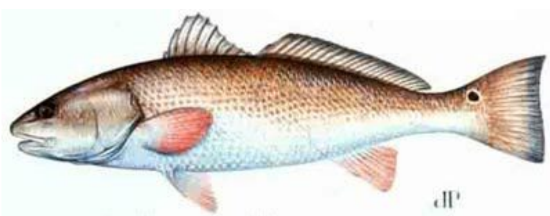
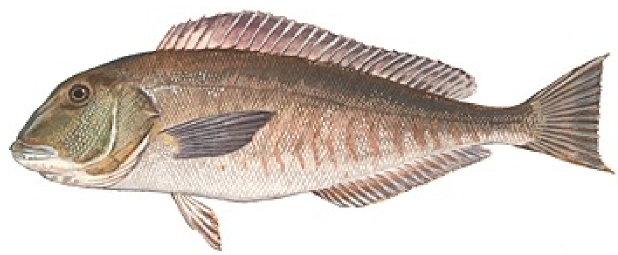
Tab E, No. 5
1/17/2020

Status Determination Criteria and Optimum Yield for Reef Fish and Red Drum





Public Hearing Draft
Amendment 48 to the Reef Fish Fishery Management Plan
Amendment 5 to the Red Drum Fishery Management Plan

January 2020

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ENVIRONMENTAL ASSESSMENT COVER SHEET

Name of Action

Status Determination Criteria and Optimum Yield for Reef Fish and Red Drum, Amendment 48 to the Reef Fish Fishery Management Plan and Amendment 5 to the Red Drum Fishery Management Plan.

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Type of Action

( ) Administrative
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( ) Final

Summary/Abstract

ABBREVIATIONS USED IN THIS DOCUMENT

ABC	Acceptable biological catch
ACL	Annual catch limit
ACT	Annual catch target
AM	Accountability measures
B	Biomass
B_{MSY}	Stock biomass level capable of producing an equilibrium yield of MSY
Council	Gulf of Mexico Fishery Management Council
DLM	Data Limited Method
DLMTool	Data Limited Methods Tool
EA	Environmental Assessment
EEZ	Exclusive Economic Zone
EIS	Environmental impact statement
ESA	Endangered Species Act
F	Instantaneous rate of fishing mortality
F_{MAX}	Fishing mortality rate corresponding to maximum yield-per-recruit
F_{MSY}	Fishing mortality rate corresponding to an equilibrium yield of MSY
F_{OY}	Fishing mortality rate corresponding to an equilibrium yield of OY
F_{PROXY}	Fishing mortality rate corresponding to an MSY proxy
$F_{REBUILD}$	Fishing mortality rate corresponding to a stock rebuilding plan
$F_{x\%\ SPR}$	Fishing mortality corresponding to an x percent spawning potential ratio
FMP	Fishery Management Plan
FRFA	Final Regulatory Flexibility Analysis
Gulf	Gulf of Mexico
IFQ	Individual Fishing Quota
IRFA	Initial regulatory flexibility analysis
M	Mortality
Magnuson-Stevens Act	Magnuson-Stevens Fishery Conservation and Management Act
MFMT	Maximum fishing mortality threshold
MSST	Minimum stock size threshold
MSY	Maximum sustainable yield
NMFS	National Marine Fisheries Service
NS1	National Standard 1 guidelines
OFL	Overfishing level
OY	Optimum yield
Reef Fish FMP	Fishery Management Plan for the Reef Fish Resources in the Gulf of Mexico
RFA	Regulatory Flexibility Act of 1980
RIR	Regulatory impact review
SDC	Status determination criteria
Secretary	Secretary of Commerce
SEDAR	Southeast Data, Assessment and Review
SEFSC	Southeast Fisheries Science Center
SEIS	Supplemental environmental impact statement

SFA	Sustainable Fisheries Act
South Atlantic Council	South Atlantic Fishery Management Council
SSB	Spawning stock biomass
SSBR	Spawning stock biomass per recruit
SSC	Scientific and Statistical Committee
SPR	Spawning potential ratio
TAC	Total allowable catch

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CHAPTER 1. INTRODUCTION

1.1 Background

The Magnuson-Stevens Fishery Conservation and Management Act (Magnuson-Stevens Act) requires the National Marine Fisheries Service (NMFS) and the Regional Fishery Management Councils to end overfishing, rebuild overfished stocks, and achieve, on a continuing basis, the optimum yield (OY) from federally managed fish stocks. These mandates are intended to ensure fishery resources are managed for the greatest overall benefit to the nation, particularly with respect to providing food production, recreational opportunities, and protecting marine ecosystems.

Status Determination Criteria and Biological Reference Points

The National Standard 1 (NS1) guidelines require that each fishery management plan (FMP) describe objective and measurable criteria to determine overfishing and overfished status for each stock or stock complex, including a minimum stock size threshold (MSST) and maximum fishing mortality threshold (MFMT) or an overfishing limit (OFL), collectively known as status determination criteria (SDC). These thresholds represent the point at which a stock is determined to be overfished (MSST) or experiencing overfishing (MFMT or OFL). The FMP must also specify a maximum sustainable yield (MSY) or proxy, and an optimum yield (OY) for each stock or stock complex.

Catch Level Reference Points

MSY and OY are long-term average catch levels. They are usually measured in terms of biomass (pounds) caught but could be measured in terms of numbers of fish caught. MSY is the largest, long-term average catch that can be taken from a stock or stock complex under prevailing ecological and environmental conditions, fishery technology characteristics, and the distribution of catch among fleets. OY is a long-term average catch level based on MSY as reduced by any relevant economic, social, or ecological factors. Therefore, OY cannot exceed MSY. A proxy may be used when data are insufficient to estimate MSY directly. The most common proxy is a yield that will allow the stock to maintain a certain level of egg production or spawning potential ratio (SPR). Other proxies are described in Appendix B.

Stock Biomass Reference Points

A biomass reference point measures how many fish are left in the water rather than how many fish are caught. This can be measured in terms of biomass (e.g., pounds left in the water), numbers of fish, or the expected egg production from the spawning stock biomass (SSB) of the adult stock. The long-term average size of a stock that results from harvesting at the MSY level is called the biomass at MSY (B_{MSY}). If the stock level falls below B_{MSY}, it cannot sustain harvest at the MSY level without further depletion. However, biomass may fluctuate over time, due to changes in environmental conditions, recruitment to the stock, or other variables. Because of these natural fluctuations, a stock is not considered to be overfished until it drops to some level further below B_{MSY}. This is the MSST level. The Gulf of Mexico Fishery Management

Council (Council) has broad latitude in deciding how far the MSST can be set below B_{MSY}, except that is the MSST cannot be set below 50% of B_{MSY}. The wider the gap between B_{MSY} and MSST, the less likely a stock is to be declared overfished, but the more difficult it may be to rebuild the stock back to B_{MSY}. The narrower the gap between B_{MSY} and MSST, the more likely a stock is to be declared overfished, but the less difficult it may be to rebuild the stock. If MSST is set too close to B_{MSY}, natural fluctuations may cause the stock to enter an overfished condition even if the stock or stock complex is well-managed.

Minimum Stock Size Threshold (overfished)

Minimum stock size threshold (MSST) is the biomass level that a stock can decline to before being declared overfished (stock abundance is too low), requiring a rebuilding plan. MSST is usually expressed as a percentage of the biomass level at MSY or MSY proxy.

A narrower buffer is more likely to trigger an overfished determination, but if triggered, less restrictive regulations would be needed during the rebuilding plan.

Narrower buffer

$0.75*B_{MSY}$

$0.50*B_{MSY}$

Wider buffer

A wider buffer is less likely to trigger an overfished determination, but if triggered, more restrictive regulations would likely be required during the rebuilding plan.

Fishing Mortality Rate Reference Points

MSY, OY, and MSST are all considered to be biomass reference points that refer to either the amount of fish harvested (MSY and OY) or the amount of fish left in the ocean. In contrast, fishing mortality (F) and MFMT refer to rates of removal of fish by fishing.[1]

The F_{MSY} is the fishing mortality rate that, if applied over the long-term, would result in harvesting the MSY. The fishing mortality rate above which overfishing is occurring is MFMT. MFMT is also the fishing mortality rate that results in catching the OFL level on an annual basis. For this reason, exceeding the OFL is also considered overfishing. MFMT cannot be set higher

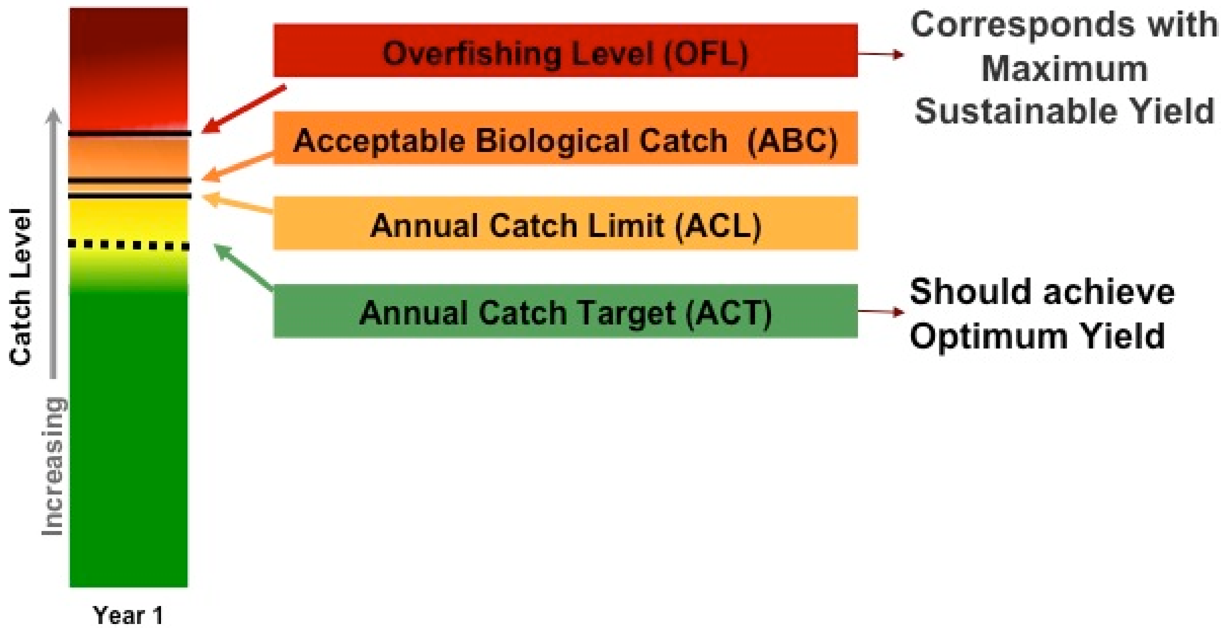
[1] Think of your car's dashboard. The speedometer tells you your rate of travel (e.g. 50 miles per hour), but does not tell you how far you have travelled. An odometer tells you how far you have travelled, but not the rate of travel. The speedometer and odometer are therefore analogous to fishing mortality rates and biomass levels, respectively.

than F_{MSY}, and is often set equal to F_{MSY}. However, under some conditions it may be necessary to set it at a more conservative level. For example, an overfished stock that is required to be rebuilt in a certain number of years may require a maximum fishing mortality rate less than F_{MSY} in order to reach its rebuilding target.

Long-term vs. Annual Reference Points

Once calculated, the MSY and OY reference points do not change unless some new information about the productivity of the stock is identified, or the Council modifies the MSST or MFMT. On the other hand, the OFL, acceptable biological catch (ABC), annual catch limit (ACL), and annual catch target (ACT) are annual catch levels that may change from year to year depending upon the stock condition. The ABC, ACL, and ACT are all based on OFL (Figure 1.1.1); whereas, OY, B_{MSY}, and MSST are all based on MSY.

Figure 1.1. Description of annual reference points used to set harvest limits.



The OFL is the catch level that results from fishing at the MFMT rate. If MFMT is set equal to F_{MSY}, then OFL is the annual catch when fishing at F_{MSY}, and can be considered an annualized MSY. If the stock biomass level is higher than B_{MSY} (which can occur if fishing pressure has been relatively light or if a strong spawning year-class has entered the fishery), then OFL will be higher than the long-term MSY, but will gradually be reduced as the stock is fished down to its B_{MSY} level.

The Council currently has MFMT and OFL defined for all stocks or complexes. However, MSY proxies, MSST, and OY are defined for some, but not all, reef fish stocks and not for red drum. The Generic Sustainable Fisheries Act Amendment (GMFMC 1999) established fishing mortality-based reference points for all stocks, but the proposed biomass reference points were not approved by NMFS. Reference points were subsequently adopted in plan amendments for some stocks as other management changes were needed.

The actions in this amendment are intended to establish reference points where they do not currently exist, and in some cases to consider modifying existing reference points. To comply with the Magnuson-Stevens Act and NS1 guidelines, and to provide measurable reference points for determining overfished and overfishing status, MSY proxies, MFMT, MSST, and OY must be established for all stocks. Several reef fish stocks have these values defined, which are shown in Table 1.1.1. For other reef fish stocks and stock complexes, they remain undefined and are addressed in Actions 1-4.

For some reef fish stocks, the South Atlantic Fishery Management Council (South Atlantic Council) has established MSY proxies, MSST, and OY for four stocks that occur in both Councils' jurisdictions (Table 1.1.2). All of the status determination criteria defined for these single stocks apply to the stock throughout its range, with the exception of the OY definitions that only apply to the South Atlantic Council's jurisdictional apportionment of black grouper, mutton snapper, and yellowtail snapper.

Table 1.1.1. Stocks with Status Determination Criteria assigned.

Stock	MSY	MFMT	MSST*	OY	Source
Gag	Yield at F_{MAX}**	F_{MAX}**	0.50*B_{MAX}**	Yield at 75% of F_{MAX}**	Amendment 30B (GMFMC 2008a)
Red grouper	Yield at $F_{30\% SPR}$	$F_{30\% SPR}$	0.50* $B_{30\% SPR}$	Yield at 75% of F_{MSY}	Secretarial Amendment 1 (GMFMC 2004a)
Red snapper	Yield at $F_{26\% SPR}$	$F_{26\% SPR}$	0.50*B_{MSY}	Yield at 75% of $F_{26\% SPR}$	Amendment 22 (GMFMC 2004b) Amendment 27 (GMFMC 2007)
Vermilion snapper	Yield at $F_{30\% SPR}$	$F_{30\% SPR}$	0.50*$B_{30\% SPR}$	Yield at 75% of $F_{30\% SPR}$	Amendment 23 (GMFMC 2004c) Amendment 47 (GMFMC 2017a)
Gray triggerfish	Yield at $F_{30\% SPR}$	$F_{30\% SPR}$	0.50*$B_{30\% SPR}$	Yield at 75% of $F_{30\% SPR}$	Amendment 30A (GMFMC 2008b)
Greater amberjack	Yield at $F_{30\% SPR}$	$F_{30\% SPR}$	0.50*$B_{30\% SPR}$	Yield at $F_{40\% SPR}$	Secretarial Amendment 2 (GMFMC 2002)
Hogfish	Yield at $F_{30\% SPR}$	$F_{30\% SPR}$	0.50*$B_{30\% SPR}$	Yield at $F_{20\% SPR}$	Amendment 1 (GMFMC 1989) Amendment 43 (GMFMC 2016)
Gray Snapper* **	Yield at $F_{26\% SPR}$	$F_{26\% SPR}$	0.50*$B_{26\% SPR}$	Yield at 90% of $F_{26\% SPR}$	Amendment 51 (GMFMC 2019)

* MSST was set equal to 0.50*$B_{MSY\ proxy}$ in Amendment 44 (GMFMC 2017b).
** F_{MAX} and B_{MAX} refer to the fishing mortality rate and biomass level that produce maximum yield-per-recruit.
*** Status determination criteria noted for gray snapper were selected in Reef Fish Amendment 51 (GMFMC 2019) that was approved by the Council and transmitted to NMFS in November 2019.

Table 1.1.2. Stocks assessed across both Councils' jurisdictions with Status Determination Criteria assigned by the South Atlantic Council.

Stock	MSY	MFMT	MSST	OY	Source
Black Grouper	Yield at $F_{30\%\ SPR}$	$F_{30\%\ SPR}$	$0.75*SSB_{30\%\ SPR}$	ACL = OY = ABC	Amendment 11 (SAFMC 1998) Amendment 21 (SAFMC 2014) Amendment 25 (SAFMC 2011)
Mutton Snapper	Yield at $F_{30\%\ SPR}$	$F_{30\%\ SPR}$	$0.75*SSB_{30\%\ SPR}$	ACL = OY = ABC	Amendment 11 (SAFMC 1998) Amendment 41 (SAFMC 2017)
Yellowtail Snapper	Yield at $F_{30\%\ SPR}$	$F_{30\%\ SPR}$	$0.75*SSB_{30\%\ SPR}$	ACL = OY = ABC	Amendment 11 (SAFMC 1998) Amendment 15 (SAFMC 2013) Amendment 21 (SAMFMC 2014)
Goliath Grouper	Yield at $F_{40\%\ SPR}$	$F_{40\%\ SPR}$	[(1-M) or 0.5 whichever is greater]*B_{MSY} M=0.12	$F_{50\%\ SPR}$	Amendment 11 (SAFMC 1998)

Traditionally, management measures have been implemented using MSY proxies in species-specific stock assessments. However, red drum and many of the stocks in the FMP for the Reef Fish Resources in the Gulf of Mexico (Reef Fish FMP) have not had stock assessments and are unlikely to be assessed in the near future. In these cases, the National Standard 1 (NS1) guidelines allow an MSY proxy to be assigned to a stock complex under certain conditions. A stock complex is defined as a group of stocks that are sufficiently similar in geographic distribution, life history, and vulnerabilities to the fishery such that the impact of management actions on the stocks is similar. Stocks may be grouped into complexes for various reasons, including where stocks in a multispecies fishery cannot be targeted independent of one another and MSY cannot be defined on a stock-by-stock basis; where there are insufficient data to measure their status relative to SDC; or when it is not feasible for fishermen to distinguish individual stocks among their catch. The Generic ACL/Accountability Measures (AM) Amendment defined the five stock complexes listed in Table 1.1.3 (GMFMC 2011). Farmer et al. (2010) conducted an analysis to develop a scientific basis for defining multiple stocks for management purposes and a variety of life history parameters, landings data, and depth and area fished information were utilized from a large number of fishery independent and fishery-dependent data sources for the analysis. An ACL, AM, and OFL are established for each stock complex.

Table 1.1.3. Stock complexes and possible indicator species

Stock Complex	Species
Tilefishes	Tilefish (Golden) Blueline Tilefish Goldface Tilefish
Other Shallow-water Grouper	Black Grouper Scamp Yellowmouth Grouper Yellowfin Grouper
Deep-water Grouper	Yellowedge Grouper Warsaw Grouper Snowy Grouper Speckled Hind
Jacks	Lesser Amberjack Almaco Jack Banded Rudderfish
Mid-water Snappers	Silk Snapper Wenchman Blackfin Snapper Queen Snapper

Maximum Sustainable Yield Proxy

Maximum sustainable yield (MSY) is the theoretical maximum largest average amount of fish that can be caught each year on a continuing basis. MSY can rarely be calculated with accuracy, so a proxy that can be more readily calculated is typically used to represent a sustainable level of harvest.

Maximum Fishing Mortality Threshold (Overfishing)

Maximum fishing mortality threshold (MFMT) is the rate of fishing mortality above which a stock is declared to be experiencing overfishing (fish are being removed at too rapid a rate). MFMT is also the fishing mortality rate that results in catching the OFL level on an annual basis. MFMT may not exceed the rate of fishing associated with MSY or the MSY proxy.

Optimum Yield

Optimum yield (OY) is a level of harvest that is based on MSY as reduced by any relevant economic, social, or ecological factors and accounts for the protection of marine ecosystems, and in the case of an overfished fishery, provides for rebuilding to a level consistent with producing the MSY or MSY proxy.

Spawning Potential Ratio (SPR)

Spawning potential ratio (SPR) assumes that a certain amount of fish must survive and spawn in order to replenish the stock. It is calculated as the average number of eggs per fish over its lifetime when the stock is fished, compared to the average number of eggs per fish over its lifetime when the stock is not fished. The optimum SPR is dependent upon life history of the species, but in general, SPRs of 20% to 40% are considered sustainable.

1.2 Purpose and Need

The purpose of this action is to establish or modify MSY proxies, MFMT, MSST, and OY that are consistent with the current NS1 guidelines for stocks in the Reef Fish and Red Drum FMPs.

The need is to have biological reference points that can be used for determining status of the stocks or stock complexes.

1.3 History of Management

This history of management covers events pertinent to the development of status determination criteria for reef fish and red drum in the Gulf. A complete history of management for the Reef Fish FMP is available on the Council's website[2].

1.3.1 Reef Fish Amendments – Status Determination Criteria

The Reef Fish FMP (with its associated environmental impact statement [EIS]) was implemented in November 1984. The management objectives included, "Rebuild the declining reef fish stocks wherever they occur within the fishery." The FMP defined MSY as 51 million pounds for all snappers and groupers combined, and 500,000 lbs for all sea basses combined. The OY was defined as 45 million pounds for all snappers and groupers combined, and 500,000 lbs for all sea basses combined.

Amendment 1 (with its associated environmental assessment (EA), regulatory impact review (RIR), and regulatory flexibility analysis (RFA)) to the Reef Fish FMP, implemented in 1990, had a primary objective to stabilize long-term population levels of all reef fish species by establishing a spawning age survival rate to achieve at least 20% spawning stock biomass per recruit (SSBR), relative to the SSBR that would occur with no fishing. This stock level was to be achieved for each stock in need of rebuilding by January 1, 2000. This amendment also revised the definition of OY to allow specification at the species level, and implemented a framework procedure to allow for annual management changes in the reef fish fishery.

Amendment 3 (with its associated EA and RIR), implemented in July 1991, revised the target for stock rebuilding from 20% SSBR to 20% SPR, a more general term that allowed the stock status to be expressed in terms of total adult fish biomass (number alive x average weight), gonad biomass (number alive x average gonad weight), or eggs produced (number alive x average number of eggs spawned) for each age-class of fish. The amendment also changed the target date for rebuilding red snapper from January 1, 2000 to January 1, 2007 because the original target date was unattainable for red snapper, and it provided additional flexibility in the annual framework procedure for specifying total allowable catch (TAC) by allowing the target date for rebuilding an overfished stock to be changed depending on changes in scientific advice, except that the rebuilding period cannot exceed 1.5 times the generation time of the species under consideration.

[2] http://gulfcouncil.org/fishery-management/implemented-plans/reef-fish/

Amendment 11 (with its associated EA and RIR), implemented in January 1996, included revision to dealer and vessel permit requirement and to fish trap endorsements. It also included three proposed measures that were disapproved by NMFS. These included: 1) a proposed redefinition of OY; 2) use of ABC range for specification of TAC; and 3) re-specification of the Generation Time Multiplier for the Recovery periods. In April 1997, the Council resubmitted the disapproved measure for specifying OY with a proposal that OY be defined as a yield level that would result in at least 30% SPR. NMFS disapproved the resubmission on May 4, 1998 on the basis that, for the grouper species, some of which change sex or for which biological information was currently unavailable, an OY based on 40% SPR was more appropriate than one base on 30% SPR [63 FR 24522].

Amendment 22 (with its associated supplemental environmental impact statement (SEIS), RIR, and IRFA, implemented July 5, 2005 revised the red snapper rebuilding plan. It set the Sustainable Fisheries Act (SFA) parameters MSY, OY, MFMT, and MSST for red snapper, and sets bycatch reporting methodologies for the permitted reef fish fisheries.

Amendment 23 (with its associated SEIS, RIR, and RFA), implemented July 8, 2005, established a rebuilding plan for vermilion snapper, and set the SFA parameters (MSY, OY, MFMT, and MSST) for vermilion snapper. For MSY, no proxy was selected. MSY for vermilion snapper was set at the yield associated with the assessment calculation of F_{MSY} when the stock is at equilibrium, estimated to be 3.37 mp whole weight. MFMT was set equal to F_{MSY}, and MSST was set (1-M)*B_{MSY} (where M = 0.15). OY was set at the yield when fishing at 75% of F_{MSY}, which was estimated to be approximately 94% of MSY, except that, during rebuilding, allowable harvest for each year based on the rebuilding strategy.

Amendment 27 implemented February 28, 2008, except for reef fish bycatch reduction measures that became effective on June 1, 2008. This amendment addressed overfishing and revised the stock rebuilding for red snapper. It changed the MSY proxy for red snapper to be yield when fishing at $F_{26\%\ SPR}$. It also required the use of non-stainless steel circle hooks when using natural baits to fish for Gulf reef fish, and required the use of venting tools and dehooking devices when participating in the commercial or recreational reef fish fisheries effective June 1, 2008.

Amendment 30A (with its associated SEIS, RIR, and RFA), implemented August 2008, revised the greater amberjack rebuilding plan and established a rebuilding plan for gray triggerfish. For gray triggerfish, it set the MSY proxy as the yield associated with $F_{30\%\ SPR}$, set MFMT equal to $F_{30\%\ SPR}$, set MSST equal to (1-M)*SSB_{MSY}, and set OY as the yield associated with 75% of F_{MSY} when the stock is at equilibrium.

Amendment 30B (with its associated final EIS, RIR, and IRFA), implemented August 2008, contained measures to end overfishing of gag and revise red grouper management measures. For gag, it set status determination criteria based on maximum-yield-per-recruit. The MSY proxy was the yield when fishing at a rate corresponding to maximum-yield-per-recruit (F_{MAX}). MFMT was set equal to F_{MAX}, and MSST was set at (1-M)*SSB_{MAX} (where M = 0.15). The OY was set at the yield at 75% of F_{MAX}.

Amendment 43 (with its associated EA, RIR, and RFA), implemented August 24, 2017, defined the geographical boundaries for Gulf stock of hogfish. It set the MSY proxy for hogfish at the equilibrium yield at $F_{30\%\ SPR}$, MFMT at $F_{30\%\ SPR}$, and MSST at 75% of the spawning stock biomass when fishing at $F_{30\%\ SPR}$,

Amendment 44 (with its associated EA), was approved on December 21, 2017 (there was no rulemaking associated with this amendment, and therefore no implementation date). The amendment re-defined MSST for seven reef fish species: gag, red grouper, red snapper, vermilion snapper, gray triggerfish, greater amberjack, and hogfish. For these stocks, MSST was re-defined to be 50% of the B_{MSY} proxy.

Amendment 51 (with its associated EA), was transmitted to National Marine Fisheries Service on November 15, 2020. This Amendment establishes a Maximum Sustainable Yield proxy, Minimum Stock Size Threshold, and Optimum Yield for Gray Snapper. This Amendment also modifies the Maximum Fishing Mortality Threshold and the Annual Catch Limits for gray snapper. The MSY proxy was the yield associated with $F_{26\%\ SPR}$. The MSST was defined to be 50% of the B_{MSY} proxy.

Secretarial Amendments

Section 304(c)(1) and Section 304 (e)(5) of the Magnuson-Steven Act provides for circumstances under which the Secretary of Commerce (Secretary) may prepare a fishery management plan or amendment. The following amendments have been developed as Secretarial Amendments to the Reef Fish FMP in conjunction with the Council.

Secretarial Amendment 1, including an EA, RIR, and Final Regulatory Flexibility Analysis (FRFA), implemented in July 2004, established MSY, F_{msy}, MFMT, SSB_{msy}, MSST, and OY for the U.S. Gulf red grouper stock.

Secretarial Amendment 2, including EA, RIR, and RFA, was submitted to NMFS in November 2002, and implemented on June 17, 2003. It specified MSY, OY, MFMT, and MSST levels for greater amberjack in compliance with the Magnuson-Stevens Act, and established a rebuilding plan for greater amberjack based on 3-year intervals. The MSY proxy was the yield associated with $F_{30\%\ SPR}$. OY was set at the yield associated with an $F_{40\%\ SPR}$ when the stock is at equilibrium. MFMT was set at $F_{30\%\ SPR}$, and MSST was set at $(1\text{-}M)^*B_{MSY}$ (where $M = 0.25$).

1.3.2 Red Drum History Amendments – Status Determination Criteria

A **Secretarial FMP for the Red Drum Fishery of the Gulf of Mexico** (with its associated EA and RIR) was implemented December 19, 1986. It prohibited directed commercial harvest of red drum from the exclusive economic zone (EEZ) for 1987. The FMP provided for a recreational bag limit of one fish per person per trip, and an incidental catch allowance for commercial net and shrimp fishermen. It established an escapement goal of 20% of juvenile red drum to the offshore spawning stock. MSY was defined as the combination of inshore and offshore fishing mortality rates which maximizes the yield-per-recruit times present inshore recruitment, subject to the constraint that spawning stock biomass per recruit is no less than 30% of what it would be if there were no exploitation. Inshore equilibrium yield was estimated to be 10.2 million pounds, but the overall range of MSY estimates was between 6.1 million pounds and 63.2 million pounds.

Amendment 2, implemented in 1988, prohibited retention and possession of red drum from the EEZ. Overfishing was defined as a fishing mortality that prohibits attaining the spawning stock goal or threshold which is currently set at a 20 percent SSBR ratio. OY was defined as all red drum recreationally and commercially harvested from state waters landed consistent with state laws and regulations, under a goal of allowing 30 percent escapement of the juvenile population. In addition, all red drum commercially or recreationally harvested from the Primary Area of the EEZ under the TAC level and allocations specified under the provisions of the FMP, and a zero-retention level from the Secondary Areas of the EEZ. A Southeast Fisheries Science Center (SEFSC) Stock Assessment report (Goodyear 1988) indicated the SSBR would likely decline to 13%. The 1989 Stock Assessment Panel report recommended ABC for the EEZ be maintained at zero, and that the states increase escapement to 30%.

1.3.3 Generic Amendments – Status Determination Criteria

Generic Sustainable Fisheries Act Amendment (with its associated EA, RIR, and IRFA), partially approved and implemented in November 1999, set the MFMT) for most reef fish stocks at $F_{30\%\ SPR}$. Estimates of MSY, MSST, and OY were disapproved because they were based on SPR proxies rather than biomass based estimates.

The **Generic ACL/AM Amendment** addressed a requirement in the Reauthorized Magnuson-Stevens Act of 2006 to establish Annual Catch Limits and Accountability Measures for federally managed species. The amendment also established five stock complexes and to allows the annual catch limits and management measures to be applied on the complex.

1.3.4 South Atlantic Amendments – Status Determination Criteria

Comprehensive Sustainable Fisheries Act
Amendment 11, implemented in 1999 established and MSY Proxy for goliath and Nassau grouper = 40% static SPR; all other species = 30% static SPR; OY: hermaphroditic groupers = 45% static SPR; goliath and Nassau grouper = 50% static SPR; all other species = 40% static SPR. Defined MFMT for goliath grouper as $F_{40\%\ SPR}$ and established MSST = [(1-M) or 0.5 whichever is greater]*B_{MSY}.

Regulatory Amendment 21 redefined the overfished threshold for red snapper, blueline tilefish, gag, black grouper, yellowtail snapper, vermilion snapper, red porgy, and greater amberjack. The current definition of the MSST for these species, which is used to determine if a species is overfished, is function of the natural mortality rate (M). MSST equals SSB_{MSY}*(1-M or 0.5, whichever is greater), where SSB_{MSY} is the biomass when the stock is at the MSY level and considered to be rebuilt.

Regulatory Amendment 13 Modified the existing specification of OY and the ACL for yellowtail snapper in the South Atlantic.

Amendment 25 Comprehensive Annual Catch Limit Amendment was implemented in 2012. This Amendment established ABC control rules, ABCs, ACLs, and AMs for species not undergoing overfishing; removed some species from South Atlantic Fishery Management Unit and designated others as ecosystem component species; specified allocations between the commercial and, recreational sectors for species not undergoing overfishing; limited the total mortality for federally managed species in the South Atlantic to the ACLs.

