass estimate. To address this, the SEFSC supplemented the results of the GRSC with existing size at age composition data from previous efforts in the sampling area to estimate biomass from the GRSC numerical results. Using this approach, biomass estimates from the GRSC are similar to the results of SEDAR 52 over artificial and natural hardbottom habitats. However, in comparison to the GRSC, SEDAR 52 underestimates the abundance of red snapper in the Gulf of Mexico, likely due to limited sampling on the UCB (e.g., NMFS bottom longline survey) which only samples a small area of the UCB. Information from GRSC suggests that the size of the spawning stock is much larger than historically considered and may influence perceptions of stock productivity, which may require reconsideration of the current F_{MSY} proxy ($F_{26\%SPR}$) in a future management action. For example, using the observed recruitment of juvenile red snapper based the estimates of spawning stock biomass (SSB) from SEDAR 52 and previous assessments, it was estimated that the stock size was smaller and more productive as compared to the results based on the GRSC that assumes a larger, but less productive stock. Some SSC members expressed concern that substantial increases in allowable harvest based on the GRSC and subsequent analyses by the SEFSC may lead to localized depletion of red snapper on hardbottom and high relief artificial habitats where most fishing occurs, as this habitat is more accessible to anglers and supports the majority of the fishing effort for red snapper.

The SEFSC has worked collaboratively with the GRSC investigators to develop a pathway to integrate the results of the GRSC into catch limit advice that is currently based on SEDAR 52 and subsequent OFL and ABC recommendations by the SSC. The SEFSC developed catch projections using GRSC estimates of abundance to scale projections that initially used abundance

estimates from the last accepted Gulf Red Snapper stock assessment, SEDAR 52[2]. The projections were reviewed by the SSC at the March 30 – April 2, 2021 SSC meeting.

The SEFSC has also developed an analytical process to provide an interim analysis that uses a harvest control rule (HCR) to adjust the catch advice based on an index of relative abundance. Specifically, the HCR compares where the stock seems to be now (observed index value) with where the stock should be (forecasted index value). The chosen HCR adjusts the ABC recommendation based on variation between projected and observed index values. For red snapper, the SEFSC recommended the fishery-independent NMFS bottom longline (BLL) index for use in the HCR because of its widespread spatial coverage, consistent sampling design, long time-series, and prevalence of red snapper in the survey.

For the March 30 – April 2, 2021 SSC meeting, the SEFSC prepared an interim analysis for red snapper based on the NMFS BLL index. This type of analysis aims to provide updated management advice based on more recent information than the prior stock assessment. The SEFSC has previously conducted this type of analyses for red grouper and gray triggerfish as the basis for updated ABC catch advice. In general terms, the indices of abundance serve as a proxy for the relative stock size and an increase in the index over the reference period can provide support for increases in allowable harvest. Conversely, a decline in the index could indicate that a reduction in allowable harvest is necessary. For red snapper, the Gulf-wide BLL was used as the index. The index value in the terminal year was compared to the reference period using the approach previously applied for other Gulf stocks.

Independent Consultants and SSC Review and Recommendations

During this meeting, the SSC and three independent consultants reviewed the GRSC project report, supporting documentation, and findings of the independent consultants. The review included a comprehensive overview of the methods, assumptions, and limitations of the GRSC by the project team leaders as well as discussion, requests for further information, and suggestions to improve the report from SSC members and independent consultants. In general, the reviewers noted that this was an unprecedented effort to enumerate the absolute abundance of red snapper in the Gulf . The reviewers also identified some key limitations to the study to be considered when providing catch level recommendations. The SSC and reviewers discussed that red snapper inhabiting the UCB were largely not considered in the previous stock assessments and represent the primary driver in the difference in abundance estimates between the SEDAR 52 stock assessment and the GRSC. An additional preliminary analysis was presented from Gardner et al. (in prep) that suggests the fish occupying the UCB are likely not exploited as intensively (i.e., approximately 21% of fish likely exploitable based on current fishing practices) as the red snapper on known hard bottom and high relief artificial reefs because they occur at low densities (i.e., widely dispersed over low relief habitat), or the areas of relief were previously unknown.

Despite the groundbreaking advances of the GRSC, the review team identified some limitations and caveats of the study that may warrant further investigation or consideration when

[2] https://sedarweb.org/sedar-52-gulf-mexico-red-snapper-final-stock-assessment-report

considering the applicability of this information to inform catch level recommendations. Much of the discussion and conclusions of the reviewers focused on the likely underestimation of red snapper in UCB, the underestimation of variance by strata and in total, and the directionality of the biases of the data and methods. Regarding the applicability for immediate catch level recommendations, some SSC members stated that while the GRSC made a great contribution to science and the understanding of red snapper in the Gulf, they would prefer to see the modifications recommended by the reviewers implemented in the GRSC report before adjusting catch advice. Overall, the review team (external consultants and SSC) determined that the great red snapper count provided a representative estimate of abundance for the eastern Gulf and a highly uncertain estimate for the Western Gulf. However, the review team also considers that the true uncertainty in both estimates is substantially larger than implied by the 11% CV stated in the GRSC report, and that the estimate for uncharacterized bottom is particularly uncertain.

Next, the SSC reviewed the interim catch advice for Gulf red snapper based on the GRSC. The Gulf-wide estimate of 110 million Red Snapper (age-2 and older) from the GRSC is about three times greater than the corresponding estimate from the latest stock assessment (SEDAR 52), which suggests the stock may be able to support more removals than previously thought. Spreadsheet projections were completed that use the GRSC estimate of abundance to scale projections that initially used abundance estimates from SEDAR 52. Six projection scenarios were completed to provide a range of alternatives based on two F_{MSY} proxies ($F_{SPR26\%}$ and $F_{SPR40\%)}$ and three subsets of the GRSC absolute abundance estimate. When projections were completed using all 110 million fish across all habitats in the Gulf, catch advice ranged from 45 – 55 million pounds depending on the F_{MSY} proxy. Using the GRSC estimates for fish over structure (artificial reef, natural reef, and pipeline) resulted in catch advice that ranged from 17 – 21 million pounds depending on the F_{MSY} proxy.

The SSC discussed that fish occupying UCB have historically faced lower fishing mortality than fish occupying known natural and high relief artificial reefs. Thus, basing harvest levels on the entire population may lead to localized depletion on reefs as the overwhelming majority of harvest would be expected to occur on this habitat. However, it is likely that some harvest does occur in the UCB and a subset of the abundance could be included into the "harvestable" population in terms of setting catch advice. As part of the GRSC, a random forest model (i.e., similar to a multivariate regression model) was used to classify sampling sites in the UCB as low, medium, or high suitability for red snapper where high suitability sites were likely areas with higher relief. The model estimated 13% of the sampling sites in the UCB were considered highly suitable and this value was used in the spreadsheet projections. Thus, a catch recommendation scenario was developed based on the abundance of all red snapper over structure (artificial reef, natural reef, and pipeline) and 13% of the abundance from the UCB. Using an $F_{SPR\ 26\%}$ (i.e., definition of MSY for red snapper), the catch level recommendation was 25.6 mp ww.

The SSC defined the OFL for Gulf red snapper in 2021 at 25.6 mp ww in MRIP-CHTS units based on the GRSC interim analysis using a three-year average at $F_{SPR\ 26\%}$. The SSC did not make an ABC recommendation based on the GRSC-informed interim analysis.

The SEFSC also provided a red snapper interim analysis using the NMFS bottom longline (BLL) survey, with data from 2000 – 2020. From the SEDAR 52 stock assessment, the SSC set the OFL at 15.5 mp ww, and the ABC at 15.1 mp ww, given constant catch projections for 2019 – 2021 and subsequent years. The NMFS BLL survey index, including 2020 or excluding 2020 (due to reduced sampling from COVID-19), shows that the highest Gulf-wide abundance of red snapper was in 2016 and has declined since. Similar trajectories in biomass in the eastern Gulf with reduced area from 2020 indicate that reduced sampling had little effect on abundance estimates in the eastern Gulf. The decline in the 2020 index value was likely due to no sampling in the western Gulf in 2020, due to COVID-19.

The SSC considered two main decision points for selecting catch advice for this interim analysis: the selection of an index terminal year (2019 or 2020), and the selection of a three- or five-year average for the harvest control rule. An SSC member thought that 2020 data should not be used for this interim analysis, given the low sample size and high coefficient of variation (CV) for the data for that year. Moreover, the SSC recommended that the catch advice be derived from the 5-year average. Based on these selections the SSC provided an ABC recommendation of 15.4 mp ww for 2021 in MRIP-CHTS units based on the NMFS BLL interim analysis. This recommendation reflects the SSC determination that the ABC should be considerably more conservative than the OFL noting the uncertainties in the advice based on the GRSC interim analysis (Table 1.2.1).

Table 1.2.1. Shows the recommended OFL and ABC (lbs ww) advice from the SSC for 2021.

Year	OFL	ABC
2021	25,600,000	15,400,000

1.3 Current Gulf Red Snapper Management and Landings

The Gulf red snapper stock is currently under a rebuilding plan. Consistent with this rebuilding plan, both commercial and recreational catch limits have been allowed to increase as the stock has recovered. Red snapper landings for the commercial and recreational sectors in pounds whole weight (ww) for the years 2001 through 2019 are given in Table 1.3.1. The 2020 recreational landings are not available yet due to sampling limitations from the COVID-19 pandemic. Recreational landings are in Marine Recreational Information Program (MRIP) Coastal Household Telephone Survey (CHTS) units. The recreational sector ACL is further divided into component and state ACLs. In 2015, the recreational sector ACL was divided into a private angling component and a federal for-hire component (GMFMC 2014a), which receive 57.7% and 42.3%, respectively. The federal for-hire component consists of fishermen fishing from vessels with a federal charter/headboat permit for Gulf reef fish. The private angling component consists of fishermen fishing from privately owned and rented vessels, and for-hire vessels (charter boats and headboats) without a federal permit (i.e., state-licensed for-hire vessels). For-hire vessels without federal permits may not fish for red snapper in federal waters.

Beginning in 2007, the commercial sector's harvest of red snapper has been managed through an individual fishing quota (IFQ) program that distributes the commercial ACL as pounds of allocation to shareholders (GMFMC 2006). The IFQ program serves as an accountability measure (AM) and a buffer below the ACL is not used to constrain harvest.

Table 1.3.1. Red snapper landings for the commercial and recreational sectors (in MRIP-CHTS) in pounds whole weight for the years 1986 through 2019.

Year	Commercial	For-Hire	Private Angling	Recreational Total
1986	3,747,258	2,491,843	1,002,548	3,494,391
1987	3,066,519	1,374,764	719,429	2,094,193
1988	3,983,543	1,682,765	1,575,431	3,258,196
1989	3,101,648	1,744,571	1,195,768	2,940,339
1990	2,660,318	1,000,150	648,549	1,648,699
1991	2,240,375	2,062,149	886,773	2,948,922
1992	3,118,188	2,229,721	2,438,950	4,668,671
1993	3,423,412	4,214,701	3,091,884	7,306,585
1994	3,251,008	3,629,179	2,507,294	6,136,473
1995	2,945,613	3,221,254	2,278,577	5,499,831
1996	4,334,123	3,609,861	1,854,909	5,464,770
1997	4,813,629	3,991,305	2,852,797	6,844,102
1998	4,689,316	3,340,015	1,516,832	4,856,847
1999	4,883,581	2,145,136	2,914,187	5,059,323
2000	4,838,976	2,598,453	2,161,131	4,759,584
2001	4,638,087	2,404,653	2,877,533	5,282,186
2002	4,797,144	3,503,625	3,051,803	6,555,428
2003	4,432,297	3,138,399	2,998,835	6,137,234
2004	4,671,302	3,206,803	3,228,439	6,435,242
2005	4,105,622	2,383,084	2,210,569	4,593,653
2006	4,679,893	2,480,471	1,709,911	4,190,382
2007	3,182,731	2,662,717	3,191,247	5,853,964
2008	2,483,603	1,627,797	2,478,110	4,105,907
2009	2,483,565	2,235,562	3,396,531	5,632,093
2010	3,392,209	786,197	1,822,384	2,608,581
2011	3,594,552	1,840,603	4,941,321	6,781,924
2012	4,036,398	2,246,868	5,369,594	7,616,462
2013	5,448,544	1,703,768	7,999,134	9,702,902
2014	5,567,822	599,154	3,085,813	3,684,967
2015	7,184,210	1,998,226	3,785,851	5,784,077
2016	6,723,823	2,139,008	5,047,118	7,186,126
2017	6,978,662	2,339,896	6,331,551	8,671,447
2018	6,977,131	2,441,612	4,849,727	7,291,339
2019	7,658,140	2,558,734	5,434,757	7,993,491

Source: Commercial landings from the IFQ database (2007-2019) and the SEFSC Commercial ACL File (October 9, 2020; 1986-2006). Recreational component landings (1996-2016) are from the SEDAR 52 Recreational File. All other landings are from the SEFSC Recreational ACL File (September 14, 2020). Landings include data from MRIP CHTS, SRHS, LA Creel, and Texas Parks and Wildlife Department. 2019 landings are preliminary.

Table 1.3.2 provides a breakdown of the catch limits for Gulf red snapper from the OFL to the state-specific annual catch limits (ACL). If the OFL and ABC are modified, the remaining catch limits would be determined through established calculations as shown in the table. The stock ACL is set equal to the ABC. An annual catch target (ACT) is set at 20% below each component's ACL and is used to determine the duration of the component's fishing season each year. Currently, the ACT is only used for determining the fishing season for the federal for-hire component. The private angling ACL is divided into five state ACLs for each of the Gulf states, and each state has been delegated the authority to manage its portion of the private angling ACL. The delegation provision specifies an AM that requires any overage of a state's ACL be deducted in the following year contingent on the best scientific information available. The private angling ACT remains in place as part of the default federal regulations that would apply in the event the state's delegation is no longer in effect.

Table 1.3.2. Current Gulf red snapper catch limits by type and sector in pounds whole weight. For a modified OFL and ABC, the remaining catch limits would be calculated relative to the previous catch limit as specified.

Catch Limit Type	Current Catch Limits (lbs ww)	Calculation
OFL	15,500,000	N/A
ABC	15,100,000	2.581% less than OFL
Stock ACL	15,100,000	ACL = ABC
Commercial ACL	7,701,000	51% of ABC
Recreational ACL	7,399,000	49% of ABC
Federal For-Hire ACL	3,130,000	42.3% of Recreational ACL
Federal For-Hire ACT	2,848,000	9% less than For-Hire ACL
Private Angling ACL	4,269,000	57.7% of Recreational ACL
Florida ACL	1,913,451	44.822% of Private Angling ACL
Alabama ACL	1,122,662	26.298% of Private Angling ACL
Mississippi ACL	151,550	3.55% of Private Angling ACL
Louisiana ACL	816,233	19.12% of Private Angling ACL
Texas ACL	265,105	6.21% of Private Angling ACL

Note: The private angling ACL is currently managed through individual ACLs for each of the 5 Gulf states. A private angling ACT is not currently used for management, but remains in place as part of the default federal regulations that would apply to a state in the event the state's delegation is no longer in effect.

1.4 Purpose and Need

The purpose is to modify the Gulf red snapper catch limits including the OFL, ABC, sector ACLs and sector ACTs based on the interim analyses completed by the SEFSC.

The need for this action is to use the best scientific information available to prevent overfishing while achieving optimum yield, consistent with the red snapper rebuilding plan and the requirements of the Magnuson-Stevens Fishery Conservation and Management Act (Magnuson-Stevens Act).

1.5 History of Management

The **Fishery Management Plan (FMP) for Reef Fish Resources in the Gulf of Mexico (Reef Fish FMP)** was implemented in November 1984. The original list of species included in the management unit consisted of snappers, groupers, and sea basses. This summary focuses on management actions pertinent to catch limits of red snapper. A complete history of management for the **Reef Fish FMP** is available on the Council's website[3] including other actions affecting red snapper management.

In 1990, **Amendment 1** established the first red snapper rebuilding plan. From 1990 through 2009, red snapper harvest was managed using an annual total allowable catch (TAC), which was divided 51% to the commercial and 49% to the recreational based on the average of historical landings during 1979 through 1987. Amendment 1 also established a commercial red snapper quota of 3.1 mp ww. There was no recreational quota specified, only a bag limit of seven fish and a minimum size limit of 13 inches total length (TL) (GMFMC 1989). Based on the 51:49 commercial to recreational sector allocation, the commercial quota implied a TAC of approximately 6.1 mp ww in 1990, followed by explicit TACs of 4.0 mp ww in 1991 and 1992, 6.0 mp ww in 1993 through 1995, and 9.12 mp ww from 1996 through 2006. The TAC was reduced to 6.5 mp ww in 2007 and 5.0 mp ww in 2008 and 2009.

The **Generic Sustainable Fisheries Act Amendment** (1999) required the establishment of quotas for recreational and commercial fishing that, when reached, result in a prohibition on the retention of fish caught for each sector for the remainder of the fishing year. With the establishment of a recreational quota in 1997, the NMFS Southeast Regional Administrator was authorized to close the recreational season for each species when the quota is reached, as required by the Magnuson-Stevens Act.

In 2006, **Amendment 26** established a red snapper IFQ program for the commercial sector. Commercial fishermen received red snapper shares based on their catch history. Allocation of the annual commercial harvest of red snapper is awarded to IFQ shareholders each year based on the commercial ACL and how many shares they hold. They are then able to fish that allocation throughout the year until they run out of allocation. Both shares and allocation are transferable, so a fisherman may purchase either shares or allocation from another fisherman during the fishing year (GMFMC 2006a).

