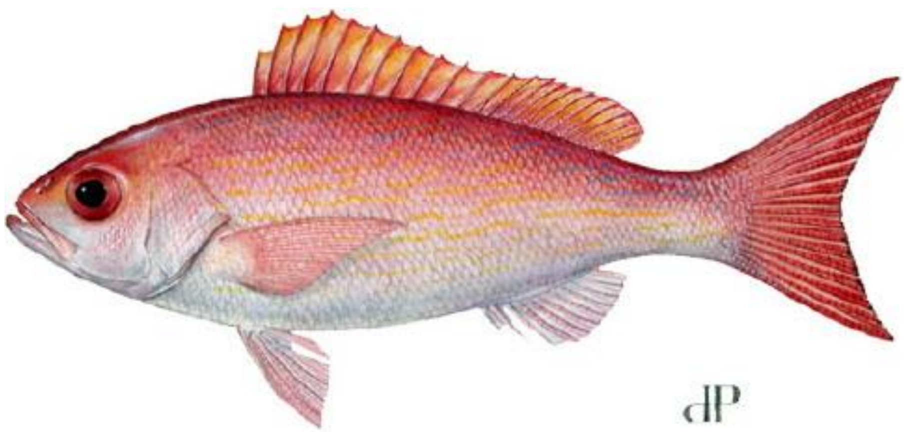
Tab B, No. 8
3/24/2017

Establish a Vermilion Snapper MSY Proxy and Adjust the Stock Annual Catch Limit



Amendment 47

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

Including Environmental Assessment,
Fishery Impact Statement, Regulatory Impact Review,
and Regulatory Flexibility Act Analysis

April 2017

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ENVIRONMENTAL ASSESSMENT COVER SHEET

Name of Action

Draft Amendment 47 to the Fishery Management Plan for the Reef Fish Resources of the Gulf of Mexico: Establish a Vermilion Snapper MSY Proxy and Adjust the Stock Annual Catch Limit

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Type of Action

( ) Administrative
(X) Draft

( ) Legislative
( ) Final

ABBREVIATIONS USED IN THIS DOCUMENT

ABC	Acceptable biological catch
ACL	Annual catch limit
ACT	Annual catch target
ALS	Accumulated landings system
AM	Accountability Measures
AP	Advisory Panel
B	Stock biomass level
B_{MSY}	Value of B capable of producing MSY on a continuing basis
CMAX	Maximum yield-per-recruit under current fishing selectivities
COI	Certificate of inspection
Council	Gulf of Mexico Fishery Management Council
CS	Consumer surplus
EA	Environmental assessment
EEZ	Exclusive economic zone
EFH	Essential fish habitat
EIS	Environmental impact statement
EJ	environmental justice
EPA	Environmental Protection Agency
ESA	Endangered Species Act
F	Instantaneous Rate of Fishing Mortality
F_{CMAX}	Fishing mortality rate corresponding to maximum yield-per-recruit under current fishing selectivities
F_{MAX}	Fishing mortality rate corresponding to conditional maximum yield-per-recruit under knife-edge selectivity
F_{MSY}	Fishing mortality rate corresponding to an equilibrium yield of MSY
F_{OY}	Fishing mortality rate corresponding to an equilibrium yield of OY
$F_{30\%SPR}$	fishing mortality corresponding to 30% spawning potential ratio
FMP	Fishery Management Plan
GMFMC	Gulf of Mexico Fishery Management Council
Gulf	Gulf of Mexico
gw	Gutted weight
IFQ	individual fishing quota
IPCC	International Panel on Climate Change
LEAP	Law Enforcement Advisory Panel
LOF	List of fisheries under the Marine Mammal Protection Act
M	Instantaneous Rate of Natural Mortality
Magnuson-Stevens Act	Magnuson-Stevens Fishery Conservation and Management Act
MAX	Maximum yield per recruit
MFMT	Maximum fishing mortality threshold
MMPA	Marine Mammal Protection Act
MRIP	Marine Recreational Information Program
MSST	Minimum stock size threshold
MSY	Maximum sustainable yield
NMFS	National Marine Fisheries Service

NOAA	National Oceanic and Atmospheric Administration
NS1	National Standard 1
OFL	Overfishing limit
OMB	Office of Management and Budget
OY	Optimum yield
P*	Probability of overfishing
PDARP	Programmatic Damage Assessment and Restoration Plan
PIMS	Permit Information Management System
RFA	Regulatory flexibility analysis
RFFA	reasonably foreseeable future actions
RFFA	Reasonably foreseeable future actions
RFSAP	Reef fish stock assessment panel
RIR	Regulatory impact review
RQ	Regional quotient
SDC	Status determination criteria
Secretary	Secretary of Commerce
SEDAR	Southeast Data, Assessment, and Review
SEFSC	Southeast Fisheries Science Center
SERO	NMFS Southeast Regional Office
SPR	Spawning potential ratio
SSB	Spawning stock biomass
SSBR	Spawning stock biomass per recruit
SSC	Scientific and statistical committee
SPR	Spawning potential ratio
TAC	Total allowable catch
TL	Total length
USFWS	United States Fish and Wildlife Service
VMS	Vessel monitoring system
VPA	Virtual population analysis
ww	Whole weight

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CHAPTER 1. INTRODUCTION

1.1 Background

The Gulf of Mexico Fishery Management Council (Council) is one of eight regional Fishery Management Council established by the Fishery Conservation and Management Act of 1976. The Council prepares fishery management plans (FMPs) which are designed to manage fishery resources within the federal waters of the Gulf of Mexico (Gulf). One such FMP is the Fishery Management Plan for Reef Fish Resources of the Gulf of Mexico. Vermilion snapper is 1 of 31 species managed under the Reef Fish FMP.

The National Marine Fisheries Service (NMFS) is responsible for the stewardship of the nation's ocean resources and their habitat. They are responsible for the collection data and for conducting stock assessments in support of science-based fishery management to prevent overfishing and rebuild fish stocks that are overfished. FMPs and amendments submitted by the Council may be approved, rejected, or partially approved by the Secretary of Commerce (Secretary), and NMFS is responsible for implementing and enforcing management measures based on the FMPs and amendments. NMFS has five regional offices (Alaska, Greater Atlantic, Pacific Islands, Southeast, and West Coast). The Gulf falls under the jurisdiction of the Southeast Regional Office (SERO).

Maximum Sustainable Yield Proxy

The Sustainable Fisheries Act of 1996 and the subsequent revisions to the National Standard 1 (NS1) guidelines require Councils to establish definitions of overfishing (maximum fishing mortality threshold – MFMT), overfished (minimum stock size threshold –MSST), and estimates of maximum sustainable yield (MSY) or proxy for managed stocks. Collectively, these are referred to as status determination criteria. For vermilion snapper, the following status determination criteria were adopted in Amendment 23 (GMFMC 2004a) (Table 1.1.1):

Table 1.1.1. Vermilion snapper status determination criteria from Amendment 23.

Status Reference Point	Current Definition
MSY	Yield at F_{MSY} (no proxy)
MFMT	F_{MSY} (no proxy)
MSST	$(1-M)*B_{MSY}$ ($M = 0.25$) [1]

Under the criteria in Amendment 23, there is no proxy used for MSY. Rather, the estimate generated by the assessment model is used. However, the calculation for this estimate of MSY is dependent upon the spawner-recruit relationship. For vermilion snapper, there is a high degree of variability and a narrow range of spawning biomass in the data used to calculate the spawner-recruit relationship.