CHAPTER 2. MANAGEMENT ALTERNATIVES

2.1 Action 1 - Maximum Sustainable Yield (MSY) Proxies

Alternative 1: No Action. The MSY proxy for stocks or complexes that do not have an MSY proxy will remain undefined.

Alternative 2: For stocks or complexes that do not have an MSY proxy, the MSY proxy is the yield when fishing at:

Option 2a: the yield when fishing at 20% spawning potential ratio ($F_{20\%\ SPR}$).

Option 2b: the yield when fishing at 30% spawning potential ratio ($F_{30\%\ SPR}$).

Option 2c: the yield when fishing at 40% spawning potential ratio ($F_{40\%\ SPR}$).

Alternative 3: For goliath grouper, the MSY proxy is the yield when fishing at:

Option 3a: the yield when fishing at 30% spawning potential ratio ($F_{30\%\ SPR}$).

Option 3b: the yield when fishing at 40% spawning potential ratio ($F_{40\%\ SPR}$).

Option 3c: the yield when fishing at 50% spawning potential ratio ($F_{50\%\ SPR}$).

Alternative 4: For red drum, the MSY proxy is the yield when fishing at:

Option 4a: the yield that provides for an escapement rate of juvenile fish to the spawning stock biomass (SSB) equivalent to 30% of those that would have escaped had there been no inshore fishery.

Option 4b: the yield when fishing at 30% spawning potential ratio ($F_{30\%\ SPR}$).

Alternative 5: For future assessments of reef fish stocks and red drum, the MSY proxy equals the yield produced by F_{MSY} or F_{Proxy} recommended by the Gulf of Mexico Fishery Management Council's (Gulf Council) Scientific and Statistical Committee (SSC) and subject to approval by the Gulf Council through a plan amendment.

*Note: **Alternatives 2-5** can be selected concurrently.

Discussion:

Stocks need an estimate of MSY and the fishing mortality rate associated with catching the MSY (F_{MSY}) in order to determine overfished and overfishing status. Under the Magnuson-Stevens Fishery Conservation and Management Act (Magnuson-Stevens Act), the Scientific and Statistical Committee (SSC) is tasked with recommending an MSY to the Gulf Council for implementation for each managed stock or stock complex in the fishery management plan (FMP). However, the actual MSY can rarely be estimated with certainty due to the difficulty in accurately estimating the relationship between the size of the spawning stock and the subsequent annual recruitment. Thus, proxies that are easier to measure are typically used. Generally, MSY proxies used for reef fish species in the Gulf of Mexico (Gulf) are based on some percentage of spawning potential ratio (SPR) and are expressed as the yield when fishing at F_{PROXY}.

This action includes alternatives to establish MSY proxies for stocks and stock complexes that an MSY or an MSY proxy has not been previously defined. This action would include species managed in five stock complexes that were defined in the Generic Annual Catch Limits/Accountability Measures (ACL/AM) Amendment (GMFMC 2011), as well as MSY proxies for cubera snapper, lane snapper, mutton snapper, yellowtail snapper, goliath grouper, and red drum; all of which are not managed as part of a complex. The methodology used to establish the stock complexes in the Generic ACL/AM Amendment was described in Farmer et al. 2010, and is summarized in Appendix A.

Alternative 1 would leave the MSY proxy for the stocks listed in Table 2.1.1 undefined in the FMP for the Reef Fish Resources in the Gulf of Mexico (Reef Fish FMP) and the FMP for the Red Drum Fishery of the Gulf of Mexico (Red Drum FMP), and the Secretarial FMP for the Red Drum Fishery of the Gulf of Mexico (Red Drum FMP), and in non-compliance with the Magnuson-Stevens Act. The SSC would continue to provide recommendations to the Council regarding the most appropriate MSY proxy.

Table 2.1.1. Stocks and stock complexes affected by the alternatives in this action.

Alternative	Complex	Stock
2	Shallow-water grouper	Scamp, black, yellowmouth, yellowfin
2	Deep-water grouper	Yellowedge, warsaw, snowy groupers, speckled hind
2	Tilefishes	Golden, blueline, goldface tilefish
2	Jacks	Lesser amberjack, almaco jack, banded rudderfish
2	Mid-water snapper	Wenchman, silk, blackfin, queen snapper
2		Cubera snapper
2		Lane snapper
2		Mutton snapper
2		Yellowtail snapper
3		Goliath grouper
4		Red drum
5		All reef fish stocks, complexes, and red drum

The action alternatives contain a broad range of options from **$F_{20\%\ SPR}$ – $F_{40\%\ SPR}$** for **Alternative 2** (reef fish), **$F_{30\%\ SPR}$ – $F_{50\%\ SPR}$** for **Alternative 3** (Goliath grouper), and both escapement rate and SPR options for red drum (**Alternative 4**).

Alternative 2 would define MSY proxies for the five stock complexes and four individual stocks listed in Table 2.1.1. This alternative contains three options. **Option a** would define the MSY proxy as **$F_{20\%\ SPR}$**. This is the least conservative MSY proxy considered by the SSC. It may be a sustainable level, has more risk of driving the stock below the true B_{MSY} than **Options 2b** or **2c**.

Option 2b would define the MSY proxy as **$F_{30\%\ SPR}$**. This is the proxy usually selected by the SSC for assessed reef fish stocks and was recommended as the preferred MSY proxy by the SSC for stocks considered in **Alternative 2**. It is likely a sustainable level with a lower risk of driving the stock below the true B_{MSY} than **Option 2a ($F_{20\%\ SPR}$)**. All reef fish stocks except for red snapper, gag, and gray snapper have an MSY proxy of $F_{30\%\ SPR}$ (Table 1.1.1). In addition, for mutton snapper and yellowtail snapper, the stock assessments and subsequent management advice were based on an MSY proxy of $F_{30\%\ SPR}$.

Option 2c would define the MSY proxy as the yield at **$F_{40\%\ SPR}$** and is the most biologically conservative option in **Alternative 2**. This is the proxy recommended by Harford et al. (2019) for gonochoristic (non-sex changing) species. This is likely a sustainable level, with a lower risk of driving the stock below the true B_{MSY} than $F_{20\%\ SPR}$ **(Option 2a)** or $F_{30\%\ SPR}$ **(Option 2b).** However, if this option is unnecessarily restrictive, it may result in foregone yield.

Alternative 3 would define an MSY proxy for goliath grouper. This species occurs as a single stock in the Gulf and U.S. South Atlantic. It is vulnerable to overfishing because of its long life-span and slow growth rate. This species has been closed to harvest since 1990 in the Gulf and

South Atlantic, but no stock assessment has been completed for this species. **Alternative 3** contains three options (**Options 3a-3c**) that would establish the MSY proxy as $F_{30\%\ SPR}$, $F_{40\%\ SPR}$, or $F_{50\%\ SPR}$, respectively. In comparison to **Alternative 2** that addresses other reef fish stocks and complexes, the options for Goliath grouper are biologically more conservative. The 1999 Sustainable Fisheries Act (SFA) Amendment had proposed an MSY proxy of 50% SPR for Goliath grouper. That proposal was rejected by the National Marine Fisheries Service (NMFS) on the basis that SPR by itself was not an acceptable proxy for biomass. However, the yield from fishing at $F_{50\%\ SPR}$ is an acceptable proxy, and it accomplishes the intent of the SFA Amendment.

The South Atlantic Fishery Management Council (South Atlantic Council) has established an MSY proxy of $F_{SPR\ 40\%}$ for goliath grouper, which is **Option 3b** in this document.

Alternative 4 considers three options to set an MSY proxy for red drum. Directed commercial harvest of red drum from the exclusive economic zone (EEZ) has been prohibited since 1987, and all harvest from the EEZ has been prohibited since 1988. Harvest in state waters has continued. In Red Drum Amendment 2 (1988), the Gulf of Mexico Fishery Management Council (Council) requested that all Gulf states implement rules within their jurisdictions that would provide for an escapement rate of juvenile fish to the SSB equivalent to 30% of those that would have escaped had there been no inshore fishery. **Option 4a** sets the MSY proxy for red drum at the yield that provides for an escapement rate of juvenile fish to the SSB equivalent to 30% of those that would have escaped had there been no inshore fishery. This is the management objective adopted by the states in response to the Council's request, and could function as an alternative proxy to the yield at $F_{X\%\ SPR}$. One drawback to this alternative is that, while it is generally assumed that a 30% escapement is approximately equivalent to 20% SPR, the relationship between escapement and SPR is not known. Another drawback is that, while escapement may be a measurable objective, there is no standard way of measuring it and in practice, the five Gulf states have adopted different methods to estimate escapement. Consequently, escapement estimates from the different states, measured in different ways, may not be comparable. If this alternative is adopted, NMFS and the states should work to develop standard and compatible methods for estimating escapement. **Option 4b** sets the MSY proxy for red drum equal to the yield when fishing at $F_{30\%\ SPR}$. As discussed above, the current policy of a 30% escapement is considered approximately equivalent to 20% SPR, but the relationship between escapement and SPR is not known. However, **Option 4b** would presumably be more biologically conservative than **Option 4a**. One drawback to **Option 4b** is that the fishing mortality rate is difficult to estimate for this stock as harvest in prohibited in the EEZ, and stock assessments conducted on the inshore components of the stock by each Gulf state may not be comparable.

Alternative 5 allows for a streamlined procedure to modify the MSY proxy defined in the Reef Fish or Red Drum FMP in the future. Currently, in order to adopt a new recommended proxy by the SSC, the Council must create an action in a plan amendment that contains a range of alternative proxies along with an analysis of those alternatives. **Alternative 5** would allow the Council to adopt the new MSY proxy that is recommended by the SSC by noting the change in a plan amendment rather than by requiring a full action with alternatives. This alternative could be applied to the setting of an MSY proxy for a stock being assessed for the first time as well as to changes for stocks previously assigned a proxy. **Alternative 5** would not require the Council to adopt an MSY proxy based on an SSC recommendation. The Council could return a recommendation to the SSC with questions, which could affect the SSC's recommendation, choose to retain the current definition, or establish a different MSY proxy than recommended by the SSC. In addition, the SSC might recommend alternative MSY proxies. In this situation, a plan amendment action with alternatives may be required. For further explanation of other MSY proxies see Appendix B.

2.2 Action 2 - Maximum Fishing Mortality Threshold

Alternative 1: No action. Maintain current definitions of the Maximum Fishing Mortality Threshold (MFMT). These are: $F_{26\%\ SPR}$ for red and gray snapper[3]; $F_{50\%\ SPR}$ for goliath grouper; F_{MAX} for gag (where MAX is maximum yield per recruit); and $F_{30\%\ SPR}$ for all other reef fish stocks and red drum.

Alternative 2: For stocks where an MSY proxy has not been defined, set the MFMT equal to the fishing mortality at the MSY proxy for each stock or stock complex as determined in Action 1.

<u>Discussion</u>:

The Generic ACL/AM Amendment (GMFMC 2011) established two methods for determining if overfishing is occurring:

1. The National Standard 1 (NS1) guidelines define MFMT as the level of fishing mortality above which overfishing is occurring. The MFMT or reasonable proxy may be expressed either as a single number (a fishing mortality rate), or as a function of spawning biomass or other measure of reproductive potential. Under the provisions of the Generic ACL/AM Amendment (GMFMC 2011), in years where there is a stock assessment, overfishing is occurring if the stock assessment's estimate of the current fishing mortality rate is above MFMT.
2. The overfishing limit (OFL) is a yield that corresponds to fishing at MFMT. Under the provisions of the Generic ACL/AM Amendment (GMFMC 2011), in years when there is not a stock assessment, or for stocks that do not have assessments that provide estimates of fishing mortality, overfishing is occurring if the annual harvest exceeds the OFL.

The Generic Sustainable Fisheries Act (SFA) Amendment (GMFMC 1999) set MFMT equal to $F_{50\%\ SPR}$ for Nassau grouper and goliath grouper. It set MFMT equal to $F_{30\%\ SPR}$ for red drum, and for all reef fish stocks except red snapper. For gag, the fishing mortality rate proxy for MSY (F_{MSY} proxy) and MFMT were subsequently set equal to the fishing mortality rate corresponding to maximum yield per recruit (F_{MAX}) in Amendment 30B to the Reef Fish FMP (GMFMC 2008a). Following additional analyses conducted for the 2005 benchmark assessment of red snapper (SEDAR 7 2005), Amendment 27 to the Reef Fish FMP (GMFMC 2007) and subsequent management actions used $F_{26\%\ SPR}$ as the red snapper proxy for F_{MSY} and MFMT.

Alternative 1 (No Action) would leave MFMT unchanged. All Action 1 reef fish stocks and stock complexes plus red drum have an MFMT of $F_{30\%\ SPR}$ as a result of the Generic SFA Amendment (GMFMC 1999), or subsequent amendments.

Alternative 2 would set MFMT equal to the fishing mortality rate based on the MSY proxies adopted in Action 1. This would only apply to the stocks and complexes addressed in Action 1 (**Alternatives 2 - 4**, see Table 2.1.1.). In most cases, this would be the same as **Alternative 1**,

[3] This reflects the preferred alternative for gray snapper in Amendment 51.

but if an MSY proxy is changed in Action 1 or in a future amendment, the MFMT would also change to reflect the new proxy. For example, this may be the case for goliath grouper. The South Atlantic Council established an MSY proxy and corresponding MFMT level of the yield at $F_{SPR\ 40\%\ SPR}$ for goliath grouper. If the Gulf Council concurs with this change then the corresponding MFMT would also need to be updated in this action.

If an F_{Proxy} based MSY proxy is adopted where the fishing mortality rate cannot be determined, the MFMT would be a placeholder until a stock assessment can be conducted and fishing mortality (F) values estimated. Overfishing status could not be determined using F_{Proxy} because the value of F_{Proxy} is unknown. However, such stocks could still be determined to be undergoing overfishing if the OFL is exceeded.

2.3 Action 3 - Minimum Stock Size Threshold

Alternative 1: No action. Do not define minimum stock size threshold (MSST) for stocks and stock complexes in action 1. Stocks with established minimum stock size threshold (MSST) will be retained for gag, gray triggerfish, greater amberjack, hogfish, red grouper, red snapper, vermilion snapper, and gray snapper[4].

Alternative 2: MSST = (1-M)*B_{MSY} (or proxy) where M is the natural mortality rate. This alternative applies to stocks and stock complexes in Action 1.

Alternative 3: MSST = 0.75*B_{MSY} (or proxy). This alternative applies to stocks and stock complexes in Action 1.

Alternative 4: MSST = 0.50*B_{MSY} (or proxy). This alternative applies to stocks and stock complexes in Action 1.

Alternative 5. For stocks assessed across the South Atlantic and Gulf Councils' jurisdictions (Goliath grouper, mutton snapper, yellowtail snapper, and black grouper). MSST for these species would use existing definitions of MSST defined by the South Atlantic Council.

*Note: **Alternative 5** can be selected with **Alternative 2, 3,** or **4**.

<u>**Discussion**</u>:

MSST is a biomass level set at or below the biomass level capable for producing MSY or the MSY proxy (B_{MSY} [or proxy]) for a stock or stock complex. It is used to determine when a stock or stock complex is overfished. Amendment 44 to the Reef Fish FMP (GMFMC 2017b) revised the MSST for seven reef fish stocks where it was previously defined (gag, red grouper, red snapper, vermilion snapper, gray triggerfish, greater amberjack, and hogfish). For these seven stocks, Amendment 44 set MSST equal to 0.50*B_{MSY} (or proxy). If implemented by the Secretary of Commerce, Amendment 51 to the Reef Fish FMP (GMFMC 2019) would define MSST equal to 0.50*B_{MSY} (or proxy) for gray snapper. The remaining reef fish stocks and stock complexes have not had MSST defined, nor has it been defined for red drum in the Red Drum FMP. This action proposes to define MSST for the remaining reef fish stocks and stock complexes, and for red drum.

The NS1 guidelines allow MSST to be set at a level below B_{MSY} (or proxy), but no lower than 0.50*B_{MSY} (or proxy). If the fishing mortality can be kept below the overfishing threshold (MFMT), the stock or stock complex biomass is unlikely to drop below the overfished level (MSST). However, the stock or stock complex biomass can fluctuate due to environmental variability, or due to management being unsuccessful in constraining fishing mortality. In such cases, there are concerns with setting MSST either too close to or too far from B_{MSY} (or proxy).

[4] This reflects the preferred alternative for gray snapper in Amendment 51.

Concerns When Setting MSST

- If MSST is too close to B_{MSY}:
  - It may not allow for natural fluctuations in the stock biomass.
  - It may not be detectably different from B_{MSY}.

- If MSST is too far from B_{MSY}:
  - Stock could become in danger of recruitment collapse due to uncertainty about the 50% B_{MSY} level.
  - A stock that drops below MSST will require a more restrictive rebuilding plan.

Each of the alternatives in Action 3 sets MSST equal to some multiple of the stock or stock complex biomass corresponding to MSY or the MSY proxy (B_{MSY} [or proxy]). B_{MSY} (or proxy) may not be known for data-poor stocks. If B_{MSY} (or proxy) is unknown, then MSST is also unknown. For these stocks and stock complexes, the MSST definition is a placeholder until B_{MSY} (or proxy) can be calculated.

Under **Alternative 1** (No Action), MSST is undefined and would need to be established on a case-by-case basis. This approach is inconsistent with the MSA and NS1 guidelines, which require that FMPs establish criteria to determine when a stock or stock complex is overfished.

Alternative 2 sets MSST at (1-M)*B_{MSY} (or proxy) for reef fish stocks and stock complexes and red drum. In the past, this method has often been the *de facto* MSST used to determine overfished status for stocks where MSST is undefined. When MSST is defined as equal to (1-M)*B_{MSY} (or proxy), stocks with a low natural mortality rate (M) could have an MSST that is only slightly below SSB at B_{MSY} (or proxy). In such situations it can be difficult to determine if a stock is actually below MSST due to imprecision and accuracy of the data. In addition, natural fluctuations in stock biomass levels around B_{MSY} may temporarily drop the SSB below MSST, although analysis from the Southeast Fisheries Science Center (SEFSC) suggests that this is unlikely except at very low M values (see below). Setting a wider buffer between B_{MSY} (or proxy) and MSST can avoid these issues. In addition, setting a wider buffer can allow a greater opportunity for management to take action to end a decline in a stock that is approaching an overfished condition without the constraints imposed by a rebuilding plan. However, if a stock drops below MSST and is declared overfished, a more restrictive rebuilding plan may be needed than if there were a narrower buffer between B_{MSY} and MSST. This formula for MSST is used for some stocks managed by four of the Regional Management Councils (South Atlantic, Caribbean, Pacific, Western Pacific), plus the Highly Migratory Species Division of NMFS. In addition, this is the MSST value used by the South Atlantic Council for goliath grouper, a species constituting a single stock under shared management by the South Atlantic and the Gulf Councils.

Alternative 2 requires an estimate of M. Such estimates have generally been made through stock assessments for reef fish species. For reef fish stocks considered in Action 3 that have been assessed, estimates of M range from a low of 0.073 (yellowedge grouper) to a high of 0.30 (maximum estimate for lane snapper; Table 2.2.2.). For these stocks, resulting MSST values using this formula range from 70% to 93% of the B_{MSY} (or proxy). For the stock complexes, the MSST for the shallow-water and deep-water grouper stock complexes would use the M for black grouper (0.136) and yellowedge grouper (0.073). For the tilefish complex, only tilefish (golden) has an estimate of M (0.13) from the Gulf, and this estimate could be used as a proxy for this complex upon SSC recommendation and Gulf Council approval. For the jack and mid-water snapper complexes, and for cubera snapper, there are no Gulf estimates of M. The SEFSC and the SSC would need to determine if proxies for M could be developed by other means (e.g., estimates of M from the literature or from species sharing similar life history characteristics). A proxy for M would also need to be developed for lane snapper as literature-based estimates of M in the Gulf range from 0.11 to 0.30.

Under **Alternative 2**, if any species are added to the management unit, or if the estimate of M is changed in a peer-review report or SEDAR assessment for any existing species in the management unit, the MSST would be adjusted based on the most recent estimate of M if applicable under the preferred alternative selected in this action.

Alternative 3 sets MSST at 0.75*B_{MSY} (or proxy) for all reef fish stocks and stock complexes, and for red drum. This alternative does not require an estimate of M because it sets the MSST at a fixed percentage of the B_{MSY} (or proxy). It is halfway between the B_{MSY} (or proxy) stock level and the 50% of B_{MSY} (or proxy) level, which is the lowest MSST level allowed by the NS1 guidelines. Therefore, this alternative is more conservative than **Alternative 4**, which sets MSST at 50% of B_{MSY}. Relative to **Alternative 2**, the effect of this alternative depends on the M of the individual species (Table 2.3.1). For species where M is greater than 0.25, **Alternative 3** is more conservative than **Alternative 2** (e.g., lane snapper). Where M is equal to 0.25, **Alternative 3** is equal to **Alternative 2**. Where M is less than 0.25, **Alternative 3** is less conservative than **Alternative 2**.

Alternative 4 sets MSST equal to 0.50*B_{MSY} (or proxy) for reef fish stocks and stock complexes, and red drum. This would set MSST at the 50% level for all stocks and stock complexes in Sub-actions 1.1-1.3. This level of MSST would match the MSST level established for seven other reef fish stocks in Amendment 44 to the Reef Fish FMP. This is the widest buffer allowed under the NS1 guidelines and is the least conservative alternative. This buffer is used for at least some stocks managed by three of the Regional Management Councils (New England, Mid-Atlantic, and North Pacific).

Table 2.3.1. Reef fish species with estimates of M from stock assessments for the Gulf stocks.

Common Name	Scientific Name	M	Source
Snappers			
Mutton snapper	*Lutjanus analis*	0.11	SEDAR 15A (2015)
Lane snapper*	*Lutjanus synagris*	0.30 0.11-0.24	Ault et al. (2005) Johnson et al. (1995)
Yellowtail snapper	*Ocyurus chrysurus*	0.194	O'Hop et al. (2012)
Vermilion snapper	*Rhomboplites aurorubens*	0.25	SEDAR 9 (2006a)
Groupers			
Yellowedge grouper	*Hyporthodus flavolimbatus*	0.073	SEDAR 22 (2011b)
Goliath grouper	*Epinephelus itajara*	0.12	SEDAR 23 (2011b)
Black grouper	*Mycteroperca bonaci*	0.136	SEDAR 19 (2010)
Tilefishes			
Tilefish	*Lopholatilus chamaeleonticeps*	0.13	SEDAR 22 (2011a)

* Lane snapper: Ault et al. (2005) estimated M=0.30 for lane snapper in the Florida Keys. Johnson et al. (1995) reported a range of M estimates from 0.11 to 0.24 for lane snapper from the northern Gulf.

Alternative 5 would use existing definitions of MSST defined by the South Atlantic Council for four stocks assessed as single stocks that span both the South Atlantic and Gulf Council's areas of jurisdiction: goliath grouper, black grouper, mutton snapper, and yellowtail snapper. Neither the Gulf nor South Atlantic Council's SSCs were able to endorse the goliath grouper assessment (SEDAR 48), so the condition of the stock is unknown. The stock acceptable biological catch (ABC) for black grouper, mutton snapper, and yellowtail snapper is allocated between the Councils for management (Table 2.3.2). For these stocks, the South Atlantic Council has already set MSST values and **Alternative 5** would use the South Atlantic Council's existing definitions of MSST defined for these stocks throughout both Councils' jurisdictions. The MSST for goliath grouper is (1-M)*B_{MSY} and the MSST for black grouper, mutton snapper, and yellowtail uses 0.75*$SSB_{30\%SPR}$. Using the South Atlantic Council's MSST for goliath grouper, mutton snapper, yellowtail snapper, and black grouper would provide a single overfished definition and preclude a situation where two different overfished definitions would apply to a single stock.

Table 2.3.2. South Atlantic Council MSST definitions for four snapper-grouper stocks and South Atlantic:Gulf allocations for three stocks.

Species	MSST	Allocation S Atl:Gulf
Mutton snapper	$0.75*SSB_{30\%SPR}$	82:18
Yellowtail snapper	$0.75*SSB_{30\%SPR}$	75:25
Black grouper	$0.75*SSB_{30\%SPR}$	47:53
Goliath grouper	$(1\text{-}M)*B_{MSY}$	---

M = 0.12 for Goliath Grouper

2.4 Action 4 – Optimum Yield

2.4.1 Action 4.1 – Optimum Yield for Action 1 Reef Fish Stocks and Hogfish

Alternative 1: No action. Do not define optimum yield (OY) for stocks and stock complexes in Action 1. Do not define an OY for hogfish.

Alternative 2: For reef fish stocks from Action 1 and for hogfish,where OY is undefined, OY, implicitly accounting for relevant economic, social, or ecological factors, would be:

Option 2a. 50% of MSY or MSY_{proxy}.

Option 2b. 75% of MSY or MSY_{proxy}.

Option 2c. 90% of MSY or MSY_{proxy}.

Option 2d. (ACL/OFL) * MSY or MSY_{proxy}; or zero if the OFL equals zero.

Alternative 3: For goliath grouper, OY, implicitly accounting for relevant economic, social, or ecological factors, would be:

Option 3a. 50% of MSY or MSY_{Proxy}.

Option 3b. 75% of MSY or MSY_{Proxy}.

Option 3c. 90% of MSY or MSY_{Proxy}.

Option 3d. (ACL/OFL) * MSY or MSY_{Proxy}; or zero if the OFL equals zero.

<u>Discussion</u>:

The Magnuson-Stevens Act and NS1 guidelines state that OY should be based on MSY as reduced by relevant economic, social, or ecological factors. The NS1 guidelines provide additional detail in considering such factors, and also state that OY should include some consideration of uncertainty. The NS1 guidelines also state that if the estimates of MFMT and current biomass are known with a high level of certainty, and management controls can accurately limit catch, then OY could be set very close to MSY, assuming no other reductions are necessary for social, economic, or ecological factors. To the degree that such MSY estimates and management controls are lacking or unavailable, OY should be set farther from MSY.

For Action 4, hogfish is included with the reef fish stocks identified in Action 1, Alternative 2. MSY, MFMT, and MSST for hogfish were defined in Amendment 43 to the Reef Fish FMP, but OY was not defined. Therefore, OY for hogfish remains undefined and is included here. Goliath grouper is addressed in a separate alternative here as a biologically more conservative OY may be appropriate given the concerns expressed in Action 1, Alternative 3. The red drum OY is addressed in a separate sub-action (Action 4.2) because it currently has a defined OY that the Council may or may not wish to revise.

Alternative 1 (No Action) would leave OY undefined for the stocks and stock complexes identified in Action 1 as needing an MSY with the addition of hogfish. Leaving stocks or stock complexes with OY undefined is inconsistent with the NS1 guidelines.

Alternatives 2-3 are aligned similarly to those in Action 1 with the exception that hogfish is included in **Alternative 2** for the reasons stated above. **Alternative 2** would specify a long-term OY for the reef fish stocks and complexes shown in Table 2.4.1. **Alternative 3** would apply to goliath grouper.

Table 2.4.1. Stocks or stocks complexes that do not have an accepted definition of OY and are included in **Alternative 2**.

Complex	Stock
Shallow-water grouper	Black grouper*
	Scamp
	Yellowmouth grouper
	Yellowfin grouper
Deep-water grouper	Yellowedge grouper
	Warsaw grouper
	Snowy grouper
	Speckled hind
Tilefish	Golden tilefish
	Blueline tilefish
	Goldface tilefish
Jacks	Lesser amberjack
	Almaco jack
	Banded rudderfish
Mid-water snapper	Silk snapper
	Wenchman
	Blackfin snapper
	Queen snapper
---	Cubera snapper
---	Lane snapper
---	Goliath grouper**
---	Mutton snapper*
---	Yellowtail snapper*
---	Hogfish

* Stocks jointly managed with the South Atlantic Council and they also have a South Atlantic Council defined OY = ABC = ACL in the South Atlantic region.
** Goliath grouper is jointly managed with the SAFMC and has a SAFMC defined OY = 50% static SPR in the South Atlantic region.

There are four options for **Alternatives 2** and **3**. **Options a-c** are fixed percentages where OY would be between 50% and 90% of the MSY (or MSY proxy) and **Option d** is a percentage based on the relationship between the stock or stock complex ACL and OFL. **Option a** would define OY as 50% of the MSY (or MSY proxy) and is the most conservative of the options considered, as the OY value would be the furthest below MSY. This option would provide the greatest protection for the stock or stock complex; however, setting the OY this low may have negative social and economic costs as fewer fish would be available for harvest from the reef fish fishery. Fishing at 90% of the MSY (or MSY proxy) would be the least conservative option (**Option c**), as OY would be closest to MSY. **Option c** would provide the least protection to the stock or stock complex, but would provide more fish to the fishery and likely have greater social and economic benefits. **Option b** (75% of the MSY [or MSY proxy]) is intermediate to **Option a** and **Option c**.

Option d uses the ratio between the ACL and OFL to determine the amount MSY should be reduced to achieve OY. Using this relationship accounts for scientific and management uncertainty and would apply that knowledge to guide where OY should be set relative to MSY. The OFL refers to the annual amount of catch (numbers of fish or weight) that corresponds to the estimate of MFMT applied to a stock or stock complex's abundance. The ABC is a level of a stock or stock complex's annual catch, which is based on a Council's ABC Control Rule that accounts for the scientific uncertainty in the estimate of OFL, any other scientific uncertainty, and the Council's risk policy. Thus, the ABC, which is the basis for setting ACLs, is less than the OFL. The ACL is a limit on the total annual catch of a stock or stock complex, which cannot exceed the ABC. The ACL serves as the basis for invoking AMs, and in a Council's ACL Control Rule, would account for management uncertainty. As a result, setting OY based on the percent difference between the ACL and OFL would account for scientific and management uncertainty and provide an account of certainty that management controls can accurately limit catch. The greater the difference between the ACL and OFL, the less the certainty there is for limiting catch and the greater the difference between MSY and OY. For the stocks in **Alternative 2**, these values range from 53.9% (mutton snapper) to 90.6% (deep-water grouper; Table 2.4.2). For **Option d** in **Alternative 3**, the goliath grouper OY would be zero because the OFL for goliath grouper is also zero.

The South Atlantic Council has previously defined OY for black grouper, mutton snapper, and yellowtail snapper as OY = ABC = ACL. However, this approach is not consistent with the revised NS1 guidelines and thus, the Gulf Council is unable to adopt a concurrent definition for these stocks. For When mutton snapper and yellowtail snapper are assessed, a stock OFL and ABC are provided by the two Council's SSC and then the ABC is allocated between the Gulf and South Atlantic Councils for setting ACLs. The current allocations are 18% Gulf and 82% South Atlantic for mutton snapper and 25% Gulf and 75% South Atlantic for yellowtail snapper. To apply **Option d** to these species, the Gulf portion of the OFL, based on the jurisdictional allocations, would be used as the divisor in the **Option d** equation. These values are provided in Table 2.4.2.

Table 2.4.2. Overfishing limits (OFL), stock annual catch limits (ACL), and the percent the ACL is of the OFL.

Species	OFL	ACL	Percent ACL/OFL
Shallow-water grouper	Not defined	710,000	
Deep-water grouper	1,220,000	1,105,000	90.6
Tilefishes	747,000	608,000	81.4
Jacks complex	372,000	312,000	83.9
Mid-water snapper	209,000	116,000	55.5
Cubera snapper	7,000	5,065	72.4
Lane snapper	358,000	301,000	84.1
Hogfish 2020	163,700	141,300	86.3
2021+	172,500	150,400	87.1
Yellowtail snapper*	1,127,500	901,125	87.3
Mutton snapper**	266,400	143,694	53.9
Goliath grouper	0	0	---

***** The allocation of the yellowtail snapper ABC is 75% to the South Atlantic and 25% to the Gulf. What is provided for the OFL for this table is 25% of the stock OFL of 4.51 million pounds.
** The allocation of the mutton snapper ABC is 82% to the South Atlantic and 18% to the Gulf. What is provided for the OFL for this table is 18% of the stock OFL of 1.48 million pounds.