From 2010 through 2012, the SSC recommended the red snapper ABC at 75% of the OFL and the Council set the ACL equal to the ABC (GMFMC 2012f). In 2010, the total ACL was increased to 6.945 mp ww. This increased the commercial quota from 2.550 mp ww to 3.542 mp ww and the recreational quota from 2.450 mp ww to 3.403 mp ww. In 2011, the ACL was raised to 7.185 mp ww, resulting in a 3.664 mp ww commercial quota and a 3.525 mp ww recreational quota. On August 12, 2011, NMFS published an emergency rule that, in part, increased the recreational red snapper quota by 345,000 lbs for the 2011 fishing year.

[3] https://gulfcouncil.org/fishery-management/implemented-plans/reef-fish/

In 2012, the SSC recommended that the ABC should be set at the yield corresponding to 75% of $F_{SPR26\%}$. The Council set the ACL equal to the ABC, which increased the ACL to 8.080 mp ww, resulting in a commercial quota of 4.121 mp ww and recreational quota of 3.96 mp ww (GMFMC 2012f).

The **Generic ACLs/AMs Amendment** (2012) addressed a requirement in the Magnuson-Stevens Reauthorization Act of 2006 to establish ACLs and AMs for federally managed species.

A scheduled ACL increase in 2013 to 8.69 mp ww was cancelled due to an overharvest in 2012 by the recreational sector. After an analysis of the impacts of the overharvest on the red snapper rebuilding plan, the 2013 ACL was increased to 8.46 mp ww. In July 2013, the SSC reviewed a new benchmark assessment (SEDAR 31 2014) which showed that the red snapper stock was rebuilding faster than projected. The SSC used Tier 1 of the ABC and the rebuilding yield level was set as the yield that would rebuild the stock to 26% SPR by 2032 under a constant fishing mortality rate strategy ($F_{rebuild26\% SPR}$) (GMFMC 2013b). This increased the ABC for 2013 to 13.50 mp ww, but the SSC warned that the catch levels would have to be reduced in future years if recruitment returned to average levels. To reduce the possibility of having to decrease the ACL later, the Council set the 2013 stock ACL to 11.00 mp ww and the commercial quota at 5.61mp ww and the recreational quota at 5.39 mp ww. Beginning in 2014, the recreational season length was set using an ACT that is 20% below the recreational ACL. A post-season AM that required an overage adjustment if the recreational ACL was exceeded if the stock was overfished was also implemented in 2014. The total ACL was set at 10.40 mp ww in 2014, 14.30 mp ww in 2015, 13.96 mp ww in 2016, and 13.74 mp ww in 2017 and subsequent years.

Amendment 40 divided the recreational quota into a federal for-hire component quota (42.3%) and a private angling component quota (57.7%) (GMFMC 2014d). In 2015, this resulted in an ACT of 2.371 mp ww for the federally permitted for-hire component and 3.234 mp ww for the private angling component. The amendment also included a 3-year sunset provision on the separation of the recreational sector into distinct components. **Amendment 45** extended the separate management of the federal for-hire and private angling components for an additional 5 years through the 2022 red snapper fishing season (GMFMC 2016f). In 2018, the ACT and ACL were 2.278 mp ww and 2.848 mp ww for federally permitted for-hire component, and 3.108 mp ww and 3.885 mp ww for the private angling component.

For 2018, NMFS established a 51-day red snapper fishing season for the federal for-hire component [83 FR 17623] based on the component's ACT. For the private angling component, the 2018 and 2019 red snapper fishing seasons were set by the individual states through exempted fishing permits (EFP) approved by NMFS. The EFPs allocated a portion of the private-angling ACL to each state for harvest during the 2018 and 2019 fishing years.[4]

Amendment 36A modified the commercial IFQ programs. It included a provision that allows NMFS to withhold a portion of IFQ allocation at the start of the year equal to an anticipated quota reduction, which became effective in 2018.

[4] For more information: https://www.fisheries.noaa.gov/southeast/state-recreational-red-snapper-management-exempted-fishing-permits

A 2018 Framework Action to **Modify the Recreational Red Snapper Annual Catch Target Buffers** reduced the federal for-hire buffer by setting the ACT at 9% below the component's ACL for the 2019 fishing season only.

Amendments 50A-F (GMFMC 2019) became effective February 6, 2020, establishing a state management program in each Gulf state for the private angling component's harvest of red snapper. Under Amendments 50A-F, each Gulf state is responsible for managing its annual allocation of the private angling component ACL for red snapper using size limits, bag limits, and seasonal closures. If a state exceeds its allocation in a given fishing year, then the amount of the overage would be deducted from that state's quota for the following fishing year. The individual Gulf states are responsible for their own quota monitoring, and each has a data collection program in place to monitor that state's private angling landings. The individual states would determine if additional catch limit buffers (e.g., an ACT set lower than an ACL, with the fishing season based on the ACT) are necessary to successfully manage that state's allocated quota. A private angling ACT remains in place in the event a state's delegation is no longer effective. The federal for-hire component's harvest of red snapper will continue to be federally managed.

A 2019 **Framework Action to Modify Red Snapper and Hogfish Catch Limits** increased the ACL for red snapper for 2019 and subsequent years. In 2019 another **Framework Action to Modify the Recreational Red Snapper ACT** established a federal for-hire ACT 9% below the component's ACL for 2019 only.

CHAPTER 2. MANAGEMENT ALTERNATIVES

2.1 Action 1: Modification of Gulf of Mexico (Gulf) Red Snapper Catch Limits

Alternative 1: No Action. The red snapper overfishing limit (OFL), acceptable biological catch (ABC), annual catch limits (ACL) and recreational annual catch targets (ACT) will remain at 2019+ levels, as shown in the table below:

Catch Limit Type	Current Catch Limits	Calculation
OFL	15,500,000	N/A
ABC	15,100,000	2.581% less than OFL
Total ACL	15,100,000	ACL = ABC
Commercial ACL	7,701,000	51% of ABC
Recreational ACL	7,399,000	49% of ABC
Federal For-Hire ACL	3,130,000	42.3% of Recreational ACL
Federal For-Hire ACT	2,848,000	9% less than For-Hire ACL
Private Angling ACL[5]	4,269,000	57.7% of Recreational ACL
Florida ACL	1,913,451	44.822% of Private Angling ACL
Alabama ACL	1,122,662	26.298% of Private Angling ACL
Mississippi ACL	151,550	3.55% of Private Angling ACL
Louisiana ACL	816,233	19.12% of Private Angling ACL
Texas ACL	265,105	6.21% of Private Angling ACL

Note: Values are in pounds whole weight. Units are in MRIP-CHTS. The OFL reflects the SSC's January 2016 recommendation.

[5] The private angling ACL is currently managed through individual ACLs for each of the 5 Gulf states. A private angling ACT is not currently used for management, but remains in place as part of the default federal regulations that would apply in the event a state's delegation is no longer in effect.

Alternative 2: Modify the red snapper red snapper OFL, ABC, ACLs, and recreational ACTs for 2021 based on the OFL and ABC recommendation of the Scientific and Statistical Committee (SSC) at the March 30 – April 2, 2021 SSC meeting. The OFL was based on the interim analysis informed by the results of the Great Red Snapper Count (GRSC). The ABC was based on the fishery-independent NMFS bottom longline (BLL) survey-based interim analysis.

Catch Limit Type	Current Catch Limits	Calculation
OFL	25,600,000	N/A
ABC	15,400,000	39.8% less than OFL
Total ACL	15,400,000	ACL = ABC
Commercial ACL	7,854,000	51% of ABC
Recreational ACL	7,546,000	49% of ABC
Federal For-Hire ACL	3,191,958	42.3% of Recreational ACL
Federal For-Hire ACT	2,904,682	9% less than For-Hire ACL
Private Angling ACL	4,354,042	57.7% of Recreational ACL
Florida ACL	1,951,569	44.822% of Private Angling ACL
Alabama ACL	1,145,026	26.298% of Private Angling ACL
Mississippi ACL	154,568	3.55% of Private Angling ACL
Louisiana ACL	832,493	19.12% of Private Angling ACL
Texas ACL	270,386	6.21% of Private Angling ACL

Note: Values are in pounds whole weight. Units are in MRIP-CHTS.
Note: Changes in the respective Gulf states ACLs are being considered simultaneously in another action to address issues related to calibration of recreational data among the various state data collection programs.

Discussion:

The SSC met March 30-April 2, 2021 to review the GRSC report and GRSC-based interim analysis produced by the Southeast Fisheries Science Center (SEFSC). In addition, the SSC reviewed the NMFS BLL interim analysis that was developed independently of the GRSC and is similar to the approach used previously for red grouper and gray triggerfish to produce new ABC catch advice.

The SSC defined the OFL for Gulf red snapper in 2021 at 25.6 mp ww in MRIP-CHTS units based on the GRSC interim analysis using a three-year average at $F_{SPR\ 26\%}$. The SSC did not make an ABC recommendation based on the GRSC-informed interim analysis.

The SSC considered two main decision points for selecting ABC catch advice for this interim analysis: the selection of an index terminal year (2019 or 2020), and the selection of a three- or five-year average for the harvest control rule. The SSC determined that 2020 data should not be used for this interim analysis, given the low sample size and high coefficient of variation (CV) for the data for that year and recommended that the catch advice be derived from the 5-year average. Based on these selections the SSC provided an ABC recommendation of 15.4 mp ww for 2021 in MRIP-CHTS units based on the NMFS BLL interim analysis. This recommendation

reflects the SSC determination that the ABC should be considerably more conservative than the OFL noting the uncertainties in the advice based on the GRSC interim analysis.

Alternative 1 (No Action) would maintain the current OFL equal to 15.5 mp ww recommended by the SSC after review of SEDAR 52. The ABC and total ACL would remain equal to 15.1 mp ww. **Alternative 1** would maintain the current ACL for the commercial sector at 7.701 mp ww, and the current recreational ACL at 7.399 mp ww. It would maintain the current ACL for the private angling component at 4.269 mp ww, and the current ACT and ACL for the federal for-hire component at 2.848 and 3.130 mp ww. **Alternative 1** does not incorporate the most recent SSC recommendations and may result in harvest below the optimum yield.

Alternative 2 would incorporate the results of both the GRSC and NMFS-BLL interim analyses. It would establish an OFL of 25.6 mp ww and an ABC of 15.4 mp ww for 2021. In comparison to **Alternative 1**, **Alternative 2** would increase the OFL by 10.1 mp ww and the ABC by 0.3 mp ww for 2021 (Table 2.1.1). Like **Alternative 1,** the sector and component allocations would remain unchanged and each sector and component would receive an increase in the respective sector and component ACLs. With regard to the state-specific ACLs, these values are subject to a concurrent action to achieve a common currency from the various state data collection to the MRIP-CHTS currency used to monitor harvest at the federal level. Depending upon the outcome of this related action, the final state-specific ACL values may be different than the values in **Alternatives 1** or **2**.

Table 2.1.1. Changes to the OFL, ABC, ACLs, and ACT for red snapper for Alternative 2 relative to Alternative 1. Values are in million pounds, whole weight.

Catch Limit Type	Change Relative to Alternative 1 (lbs ww)
OFL	10,100,000
ABC	300,000
Total ACL	300,000
Commercial ACL	153,000
Recreational ACL	147,000
Federal For-Hire ACL	61,958
Federal For-Hire ACT	56,682
Private Angling ACL	85,042
Florida ACL	38,118
Alabama ACL	22,364
Mississippi ACL	3,018
Louisiana ACL	16,260
Texas ACL	5,281

CHAPTER 3. AFFECTED ENVIRONMENT

The actions considered in this framework action with associated environmental assessment (EA) would affect fishing in federal waters of the Gulf of Mexico (Gulf). Descriptions of the physical, biological, economic, social, and administrative environments (affected environments) completed in the environmental impact statements (EIS) in the Generic Essential Fish Habitat (EFH) Amendment (GMFMC 2004a), and the Generic Annual Catch Limits/Accountability Measures (ACL/AM) Amendment (GMFMC 2011a) apply to the Fishery Management Plan (FMP) for Reef Fish Resources in the Gulf of Mexico (Reef Fish FMP). Descriptions of the affected environments for reef fish are further described in Reef Fish Amendments 30B (GMFMC 2008), 32 (GMFMC 2011b), 40 (GMFMC 2014), 28 (GMFMC 2015), and 50A (GMFMC 2019a). Below, information on each of these environments is summarized or updated, as appropriate.

3.1 Description of the Physical Environment

The Gulf has a total area of approximately 600,000 square miles (1.5 million km[6]), 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 73º F through 83º F (23-28º C) including bays and bayous (Figure 3.2.1) between 1982 and 2009, according to satellite-derived measurements.[2] In general, mean sea surface temperature increases from north to south with large seasonal variations in shallow waters.

[6] NODC 2012: http://accession.nodc.noaa.gov/0072888

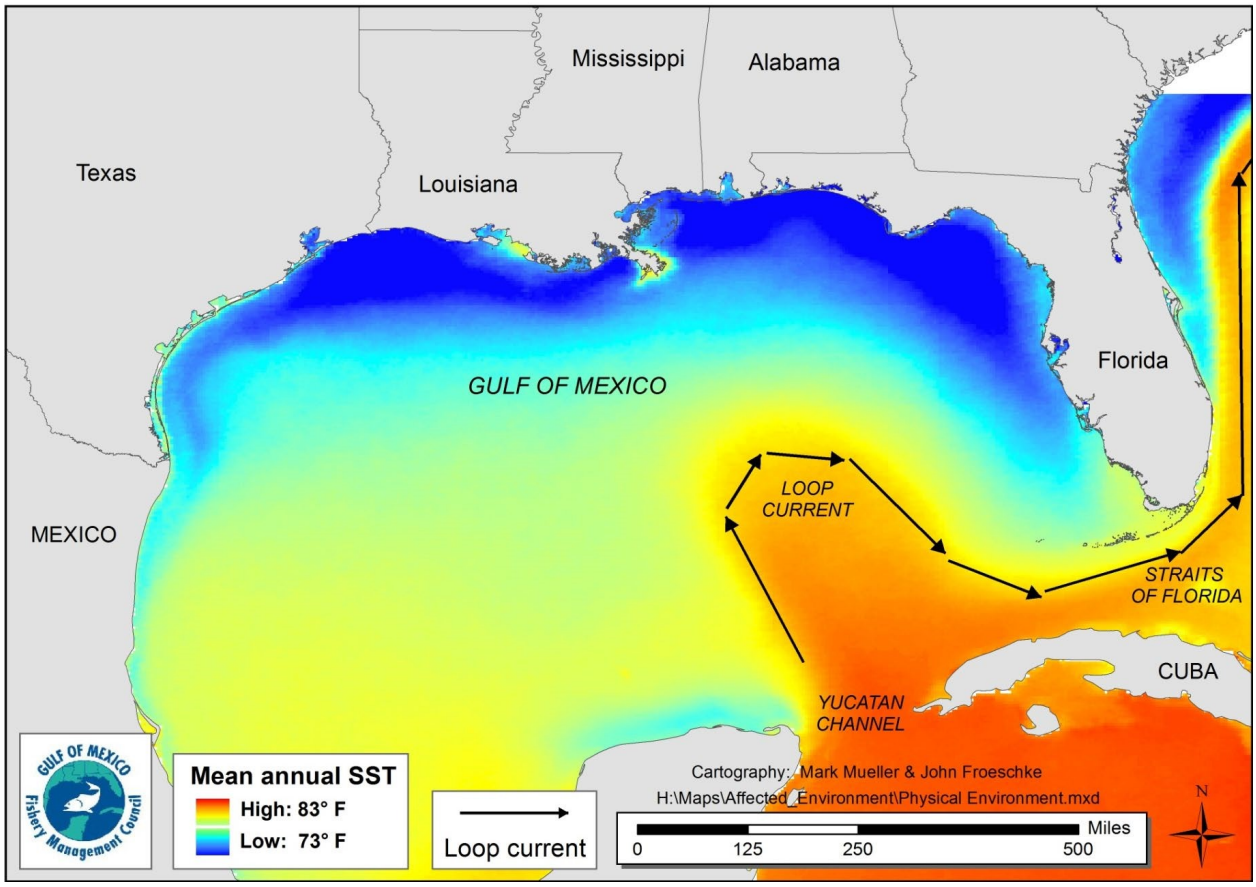

Figure 3.2.1. Physical environment of the Gulf including major feature names and mean annual sea surface temperature as derived from the Advanced Very High-Resolution Radiometer Pathfinder Version 5 sea surface temperature data set (http://accession.nodc.noaa.gov/0072888).

The physical environment for Gulf reef fish, including red snapper and West Florida hogfish, is also detailed in the Generic EFH Amendment, the Generic ACL/AM Amendment, and Reef Fish Amendment 40 (GMFMC 2004a; GMFMC 2011a; GMFMC 2014d, respectively), and is incorporated by reference and further summarized below. 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.

In the Gulf, habitat for adult red snapper consists of submarine gullies and depressions, coral reefs, rock outcroppings, gravel bottoms, oil rigs, and other artificial structures (GMFMC 2004a); eggs and larvae are pelagic; and juveniles are found associated with bottom inter-shelf habitat (Szedlmayer and Conti 1998) and prefer shell habitat to sand (Szedlmayer and Howe 1997).