[1] Where M means the instantaneous natural mortality rate, B means stock biomass level, and B_{MSY} means the value of B capable of producing MSY on a continuing basis.

Because of the poor fit of the spawner-recruit curve to the available data, the Council's Scientific and Statistical Committee (SSC) had little confidence in the resulting estimate of MSY. Instead, the SSC recommended the use of an MSY proxy. The SSC had, in some past assessments including assessments conducted under the Southeast Data, Assessment and Review (SEDAR) process, used as an MSY proxy the yield when fishing for maximum yield-per-recruit (F_{MAX}) (Schirripa 1992, SEDAR 9 Update 2012), and provided management advice based on that proxy. In the most recent assessment (SEDAR 45 2016), the SSC selected the yield when fishing at a mortality rate corresponding to 30% spawning potential ratio ($F_{30\%\ SPR}$), measured in terms of egg production relative to an unfished stock, as a better proxy. The SSC's use of an MSY proxy provides the best scientific information available, but is inconsistent with the status determination criteria currently in the Reef Fish FMP for vermilion snapper.

Annual Catch Limit

The stock annual catch limit (ACL) is the amount of vermilion snapper that can be caught each year before triggering accountability measures (i.e. season closures). There is no allocation of vermilion snapper between the commercial and recreational sectors. When the combined commercial and recreational catch reaches the stock ACL (or is projected to reach the stock ACL), the season is closed for both sectors. The stock ACL for vermilion snapper has been at 3.42 million pounds whole weight (mp ww) since 2012 when it was set using Tier 3a of the acceptable biological catch (ABC) control rule. Tier 3a is a data poor method that relies only on catch data. The 3.42 mp ww ACL was the average annual catch during 1999-2008 plus one standard deviation.

An update assessment conducted in 2012 (SEDAR 9 update 2012) evaluated the spawning stock biomass (SSB) and fishing mortality rate (F) status using MSY proxies of both 30% SPR ($SSB_{30\%\ SPR}$ and $F_{30\%\ SPR}$) and maximum yield per recruit (SSB_{MAX} and F_{MAX}). Under both proxies the stock was determined to be neither overfished nor undergoing overfishing, but the proxy based on maximum yield per recruit did bring the stock closer to the overfishing and overfished thresholds. The SSC felt that maximum yield per recruit was a better proxy because the yield-per-recruit curve for vermilion snapper revealed that $F_{30\%\ SPR}$ was greater than F_{MAX} for this stock under directed yield projections. Projections for the overfishing limit (OFL) and ABC conducted under Tier 1 of the ABC control rule with a probability of overfishing (P*) = 39.8% resulted in ABC yields higher than the existing 3.42 mp ww ACL suggesting that the ACL could be increased. However, members of the Council's Reef Fish Advisory Panel (AP) as well as fishermen who testified to the Council felt that, based on their personal observations, the vermilion snapper stock was not in as good condition as the assessment suggested. As a result, the 3.42 mp ww ACL was maintained in a 2013 framework action (GMFMC 2013). The vermilion snapper landings have been below this ACL since it was established (Table 1.1.2). Consequently, there have been no season closures.

Table 1.1.2. Vermilion snapper landings vs. ACL, 2012-2016. Landings are in pounds whole weight.

Year	Recreational Landings	Commercial Landings	Total Landings	ACL	Percent of ACL
2012	756,052	2,410,891	3,166,943	3,420,000	93%
2013	1,118,790	1,418,401	2,537,191	3,420,000	74%
2014	1,160,951	1,759,141	2,920,092	3,420,000	85%
2015	886,587	1,396,545	2,283,132	3,420,000	67%
2016*	1,013,800	1,577,600	2,591,400	3,420,000	76%

Source: NMFS ACL webpage:
http://sero.nmfs.noaa.gov/sustainable_fisheries/acl_monitoring/stock_gulf/index.html
*2016 landings are preliminary, and only include recreational landings through October.

In 2016, a standard assessment for vermilion snapper was conducted (SEDAR 45 2016). Stock status was evaluated using MSY proxies of 30% SPR ($SSB_{30\%\ SPR}$ and $F_{30\%\ SPR}$), maximum yield per recruit (SSB_{MAX} and F_{MAX}) and under a proxy that accounted for prevailing fishing selectivities (SSB_{CMAX} and F_{CMAX}). Under $SSB_{30\%\ SPR}$ and SSB_{CMAX} the stock was not overfished (a status was not provided for SSB_{MAX}). Under all proxies, overfishing was not occurring. The SSC selected 30% SPR as the best MSY proxy for this assessment.

Projections were made for OFL and ABC. However, the SSC felt that ABCs calculated under Tier 1 of the ABC control rule produced catch levels that were too close to the OFLs, and instead provided ABC projections based on the yield when fishing at 75% of $F_{30\%\ SPR}$. This is the yield level that the Council usually uses to define optimum yield (OY). Based on the results, the SSC offered two recommendations for ABC yield streams during the five-year period 2017 – 2021. The first was a declining yield stream from 3.21 mp ww in 2017 to 3.03 mp ww in 2021, and the second was a constant catch ABC of 3.11 mp ww for the entire five-year period (see Table 2.2.3 for specific OFL and ABC values). These two yield streams were considered equivalent in terms of maintaining the stock status, so the Council could select either recommendation. Under either recommendation, the current ACL of 3.42 mp ww exceeds the new ABC and must be adjusted.

Gulf of Mexico Fishery Management Council

- Responsible for conservation and management of fish stocks
- Consists of 17 voting members, 11 of whom are appointed by the Secretary of Commerce, the National Marine Fisheries Service Regional Administrator, and 1 representative from each of the 5 Gulf states marine resource agencies
- Responsible for developing fishery management plans and amendments, and for recommending actions to National Marine Fisheries Service for implementation

National Marine Fisheries Service

- Responsible for conservation and management of fish stocks
- Responsible for compliance with federal, state, and local laws
- Approves, disapproves, or partially approves Council recommendations
- Implements regulations

1.2 Purpose and Need

The purpose for the action is to establish a proxy for MSY and to adjust the ACL for the Gulf vermilion snapper stock consistent with the most recent stock assessment.

The need for the proposed action is to establish an MSY proxy and associated status determination criteria that are consistent with the best scientific information available under the National Standard 2 Guideline, and to establish an ACL that does not exceed the ABC yields from the most recent stock assessment (SEDAR 45 2016).

1.3 History of Management

This history of management covers events pertinent to the management of vermilion snapper in the Gulf. A complete history of management for the Reef Fish FMP is available on the Council's website: http://www.gulfcouncil.org/fishery_management_plans/reef_fish_management.php. The original Reef Fish FMP (with its associated environmental impact statement [EIS]) (GMFMC 1981) was effective November 8, 1984. There were no regulations specific to vermilion snapper, but vermilion snapper were included in the reef fish management unit. Species in the management unit were subject to certain gear restrictions when fished inside the defined "stressed area" including a prohibition on the use of fish traps, roller trawls, and powerheads for the taking of reef fish in the stressed area.

1.3.1 Vermilion Snapper History of Management

Amendments to the Reef Fish FMP

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. A minimum size limit of 8 inches total length (TL) was established for vermilion snapper, but vermilion snapper was exempted from an aggregate snapper recreational bag limit. The stressed area was expanded to run contiguously around the Gulf coast, and a longline boundary was established shoreward of which longlines could not be used for the harvest of reef fish. A commercial fishing permit was established and required for vessels to exceed the recreational bag limit (where applicable) and for the sale of reef fish. A framework procedure for the specification of the total allowable catch (TAC) was created to allow for annual management changes.