The shallow-water grouper complex OFL was not defined in the Generic ACL/AM Amendment (GMFMC 2011). This was because of incompatible OFLs within the complex: the black grouper stock OFL is for the combined Gulf and South Atlantic jurisdictions and the OFLs for the other groupers of this complex are for the Gulf only. This is why the OFL in Table 2.4.2 is not defined

Goliath grouper (**Alternative 3**) is managed separately by the South Atlantic Council but the assessment of the stock covers the jurisdiction of the Gulf Council and the South Atlantic Council. Even though the OY for the South Atlantic region is equivalent to zero, as would be the value derived from **Options a-d** of **Alternative 3** given no harvest is allowed**,** the method for calculating OY would need to be reconciled between jurisdictions.

2.4.2 Action 4.2 – Optimum Yield for Red Drum

Alternative 1: No action. Maintain the red drum optimum yield (OY) for red drum:

- All red drum recreationally and commercially harvested from state waters landed consistent with state laws and regulations under a goal of allowing 30 percent escapement of the juvenile population.

- All red drum commercially or recreationally harvested from the Primary Area of the exclusive economic zone (EEZ) under the total allowable catch (TAC) level and allocations specified under the provisions of the FMP, and a zero retention level from the Secondary Areas of the EEZ. (Note: TAC for the EEZ has been set at zero since 1988.)

Alternative 2: For red drum, where OY is undefined, OY, implicitly accounting for relevant economic, social, or ecological factors, would be:

Option 2a: 50% of MSY or MSY_{Proxy}.

Option 2b: 75% of MSY or MSY_{Proxy}.

Option 2c: 90% of MSY or MSY_{Proxy}.

<u>Discussion</u>:

Alternative 1 (no action) is an OY definition established through Amendment 2 to the Red Drum FMP and implemented in 1988. This OY definition was based on a SEFSC stock assessment (Goodyear 1987), that concluded under certain escapement rates of juveniles, the stock could rebuild. The 1987 Red Drum Stock Assessment Panel (RDSAP 1987) recommended the ABC for the EEZ be maintained at zero, and that the states increase escapement rates of juveniles to 30 percent to rebuild the stock. This escapement rate would allow the stock to recover to a 20 percent SSB ratio relative to the unfished stock. Note that Goodyear (1987) separated the stock into a primary area, the EEZ waters off Louisiana, Mississippi, and Alabama, and a secondary area, the EEZ waters off Florida and Texas. To achieve this OY, the Gulf states have independently and cooperatively implemented red drum regulations to try to achieve a 30 percent or greater escapement rate to the spawning stocks of for each year class. Harvest of red drum is still prohibited in the EEZ. This alternative is equivalent to the red drum MSY in Alternative 4, Option 4a in Action 1.

For **Alternative 2**, there are three options that reduce OY from MSY (or MSY proxy) by fixed percentages between 50% and 90%. **Option 2a** would define OY as 50% of the MSY (or MSY proxy) and is the most conservative of the options considered, as the OY value would be the furthest below MSY. This option would provide the greatest protection for the stock; however, setting the OY this low may have negative social and economic costs as fewer fish would be for harvest from the red drum fishery. Fishing at 90% of the MSY (or MSY proxy) would be the least conservative option (**Option 2c**), as OY would be closest to MSY. **Option 2c** would provide the least protection to the stock, but would provide more fish for harvest from the fishery and likely have greater social and economic benefits. **Option 2b** (75% of the MSY [or MSY proxy]) is intermediate to **Option a** and **Option c**.

Unlike Alternatives 2 and 3 inAction 2, no Option d ([ACL/OFL] * MSY or MSY Proxy; or zero if the OFL equals zero) was added to Alternative 2 of Action 4.2. This is because there is no OFL for red drum. In the Generic ACL/AM Amendment (GMFMC 2011), it was determined that because the harvest of red drum in the EEZ is currently set to zero through earlier actions to the Red Drum FMP, red drum has an ACL, which is effectively set at zero for the EEZ. Thus, the conclusion in the Generic ACL/AM Amendment was that no further action was needed for this stock. Hence, no effort was made to establish a red drum OFL.

CHAPTER 3. AFFECTED ENVIRONMENT

3.1 Description of the Fishery

This section provides general information on the reef fish and red drum fisheries. Fishing in the Gulf of Mexico (Gulf) is divided into two broad sectors: recreational and commercial. Management of the commercial and recreational fishing sectors fishing for reef fish in federal waters of the Gulf began in 1984 with the implementation of the Fishery Management Plan for the Reef Fish Resources in the Gulf of Mexico (Reef Fish FMP). The Reef Fish FMP has been continuously amended through plan amendments and framework actions (previously known as regulatory amendments). A summary of reef fish management actions can be found on the Gulf of Mexico Fishery Management Council's (Council) webpage.[5] Presently, the reef fish fishery management unit contains 31 species (see Section 3.3).

Management of commercial and recreational fishing for red drum in federal waters of the Gulf began in 1986 with the implementation of the Secretarial FMP for the Red Drum Fishery of the Gulf of Mexico (Red Drum FMP). Harvest of red drum from federal waters has been prohibited since 1988, as implemented under Amendment 2 to the Red Drum FMP (GMFMC 1988). There is no federal for-hire permit for red drum and there is no allowable harvest of red drum from federal waters. A summary of red drum management actions can be found on the Council's Web page.[6]

3.1.1 Reef Fish

A detailed description of the fishing gears and methods used in the reef fish fishery is provided in Amendment 1 to the Reef Fish FMP (GMFMC 1989).[7] Additionally, Sections 3.4 and 3.5 provide information on the respective economic and social environments of the fishery.

Commercial Sector

A commercial vessel permit for Gulf reef fish is required for the commercial harvest of reef fish from the Gulf exclusive economic zone (EEZ). Commercial reef fish permits are under a moratorium and are thus limited access; no new permits are available. An expired permit may no longer be used for fishing, but is renewable for one year after it expires. Both valid and renewable permits may be transferred to another operator. As of February 20, 2018, a total of 845 vessels have the permit (770 valid and 72 renewable). Of these, 98% provide a mailing address in a Gulf state (Table 3.1.1.1). These vessels must have a vessel monitoring system onboard.

[5] http://gulfcouncil.org/fishery-management/
[6] http://gulfcouncil.org/fishery-management/implemented-plans/red-drum/
[7] http://www.gulfcouncil.org/Beta/GMFMCWeb/downloads/RF%20Amend-01%20Final%201989-08-rescan.pdf

Table 3.1.1.1. Number and percentage of vessels with a commercial permit for Gulf reef fish by state.

State	Commercial Reef Fish Permits	
	Number	**Percent**
AL	36	4.3%
FL	669	79.2%
LA	40	4.7%
MS	7	0.8%
TX	76	9.0%
Subtotal	**831**	**98.0%**
Other	17	2.0%
Total	**847**	**100.0%**

Source: NMFS SERO.[8]

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. As of January 16, 2017, 62 of the permit holders have the longline endorsement (61 valid and one renewable/transferrable), and all but one of the endorsement holders have a mailing address in Florida. In addition to these restrictions, operators of reef fish fishing vessels who want to harvest red snapper or grouper and tilefish species must participate in the red snapper or grouper-tilefish individual fishing quota (IFQ) programs. For more information about the IFQ programs and commercial reef fish management, see Amendments 26 (GMFMC 2006), 29 (GMFMC 2008c), and 36A (GMFMC 2017a). This includes the commercial harvest of shallow-water grouper (SWG), deep-water grouper (DWG), and tilefish (TF). 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 shares and allocation are transferable and eligible vessels can receive allocation from other IFQ participants.

Of the 31 species in the Reef Fish FMP, 14 are managed under IFQ programs. Not all IFQ program-managed species have sector allocations, but all have a commercial quota. Of the remaining reef fish species, only two (gray triggerfish and greater amberjack) have sector allocations. Table 3.1.1.2 provides the commercial landings in recent years for IFQ-managed species and those with a sector allocation. Information on recent landings for the remaining reef fish species can be found on the National Marine Fisheries Service (NMFS) annual catch limits (ACL) monitoring webpage.[9]

[8] http://sero.nmfs.noaa.gov/operations_management_information_services/constituency_services_branch/freedom_of_information_act/common_foia/RCG.htm Accessed February 21, 2018.
[9] http://sero.nmfs.noaa.gov/sustainable_fisheries/acl_monitoring/index.html

Table 3.1.1.2. Commercial landings for several reef fish species in pounds whole weight (2010-2016).

	Groupers and Tilefishes	Red snapper	Gray triggerfish	Greater amberjack
2010	4,928,955	3,392,209	55,661	534,095
2011	7,164,184	3,594,552	105,251	508,871
2012	8,277,929	4,036,398	72,778	308,334
2013	7,587,068	5,448,544	63,086	457,879
2014	8,898,807	5,567,822	42,630	486,679
2015	7,848,945	7,184,210	49,201	459,532
2016	7,839,690	6,723,823	61,122	437,390

Source: Grouper and tilefish landings from Table 17 in NMFS 2016b, except 2016, which is from SERO Commercial Quotas Catch Allowance Table.[10] Gray triggerfish and greater amberjack landings from NMFS SERO ACL commercial monitoring webpage.[11]

Recreational Sector

Recreational fishing includes fishing from charter boats and headboats (collectively referred to as for-hire vessels), privately owned and rental vessels, and from shore. No federal permit is needed for privately owned vessels to fish for reef fish in the EEZ, but persons fishing onboard private vessels do need either a state recreational saltwater fishing permit or be registered in the federal National Saltwater Angler Registry system. To harvest reef fish from the EEZ, for-hire vessels are required to have a federal charter/headboat permit for reef fish that is specifically assigned to that vessel. As with commercial permits, charter/headboat permits for reef fish are under a moratorium and no new permits are available. Existing permits are renewable and transferable. An expired permit may no longer be used for fishing, but is renewable for one year after it expires. Both valid and renewable permits may be transferred to another operator. As a condition of the permit, operators must abide by federal fishing regulations whether in federal or state waters. Reef fish caught under recreational bag limits are not allowed to be sold.

Anglers must follow size limits, bag limits, and season openings and closings when fishing in federal waters for those species that have such regulations (Table 3.1.1.3). In some cases, state regulations are different than federal regulations, which apply for the harvest of reef fish from state waters. In those circumstances (e.g., red snapper fishing seasons), fishermen on privately owned or rented vessels must obey the regulations for the waters in which they are fishing.

[10] https://portal.southeast.fisheries.noaa.gov/cs/documents/pdf/CommercialQuotasCatchAllowanceTable.pdf

[11] http://sero.nmfs.noaa.gov/sustainable_fisheries/acl_monitoring/commercial_gulf/reef_fish_historical/gulf_historic_commercial_final.pdf

Table 3.1.1.3. Min. size limits, bag limits, and seasons for reef fish species in the Gulf EEZ

Stock	Min size	Daily bag limit	Season
Red snapper	16 inches TL	2 per person	Open June 1, close when annual catch target is projected to be met.
Gray (mangrove) snapper	12 inches TL	10 snapper aggregate bag limit**	January 1-December 31*
Mutton snapper	16 inches TL	10 snapper aggregate bag limit **	January 1-December 31*
Yellowtail snapper	12 inches TL	10 snapper aggregate bag limit **	January 1-December 31*
Cubera snapper	12 inches TL	10 snapper aggregate bag limit **	January 1-December 31*
Queen snapper, Blackfin snapper, Wenchman, Silk snapper	none	10 snapper aggregate bag limit **	January 1-December 31*
Vermilion snapper	10 inches TL	10 per person within 20 reef fish aggregate bag limit	January 1-December 31*
Lane snapper	8 inches TL	20 reef fish aggregate bag limit	January 1-December 31*
Gray triggerfish	14 inches FL	2 per person within 20 reef fish aggregate bag limit	January 1-16, March 1-December 31*
Almaco jack	none	20 reef fish aggregate bag limit	January 1-December 31*
Golden tilefish, Goldface tilefish Blueline tilefish	none	20 reef fish aggregate bag limit	January 1-December 31*
Hogfish	14 inches FL	5 per person	January 1-December 31*
Greater amberjack	34 inches FL	1 per person	August 1-October 31, May 1-31#
Lesser amberjack, Banded rudderfish	14-22 inches FL slot limit	5 per person combined	January 1-December 31*
Gag	24 inches TL	2 per person within 4 grouper aggregate bag limit	June 1-December 31*
Red grouper	20 inches TL	2 per person within 4 grouper aggregate bag limit	January 1-December 31*^
Black grouper	24 inches TL	4 grouper aggregate bag limit	January 1-December 31*^
Scamp	16 inches TL	4 grouper aggregate bag limit	January 1-December 31*^
Yellowfin grouper	20 inches TL	4 grouper aggregate bag limit	January 1-December 31*^
Yellowmouth grouper	none	4 grouper aggregate bag limit	January 1-December 31*^
Yellowedge grouper, Snowy grouper	none	4 grouper aggregate bag limit	January 1-December 31*
Speckled hind	none	1 per vessel, included in 4 grouper aggregate bag limit	January 1-December 31*
Warsaw grouper	none	1 per vessel, included in 4 grouper aggregate bag limit	January 1-December 31*
Goliath grouper, Nassau grouper	Harvest prohibited		

*Season closures can occur prior to Dec 31 if a species annual catch limit is caught or is projected to be caught.
** 10 snapper aggregate bag limit includes all snappers except red, vermilion, and lane.
# The greater amberjack recreational fishing year is August 1-June 30. Season closures can occur prior to June 30 if a species annual catch limit is caught or is projected to be caught (regulation pending).
^ Recreational shallow-water grouper (red, black, scamp, yellowfin, yellowmouth) season is closed February 1-March 31 when fishing beyond 20 fathom break.
Note: TL means total length; FL means fork length.

As of February 20, 2018, there were 1,310 vessels with a valid or renewable for-hire reef fish permit: 1,278 vessels with the permit and another 32 with a historical captain endorsement (Table 3.1.1.4). Approximately 58% of the permits have mailing recipients in Florida. Texas recipients hold the second highest number of permits with 17%. Collectively, approximately 97% of the permits have mailing recipients in one of the Gulf states.

Table 3.1.1.4. Number and percentage of vessels with a charter/headboat permit for Gulf reef fish, including historical captain endorsements, by state.

State	Gulf Reef Fish Permits		
	Permits	Historical Captain	Percent
AL	127	3	9.9%
FL	748	17	58.4%
LA	105	6	8.5%
MS	36	2	2.9%
TX	216	4	16.8%
Subtotal	**1,232**	**32**	**96.5%**
Other	46		3.5%
Total	**1,278**	**32**	**100.0%**

Source: NMFS SERO.[12]

Table 3.1.1.5 provides the recreational landings in recent years for all reef fish by component. The for-hire component includes federally permitted charter vessels and headboats, and the private component incudes privately owned vessels and fishing from shore.

Table 3.1.1.5. Recreational landings for all reef fish (pounds whole weight) by component (2010-2016).

	For-hire	Private	Total
2010	3,129,423	5,240,128	8,369,551
2011	4,366,054	5,462,209	9,828,262
2012	4,881,069	8,158,138	13,039,208
2013	5,118,499	15,155,915	20,274,414
2014	3,538,404	8,699,338	12,237,743
2015	5,667,588	8,691,052	14,358,641
2016	5,488,516	11,199,073	16,687,588

Source: NMFS SEFSC Recreational ACL file, February 28, 2018.

3.1.2 Red Drum

Red drum have historically been fished by both recreational and commercial fishermen. Records of commercial fishing date back to 1950, and recreational fishing records date back to the early 1980s. Commercial fishing in the EEZ was prohibited in 1987, but incidental catch was still allowed until 1988. Commercial fishing throughout the EEZ largely targeted offshore schools of larger fish, with run-around gill nets and purse seines landing the majority of those fish. Recreational fishing for red drum is conducted almost exclusively through hook-and-line gear,

12 http://sero.nmfs.noaa.gov/operations_management_information_services/constituency_services_branch/freedom_of_information_act/common_foia/RCG.htm Accessed February 20, 2018.

and retention of fish in the EEZ was prohibited in 1988 (GMFMC 1988). Thus, the remainder of this section addresses landings in state waters, only.

Commercial Sector

All states except Mississippi prohibit commercial harvest of red drum from state waters. From 1980 through 1988, when commercial harvest was allowed in the EEZ, commercial fishermen took an average of 28% of the redfish, while sport fishermen harvested 72%.[13] Mississippi currently allows commercial harvest with a quota of 60,000 lbs. The principal gear used for commercial harvest is trammel nets (Porch 2000). It is illegal for any vessel carrying a purse seine to have on board any quantity of red drum. Commercial harvest has been increasing from about 18,000 lbs in 2002 to slightly over 60,000 lbs in 2015 and 2016.

Recreational Sector

Red drum remains a popular directed fishery for the recreational sector in all five states. The recreational harvest of red drum is open year-round Gulf-wide in state waters. All five states manage red drum using a slot limit (i.e., a fish must be larger than the minimum and smaller than the maximum size limit). Table 3.1.2.1 provides the size and bag limits for red drum by state, and Table 3.1.2.2 provides recreational landings in recent years by state. Florida manages red drum using three management zones: the northwest zone extends from Escambia through Pasco County; the south zone begins in Pinellas County and covers the southern Florida Peninsula northeast through Volusia County; and the northeast zone covers Flagler through Nassau County. The northwest and south zone are adjacent to federal waters under the Council's jurisdiction.

[13] Source: https://en.wikipedia.org/wiki/Red_drum

Table 3.1.2.1. Recreational bag and size limits of red drum in state waters.

State	Size limit (min-max)	Bag limit (daily)	Exceptions to bag limit
Florida	18-27 inches TL	By zone: NE zone: 2 per person; S and NW: 1 per person; All zones: vessel limit of 8 fish	None
Alabama	16-26 inches TL	3 per person	1 fish may be greater than 26 inches TL
Mississippi	18-30 inches TL	3 per person	1 fish may be greater than 30 inches TL
Louisiana	16-27 inches TL	5 per person	1 fish may be greater than 27 inches TL
Texas	20-28 inches TL	3 per person	Per license year, each angler may retain 1 additional fish greater than 28 inches by affixing a Red Drum Tag, and 1 additional fish by affixing a Bonus Red Drum Tag.

Table 3.1.2.2. Recreational landings of red drum by state (pounds whole weight) from 2010 through 2016.

	AL	FL	LA	MS	TX	Total
2010	828,593	1,032,604	11,502,642	373,847	1,424,770	15,162,455
2011	768,784	1,137,160	13,040,458	588,937	1,814,163	17,349,501
2012	870,505	1,762,781	9,004,719	799,338	1,766,361	14,203,703
2013	1,999,251	1,638,902	14,113,356	1,381,350	1,374,069	20,506,928
2014	577,991	1,695,759	6,473,007	741,523	1,361,193	10,849,473
2015	1,372,207	2,065,928	9,479,472	912,376	1,302,599	15,132,581
2016	850,835	1,585,903	4,776,611	1,077,903	1,511,272	9,802,524

Source: NMFS SEFSC Recreational ACL file, February 28, 2018.

3.2 Description of the Physical Environment

General Description of the Physical Environment

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

The Gulf has a total area of approximately 600,000 square miles (1.5 million km^2), including state waters (Gore 1992). It is a semi-enclosed, oceanic basin connected to the Atlantic Ocean by the Straits of Florida and to the Caribbean Sea by the Yucatan Channel (Figure 3.2.1).

Oceanographic conditions are affected by the Loop Current, discharge of freshwater into the northern Gulf, and a semi-permanent, anti-cyclonic gyre in the western Gulf. The Gulf includes both temperate and tropical waters (McEachran and Fechhelm 2005). Gulf water temperatures range from 54º F to 84º F (12º C to 29º C) depending on time of year and depth of water. Mean annual sea surface temperatures ranged from 73 º F through 83º F (23-28º C) including bays and bayous (Figure 3.1.1) between 1982 and 2009, according to satellite-derived measurements (NODC 2011)[14]. In general, mean sea surface temperature increases from north to south with large seasonal variations in shallow waters.

General Description of the Reef Fish Physical Environment

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

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

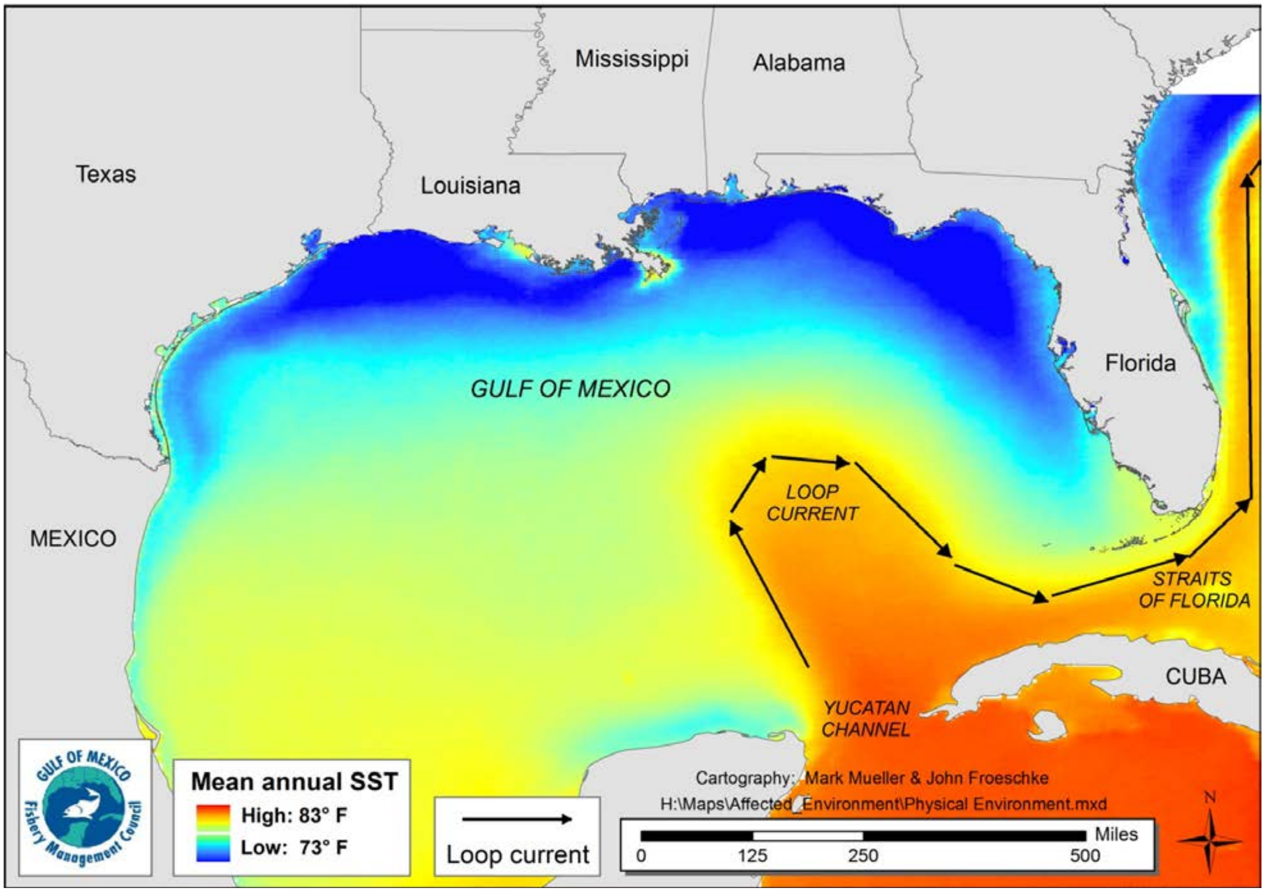


Figure 3.2.1. Physical environment of the Gulf, including major feature names and mean annual sea surface temperature as derived from the Advanced Very High Resolution Radiometer Pathfinder Version 5 sea surface temperature data set (http://accession.nodc.noaa.gov/0072888)

General Description of the Red Drum Physical Environment

Red drum are distributed over a geographical range from Massachusetts on the Atlantic coast to Tuxpan, Mexico (Simmons and Breuer 1962). They occur throughout the Gulf in a variety of habitats, ranging from depths of about 40 m offshore to very shallow estuarine waters. They commonly occur in virtually all of the Gulf's estuaries where they are found over a variety of substrates including seagrass, sand, mud, and oyster reefs. Red drum can tolerate salinities ranging from freshwater to highly saline, but optimum salinities for the various life stages have not been determined. Estuarine wetlands are especially important to larval, juvenile, and sub-adult red drum. Based on such a habitat suitability index model for larval and juvenile red drum developed by the Fish and Wildlife Service (Buckley 1984), shallow water (1.5 to 2.5 m deep) with 50 to 75% submerged vegetation growing on mud bottoms and fringed with emergent vegetation provided optimum red drum habitat. The model, however, needs to be further refined, and estuaries in the Gulf need to be surveyed for habitat and optimum environmental conditions available for red drum production.

The Red Drum FMP (GMFMC 1986) reported that habitat utilized by this species has generally deteriorated since approximately 1940, mostly as a result of industrial and human population growth in existing estuarine systems. Changes have ranged from residential development in Florida to extensive dredging and channelization in Louisiana. This dredging is largely attributable to the quest for petroleum products. Gagliano (1973) stated that loss of productive habitat in Louisiana averages 16.5 square miles per year. The Corps of Engineers estimated that 13% of this amount resulted from dredging associated with oil and gas operations (Louisiana Wetlands Prospectus 1973). The entire Gulf is heavily impacted by activities in other parts of the U.S., as almost two-thirds of the natural sediments and industrial pollutants of the U.S. are dumped into the Gulf (Boykin 1971). Diminishment and degradation of coastal wetlands and estuarine habitat may be responsible to some degree for perceived declines in the inshore portion of Gulf red drum stocks.

Historic Places

With respect to the National Register of Historic Places, there is one site listed in the Gulf. This is the wreck of the *U.S.S. Hatteras*, located in federal waters off Texas. Historical research indicates that over 2,000 ships have sunk on the Federal Outer Continental Shelf in the Gulf between 1625 and 1951; thousands more have sunk closer to shore in state waters during the same period. Only a handful of these have been scientifically excavated by archaeologists for the benefit of generations to come. Further information can be found at: http://www.boem.gov/Environmental-Stewardship/Archaeology/Shipwrecks.aspx.

Northern Gulf of Mexico Hypoxic Zone

Every summer in the northern Gulf, a large hypoxic zone forms. It is the result of allochthonous materials and runoff from agricultural lands by rivers to the Gulf, increasing nutrient inputs from the Mississippi River, and a seasonal layering of waters in the Gulf. The layering of the water is temperature and salinity dependent and prevents the mixing of higher oxygen content surface water with oxygen-poor bottom water. For 2019, the extent of the hypoxic area was estimated to be 6,952 square miles and ranks as the eighth largest event over the past 33 years the area has been mapped.[15] The hypoxic conditions in the northern Gulf directly affect less mobile benthic macroinvertebrates (e.g., polychaetes) by influencing density, species richness, and community composition (Baustian and Rabalais 2009). However, more mobile macroinvertebrates and demersal fishes (e.g., gray snapper) are able to detect lower dissolved oxygen levels and move away from hypoxic conditions. Therefore, although not directly affected, these organisms are indirectly affected by limited prey availability and constrained available habitat (Baustian and Rabalais 2009; Craig 2012).

Greenhouse Gases

The Intergovernmental Panel on Climate Change[16] 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

[15] http://gulfhypoxia.net
[16] http://www.ipcc.ch/publications_and_data/publications_and_data.shtml

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	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

3.3 Description of the Biological/Ecological Environment

The biological environment of the Gulf, including the species addressed in this amendment, is described in detail in the Generic EFH Amendment (GMFMC 2004d), Generic ACL/AM Amendment (GMFMC 2011a), and Reef Fish Amendments 28 (GMFMC 2015b) and 40 (GMFMC 2014a) and is incorporated here by reference and further summarized below.

General Information on Reef Fish Species

The National Ocean Service (NOS) collaborated with NMFS and the Council to develop distributions of reef fish (and other species) in the Gulf (SEA 1998). The NOS obtained fishery-independent data sets for the Gulf, including Southeast Area Monitoring and Assessment Program and state trawl surveys. Data from the Estuarine Living Marine Resources Program (ELMRP) contain information on the relative abundance of specific species (highly abundant, abundant, common, rare, not found, and no data) for a series of estuaries, by five life stages (adult, spawning, egg, larvae, and juvenile) and month for five seasonal salinity zones (0-0.5, 0.5-5, 5-15, 15-25, and greater than 25 parts per thousand). NOS staff analyzed these data to determine relative abundance of the mapped species by estuary, salinity zone, and month. For some species not in the ELMRP database, distribution was classified as only observed or not observed for adult, juvenile, and spawning stages.

Reef fish are widely distributed in the Gulf, occupying both pelagic and benthic habitats during their life cycle. Habitat types and life history stages can be found in more detail in GMFMC (2004d). In general, both eggs and larval stages are planktonic. Larvae feed on zooplankton and phytoplankton. Exceptions to these generalizations include gray triggerfish, which lay their eggs in depressions in the sandy bottom (Simmons and Szedlmayer 2012), and gray snapper whose larvae are found around submerged aquatic vegetation. Juvenile and adult reef fish are typically demersal, and are usually associated with bottom topographies on the continental shelf (less than 328 feet; less than 100 m) which have high relief, i.e., coral reefs, artificial reefs, rocky hard-bottom substrates, ledges and caves, sloping soft-bottom areas, and limestone outcroppings. However, several species are found over sand and soft-bottom substrates. Juvenile red snapper are common on mud bottoms in the northern Gulf, particularly from Texas to Alabama. Also, some juvenile snappers (e.g., mutton, gray, red, dog, lane, and yellowtail snappers) and groupers (e.g., goliath grouper, red, gag, and yellowfin groupers) have been documented in inshore seagrass beds, mangrove estuaries, lagoons, and larger bay systems (GMFMC 1981). More detail on hard bottom substrate and coral can be found in the FMP for Corals and Coral Reefs (GMFMC and SAFMC 1982).

Status of Reef Fish Stocks

The Reef Fish FMP currently encompasses 31 species (Table 3.3.1). Eleven other species were removed from the FMP in 2012 through the Generic ACL/AM Amendment (GMFMC 2011a). The NMFS Office of Sustainable Fisheries updates its Status of U.S. Fisheries Report to Congress[17] on a quarterly basis utilizing the most current stock assessment information. Stock assessments and status determinations have been conducted and designated for 12 stocks and can be found on the Council[18] and Southeast Data, Assessment and Review (SEDAR)[19] websites. Of the 12 stocks for which stock assessments have been conducted, the third quarter report of the 2019 Status of U.S. Fisheries classifies only one as overfished (greater amberjack), and two stocks as undergoing overfishing (gray snapper and lane snapper).

The status of both assessed and unassessed stocks, as of the writing of this report is provided in Table 3.3.1. However, it should be noted that greater amberjack, gray triggerfish, and red snapper are under rebuilding plans. Reef fish Amendment 44 (GMFMC 2017a), implemented December 2017, modified the minimum stock size threshold for seven species in the Reef Fish FMP. Red snapper and gray triggerfish are now listed as not overfished but rebuilding, because the biomass for the stock is currently estimated to be greater than 50% of B_{MSY}. The greater amberjack stock remains classified as overfished.

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

Stock assessments were conducted for seven reef fish stocks using the Data Limited Methods Tool (DLMTool; SEDAR 49 2016). This method allows the setting of overfishing limit (OFL) and acceptable biological catch (ABC) based on limited data and life history information, but

[17] https://www.fisheries.noaa.gov/national/population-assessments/fishery-stock-status-updates
[18] www.gulfcouncil.org
[19] http://sedarweb.org/

does not provide assessment-based status determinations. Data were requested for the following stocks but it was determined not enough information was available to complete an assessment even using the DLMTool. These stocks are not experiencing overfishing based on annual harvest remaining below the OFL, but no overfished status determination has been made (Table 3.3.1). Lane snapper was the only stock with adequate data to be assessed using the DLMTool methods resulting in OFL and ABC recommendations by the SSC.