Adult red snapper are closely associated with artificial structures in the northern Gulf (Szedlmayer and Shipp 1994; Shipp and Bortone 2009) and larger individuals have been found to use artificial habitats, but move further from the structure as they increase in size and based on the time of day (Topping and Szedlmayer 2011).

In the Gulf, fish habitat for adult hogfish consists of reef and hard bottom habitats that provide structural cover, and hogfish have been observed at depths greater than 60 m (GMFMC 2004a, SEDAR 37 2014). Juveniles are found in polyhaline estuarine seagrass beds or nearshore reef habitats.

Detailed information pertaining to the Gulf area closures and marine reserves is provided in Amendment 32 (GMFMC 2011b). There are environmental sites of special interest that are discussed in the Generic Essential Fish Habitat (EFH) Amendment (GMFMC 2004a) that are relevant to red snapper and hogfish management. These include the longline/buoy area closure, the Edges Marine Reserve, Tortugas North and South Marine Reserves, individual reef areas and bank habitat areas of particular concern (HAPC) of the northwestern Gulf, the Florida Middle Grounds HAPC, the Pulley Ridge HAPC, and Alabama Special Management Zone. These areas are managed with gear restrictions to protect habitat and specific reef fish species. These restrictions are detailed in the Generic EFH Amendment (GMFMC 2004a).

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 between 1625 and 1951; thousands more have sunk closer to shore in state waters during the same period. Only a handful of these have been scientifically excavated by archaeologists for the benefit of generations to come.[7]

Northern Gulf of Mexico Hypoxic Zone

Every summer in the northern Gulf, a large hypoxic zone forms. It is the result of allochthonous materials and runoff from agricultural lands by rivers to the Gulf, increasing nutrient inputs from the Mississippi River, and a seasonal layering of waters in the Gulf. The layering of the water is temperature and salinity dependent and prevents the mixing of higher oxygen content surface water with oxygen-poor bottom water. For 2018, the extent of the hypoxic area was estimated to be 2,720 square miles and fourth smallest area mapped since 1985.[4] 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., red snapper and hogfish) are able to detect lower dissolved oxygen levels and move away from hypoxic conditions. Therefore, although not directly affected, these

[7] Further information can be found at http://www.boem.gov/EnvironmentalStewardship/Archaeology/Shipwrecks.aspx. [4] http://gulfhypoxia.net

organisms are indirectly affected by limited prey availability and constrained available habitat (Baustian and Rabalais 2009; Craig 2012).

Greenhouse Gases

The Intergovernmental Panel on Climate Change (IPCC) has indicated greenhouse gas emissions are one of the most important drivers of recent changes in climate. 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 [tpy]) 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	CO2	Greenhouse CH4	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.

3.2 Description of the Biological and Ecological Environment

The biological environment of the Gulf is described in detail in the final environmental impact statement for the Generic EFH Amendment (GMFMC 2004a) and is incorporated herein by reference.

The National Ocean Service collaborated with the National Marine Fisheries Service (NMFS) and the Gulf of Mexico Fishery Management Council (Council) to develop distributions of reef fish (and other species) in the Gulf (SEA 1998).

3.2.1 Red Snapper

Red Snapper Life History and Biology

Red snapper demonstrates the typical reef fish life history pattern. Eggs and larvae are pelagic (Lyczkowski-Shultz and Hanisko 2007) while juveniles are found over mud bottom and oyster shell reef (Szedlmayer and Conti 1999; Rooker et al. 2004). Red snapper is associated with both natural and artificial habitats (Wilson and Nieland 2001; Szedlmayer and Lee 2004; Glenn 2014) but larger older fish occur over open habitat in deeper water (Gallaway et al. 2009). Spawning is protracted from April through September throughout the Gulf with peak spawning in June through August (Futch and Bruger 1976; Collins et al. 1996). Adult females mature as early as two years and most are mature by four years (Schirripa and Legault 1999). Red snapper has been aged up to 57 years (SEDAR 31 2013). Until 2013, most red snapper caught by the directed fishery were 2 to 4 years old, but the SEDAR 31 stock assessment suggested that the age and size of red snapper in the directed fishery has increased (SEDAR 31 2013). Adult red snapper is estimated to have high site fidelity (Szedlmayer and Shipp 1994; Strelcheck et al. 2007). However, other conventional tagging studies have suggested the occurrence of hurricanes greatly affect the distance of red snapper movement (Patterson et al. 2001).

Status of the Red Snapper Stock

Southeast Data, Assessment, and Review (SEDAR) 52 Assessment and Stock Status

The SEDAR 52 (2018) base model was similar to the 2014 SEDAR 31 Update, with select updates to model fitting procedures. The SEDAR 52 stock assessment found that the red snapper resource continues to rebuild from the severely overfished and depleted conditions during of the 1980s and 1990s. Under current conditions, it is expected that the resource will continue to rebuild. Biomass estimates show the western Gulf continues to rebuild, while the eastern Gulf has leveled off over the last few years. The number of older fish present has increased Gulf-wide, indicating rebuilding age structure.

The Scientific and Statistical Committee (SSC) reported that based on the results from SEDAR 52, red snapper, although in a rebuilding plan, is not considered to be undergoing overfishing or to be overfished. The ratio of the current fishing mortality rate (F)/maximum fishing mortality threshold (MFMT) = 0.823, which is less than 1.0 indicating the stock is not undergoing overfishing. The Gulf red snapper stock is not considered to be overfished because the ratio of the spawning stock biomass (SSB)/minimum stock size threshold (MSST) = 1.41, which is greater than 1, which is greater than 1.0. The change in the MSST value to 50% of the SSB at the maximum sustainable yield (26% spawning potential ratio [SPR]) in Amendment 44 (GMFMC 2017) was the primary reason for the change in stock status from overfished to not overfished. The stock is still in a rebuilding plan, and fishing at $F_{Rebuild}$, the stock is not expected to be rebuilt until 2032.

Definition of Overfishing

In January 2012, the Generic ACL/AM Amendment (GMFMC 2011a) became effective. One of the provisions in this amendment was to redefine the criteria used to determine when a stock is undergoing overfishing. In years when there is a stock assessment, overfishing is defined as the fishing mortality rate exceeding the MFMT. In years when there is no stock assessment, overfishing is defined as the catch exceeding the overfishing limit (OFL). The SEDAR 31 update assessment indicates that, as of the terminal year of the assessment data, 2013, overfishing was not occurring. Note that, because the overfishing threshold is now re-evaluated each year instead of only in years when there is a stock assessment, this status could change on a year-to-year basis.

Impact of 2017 Extended Recreational Fishing Season

Due to an extension of the recreational fishing season in 2017, the estimated provisional landings for 2017 (15.36 million pounds) at that time exceeded both the annual biological catch (ABC) (13.74 million pounds) and OFL (14.79 million pounds) for Gulf red snapper as calculated based on the 2014 SEDAR 31 Update Assessment. However, based on the SEDAR 52 reference point projections, overfishing did not occur in 2017. In the interim years between the assessments (2015 and 2016), the projected recruitment assumed in the 2014 SEDAR 31 Update projections was much lower than estimated in the SEDAR 52 assessment (Figure 3.2.1.1), whereas the projected removals were much higher than realized (Figure 3.2.1.2). Therefore, in 2017 the Gulf-wide red snapper resource had rebuilt to a higher biomass and SPR than projected by the 2014 SEDAR 31 Update Assessment, which allowed it to undergo larger removals (i.e., a higher fishing pressure) without any major negative impacts to the rebuilding schedule. Although the result is beneficial for the future status of the red snapper resource, it cannot be expected that projections will always underestimate rebuilding success. It is possible that future recruitment may be below average, which, in combination with higher than predicted removals, would result in overestimation of rebuilding progress.

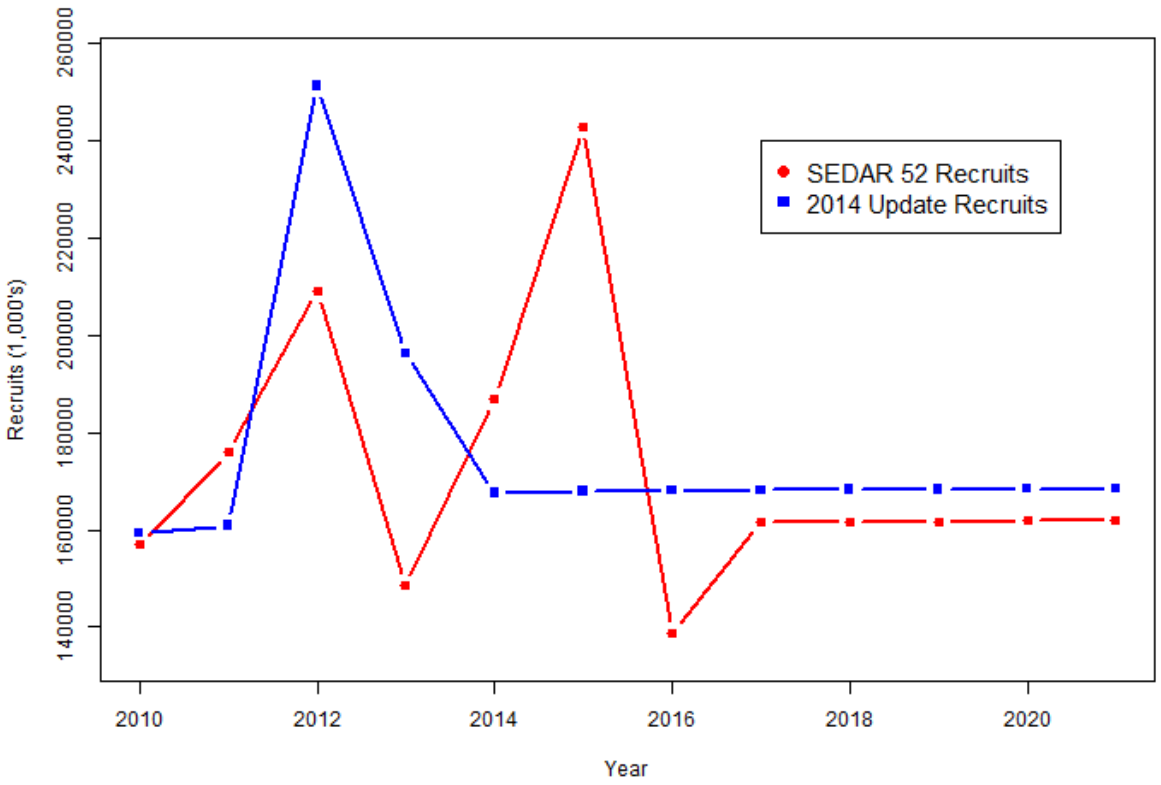

Figure 3.2.1.1. Recruitment (1000s of fish) estimated by the assessment model and projected for OFL forecasts (assuming 2017 provisional landings and 2018 ACLs for SEDAR 52 projections). The results from the 2014 SEDAR 31 Update Assessment (2014 terminal year; blue line) are compared with those from SEDAR 52 (2016 terminal year; red line).

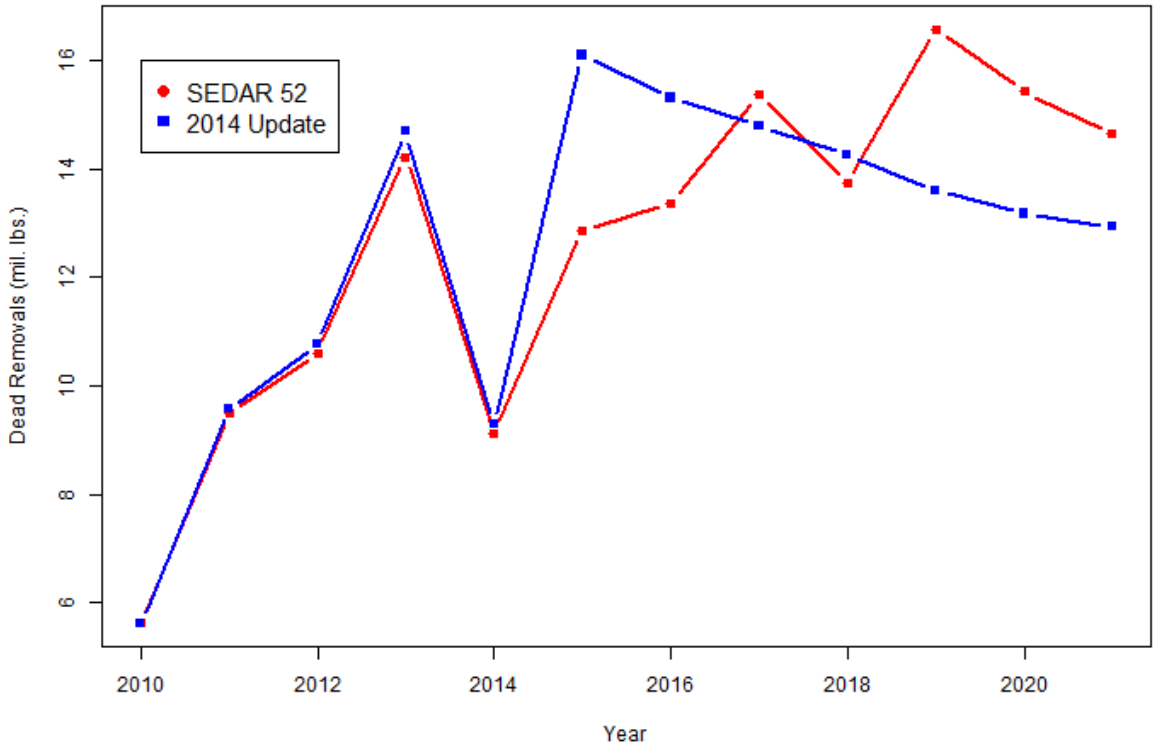

Figure 3.2.1.2. Dead removals (millions of pounds) estimated by the assessment model and projected for OFL forecasts (assuming 2017 provisional landings and 2018 ACLs for SEDAR 52 projections). The results from the 2014 SEDAR 31 Update Assessment (2014 terminal year; blue line) are compared with those from SEDAR 52 (2016 terminal year; red line).

3.2.2 General Information on Reef Fish

Reef fish are widely distributed in the Gulf, occupying both pelagic and benthic habitats during their life cycle. In general, both eggs and larval stages are planktonic. Larval fish feed on zooplankton and phytoplankton. Gray triggerfish are exceptions to this generalization as they lay their eggs in nests on the sandy bottom (Simmons and Szedlmayer 2012), as are gray snapper whose larvae are found around submerged aquatic vegetation.

Status of Reef Fish Stocks

The NMFS Office of Sustainable Fisheries updates its Status of U.S. Fisheries Report to Congress[8] on a quarterly basis utilizing the most current stock assessment information. The Reef Fish FMP currently encompasses 31 species (Table 3.2.1.1). Stock assessments and status

[8] http://www.nmfs.noaa.gov/sfa/fisheries_eco/status_of_fisheries/status_updates.html

determinations have been conducted and designated for 12 stocks and can be found on the Council[9] and the Southeast Data and Review (SEDAR)[10] websites. Of the 12 stocks for which stock assessments have been conducted (Table 3.2.1.1), the fourth quarter report of the 2020 Status of U.S. Fisheries classifies no stocks as overfished, and two stocks as undergoing overfishing (greater amberjack and gray triggerfish).

Stock assessments were conducted for seven reef fish stocks using the Data Limited Methods Toolkit (DLM Toolkit; SEDAR 49 2016). This method allows the setting of an overfishing limit (OFL) and acceptable biological catch (ABC) based on limited data and life history information, but does not provide assessment-based status determinations. Several stocks did not have enough information available to complete an assessment even using the DLM Toolkit. These stocks are not experiencing overfishing based on annual harvest remaining below the OFL, but no overfished status determination has been made (Table 3.2.1). Lane snapper was the only stock with adequate data to be assessed using the DLM Toolkit methods resulting in OFL and ABC recommendations by the Scientific and Statistical Committee (SSC). The remaining species within the Reef Fish FMP have not been assessed at this time. Therefore, whether or not those stocks are overfished is unknown (Table 3.2.1.1). For those species that are listed as not undergoing overfishing, that determination has been made based on the annual harvest remaining below the OFL. No other unassessed species are scheduled for a stock assessment at this time.

[9] www.gulfcouncil.org
[10] www.sedarweb.org

Table 3.2.1.1. Status of species in the Reef Fish FMP grouped by family.