Amendment 4 (with its associated EA and RIR), implemented in May 1992, established a moratorium on the issuance of new commercial reef fish vessel permits for a maximum period of three years.

Amendment 5 (with its associated supplemental EIS, RIR, and RFA), implemented in February 1994, required that all finfish except for oceanic migratory species be landed with head and fins attached, and closed the region of Riley's Hump (near Dry Tortugas, Florida) to all fishing during May and June to protect mutton snapper spawning aggregations. This amendment also established a fish trap endorsement and a three-year moratorium on the issuance on new fish trap permits.

Amendment 9 (with its associated EA and RIR), implemented in July 1994, extended the commercial reef fish permit moratorium through December 31, 1995.

Amendment 11 (with its associated EA and RIR), implemented in January 1996, included the following: (1) limited sale of Gulf reef fish by permitted vessels to permitted reef fish dealers; (2) required that permitted reef fish dealers purchase reef fish caught in Gulf federal waters only from permitted vessels; (3) established a limited transfer provision for fish trap endorsements; allowed transfer of commercial reef fish permits and fish trap endorsements in the event of death or disability; and (4) implemented a new reef fish permit moratorium for no more than five years or until December 31, 2000.

Amendment 12 (with its associated EA and RIR), implemented in January 1997, created an aggregate bag limit of 20 reef fish for all reef fish species not having a bag limit (including vermilion snapper).

Amendment 14 (with its associated EA and RIR), implemented in March and April 1997, provided for a 10-year phase-out for the fish trap fishery. The amendment also provided the Regional Administrator of NMFS with authority to reopen a fishery prematurely closed before the quota was reached and modified the provisions for transfer of commercial reef fish vessel permits.

Amendment 15 (with its associated EA, RIR, and RFA), implemented in January 1998, increased the vermilion snapper minimum size limit from 8 inches TL to 10 inches TL.

Amendment 17 (with its associated EA), implemented in August 2000, extended the commercial reef fish permit moratorium for another five years, from December 31, 2000 to December 31, 2005, unless replaced sooner by a comprehensive controlled access system.

Amendment 18A (EA/RIR/RFA) was implemented on September 8, 2006, except for vessel monitoring system (VMS) requirements which were implemented May 6, 2007. Amendment 18A addresses the following: (1) prohibits vessels from retaining reef fish caught under recreational bag/possession limits when commercial quantities of Gulf reef fish are aboard, (2) adjusts the maximum crew size on charter vessels that also have a commercial reef fish permit and a United States Coast Guard certificate of inspection (COI) to allow the minimum crew size specified by the COI when the vessel is fishing commercially for more than 12 hours, (3) prohibits the use of reef fish for bait except for sand perch or dwarf sand perch, (4) requires devices and protocols for the safe release in incidentally caught endangered sea turtle species and smalltooth sawfish, (5) updates the TAC procedure to incorporate the SEDAR assessment methodology, (6) changes the permit application process to an annual procedure and simplifies income qualification documentation requirements, and (7) requires electronic VMS aboard vessels with federal reef fish permits, including vessels with both commercial and charter vessel permits.

Amendment 19 (FSEIS/RIR/RFA), also known as the Generic Amendment Addressing the Establishment of the Tortugas Marine Reserves, or Generic Essential Fish Habitat (EFH) Amendment 2, was implemented on August 19, 2002. This amendment established two marine reserves off the Dry Tortugas where fishing for any species and anchoring by fishing vessels is prohibited.

Amendment 20 (EA/RIR/RFA), implemented July 2003, established a three-year moratorium on the issuance of charter and headboat vessel permits in the recreational reef fish and coastal migratory pelagic fisheries in the Gulf exclusive economic zone (EEZ).

Amendment 21 (EA/RIR/RFA), implemented in July 2003, continued the Steamboat Lumps and Madison-Swanson reserves for an additional six years, until June 2010. In combination with the initial 4-year period (June 2000-June 2004), this allowed a total of 10 years in which to evaluate the effects of these reserves and to provide protection to a portion of the gag spawning aggregations.

Amendment 23 (SEIS/RIR/RFA), implemented July 8, 2005, established a rebuilding plan for vermilion snapper, including an 11 inch TL minimum size limit, a 10-fish vermilion snapper bag limit within the 20-reef fish aggregate bag limit, and an April 22 through May 31 closed season for the commercial sector.

Amendment 24 (EA/RIR/RFA), implemented on August 17, 2005, replaced the commercial reef fish permit moratorium that was set to expire on December 31, 2005 with a permanent limited access system.

Amendment 25 (SEIS/RIR/RFA), implemented on June 15, 2006, replaced the reef fish for-hire permit moratorium that expired in June 2006 with a permanent limited access system.

Amendment 27 (EA/RIR/RFA), implemented February 2008, addressed 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 31 (FEIS/RIR/RFA), implemented May 26, 2010, established additional restrictions on the use of bottom longline gear in the eastern Gulf in order to reduce bycatch of endangered sea turtles, particularly loggerhead sea turtles. The amendment (1) prohibits the use of bottom longline gear shoreward of a line approximating the 35-fathom contour from June through August; (2) reduces the number of longline vessels operating in the fishery through an endorsement provided only to vessel permits with a demonstrated history of landings, on average, of at least 40,000 lbs of reef fish annually with fish traps or longline gear during 1999-2007; and (3) restricts the total number of hooks that may be possessed onboard each reef fish bottom longline vessel to 1,000, only 750 of which may be rigged for fishing. The boundary line was initially moved from 20 to 50 fathoms by emergency rule effective May 18, 2009. That rule was replaced on October 16, 2009 by a rule under the Endangered Species Act moving the boundary to 35 fathoms and implementing the maximum hook provisions.

Amendment 34 (EA/RIR/RFA), implemented November 2012, defined dual-permitted vessels as vessels with both a charter vessel/headboat permit and a commercial reef fish permit. The amendment eliminated the earned income requirement for the renewal of commercial reef fish permits and increased the maximum crew size from three to four when dual-permitted vessels are operating as a commercial reef fish vessel.

The **Generic ACL/AM Amendment** (GMFMC 2011a), implemented in January 2012, established in-season closure authority for when vermilion snapper landings are estimated to have reached the ACL.

Framework Actions and Regulatory Amendments

August 1999: Closed two areas (i.e., created two marine reserves), known as Steamboat Lumps and Madison-Swanson (104 and 115 nautical square miles respectively), year-round to all fishing under the jurisdiction of the Council with a four-year sunset closure.

February 2007: Revised management measures for vermilion snapper to those prior to implementation of Reef Fish Amendment 23 by reducing the minimum size limit from 11 inches TL to 10 inches TL; eliminating the 10-fish bag limit for vermilion snapper and retaining the current 20-fish aggregate bag limit for those reef fish species without a species-specific bag limit; and eliminating the April 22 through May 31 commercial closed season for vermilion snapper.

September 2010: Provides a more specific definition of buoy gear by limiting the number of hooks, limiting the terminal end weight, restricting materials used for the line, restricting the length of the drop line, and where the hooks may be attached. In addition, the Council requested that each buoy must display the official number of the vessel (United States Coast Guard documentation number or state registration number) to assist law enforcement in monitoring the use of the gear, which requires rulemaking.

June 2013: Modifies the frequency of headboat reporting to be on a weekly basis (or intervals shorter than a week if notified by the Science and Research Director via electronic reporting), and will be due by 11:59 p.m., local time, the Sunday following a reporting week. If no fishing activity occurs during a reporting week, an electronic report stating so must be submitted for that week.