The remaining species within the Reef Fish FMP have not been assessed at this time. Therefore, their stock status is unknown (Table 3.3.1). For those species that are listed as not undergoing overfishing, that determination has been made based on the annual harvest remaining below the OFL. Scamp is undergoing a research track assessment at this time.

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

Common Name	Scientific Name	Stock Status		Most recent assessment or SSC workshop
		Overfishing	Overfished	
Family Balistidae – Triggerfishes				
gray triggerfish	*Balistes capriscus*	N	N	SEDAR 43 2015
Family Carangidae – Jacks				
greater amberjack	*Seriola dumerili*	N	Y	SEDAR 33 Update 2016a
lesser amberjack	*Seriola fasciata*	N	Unknown	SEDAR 49 2016
almaco jack	*Seriola rivoliana*	N	Unknown	SEDAR 49 2016
banded rudderfish	*Seriola zonata*	Unknown	Unknown	
Family Labridae – Wrasses				
hogfish	*Lachnolaimus maximus*	N	N	SEDAR 37 2013
Family Malacanthidae – Tilefishes				
tilefish (golden)	*Lopholatilus chamaeleonticeps*	N	N	SEDAR 22 2011a
blueline tilefish	*Caulolatilus microps*	Unknown	Unknown	
goldface tilefish	*Caulolatilus chrysops*	Unknown	Unknown	
Family Serranidae – Groupers				
gag	*Mycteroperca microlepis*	N	N	SEDAR 33 Update 2016b
red grouper	*Epinephelus morio*	N	N	SEDAR 42 2015
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*	N	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 31 Update 2015
cubera snapper	*Lutjanus cyanopterus*	N	Unknown	
gray snapper	*Lutjanus griseus*	Y	Unknown	
lane snapper	*Lutjanus synagris*	Y	Unknown	SEDAR 49 2016
silk snapper	*Lutjanus vivanus*	Unknown	Unknown	
yellowtail snapper	*Ocyurus chrysurus*	N	N	SEDAR 27A 2012
vermilion snapper	*Rhomboplites aurorubens*	N	N	SEDAR 45 2016
Wenchman	*Pristipomoides aquilonaris*	N	N	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.

General Information on Red Drum

Red drum range throughout the coastal regions of the northern Gulf and southeastern United States. Several tagging studies have indicated that the movements of juvenile red drum are limited (Matlock and Weaver 1979; Osburn et al. 1982), leading some to suggest that several metapopulations may exist. Additionally, Rooker et al. (2010) found evidence of metapopulations structures in Texas bays and estuaries. On the other hand, red drum have pelagic larvae and are capable of extensive migrations as adults (Nichols 1988). Females typically breed less than 600 kilometers (km) of their natal estuary, creating a continuum of gradual genetic variations along the Gulf coast (Porch 2000).

Wilson and Nieland (1994) found that the sex ratio of the offshore spawning stock in the northern Gulf was close to 1:1. Spawning takes place primarily in nearshore waters, with occasional spawning activity observed in estuarine environments (Peters and McMichael 1987; Johnson and Funicelli 1991; Wilson and Nieland 1994; Vaughan and Carmichael 2000). Gulf red drum spawn from summer through early fall. During this time a typical female spawns every few days and produces millions of eggs (Peters and McMichael 1987; Wilson and Nieland 1994).

Red drum grow rapidly during their first few years of life, but slow thereafter. Pelagic larvae recruit to estuarine environments and are estuarine residents remain until reaching maturity (~ age 4). Once mature, individuals join offshore spawning aggregations. Mature red drum migrate in and out of estuarine habitats seasonally (Vaughan and Carmichael 2000). Larvae subsist on a diet primarily composed of copepods. Principal prey for small juveniles is comprised of mysids, amphipods, and shrimp, while larger juveniles feed more frequently on larger crustaceans and small fish (Peters and McMichael 1987). Adults have a more varied diet largely comprised of crustaceans and fish.

The most recent stock assessment determined annual natural mortality (M) by age, with an overall estimate for M of approximately 0.2^{y-1}, with a mean generation time of 14.2 years (Porch 2000). Red drum can live for 50 years (Ross et al. 1995), with males reaching lengths in excess of 150 cm total length (TL) (Chao 1978).

Status of Red Drum

The most recent red drum stock assessment was conducted in 2000 (Porch 2000). While the assessment concluded that red drum were overfished and that overfishing was occurring, both the Council’s Red Drum Stock Assessment Panel (RDSAP) and the NMFS assessment biologist noted that there was a high degree of uncertainty regarding the assessment results. The NMFS assessment biologist cited uncertainty in the stock structure, the flat stock-recruitment relationship even at very small stock sizes, the small sample size for offshore age composition, the unknown age composition of the shrimp bycatch, the unknown length composition on the inshore commercial fishery, and the unknown magnitude and composition of the inshore shrimp fleet bycatch as reasons why the results of the assessment must be regarded as uncertain (Porch 2000). Given uncertainties about the assessment’s findings that red drum are overfished in the Gulf, the RDSAP chose to recommend that the ABC remain at zero in the EEZ; however, the RDSAP chose not to estimate rebuilding schedules or MSY until the uncertainties in the assessment could be addressed with improved data.

In 2010, the SSC formed a working group to review the available information on red drum and determine if an ABC could be established. The working group reported back to the SSC in July 2010. After reviewing landings from the past 5 years for each state, the working group decided to recommend an ABC based on the sum of the highest annual landing from each state, or about

17 million pounds. However, this recommendation was based on catches under current selectivity patterns, i.e., fishing in state waters only. In order to allow data to be collected to determine the age composition of red drum on offshore waters, the working group recommended that an additional 20,000 red drum (in numbers) be allowed to be harvested from the EEZ under a scientific study that would be endorsed by the SSC. The working group further recommended that scientific studies include mercury concentrations as well as genetic characterizations of sub-stocks. The SSC accepted the working group recommendations and moved to forward the ABC recommendations to the Council. However, the Council felt that an EEZ ABC of 20,000 red drum (in numbers) for a scientific study was not workable, and chose to leave the red drum ABC at zero.

Harvest of red drum from the EEZ is currently prohibited. For this reason, NMFS has determined that overfishing is not currently occurring. However, due to the length of time since the last stock assessment, the current overfished status is considered unknown (Table 3.3.2).

Table 3.3.2. Red drum stock status as of September 30, 2019.

Stock	Stock Status		Most Recent SSC Determination	Most Recent Stock Assessment
	Overfishing	Overfished		
Red drum	N	unknown	July 2010	Porch 2000

The NMFS Office of Sustainable Fisheries updates its Status of U.S. Fisheries Report to Congress on a quarterly basis utilizing the most current stock assessment information. The most recent update can be found at: https://www.fisheries.noaa.gov/national/population-assessments/fishery-stock-status-updates.

Bycatch of Managed Finfish Species

Many of the reef fish species co-occur with each other and can be incidentally caught when fishermen target certain species. In some cases, these fish may be discarded for regulatory reasons and thus are considered bycatch. Bycatch practicability analyses have been completed for red snapper (GMFMC 2004b, GMFMC 2007, GMFMC 2014a, GMFMC 2015b), grouper (GMFMC 2008a, GMFMC 2009, GMFMC 2010, GMFMC 2011b, GMFMC 2012a), vermilion snapper (GMFMC 2004c, GMFMC 2017c), greater amberjack (GMFMC 2008b, GMFMC 2012b, GMFMC 2017b), gray triggerfish (GMFMC 2012c), and hogfish (GMFMC 2016a). These analyses examined the effects of fishing on these species. In general, these analyses have found that reducing bycatch provides biological benefits to managed species as well as benefits to the fishery through less waste, higher yields, and less forgone yield. However, in some cases, actions are approved that can increase bycatch through regulatory discards such as increased minimum sizes and closed seasons. Under these circumstances, there is some biological benefit to the managed species that outweigh any increases in discards from the action.

Protected Species

NMFS manages marine protected species in the Southeast region under the Endangered Species Act (ESA) and the Marine Mammal Protection Act (MMPA). A very brief summary of these two laws and more information is available on NMFS Office of Protected Resources website[20]. There are 21 ESA-listed species of marine mammals, sea turtles, fish, and corals that may occur in the exclusive economic zone (EEZ) of the Gulf. There are 91 stocks of marine mammals managed within the Southeast region plus the addition of the stocks such as North Atlantic right whales (NARW), and humpback, sei, fin, minke, and blue whales that regularly or sometimes occur in Southeast region managed waters for a portion of the year (Hayes et al. 2017). All marine mammals in U.S. waters are protected under the MMPA.

Of the four marine mammals that may be present in the Gulf (sperm, sei, fin, and Gulf Bryde's), the sperm, sei, and Gulf of Mexico Bryde's whale are listed as endangered under the ESA. Bryde's whales are the only resident baleen whales in the Gulf. Manatees, listed as threatened under the ESA, also occur in the Gulf and are the only marine mammal species in this area managed by the U.S. Fish and Wildlife Service.

The gear used by the Gulf reef fish fishery is classified in the MMPA 2019 List of Fisheries as a Category III fishery (84 FR 22051). This classification indicates the annual mortality and serious injury of a marine mammal stock resulting from any fishery is less than or equal to 1% of the maximum number of animals, not including natural mortalities, that may be removed from a marine mammal stock while allowing that stock to reach or maintain its optimum sustainable population. Dolphins are the only species documented as interacting with the reef fish fishery. Bottlenose dolphins prey upon bait, catch, and/or released discards of fish from the reef fish fishery. They are also a common predator around reef fish vessels, feeding on the discards. Marine Mammal Stock Assessment Reports and additional information are available on the NMFS Office of Protected Species website.[21]

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

The most recent biological opinion (BiOp) for the FMP was completed on September 30, 2011. The BiOp determined the continued authorization of the Gulf reef fish fishery managed under the Reef Fish FMP is not likely to adversely affect ESA-listed marine mammals or coral, and was not likely to jeopardize the continued existence of sea turtles (loggerhead, Kemp's ridley, green, hawksbill, and leatherback) or smalltooth sawfish. Since issuing the opinion, in memoranda dated September 16, 2014, and October 7, 2014, NMFS concluded that the activities associated with the Reef Fish FMP is not likely to adversely affect critical habitat for the Northwest Atlantic Ocean loggerhead sea turtle DPS and four species of corals (lobed star, mountainous star, boulder star, and rough cactus). On September 29, 2016, NMFS requested reinitiation of Section

[20] http://www.nmfs.noaa.gov/pr/laws/
[21] http://www.nmfs.noaa.gov/pr/sspecies/

7 consultation on the continued authorization of reef fish fishing managed by the Reef Fish FMP because new species (i.e., Nassau grouper [81 FR 42268] and green sea turtle North Atlantic and South Atlantic DPSs [81 FR 20057]) were listed under the ESA that may be affected by the proposed action. NMFS documented a determination that allowing the fishery to continue during the reinitiation period is not likely to adversely affect these species.

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

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

Climate Change

Climate change projections predict increases in sea-surface temperature and sea level; decreases in sea-ice cover; and changes in salinity, wave climate, and ocean circulation.[22] These changes are likely to affect plankton biomass and fish larvae abundance that could adversely affect fish, marine mammals, seabirds, and ocean biodiversity. Kennedy et al. (2002) and Osgood (2008) have suggested global climate change could affect temperature changes in coastal and marine ecosystems that can influence organism metabolism and alter ecological processes such as productivity and species interactions, change precipitation patterns and cause a rise in sea level. This could change the water balance of coastal ecosystems; altering patterns of wind and water circulation in the ocean environment; and influence the productivity of critical coastal ecosystems such as wetlands, estuaries, and coral reefs. The National Oceanic and Atmospheric Association (NOAA) Climate Change Web Portal[23] predicts the average sea surface temperature in the Gulf will increase by 1-3ºC for 2010-2070 compared to the average over the years 1950-2010. For reef fishes, Burton (2008) speculated climate change could cause shifts in spawning seasons, changes in migration patterns, and changes to basic life history parameters such as growth rates. The smooth puffer and common snook are examples of species for which there has been a distributional trend to the north in the Gulf. For other species, such as red snapper and the dwarf sand perch, there has been a distributional trend towards deeper waters. For other fish species, such as the dwarf goatfish, there has been a distributional trend both to the north and to deeper waters. These changes in distributions have been hypothesized as a response to environmental factors, such as increases in temperature.

[22] http://www.ipcc.ch/
[23] https://www.esrl.noaa.gov/psd/ipcc/

The distribution of native and exotic species may change with increased water temperature, as may the prevalence of disease in keystone animals such as corals and the occurrence and intensity of toxic algae blooms. Hollowed et al. (2013) provided a review of projected effects of climate change on the marine fisheries and dependent communities. Integrating the potential effects of climate change into the fisheries assessment is currently difficult due to the time scale differences (Hollowed et al. 2013). The fisheries stock assessments rarely project through a time span that would include detectable climate change effects. However, some stocks, including gray snapper, have shown increases in abundance in the northern Gulf (Fodrie et al. 2010) and Texas estuaries (Tolan and Fisher 2009) during the interval between 1979 and 2006. This may be a result of increasing water temperatures in coastal environments.

Deepwater Horizon MC252 Oil Spill

The presence of polycyclic aromatic hydrocarbons (PAH), which are highly toxic chemicals that tend to persist in the environment for long periods of time, in marine environments can have detrimental impacts on marine finfish, especially during the more vulnerable larval stage of development (Whitehead et al. 2012). When exposed to realistic, yet toxic levels of PAHs (1–15 μg/L), greater amberjack larvae develop cardiac abnormalities and physiological defects (Incardona et al. 2014). The future reproductive success of long-lived species, including red drum and many reef fish species, may be negatively affected by episodic events resulting in high-mortality years or low recruitment. These episodic events could leave gaps in the age structure of the population, thereby affecting future reproductive output (Mendelssohn et al. 2012). Other studies have described the vulnerabilities of various marine finfish species, with morphological and/or life history characteristics similar to species found in the Gulf, to oil spills and dispersants (Hose et al. 1996; Carls et al. 1999; Heintz et al. 1999; Short 2003).

Increases in histopathological lesions were found in red snapper in the area affected by the oil, but Murawski et al. (2014) found that the incidence of lesions had declined between 2011 and 2012. The occurrence of such lesions in marine fish is not uncommon (Sindermann 1979; Haensly et al. 1982; Solangi and Overstreet 1982; Khan and Kiceniuk 1984, 1988; Kiceniuk and Khan 1987; Khan 1990). Red snapper diet was also affected after the spill. A decrease in zooplankton consumed, especially by adults (greater than 400 mm total length) over natural and artificial substrates may have contributed to an increase in the consumption of fish and invertebrate prey – more so at artificial reefs than natural reefs (Tarnecki and Patterson 2015).

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

Red Tide

Red tide is a common name for harmful algal blooms caused by species of dinoflagellates and other organisms that cause the water to appear to be red. Red tide blooms occur in the Gulf almost every year, generally in late summer or early fall. They are most common off the central and southwestern coasts of Florida between Clearwater and Sanibel Island but may occur anywhere in the Gulf. More than 50 species capable of causing red tides occur in the Gulf, but one of the best-known species is *Karenia brevis*. This organism produces toxins capable of killing fish, birds and other marine animals.[24]

The effects of red tide on fish stocks have been well established. In 2005, a severe red tide event occurred in the Gulf along with an associated large decline in multiple abundance indices for red grouper, gag, and other species thought to be susceptible to mortality from red tide events. It is unknown whether mortality occurs via absorption of toxins across gill membranes (Abbott et al. 1975, Baden 1988), ingestion of toxic biota (Landsberg 2002), or from some indirect effect of red tide such as hypoxia (Walter et al. 2013). In 2018, a severe red tide event occurred off the southwest coast of Florida from Monroe County to Sarasota County that persisted for more than 10 months; the impacts on fish stocks will likely be considered in future stock assessments.

3.5 Description of the Social Environment

This amendment affects both commercial and recreational management of reef fish and red drum in the Gulf. Harvest of red drum is not allowed in Federal waters, however some states allow harvest and some states allow red drum to be landed although disallowing harvest in their waters.

Descriptions of the top recreational and commercial fishing communities based on engagement and reliance are included. Community level data are presented to meet the requirements of National Standard 8 of the Magnuson-Stevens Fishery Conservation and Management Act (Magnuson-Stevens Act), which requires the consideration of the importance of fishery resources to human communities when changes to fishing regulations are considered. Additional details on the social environment of the recreational and commercial sectors of the Gulf reef fish fishery, or components thereof, are provided in Reef Fish Amendment 51 (GMFMC 2019), Reef Fish Amendment 47 (GMFMC 2017a), and Reef Fish Amendment 44 (GMFMC 2017b).

3.5.1 Commercial Fishing Communities

Reef fish landings by all gear types are depicted in Figure 3.5.1.1 (Overstreet et al. 2017) and show a concentration of the largest landings in the eastern Gulf. This is consistent with the location of many reef fish vessel homeports as revealed in figures below.

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

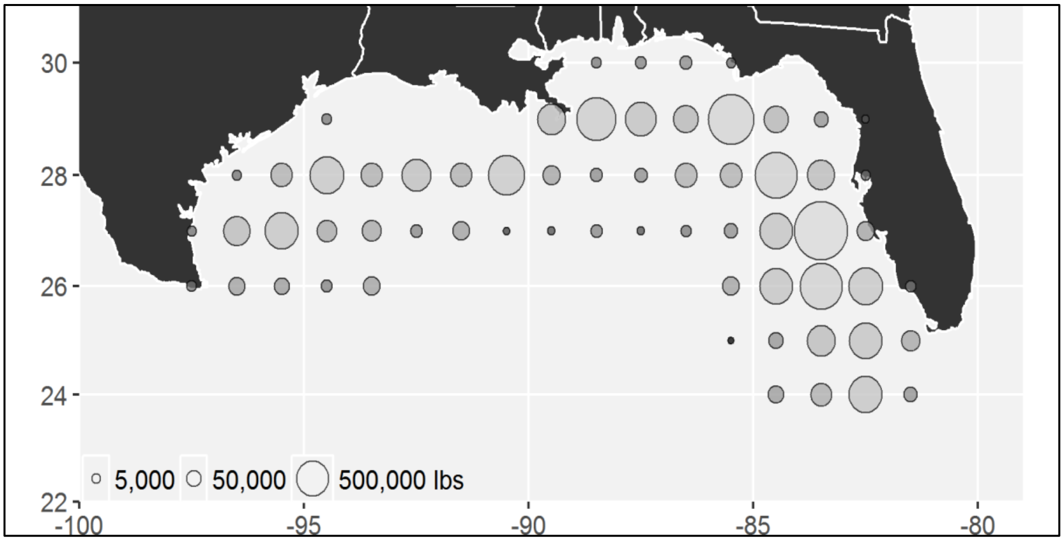


Figure 3.5.1.1. Distribution of reef fish landings by area fished for Gulf reef fish.
Source: Overstreet et al. 2017.

To further understand the importance of commercial fishing to Gulf coast communities, a list of top 20 commercial fishing communities is included by using their rank on commercial fishing engagement. Commercial fishing engagement is represented by the number of commercial vessels designated as "commercial" by homeport and owners address plus landings and value of all commercially harvested species for a community. Another measure examines fishing reliance, which includes the same variables as fishing engagement divided by population. Communities are presented in rank order by fishing engagement and all 20 included communities demonstrate high levels of commercial engagement, although this is not specific to fishing for reef fish. Factor scores of both engagement and reliance were plotted together in Figure 3.5.1.2 to provide some indication of the importance of commercial fishing to a particular community.

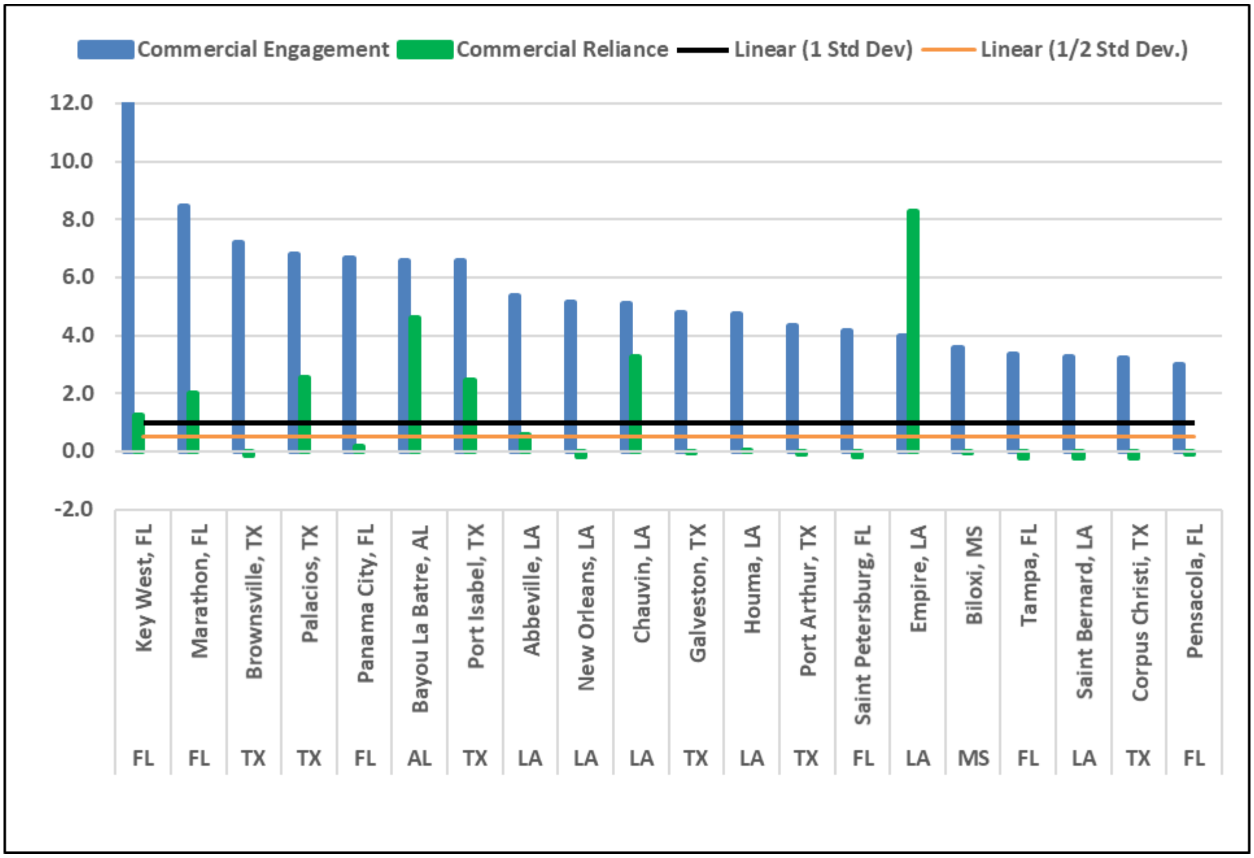


Figure 3.5.1.2. Top 20 Gulf commercial fishing communities by overall commercial fishing engagement and reliance.
Source: SERO, Community Social Vulnerability Indicators Database 2019.

Figure 3.5.1.2 identifies the top 20 Gulf communities that are engaged and reliant upon commercial fishing in general, not specific to reef fish. Two thresholds of one and one-half standard deviation above the mean were plotted to help determine a threshold for significance. All states are represented within the top 20 commercially engaged fishing communities in the Gulf. Alabama and Mississippi each have one community in the top 20, while Florida, Louisiana, and Texas have several. The most reliant communities within the top 20 are located in Louisiana. The ranking of many of the top 20 commercial fishing communities are likely attributable to their involvement in the shrimp fishery. However, several communities, especially those that are highly reliant on commercial fishing in general are also homeports for the larger concentrations of commercial reef fish permit holders.

The distribution of commercial reef fish permits by county is provided in Figure 3.5.1.3. The top counties are in Florida with Pinellas County having more commercial permits than any other county in the Gulf with over 170 permits. Bay and Monroe Counties have the next largest number of permits with 94 and 85 permits, respectively in 2018. Galveston County in Texas is ranked fifth with 45 commercial reef fish permits, followed by Mobile County in Alabama with 24 permits.

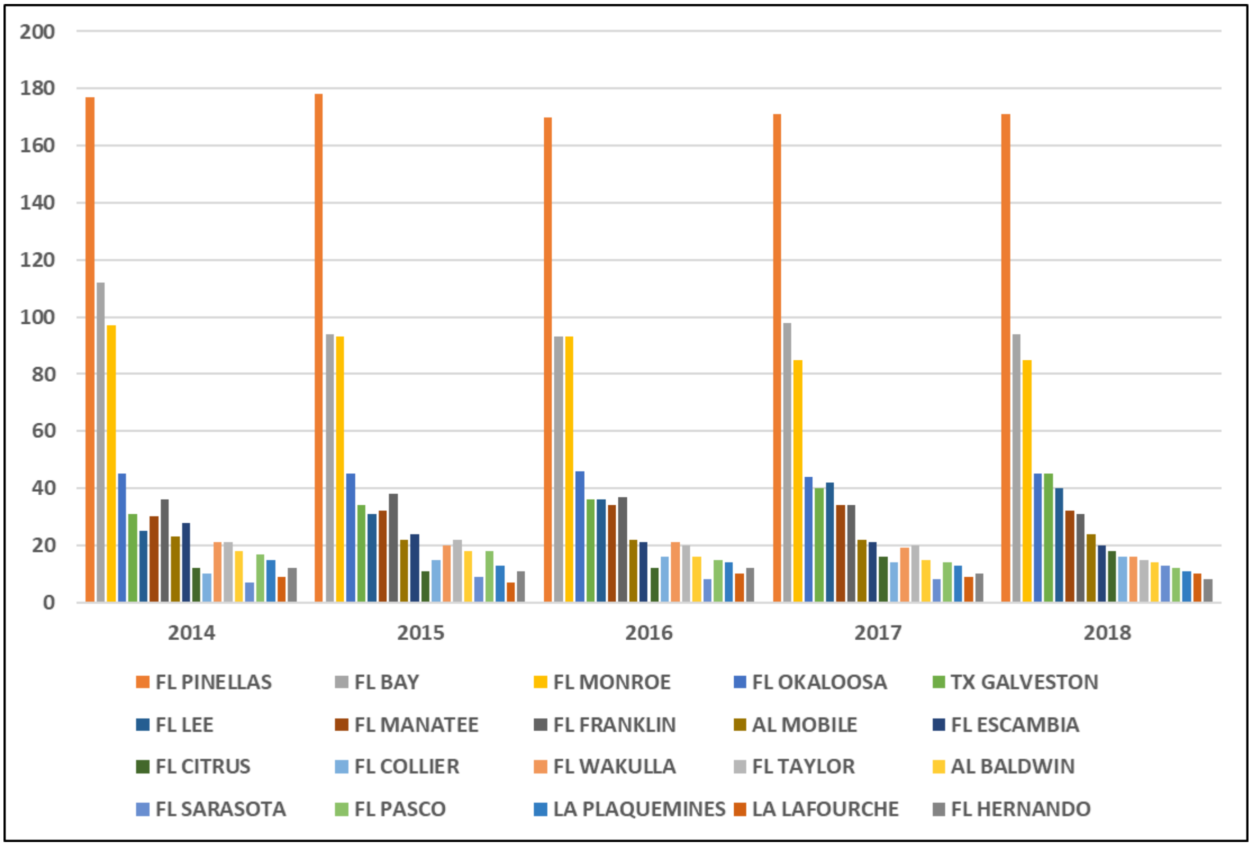


Figure 3.5.1.3. Top 20 Gulf counties with commercial reef fish permits for 2014-2018, ranked by year 2018.

Source: NMFS Southeast Regional Office permit office, SERO Access database December 27, 2019. Includes valid and renewable permits.

The distribution of commercial reef fish permits by community is provided in Figure 3.5.1.4 and are rank ordered in the legend by year 2018. The two top communities are in Florida with Panama City and Key West having far more than any other communities with each having over 70 permits. Galveston, Texas is ranked third with just over 40 commercial reef fish permits and has surpassed the Florida communities of Destin, Madiera Beach and Tarpon Springs over the past five years.

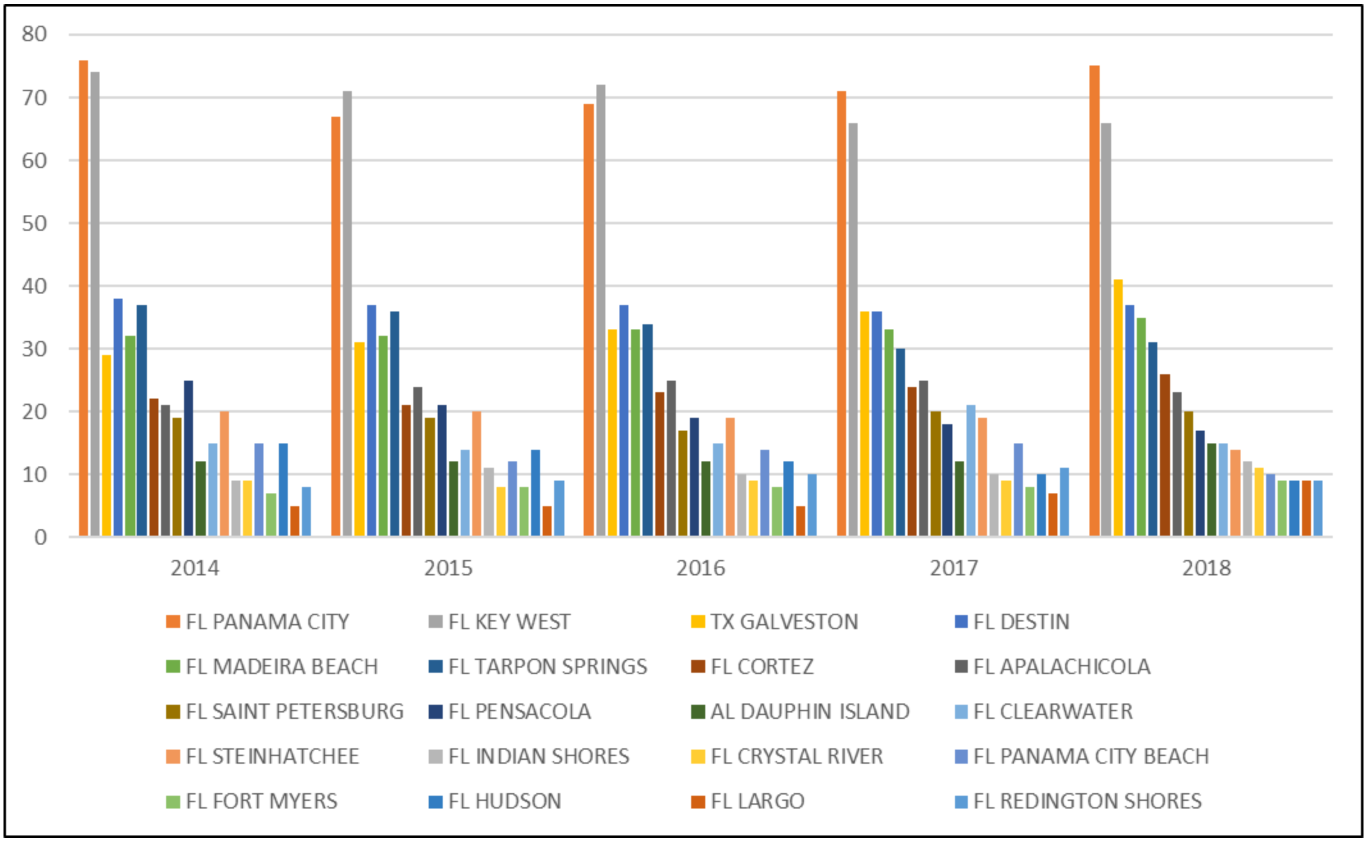


Figure 3.5.1.4. Top 20 Gulf communities with commercial reef fish permits for 2014-2018, ranked by year 2018.
Source: NMFS Southeast Regional Office permit office, SERO Access database December 27, 2019. Includes valid and renewable permits.