Common Name	Scientific Name	Stock Status		Most recent assessment or SSC workshop
		Over-fishing	Over-fished	
Family Balistidae – Triggerfishes				
gray triggerfish	Balistes capriscus	N	N	SEDAR 43 2015
Family Carangidae – Jacks				
greater amberjack	Seriola dumerili	N	Y	SEDAR 70 2020
lesser amberjack	Seriola fasciata	Y	Unknown	SEDAR 49 2016
almaco jack	Seriola rivoliana	Y	Unknown	SEDAR 49 2016
banded rudderfish	Seriola zonata	Y	Unknown	
Family Labridae – Wrasses				
hogfish	Lachnolaimus maximus	N	N	SEDAR 37 2014
Family Malacanthidae – Tilefishes				
tilefish (golden)	Lopholatilus chamaeleonticeps	N	N	SEDAR 22 2011a
blueline tilefish	Caulolatilus microps	N	Unknown	
goldface tilefish	Caulolatilus chrysops	N	Unknown	
Family Serranidae – Groupers				
gag	Mycteroperca microlepis	N	N	SEDAR 33 Update 2016b
red grouper	Epinephelus morio	N	N	SEDAR 61 2019
Scamp	Mycteroperca phenax	Unknown	Unknown	
black grouper	Mycteroperca bonaci	N	N	SEDAR 19 2010
yellowedge grouper	Hyporthodus flavolimbatus	N	N	SEDAR 22 2011b
snowy grouper	Hyporthodus niveatus	N	Unknown	SEDAR 49 2016
speckled hind	Epinephelus drummondhayi	N	Unknown	SEDAR 49 2016
yellowmouth grouper	Mycteroperca interstitialis	Unknown	Unknown	SEDAR 49 2016
yellowfin grouper	Mycteroperca venenosa	Unknown	Unknown	
warsaw grouper	Hyporthodus nigritus	N	Unknown	
Atlantic goliath grouper	Epinephelus itajara	N	Unknown	SEDAR 47 2016
Family Lutjanidae – Snappers				
queen snapper	Etelis oculatus	N	Unknown	
mutton snapper	Lutjanus analis	N	N	SEDAR 15A Update 2015
blackfin snapper	Lutjanus buccanella	N	Unknown	
red snapper	Lutjanus campechanus	N	N	SEDAR 52 2018
cubera snapper	Lutjanus cyanopterus	N	Unknown	
gray snapper	Lutjanus griseus	N	N	
lane snapper	Lutjanus synagris	Y	Unknown	SEDAR 49 Update 2019
silk snapper	Lutjanus vivanus	N	Unknown	
yellowtail snapper	Ocyurus chrysurus	N	N	SEDAR 64 2020
vermilion snapper	Rhomboplites aurorubens	N	N	SEDAR 45 2016
wenchman	Pristipomoides aquilonaris	N	Unknown	SEDAR 49 2016

Note: *Atlantic goliath grouper is a protected grouper (i.e., ACL is set at zero) and benchmarks do not reflect appropriate stock dynamics. Species status based on the NOAA Quarter 4 2020 FSSI report. The most recent stock assessment is provided for reference, and the stock status determination may reflect more current information than reported in the latest stock assessment. †The greater amberjack assessment (SEDAR 70) which determined the stock was overfished and

undergoing overfishing was accepted by the SSC in January 2021. However, the Quarter 4 2020 Fish Stock Sustainability Index report does not include this update for greater amberjack.

Bycatch

Bycatch is defined as fish harvested in a fishery, but not sold or retained for personal use. This definition includes both economic and regulatory discards, and excludes fish released alive under a recreational catch-and-release fishery management program. Economic discards are generally undesirable from a market perspective because of their species, size, sex, and/or other characteristics. Regulatory discards are fish required by regulation to be discarded, but also include fish that may be retained but not sold. Bycatch practicability analyses have been completed for red snapper (GMFMC 2004b, GMFMC 2007, GMFMC 2014, GMFMC 2015), grouper (GMFMC 2008a, GMFMC 2008c, GMFMC 2011a, GMFMC 2011c), vermilion snapper (GMFMC 2016), greater amberjack (GMFMC 2008b), gray triggerfish (GMFMC 2008b). In addition, a bycatch practicability analysis was conducted for the Generic Annual Catch Limits/Accountability Measures Amendment (GMFMC 2011a) that covered the Reef Fish, Coastal Migratory Pelagics, Red Drum, and Coral FMPs. In general, these analyses found that reducing bycatch provides biological benefits to managed species as well as benefits to the Reef Fish fishery through less waste, higher yields, and 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. In these cases, there is some biological benefit to the managed species that outweighs any increases in discards. Discard mortality rates for red snapper from the most recent stock assessment (SEDAR 52 2018) are shown in Table 3.2.2.2.

Table 3.2.2.2. Discard mortality rates for red snapper by fleet and season from the SEDAR 52 stock assessment. The discard mortality rate has been found to increase with depth and decrease with venting. "East" and "West" are defined as Gulf of Mexico waters east and west of the Mississippi River. Although venting has not been mandatory since 2013, limited information was available to determine discard mortality rates for the most recent time block. Therefore, the values from the mandatory venting period were maintained from 2013 – 2016.

Sector	Venting	Year	East	East	West	West
	Y/N	Pre/Post 2008	Closed	Open	Closed	Open
Recreational	N	Pre	0.21	0.21	0.22	0.22
Recreational	Y	Post	0.118	0.118	0.118	0.118
Commercial vertical line	N	Pre	0.74	0.75	0.87	0.78
Commercial vertical line	Y	Post	0.55	0.56	0.74	0.6
Commercial longline	N	Pre	0.74	0.81	0.87	0.91
Commercial longline	Y	Post	0.55	0.64	0.74	0.81

Protected Species

The Marine Mammal Protection Act (MMPA) and Endangered Species Act (ESA) provide special protections to some species that occur in the Gulf. A brief summary of these two laws

and more information is available on the NMFS Office of Protected Resources website.[11] All 22 marine mammals in the Gulf are protected under the MMPA. Three marine mammals (sperm whales, Gulf of Mexico Bryde's whales, and manatees) are also protected under the ESA. Gulf of Mexico Bryde's whales are the only resident baleen whales in the Gulf and the species was recently listed as endangered (84 FR 15446; April 15, 2019). Other species protected under the ESA include sea turtle species (Kemp's ridley, loggerhead (Northwest Atlantic Ocean distinct population segment [DPS]), green (South Atlantic and North Atlantic DPSs), leatherback, and hawksbill), fish species (Gulf sturgeon, smalltooth sawfish, Nassau grouper, giant manta ray, and oceanic whitetip shark), and coral species (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 also occurs in the Gulf, though only loggerhead critical habitat occurs in federal waters.

Reef Fish Fishing Activity

The most recent biological opinion (BiOp) on the Reef Fish FMP was completed on September 30, 2011 (NMFS 2011a). The opinion determined the authorization of the Gulf reef fish fishery managed under the Reef Fish FMP is not likely to affect ESA-listed marine mammals or Acropora corals, and is not likely to jeopardize the continued existence of sea turtles (loggerhead, Kemp's ridley, green, hawksbill, and leatherback), or smalltooth sawfish. An incidental take statement was provided. 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 or four newly listed species of corals (rough cactus, lobed star, mountainous star, and boulder star).

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

[11] https://www.fisheries.noaa.gov/protecting-marine-life

DPSs, Nassau grouper, the giant manta, or the oceanic whitetip. Since the revised request for reinitiation of consultation, NMFS determined that the newly listed Gulf of Mexico Bryde's whale may be affected by fishing managed under the Reef Fish FMP in a June 20, 2019, memorandum. In that same June 20, 2019, memorandum, NMFS concluded that the activities associated with the Reef Fish FMP were not likely to jeopardize the continued existence of the Bryde's whale during the revised reinitiation period.

There is no information to indicate marine mammals and birds rely on reef fish for food, and they are not generally caught by fishers harvesting reef fish. Primary gear types used in the Gulf reef fish fishery are classified in the Final List of Fisheries for 2021 (86 FR 3028) as Category III gear. This classification indicates the annual mortality and serious injury of a marine mammal stock resulting from any fishery is less than or equal to one percent of the maximum number of animals, not including natural mortalities, that may be removed from a marine mammal stock, while allowing that stock to reach or maintain its optimum sustainable population. Additionally, there is no evidence that the directed reef fish fishery is adversely affecting seabirds.

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 (Intergovernmental Panel on Climate Change [IPCC]).[12] These changes are likely to affect plankton biomass and fish larvae abundance that could adversely impact fish, marine mammals, seabirds, and ocean biodiversity. Kennedy et al. (2002) and Osgood (2008) have suggested global climate change could affect temperature changes in coastal and marine ecosystems that can influence organism metabolism and alter ecological processes such as productivity and species interactions; change precipitation patterns and cause a rise in sea level which could change the water balance of coastal ecosystems; altering patterns of wind and water circulation in the ocean environment; and influence the productivity of critical coastal ecosystems such as wetlands, estuaries, and coral reefs. The National Oceanic and Atmospheric Association (NOAA) Climate Change Web Portal[13] predicts the average sea surface temperature in the Gulf will increase by approximately 2ºC for 2006-2100 compared to the average over the years 1956-2005. 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. It is unclear if reef fish distribution in the Gulf and South Atlantic has been affected. 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 additional 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

[12] http://www.ipcc.ch/
[13] https://www.esrl.noaa.gov/psd/ipcc/

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.

Greenhouse gases

The IPCC 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 3.2.3.1 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 3.2.3.1. Total Gulf greenhouse gas 2014 emissions estimates (tons per year [tpy]) from oil platform and non-oil platform sources, commercial fishing, and percent greenhouse gas emissions from commercial fishing vessels of the total emissions*.

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

*Compiled from Tables 6-11, 6-12, and 6-13 in 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.

Deepwater Horizon MC252 Oil Spill

General Impacts on Fishery Resources

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 (*Sciaenops ocellatus*) 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 to oil spills and dispersants of various marine finfish species, with morphological and/or life history characteristics similar to species found in the Gulf (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). Subsequent work analyzing red snapper after the *Deepwater Horizon* MC252 oil spill showed liver damage from aromatic hydrocarbon (oil) exposure in the form of inflammation, lesions, and other damage (Pulster et al. 2021). These results may be signaling increased disease progression in Gulf red snapper from chronic environmental stressors, including elevated PAH exposures and concentrations. 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 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 well head (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. Marine fish species typically concentrate PAHs in the digestive tract, making stomach bile an appropriate testing medium. A study by Synder et al. (2015) assessed bile samples from golden tilefish (*Lopholatilus chamaeleonticeps*), king snake eel (*Ophichthus rex*), and red snapper for PAH accumulation over time, and reported concentrations were highest in golden tilefish during the same time period when compared to king snake eel and red snapper. These results suggest that the more highly associated an organism is with the sediment in an oil spill area, the higher the likelihood of toxic PAH accumulation. Twenty-first century dispersant applications are thought to be less harmful than their predecessors. However, the combination of oil and dispersants has proven to be more toxic to marine fishes than either dispersants or crude oil alone. Marine fish which are more active (e.g., a pelagic species versus a demersal species) appear to be more susceptible to negative effects from interactions with weathered oil/dispersant emulsions. These effects can include mobility impairment and inhibited respiration (Swedmark et al. 1973). Another study found that while Corexit 9500A® and oil are similar in their toxicity, when Corexit 9500A® and oil were mixed in lab tests, toxicity to microscopic rotifers increased up to 52-fold (Rico-Martínez et al. 2013). These studies suggest that the toxicity of the oil and dispersant combined may be greater than anticipated.

As reported by NOAA's Office of Response and Restoration (NOAA 2010), the oil from the *Deepwater Horizon* MC252 spill is relatively high in alkanes, which can readily be used by microorganisms as a food source. As a result, the oil from this spill is likely to biodegrade more readily than crude oil in general. The *Deepwater Horizon* MC252 oil is also relatively much lower in PAH, especially if the spilled oil penetrates into the substrate on beaches or shorelines. Like all crude oils, MC252 oil contains volatile organic compounds (VOC) such as benzene, toluene, and xylene. Some VOCs are acutely toxic but, because they evaporate readily, they are generally a concern only when oil is fresh.

Outstanding Effects

As a result of the *Deepwater Horizon* MC252 oil spill, NMFS reinitiated the ESA consultation on the Gulf reef fish fishery. As discussed above, on September 30, 2011, the Protected Resources Division released an opinion, which after analyzing best available data, the current status of the species, environmental baseline (including the impacts of the recent *Deepwater Horizon* MC252 oil spill in the northern Gulf), effects of the proposed action, and cumulative effects, concluded that the continued operation of the Gulf reef fish fishery is not likely to jeopardize the continued existence of green, hawksbill, Kemp's ridley, leatherback, or loggerhead sea turtles, nor the continued existence of smalltooth sawfish (NMFS 2011a). The most recent biological opinion addressing the CMP fishery also considered the impacts of the Deepwater Horizon MC252 oil spill in the northern Gulf and concluded that the fishing would not jeopardize continued existence of the species considered. More information is available on the *Deepwater Horizon* MC252 oil spill and associated closures is available on the Southeast Regional Office website.[14]

[14] http://sero.nmfs.noaa.gov/deepwater_horizon_oil_spill.htm

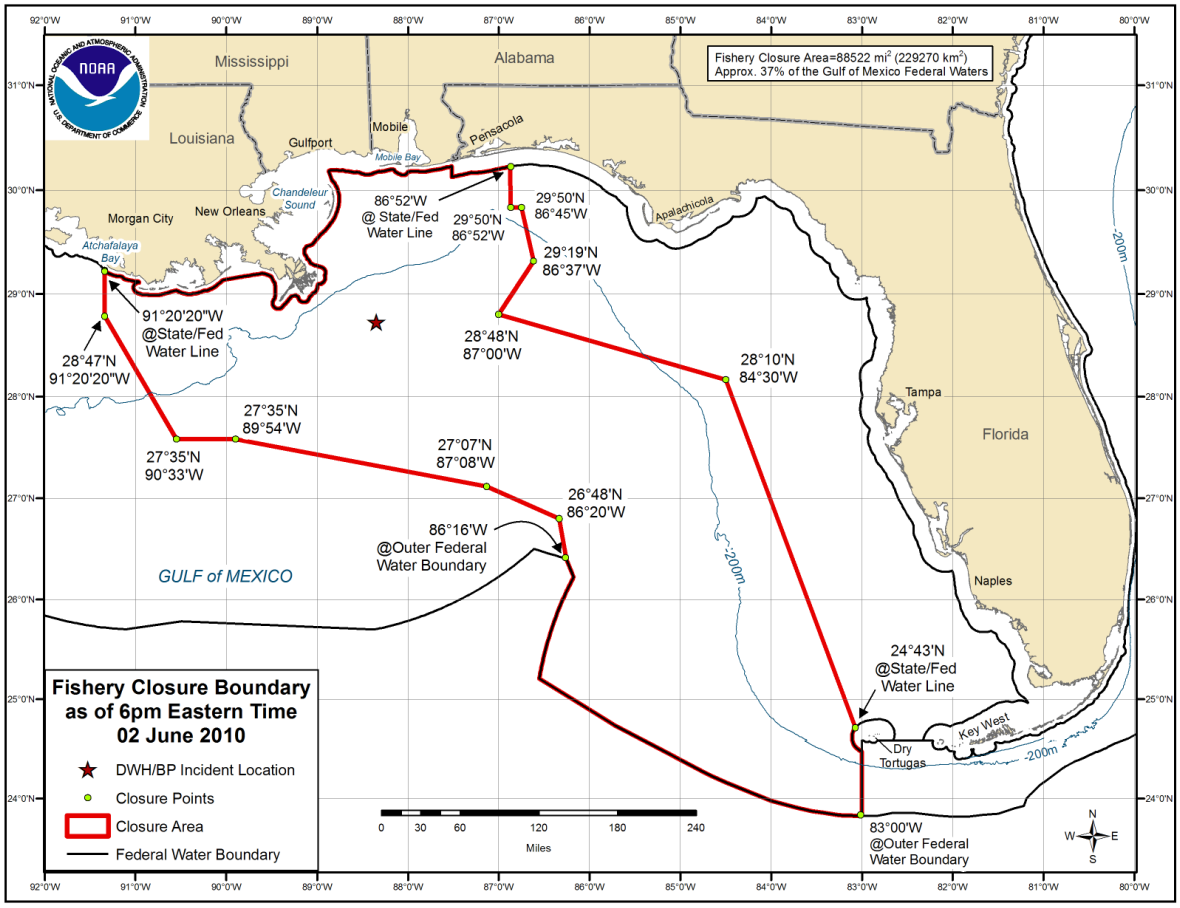

Figure 3.2.3.1. Fishery closure at the height of the *Deepwater Horizon* MC252 oil spill.

3.3 Description of the Economic Environment

Economic information pertaining to Gulf red snapper can be found in Amendment 28 (GMFMC 2015) and Amendment 50A (GMFMC 2019a) and is incorporated herein by reference. Recent performance information related to the Gulf red snapper individual fishing quota (IFQ) program, in particular, is included in the 2019 update to the Gulf of Mexico Red Snapper IFQ Report (NMFS 2020) and is also incorporated herein by reference. The following section contains select updated information on the economic environment of the red snapper portion of the reef fish fishery, broken down by sector. Inflation adjusted revenues and prices are reported in 2019 dollars using the annual, non-seasonally adjusted Gross Domestic Product (GDP) implicit price deflator provided by the U.S. Bureau of Economic Analysis (BEA).

3.3.1 Commercial Sector

Permits

Any fishing vessel that harvests and sells any of the reef fish species managed under the Reef Fish Fishery Management Plan (FMP) from the Gulf exclusive economic zone (EEZ) must have a valid Gulf reef fish permit. As of February 23, 2021, there were 831 limited access valid or

renewable[15] reef fish permits, 62 of which had longline endorsements (745 of these reef fish permits and 60 of these longline endorsements were valid). In order to harvest red snapper, a vessel permit must also be linked to an IFQ account and possess sufficient allocation for this species. IFQ accounts can be opened and valid permits can be linked to IFQ accounts at any time during the year. Eligible vessels can receive red snapper allocation from other IFQ participants.

Although many fishing businesses only own one permitted vessel, some hold or own multiple permits and vessels. Detailed discussions on the business composition of IFQ participants are provided in the description of the economic environment sections of Amendment 36B (GMFMC 2020) and Amendment 53 (GMFMC 2021) and are incorporated herein by reference.