September 2013: Establishes a 10-vermilion snapper recreational bag limit within the 20-reef fish aggregate, and removes the requirement to have onboard and use venting tools when releasing reef fish.

Emergency Actions

Emergency Rule - Implemented May 18, 2009 through October 28, 2009: Prohibited the use of bottom longline gear to harvest reef fish east of 85°30′ W longitude in the portion of the Gulf EEZ shoreward of the coordinates established to approximate a line following the 50–fathom (91.4–m) contour as long as the 2009 deepwater grouper and tilefish quotas are unfilled. After the quotas have been filled, the use of bottom longline gear to harvest reef fish in water of all depths east of 85°30′ W longitude is prohibited [74 FR 20229].

Emergency Rule - Implemented May 3, 2010 through November 15, 2010: NMFS issued an emergency rule to temporarily close a portion of the Gulf EEZ to all fishing [75 FR 24822] in response to an uncontrolled oil spill resulting from the explosion on April 20, 2010 and subsequent sinking of the Deepwater Horizon oil rig approximately 36 nautical miles (41 statute miles) off the Louisiana coast. The initial closed area extended from approximately the mouth of the Mississippi River to south of Pensacola, Florida and covered an area of 6,817 square statute miles. The coordinates of the closed area were subsequently modified periodically in response to changes in the size and location of the area affected by the spill. At its largest size on June 1, 2010, the closed area covered 88,522 square statute miles, or approximately 37% of the Gulf EEZ.

1.3.2 Status Determination Criteria History of Management

Management measures from **Amendment 1** (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% SSBR, relative to the SSBR that would occur with no fishing.

Amendment 3 (EA/RIR/RFA), implemented in July 1991, provided additional flexibility in the annual framework procedure for specifying TAC by allowing the target date for rebuilding an overfished stock to be changed. It also revised the FMP's primary objective from a 20% SSBR target to a 20% SPR.

The **Generic Sustainable Fisheries Act Amendment** (GMFMC 1999; EA/RIR/RFA), was partially approved and implemented in November 1999. It set the MFMT for most reef fish stocks including hogfish at $F_{30\% \ SPR}$. Estimates of MSY, MSST, and OY were disapproved because they were based on spawning potential ratio proxies rather than biomass-based estimates.

Amendment 23 (SEIS/RIR/RFA), implemented July 8, 2005, established MSY for vermilion snapper is the yield associated with F_{MSY} when the stock is at equilibrium. It also established MFMT = F_{MSY}, and MSST = (1-M)*B_{MSY} or B_{MSY} proxy.

1.3.3 Annual Catch Limits (ACL) and Annual Catch Targets (ACT) History of Management

The **Generic ACL/Accountability Measures (AMs) Amendment** (GMFMC 2011a), implemented in January 2012, established a vermilion snapper OFL, ACL, and ACT. Vermilion snapper were classified as a Tier 3a species in the Council's ABC control rule. This tier is applied to stocks where no assessment is available, but landings data do exist, and recent landings do appear sustainable. As a Tier 3a species, the OFL was set equal to the mean of 1999-2008 landings plus two standard deviations and equaled 4.08 mp ww. To account for scientific uncertainty, the Council's SSC applied the default buffer from the OFL using the formula ABC = mean of the landings plus 1.0 * standard deviation. This resulted in an ACL of 3.42 mp ww. This amendment also established an ACT for vermilion snapper using the ACL/ACT control rule. The control rule indicated a 14% buffer should be applied to the ACL resulting in an ACT of 2.94 mp ww. However, the ACT is not currently used for management purposes.

CHAPTER 2. MANAGEMENT ALTERNATIVES

2.1 Action 1 – Maximum Sustainable Yield (MSY) Proxy

Alternative 1: No Action. Do not use a proxy. Use the vermilion snapper MSY estimated by the assessment model.

Alternative 2: The proxy for vermilion snapper MSY is the yield when fishing at $F_{30\%\ SPR}$.

Discussion:

MSY Proxies other than 30% spawning potential ratio (SPR)

Alternative MSY proxies can include proxies based on maximum yield-per-recruit (yield at F_{MAX}) or on SPR-based proxies other than 30% SPR. Previous assessments have used 20% SPR (Schirripa 1996a,b; Schirripa 1998), the actual MSY estimate from the assessment model (Porch and Cass-Calay 2001), the yield at $F_{30\%\ SPR}$ (Schirripa and Legault 2000; SEDAR 9 2006), SEDAR 9 Update 2011), and the yield at F_{MAX} (Schirripa 1992; SEDAR 9 Update 2012).

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

In addition to SPR based MSY proxies, the Southeast Data, Assessment, and Review (SEDAR) 45 standard assessment for Gulf of Mexico (Gulf) vermilion snapper investigated two maximum yield-per-recruit based proxies for MSY. Initially, F_{MAX}, which is sometimes referred to as the global maximum yield per recruit, was calculated. 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, many developed fisheries consist 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, 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 2.1.1). Given the nearly identical yields 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 and is unrealistic, the Southeast Fisheries Science Center (SEFSC) recommended that these values should not be put forward as plausible alternatives for management[2].

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

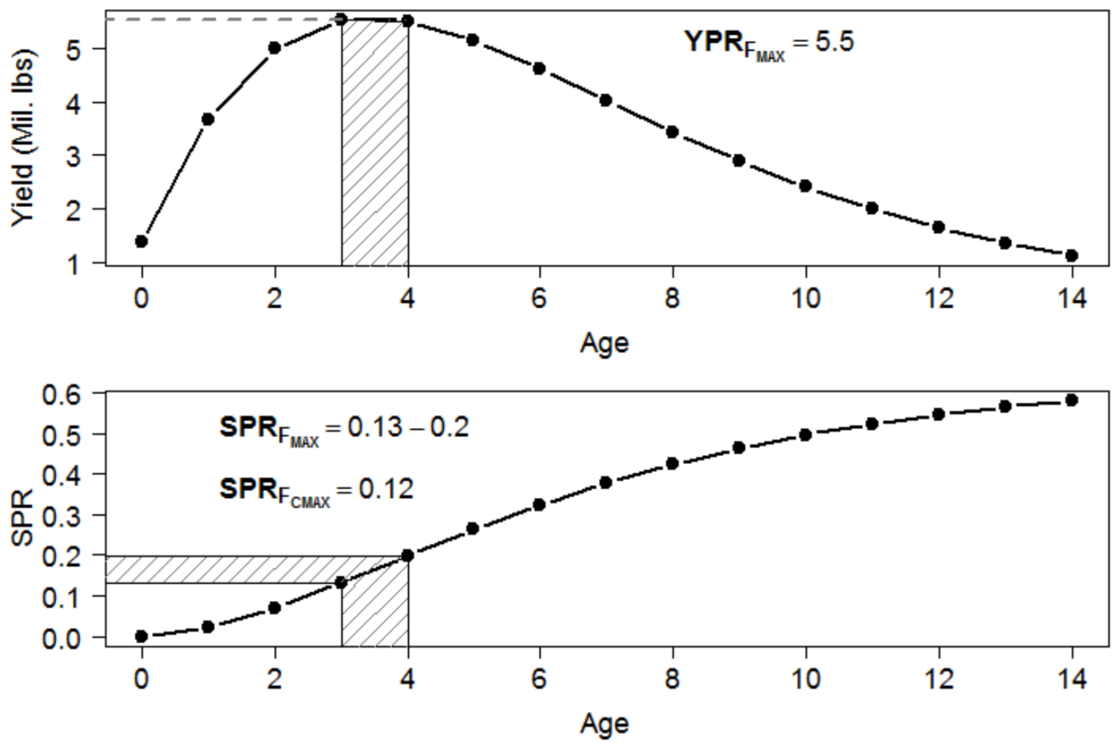

Figure 2.1.1. Results of the global yield per recruit projections assuming a single fleet with optimal knife-edge selectivity at a given age, no bycatch or discards, and near infinite fishing mortality. The maximum yield occurs with recruitment to the fishery between ages 3 and 4 and results in a SPR 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 extent selectivity, bycatch, and discard patterns (F_{CMAX}) was calculated. For SEDAR 45, F_{CMAX} was computed assuming that the relative fishing mortality rates exerted by each directed fleet would be the same as in the recent past and that the absolute fishing mortality rate could be scaled up or down for each fleet in exactly the same proportion. Discards of the directed fleets were minimal and not incorporated into the model for SEDAR 45; however, bycatch from the shrimp fishery was 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.