In terms of reef fish landings, Figure 3.5.1.5 provides a ranking of communities by their regional quotient of species included in this amendment. Regional quotient is the amount of landings in the community divided by the total landed in the region. The Florida communities of Key West, Marathon, Madeira Beach, and Panama City are currently the top communities in terms of regional quotient, although in past years Galveston, Texas was ranked third in terms of regional quotient while ranking fifth in 2017.

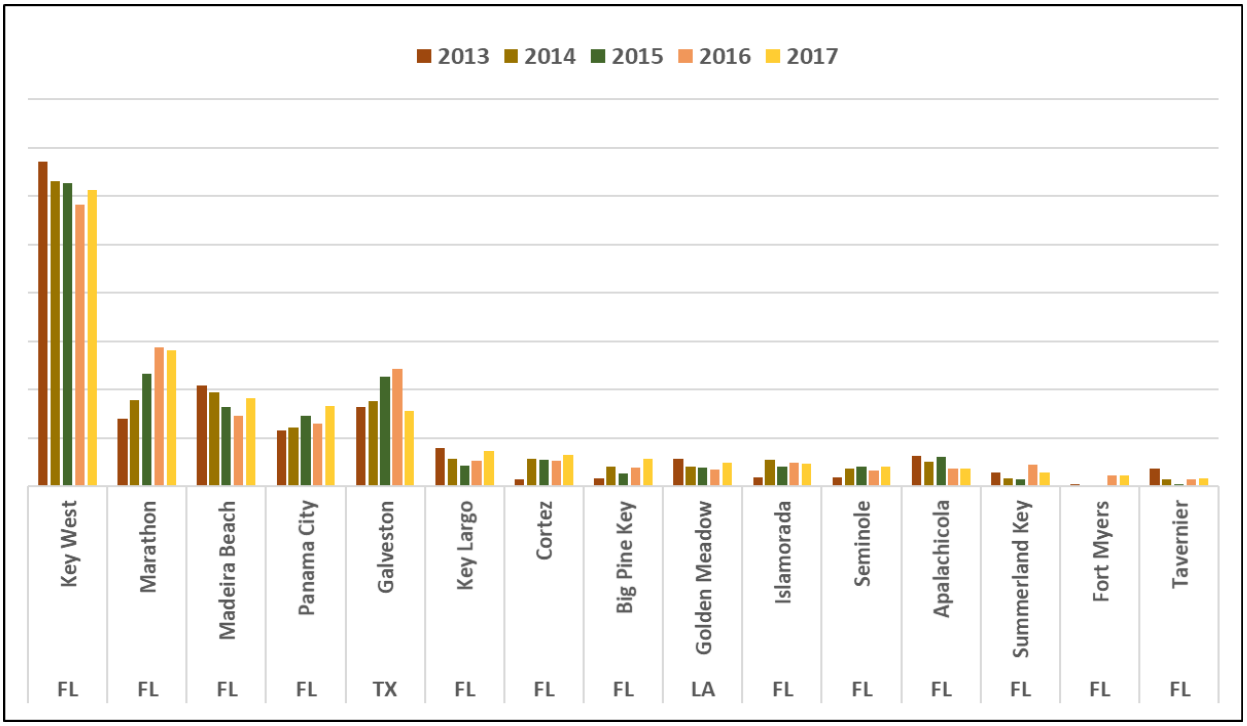


Figure 3.5.1.5. Top 15 Gulf communities ranked by regional quotient of reef fish species included in this amendment 2013-2017, ranked by year 2017.
Source: SERO, Community Accumulated Landings Database 2019

The top communities in terms of regional quotient for red drum are ranked in order by their regional quotient in 2017 in Figure 3.5.1.6. Bayou La Batre, Alabama is currently the top ranked community but the communities in Mississippi were ranked much higher in the previous years. Pascagoula, Mississippi was the top ranked community in 2013 and 2014 with a regional quotient higher than any community, but has since seen substantially lower landings. Red drum harvest is not allowed in Federal waters, however, some states do allow harvest and landings are allowed in some states where harvest is prohibited. In both Figures 3.5.1.5 and 3.5.1.6 the y axis has been removed to protect confidentiality.

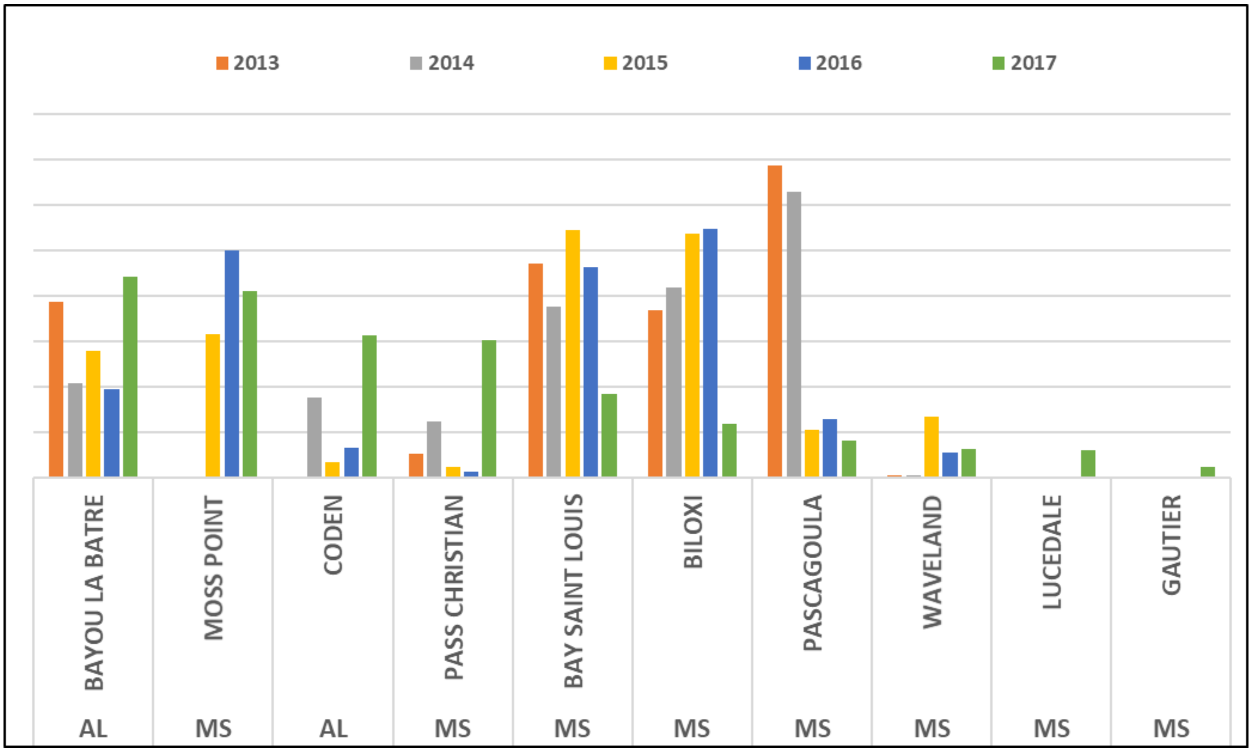


Figure 3.5.1.6. Top 10 Gulf communities ranked by regional quotient of red drum 2013-2017, ranked by year 2017.
Source: SERO, Community Accumulated Landings Database 2019

3.5.2 Recreational Fishing Communities

Reef fish landings for the recreational sector are not available at the community level, making it difficult to identify communities as dependent on recreational fishing for reef fish. Because limited data are available concerning how recreational fishing communities are engaged and reliant on specific species or species groups, 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). Recreational fishing engagement is represented by the number of charter/headboat permits for reef fish and vessels designated as "charter/headboat" 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 into Figure 3.5.2.1.

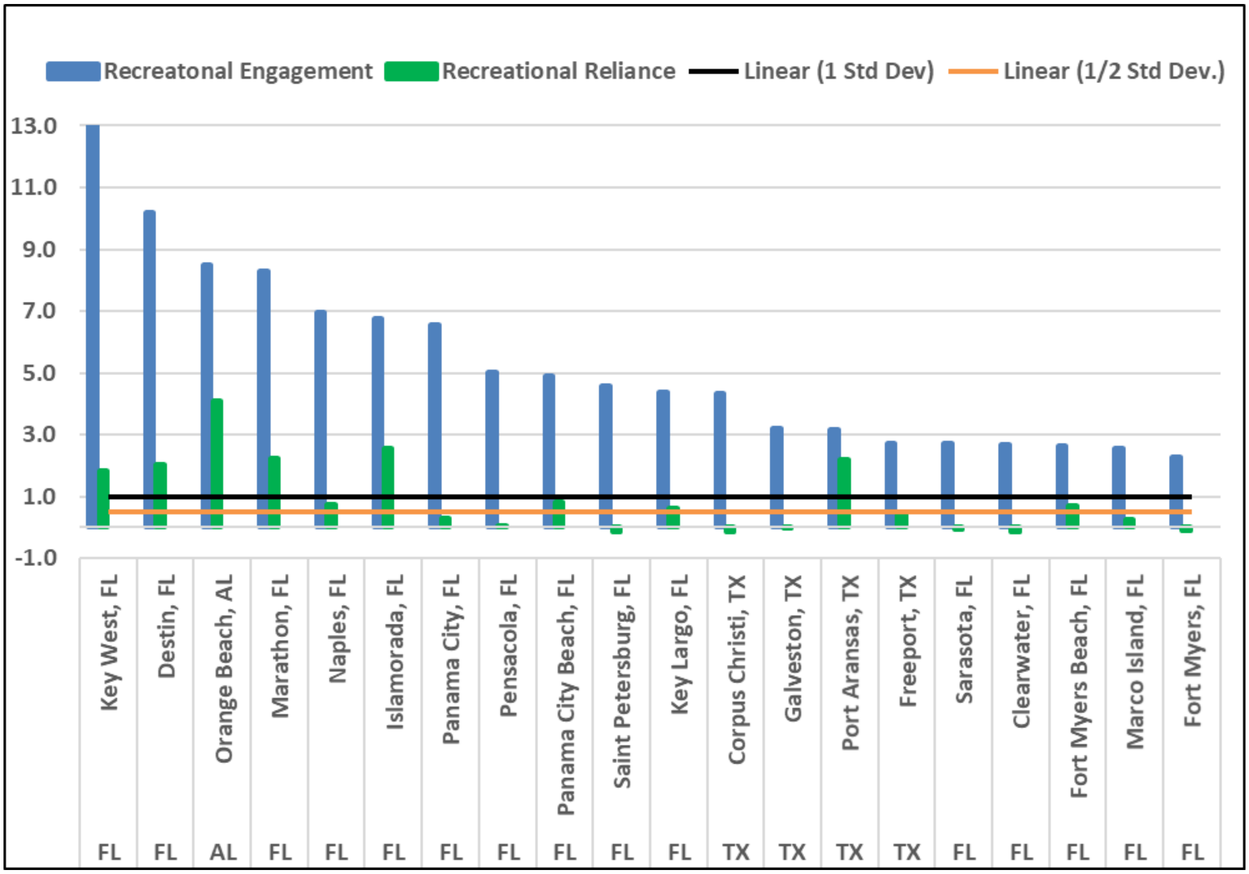


Figure 3.5.2.1. Top 20 recreational fishing communities' overall recreational fishing engagement and reliance.
Source: SERO, Community Social Vulnerability Indicators Database 2019.

The top Gulf communities that are engaged and reliant upon recreational fishing in general are identified in Figure 3.5.2.1. 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 reef fish. Because the analysis used discrete geo-political boundaries, Panama City and Panama City Beach, Florida 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. The communities of Key West, Destin, Marathon, and Islamorada in Florida, all demonstrate high reliance on recreational fishing in addition to high engagement. Outside of Florida, the communities of Orange Beach, Alabama and Port Aransas, Texas are the only communities among the top 20 that demonstrate both a high reliance and high engagement upon recreational fishing. It is important to note that Port Aransas, Texas was significantly affected by Hurricane Harvey in 2017 and has been recovering since then, yet continues to demonstrate both reliance and engagement upon recreational fishing.

Reef Fish For-hire Permits by County and Community

In order to present information about the for-hire component of the recreational sector that is engaged in the recreational reef fish fishery, federal for-hire permit for the top 20 counties with reef fish charter/headboat permits are included in Figure 3.5.2.2 rank ordered by the number of permits in 2018.

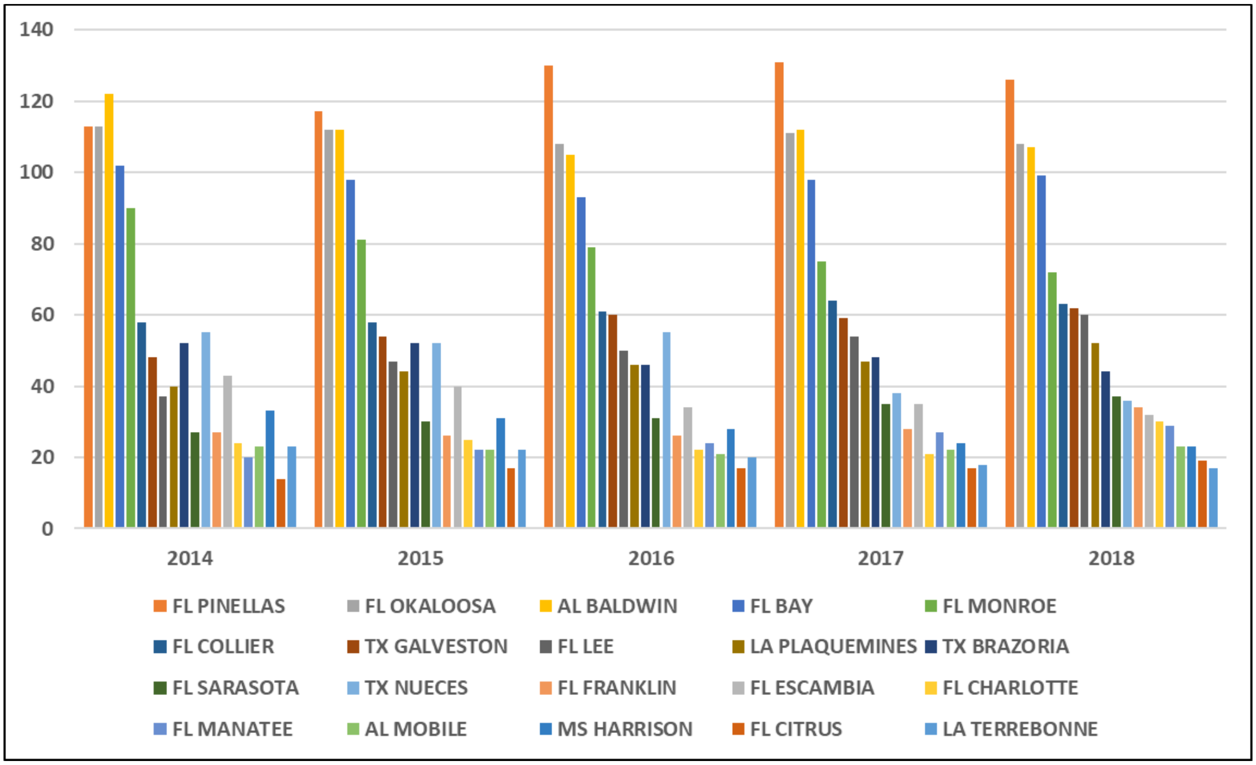


Figure 3.5.2.2. Number of federal for-hire permits for Gulf reef fish by top 20 counties 2014-2018, ranked in order by year 2018.
Source: NMFS Southeast Regional Office permit office, SERO Access database December 27, 2019. Includes valid and renewable permits.

Currently, the most federal charter/headboat permits for reef fish are held by operators in the Florida counties of Pinellas and Okaloosa, although Baldwin County, Alabama currently ranks third, but ranked first in 2014. Texas has two counties in the top ten with Galveston ranked seventh and Brazoria tenth in 2018. Louisiana has only one county (parish) in the top ten with Plaquemines ranked ninth. Data included in Table 3.5.2.2 are based on the number of permits throughout the year, rather than from a specific date, and include permits that were valid or renewable sometime during the year. However, if the permit was sold, then only the location of the most current permit holder has been counted.

The number of for-hire reef fish permits by community are provided in Figure 3.5.2.3 with the top 20 communities ranked by the number of permits in 2018. Destin, Florida and Orange Beach, Alabama far exceed other communities in terms of the number of permits in their communities. Galveston, Texas ranks third, with the next three communities (Panama City and Key West in Florida, and Venice, Louisiana) being close in the number of permits. The number of permits within each community have remained fairly stable over time with some fluctuation.

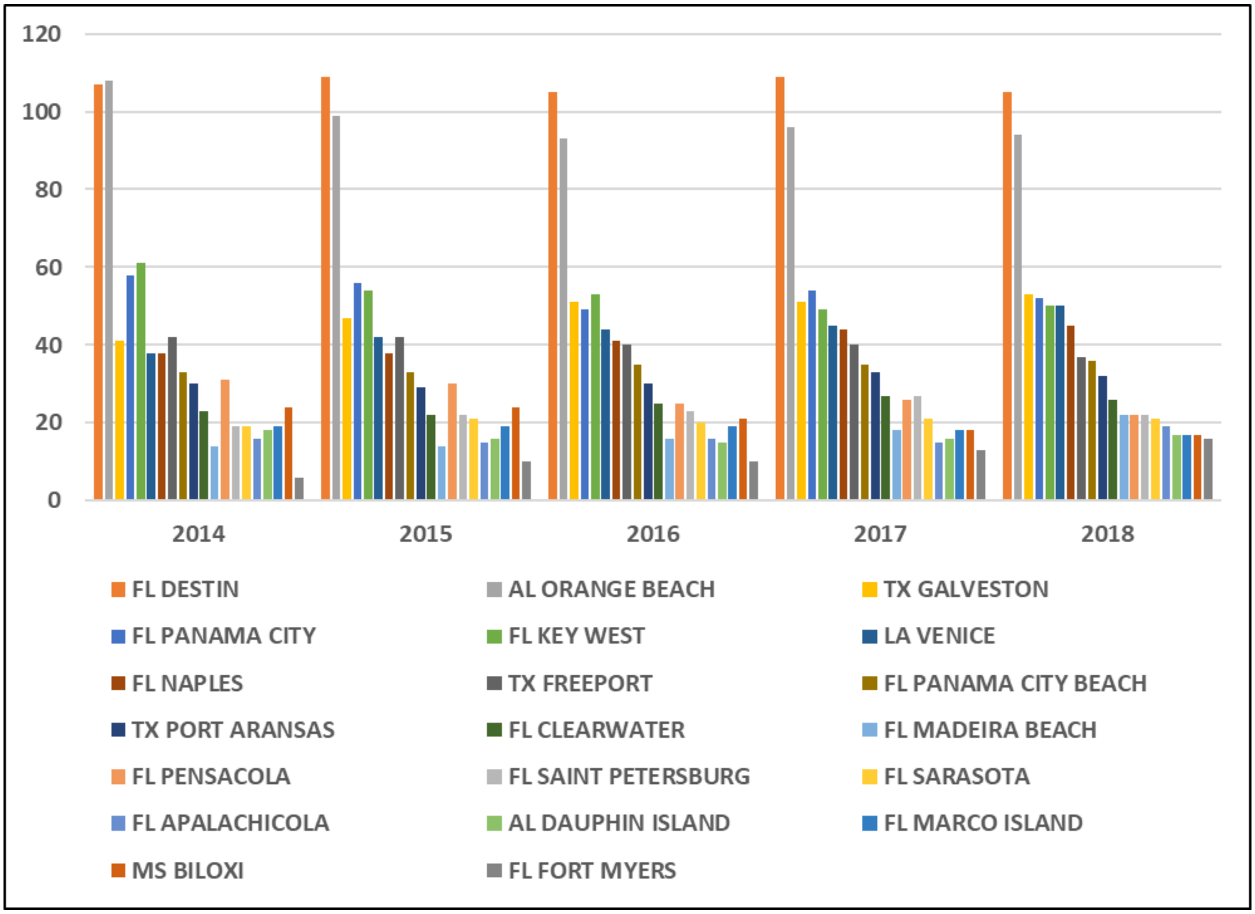


Figure 3.5.2.3. Number of federal for-hire permits for Gulf reef fish by top 20 communities 2014-2018, ranked in order by year 2018.
Source: NMFS Southeast Regional Office permit office, SERO Access database December 27, 2019. Includes valid and renewable permits.

3.5.3 Environmental Justice Considerations

Executive Order 12898 requires federal agencies to identify and address, as appropriate, disproportionately high and adverse human health or environmental effects of its programs, policies, and activities on minority populations and low-income populations. This executive order is generally referred to as environmental justice (EJ).

To evaluate EJ considerations for the proposed actions, analysis was completed utilizing a suite of indices created to examine the social vulnerability of coastal communities and is shown in Figures 3.5.3.1 and 3.5.3.2. 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 social vulnerability. Indicators such as increased poverty rates for different groups; more single female-headed households; more households with children under the age of 5; and disruptions like higher separation rates, higher crime rates, and unemployment all are signs of populations having vulnerabilities. The data used to create these indices are from the American Community Survey estimates at the U.S. Census Bureau. The thresholds of 1 and 0.5 standard deviation are the same for these standardized indices. For those communities that exceed both thresholds for all indices, it would be expected that they are exhibiting vulnerabilities to sudden changes or social disruption that might accrue from regulatory change.

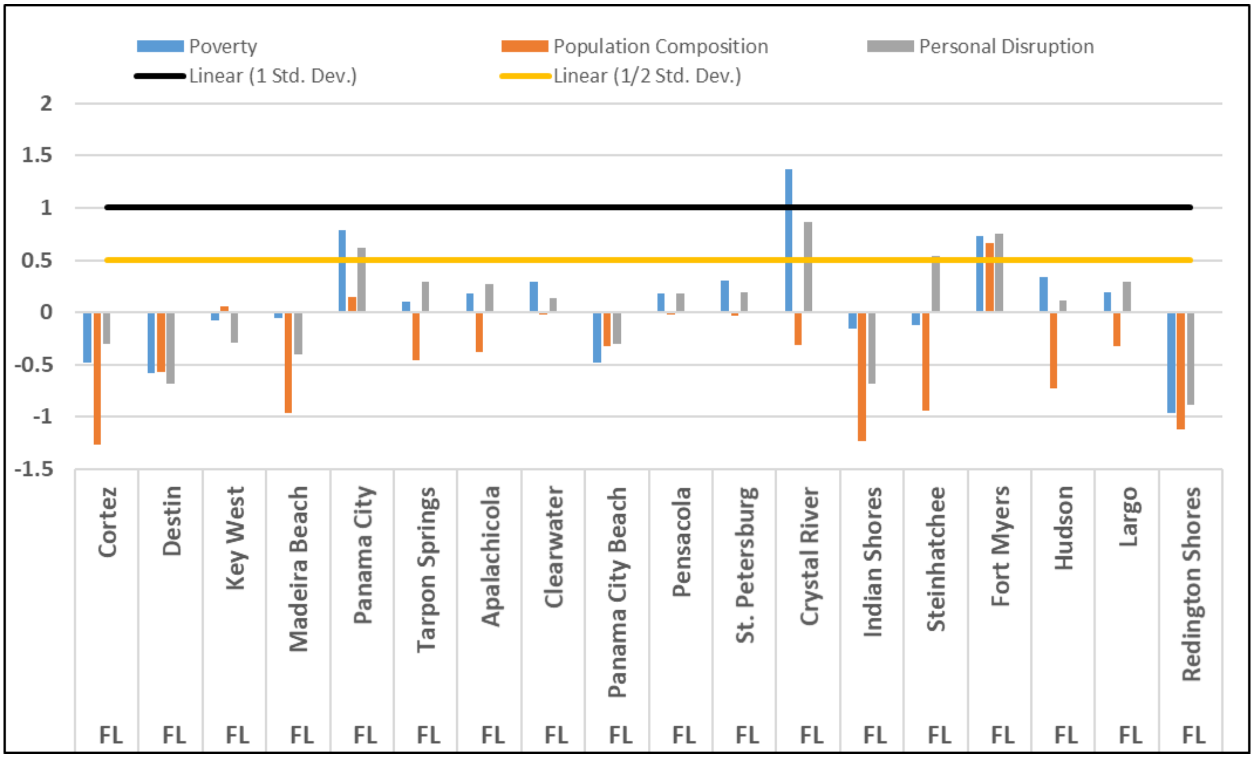


Figure 3.5.3.1 Community social vulnerability indices for Florida fishing communities identified in the description of the social environment as engaged and/or reliant on fishing.
Source: SERO, Community Social Vulnerability Indicators Database 2019 (2016 ACS data).

Similar to the reliance index discussed previously, the vulnerability indices also use normalized factor scores. Comparison of vulnerability scores is relative, but the score is related to the percent of communities with similar attributes. The social vulnerability indices provide a way to gauge change over time within these communities but also provides a comparison of one community with another.

With regard to social vulnerabilities (Figure 3.5.3.1), the following Florida communities exceed the threshold of 0.5 standard deviation for at least one of the social vulnerability indices: Panama City, Crystal River, Steinhatchee, and Fort Myers. Fort Myers exceeds the threshold of ½ standard deviation on all three social vulnerability indices, while Crystal River exceeds the 1 standard deviation threshold for poverty. This suggests that these communities are expressing social vulnerabilities and may be susceptible to further effects from any regulatory change depending upon the direction and extent of that change.

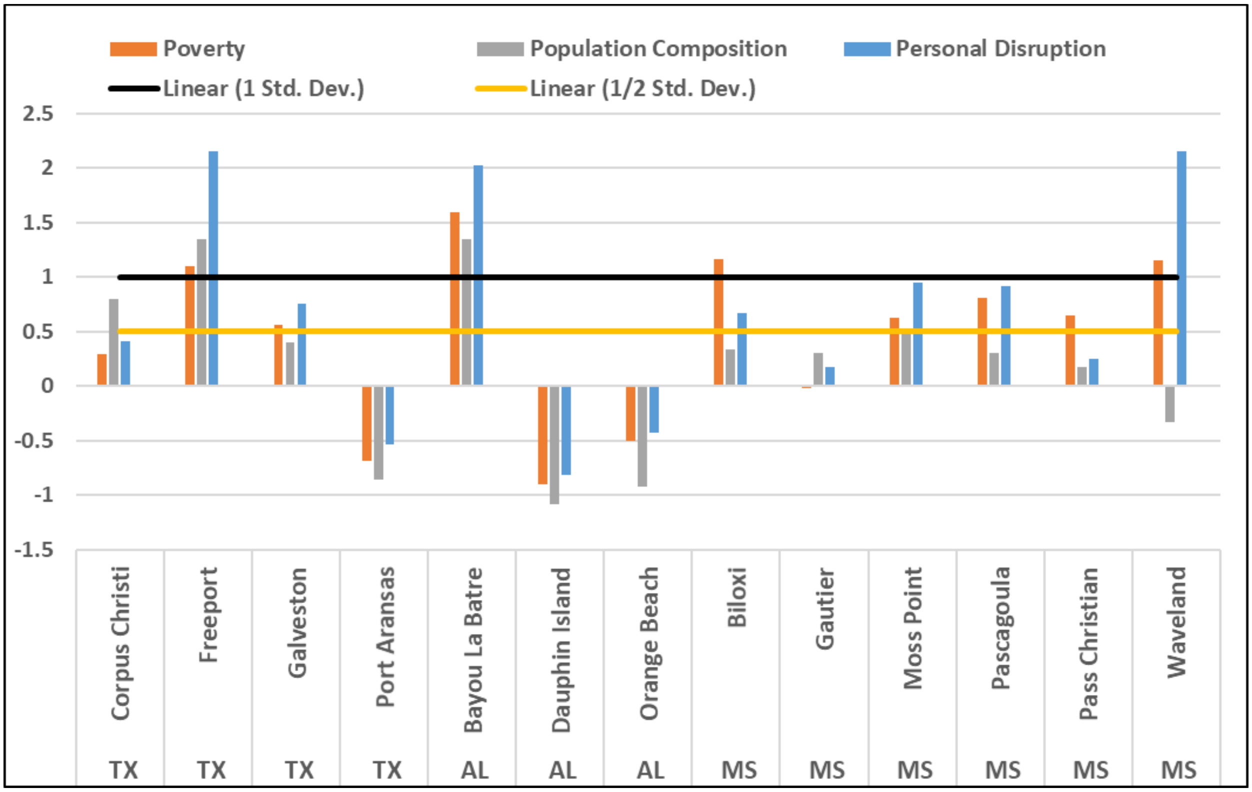


Figure 3.5.3.2 Community Social Vulnerability Indices for other Gulf fishing communities identified in this amendment.
Source: SERO, Community Social Vulnerability Indicators Database 2019 (2016 ACS data).

With regard to social vulnerabilities in other Gulf states several communities exceed the threshold of 0.5 standard deviation for at least one or more of the social vulnerability indices (Figure 3.5.3.2). The communities of Freeport, Texas and Bayou LaBatre, Alabama exceed both thresholds for all three indices, which suggests these communities may exhibit considerable social vulnerabilities. Waveland, Mississippi exceeds the 1 standard deviation for poverty and personal disruption, which also suggests substantial vulnerabilities. Other communities that exceed the 0.5 standard deviation for several indices would also express some vulnerabilities, but not to the degree of the previously mentioned communities.

People in these communities may be affected by fishing regulations in two ways: participation and employment. Although some Gulf communities have been identified as exhibiting some measure of social vulnerability, and may have the greatest potential for EJ concerns, no data are available on the race and income status for those involved in the local fishing industry (employment), or for their dependence on fishing specifically (participation). However, the implementation of the proposed actions of this amendment, the effects of which are expected to be minimal and indirect, would not discriminate against any group based on their race, ethnicity, or income status because the proposed actions would be applied to all participants in the fishery. Further, there is no known subsistence fishing for reef fish or red drum. Thus, the actions of this amendment are not expected to result in adverse or disproportionate environmental or public health impacts to EJ populations. Although no EJ issues have been identified, the absence of potential EJ concerns cannot be assumed.

3.6 Description of the Administrative Environment

3.6.1 Federal Fishery Management

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

Responsibility for federal fishery management is shared by the Secretary of Commerce (Secretary) and eight regional fishery management councils that represent the expertise and interests of constituent states. Regional councils are responsible for preparing, monitoring, and revising management plans for fisheries needing management within their jurisdiction. The Secretary is responsible for promulgating regulations to implement proposed plans and amendments after ensuring management measures are consistent with the Magnuson-Stevens Act and with other applicable laws summarized in Appendix A. In most cases, the Secretary has delegated this authority to NMFS.

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

The Council consists of seventeen voting members: 11 public members appointed by the Secretary; one each from the fishery agencies of Texas, Louisiana, Mississippi, Alabama, and Florida; and one from NMFS. The public is also involved in the fishery management process through participation on advisory panels and through Council meetings that, with few exceptions for discussing personnel matters, are open to the public. The regulatory process is also in accordance with the Administrative Procedures Act, in the form of "notice and comment" rulemaking, which provides extensive opportunity for public scrutiny and comment, and requires consideration of and response to those comments.

Regulations contained within FMPs are enforced through actions of NOAA's Office of Law Enforcement, the United States Coast Guard, and various state authorities. To better coordinate enforcement activities, federal and state enforcement agencies have developed cooperative agreements to enforce the Magnuson-Stevens Act. These activities are being coordinated by the Council's Law Enforcement Technical Committee and the Gulf States Marine Fisheries Commission's Law Enforcement Committee, which have developed joint enforcement agreements and cooperative enforcement programs (www.gsmfc.org).