Commercial harvest of reef fish in the EEZ may only be sold to dealers with a federal dealer permit. As of February 23, 2021, there were 382 entities with a federal Gulf and South Atlantic Dealers (GSAD) permit. In order to purchase IFQ species, including red snapper, dealers are also required to have a Gulf IFQ dealer endorsement. As of February 23, 2021, there were 180 eligible IFQ dealers; however, the total number of dealers can vary over the course of the year and from year to year.

Vessels, Landings, and Dockside Revenue

The information in Table 3.3.1.1 describes the landings and revenue for vessels that harvested red snapper each year from 2015 through 2019, including their revenue from other IFQ species, Gulf non-IFQ fisheries, and South Atlantic fisheries. Although not shown in the table, on average (2015 through 2019), vertical gear (bandit and handline) accounted for approximately 95% of red snapper commercial landings each year and bottom longline gear accounted for most of the remainder. There were minimal landings from other gears including spear, trolling, buoy, and powerhead gear. The number of vessels that harvested red snapper each year increased steadily from 2015 through 2018 and then dropped substantially in 2019 (Table 3.3.1.1). On average, red snapper comprised approximately half of these vessels' total annual ex-vessel revenue and IFQ species in general comprised 87%. Red snapper landings and ex-vessel revenue were fairly stable during 2015 through 2019; whereas, landings (not shown in table) and ex-vessel revenue from other IFQ species trended downward (Table 3.3.1.1). Average total ex-vessel revenue per vessel also declined steadily from 2015 through 2018, but then ticked up modestly in 2019 (Table 3.3.1.1). Although not shown in the table, the maximum annual gross revenue earned by a single vessel during the time period was approximately $2.7 million (2019 dollars) in 2015.

[15] A renewable permit is an expired limited access permit that cannot be actively fished, but can be renewed for up to one year after expiration.

Table 3.3.1.1. Landings and revenue statistics for vessels harvesting red snapper (2019 dollars).

Year	# of Vessels	Red Snapper landings in pounds (lbs) gutted weight (gw)	Red Snapper ex-vessel revenue	Other IFQ species ex-vessel revenue	Gulf Non-IFQ species ex-vessel revenue	South Atlantic all species ex-vessel revenue	Average total ex-vessel revenue per vessel
2015	415	6,472,261	$ 31,935,695	$ 30,053,329	$ 8,028,675	$ 456,375	$ 169,817
2016	430	6,057,498	$ 29,711,347	$ 29,159,111	$ 8,583,482	$ 269,404	$ 157,496
2017	449	6,287,083	$ 30,753,588	$ 22,787,676	$ 8,081,840	$ 188,444	$ 137,665
2018	450	6,285,704	$ 30,451,721	$ 19,797,938	$ 7,096,328	$ 251,699	$ 127,995
2019	428	6,899,225	$ 33,086,668	$ 20,784,251	$ 6,661,132	$ 276,554	$ 142,076
Average	434	6,400,354	$ 31,187,804	$ 24,516,461	$ 7,690,291	$ 288,495	$ 147,010

Source: NMFS Southeast Regional Office (SERO) IFQ database (accessed 2/12/2020) and Southeast Fisheries Science Center (SEFSC) Socioeconomic Panel (January 2021 version).

Estimates of economic returns for red snapper vessels are available in Overstreet and Liese (2018), including net revenue from operations[16] as a percentage of annual gross revenue. According to Overstreet and Liese (2018), annual net revenue from operations for commercial vessels that harvested red snapper was approximately 36% of their average annual gross revenue from 2014 through 2016. Applying this percentage to the results provided in Table 3.3.1.1 would result in an estimated per vessel average annual net revenue from operations of approximately $53,000 (2019 dollars) per year for 2015 through 2019. Because economic performance may have changed post 2016, this estimate should be used with some caution.

IFQ Share Transfer, IFQ Allocation Transfer, and Ex-vessel Prices

Price information is important for evaluating the performance of a catch share program. Theoretically, allocation prices should reflect the expected annual profit from harvesting one unit of quota; whereas, share prices should reflect the net present value of the expected profit from harvesting one unit of quota in the long-run. Dockside or ex-vessel price is the price the vessel receives at the first sale of harvest. Average share transfer, allocation transfer, and ex-vessel prices all experienced upward trends from 2015 through 2019. Share transfer price increased by 14% overall, allocation transfer price increased by 11%, and ex-vessel price increased by only 2% (Table 3.3.1.2). Median values were reasonably close to average values during this time period (with the exception of share transfer prices in 2016), suggesting low skewness in the distributions of reported prices (Table 3.3.1.2 and Table 3.3.1.3).

[16] Defined in Overstreet and Liese (2018) as revenue minus the costs for fuel, other supplies, hired crew, vessel repair and maintenance, insurance, overhead, and the opportunity cost of an owner's time as captain as well as the vessel's depreciation. Net revenue from operations is the best available measure of a commercial fishing vessel's economic profit.

Table 3.3.1.2. Average red snapper share transfer, allocation transfer, and ex-vessel prices per pound (lb) gutted weight (gw) in 2019 dollars.

Year	Share Transfer	Allocation Transfer	Ex-vessel
2015	$36.07	$3.32	$5.18
2016	$32.56	$3.41	$5.17
2017	$36.27	$3.46	$5.18
2018	$36.89	$3.46	$5.19
2019	$41.17	$3.69	$5.28
Average	$36.59	$3.47	$5.20

Source: NMFS (2020).

Table 3.3.1.3. Median red snapper share transfer, allocation transfer, and ex-vessel prices per lb gw in 2019 dollars.

Year	Share Transfer	Allocation Transfer	Ex-vessel
2015	$38.01	$3.49	$5.36
2016	$37.16	$3.45	$5.31
2017	$37.26	$3.49	$5.21
2018	$37.14	$3.56	$5.29
2019	$41.22	$3.75	$5.40
Average	$38.16	$3.55	$5.32

Source: NMFS (2020).

Dealers

The information in Table 3.3.1.4 illustrates the purchasing activities of dealers that bought red snapper landings from vessels during 2015 through 2019.17 Like vessels, dealer participation in the red snapper IFQ program is fluid and not all dealers purchased red snapper in each year during this time. On average, from 2015 through 2019, IFQ purchases comprised 51% of all purchases made by these dealers, with red snapper, in particular, accounting for 28%. The average value of purchases per red snapper dealer decreased by approximately 12% overall during the time period, with fluctuations in between (Table 3.3.1.4). Although not shown in the table, the maximum annual value of all purchases made by a single dealer during the time period was $10.6 million (2019 dollars) in 2016.

[17] The estimates in this table are based on Accumulated Landings System data, which tends to produce slightly different estimates of ex-vessel landings and value for red snapper than the IFQ database due to waterbody code assignment issues in the Keys.

Table 3.3.1.4. Purchase statistics for dealers that bought red snapper landings (2019 dollars).

Year	Number of dealers	Red Snapper purchases	Other IFQ purchases	Gulf Non-IFQ purchases	South Atlantic purchases	Average total purchases per dealer
2015	109	$ 30,002,302	$ 29,141,562	$ 46,015,468	$ 8,929,665	$ 1,046,688
2016	101	$ 28,599,827	$ 29,933,091	$ 46,152,299	$ 7,439,429	$ 1,110,145
2017	113	$ 29,547,837	$ 22,641,510	$ 45,084,051	$ 7,192,023	$ 924,473
2018	117	$ 29,488,108	$ 19,305,434	$ 44,162,130	$ 7,765,548	$ 860,865
2019	113	$ 31,906,883	$ 20,547,260	$ 42,738,929	$ 9,202,711	$ 923,856
Average	111	$ 29,908,992	$ 24,313,771	$ 44,830,575	$ 8,105,875	$ 973,205

Source: SEFSC Fishing Communities Web Query Tool (Version Sep 08, 2020 Years: 2014-2019).

Imports

Imports of seafood products compete in the domestic seafood market and have in fact dominated many segments of the seafood market. Imports affect 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 reef fish in general and red snapper in particular, imports affect the returns to fishermen through the ex-vessel prices they receive for their landings. As substitutes to domestic production of reef fish, including red snapper, 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 snappers, including red snapper.

Imports[18] of fresh snapper increased from 26.1 million pounds product weight (pw) in 2015 to 32.8 million pounds pw in 2019. Total revenue from fresh snapper imports increased from $84.7 million (2019 dollars[19]) in 2015 to a five-year high of $109.5 million in 2019. Imports of fresh snappers primarily originated in Mexico, Central America, or South America, and entered the U.S. through the port of Miami. Imports of fresh snapper were highest on average (2015 through 2019) during the months of March through August.

Imports of frozen snapper were substantially less than imports of fresh snapper from 2015 through 2019. During this time, frozen snapper imports ranged from 11.4 million pounds pw to 14.4 million pounds pw and the value of these imports ranged from $34.8 million (2019 dollars) to $40.3 million. Imports of frozen snapper primarily originated in South America (especially Brazil), Indonesia, and Mexico. The majority of frozen snapper imports entered the U.S. through the ports of Miami and New York. Imports of frozen snappers tended to be lowest during February through June when fresh snapper imports were strong.

[18] NOAA Fisheries Service purchases fisheries trade data from the Foreign Trade Division of the U.S. Census Bureau. Data are available for download at https://www.fisheries.noaa.gov/national/sustainable-fisheries/foreign-fishery-trade-data

[19] Converted to 2019 dollars using the annual, non-seasonally adjusted GDP implicit price deflator provided by the U.S. BEA.

Business Activity

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 snapper 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, such as other finfish or seafood products, and services, such as visits to different food service establishments. As a result, the analysis presented below represents a distributional analysis only; that is, it only shows how economic effects may be distributed through regional markets and should not be interpreted to represent the impacts if this species is not available for harvest or purchase.

Estimates of the U.S. average annual business activity associated with the commercial harvest of red snapper in the Gulf were derived using the model developed for and applied in NMFS (2018) and are provided in Table 3.3.1.5.[20] This business activity is characterized as jobs (full- and part-time), output impacts (gross business sales), income impacts (wages, salaries, and self-employed income), and value-added impacts, which represent the contribution made to the U.S. GDP. These impacts should not be added together because this would result in double counting. It should be noted that 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. Separate models to address individual species are not available. For example, the results provided here apply to a general "reef fish" category rather than just red snapper, and a harvester job is "generated" for approximately every $33,500 (2019 dollars) in ex-vessel revenue. These results contrast with the number of harvesters (vessels) with recorded landings of red snapper presented in Table 3.3.1.1.

Table 3.3.1.5. Average annual business activity (2015 through 2019) associated with the commercial harvest of red snapper in the Gulf. All monetary estimates are in 2019 dollars.

Species	Average Ex-vessel Value ($ thousands)	Total Jobs	Harvester Jobs	Output (Sales) Impacts ($ thousands)	Income Impacts ($ thousands)	Value Added ($ thousands)
Red Snapper	$31,188	3,924	931	$309,284	$113,580	$160,475

Source: Calculated by NMFS Southeast Regional Office (SERO) using the model developed for and applied in NMFS (2018).

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

3.3.2 Recreational Sector

The 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. 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 because larger concentrations of fish are required to satisfy larger groups of anglers.

Permits

For-hire vessels are required to have a Gulf charter/headboat permit for reef fish (for-hire permit) to fish for or possess reef fish species in the Gulf EEZ. These are limited access permits. On February 23, 2021, there were 1,306 vessels with a valid (non-expired) or renewable[21] for-hire reef fish permit (including historical captain permits). 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, only federally permitted headboats are required to submit harvest and effort information to the NMFS Southeast Region Headboat Survey (SRHS).[22] Participation in the SRHS is based on determination by the SEFSC that the vessel primarily operates as a headboat. As of March 9, 2021, 69 Gulf headboats were registered in the SRHS (K. Fitzpatrick, NMFS SEFSC, pers. comm. 2021). The majority of these headboats were located in Florida (39), followed by Texas (16), Alabama (9), and Mississippi/Louisiana (5).

Information on Gulf charter vessel and headboat operating characteristics is included in Savolainen et al. (2012) and is incorporated herein by reference.

There are no specific federal permitting requirements for recreational anglers to fish for or harvest reef fish species, including red snapper. Instead, 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 this action.

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[21] A renewable permit is an expired permit that may not be actively fished, but is renewable for up to one year after expiration.

[22] All federal charter/headboat permit holders, including charter vessel owners or operators, are required to comply with the new Southeast For-Hire Electronic Reporting Program as of January 5, 2021. Under this program, all such permit holders must declare trips prior to departure and submit electronic fishing reports prior to offloading fish, or within 30 minutes after the end of a trip, if no fish are landed. Those vessels selected to report to the SRHS (i.e., federally permitted headboats) will continue to submit their reports under the new requirements directly to the SRHS program. For more information, see: https://www.fisheries.noaa.gov/southeast/recreational-fishing-data/southeast-hire-electronic-reporting-program?utm_medium=email&utm_source=govdelivery

Angler Effort

Recreational effort derived from the Marine Recreational Information Program (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.

A target trip may be considered an angler's revealed preference for a certain species, and thus may carry more relevant information when assessing the economic effects of regulations on the subject species than the other two measures of recreational effort. Given the subject nature of this action, the following discussion focuses on target trips for red snapper in the Gulf.

Data from MRIP, the Louisiana Department of Wildlife and Fisheries (LDWF), and the Texas Parks and Wildlife Department (TPWD) were used to estimates target trips for red snapper by state-permitted (and not federally permitted) for-hire vessels, federal for-hire vessels, and private/rental vessels. It is important to note that in 2018, MRIP transitioned from the old Coastal Household Telephone Survey (CHTS) to a new mail-based fishing effort survey (FES). The MRIP-based estimates presented for FL, AL, and MS in Table 3.3.2.1 are calibrated to the FES and may be greater than estimates that are non-calibrated.[23] In addition, effort estimates for Louisiana from the LDWF LA Creel survey are not calibrated to MRIP and are therefore not directly comparable to the MRIP-based estimates.

Florida and Alabama recorded the most target trips for red snapper from 2015 through 2019 and the dominant mode of fishing in all Gulf states was the private/rental mode (Table 3.3.2.1). Both Florida and Alabama experienced 5-year peaks in target effort in 2017; whereas, Mississippi and Louisiana experienced upward trends through 2019. Texas target red snapper effort peaked in 2018 (Table 3.3.2.1).

[23] As of August 2018, all directed trip estimate information provided by MRIP (public use survey data and directed trip query results) for the entire time series were updated to account for both the Access Point Angler Intercept Survey (APAIS) design change in 2013, as well as the transition from the CHTS to the FES in 2018. Back-calibrated estimates of directed effort are not available. For more information, see: https://www.fisheries.noaa.gov/recreational-fishing-data/recreational-fishing-estimate-updates

Table 3.3.2.1. Gulf red snapper recreational target trips, by mode and state, 2015-2019.

	Alabama	Florida	Louisiana	Mississippi	Texas
	State Charter				
2015	3,238	10,440	N/A	0	255
2016	11,031	10,217	611	492	499
2017	4,298	9,720	78	3	74
2018	0	490	16	62	0
2019	3	444	1,402	594	406
Average	3,714	6,262	527	230	247
	Federal For-Hire Charter				
2015	15,938	40,429	N/A	338	940
2016	21,860	41,398	6,710	935	697
2017	26,527	57,195	5,943	2,411	1,706
2018	27,826	81,560	6,187	264	2,258
2019	40,664	76,421	5,451	2,271	2,436
Average	26,563	59,401	6,073	1,244	1,607
	Private/Rental Mode				
2015	278,165	447,544	N/A	11,436	4,324
2016	330,506	570,887	46,557	69,729	2,499
2017	643,163	962,252	55,295	77,092	6,864
2018	364,538	836,260	51,266	91,733	11,630
2019	562,351	736,971	68,186	106,163	9,171
Average	435,745	710,783	55,326	71,230	6,898
	All Modes				
2015	297,341	498,412	N/A	11,773	5,519
2016	363,397	622,502	53,878	71,156	3,696
2017	673,988	1,029,167	61,316	79,506	8,644
2018	392,363	918,309	57,469	92,059	13,888
2019	603,018	813,836	75,039	109,029	12,013
Average	466,022	776,445	61,926	72,704	8,752

Source: MRIP database, SERO, NMFS (February, 2021) for AL, FL and MS. LA Creel for LA. TPWD for TX.

Note 1: Charter effort from waves when the federal for-hire season was closed (typically waves 1, 2, 5, and 6) are all assigned to state charters regardless of area fished (e.g. state or federal waters). All charter effort from federal waters and a portion of charter effort from state waters are assigned to the federal for-hire fleet from waves when the for-hire season was open. If the federal season was open during a wave but a state season was open during days outside the federal season in that wave, federal season effort was considered to be effort from federal waters plus a portion of the effort in state waters computed from the ratio of the federal season length in the wave to the state season length in the wave. If the state season ended before the federal season in a wave, then all effort was assumed to come from the federal season.

Note 2: Headboat information is unavailable.

Similar analysis of recreational effort is not possible for the headboat mode because headboat data are not collected at the angler level. Estimates of effort by the headboat mode are provided

in terms of angler days, or the total number of standardized full-day angler trips.[24] Headboat angler days were fairly stable across the Gulf states from 2015 through 2019 (Table 3.3.2.2). There was, however, a downward trend in reported angler days in Florida from 2016 on. On average (2015 through 2019), Florida accounted for the majority of headboat angler days reported, followed by Texas and Alabama; whereas, Mississippi and Louisiana combined accounted for only a small percentage (Table 3.3.2.2). Headboat effort in terms of angler days for the entire Gulf tended to be concentrated most heavily during the summer months of June through August (Table 3.3.2.3).