Yield at $F_{20\%\ SPR}$ and other SPR based proxies

Other possibilities for MSY proxies include SPR based proxies at other than 30%. A proxy of 20% SPR was used in some of the early vermilion snapper stock assessments (Schirripa 1996a,b; Schirripa 1998). In 1998 the Gulf of Mexico Fishery Management Council (Council) convened two Ad Hoc Finfish Stock Assessment Panels to review MSY proxies (FSAP 1998a,b). Based on the recommendations of those groups, the Council in 1999 proposed proxies of 30% SPR for most reef fish species (GMFMC 1999). Biomass proxies based purely in terms of static SPR were rejected by the National Marine Fisheries Service (NMFS) because SPR itself was not considered a biomass-based proxy. However, the yield when fishing at $F_{x\%\ SPR}$ was considered an acceptable proxy, and has been used in subsequent amendments when defining MSY proxies for specific species. The SEFSC recommended that any F_{MSY} proxy used to manage Gulf vermilion snapper result in a SPR value greater than or equal to 20%. The SSC is currently reviewing MSY proxies in light of recent studies. As of the writing of this amendment, the yield at $F_{30\%\ SPR}$ remains their recommended proxy for most species,

For the above reasons, MSY proxies other than the one provided of $F_{30\%\ SPR}$ (**Alternative 2**) are not considered to be plausible proxies, and are not included in the scope of reasonable alternatives.

Discussion of Alternatives

The SSC in its review of the SEDAR 45 vermilion snapper standard assessment (SEDAR 45 2016) recommended that the yield when fishing at $F_{30\%\ SPR}$ be used as a proxy for MSY and based its advice for catch levels on that proxy (GMFMC 2016a). Although there are other potential proxies for MSY, as discussed above, these alternative proxies are not considered plausible for management and are inconsistent with the best scientific information available.

Therefore, only two alternatives are presented for consideration; no action (**Alternative 1**), or the 30% SPR proxy recommended by the SSC (**Alternative 2**).

The status determination criteria (SDC) of maximum fishing mortality threshold (MFMT) and minimum stock size threshold (MSST) are functions of MSY or its proxy. The values for MFMT and MSST are determined by the proxy. Amendment 23 also established optimum yield (OY) for vermilion snapper as the yield when fishing at 75% of F_{MSY} (or proxy). The MFMT and MSST values under each of the alternatives are shown in Table 2.1.1. Note that for MSST, annual stock egg production is used to represent spawning stock biomass (SSB).

Table 2.1.1. MFMT and MSST under each MSY proxy alternative.

	Alt. 1	Alt. 2
MSY proxy	none	Yield at 30% SPR
MFMT	F_{MSY} = 0.76 (SEDAR 9)	$F_{30\%\ SPR}$ = 0.106 (SEDAR 45)
MSST (1-M)*SSB_{Proxy}	SSB_{MSY} = 52.7 trillion eggs (SEDAR Update 2011)	$SSB_{30\%\ SPR}$ = 197 trillion eggs (SEDAR 45)

Alternative 1 is the existing definition of MSY for vermilion snapper, which was adopted in Amendment 23 (GMFMC 2004a). There is no proxy used for MSY. Instead, the assessment model generated estimate of MSY is used. In 2001, a vermilion snapper stock assessment (Porch and Cass-Calay, 2001) evaluated the stock status using two alternative methods. Based on a Pella-Tomlinson surplus production model, the 2001 assessment estimated the value of MSY to be 3.37 million pounds whole weight (mp ww), with a range of 3.18 – 4.03 mp ww. An alternative would have defined MSY for vermilion snapper as the yield associated with $F_{30\%\ SPR}$ when the stock is at equilibrium. Using a virtual population analysis (VPA) model, the 2001 assessment estimated the MSY proxy value to be between 2.58 and 3.24 mp ww. The 2001 assessment pre-dated the SEDAR process, and the assessment was reviewed by a Reef Fish Stock Assessment Panel (RFSAP) rather than a SEDAR review panel. The RFSAP felt that the results of the VPA-based assessment were highly uncertain due to an enormous variance in size-at-age. The RFSAP endorsed the (non-proxy) MSY results based on the Pella-Tomlinson surplus production model as the most reliable. Amendment 23 (GMFMC 2004a) included alternatives to define MSY based on either the actual model MSY estimate or the 30% SPR proxy. Based on the recommendation of the RFSAP, the Council selected MSY for vermilion snapper as the yield associated with F_{MSY} when the stock is at equilibrium.

Alternative 2 is the MSY proxy recommended by the SSC and used to make projections for the overfishing limit (OFL) and acceptable biological catch (ABC). In more recent vermilion snapper assessments, more reliable age and growth data has become available, and the assessment model has been replaced by a more flexible Stock Assessment 3 model. However, estimates of MSY from the assessment model are dependent on having a robust stock-recruit function. Although the SEDAR 45 assessment was able to derive a Beverton-Holt stock-recruit function using data from the years 1994-2012, the SSC had low confidence in the curve because most of the data points were concentrated in a narrow range of SSB (Figure 2.1.2) (GMFMC 2016a). Therefore, the SSC determined that a proxy for MSY should be used to determine stock status. After reviewing alternative proxies, including the yield that produces maximum yield-per-recruit under existing gear selectivities (yield at F_{CMAX}), the SSC concluded that the best proxy to use with vermilion snapper was the yield at $F_{30\%\ SPR}$ (GMFMC 2016a). As shown in Table 2.1.1, this resulted in achieving MSY at a much lower fishing mortality rate than the model estimate, and also resulted in MSST spawning stock biomass that produces nearly 4 times as many eggs.