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

3.6.2 State Fishery Management

The purpose of state representation at the Council level is to ensure state participation in federal fishery management decision-making and to promote the development of compatible regulations in state and federal waters. The state governments of Texas, Louisiana, Mississippi, Alabama, and Florida have the authority to manage their respective state fisheries. Each of the five Gulf States exercises legislative and regulatory authority over their respective state's natural resources through discrete administrative units. Although each agency is the primary administrative body with respect to the states' natural resources, all states cooperate with numerous state and federal regulatory agencies when managing marine resources. A more detailed description of each state's primary regulatory agency for marine resources is provided on their respective web pages (Table 3.6.2.1).

Table 3.6.2.1. Gulf state marine resource agencies and Web pages.

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

CHAPTER 4. ENVIRONMENTAL CONSEQUENCES

4.1 Action 1: Maximum Sustainable Yield (MSY) Proxies

4.1.1 Direct and Indirect Effects on the Physical Environment

The alternatives in this action establish a proxy for maximum sustainable yield (MSY). This is an administrative action that has no direct impact on the physical environment. However, the MSY proxy is used in establishing the catch levels for the overfishing limit (OFL), acceptable biological catch (ABC), and annual catch limit (ACL). Proxies that allow larger catch levels may result in greater fishing activity, which would increase potential effects.

The commercial sector of the reef fish fishery is conducted using vertical lines (i.e., electric reel, bandit rig, hook-and-line, and trolling) and longlines. The recreational sector (headboat, charter, and private modes) primarily uses vertical line gear (hook-and-line). Reef fish are also harvested by spearfishing in both the commercial and recreational sectors. Harvest of red drum in the exclusive economic zone (EEZ) is currently prohibited. Recreational harvest occurs in state waters, primarily by hook-and-line. Commercial harvest of red drum is prohibited in most state waters, but is allowed in Mississippi state waters under an annual quota. It is illegal for a vessel carrying a purse seine in Mississippi waters to possess any red drum.

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

Concentrations of many managed reef fish species are higher on hard bottom areas than on sand or mud bottoms, thus vertical line gear fishing generally occurs over hard bottom areas (GMFMC 2004d). Vertical lines include multi-hook lines known as bandit gear, handlines, and rod-and-reels. Vertical line gear is less likely to contact the bottom than longlines, but still has the potential to snag and entangle bottom structures and cause attached organisms such as soft corals and sponges to tear off or be abraded (Barnette 2001). In using bandit gear, a weighted line is lowered to the bottom, and then the weighted line is raised slightly off the bottom (Siebenaler and Brady 1952). The gear is in direct contact with the bottom for only a short period of time. Barnette (2001) suggests that physical impacts may include entanglement and minor degradation of benthic species from line abrasion and the use of weights (sinkers).

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

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

Action 1 sets the Maximum Sustainable Yield (MSY) proxy for several reef fish species and stocks that are not currently defined in the Reef Fish Fishery Management Plan (FMP). **Alternative 1** (No Action) would leave the MSY proxy undefined for these stocks and stock complexes resulting in no change to the Reef Fish FMP or Red Drum FMP. Therefore, under **Alternative 1** there would be no change to the fishing effort or effects on the physical environment. **Alternative 2** would define MSY proxies for the five stock complexes and four individual stocks listed in Table 2.1.1. **Alternative 2** contains **options 2a**, **2b**, and **2c** that would define an MSY proxy as the yield at the fishing mortality rate (F) corresponding to a spawning potential ratio (SPR) of 20%, 30%, or 40%, respectively. Generally, lower SPRs will allow higher MSY levels and possibly higher levels of fishing effort, producing potentially greater adverse effects to the physical environment. Thus $F_{20\%SPR}$ could result in the greatest adverse effects, with fewer adverse effects expected for $F_{30\%SPR}$, and the least for $F_{40\%SPR}$. **Alternative 3** would define the MSY proxy for goliath grouper and contains three options. The MSY proxy can be defined as $F_{30\%\ SPR}$ (**Option 3a**), $F_{40\%\ SPR}$ (**Option 3b**), $F_{50\%\ SPR}$ (**Option 3c**). Harvest of goliath grouper has been prohibited in the Gulf since 1990; therefore, results from a stock assessment or recent landings data cannot be applied for setting the MSY proxy for this stock. Given that harvest is prohibited, no differences in physical effects are expected among **options 3a-3c** or between **Alternative 3** and **Alternative 1** with respect to goliath grouper. However, if harvest of goliath were permitted in the future, expected effects would be similar to **Alternative 2** where lower SPRs will allow higher MSY levels which could result in higher fishing effort. **Alternative 4** would establish an MSY proxy for red drum and contains two options. Harvest of red drum has been prohibited in the Gulf EEZ since 1988, but an extensive fishery for red drum has continued in state waters. Without landings data or fishery independent sampling of the EEZ portion of the red drum population, it has not been possible to conduct a Gulf-wide stock assessment. **Alternative 4** option 4a would set the MSY proxy as the yield corresponding to an escapement rate of juvenile fish to the spawning stock biomass equivalent to 30 percent of those that would have escaped had there been no inshore fishery. This proxy is consistent with the state management objectives of achieving a 30% escapement. The impacts to the bottom habitat from interaction with the fishing gear from **option 4a** should be similar to **Alternative 1** as it would not be expected to change the nature or magnitude of the red drum fishery. **Alternative 4 option 4b** would set the MSY proxy for red drum at the yield at $F_{30\%\ SPR}$. This is the MSY proxy that the Council has adopted for most reef fish species. **Option 4b** would have no immediate effect on the physical environment because, without a stock assessment, fishing mortality rates cannot be determined, and there is currently insufficient information from the Gulf EEZ portion of the stock to conduct a traditional assessment that would provide fishing mortality rate information. Therefore, there would be no basis for setting an ABC that would allow harvest in federal waters. This proxy is not currently measurable. It would serve as a placeholder until an assessment can be conducted. **Alternative 5** allows for a streamlined procedure to modify the MSY proxy defined in the Reef Fish or Red Drum FMP in the future. This objective of this alternative is to allow for more efficient management and most greatly effects the administrative process. Therefore, **Alternative 5** has no measurable effects to the physical environment.

4.1.2 Direct and Indirect Effects on the Biological/Ecological Environment

Direct and indirect effects from fishery management actions have been discussed in detail for a variety of reef fish species in past Reef Fish FMP Amendments (e.g., GMFMC 2004d, 2007, 2008a, 2008b, 2008c, 2009, 2011b, 2012b, 2012c, 2015b, 2016a, 2017c)) and are incorporated here by reference. Less has been discussed for red drum as the last amendment (Amendment 3 to the Fishery Management Plan for the Red Drum Fishery of the Gulf of Mexico) occurred in 1992. Management actions that affect this environment mostly relate to the impacts of fishing on a species' population size, life history, and the role of the species within its habitat. Removal of fish from the population through fishing reduces the overall population size. Fishing gear have different selectivity patterns which refer to a fishing method's ability to target and capture organisms by size and species. This would include the number of discards, mostly sublegal fish or fish caught during seasonal closures, and the mortality associated with releasing these fish. Potential impacts of the 2010 *Deepwater Horizon* MC252 oil spill on the biological/ecological environment are discussed in Section 3.3 of a January 2011 Framework Action (GMFMC 2011c), and the Deepwater Horizon Programmatic Damage Assessment and Restoration Plan (DWH Trustees 2016) and are also incorporated here by reference. These impacts include recruitment failure and reduced fish health.

Fishing can affect life history characteristics of reef fish such as growth and maturation rates. For example, Fischer et al. (2004) and Nieland et al. (2007) found that the average size-at-age of red snapper had declined and associated this trend with fishing pressure. Lombardi-Carlson et al. (2006) found that the mean size of gag at age was larger pre-1990 than in post-1990 years and suggested this change was also due to fishing. For red snapper, Woods (2003) found that the size at maturity for Gulf of Mexico (Gulf) red snapper had declined and speculated this change may also have been due to increases in fishing effort. Grouper reproduction may also have been impacted by fishing. Fitzhugh et al. (2006a, 2006b) reported the size at 50% maturity and 50% transition from females to males was smaller in their studies compared to earlier years. In addition, for hermaphroditic species, fishing pressure has been suggested for changes in sex ratios. The proportion of male gag in the population has decreased from historical levels of 17% (Hood and Schlieder 1992) to 2-10% in the 1990s (Coleman et al. 1996), leading to concerns by the Council's Reef Fish Stock Assessment Panel that the reduction in proportion of males may have a potentially negative consequence on population reproductive potential (GMFMC 1998). It has been suggested the resulting reduction in the number of males is a consequence of males being more aggressive feeders than females. Thus, hook-and-line fishing on gag spawning aggregations tends to selectively remove males before females (Gilmore and Jones 1992; Koenig at al. 1996). A decline in the ratio of male to female gag in the Gulf has been an ongoing source of concern. Furthermore, for species that aggregate, such as gag, the species is particularly vulnerable to fishing because they are concentrated at specific locations. This problem is confounded because of the depth gag spawn (from 27-66 fathoms, but concentrated around 44 fathoms; Koenig at al. 1996). At these depths, gag are vulnerable to mortality from barotrauma through the capture process.

Less is known about how fishing affects red drum life history. As described in Sections 3.1 and 3.3, the red drum fishery primarily targets late juvenile fish caught in inshore waters (primarily 50-60 cm fork length; Chih 2016). The red drum stock became overfished in the 1980's and its current status is undefined. With the prohibition of harvest in federal waters, the composition of the offshore component has become older and larger (Winner et al 2014, Powers et al. 2012) off the eastern and northern Gulf.

Bycatch does occur within the reef fish fishery. If fish are released due to catch limits, seasons, or other regulatory measures, these fish are considered bycatch. Bycatch practicability analyses have been completed for red snapper (GMFMC 2004b, GMFMC 2007, GMFMC 2014a, GMFMC 2015b), grouper (GMFMC 2008a, GMFMC 2009, GMFMC 2011b, GMFMC 2012a), vermilion snapper (GMFMC 2004c, GMGMC 2017c), greater amberjack (GMFMC 2008b, GMFMC 2012b), gray triggerfish (GMFMC 2012c), and hogfish (GMFMC 2016a). In general, these analyses have found that reducing bycatch provides biological benefits to managed species as well as benefits to the fishery through less waste, higher yields, and less forgone yield. In some cases, actions are approved that can increase bycatch through regulatory discards such as increased minimum sizes and closed seasons. Under these circumstances, biological benefit to the managed species outweighs any increases in discards from the action.
Red drum bycatch occurs both in the state directed fisheries and non-directed fisheries – possession of red drum in federal waters is prohibited. However, information on red drum bycatch is sparse (Sagarese et al 2016). Some bycatch occurs in the menhaden fishery, but this bycatch is likely minimal (Sagarese et al 2016). SEDAR 49 (2016) indicated that red drum bycatch in the shrimp fishery and hook-and-line portion of the reef fish fishery was rare and so was considered negligible in the stock assessment.

The reef fish fishery can also affect species outside the reef fish complex. Specifically, sea turtles have been observed to be directly affected by the longline component of the Gulf reef fish fishery. These effects occur when sea turtles interact with fishing gear and result in an incidental capture injury or mortality and are summarized in GMFMC (2009). However, for sea turtles and other Endangered Species Act listed species, the most recent biological opinion (NMFS 2011) for the Reef Fish FMP concluded authorization of the Gulf reef fish fishery managed in the Reef Fish FMP is not likely to jeopardize the continued existence of sea turtles, smalltooth sawfish, or *Acropora* species (See Section 3.3 for more information). This fishery is also not expected to adversely affect marine mammals; the primary gear types used by the commercial sector (longline and hook-and-line) were classified in the 2019 proposed List of Fisheries (83 FR

53422) as a Category III fishery with regard to marine mammal species, indicating the gear has little effect on these populations (see Section 3.3 for more information).

Action 1 sets the Maximum Sustainable Yield (MSY) proxy for several reef fish species and stocks that are not currently defined in the Reef Fish Fishery Management Plan (FMP). **Alternative 1** (no action) would not assign an MSY proxy for these reef fish species and stocks. **Alternative 2** would define MSY proxies for the five stock complexes and four individual stocks listed in Table 2.1.1. **Alternative 2** contains **options 2a**, **2b**, and **2c** that would define an MSY proxy of the yield at the fishing mortality rate (F) corresponding to a spawning ratio (SPR) of 20%, 30%, or 40%, respectively. Lower SPRs will allow higher MSY levels and higher levels of fishing effort, producing potentially greater adverse effects of the biological/ecological environment. Thus $F_{20\%\ SPR}$ would have the greatest adverse impacts, with successively fewer adverse impacts for $F_{30\%\ SPR}$, $F_{40\%\ SPR}$. For **Alternative 2**, establishing an MSY proxy of $F_{30\%SPR}$ (**option 2b**) would be consistent with many other reef fish species (except red snapper and gray snapper) which currently have defined MSY proxies of $F_{30\%SPR}$. So, **Alternative 2 option 2b** is not expected to have a change in effects on the biological/ecological environment relative to **Alternative 1**. Increased fishing effort could occur if selecting **option 2a** relative to **option 2b** which could negatively affect the biological/ecological environment. **Option 2c** would have the fewest adverse effects to the biological/ecological environment relative to **options 2a** or **2b**. For **Alternative 3**, harvest of goliath grouper has been prohibited in the Gulf since 1990. Therefore, the methods used in the previous sections for setting the MSY proxy, which depend upon either an assessment or recent landings data, cannot be applied to this stock. Under **Alternative 1** (no action), the MSY proxy for goliath grouper would continue to be undefined. Because harvest is currently prohibited, this would have no effect on the biological/ecological environment. **Alternative 3 options 3a** and **3b** have lower SPRs than **option 3c** which could create fewer negative effects on the biological/ecological environment than **options 3a** or **3b**. **Option 3c** would set the MSY proxy for goliath grouper at the yield at $F_{50\%\ SPR}$. This was essentially the MSY proxy proposed in the Generic Sustainable Fisheries Act (SFA) Amendment (GMFMC 1999) except that the SFA amendment set the proxy in terms of 50% static SPR rather than the yield corresponding the $F_{50\%\ SPR}$. The SFA amendment had proposed 50% SPR rather than the 30% SPR (**option 3a**) used for most stocks because goliath grouper were considered to be large sedentary fish that were easily targeted by fishermen, and were generally believed to be neither very resistant nor resilient to overfishing. The 1999 proposed proxy was rejected by NMFS on the basis that SPR by itself is not a biomass reference point. **Alternative 3 option 3c** would have no effect on the biological/ecological environment because, without a stock assessment, fishing mortality rates cannot be determined, and there is currently insufficient information to conduct a traditional assessment that would provide fishing mortality rate information. This proxy is not currently measurable. It would serve as a placeholder until an assessment can be conducted.

Alternative 4 would establish an MSY proxy for red drum. Harvest of red drum has been prohibited in the Gulf EEZ since 1988, but it has continued to be allowed in state waters. Without landings data or fishery independent sampling of the EEZ portion of the red drum population, it has not been possible to conduct a Gulf-wide stock assessment. Therefore, the methods used in the previous sections for setting the MSY proxy cannot be applied to this stock. Under **Alternative 1** (no action), the MSY proxy for red drum would continue to be undefined.

Because harvest is currently prohibited, this would have no effect on the biological/ecological environment. **Alternative 4 option 4a** would set the MSY proxy as the yield corresponding to an escapement rate of juvenile fish to the spawning stock biomass equivalent to 30 percent of those that would have escaped had there been no inshore fishery. This proxy is consistent with the state management objectives of achieving a 30% escapement, and it is objective and measurable as recommended by the National Standard 1 guidelines. However, each state calculates its escapement rate differently, and the different methods may not be compatible. In order to determine if the Gulf-wide escapement rate is achieving its objective, a method would need to be developed to combine the escapement rates from each of the states. This MSY proxy provides positive benefits to the biological/ecological environment because, assuming that the state escapement rates can be combined, it assures that the current level of conservation will be maintained even if the EEZ is re-opened to red drum harvest. **Alternative 4 option 4b** would set the MSY proxy for red drum at the yield at $F_{30\%\ SPR}$. This is the MSY proxy that the Council has adopted for most finfish, and was essentially the MSY proxy proposed in the Generic SFA Amendment (GMFMC 1999) except that the SFA amendment set the proxy in terms of 30% static SPR rather than the yield corresponding the $F_{30\%\ SPR}$. The 1999 proposed proxy was rejected by NMFS on the basis that SPR by itself is not a biomass reference point. **Alternative 4 option 4b** would have no effect on the biological/ecological environment because, without a stock assessment, fishing mortality rates cannot be determined, and there is currently insufficient information from the Gulf EEZ portion of the stock to conduct a traditional assessment that would provide fishing mortality rate information. This proxy is not currently measurable. It would serve as a placeholder until an assessment can be conducted.

4.1.3 Direct and Indirect Effects on the Economic Environment

Alternative 1 (No Action) would not establish MSY proxies for stocks or complexes that do not have a MSY proxy. Therefore, **Alternative 1** would not be expected to affect the harvest of these stocks and stock complexes and would not be expected to result in economic effects.

Alternative 2 would define MSY proxies for stocks and stock complexes currently without a MSY proxy. **Option 2a** would set the MSY proxies as the yield when fishing at $F_{20\%\ SPR}$. **Options 2b** and **2c** would set the MSY proxy for these stocks and stock complexes as the yield at $F_{30\%SPR}$ and $F_{40\%SPR}$, respectively. Relative to **Option 2a, Option 2b** would set a more conservative MSY proxy for stocks and stock complexes currently without an MSY proxy. Therefore, **Option 2b** would be expected to result in more potential negative economic effects stemming from larger possible decreases in fishing opportunities in the short run. However, these potential losses would be counterbalanced by the anticipated decreases in the risk of stock depletion, which would be expected to result in positive economic effects in the long run. In turn, **Option 2c** would set more conservative MSY proxies than **Option 2b**. Therefore, compared to **Option 2b**, **Option 2c** would be expected to result in larger potential adverse economic effects in the short run due to forgone fishing opportunities. **Option 2c** would also be expected to result in greater economic benefits in the long run because it would further reduce the risk of stock (or stock complex) depletion relative to **Option 2b**.

Options in **Alternative 3** consider a range of MSY proxies for goliath grouper. Because the harvest of goliath grouper is currently prohibited, the potential economic effects discussed below would only be applicable once harvest of goliath grouper in the Gulf EEZ is allowed. **Option 3a** would set the MSY proxy for goliath grouper as the yield when fishing at $F_{30\%\ SPR}$. **Options 3b** and **3c** would set the MSY proxy as the yield at $F_{40\%SPR}$ and $F_{50\%SPR}$, respectively. Of the MSY proxies for goliath grouper considered in **Alternative 3**, **Option 3c** would correspond to the most conservative MSY proxy, followed by **Option 3b**, and **Option 3a**. Net economic effects expected to result from the establishment of a MSY proxy are determined by adverse economic effects that may result from forgone fishing opportunities in the short term and by longer term benefits resulting from reductions in the risk of stock depletion. More conservative proxies would be associated with larger adverse short term adverse economic costs but would be expected to result in greater long-term benefits.

Because the harvest of red drum is prohibited in federal waters, potential economic effects expected to result from setting an MSY proxy in **Alternative 4** would only be applicable once harvests become allowed. **Option 4b** would set a more conservative MSY proxy than **Option 4a**. Therefore, **Option 4a** is expected to result in more short term adverse economic effects but would be expected to result in greater long-term economic benefits due to more substantial reductions in the risk of depletion of the red drum stock.

Alternative 4, which could be selected as a preferred alternative in conjunction with **Alternatives 2 and 4**, would provide flexibility to the determination of future MSY proxies by streamlining modifications to the proxy without the development of regulatory actions. With Council agreement, **Alternative 4** would allow the establishment of a proxy recommended by the SSC and based on a stock assessment. **Alternative 4** would be expected to result in economic effects stemming from the trade-off between short run fishing opportunities and long-term risks of stock depletion discussed above. **Alternative 4** would also be expected to result in positive indirect economic effects due to a timelier adjustment to the MSY proxy, when warranted. Net economic effects expected to result from **Alternative 4** would be determined by the MSY proxy selected by the SSC and by the timeliness of its implementation.

4.1.4 Direct and Indirect Effects on the Social Environment

Although additional effects are not usually expected from retaining **Alternative 1** (No Action), the lack of stock status determination criteria is not consistent with NS1 guidelines and an MSY or its proxy needs to be defined to determine overfished and overfishing status. **Alternative 2** would establish an MSY proxy for those stocks or complexes without one (Table 2.1.1). **Option 2a** would be the least conservative biologically ($F_{20\%\ SPR}$), **Option 2c** would be the most conservative ($F_{40\%\ SPR}$), and **Option 2b** would be intermediary ($F_{30\%\ SPR}$). In general, a more biologically conservative MSY proxy would be expected to result in fewer fishing opportunities in the short term, thereby resulting in negative effects, while a less conservative MSY proxy would be expected to result in more fishing opportunities in the short term (and fewer negative effects). However, more conservative proxies would also be expected to reduce the risk of overharvest and therefore would be expected to result in positive effects in the long term. Less conservative proxies could increase the risk of overharvest, potentially resulting in negative effects in the long term.

Harvest of Goliath grouper has ben closed since 1990 in the Gulf and South Atlantic. Thus, the establishment of stock status determination criteria for Goliath grouper would have no social effects, as regardless of the MSY proxy selected, harvest will remain closed. Because Goliath grouper is considered a single stock through the Gulf and South Atlantic regions, the MSY proxy should be consistent for both regions. The South Atlantic Council has established an MSY proxy for the stock of $F_{40\%\ SPR}$ (**Option 3b**). Some minimal benefits may be expected from selecting **Option 3b**, as the MSY proxy would be consistent between regions.

Although there is no harvest of red drum permitted in federal waters, harvest is allowed in state waters. Nevertheless, setting an MSY proxy for red drum (**Option 4a** or **4b**) would not be expected to have any direct or indirect effects, as adopting an MSY proxy would be unlikely to affect the harvest opportunities established by the Gulf states in state waters. Streamlining the Council's procedure to modify the MSY proxy in the future (**Alternative 5**) could result in some minimal positive effects, although these effects would primarily be administrative.

4.1.5 Direct and Indirect Effects on the Administrative Environment

The setting of MSY is an administrative action and would have effects on the administrative environment through additional rulemaking (direct effect), addressing overfished and overfishing conditions (indirect effect from setting other status determination criteria), and monitoring the harvest (indirect effect). Because alternatives in this action would not result in added regulations, there would not be any immediate effect on the administrative environment from rulemaking.

Alternative 1 would result in no stock or stock complex MSY proxies being established and would be inconsistent with NS1 Guidance. **Alternatives 2-4** select the MSY values for the reef fish stocks without an MSY proxy, goliath grouper, and red drum. When compared to **Alternative 1**, **Alternatives 2-4** are administratively advantageous because they would result in a metric assisting to assure that harvest levels are set to reduce the likelihood that overfishing or stock depletion would occur.

For **Alternatives 2** and **3**, options would be selected from a suite of increasing SPRs for a level of F (the yield at $F_{20\%SPR}$, $F_{30\%SPR}$, or $F_{40\%SPR}$ for **Alternative 2** and the yield at $F_{30\%SPR}$, $F_{40\%SPR}$, or $F_{50\%SPR}$ for **Alternative 3**). Between the SPR proxies considered by the alternatives, those that allow a higher MSY would likely have greater adverse effects on the administrative environment as described because they would allow a higher rate of harvest, increasingthe likelihood that overfishing or a stock depletion could occur. Thus, for **Alternative 2**, $F_{20\%SPR}$ (**Option 2a**) would have the greatest likelihood for adversely affecting this environment, effects, with successively reduced likelihoods of adversely affecting this environment by the yields at $F_{30\%SPR}$ (**Option 2b**) and $F_{40\%SPR}$ (**Option 2c**), respectively. Similarly, for **Alternative 3**, $F_{30\%SPR}$ (**Option 3a**) would have the greatest likelihood of adversely affecting this environment compared to the yields at $F_{40\%SPR}$ (**Option 3b**), followed by the yield at $F_{50\%SPR}$ (**Option 3c**), respectively.

Alternative 4, **Option 4a** would set MSY equivalent to a red drum management target of 20% SPR. This would have a greater adverse effect on the administrative environment than if **Option**

4b, which would set MSY as the yield at $F_{30\%SPR}$, due to the disparate and incomparable nature with which escapement is quantified by the five Gulf states.

Alternative 5 would benefit the administrative environment if selected with other alternatives. It would streamline the process to adopt newly approved MSY and MSY proxies. Rather than conducting an alternatives analyses of different MSY and MSY proxies, the recommended value by the SSC would just be adopted in an amendment. Thus, this alternative in conjunction with **Alternatives 2-4** would reduce the burdens to the administrative environment.

Although these alternatives have different effects on the administrative environment, these effects are likely minor. Assessing stocks to determine MSY or an MSY proxy is routine for the National Marine Fisheries Service (NMFS). Actions to control harvest by the Council and NMFS are mostly routine and conducted through the Council system established by the Magnuson-Stevens Fishery Conservation and Management Act (Magnuson-Stevens Act). Additionally, through the use of ACLs and AMs the Council and NMFS can determine if overfishing is occurring annually and take measures to reduce the likelihood a stock would get into an overfished condition. This minimizes the risk that the stock would be depleted triggering further management action.

4.2 Action 2: Maximum Fishing Mortality Threshold (MFMT)

4.2.1 Direct and Indirect Effects on the Physical Environment

This action does not affect the gear used and therefore has no direct effect on the physical environment. However, changes to the maximum fishing mortality threshold (MFMT) could affect the likelihood of a stock being declared to be experiencing overfishing, which could result in indirect effects. An "overfishing" determination would require that action be taken to end overfishing immediately, which would likely include restrictions that reduce fishing effort. Less fishing effort would result in less gear interaction with the physical habitat, which would be beneficial to the environment. Therefore, alternatives that allow higher levels of fishing mortality before overfishing is declared, or which do not provide a means to determine if overfishing is occurring, would have a greater negative effect on the physical environment.

Alternative 1 leaves the existing MFMT definitions in place. All of the stocks included in this amendment have MFMT definitions which were implemented either in the Generic Sustainable Fisheries Act Amendment (GMFMC 1999) or in subsequent amendments. However, these definitions may not be based on the same MSY proxy used to determine the minimum stock size threshold (MSST), particularly if the MSY proxy was changed in Action 1. Furthermore, all current MFMT definitions are based on fishing mortality rates, i.e., the F at a level equal to the MFMT (F_{MFMT}). For stocks that have been assessed, this provides a cap on the level of fishing that can occur, which limits any adverse effects in the physical environment. However, for stocks that have not been assessed, there is no calculation of F, and therefore these stocks cannot be found to be experiencing overfishing regardless of the level of fishing effort. For these stocks, there is no direct limit on the level of fishing effort, and therefore no limit on the quantity or severity of adverse effects that may occur to the physical environment.

Alternative 2 sets the MFMT equal to the MSY F_{Proxy} for each stock as determined in Action 1, or as established in earlier amendments. This assures that, for assessed stocks, the MFMT and MSST are both based on the same MSY proxy. For the majority of assessed stocks, there will be no change in the MFMT relative to **Alternative 1**, and therefore no change to the effects on the physical environment. For unassessed stocks, the effects of **Alternative 2** depend on the alternatives selected in Action 1. If an F_{SPR}-based MSY proxy was established, then, as discussed above, there is no calculation of F, and therefore these stocks cannot be found to be experiencing overfishing regardless of the level of fishing effort. For these stocks, there is no direct limit on the level of fishing effort, and therefore no limit on the quantity or severity of adverse effects that may occur to the physical environment. On the other hand, if a data-limited method was selected to establish the MSY proxy, then the MSY proxy will be a specific harvest level. In this case, exceeded that level in a fishing year will constitute overfishing. Since overfishing can be determined for unassessed stocks using data-limited methods, there will be a cap on the level of fishing effort, and therefore fewer adverse effects to the physical environment relative to **Alternative 1**. . In general, lower SPRs will allow higher MSY levels and higher levels of fishing effort, producing potentially greater adverse effects of the physical environment. Thus $F_{20\%\ SPR}$ would have the greatest adverse impacts, with successively less adverse impact for $F_{30\%\ SPR}$, $F_{40\%\ SPR}$. Increased effects to the physical environment could occur if fishing effort were to also increase as a result in a change in yield at the MSY proxy. Therefore, much of the effects on the physical environment in Action 2 are subject to decisions contained in Action 1.

4.2.2 Direct and Indirect Effects on the Biological/Ecological Environment

Direct and indirect effects are discussed in Section 4.1.2 in detail and incorporated by reference here. In essence, alternatives that result in greater fishing effort and landings are more likely to adversely affect the biological/ecological environment than alternatives that reduce fishing effort and landings. Setting MFMT should have very little effect on other reef fish stocks, red drum, and other species in general. The reef fish fishery is a multispecies fishery where fishermen can target other species on a trip. Thus, changing fishing practices on one stock does not generally change overall fishing effort, particularly for minor stocks within the fishery. This action should also not affect red drum as harvest of this species is prohibited in federal waters and managed in state waters by the respective Gulf state marine resource management agencies (see Section 3.6.2).

An “overfishing” determination would require that action be taken to end overfishing immediately, which would likely include restrictions that reduce fishing effort. Less fishing effort would result in fewer fish harvested from a stock, which would be beneficial to the biological/ecological environment. Therefore, alternatives that allow higher levels of fishing mortality before overfishing is declared, or which do not provide a means to determine if overfishing is occurring, would have a greater negative impact on the biological/ecological environment.

Alternative 1 would retain the existing MFMT definitions. However, these definitions may not be based on the same MSY proxy used to determine the MFMT, particularly if the MSY proxy was changed in Action 1. Furthermore, all of the current MFMT definitions are based on fishing mortality rates, i.e., F_{MFMT}. For stocks that have been assessed, this provides a cap on the level of fishing that can occur, which limits any adverse effects to the stock and biological/ecological environment. However, for stocks that have not been assessed, there is no calculation of the fishing mortality rate, and therefore these stocks cannot be found to be experiencing overfishing regardless of the level of fishing effort. Thus, there is no direct limit on the level of fishing effort, and therefore no limit on the level of adverse effects that may occur to the biological/ecological environment.

Alternative 2 sets the MFMT equal to the MSY F_{PROXY} for each stock as determined in Action 1, or as established in earlier amendments. For assessed stocks, the MFMT and MSST would both be based on the same MSY proxy. For the majority of assessed stocks, there would be no change in the MFMT relative to **Alternative 1**, and therefore no change to the effects on the biological/ecological environment. For unassessed stocks, the effects of **Alternative 2** depend on the alternatives selected in Action 1, and thus the effects would be those described in Section 4.1.2. In general, lower SPRs will allow higher MSY levels and higher levels of fishing effort, producing potentially greater adverse effects of the physical environment. Thus $F_{20\%\ SPR}$ would have the greatest adverse impacts, with successively less adverse impact for $F_{30\%\ SPR}$, $F_{40\%\ SPR}$. Increased effects to the biology/ecological environment could occur if fishing effort were to also increase as a result in a change in yield at the MSY proxy. Therefore, much of the effects on the biology/ecological environment in Action 2 are subject to decisions contained in Action 1.

4.2.3 Direct and Indirect Effects on the Economic Environment

Alternative 1 (No Action) would not modify existing MFMT definitions. Therefore, **Alternative 1** would not be expected to result in economic effects because it would not be expected to affect the status of the stocks or alter the harvest of these species.