Table 3.3.2.2. Gulf headboat angler days and percent distribution by state (2015 through 2019).

	Angler Days				Percent Distribution			
	FL	**AL**	**MS-LA****	**TX**	**FL**	**AL**	**MS-LA**	**TX**
2015	176,375	18,008	3,587	55,135	69.7%	7.1%	1.4%	21.8%
2016	183,147	16,831	2,955	54,083	71.3%	6.5%	1.1%	21.0%
2017	178,816	17,841	3,189	51,575	71.1%	7.1%	1.3%	20.5%
2018	171,996	19,851	3,235	52,160	69.6%	8.0%	1.3%	21.1%
2019	161,564	18,607	2,632	52,456	68.7%	7.9%	1.1%	22.3%
Average	174,380	18,228	3,120	53,082	70.1%	7.3%	1.3%	21.3%

Source: NMFS SRHS (February, 2020).
*Headboat data from Mississippi and Louisiana are combined for confidentiality purposes.

Table 3.3.2.3. Gulf headboat angler days and percent distribution by month (2015 – 2019).

	Jan	**Feb**	**Mar**	**Apr**	**May**	**Jun**	**Jul**	**Aug**	**Sep**	**Oct**	**Nov**	**Dec**
	Headboat Angler Days											
2015	9,444	10,594	22,827	20,684	20,973	44,731	45,192	26,637	15,114	17,246	9,757	9,906
2016	7,954	13,233	21,829	18,691	21,693	50,333	49,881	21,775	13,596	15,827	11,823	10,381
2017	8,998	14,007	21,032	19,383	19,186	47,673	54,028	22,984	10,289	11,054	11,299	11,488
2018	5,524	13,694	20,762	17,584	16,876	54,251	53,304	24,819	13,235	10,633	8,183	8,377
2019	2,330	12,819	21,796	16,299	18,271	46,046	47,594	24,212	11,369	13,687	10,389	10,447
Avg	6,850	12,869	21,649	18,528	19,400	48,607	50,000	24,085	12,721	13,689	10,290	10,120
	Percent Distribution											
2015	3.7%	4.2%	9.0%	8.2%	8.3%	17.7%	17.9%	10.5%	6.0%	6.8%	3.9%	3.9%
2016	3.1%	5.1%	8.5%	7.3%	8.4%	19.6%	19.4%	8.5%	5.3%	6.2%	4.6%	4.0%
2017	3.6%	5.6%	8.4%	7.7%	7.6%	19.0%	21.5%	9.1%	4.1%	4.4%	4.5%	4.6%
2018	2.2%	5.5%	8.4%	7.1%	6.8%	21.9%	21.6%	10.0%	5.4%	4.3%	3.3%	3.4%
2019	1.0%	5.4%	9.3%	6.9%	7.8%	19.6%	20.2%	10.3%	4.8%	5.8%	4.4%	4.4%
Avg	2.7%	5.2%	8.7%	7.4%	7.8%	19.5%	20.1%	9.7%	5.1%	5.5%	4.1%	4.1%

[24] Headboat trip categories include half-, three-quarter-, full-, and 2-day trips. A full-day trip equals one angler day, a half-day trip equals .5 angler days, etc. Angler days are not standardized to an hourly measure of effort and actual trip durations may vary within each category.

Source: NMFS SRHS (February, 2020).

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 monetary 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. The estimated value of the CS for catching and keeping a second red snapper on an angler trip is $85.69 (values updated to 2019 dollars[25]), and decreases thereafter ($57.13 for a third red snapper, $42.10 for a fourth red snapper, and $33.19 for a fifth red snapper) (Carter and Liese 2012).

The foregoing estimates of economic value should not be confused with economic impacts associated with recreational fishing expenditures. Although expenditures for a specific good or service may represent a proxy or lower bound of value (a person would not logically pay more for something than it was worth to them), they do not represent the net value (benefits minus cost), nor the change in value associated with a change in the fishing experience.

With regard to for-hire businesses, economic value can be measured by producer surplus (PS) per passenger trip (the amount of money that a vessel owner earns in excess of the cost of providing the trip). Estimates of the PS per for-hire passenger trip are not available. Instead, trip net revenue (TNR), which is the return used to pay all labor wages, returns to capital, and owner profits, is used as a proxy for PS. When TNR is divided by the number of anglers on a trip, it represents cash flow per angler (CFpA). The estimated CFpA value for an average Gulf charter angler trip is $164 (2019 dollars) and the estimated CFpA value for an average Gulf headboat angler trip is $54 (Souza and Liese 2019). Estimates of CFpA for a red snapper target trip are not available.

According to Savolainen et al. (2012), the average charter vessel operating in the Gulf is estimated to receive approximately $90,000 (2019 dollars) in gross revenue and $27,000 in net income (gross revenue minus variable and fixed costs) annually. The average headboat is estimated to receive approximately $272,000 (2019 dollars) in gross revenue and $79,000 in net income annually.

[25] Converted to 2019 dollars using the annual, not seasonally adjusted GDP implicit price deflator provided by the U.S. Bureau of Economic Analysis.

Business Activity

The desire for recreational fishing generates economic activity as consumers spend their income on various goods and services needed for recreational fishing. This spurs economic activity in the region where recreational fishing occurs. It should be clearly noted that, in the absence of the opportunity to fish, the income would presumably be spent on other goods and services and these expenditures would similarly generate economic activity in the region where the expenditure occurs. As such, the analysis below represents a distributional analysis only.

Estimates of the business activity (economic impacts) associated with recreational angling for red snapper in the Gulf were calculated using average trip-level impact coefficients derived from the 2016 Fisheries Economics of the U.S. report (NMFS 2018) and underlying data provided by the NOAA Office of Science and Technology. Economic impact estimates in 2016 dollars were adjusted to 2019 dollars using the annual, not seasonally adjusted GDP implicit price deflator provided by the U.S. Bureau of Economic Analysis.

Business activity (economic impacts) for the recreational sector is characterized in the form of jobs (full- and part-time), income impacts (wages, salaries, and self-employed income), output impacts (gross business sales), and value-added impacts (contribution to the GDP in a state or region). Estimates of the average annual economic impacts (2015-2019) resulting from Gulf red snapper target trips are provided in Table 3.3.2.4. The average impact coefficients, or multipliers, used in the model are invariant to the "type" of effort and can therefore be directly used to measure the impact of other effort measures such as red snapper catch trips. To calculate the multipliers from Table 3.3.2.4, simply divide the desired impact measure (sales impact, value-added impact, income impact, or employment) associated with a given state and mode by the number of target trips for that state and mode.

The estimates provided in Table 3.3.2.4 only apply at the state-level. 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. It is also important to note that these economic impacts estimates are based on trip expenditures only and do not account for durable expenditures. Durable expenditures cannot be reasonably apportioned to individual species. As such, the estimates provided in Table 3.3.2.4 may be considered a lower bound on the economic activity associated with those trips that targeted red snapper.

Estimates of the business activity associated with headboat effort are not available. Headboat vessels are not covered in MRIP in the Southeast, so, in addition to the absence of estimates of target effort, estimation of the appropriate business activity coefficients for headboat effort has not been conducted.

Table 3.3.2.4. Estimated annual average economic impacts (2015-2019) from recreational trips that targeted Gulf red snapper, by state and mode, using state-level multipliers. All monetary estimates are in 2019 dollars in thousands.

	FL	AL	MS	LA	TX
	Charter Mode*				
Target Trips	65,663	30,277	1,474	6,600	1,854
Value Added Impacts	$22,700	$12,461	$653	$3,093	$742
Sales Impacts	$38,119	$22,661	$1,232	$5,810	$1,231
Income Impacts	$13,265	$7,107	$375	$1,823	$416
Employment (Jobs)	355	250	15	68	11
	Private/Rental Mode				
Target Trips	710,783	435,745	71,230	55,326	6,898
Value Added Impacts	$25,320	$19,464	$1,536	$8,156	$1,167
Sales Impacts	$39,243	$30,118	$2,551	$13,963	$1,923
Income Impacts	$13,286	$7,576	$808	$4,407	$597
Employment (Jobs)	363	281	26	111	14
	All Modes				
Target Trips	776,445	466,022	72,704	61,926	8,752
Value Added Impacts	$48,019	$31,925	$2,189	$11,250	$1,908
Sales Impacts	$77,363	$52,778	$3,783	$19,773	$3,154
Income Impacts	$26,551	$14,683	$1,184	$6,230	$1,012
Employment (Jobs)	718	531	41	179	24

Source: Effort data from MRIP, LDWF LA Creel, and TPWD; economic impact results calculated by NMFS SERO using NMFS (2018) and underlying data provided by the NOAA Office of Science and Technology.
*Includes state charter and federal for-hire charter trips.
Note: headboat information is unavailable.

3.4 Description of the Social Environment

This framework action affects commercial and recreational management of red snapper in the Gulf. A description of the permits and endorsements related to the commercial and recreational reef fish fishing is included by state in order to provide a geographic distribution of fishing involvement. Top communities based on the number of permits and endorsements are presented. Commercial and recreational landings by state are included to provide information on the geographic distribution of fishing involvement. Descriptions of RS-IFQ accounts, IFQ accounts, and IFQ dealers are included at the state and community level. The top fishing communities involved in red snapper fishing in the Gulf are identified. Descriptions of communities with SRHS landings of red snapper along with the top recreational fishing communities based on recreational engagement are included. Community level data are presented in order to meet the requirements of National Standard 8 of the Magnuson-Stevens Act, which requires the consideration of the importance of fishery resources to human communities when changes to

fishing regulations are considered. Lastly, social vulnerability data are presented to assess the potential for environmental justice concerns.

Additional detailed information about communities in the following analysis can be found on the SERO's Community Snapshots website.[26]

3.4.1 Commercial Sector

Permits

Gulf reef fish permits are issued to individuals in Florida (80.6% of Gulf reef fish vessels), Texas (8.1%), Alabama (4.5%), Louisiana (3.9%), and Mississippi (0.8%), SERO permit office, March 24, 2021). Residents of other states (Arkansas, Georgia, Illinois, Maryland, Missouri, North Carolina, New York, Oklahoma, and South Carolina) also hold commercial reef fish permits, but these states represent a smaller percentage of the total number of issued permits.

Gulf reef fish permits are held by individuals with mailing addresses in 230 communities (SERO permit office, March 24, 2021). Communities with the most commercial reef fish permits are located in Florida and Texas (Table 3.4.1.1). The communities with the most reef fish permits are Panama City, Florida (8.3% of reef fish permits), Key West, Florida (4.6%), and St. Petersburg, Florida (3.3%).

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

Table 3.4.1.1. Top communities by number of Gulf reef fish permits and Eastern Gulf reef fish bottom longline endorsements.

State	Community	Reef Fish Permits (RR)	State	Community	Eastern Gulf Reef Fish Bottom Longline Endorsements (RRLE)
FL	Panama City	68	FL	Cortez	9
FL	Key West	38	FL	Largo	7
FL	St. Petersburg	27	FL	Madeira Beach	6
FL	Largo	24	FL	Seminole	5
FL	Destin	22	FL	Lecanto	4
TX	Galveston	22	FL	Palm Harbor	4
FL	Pensacola	20	FL	St. Petersburg	4
FL	Cortez	18	FL	Clearwater	3
FL	Seminole	18	FL	Indian Shores	3
FL	Tampa	16	FL	Panama City	3
FL	Clearwater	15			
FL	Naples	13			
FL	Fort Walton Beach	11			
FL	Tarpon Springs	11			
FL	Lecanto	10			
FL	Lynn Haven	10			
TX	Houston	10			
FL	Miami	9			
FL	Steinhatchee	9			
FL	Winter Springs	9			

Source: SERO permit office, March 24, 2021.

A valid Gulf reef fish permit is required for a commercial Eastern Gulf reef fish bottom longline endorsement. Nearly all Eastern Gulf reef fish bottom longline endorsements are issued to individuals in Florida, with one endorsement issued to an individual in Texas. Longline endorsements are held by individuals with mailing addresses in 21 communities, and a large portion of these communities are located in the greater Tampa Bay area in Pinellas, Manatee, Pasco, and Sarasota Counties (approximately 81% of communities with bottom longline endorsements, SERO permit office, March 24, 2021). The communities with the most longline endorsements are Cortez, Florida (14.5% of longline endorsements), followed by Largo (11.3%), and Madeira Beach (9.7%, Table 3.4.1.1).

Landings

The greatest proportions of the commercial red snapper catch are landed along the west coast of Florida (average of approximately 37.8% from 2015-2019, Table 3.4.1.2) and in Texas (36.8%). Louisiana (average of 17.9%) also includes a sizable amount of the commercial red snapper catch. Other Gulf states are also involved in commercial red snapper fishing, but these states represent a much smaller percentage of the total commercial landings.

Table 3.4.1.2. Percentage of total commercial red snapper landings by state for 2015-2019.

Year	AL/MS	FL	LA	TX
2015	5.8%	40.3%	15.9%	37.9%
2016	7.2%	35.4%	16.7%	40.6%
2017	9.2%	37.1%	18.1%	35.6%
2018	7.6%	37.4%	20.1%	34.9%
2019	7.6%	38.8%	18.7%	34.9%

Source: NMFS SERO IFQ database accessed 2/12/20.

IFQ Accounts

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

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

Shareholders

As of February 19, 2020, a total of 340 IFQ accounts held shares in the RS-IFQ program (IFQ database; includes active and suspended accounts). The majority of accounts with shares in the RS-IFQ program have a mailing address in Florida (67.9% of accounts with RS-IFQ shares, Table 3.4.1.3), followed by Texas (16.2%), Louisiana (5.9%), and Alabama (5%). Accounts with mailing addresses in Mississippi and in other states (Georgia, Iowa, Michigan, New York, South Carolina, and Tennessee) also hold RS-IFQ shares, but these states represent a smaller percentage of the total number of accounts with shares.

The greatest proportion of RS-IFQ shares are held in accounts with mailing addresses in Florida, followed by Texas, Louisiana, and Alabama (Table 3.4.1.3). Accounts in Mississippi and other state also hold RS-IFQ shares, but these states represent a smaller percentage of shares.

Table 3.4.1.3. Number of IFQ accounts with red snapper shares by state, including the percentage of shares by state by share category.

State	Accounts	RS Shares (%)
AL	17	4.412
FL	231	47.611
LA	20	8.399
MS	8	2.424
TX	55	35.031
Other	9	2.052
Total	**340**	**99.929**

Source: NMFS SERO IFQ database accessed 2/19/20. Note: Includes active and suspended accounts.

Accounts with RS-IFQ shares are held by people with mailing addresses in a total of 151 communities (IFQ database accessed 2/19/20). Communities with the most accounts with RS-IFQ shares are located in Florida and Texas (Table 3.4.1.4). The community with the most accounts with RS-IFQ shares is Panama City, Florida (8.5% of accounts with shares), followed by Destin, Florida (4.1%), and Cortez, Florida (3.5%).

Table 3.4.1.4. Top communities by number of IFQ accounts with red snapper shares, including the percentage of shares by community by share category.

State	Community	Accounts	RS Shares (%)
FL	Panama City	29	11.863
FL	Destin	14	6.288
FL	Cortez	12	0.024
TX	Galveston	11	14.337
TX	Houston	11	4.563
FL	Pensacola	9	2.795
FL	Largo	8	0.470
FL	Lynn Haven	8	9.637
FL	Ft. Walton Beach	7	2.108
FL	Seminole	6	0.024
FL	Steinhatchee	6	0.524
FL	Apalachicola	5	0.558
FL	Gulf Breeze	5	1.034
FL	St. Petersburg	5	0.089
FL	Tallahassee	5	1.151
FL	Tampa	5	0.013

Source: NMFS SERO IFQ database accessed 2/19/20.

The largest or maximum percent of RS-IFQ shares held in a community is 14.337% in Galveston, Texas (IFQ database accessed 2/19/20). The percentage of shares by community varies widely and a large number of accounts with shares may not necessarily correlate to a large percentage of shares in a particular category (Table 3.4.1.4). Some communities with a relatively smaller number of accounts may have a larger percentage of shares in a particular share category or categories.

Account Holders without Shares

As of February 19, 2020, a total of 331 IFQ accounts were activated or suspended without shares in any IFQ category (IFQ database accessed 2/19/20, includes activated and suspended accounts without shares in any RS-IFQ or GT-IFQ share category). Activated accounts include those that have logged in. Suspended accounts can be re-activated after citizenship requirements have been completed. However, these accounts may be related to accounts with shares. The majority of accounts without shares have mailing addresses in Florida (78.9% of activated or suspended accounts without shares, Table 3.4.1.5), followed by Texas (6.9%), Alabama (6%) and Louisiana (4.2%). Account holders without shares also have mailing addresses in Mississippi and other states (Connecticut, Iowa, Illinois, Kentucky, Massachusetts, Maryland, North Carolina, Ohio, South Carolina, and Wisconsin), but these states represent a smaller percentage of the total number of activated or suspended accounts without shares.

Table 3.4.1.5. Number of IFQ accounts without shares by state.

State	Accounts
AL	20
FL	261
LA	14
MS	3
TX	23
Other	10
Total	**331**

Source: NMFS SERO IFQ database accessed 2/19/20. Note: Includes active and suspended accounts.

IFQ accounts without shares have mailing addresses in a total of 145 communities (IFQ database accessed 2/19/20). Communities with the most accounts without shares are located in Florida, Texas, and Alabama (Table 3.4.1.6). The community with the most accounts without shares is Panama City, Florida (7.3% of activated or suspended accounts without shares, Table 3.4.1.6), followed by St. Petersburg, Florida (4.5%), and Galveston, Texas (4.5%).