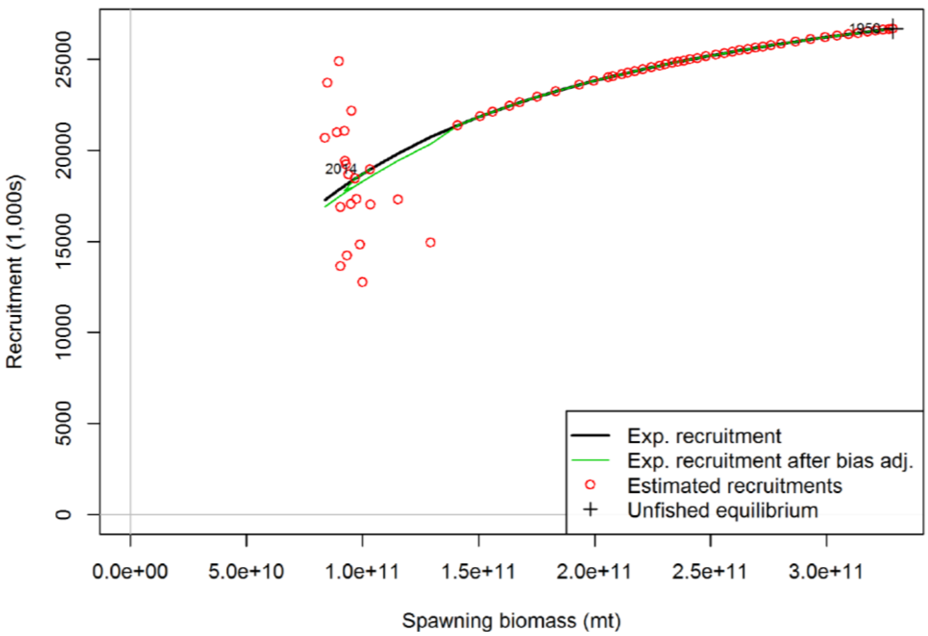

Figure 2.1.2. Beverton-Holt stock-recruit curve for vermilion snapper from SEDAR 45.

2.2 Action 2 –Annual Catch Limit (ACL)

Alternative 1: No Action. The ACL for vermilion snapper will remain at 3.42 mp ww.

Alternative 2: The ACL for vermilion snapper for the years 2017 through 2021 will be based on the annual ABC derived from fishing at 75% of $F_{30\%\ SPR}$. (see table below)

Option a. After 2021, the ACL will be remain at 3.03 mp ww.

Option b. After 2021, the ACL will be set at 2.98 mp ww (equilibrium ABC).

Alternative 3: The ACL for vermilion snapper for the years 2017 through 2021 will be 3.11 mp ww (constant catch average of the 5-year annual ACLs).

Option a. After 2021, the ACL will be remain at 3.11 mp ww.

Option b. After 2021, the ACL will be set at the equilibrium ABC level of 2.98 mp ww.

Alternative 4: The ACL for vermilion snapper for the years 2017 through 2021 will be a constant catch at the equilibrium ABC of 2.98 mp ww.

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

Table 2.2.1 shows the annual ACLs under each of the alternatives and options.

Table 2.2.1. Vermilion snapper ACL for 2017-2021 plus 2022 and beyond under each alternative.

Year	Alt 1 No action	Alt 2 Constant F	Alt 3 Constant catch at avg. of 2017-2021	Alt 4 Constant catch at equilibrium ABC
2017	3.42 mp	3.21 mp	3.11 mp	2.98 mp
2018		3.15 mp		
2019		3.10 mp		
2020		3.05 mp		
2021		3.03 mp		
2022+		3.03 mp (opt. a) 2.98 mp (opt. b)	3.11 mp (opt. a) 2.98 mp (opt. b)	

Table 2.2.2 shows the annual landings of vermilion snapper from 1966 through 2015. There is no recreational:commercial sector allocation. Over the entire time period, landings by sector have averaged 74% commercial, 26% recreational. However, during the most recent 5 years

(2011-2015), landings by sector have averaged 65% commercial, 35% recreational. Total landings have ranged from a low of 1.77 mp in 2000 to a high of 4.49 mp in 2009. Since 2011, landings have shown a declining trend, from 4.27 mp in 2011 to 2.34 mp in 2015.

Table 2.2.2. Vermilion snapper commercial and recreational landing in pounds whole weight, 1986-2015.

Year	Commercial	Recreational	Total
1986	1,748,509	859,422	2,607,931
1987	1,605,405	703,202	2,308,607
1988	1,553,896	832,979	2,386,875
1989	1,657,410	598,818	2,256,228
1990	2,166,555	930,881	3,097,436
1991	1,793,380	970,547	2,763,927
1992	2,374,469	1,021,446	3,395,915
1993	2,722,983	958,393	3,681,376
1994	2,643,045	739,777	3,382,822
1995	2,183,844	886,552	3,070,396
1996	1,852,352	470,502	2,322,854
1997	2,132,004	590,121	2,722,125
1998	1,741,620	326,802	2,068,422
1999	2,043,474	406,677	2,450,151
2000	1,462,946	308,725	1,771,671
2001	1,723,017	555,252	2,278,269
2002	2,010,190	525,223	2,535,413
2003	2,422,367	566,999	2,989,366
2004	2,175,136	795,328	2,970,464
2005	1,870,155	521,974	2,392,129
2006	1,765,292	567,835	2,333,127
2007	2,383,953	612,758	2,996,711
2008	2,826,905	546,987	3,373,892
2009	3,796,100	691,317	4,487,417
2010	2,108,306	468,242	2,576,548
2011	3,146,168	1,126,853	4,273,021
2012	2,441,360	708,002	3,149,362
2013	1,418,401	1,165,104	2,583,505
2014	1,762,284	1,166,245	2,928,529
2015	1,365,056	972,510	2,337,566

Source: SEFSC Commercial and recreational ACL Database (Sept 2016)

There is no annual catch target (ACT) proposed for any of the alternatives because the ACT serves no function for vermilion snapper. Accountability measures (AMs) are based on total landings and apply to both sectors. The AM for vermilion snapper that was adopted in the Generic ACL/AM Amendment (GMFMC 2011a) states that if the ACL is reached or projected to be reached within a fishing year, the Assistant Administrator for Fisheries shall file a notification with the Office of the Federal Register to close fishing for the remainder of the fishing year. There is no overage adjustment (post-season AM) for exceeding the ACL.

Alternative 1 retains the existing ACL of 3.42 mp ww. This ACL is equal to the ABC adopted in 2012 under the Generic ACL/AM Amendment (GMFMC 2011a) using Tier 3a of the ABC control rule. This is a data poor method based on the average landings for 1999-2008 plus one standard deviation. Prior to 2012, there were no catch limits for vermilion snapper. Landings exceeded 3.42 mp ww three times (1993, 2009, and 2011). This ACL has not been exceeded since it was adopted in 2012. However, this ACL exceeds the ABC recommended by the SSC in 2015 for 2017-2021 for all years. It does not exceed the OFL (the yield when fishing at $F_{30\%\ SPR}$) for any of the years (Table 2.2.3), but because it exceeds the ABC, **Alternative 1** is not a viable alternative because the Council cannot set the stock ACL at a level higher than the SSC's recommended ABC.

Table 2.2.3. Vermilion snapper OFL and ABC projections under constant F and constant catch scenarios. Units are millions of pounds whole weight.

	Constant F		Constant Catch
Year	**OFL (yield at $F_{30\%\ SPR}$)**	**ABC (yield at 75% of $F_{30\%\ SPR}$)**	**ABC (avg. of 2017-2021 ABCs)**
2017	4.17 mp	3.21 mp	3.11 mp
2018	3.91 mp	3.15 mp	3.11 mp
2019	3.71 mp	3.10 mp	3.11 mp
2020	3.58 mp	3.05 mp	3.11 mp
2021	3.49 mp	3.03 mp	3.11 mp

Source: June 2015 SSC meeting summary

Alternative 2 sets the ACL equal to the annual ABC for each year during 2017-2021. In its determination of where to set ABC, the SSC felt that the probability of overfishing (P*) method used in Tier 1 of the ABC control rule produced unexpectedly small uncertainty estimates in the OFL, resulting in ABC values extremely close to OFL. The SSC felt that a more conservative ABC should be used, and after discussion, agreed to use the yield when fishing at 75% of $F_{30\%\ SPR}$ as the ABC yield (GMFMC 2016a). This is also the definition of OY established in Amendment 23 (GMFMC 2004a). The current biomass level is estimated to be 35% SPR which is above the equilibrium level, so this alternative results in a declining yield stream from 3.21 mp in 2017 to 3.03 mp in 2021. For the years 2022 and beyond, if **Alternative 2, Option a,** is selected, the ACL will remain at the 2021 level of 3.03 mp until modified by future rulemaking. If **Alternative 2, Option b,** is selected, the ACL will decrease to the equilibrium yield of 2.98 mp until modified by future rulemaking. During the 30-year period 1986-1990, vermilion snapper landings have exceeded 3.03 mp nine times, but only once (in 2012) since ACLs were implemented in 2012. Landings have exceeded 2.98 mp 11 times since 1986, but only once (2012) since ACLs were implemented in 2012 (Table 2.2.2).