For stocks and complexes without an MSY proxy, **Alternative 2** would set the MFMT equal to the fishing mortality at the MSY proxy for each stock or stock complex as determined in Action 1. **Alternative 2** would not be expected to affect the harvest of these stocks or stock complexes and would therefore not be expected to result in direct economic effects. However, for a given stock (or complex), if **Alternative 2** results in a more conservative MFMT compared to **Alternative 1**, **Alternative 2** would be expected to increase the likelihood that the stock (or complex) would be rebuilt according to the schedule in its rebuilding plan (should the stock be under rebuilding), thereby potentially resulting in indirect economic benefits. Conversely, if a less conservative MFMT is established, **Alternative 2** would be expected to decrease the likelihood that the stock (or complex) considered would be rebuilt according to the schedule determined in its rebuilding plan (should the stock be under rebuilding), thereby potentially resulting in adverse indirect economic effects. **Alternative 2** would also be expected to result in indirect economic benefits relative to **Alternative 1** because it would ensure consistency between the MFMT and the MSY proxy for each stock or stock complex.

4.2.4 Direct and Indirect Effects on the Social Environment

Additional effects to the social environment are not expected from **Alternative 1** as the current definitions for MFMT would remain the same and no changes to the harvest of reef fish species would occur. Direct effects would not occur under **Alternative 2**, but indirect effects could occur if changes to the MFMT results in a change that affects fishing activity. **Alternative 2** would only affect those stocks for which the MSY proxy is changed in Action 1. Because **Alternative 2** would modify the MFMT definition such that it matches the MSY proxies selected in Action 1, the indirect effects would be similar for the respective species as discussed in Action 1.

4.2.5 Direct and Indirect Effects on the Administrative Environment

This action would directly affect the administrative environment by defining overfishing thresholds, a requirement of the Magnuson-Stevens Act. If these thresholds are not defined (**Alternative 1**), then MFMTs for the stocks and stock complexes would need to be defined one by one as they are assessed. This would be less efficient than to set them through one action (**Alternative 2**) and add to the administrative burden.

Based on the MSY proxy defined in Action 1, **Alternative 2** sets the MFMT consistent with the MSY proxy so there is no internal conflict between values. Setting MFMTs helps the stock assessment process by providing a metric to assess whether harvest rates are too high. If too high, then immediate action can be taken to reduce the harvest rate to end overfishing.

Although the alternatives have different effects on the administrative environment, these effects are likely minor. Assessing stocks to determine if the F is above or below MFMT is routine for NMFS. Actions to control harvest by the Council and NMFS are mostly routine and conducted through the Council system established by the Magnuson-Stevens Act. Additionally, through the use of ACLs and AMs the Council and NMFS can determine if overfishing is occurring annually and take measures to reduce the likelihood a stock would get into an overfished condition. This minimizes the risk that the F for a stock would increase above MFMT and be considered undergoing overfishing.

4.3 Action 3: Minimum Stock Size Threshold (MSST)

4.3.1 Direct and Indirect Effects on the Physical Environment

Fishery management actions that affect the physical environment mostly relate to the interactions of fishing with bottom habitat, either through gear impacts to bottom habitat or through the incidental harvest of bottom habitat. This action does not affect the gear used and therefore has no direct effect on the physical environment. However, changes to the could affect the likelihood of a stock being declared overfished, which could result in indirect effects. An "overfished" determination would require that a rebuilding plan be implemented, which would likely include restrictions that reduce fishing effort. Less fishing effort would result in fewer gear interactions with the physical habitat, which would be beneficial to the environment. Therefore, alternatives that allow overfishing to occur for a longer time before an overfished status is declared (i.e., larger buffers between B_{MSY} (or proxy) and MSST, would have a greater negative effect on the physical environment.

Under all alternatives, the seven stocks for which a definition currently exists as shown in Table 1.1.1 (gag, red grouper, red snapper, vermilion snapper, gray triggerfish, greater amberjack, and hogfish) would retain that definition. The MSST was recently defined for gray snapper in Reef Fish Amendment 51 (GMFMC 2019) and is not affected by the alternatives in this action. For these 8 stocks, MSST was set equal to 50% of the B_{MSY} proxy level (GMFMC 2017b, GMFMC 2019). The alternatives below would affect the stocks and stock complexes in Action 1.

Action 3 would define the minimum stock size threshold (MSST) for stocks and complexes in Action 1. Lower values for MSST would mean that a stock could be fished more heavily before reaching MSST. Therefore, the lower the definition of MSST, the higher the fishing effort which could increase the effect on the physical environment.

Alternative 1, no action, would leave MSST undefined. Without an MSST, an overfished determination cannot be made. Stocks with established (MSST) will be retained for gag, gray triggerfish, greater amberjack, hogfish, red grouper, red snapper, vermillion snapper, and gray snapper. Therefore, there would be no control on stock biomass levels (although overfishing limits could restrict harvest). This alternative could potentially allow greater fishing effort and more adverse effects to the physical environment than any of the alternatives that set an MSST.

Alternative 2 would apply the (1-M)*B_{MSY} (or proxy) formula to all stocks considered in action 1. Under this MSST proxy, the buffer between B_{MSY} and MSST depends on the average natural mortality rate of the species. Long-lived stocks with a low natural mortality rate would have a narrow buffer, while short-lived stocks with a higher natural mortality rate would have a larger buffer. The effects on the physical environment would be variable. Greater fishing effort and greater adverse effects could occur for stocks with a high natural mortality rate, while less fishing effort and fewer adverse effects could occur on stocks with a low natural mortality rate.

Alternative 3 would apply to 0.75*B_{MSY} (or proxy) formula to all stocks considered in action 1. Relative to **Alternative 1**, this alternative would have fewer adverse effects on the physical environment because it would result in limits on fishing effort if the stock biomass dropped below MSST. Relative to **Alternative 2**, this alternative could have either greater adverse effects for stocks with a natural mortality rate less than 0.25, and fewer adverse effects for stocks with a natural mortality rate greater than 0.25.

Alternative 4 would set MSST at 0.50*B_{MSY}, which is the lowest MSST allowed under the NS1 guidelines. Relative to **Alternative 1**, this alternative would have fewer adverse effects on the physical environment because it would result in limits on fishing effort if the stock biomass dropped below MSST. Relative to **Alternative 2**, this alternative could have greater adverse effects for stocks depending on the natural mortality of the stock. Relative to **Alternative 3**, this alternative would result in the lowest likelihood of a stock being declared overfished and the highest potential level of fishing effort, and therefore the greatest potential for negative effects to the physical environment.

4.3.2 Direct and Indirect Effects on the Biological/Ecological Environment

Direct and indirect effects are discussed in Section 4.1.2 in detail and incorporated by reference here. In essence, alternatives that result in greater fishing effort and landings are more likely to adversely affect the biological/ecological environment than alternatives that reduce fishing effort and landings. Setting MFMT should have very little effect on other reef fish stocks, red drum, and other species in general. The reef fish fishery is a multispecies fishery where fishermen can target other species on trip. Thus, changing fishing practices on one stock does not generally change overall fishing effort, particularly for minor stocks within the fishery. This action should also not effect red drum as harvest of this species is prohibited in federal waters and managed in state waters by the respective Gulf state marine resource management agencies (see Section 3.6.2).

An "overfishing" determination would require that action be taken to end overfishing immediately, which would likely include restrictions that reduce fishing effort. Less fishing effort would result in fewer fish harvested from a stock, which would be beneficial to the biological/ecological environment. Therefore, alternatives that allow higher levels of fishing mortality before overfishing is declared, or which do not provide a means to determine if overfishing is occurring, would have a greater negative impact on the biological/ecological environment.

Action 3 would define the minimum stock size threshold (MSST) for stocks and complexes in Action 1. Lower values for MSST would mean that a stock could be fished more heavily before reaching MSST. Therefore, the lower the definition of MSST, the higher the fishing effort which could increase the effect on the biological/ecological environment.

Alternative 1 would retain the existing MFMT definitions fo rgag, gray triggerfish, greater amberjack, hogfish, red grouper, red snapper, vermillion snapper, and gray snapper. However, these definitions may not be based on the same MSY proxy used to determine the MFMT, particularly if the MSY proxy was changed in Action 1. Furthermore, all of the current MFMT definitions are based on fishing mortality rates, i.e., F_{MFMT}. For stocks that have been assessed, this provides a cap on the level of fishing that can occur, which limits any adverse effects to the stock and biological/ecological environment. However, for stocks that have not been assessed, there is no calculation of the fishing mortality rate, and therefore these stocks cannot be found to be experiencing overfishing regardless of the level of fishing effort. Thus, there is no direct limit on the level of fishing effort, and therefore no limit on the level of adverse effects that may occur to the biological/ecological environment.

The closer MSST is to B_{MSY} (or proxy), the time needed to rebuild the stock would likely be shorter. This is because the likelihood of larger declines in biomass from fishing is reduced and would provide more protection to the stock. **Alternative 1**, no action, would leave MSST as currently defined for the seven stocks for which a definition currently exists and gray snapper that will be in effect upon implementation of Reef Fish Amendment 51 (GMFMC 2019). This would be 50% * B_{MSY} (or proxy), which is the lowest MSST allowed under the NS 1 guidelines. For the stocks considered in Action 1, no MSST would be defined leaving no metric for determining if stock is overfished or not. Therefore, **Alternative 1** would be the most adverse alternative to this environment.

For species with estimates of natural mortality less than 0.25, **Alternative 2** is the most conservative approach considered among the alternatives. Although this alternative results in the greatest likelihood of a stock being declared overfished if there is a decline in stock size, it would also provide the greatest positive biological/ecological effect by preventing the target stock from large declines in biomass. It would also reduce the likelihood of negative biological/ecological impacts to other species as a result of effort shifting because of a more stringent rebuilding plan.

For stocks with M greater than 0.25, **Alternative 3** is the most conservative approach considered among the alternatives. This alternative would prevent the target stock from declines in biomass beyond 0.75*B_{MSY} (or proxy). It would also reduce the likelihood of negative biological/ecological impacts to other species as a result of effort shifting during a rebuilding plan. However, for those stocks with M less than 0.25, there would be a wider buffer between B_{MSY} (or proxy) and MSST and so overfishing could potentially occur for a longer time before the stocks are declared overfished.

Alternative 4 would set MSST at 50% * B_{MSY} (or proxy), which is the lowest MSST allowed under the NS 1 guidelines. Relative to the other alternatives, this would result in the longest rebuilding time and the most restrictive management measures should a stock biomass fall below MSST, and would therefore have the greatest negative impacts on the biological/ecological environment of **Alternatives 2-4**.

4.3.3 Direct and Indirect Effects on the Economic Environment

Alternative 1 (No Action) would maintain MSST already established for some reef fish species, e.g., gag and red snapper, but would not define MSST for stocks and complexes in Action 1. An undefined MSST would not be consistent with the Magnuson-Stevens Act requirements. **Alternative 1** is not expected to affect harvest or the status of these stocks or stock complexes. Therefore, **Alternative 1** would not be expected to result in economic effects.

Alternatives 2, 3 and **Alternative 4** consider MSST values ranging from 0.50*B_{MSY} (**Alternative 4**) to (1-M)*B_{MSY} (**Alternative 2** when M is less than 0.25). For a given stock or stock complex, the establishment of an MSST is an administrative action and would therefore not be expected to result in direct economic effects. For each of the stocks and stock complexes in Action 1, **Alternative 4** would set the lowest MSST value and would be expected to be associated with the lowest likelihood of classifying a stock (or complex) as overfished. **Alternative 4** would grant more flexibility to manage these stocks and complexes by establishing a wider buffer between the MSST and the biomass at MSY. Therefore, **Alternative 4** would be expected to result in indirect positive economic effects due to additional harvesting opportunities that could be made available by the increased management flexibility. The size of the potential indirect economic benefits would depend on the expected additional harvests afforded to recreational anglers and commercial fishermen. However, should a stock or complex be declared overfished, a smaller MSST would be expected to require more stringent rebuilding measures, thereby resulting in negative indirect economic effects during the rebuilding period. Although unknown at this time, the net effects that would be expected from adjustments to the MSST for these stocks and complexes would be determined by the relative magnitude of these potential economic benefits and adverse economic effects.

Because **Alternative 3** would set a greater MSST than **Alternative 4**, potential economic benefits expected to result from management flexibility would be lessened compared to **Alternative 4**. However, relative to **Alternative 4**, **Alternative 3** would necessitate less restrictive rebuilding measures if a given stock or complex is overfished, thereby resulting in smaller negative effects during the rebuilding period. It follows that **Alternative 2**, which would set a greater MSST than **Alternative 3**, would be expected to result in smaller adverse economic effects during the rebuilding period compared to **Alternative 3**.

For mutton snapper, yellowtail snapper, and black grouper, **Alternative 5** would set MSST values comparable to **Alternative 2**. Therefore, economic effects that would be expected to result from **Alternative 5** would be similar to the effects expected from **Alternative 2**. With a natural mortality estimate at 0.12, **Alternative 5** would set an MSST for goliath grouper equal to 0.88*B_{MSY}. Because harvesting goliath grouper is currently prohibited, the establishment of an MSST is a purely administrative action and would not be expected to result in economic effects at this time.

4.3.4 Direct and Indirect Effects on the Social Environment

This action would define the threshold at which 23 reef fish stocks and the red drum stock would be considered overfished (Table 2.2.1). Direct effects would not be expected from establishing an overfished threshold. Indirect effects would be tied to future determinations of whether a stock is overfished, and to regulatory action in response to an overfished determination. The closer (narrower buffer) the threshold is set to MSY, the more likely for the overfished threshold to be triggered, resulting in negative effects from the loss of harvest opportunities. A narrow buffer increases the uncertainty that a stock may enter an overfished status due to natural fluctuations in biomass. That uncertainty can have negative impacts on business planning and other aspects of both commercial and recreational fishing, as it may initiate changes in fishing behavior such as switching to other species or increased regulatory discards. On the other hand, the farther away (wider buffer) the threshold is set from B_{MSY}, the less likely the overfished threshold would be triggered. However, triggering the threshold set under a wider buffer would likely require more restrictive measures in the rebuilding plan, resulting in greater negative social effects than if the threshold had been triggered sooner.

The management measures for a rebuilding plan that may follow a stock's determination as overfished as a result of setting or modifying the MSST are unknown. Thus, it is not possible to describe the scope and strength of any indirect effects from triggering an overfished status. Therefore, this discussion of social effects is general and qualitative in nature. Moving into an overfished status could have negative social effects if harvest levels are reduced significantly. **Alternative 1** would not define MSST for these reef fish stocks and red drum, and there would be no change in the management of these stocks, and thus, no social effects. However, **Alternative 1** is inconsistent with NS1 guidance and MSST needs to be defined.

Alternative 2 would provide a narrow buffer and would be the most conservative alternative for setting MSST as it would be most likely for the overfished threshold to be triggered. Using a narrow buffer for a stock with a low natural mortality rate (e.g., less than M = 0.25), may result in the stock being more likely to move in and out of an overfished status due to natural fluctuations in biomass. Furthermore, given the lack of precision in the estimates of B_{MSY}, MSST, and current biomass, there is increased uncertainty with respect to whether the current biomass has actually dropped below MSST. The more stable approach to setting a wider buffer (such as **Alternative 3** and **Alternative 4**) that prevents a stock from moving into an overfished status may be preferable as stability would be preferable for both commercial and recreational stakeholders and businesses. **Alternative 2** would provide a more stable approach biologically, but the possibility of short-term negative effects may be higher under some circumstances, such as when stock biomass fluctuates below MSST due to a narrow buffer. However, there may be positive long-term effects if stock status becomes more stable.

Alternative 4 would adopt the widest buffer allowed under the NS1 guidelines and also among the alternatives, and would apply the same buffer as selected for the seven stocks included in Amendment 44 (GMFMC 2017b). In that amendment, this MSST definition resulted in two stocks (red snapper and gray triggerfish) being redefined from overfished to not overfished. (However, because each stock was in a rebuilding plan, that plan continues until the stock is rebuilt to B_{MSY}.) By adopting the widest buffer, the overfished threshold would be least likely to be triggered, avoiding negative effects from an overfished determination that triggers development of a rebuilding plan. However, in the event the threshold under **Alternative 4** is reached and a stock declared overfished, the rebuilding plan would be expected to include greater harvest restrictions than if a narrower buffer had been adopted. **Alternative 3** would set a buffer that sets MSST at 75% of B_{MSY}, and is a wider buffer than **Alternative 2** and a narrower buffer than **Alternative 4**. Thus, the effects of **Alternative 3** would be intermediary between **Alternative 2** and **Alternative 4**.

In summary, the social effects from **Alternatives 2-4** would be indirect and occur subsequent to a determination of overfished status based on the selected buffer. Wider buffers may allow for current fishing activity to continue, but risk future fishing activity being curtailed more if the stock falls into an overfished status. Narrow buffers may be more likely to result in an overfished determination and a subsequent rebuilding plan could curtail existing fishing effort, but may allow for more consistent fishing activity over the long term.

Among the four stocks to which **Alternative 5** would apply, no effects would be expected for Goliath grouper, as harvest would continue to be prohibited regardless of the MSST selected. For black grouper, mutton snapper, and yellowtail snapper, adopting the same MSST as the South Atlantic Council would be expected to provide some minimal positive effects by making the MSST consistent across jurisdictions that share management of each single stock.

4.3.5 Direct and Indirect Effects on the Administrative Environment

This action would directly affect the administrative environment. Under **Alternatives 2-5**, MSST would be defined for all reef fish stocks and red drum. Thus, selecting any of these alternatives as preferred would be administratively more efficient than approving a species or species complex MSST through multiple future actions as each species or complex is assessed. A less efficient approach with greater adverse effects to the administrative environment would occur under **Alternative 1** (No Action), where MSSTs would have to be considered on a stock or stock complex basis and not all at once.

How MSST is determined under **Alternatives 2-4** also has indirect administrative implications. The lower the MSST value is (i.e., the greater the difference between B_{MSY} (or proxy) and MSST), the less likely a stock could be depressed below the MSST and be declared overfished. However, after a stock has been declared overfished, action must be taken to rebuild the stock to B_{MSY} (or proxy). The greater the difference between the overfished stock biomass and B_{MSY} (or proxy), the greater the harvest restrictions would need to be to allow the stock to recover to B_{MSY} (or proxy) within the rebuilding timeframe. Therefore, the lower MSST is, the greater the likelihood any rebuilding plan would require more restrictive management measures.

How the alternatives compare to one another is dependent on M and how it influences the calculation of MSST. The wider buffer would decrease the likelihood of spurious overfished determinations due to natural fluctuations. If M is less than or equal to 0.25 (at least 5 stocks; Tables 2.3.1), then the MSST from **Alternative 2** is less than the MSST in **Alternative 3** because they would be less than $0.75*B_{MSY}$. However, if M is greater than 0.25 (at least 1stock; Tables 2.3.1), then the MSST from **Alternative 2** is greater than the MSST from **Alternative 3** because they would be greater than $(1-M)*B_{MSY}$. For vermilion snapper (M=0.25; Table 2.3.1), **Alternative 2 and 3** would be equivalent. **Alternative 4** is the least conservative MSST of $0.5*B_{MSY}$ and would be the most adverse alternative to the administrative environment. This is illustrated in Table 4.3.5.1, which calculates MSST for each alternative using a hypothetical B_{MSY} of one million pounds and two values for M (0.15 and 0.3) that are either above or below 0.25. Under this example, if M is set at 0.15 (≤ 0.25), then the probability of the stock being declared overfished is greatest for **Alternative 2** (850,000 lbs) and least for **Alternative 4** (500,000 lbs). If M is set at 0.30 (greater than 0.25), then the probability of being declared overfished would be greatest for **Alternative 3** (870,000 lbs) and least for **Alternative 4** (500,000 lbs).

Table 4.3.5.1. The estimated minimum stock size threshold values in pounds under two natural mortality rates (M) if the stock biomass that would provide the maximum sustainable yield is assumed to be 1,000,000 lbs.

Natural Mortality	Alternative 2 $(1-M)*B_{MSY}$	Alternative 3 0.75*BMSY	Alternative 4 0.5*BMSY
M = 0.15	850,000 lbs	750,000 lbs	500,000 lbs
M = 0.30	700,000 lbs	750,000 lbs	500,000 lbs

Conversely, the probability of needing greater harvest restrictions to rebuild the stock should the stock size fall below MSST is also dependent on what M is as discussed above. Under the example shown in Table 4.3.5.1, if M is 0.15 (less than or equal to 0.25), then the probability of greater harvest restrictions to rebuild the stock is greatest for **Alternative 4** (500,000 lbs) and least for **Alternative 2** and **3** (850,000 lbs and 750,000 lbs, depending on M).

Alternative 5 would set MSST values for mutton snapper, yellowtail snapper, goliath grouper, and black grouper equivalent to the MSST values set by the South Atlantic Council. Because the

South Atlantic definition of MSST for goliath grouper (equivalent to **Alternative 2**) is different from the MSST definitions of mutton snapper, yellowtail snapper, and black grouper (equivalent to **Alternative 3**), the selection of **Alternatives 2, 3, or 4** as preferred without the selection of **Alternative 5** would lead to future action to resolve the jurisdictional differences in the MSST definitions. This future action would add to the administrative burden and add to any adverse effects from **Alternatives 2-4**.

Although the alternatives have different effects on the administrative environment, these effects are likely minor. Assessing stocks to determine if the stock biomass is above or below MSST are routine endeavors by NMFS. Actions to control harvest by the Council and NMFS are mostly routine and conducted through the Council system established by the Magnuson-Stevens Act. Additionally, through the use of ACLs and AMs, the Council and NMFS can determine if overfishing is occurring annually and take measures to reduce the likelihood a stock would get into an overfished condition. This minimizes the risk that the stock size would fall below MSST and be considered overfished.

4.4 Action 4: Optimum Yield (OY)

4.4.1 Action 4.1 – Optimum Yield for Action 1 Reef Fish Stocks and Hogfish

4.4.1.1 Direct and Indirect Effects on the Physical Environment

This action does not affect the gear used in the reef fish fishery or how it is deployed. Therefore, this action would have no direct effects on the physical environment. However, the definition of optimum yield (OY) could affect the long-term harvest levels, which could indirectly effect the physical environment.

Alternative 1 would leave OY undefined for stocks included in this amendment. Harvest levels would continue to be determined by the ACL, which is derived from the OFL and ABC,. There would be no change to the current effects on the physical environment.

Alternative 2 and **Alternative 3** would define OY for the stocks and stock complexes to provide a long-term harvest goal. For **Alternative 2** (all species but goliath grouper) and **Alternative 3** (goliath grouper) would affect different species and so are not directly comparable; however, how each option for the respective alternative would have similar effects. For **Alternative 3**, the harvest of goliath grouper is currently zero, so at this time, regardless of the OY option, the harvest would be zero . Should harvest be allowed in the future, the effects of the following **Alternative 2** discussion of the options would apply for options under **Alternative 3**.

Options 2a-2c would define OY as a fixed percentage of stock or stock complex's MSY or MSY proxy while **Option 2d** would set the percentage using the relationship between the ACL and OFL. The percentage applied to MSY or MSY proxy would depend upon which option is selected. **Option 2a** would set that percentage at the lowest level of MSY (50%), resulting in the lowest OY. The smaller long-term harvest goal would reduce fishing effort more than **Option 2b** or **Option 2c**, and likely reduce any adverse effects on the physical environment (fewer gear interactions). **Option 2c**, 90% of MSY, would have the greatest adverse effect on the physical environment because it would allow for the greatest potential fishing effort (more gear interactions). **Option 2b**, 75% of MSY, would result in an intermediate level of harvest and intermediate level of adverse effects on the physical environment compared to **Option 2a** and **Option 2c**. In summary, the level of adverse effects to the physical environment for each option, from least to greatest, are **Option 2a**, **Option 2b**, and **Option 2c** for **Alternative 2**.

The percentages derived using **Option 2d** is different for each stock and stock complex (Table 2.4.2). The effects of this option are likely between those of **Option 2a** and **Option 2c**. All the stocks and stock complexes have percentages above 50% of MSY or MSY proxy (**Option 2a**), and with the exception of the deep-water grouper, the rest of the stock and stock complexes have a percentage that is less than 90% of MSY or MSY proxy (**Option 2c**). Any additive adverse effects over the species and species complexes from **Option 2d** are likely greater than from **Option 2b** as all but two of the stocks and stock complexes have percentages greater than 75% of MSY or MSY proxy.

With year-to-year harvest levels being controlled through ACLs and AMs, it is difficult to assess how **Alternatives 2 and 3** compare to **Alternative 1.** Under all alternatives, the annual harvests would be limited to the ACLs for the stocks and stock complexes. All four options for **Alternatives 2 and 3** would result in lower harvest levels and fewer adverse effects to the physical environment than if the stock were managed at MSY or MSY proxy levels. However, the relative effects of setting an OY harvest level depend on how the OY harvest levels and the ACL harvest levels are integrated into management. That discussion is beyond the scope of this amendment.

4.4.1.2 Direct and Indirect Effects on the Biological/Ecological Environment

Direct and indirect effects are discussed in Section 4.1.2 in detail and incorporated by reference here. Management measures that would be required to maintain harvests at or below OY would produce biological/ecological impacts. In essence, alternatives that result in greater fishing effort and landings are more likely to adversely affect the biological/ecological environment than alternatives that reduce fishing effort and landings.

Alternative 1 would leave OY undefined for the Action 1 reef fish stocks and stock complexes as well as hogfish. This would provide no long-term harvest goal for these stocks until they are assessed. .

Alternative 2 and **Alternative 3** would define OY for the stocks and stock complexes to provide a long-term harvest goal. For **Alternative 2** (all Action 4.1 species excluding goliath grouper) and **Alternative 3** (goliath grouper) would affect different species and so are not directly comparable; however, each option within the respective alternatives, when compared to eachother would have similar effects. For **Alternative 3**, the harvest of goliath grouper is prohibited, so at this time, regardless of the OY option, the harvest would be the same at zero. Should harvest be allowed in the future, the effects of the following **Alternative 2** discussion of the options would apply for the options under **Alternative 3**.

For **Alternative 2**, **Option 2a** is the most conservative of the OY proxies (50% of MSY or MSY proxy) because any management actions based on this OY would limit fishing effort the most and have the highest associated biomass level after a stock is assessed. Thus, it would have the lowest risk of allowing the stock size becoming depleted and would be the more beneficial to this environment than **Options 2b-2d**. **Option 2c** is the least precautionary option because any management actions based on this OY would allow the highest fishing effort and the lowest associated biomass levels. Maintaining this OY proxy would be most adverse of the **Alternative 2** options. **Option 2b** is intermediate to **Options 2a** and **2c**. Percentages derived using **Option 2d** are different for each stock and stock complex (Table 2.4.2). The effects of this option on the biological/ecological environment are likely between those of **Option 2a** and **Option 2c**. All the stocks and stock complexes have percentages above 50% of MSY or MSY proxy (**Option 2a**), and with the exception of the deep-water grouper, the rest of the stock and stock complexes have a percentage that is less than 90% of MSY or MSY proxy (**Option 2c**), thus the additive overall fishing effort across these species and species complexes would likely be between **Options 2a** and **2c**. Any additive adverse effects over the species and species complexes from **Option 2d** are likely greater than from **Option 2b** because all but two of the stocks and stock complexes have percentages greater than 75% of MSY or MSY proxy.

With year-to-year harvest levels being controlled through ACLs and AMs, it is difficult to assess how **Alternatives 2 and 3** compare to **Alternative 1.** Under all alternatives, the annual harvests would be limited to the ACLs for the stocks and stock complexes. The relative effects of setting an OY harvest level depend on how the OY harvest levels and the ACL harvest levels are integrated into management. That discussion is beyond the scope of this amendment.

4.4.1.3 Direct and Indirect Effects on the Economic Environment

Alternative 1 (No Action) would not define OY for stocks and stock complexes in Action 1. Under **Alternative 1**, this reference point could be defined in future regulatory actions as the need arises. Therefore, **Alternative 1** would not be expected to affect fishing practices or harvests of these stocks and stock complexes and would not be expected to result in economic effects.

For each stock and stock complex in Action 1, **Alternative 2** would define OY for as a fixed percentage of MSY or MSY proxy. The percentages considered range from 50% (**Option 2a**) to 90% (**Option 2c**). **Option 2b** would set OY at 75% of MSY or MSY proxy. The definition of OY for these stocks and complexes would not be expected to affect fishing practices or harvest levels for these stocks and complexes. Therefore, **Alternative 2** would not be expected to result in direct economic effects. However, once the ACL for each stock or complex is linked to future OY definitions, then **Alternative 2** may be expected to result in indirect economic effects. The direction as well as the magnitude of these potential indirect economic effects would be determined by the relationship between the stock or complex ACL and OY. **Option 2d** would set OY based on the ratio between the ACL and OFL. For the stocks and complexes considered, the ratio fluctuates between 53.9% (mutton snapper) and 90.6% (deep water grouper). Although **Option 2d** explicitly ties OY to ACL, current management measures constrain harvest levels based on ACL values and do not necessarily account for OY, which is a long-term measure. Therefore, as **Options 2a-2c**, **Option 2d** would also not be expected to result in direct economic effects. However, in the longer term, once management measures include OY considerations in setting harvest levels, indirect economic effects would be expected to result from **Option 2d**. Because the harvest of goliath grouper is currently prohibited, the establishment of an OY for goliath grouper is a purely administrative measure. Therefore, **Alternative 3** would not be expected to result in economic effects at this time. In the future, should the harvest of goliath grouper be allowed, indirect economic effects determined by the extent to which OY and ACL levels are linked would be expected to result from **Alternative 3**.

4.4.1.4 Direct and Indirect Effects on the Social Environment

Additional effects would not be expected under **Alternative 1**, but OY would remain undefined for the stocks and stock complexes in Action 1 (plus hogfish) and the reference point would need to be defined for these stocks in a subsequent plan amendment. OY is not directly tied to the setting of ACLs. Any effects from **Alternative 2** would be indirect, long-term, and relate to any changes to the total allowable harvest that results from setting OY. In general, positive effects would result in the short-term from increasing harvest levels and negative effects from a decrease in current harvest levels. However, if an increase in harvest levels jeopardizes the health of the stock, indirect long-term negative effects could result if increased catch levels trigger an overfishing or overfished status and require a rebuilding plan.

Alternative 2 would establish OY for the reef fish stocks and stock complexes in Action 1 and hogfish. It has been assumed that long-term benefits would result from setting OY at some percentage below MSY or its proxy, as there may be less chance of overfishing or a stock becoming overfished. Without knowing what economic or social benefits are foregone, however, it is difficult to determine whether OY is truly being attained. **Options 2a-2c** would specify fixed percentages of MSY (or MSY_{Proxy}) at which OY would be defined. **Option 2a** would result in a definition of OY that is reduced the most from MSY or its proxy, and could result in the greatest negative effects among the options, as the least amount of the respective reef fish stock could be caught. **Option 2c** would set OY the closest to the MSY proxy, resulting in the least short-term effects by allowing the most of the respective reef fish to be caught. However, as discussed above, higher catch levels in the short-term can increase the likelihood of triggering an overfished or overfishing status, resulting in stricter regulations during a rebuilding plan, if required. Any effects from **Option 2b** would be intermediary between **Option 2a** and **Option 2c**.

Although **Option 2d** uses the ratio between the ACL and OFL to determine the amount MSY should be reduced to achieve OY, it is not directly tied to the ACL meaning that no direct effects would be expected. The greater the difference between the ACL and OFL for a given stock or stock complex, the greater the difference would be between MSY and OY. Consistent with the discussion for **Options 2a-2c**, the greatest indirect effects would be expected when OY is farthest from MSY, while fewer indirect effects would be expected when OY is closer to MSY.

Alternative 3 would establish OY for goliath grouper, which has an ACL of zero (i.e., all harvest is prohibited). No effects would be expected under any of the **Alternative 3** options, as harvest would remain closed. Should harvest of goliath grouper be allowed in the future, it would be necessary to establish new reference points for the stock and to revisit OY.

4.4.1.5 Direct and Indirect Effects on the Administrative Environment

This action would directly affect the administrative environment by defining a long-term harvest goal for the stock assuming equilibrium levels. Under **Alternative 1**, reef fish stocks in Action 1 and hogfish would be without a defined OY, which would be in conflict with NS 1 guidelines. Selecting either **Alternative 2** or **3** as preferred would be administratively more efficient than approving OY on a species or species complex through multiple future actions as each species or complex is assessed. This less efficient approach would occur under **Alternative 1** and would result in greater adverse effects to the administrative environment.