Table 3.4.1.6. Top communities by number of IFQ accounts without shares.

State	Community	Accounts
FL	Panama City	24
FL	St. Petersburg	15
TX	Galveston	15
FL	Key West	11
FL	Destin	9
FL	Largo	9
FL	Seminole	9
FL	Fort Myers	8
FL	Cape Coral	7
FL	Clearwater	7
FL	Pensacola	7
AL	Dauphin Island	6
FL	Hudson	6
FL	Madeira Beach	6

Source: NMFS SERO IFQ database accessed 2/19/20.

IFQ Dealers

The majority of IFQ dealers are located in Florida (average of 73.7% of Gulf IFQ dealers for 2015-2019, Table 3.4.1.7), followed by Alabama and Mississippi (9.7%), Louisiana (9.4%), and Texas (7.2%).

Table 3.4.1.7. Number of Gulf IFQ dealers by state for 2015-2019.

Year	AL/MS	FL	LA	TX
2015	9	98	10	9
2016	9	90	10	8
2017	16	90	17	11
2018	14	94	12	9
2019	14	95	11	9

Source: NMFS SERO IFQ database accessed 2/12/20.

Gulf IFQ dealer facilities are located in a total 97 communities (IFQ database accessed 2/12/20, includes Gulf IFQ dealers with landings 2015-2019). Communities with the most Gulf IFQ dealer facilities are located in Florida, Alabama, Louisiana, and Texas (Table 3.4.1.8). The community with the most Gulf IFQ dealer facilities is Key West, Florida (5.8% of Gulf IFQ dealer facilities, Table 3.4.1.8), followed by Panama City, Florida (4% of Gulf IFQ dealer facilities) and Madeira Beach, Florida (3.1% of Gulf IFQ dealer facilities).

Table 3.4.1.8. Top communities by number of Gulf IFQ dealer facilities with landings during 2015-2019.

State	Community	*Dealer Facilities
FL	Key West	13
FL	Panama City	9
FL	Madeira Beach	7
FL	Destin	6
FL	St. Petersburg	6
AL	Bayou La Batre	5
AL	Bon Secour	5
FL	Panacea	5
FL	Pensacola	5
FL	St. James City	5
FL	Steinhatchee	5
FL	Tarpon Springs	5
LA	Golden Meadow	5
TX	Galveston	5

Source: NMFS SERO IFQ database accessed 2/12/20.
*Multiple dealers can use the same facility and a dealer can operate at multiple facilities.

Fishing Communities

Commercial Engagement

The program-specific commercial Fishing Engagement Index scores for the Gulf RS-IFQ Program are presented in Table 3.4.1.9. The index is an indicator of the importance of IFQ red snapper fishing in a community relative to other communities. It is a measure of the presence of IFQ red snapper fishing activity including pounds and value of red snapper, number of reef fish permits, and number of reef fish dealers within the community. There are 13 communities in Table 3.4.1.9 that were highly engaged (1.0 standard deviation or more above the mean) in the Gulf RS-IFQ Program fishery for at least one year from 2014 through 2018. Highly engaged communities are located in Texas, Florida, and Louisiana.

Table 3.4.1.9. Fishing Engagement Index scores of communities highly engaged in the Gulf RS-IFQ Program for one or more years from 2014 through 2018.

Community	2014	2015	2016	2017	2018
Galveston, TX	12.169	11.349	12.488	11.198	11.371
Panama City, FL	5.008	5.116	4.815	6.380	6.579
Destin, FL	6.826	7.432	6.170	5.605	4.774
Golden Meadow, LA	2.361	2.606	2.496	3.151	3.298
Madeira Beach, FL	1.755	1.947	1.766	2.046	2.698
Apalachicola, FL	1.703	2.138	1.790	2.446	2.383
Houma, LA	0.357	1.161	1.004	2.475	2.380
Key West, FL	2.188	2.291	2.264	2.252	2.217
Pensacola, FL	1.549	1.546	1.446	1.520	1.589
Freeport, TX	1.067	1.396	1.084	1.628	1.329
Matagorda, TX	0.875	1.106	1.015	1.231	1.238
Tarpon Springs, FL	1.237	1.207	1.151	1.121	1.229
Port Bolivar, TX	1.007	1.249	0.924	1.101	1.094

Source: PIMS, SERO Community ALS, and IFQ database accessed 2/19/20.
Note: Highlighted cells indicate high engagement. Communities are in order of 2018 engagement scores.

Of the 13 communities found in Table 3.4.1.9, the communities that were highly engaged for all years from the 2014 through 2018 are depicted in Figure 3.4.1.1. The top community of Galveston, Texas has remained at the top for the duration of the time series. For those second and third ranked communities, RS-IFQ engagement has fluctuated. The community of Destin, Florida has demonstrated a decrease in RS-IFQ engagement in recent years; whereas the community of Panama City, Florida has demonstrated an increase. The engagement scores for those highly engaged communities at the middle and bottom of the scale display some fluctuation, but tend to be fairly stable for most communities.

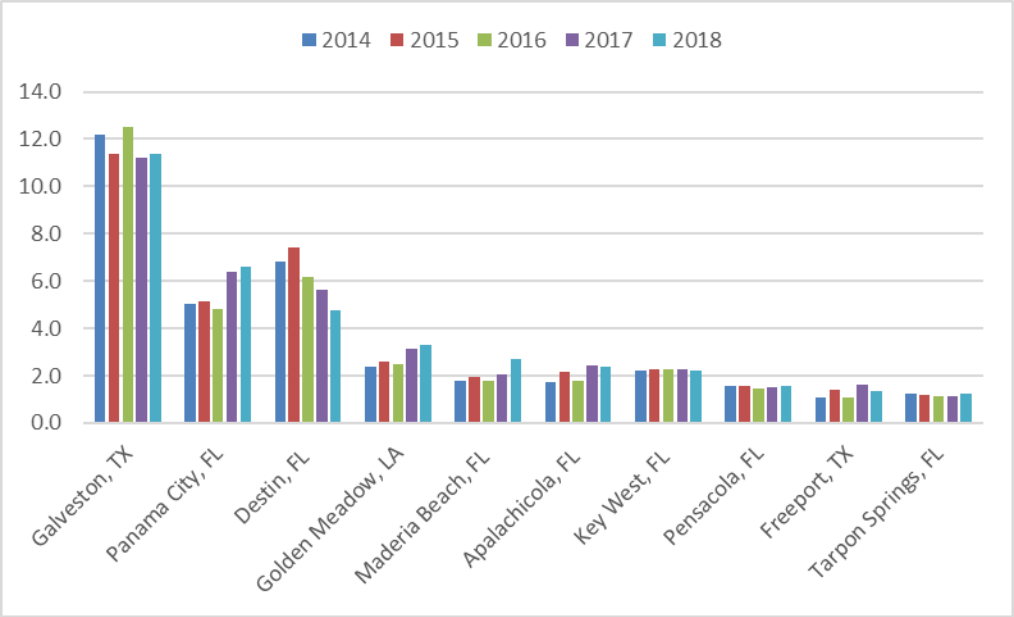

Figure 3.4.1.1. Fishing Engagement Index scores of communities highly engaged in the RS-IFQ Program for all years, from 2014 to 2018.
Source: PIMS, SERO Community ALS, and IFQ database accessed 2/19/20.

Regional Quotient

RQ is the proportion of IFQ red snapper landed within a community out of the total amount of IFQ red snapper landed within the Southeast region. It is an indicator of the percent contribution in pounds or value of IFQ red snapper landed within that community relative to the regional fishery. The RQ is reported individually only for those communities that were highly engaged for all years from 2014 through 2018. All other communities that landed IFQ red snapper are grouped as "Other Communities." Figure 3.4.1.2 shows the RQ in pounds from 2014 to 2019. The dominant IFQ red snapper communities for pounds landed included the communities of Galveston, Texas; Destin, Florida; and Panama City, Florida (Figure 3.4.1.2).

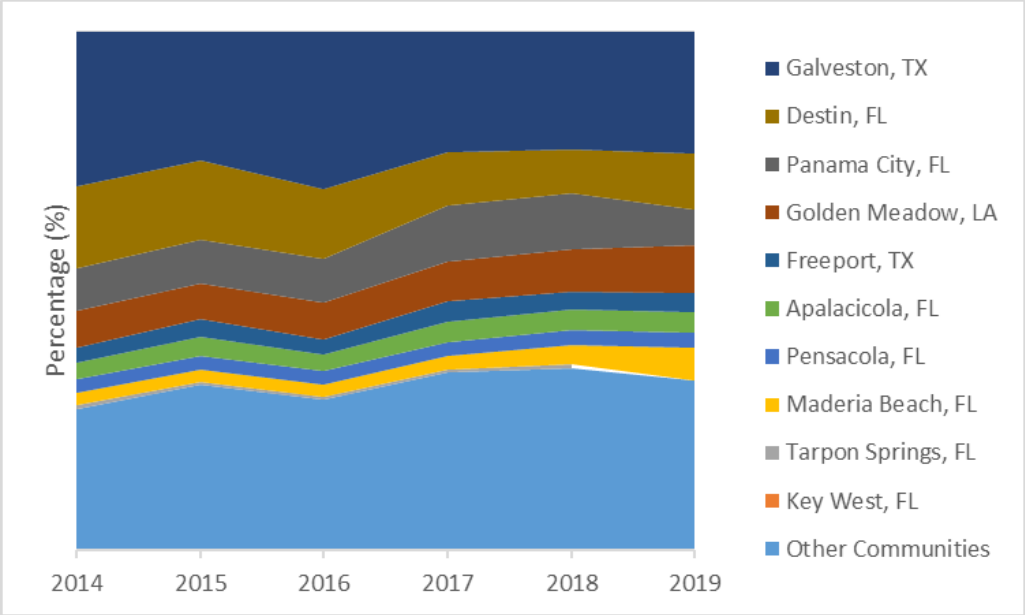

Figure 3.4.1.2. Regional Quotient (pounds) for communities highly engaged in the Gulf of Mexico RS-IFQ Program for all years from 2014 through 2019.
Source: IFQ database accessed 2/12/20.

3.4.2 Recreational Sector

Permits

Charter/headboat for reef fish permits are issued to individuals in Florida (59.3% of charter/headboat for reef fish vessels), Texas (15.9%), Alabama (10.2%), Louisiana (7.7%), and Mississippi (2.7%, SERO permit office, March 24, 2021). Residents of other states (Alaska, Arkansas, California, Georgia, Illinois, Indiana, Kansas, Michigan, Montana, North Carolina, New Jersey, New York, Ohio, Oklahoma, Tennessee, Virginia, and Wisconsin) also hold charter/headboat permits, but these states represent a smaller percentage of the total number of issued permits.

Charter/headboat for reef fish permits are held by individuals with mailing addresses in 349 communities (SERO permit office, March 24, 2021). Communities with the most charter/headboat for reef fish permits are located in Florida, Alabama, and Texas (Table 3.4.2.1). The communities with the most charter/headboat permits are Destin, Florida (4.9% of charter/headboat permits), Panama City, Florida (4.3%), and Orange Beach, Alabama (3.8%).

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

State	Community	Charter/Headboat for Reef Fish Permits (RCG)
FL	Destin	62
FL	Panama City	55
AL	Orange Beach	48
FL	Naples	45
FL	Key West	40
FL	Pensacola	28
FL	Sarasota	21
TX	Galveston	20
FL	Clearwater	19
FL	St. Petersburg	19
TX	Corpus Christi	16
FL	Cape Coral	15
FL	Crystal River	15
FL	Fort Myers	14
FL	Gulf Breeze	14

Source: SERO permit office, March 24, 2021.

Historical captain charter/headboat permits are issued to individuals in Florida (50% of historical captain charter/headboat vessels), Louisiana (18.2%), Alabama (18.2%), Texas (9.1%), and Mississippi (4.5%, SERO permit office, March 24, 2021).

Historical captain charter/headboat for reef fish permits are held by individuals with mailing addresses in 17 communities (SERO permit office, March 24, 2021). Communities with the most historical captain permits are located in Alabama, Florida, and Louisiana (Table 3.4.2.2).

Table 3.4.2.2. Top communities by historical captain Gulf charter/headboat for reef fish permits.

State	Community
AL	Orange Beach
FL	Destin
FL	Naples
FL	Port St. Joe
LA	Houma

Source: SERO permit office, March 24, 2021.

Landings

The greatest proportion of recreational landings of red snapper are from waters adjacent to Alabama (average of 40.2%% from 2015-2019), followed by Florida (33.6%), Louisiana (13.2%) and Texas (8.9%), and Mississippi (4.1%, Table 3.4.2.3).

Table 3.4.2.3. Percentage of total recreational red snapper landings by state for 2015-2019.

Year	AL	FL	LA	MS	TX
2019	37.7%	32.8%	12.0%	6.9%	10.6%
2018	36.7%	36.8%	12.0%	4.8%	9.7%
2017	44.6%	34.7%	10.7%	3.0%	7.0%
2016	39.1%	35.3%	13.4%	5.2%	7.0%
2015	42.7%	28.2%	18.0%	0.8%	10.4%

Source: MRIP APAIS Adjusted SEFSC SEDAR 52 and SEFSC Recreational ACL Data (February 2020).

Fishing Communities

Headboat Landings

Recreational landings data are available for headboats by species and can be linked to specific communities through the homeport identified for each vessel. These data are available for headboats registered in the SRHS.

In 2019, 72 federal for-hire vessels in the Gulf were registered in the SRHS (SRHS, SERO LAPPs/Data Management database). Of these, 57 vessels landed red snapper in 2019 (Table 3.4.2.4). The majority of these headboats with red snapper landings are registered in Florida, with smaller numbers of vessels registered in the other Gulf states.

Table 3.4.2.4. Number of federal for-hire vessels in the Gulf registered in the SRHS with landings of red snapper in 2019, by state.

State	Number of Vessels
AL	9
FL	29
LA/MS	5
TX	14

Source: SEFSC SRHS (2019).

Figure 3.4.2.1 includes all Gulf communities based on a 'regional quotient' (RQ) of recreational headboat landings for red snapper. The RQ is the proportion of landings out of the total SRHS landings for that region, and is a relative measure. The top four homeports represent about 70% of the red snapper landings by vessels participating in the SRHS. Homeports with the greatest landings of red snapper include Port Aransas, Texas (27.3% of red snapper landed by SRHS vessels in 2016); Galveston, Texas (22.3%); Orange Beach, Alabama (13.2%), and Panama City

Beach, Florida (7.5%; SEFSC SRHS 2019). Other homeports represent a smaller portion of landings.

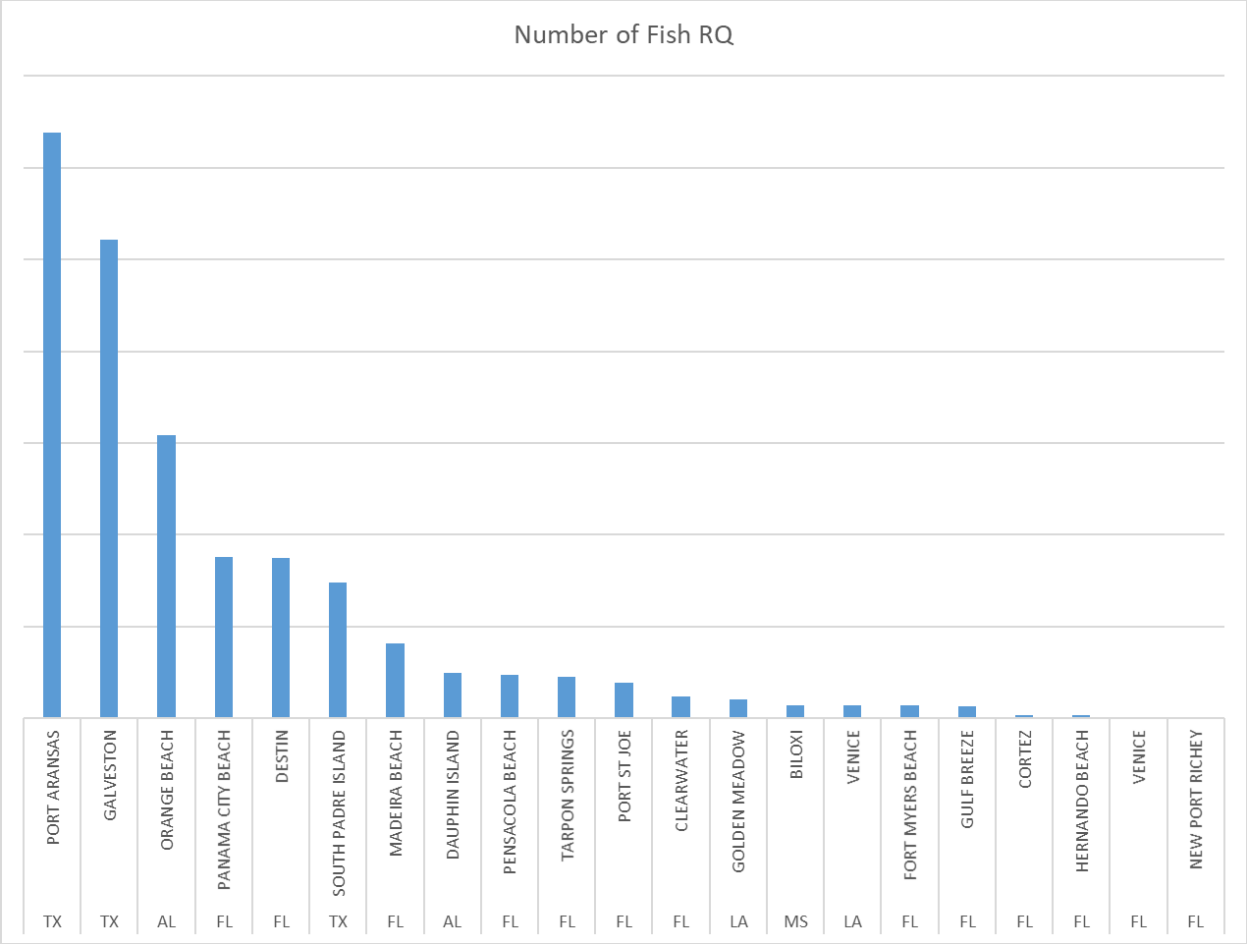

Figure 3.4.2.1. All Gulf communities ranked by number of fish landed by headboats included in the SRHS RQ for red snapper. The actual RQ values (y-axis) are omitted from the figure to maintain confidentiality.
Source: SEFSC SRHS (2019).