Alternative 3 sets the ACL equal to a constant catch of 3.11 mp during the years 2017-2021. This is the average of the annual ACLs under **Alternative 2**, and over the five-year period is expected to have approximately the same effect on the stock biomass as **Alternative 2**. For the years 2022 and beyond, if **Alternative 3, Option a,** is selected, the ACL will remain at 3.11 mp until modified by future rulemaking. If **Alternative 3, Option b,** is selected, the ACL will drop to the equilibrium yield of 2.98 mp until modified by future rulemaking. Landings have exceeded 3.11 mp seven times since 1986, but only once (2012) since ACLs were implemented in 2012 (Table 2.2.2).

Alternative 4 sets the ACL at a constant catch of 2.98 mp, which is the projected equilibrium catch if fished at 75% of $F_{30\%\ SPR}$. This is the most conservative alternative, but the difference between **Alternative 3** and **Alternative 4** is only 130,000 lbs. Landings have exceeded 2.98 mp 11 times since 1986, but only once (2012) since ACLs were implemented in 2012 (Table 2.2.2).

The vermilion snapper stock biomass is currently estimated to be at 35% SPR which is above both MSST and the biomass at $F_{30\%\ SPR}$. Analysis for SEDAR 45 indicates that fishing at the OFL level of $F_{30\%\ SPR}$ will eventually produce a catch level of 3.37 mp. Under **Alternative 1**, the fixed catch level of 3.42 mp is slightly higher than the catch at $F_{30\%\ SPR}$ and will therefore result in an SPR slightly below 30%. When fished at 75% of $F_{30\%\ SPR}$, under either a constant F (**Alternative 1**) or a constant catch (**Alternative 2**), the SPR is projected to drop from 35% to about 34% during the 2017-2021 period. If catches in subsequent years are maintained at the respective 2021 ACL (**Option a**), then SPR is projected to decrease slightly more to just under 34% by 2026 under both **Alternative 2, Option a** and **Alternative 3, Option a**. If catches in subsequent years are fixed at the long-term equilibrium rate of 2.98 mp (**Option b** in both **Alternative 2** and **Alternative 3**), or are set at 2.98 mp from the beginning (**Alternative 4**), then SPR is projected to remain at 34%. In summary, under **Alternative 1**, the SPR for vermilion snapper is projected to drop to slightly under 30%, but under all scenarios for **Alternatives 2**, **3**, and **4**, the equilibrium SPR is projected to remain above 33%. It should be noted that the SSC considers these long-range projections to have a high level of uncertainty.

CHAPTER 3. AFFECTED ENVIRONMENT

3.1 Description of the Physical Environment

The Gulf of Mexico (Gulf) has a total area of approximately 600,000 square miles (1.5 million km2), 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. Oceanic conditions are primarily affected by the Loop Current, the discharge of freshwater into the northern Gulf (e.g., Mississippi River), and a semi-permanent, anti-cyclonic gyre in the western Gulf (Figure 3.1.1).

The Gulf is both a warm temperate and a tropical body of water (McEachran and Fechhelm 2005). Based on satellite derived measurements from 1982 through 2009, mean annual sea surface temperature ranged from 73 to 83º F (23 to 28º C) including bays and bayous (Figure 3.1.1). In general, mean sea surface temperature increases from north to south depending on time of year with large seasonal variations in shallow waters (NODC 2011: http://accession.nodc.noaa.gov/0072888).

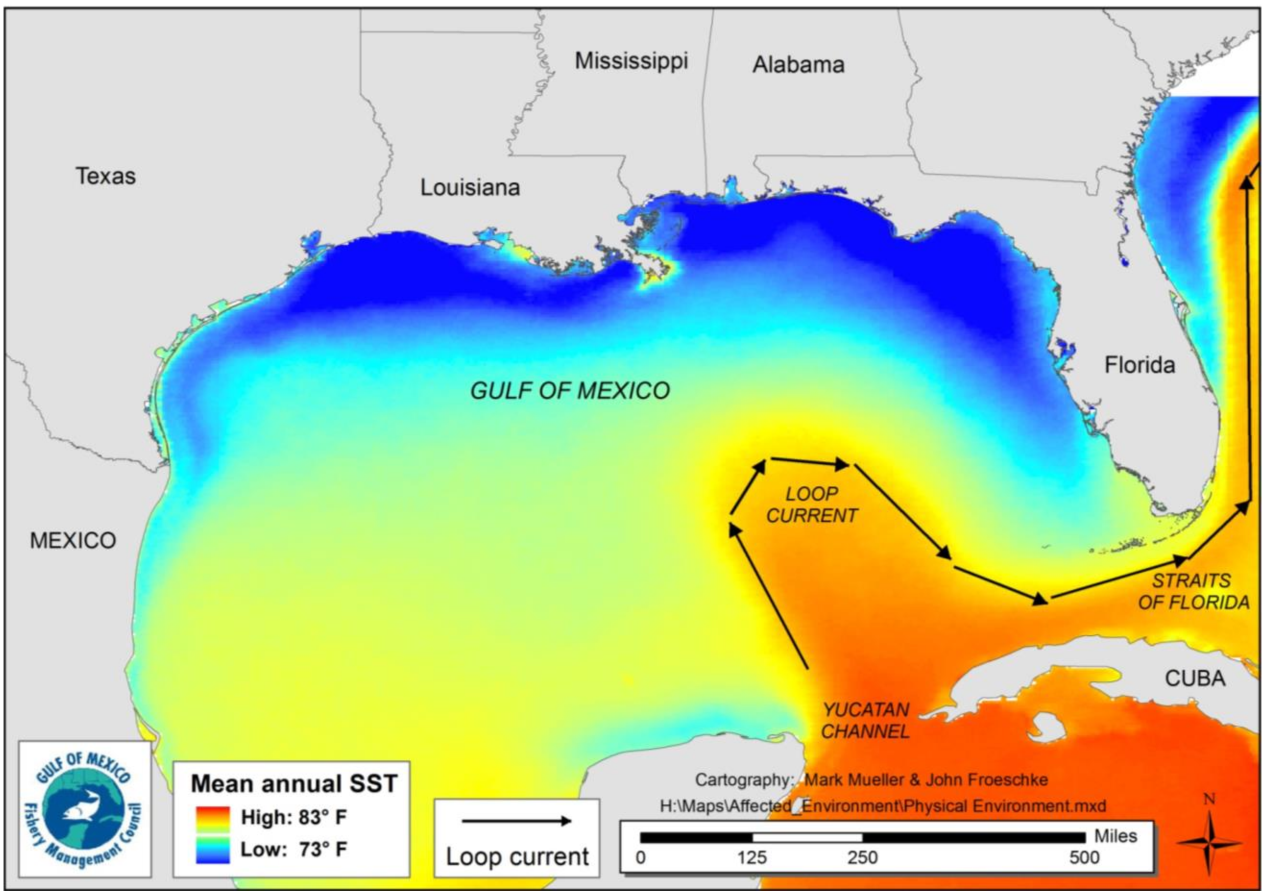

Figure 3.1.1. Physical environment of the Gulf, including major feature names and mean annual sea surface temperature as derived from the Advanced Very High Resolution Radiometer Pathfinder Version 5 sea surface temperature data set (http://accession.nodc.noaa.gov/0072888).