Alternative 2 would set OY as a percentage of MSY or MSY proxy for the subject stocks and stock complexes. The lower OY is set, the less likely any management measures based on that OY would allow the stock to become depleted and require a stock rebuilding plan. Therefore, of the **Alternative 2** options, **Option 2a** would be the least adverse to the administrative environment and **Option 2c** the most adverse. **Options 2b** and **Option 2d** would be intermediate to **Option 2a** and **Option 2c**.

Because the harvest of goliath grouper is zero, regardless of the OY option, the harvest would be zero under **Alternative 3**. However, should a harvest be allowed for this species, the effects of the **Alternative 3** options would be similar to those described above for **Alternative 2**.

Although the alternatives have different effects on the administrative environment, these effects are likely minor. Assessing stocks to determine if the stock biomass is above or below OY and other measures of stock status is routine for NMFS. Actions to control harvest by the Council and NMFS are mostly routine and conducted through the Council system established by the Magnuson-Stevens Act. Additionally, through the use of ACLs and AMs, the Council and NMFS can determine if overfishing is occurring annually and take measures to reduce the likelihood a stock would get into an overfished condition. This minimizes the risk that harvest levels would deviate from OY.

4.4.2 Action 4.2 – Optimum Yield for Red Drum

4.4.2.1 Direct and Indirect Effects on the Physical Environment

This action does not affect the gear used in the red drum fishery or how it is deployed. Therefore, this action would have no direct effects on the physical environment. However, the definition of optimum yield (OY) could affect the long-term harvest levels, which could indirectly effect the physical environment.

Alternative 1 would maintain the OY definition put in place through Amendment 2 to the Red Drum FMP. Harvest levels would continue to be prohibited in federal waters and managed in state waters to achieve a 30% escapement rate. There would be no change to the current effects on the physical environment.

Alternative 2, **Options 2a-2c** would define OY as a fixed percentage of the red drum MSY or MSY proxy defined in Action 1. The percentage applied to MSY or MSY proxy would depend upon which option is selected. **Option 2a** would set that percentage at the lowest level of MSY (50%), resulting in the lowest OY. The smaller yield would require management actions that would hold long-term fishing effort to be lower than **Option 2b** or **Option 2c**, and likely reduce any adverse effects on the physical environment (fewer gear interactions). **Option 2c**, 90% of MSY, would have the greatest adverse effect on the physical environment because it would allow for management actions that would allow greatest potential long-term fishing effort (more gear interactions). **Option 2b**, 75% of MSY, would result in effects intermediate to **Option 2a** and **Option 2c**. In summary, the level of adverse effects to the physical environment for each option, from least to greatest, are **Option 2a**, **Option 2b**, and **Option 2c**.

The effects between **Alternative 1** and **Alternative 2** are dependent on what level of MSY is selected in Action 1. **Alternative 1** would be equivalent to Action 1, Alternative 4, Option 4a and would be equivalent to managing the stock at 20% SPR. Option 4b would manage the stock at 30% SPR. Option 4b would be inconsistent with **Alternative 1** as OY would be greater than MSY. Regardless of which option is selected in Action 1, Alternative 4, any of the **Alternative 2** options would manage the stock at a more conservative level than **Alternative 1**.

4.4.2.2 Direct and Indirect Effects on the Biological/Ecological Environment

Direct and indirect effects are discussed in Section 4.1.2 in detail and incorporated by reference here. Management measures that would be required to maintain harvests at or below OY would produce biological/ecological impacts. In essence, alternatives that result in greater fishing effort and landings are more likely to adversely affect the biological/ecological environment than alternatives that reduce fishing effort and landings.

Alternative 1 would maintain the OY definition put in place through Amendment 2 to the Red Drum FMP. Harvest levels would continue to be prohibited in federal waters and managed in state waters to achieve a 30% escapement rate. There would be no change to the current effects on the biological/ecological environment.

For **Alternative 2**, **Option 2a** is the most conservative of the OY proxies (50% of MSY or MSY proxy) and would result in management measures that would reduce fishing effort over the long-term the most and allow for the highest long-term stock biomass level associated with it. Thus, it would have the lowest risk of allowing the stock size becoming depleted and would be the most beneficial **Alternative 2** option. **Option 2c** is the least precautionary option and would allow management measures with higher fishing effort levels and the lowest associated stock biomass level. Maintaining this OY proxy would be most adverse to the biological/ecological environment of the **Alternative 2** options. **Option 2b** is intermediate to **Options 2a and 2c**.

The effects on the between **Alternative 1** and **Alternative 2** are dependent on what level of MSY is selected in Action 1. **Alternative 1** would be equivalent to Action 1, Alternative 4, Option 4a and would be equivalent to managing the stock at 20% SPR. Option 4b would manage the stock at 30% SPR. Option 4b would be inconsistent with **Alternative 1** as OY would be greater than MSY. Regardless of which option is selected in Action 1, Alternative 4, any of the **Alternative 2** options would manage the stock at a more conservative level and provide better protection to the stock than **Alternative 1**.

4.4.2.3 Direct and Indirect Effects on the Economic Environment

Alternative 1 (No Action) would maintain the current OY definition for red drum. Therefore, **Alternative 1** would not be expected to result in economic effects (even once red drum harvests in federal waters are allowed).

Alternative 2 would define OY for red drum as a fixed percentage of MSY or proxy. The percentages considered range from 50% (**Option 2a**) to 90% (**Option 2c**). **Option 2b** would set OY at 75% of MSY or MSY proxy. The definition of OY for red drum would not be expected to affect fishing practices or harvest levels once harvest is permitted in the Gulf EEZ. Therefore, **Alternative 2** would not be expected to result in direct economic effects. However, once the future ACL for red drum is linked to the future OY definition, then **Alternative 2** would be expected to result in indirect economic effects. The direction as well as the size of these potential indirect economic effects would be determined by the relationship between the ACL and OY for red drum.

4.4.2.4 Direct and Indirect Effects on the Social Environment

Additional effects would not be expected under **Alternative 1** as the existing OY for red drum would be retained. No effects would be expected from any of the options under **Alternative 2**, as there is no allowable harvest of red drum from federal waters, and modifying OY would not be expected to result in changes to the availability of harvest opportunities in state waters. In the event harvest in federal waters would be opened in the future, it would be necessary to establish new reference points for the stock and to revisit OY.

4.4.2.5 Direct and Indirect Effects on the Administrative Environment

This action would directly affect the administrative environment by defining a long-term harvest goal for the red drum stock assuming equilibrium levels. Both alternatives would adversely affect the Administrative Environment.

Under **Alternative 1**, the red drum stock would be managed at a level approximately equivalent to 20% SPR level. However, to be consistent with Alternative 4 in Action 1, , Option 4a would need to be selected such that MSY does not fall below OY as would be the case with Alternative 4, Option 4a. If Option 4b were selected as preferred, MSY and OY would be inconsistent and require further action by the Council and NMFS, adversely affecting the administrative environment.

Alternative 2 would set OY as a percentage of MSY or MSY proxy for the subject stocks and stock complexes. The lower OY is set, the less likely any management measures based on that OY would allow the stock to become depleted and require a stock rebuilding plan. Therefore, of the **Alternative 2** options, **Option 2a** may be the least adverse to the administrative environment from a stock rebuilding standpoint and **Option 2c** the most adverse. **Options 2b** would be intermediate to **Option 2a** and **Option 2c**. Conversely, if **Alternative 2** is selected as preferred, further action may need to be taken no matter the which option is selected because OY would be less than the current management target based on 20% SPR. Further action regarding the stock may also need to be taken in the Red Drum FMP by the Council and NMFS relative to fishery management objectives. In addition, the Gulf states would need to revise their regulations to increase escapement percentages to the degree necessary to comply with the **Alternative 2** OY management target.

4.5 Cumulative Effects Analysis

Federal agencies preparing an environmental assessment (EA) must also consider cumulative effects of a proposed action and other actions. Cumulative effects are those effects that result from incremental impacts of a proposed action when added to other past, present, and reasonably foreseeable future actions, regardless of which agency (federal or non-federal) or person undertakes such actions. Cumulative effects can result from individually minor but collectively significant actions that take place over a period of time (40 C.F.R. 1508.7). Below is our five-step cumulative effects analysis that identifies criteria that must be considered in an EA.

1. *The area in which the effects of the proposed action will occur* - The affected area of this proposed action encompasses the state and federal waters of the Gulf of Mexico (Gulf) as well as Gulf communities that are dependent on reef fish and red drum fishing. Most relevant to this proposed action are reef fish and red drum. For more information about the area in which the effects of this proposed action will occur, please see Chapter 3, Affected Environment that goes into detail about these important resources as well as other relevant features of the human environment.

2. *The impacts that are expected in that area from the proposed action* - The proposed action would define the status determination criteria for reef fish species and red drum. The environmental consequences of the proposed status determination criteria are analyzed in detail in Sections 4.1-4.4. Setting status determination criteria and OY should have very little effect on the physical and biological/ecological environment because the action is not expected to alter the manner in which the fishery is prosecuted. These actions would not have direct effects on the social and economic environments and any indirect effects would likely be minor for the near future. The reef fish fishery is a multispecies fishery where fishermen can target other species on trip. Thus, changing fishing practices on one stock does not generally change overall fishing effort, particularly for minor stocks within the fishery. This action also should not affect red drum in federal waters as harvest of this species is prohibited. Red drum fishing in state waters is regulated by state marine resource agencies.

3. *Other Past, Present and RFFAs that have or are expected to have impacts in the area* - There are literally tens of thousands of actions going on in the Gulf annually. Many of these activities are expected to have impacts associated with them. It is not possible, nor necessary to list all of them here. Below are discussed the actions expected to have the potential to combine with the effects of the proposed action to have some kind of a cumulative effects.

Other Fishery related actions - The cumulative effects from managing the reef fish fishery have been analyzed in Amendments 30A (GMFMC 2008b), 30B (GMFMC 2008a), 31 (GMFMC 2009), 32 (GMFMC 2011b), 40 (GMFMC 2014a), and 28 (GMFMC 2015b) and are incorporated here by reference. Amendment 3 is the last stand alone amendment to the Red Drum FMP and was approved by the Council in May 1992 (GMFMC 1992). However, several generic amendments that included red drum and had a cumulative effects analysis have been approved since then and are: the Generic Sustainable Fisheries Act Amendment (GMFMC 1999), Generic Amendment Addressing The Establishment of the Tortugas Marine Reserves (GMFMC 2001), the Generic Amendment Number 3 for Addressing Essential Fish Habitat Requirements, Habitat Areas of Particular Concern, and Adverse Effects of Fishing (GMFMC 2005); Generic Annual Catch Limits/Accountability Measures Amendment (GMFMC 2011); and the Generic Amendment to the fishery management plans for the Gulf of Mexico and South Atlantic Regions for Modifications to Federally Permitted Seafood Dealer Reporting Requirements (GMFMC 2013). Additional pertinent past actions are summarized in the history of management (Section 1.3). These include: a framework action to reduce red grouper ACLs and ACTs; Amendments 36B and 36C, which would further revise the red snapper and grouper-tilefish commercial individual fishing quota (IFQ) programs; Amendment 52, which address red snapper allocation; Amendment 53, which would revise red grouper allocations and ACLs; action to revise the ABC control rule and framework procedures; and framework actions addressing greater amberjack and trolling in marine reserves. Descriptions of these actions can be found on the Council's website (http://gulfcouncil.org/).

The Council had looked into developing a plan for red drum to allow recreational fishing in Gulf EEZ waters, but that plan was postponed due to other management priorities the Council is developing (http://gulfcouncil.org/).

Non-fishery related actions - Actions affecting the reef fish fishery have been described in previous cumulative effect analyses (e.g., Amendment 40). Four important events include impacts of the *Deepwater Horizon* MC252 oil spill, the Northern Gulf Hypoxic Zone, red tide and climate change. Reef fish species and red drum are mobile and are able to avoid hypoxic conditions, so any effects from the Northern Gulf Hypoxic Zone on these species are likely minimal regardless of this action. Impacts from the *Deepwater Horizon* MC252 oil spill are still being examined; however, as indicated in Section 3.2, the oil spill had some adverse effects on fish species. However, it is unlikely that the oil spill in conjunction with setting status determination criteria and OY would have any significant cumulative effect given the primarily administrative function of this action. Although fish may be able to avoid high concentrations of red tide, red tide does cause fish kills primarily in coastal waters and these fish kills do include reef fish and red drum. They are most common off the central and southwestern coasts of Florida, they may occur anywhere in the Gulf. As with the *Deepwater Horizon* MC252 oil spill, it is unlikely that red tide in conjunction with the management criteria in this amendment would have any significant cumulative effect given the primarily administrative function of this action.

There is a large and growing body of literature on past, present, and future impacts of global climate change induced by human activities. Some of the likely effects commonly mentioned are sea level rise, increased frequency of severe weather events, and change in air and water temperatures. The Intergovernmental Panel on Climate Change (IPCC) has numerous reports addressing their assessments of climate change (http://www.ipcc.ch/publications_and_data/publications_and_data.shtml). Global climate changes could affect the Gulf fisheries as discussed in Section 3.3. However, the extent of these effects cannot be quantified at this time. The proposed action is not expected to significantly contribute to climate change through the increase or decrease in the carbon footprint from fishing as these actions should not change how the fishery is prosecuted. As described in Section 3.3, the contribution to greenhouse gas emissions from fishing is minor compared to other emission sources (e.g., oil platforms).

4. The impacts or expected impacts from these other actions - The cumulative effects from managing the reef fish fishery have been analyzed in other actions as listed in part three of this section. They include detailed analysis of the reef fish fishery, as well as other fisheries including red drum, cumulative effects on non-target species, protected species, and habitats in the Gulf.

5. *The overall impact that can be expected if the individual impacts are allowed to accumulate:* RFFAs are listed in Part 3 of this section and pertinent past actions are summarized in the history of management (Section 1.3). This action, combined with past actions and RFFAs, is not expected to have significant beneficial or adverse effects on the physical and biological/ecological environments because this action will only minimally affect current fishing practices. However, for the social and economic environments, short-term adverse effects, although minor, are likely and could result in economic losses to fishing communities. These short-term effects are expected to be compensated for by long-term management goals to maintain the stock at healthy levels. These effects are likely minimal as proposed action, along with past and RFFAs, are not expected to alter the manner in which the reef fish and red drum fisheries are prosecuted. Because it is unlikely there would be any changes in how the fisheries are prosecuted, this action, combined with past actions and RFFAs, is not expected to have significant adverse effects on public health or safety.

6. Summary: The proposed action, if conducted in a manner consistent with specific alternatives, is not expected to have individual significant effects to the biological, physical, or socio-economic environment. The effects of the proposed action are, and will continue to be, monitored through collection of landings data by NMFS, stock assessments and stock assessment updates, life history studies, economic and social analyses, and other scientific observations. Landings data for the recreational sector in the Gulf are collected through Marine Recreational Information Program, the Southeast Region Headboat Survey, and the Texas Marine Recreational Fishing Survey, and the Louisiana Department of Wildlife and Fisheries LA Creel Program. In addition, the Alabama Department of Conservation and Natural Resources has instituted a program to collect information on reef fish, and in particular, red snapper recreational landings information. Commercial data are collected through trip ticket programs, port samplers, and logbook programs, as well as dealer reporting through the individual fishing quota program.

For the reasons outlined in this CEA and the rest of the environmental assessment, we do not expect this proposed action to have the potential to combine with other past, present and reasonably foreseeable future actions to have a significant cumulative effect on the human environment.

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APPENDIX A. METHODOLOGY FOR ESTABLISHING STOCK COMPLEXES

The following is a condensed version of the discussion on stock complexes included in the Generic ACL/AM Amendment (GMFMC 2011). For a more detailed description of the analysis, refer to the analysis report by Farmer et al. (2010).

Traditionally, management measures have been implemented using MSY proxies in species-specific stock assessments. However, red drum and many of the stocks in the Fishery Management Plan (FMP) for the Reef Fish Resources in the Gulf of Mexico (Reef Fish FMP) have not had stock assessments and are unlikely to be assessed in the near future. In these cases, the National Standard 1 (NS1) guidelines allow an MSY proxy to be assigned to a stock complex under certain conditions. Stock complex is defined as a group of stocks that are sufficiently similar in geographic distribution, life history, and vulnerabilities to the fishery such that the impact of management actions on the stocks is similar. Stocks may be grouped into complexes for various reasons, including where stocks in a multispecies fishery cannot be targeted independent of one another and MSY cannot be defined on a stock-by-stock basis; where there are insufficient data to measure their status relative to status determination criteria (SDC); or when it is not feasible for fishermen to distinguish individual stocks among their catch.

Analysis of the relationships between reef fish stocks was conducted by Farmer et al (2010) for purposes of establishing the stock complexes in the Generic ACL/AM Amendment (GMFMC 2011), and used here.

The objectives of the National Marine Fisheries Service (NMFS) stock groupings analysis specified in Farmer et al. (2010) were threefold: 1) To determine whether species assemblages can be identified in the Gulf of Mexico (Gulf) among the managed Reef Fish FMP species, 2) To determine if these assemblages are consistent between commercial and recreational fisheries, and 3) To develop species complexes that are "…sufficiently similar in geographic distribution, life history, and vulnerabilities to the fishery such that the impact of management actions on the stocks is similar" per NS1.

Methods

Following Lee and Sampson (2000), multiple statistical techniques were used to identify species assemblages: 1) species life history and depth of occurrence, 2) percent landings and percent trips by dataset, 3) dimension reduction and hierarchical cluster analyses based on life history; abundance; and presence-absence, 4) correlation matrices, 5) nodal analyses, and 6) maps of species distributions. These results were synthesized across analyses to develop potential species complexes for ACL management sufficiently similar in geographic distribution, life history, and vulnerabilities to the fishery such that the impact of management actions on the stocks would be similar.

Life History and Landings Data

Life history parameters were assembled from peer-reviewed literature, Southeast Data Assessment and Review (SEDAR) reports, unpublished data from the NMFS Panama City Laboratory, Stock Assessment and Fishery Evaluation reports, and from FishBase (Froese and Pauly 2014). Data from the Gulf of Mexico (Gulf) were used whenever possible. Depth of occurrence records were assimilated from FishBase, with minimum and maximum depths of occurrence recorded (Froese and Pauly 2014).

Commercial logbook, commercial observer, headboat logbook, recreational survey, and fishery-independent bottom longline data were used to evaluate similarities in spatial and temporal patterns of fisheries exploitation in the Gulf for species in the Reef Fish FMP. Commercial logbook records (SEFSC logbook data, accessed 6 May 2010) summarize landings on a trip level, with information for each species encountered including landings (in pounds), primary gear used, and primary area and depth of capture. Depth of capture is an important consideration when evaluating similarities in fisheries vulnerability and is only available in logbook records from 2005 onward, reported as a mean depth of capture, by species captured. It should be noted that a single depth of fishing is reported for each species per trip, although they may be encountered at numerous depths during multiple sets, and even within a single drifting longline set. Additionally, depth is occasionally misreported in fathoms rather than feet.

For the purposes of these analyses, logbook landings were summarized by species, year, month, gear type, statistical area, and depth. Trip-level adjustments were made to black grouper and gag landings to account for geographic differences in misidentification rates following recommendations from SEDAR 10 (2006). Year and month were defined by the date the fish were landed. Vertical line (e.g., handline and electric rig) and longline gear types were evaluated separately. Area fished was based on the 21 Gulf commercial logbook statistical areas (Figure 1). Depth of capture was aggregated into atmospheric pressure bins (e.g., 33 ft = 2 atm, 66 ft = 3 atm, etc.). Records with no reported depth or area of capture were removed from consideration; these represented approximately 9% of the total available records for both the longline and vertical line clusters. Overall, 27,566 longline and 121,767 vertical line commercial logbook records from 2005-2009 were evaluated.

For the commercial logbook data, separate analyses were conducted for commercial longline and commercial vertical line gear types. Landings were binned by month to maximize the variety of species landed while still capturing temporal trends in abundance. Fishermen will typically make multiple sets on a trip, sometimes in geographically distant areas, targeting different species. Binning by area and depth (commercial) reduced the probability of grouping species caught during the same time period that would likely not co-occur during any given set due to disparate geographic distributions.

In July 2006, NMFS implemented a mandatory reef fish observer program (RFOP) to characterize the reef fish fishery operating in the U.S. Gulf of Mexico. The mandatory RFOP provides general fishery bycatch characterization, estimates managed finfish discard and release mortality levels, and estimates protected species bycatch levels. The RFOP provides set-level information on species encountered on trips using bottom longline, electric (bandit) reel, and handlines. Overall, 140,204 records representing 9,031 sets from 2005-2009 were evaluated.

The recreational headboat sector of the reef fish fishery was evaluated using headboat survey logbook data (Southeast Region Headboat Survey data, accessed 19 April 2010) reported by headboat operators. Headboats are large, for-hire vessels that typically accommodate 20 or more anglers on half or full day trips. Headboat records are arranged similar to commercial logbook records, and contain trip-level information on number of anglers, trip duration, date, area fished, and landings (number fish) and releases (number fish) of each species. Headboat landings and encounters (landings plus releases) were summarized by species, year, month, trip duration, and area fished. Trip duration was considered the best proxy for depth fished, as trips of longer duration are more likely to go farther offshore. Area fished was aggregated at the most common reporting level (1° latitude by 1° longitude). As with the commercial fishery data, area fished is self-reported and this introduces error into the analysis. Additionally, vessels fishing in multiple areas during a trip would be constrained by the current data form to select one area fished for the trip, which limits the spatial precision of the analysis. Records with no geographic area reported (~3%) were removed from consideration. Overall, 121,334 headboat records from 2004-2009 were evaluated.

The private, rental, and for-hire charter components were evaluated using data from the Marine Recreational Fisheries Statistics Survey (MRFSS) dockside intercept records. MRFSS intercepts collect data on port agent observed landings (‘A’ catch) and angler reported landings (‘B1’ catch) and discards (‘B2’ catch) in numbers by species, two-month wave (e.g., Wave 1 = Jan/Feb, … Wave 6 = Nov/Dec), area fished (inland, state, and federal waters), mode of fishing (charter, private/rental, shore), and state (west Florida, Alabama, Mississippi, and Louisiana). All MRFSS intercepts from the Gulf from 2000-2009 were aggregated by year, wave, mode, and area fished; computing a catch-per-angler-per-trip by species for the whole catch (e.g., ‘A’+’B1’+’B2’ catch). Overall, 64,782 dockside intercept records from 2000-2009 were evaluated.

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APPENDIX B. FURTHER EXPLANATION OF MSY PROXIES

Alternative MSY proxies can include proxies based on reference points other than SPR. Below is a brief description of some alternative reference points and the reasons why they are not being considered in this amendment.

Yield at maximum yield per recruit (F_{MAX})

In addition to SPR-based MSY proxies, SEDAR standard assessment for Gulf of Mexico (Gulf) vermilion snapper (SEDAR 45 2016) investigated two maximum yield-per-recruit based proxies for MSY. Maximum yield-per-recruit means the maximum pounds of fish that can be harvested per individual fish recruited to the stock. Computing F_{MAX} entails finding the fishing mortality rate and age at first capture (assuming knife-edge selectivity for a single fleet) that produces the maximum yield per recruit. In practice, F_{MAX} is not particularly useful as an MSY proxy for management purposes, because many of the assumptions made during its calculation are not reflective of reality. For example, F_{MAX} assumes knife-edge selectivity (i.e., all fish are caught at a specific size or age). In reality, the fishery consists of multiple fleets, operating with disparate non-knife-edged selectivities, which are overlaid with substantial bycatch and discard mortality. Furthermore, F_{MAX} is calculated assuming no stock recruitment relationship, which nearly always results in F_{MAX} overestimating F_{MSY} (Gabriel and Mace 1999). In the case of SEDAR 45 (Gulf vermilion snapper), setting the age at first capture to 3 or 4 years resulted in nearly the same yield-per-recruit and corresponded with SPR values of 13% and 20%, respectively (Figure B.1). Given the nearly identical yield-per-recruits associated with the two SPR values, the more conservative 20% SPR was the preferred result from the analysis. However, because this knife-edge age-based selectivity is dramatically different from the actual fleet selectivity dynamics, the Southeast Fisheries Science Center (SEFSC) recommended that these values should not be put forward as plausible alternatives for management[25].

[25] E-mail from Matthew Smith, SEFSC to Steven Atran, Gulf Council, dated July 11, 2016.

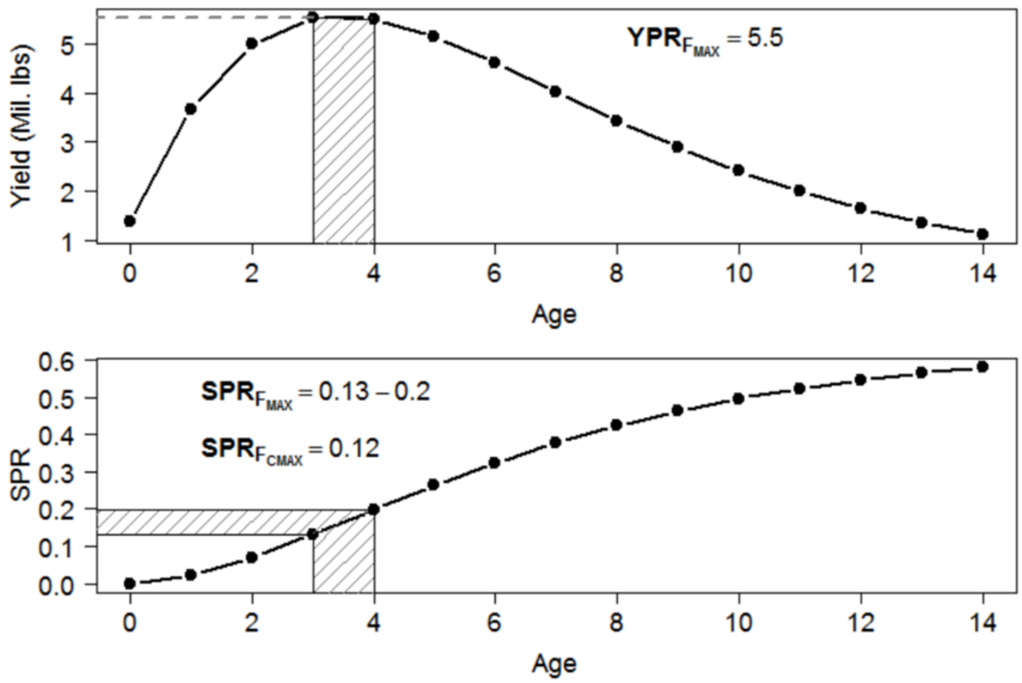

Figure B.1. Results of the global yield per recruit projections assuming a single fleet with optimal knife-edge selectivity at a given age, no bycatch or discards, and near infinite fishing mortality. The maximum yield occurs with recruitment to the fishery between ages 3 and 4 and results in a SPR between 13% and 20%. SPR associated with FCMAX analysis is displayed for reference.
Source: SEDAR 45 (2016)

Yield at conditional maximum yield per recruit (F_{CMAX})

In addition to F_{MAX}, which uses knife-edge selectivity at either age 3 or age 4, the fishing mortality rate that maximizes yield-per-recruit conditional on existing selectivity, bycatch, and discard patterns (F_{CMAX}) was calculated. Discards of the directed fleets were minimal and not incorporated into the model for SEDAR 45; however, bycatch from the shrimp fishery was included, and for the purpose of F_{CMAX} calculations, assumed to remain fixed at recent levels. Like the traditional F_{MAX} calculation, stock recruitment dynamics are not included in F_{CMAX} computations. F_{CMAX} was estimated to be 0.246 for Gulf vermilion snapper, which was projected to result in equilibrium SPR of 12%.

Despite the fact that F_{MAX}, for the reasons stated above, is generally a poor proxy for F_{MSY}, ongoing research being conducted at the SEFSC has shown that the estimated equilibrium spawning stock biomass (SSB_{MAX}) and corresponding SPR value associated with F_{MAX} can be considered minimum biomass thresholds for sustainable management. Consequently, the SEDAR 45 stock assessment report recommended that any F_{MSY} proxy used to manage Gulf vermilion snapper result in a SPR value greater than or equal to 20%. Consequently, when the results of SEDAR 45 were presented to the Scientific and Statistical Committee (SSC), SEFSC staff did not recommend the use of F_{CMAX} as a viable proxy for F_{MSY} since it resulted in an SPR value well below the 20% threshold associated with F_{MAX}.

Yield at $F_{0.1}$

Because of the issues associated with using F_{MAX}, an alternative referred to as $F_{0.1}$ was developed and promoted as a more prudent alternative (Gulland and Boerema 1973). Technically, $F_{0.1}$ is defined as the fishing mortality rate corresponding to 10% of the slope of the yield-per-recruit curve at the origin. Although $F_{0.1}$ is commonly interpreted as a conservative or cautious estimate of F_{MSY}, this is not always the case (Mace 1994; Mace and Sissenwine 1993). Even when $F_{0.1}$ does underestimate F_{MSY}, the equilibrium yields associated with the two reference points may be relatively very close (based on the argument that the difference between the equilibrium yields associated with F_{MAX} and $F_{0.1}$ are usually small, and F_{MSY} is usually less than F_{MAX}) (Gabriel and Mace 1999). Therefore, $F_{0.1}$ is also considered not to be plausible for management.

APPENDIX C. OTHER APPLICABLE LAW

The Magnuson-Stevens Fishery Conservation and Management Act (Magnuson-Stevens Act) (16 U.S.C. 1801 et seq.) provides the authority for management of stocks included in fishery management plans in federal waters of the exclusive economic zone. However, management decision-making is also affected by a number of other federal statutes designed to protect the biological and human components of U.S. fisheries, as well as the ecosystems that support those fisheries. Major laws affecting federal fishery management decision-making include the Endangered Species Act and Marine Mammals Protection Act (Section 3.3), E.O. 12866 (Regulatory Planning and Review, Chapter 5) and E.O. 12898 (Environmental Justice, Section 3.5.2). Other applicable laws are summarized below.

<u>Administrative Procedure Act</u>

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

<u>Coastal Zone Management Act</u>

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

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

<u>Data Quality Act</u>

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

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

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

Fish and Wildlife Coordination Act

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

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

National Historic Preservation Act

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

Typically, fishery management actions in the Gulf of Mexico are not likely to affect historic places with exception of the *U.S.S. Hatteras*, located in federal waters off Texas, which is listed in the National Register of Historic Places. Reef fish and red drum fishing does occur off Texas;

therefore, the proposed actions are a part of the normal fishing activities that occur at this site. Thus, no additional impacts to the *U.S.S. Hatteras* would be expected.

Executive Orders (E.O.)

E.O. 12630: Takings

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

E.O. 12962: Recreational Fisheries

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

E.O. 13089: Coral Reef Protection

The E.O. on Coral Reef Protection requires federal agencies whose actions may affect U.S. coral reef ecosystems to identify those actions, utilize their programs and authorities to protect and enhance the conditions of such ecosystems, and, to the extent permitted by law, ensure actions that they authorize, fund, or carry out do not degrade the condition of that ecosystem. By definition, a U.S. coral reef ecosystem means those species, habitats, and other national resources associated with coral reefs in all maritime areas and zones subject to the jurisdiction or control of the United States (e.g., federal, state, territorial, or commonwealth waters).

Regulations are already in place to limit or reduce habitat impacts within the Flower Garden Banks National Marine Sanctuary. Additionally, NMFS approved and implemented Generic

Amendment 3 for Essential Fish Habitat (GMFMC 2005), which established additional habitat areas of particular concern (HAPCs) and gear restrictions to protect corals throughout the Gulf of Mexico. There are no implications to coral reefs by the actions proposed in this amendment.

E.O. 13132: Federalism

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

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

E.O. 13158: Marine Protected Areas

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