Engagement and Reliance Indicators

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

Figure 3.4.2.2 identifies the top Gulf communities that are engaged and reliant upon recreational fishing in general. Two thresholds of one and one-half standard deviation above the mean were plotted to help determine a threshold for significance. Communities are presented in ranked order by fishing engagement and all 20 included communities demonstrate high levels of recreational engagement, although this is not specific to fishing for lane snapper. Because the analysis used discrete geo-political boundaries, Panama City and Panama City Beach had separate values for the associated variables. Calculated independently, each still ranked high enough to appear in the top 20 list suggesting a greater importance for recreational fishing in that area.

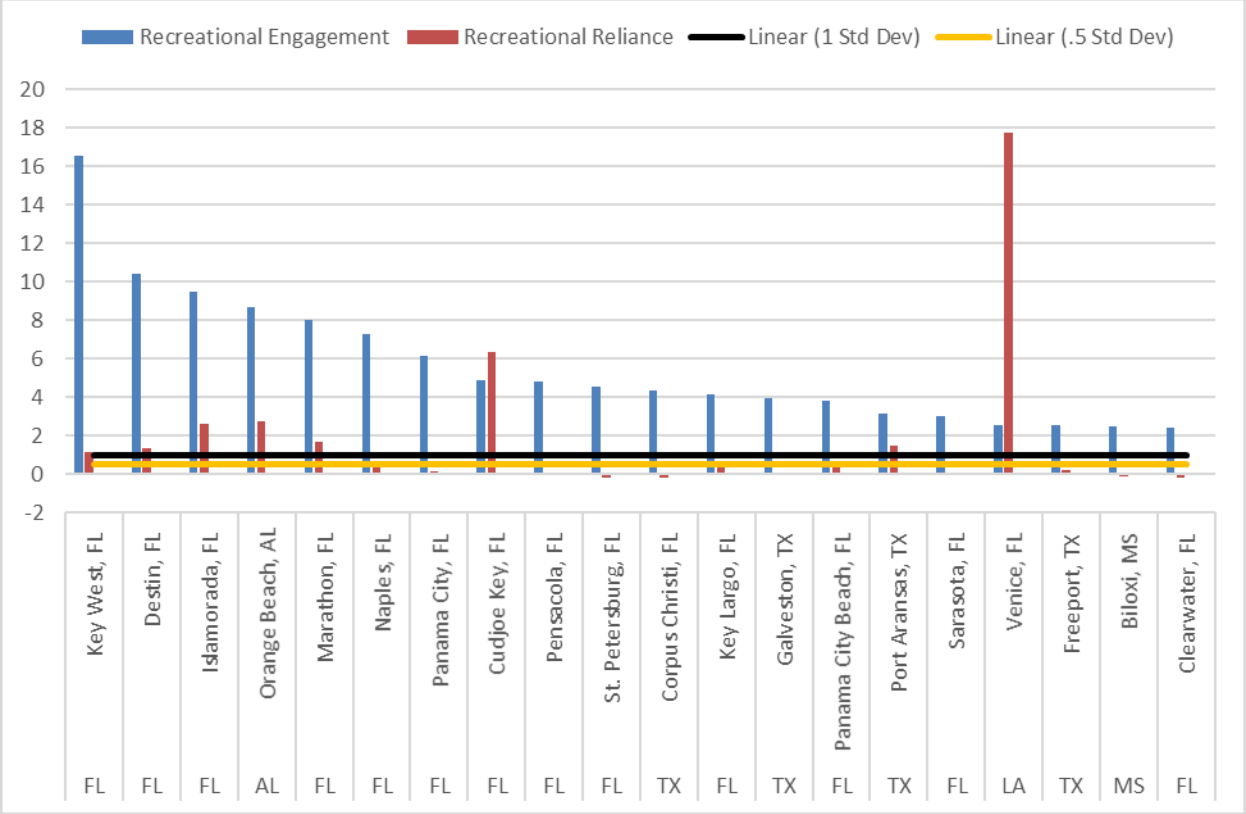

Figure 3.4.2.2. Top 20 recreational fishing communities' engagement and reliance.
Source: SERO, Community Social Vulnerability Indicators Database 2018.

3.4.3 Environmental Justice

Executive Order (E.O.) 12898 requires federal agencies conduct their programs, policies, and activities in a manner to ensure individuals or populations are not excluded from participation in, or denied the benefits of, or subjected to discrimination because of their race, color, or national origin. In addition, and specifically with respect to subsistence consumption of fish and wildlife, federal agencies are required to collect, maintain, and analyze information on the consumption patterns of populations who principally rely on fish and/or wildlife for subsistence. The main focus of E.O. 12898 is to consider "the disproportionately high and adverse human health or environmental effects of its programs, policies, and activities on minority populations and low-

income populations in the United States and its territories…" This E.O. is generally referred to as environmental justice (EJ).

Information is available concerning communities overall status with regard to minorities and poverty (e.g., census data). To help assess whether any EJ concerns may be present within regional communities, a suite of indices were 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.

Figures 3.4.3.1 and 3.4.3.2 provide the social vulnerability of the top commercial and recreational reef fish and red snapper communities. Two communities exceed the threshold of one standard deviation above the mean for all three indices, Bayou La Batre, Alabama and Freeport, Texas. Several other communities exceed the threshold of one standard deviation above the mean for any of the indices (Crystal River, Florida; Miami, Florida; Houma, Louisiana; Panacea, Florida; Golden Meadow, Louisiana; Houma, Louisiana; and Houston, Texas). These communities would be the most likely to exhibit vulnerabilities to social or economic disruption due to regulatory change.

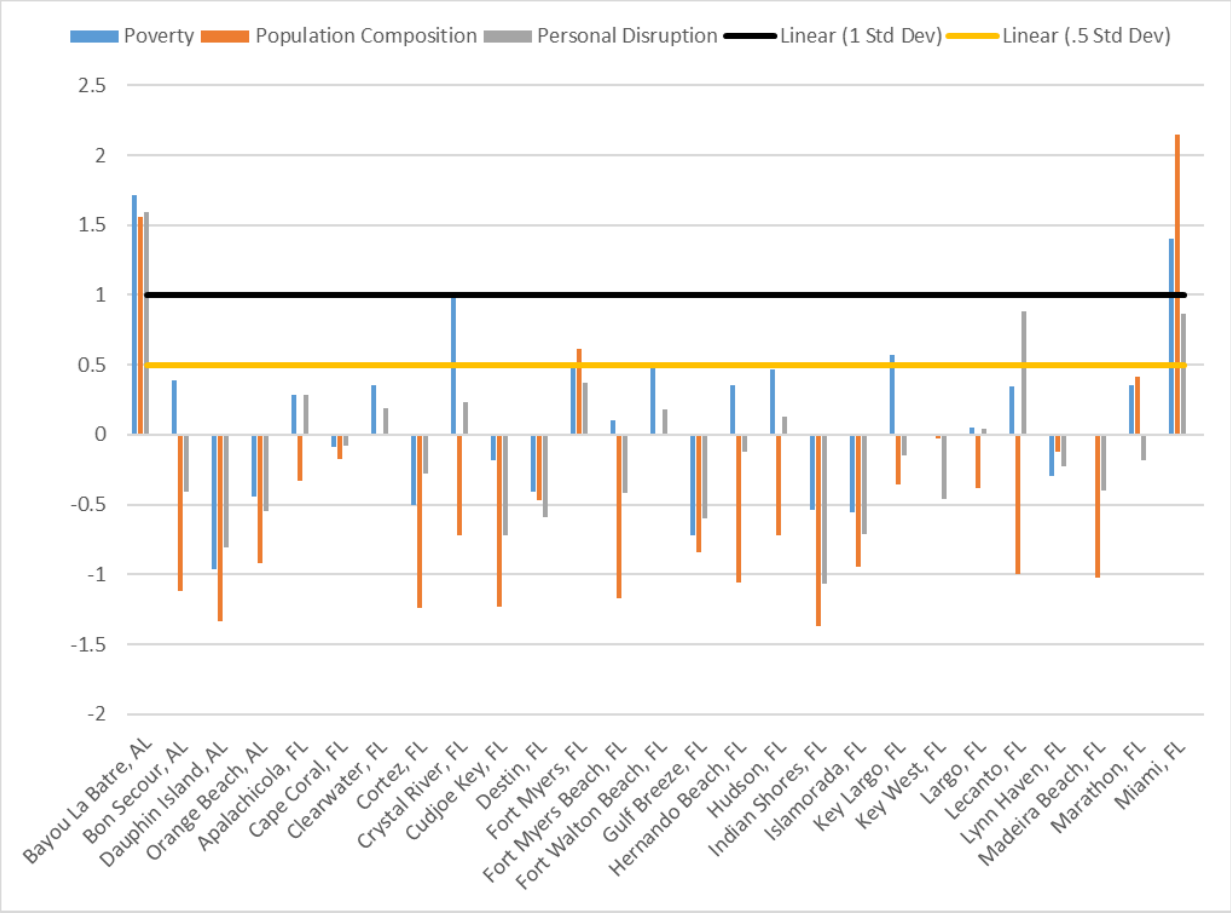

Figure 3.4.3.1. Social vulnerability indices for top commercial and recreational reef fish and red snapper communities.
Source: SERO, Community Social Vulnerability Indicators Database 2018.

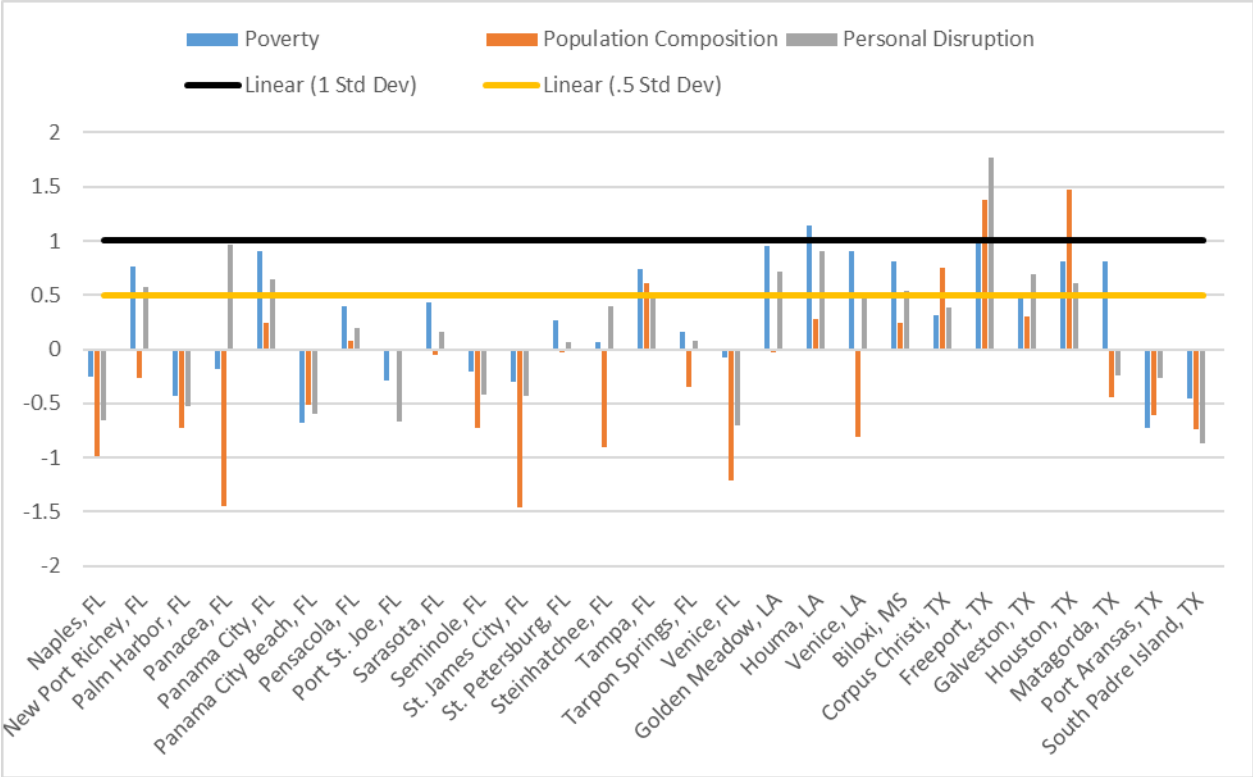

Figure 3.4.3.2. Social vulnerability indices for top commercial and recreational reef fish and red snapper communities continued.
Source: SERO, Community Social Vulnerability Indicators Database 2018.

People in these communities may be affected by fishing regulations in two ways: participation and employment. Although these communities may have the greatest potential for EJ concerns, complete data are not available on the race and income status for those involved in the local fishing industry (employment), or for their dependence on red snapper specifically (participation). Although no EJ issues have been identified, the absence of potential EJ concerns cannot be assumed.

3.5 Description of the Administrative Environment

3.5.1 Federal Fishery Management

Federal fishery management is conducted under the authority of the Magnuson-Stevens Act (16 U.S.C. 1801 *et seq*.), originally enacted in 1976 as the Fishery Conservation and Management Act. The Magnuson-Stevens Act claims sovereign rights and exclusive fishery management authority over most fishery resources within the EEZ, 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 C. 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 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 U.S. 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 Advisory Panel and the Gulf States Marine Fisheries Commission's Law Enforcement Committee, which have developed joint enforcement agreements and cooperative enforcement programs[27].

3.5.2 State Fishery Management

The purpose of state representation at the Council level is to ensure state participation in federal fishery management decision-making and to promote the development of compatible regulations in state and federal waters. The state governments of Texas, Louisiana, Mississippi, Alabama, and Florida have the authority to manage their respective state fisheries. Each of the five 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 in Amendment 22 (GMFMC

[27] www.gsmfc.org

2004b). Descriptions of individual state management and data collection programs can be found at the Web Pages shown in Table 3.5.2.1.

Table 3.5.2.1. Gulf state marine resource agencies and web pages.

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

3.5.2.1 Red Snapper Management

Recreational Sector

The private angling component's fishing seasons for red snapper were set by the states under exempted fishing permits in 2018 and 2019, a permit type issued by NMFS. The states are now responsible for establishing some management measures (i.e., fishing seasons, bag limits, size limits; these may vary by state and year) for the private angling component's harvest of red snapper (Amendment 50A; GMFMC 2019a) for 2020 and subsequent years. In-season quota monitoring for the private angling component is performed by the states, with the states being responsible for closing the waters adjacent to their state once the state's ACL has been projected to be met. 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 exclusive economic zone (EEZ). However, anglers aboard these vessels must either be federally registered or licensed in states that have a system to provide complete information on the states' saltwater anglers to the national registry.

The for-hire component of the recreational sector in the Gulf is managed by NMFS. In 2015, the for-hire component was given a separate quota from the private angling component (GMFMC 2014a); consequently, the duration of the for-hire fishing season may vary from the season durations for the private angling component as specified by each Gulf state. Presently, the for-hire component's fishing season begins on June 1, and closes when the component's annual catch target is predicted to be harvested (see Section 1.3 for more information on for-hire quota monitoring). Any for-hire fishing vessel that takes anglers into the Gulf EEZ where anglers 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. Since 2003, there has been a moratorium on the issuance of new federal reef fish for-hire permits. This means that participation in the federal for-hire component is capped; no additional federal permits are available. 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, only federally permitted headboats are required to submit harvest and effort information to NMFS Southeast Region Headboat Survey (SRHS). Participation in the SRHS is based on determination by the Southeast Fishery Science Center (SEFSC) that the vessel primarily

operates as a headboat. Most charter vessel trips occurred in the exclusive economic zone and targeted rig-reef species (i.e., snappers and groupers; Savolainen et al. 2012).

Commercial Sector

The commercial sector for red snapper in the Gulf is managed under an individual fishing quota (IFQ) program administered through the Southeast Regional Office (SERO) NMFS. Primary commercial gear types in the fishery are vertical lines (handlines and bandit gear) and bottom longlines. Commercial operators harvesting reef fish from the Gulf (EEZ) must have a Gulf reef fish permit, which is a limited access permit. Only vessels with a valid Gulf reef fish permit can harvest reef fish in the Gulf EEZ, and those that use bottom longline gear in the Gulf EEZ east of 85º30'W. longitude must also have a valid Eastern Gulf longline endorsement. In addition to these restrictions, operators of reef fish fishing vessels who want to harvest red snapper must participate in the red snapper IFQ program. 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.

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