For a more detailed description of the physical environment of the vermilion snapper, see the final environmental impact statements (EIS) for the Generic Essential Fish Habitat (EFH) Amendment, the Generic Annual Catch Limits/Accountability Measures (ACL/AM) Amendment (GMFMC 2004b; GMFMC 2011a),which are incorporated by reference.

In general, vermilion snapper are widely distributed throughout the Gulf, occupying both pelagic and benthic habitats during their life cycle. Larvae hatch from planktonic eggs and settle onto hard bottoms and reefs as early juveniles. They continue to use and be associated with those habitats as adults (GMGMC 2004b). Vermilion snapper were observed throughout the eastern and western Gulf as described in the SEDAR 45 assessment. In general vermillion snapper are found on deeper reef. The Dry Tortugas are the shallowest reefs available for sampling and in that region vermilion snapper were never observed. Sites shallower than 20m in the Panama City video index also did not observe vermilion snapper. (SEDAR 45 2016).

Environmental Sites of Special Interest Relevant to Vermilion Snapper

There are several managed areas and environmental sites of special interest throughout the Gulf relevant to vermilion snapper (Table 3.1.1). More detailed information about each of the areas, including management measures, can be found in the regulations at 50 CFR 622 or by visiting http://sero.nmfs.noaa.gov/maps_gis_data/fisheries/gom/GOM_index.html, and are incorporated by reference.

Table 3.1.1. List of individual reef areas, bank Habitat Areas of Particular Concern, and other managed areas within the Gulf that have management measures regarding fishing gear, anchoring, or general fishing activity.

Area Name
Longline/Buoy Gear Area Closure
Madison-Swanson and Steamboat Lumps Marine Reserve
The Edges Marine Reserve
Tortuga North and South Marine Reserve
Florida Middle Grounds HAPC
Pulley Ridge HAPC
Alabama Special Management Zone
East and West Flower Garden Banks and Stetson Bank National Marine Sanctuary
Sonnier Bank
MacNeil Bank
29 Fathom
Rankin Bright Bank
Geyer Bank
McGrail Bank
Bouma Bank
Rezak Bank
Alderice Bank
Jakkula Bank

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.

Additionally, Generic Amendment 3 for addressing EFH requirements (GMFMC 2005) establishes an education program on the protection of coral reefs when using various fishing gears in coral reef areas for recreational and commercial fishermen.

3.2 Description of the Biological Environment

The biological environment of the Gulf, including the reef fish species addressed in the fishery management plan, is described in detail in the Final EIS for the Generic EFH amendment and is incorporated here by reference (GMFMC 2004b). This includes summaries of reef fish life histories.

Vermilion Snapper Stock Status

Vermilion Snapper Life History

A description of vermilion snapper life history, biology, and stock status is summarized and incorporated here by reference from Amendment 23 and from the Generic ACL/AM Amendment (GMFMC 2004a, GMFMC 2011a). Vermilion snapper has a typical reef fish life history where eggs and larvae are pelagic, and then juveniles settle to the bottom associating with hard bottom habitats. They are a tropical reef fish that are most abundant in the Bahamas, south Florida, and the Caribbean. Vermilion snapper are gonochoristic (do not change sex) unlike many grouper and porgy species, and spawning extends over most of the spring and summer, peaking during May to July.

Vermilion snapper are relatively fast growing fish with a moderate level of natural mortality that allows them to reach a large fraction of their potential size and fecundity at very young ages. Their generation time is estimated to be 7.22 years. The average age of the stock in virgin conditions was estimated between 3 and 4 years of age; and is currently estimated to be age 2 years. Additionally, length at 50% maturity is estimated at 13.8 cm (SEDAR 45-WP-2). All males and nearly half of the females in the samples collected by Zhao and McGovern (1997) were mature at age 1.

Vermilion Snapper Stock Status

The Gulf vermilion snapper stock has been assessed since 1991 (Goodyear and Schirripa 1991; RFSAP 1991).

Spawning stock biomass (SSB) (number of eggs) and total biomass (metric tons) have followed similar trends over the entire time-series. Steady declines occurred as the stock moved away from virgin conditions and was lightly exploited by the commercial fisheries up until the early 1980s, but simultaneously experienced a comparatively high shrimp bycatch mortality. In the early 1980s the recreational fleet began to exploit the resource and commercial mortality concomitantly increased causing a rapid decline in biomass until the late 1990s. Time-series lows were reached in the late 1990s corresponding to the maximum bycatch mortality rates. With the reduction in shrimp effort and bycatch mortality in the late 1990s and early 2000s, the stock rebounded slightly and has seen a gradually increasing trend over the last two decades. Despite the decline in shrimp mortality being partially replaced by higher directed fishing mortality (compared to levels seen in the 1980s), the terminal biomass (10,952 mt) is estimated to be at its highest point since 1995 and the same is true for terminal SSB (2.06E+14 eggs) (SEDAR 45 2016).

An assessment history and chronological list of stock assessment reports for vermilion snapper is provided in the most recent SEDAR 45 stock assessment report (SEDAR 45 2016) and is incorporated here by reference.

Data and Stock Assessment Model

A variety of data sources were used in the SEDAR 45 assessment (e.g., fisheries dependent and independent, and recreational and commercial landings). For the most part, the SEDAR 45 model used the same data sets as the SEDAR 9 base model and the 2011 SEDAR 9 Update assessment with updated time-series through 2014. However, a handful of new data sets were provided for the SEDAR 45 analysis some of which were included in the final SEDAR 45 model. A list of the available data sources is available in SEDAR 45 (2016).

The SEDAR 45 standard assessment assumes that Gulf vermilion snapper comprise a single unit stock, which agrees with current management boundary delineations used by the Gulf of Mexico Fishery Management Council (Council) (SEDAR 45 2016).

For the purposes of the SEDAR 45 vermilion snapper assessment the Stock Synthesis 3 (SS3) software package was used (v3.24Y; Methot and Wetzel, 2013). Stock Synthesis is an integrated statistical catch-at-age (SCAA) model, which projects forward from initial conditions using age-structured population dynamics equations. SCAA models are comprised of three modeling modules: the population dynamics module, an observation module, and a likelihood function. Each of the modules is closely linked. SS3 uses input biological parameters (e.g., growth, fecundity, and natural mortality) to propagate abundance and biomass forward from initial conditions (population dynamics model) and develops predicted data sets based on estimates of fishing mortality, selectivity, and catchability (the observation model). Finally, the observed and predicted data are compared (the likelihood module) to determine best fit parameter estimates using a statistical maximum likelihood framework (SEDAR 45 2016).

Projections

The model estimated that biomass was decreasing until the mid-1990s, but, largely due to a large decline in shrimp bycatch mortality from the late 1990s to the late 2000s, biomass has stabilized and has demonstrated a slight upwards trend over the last few years. Terminal harvest rate is at the lowest level seen since the early 1980s when the directed fisheries were just beginning to develop. Recent recruitment has been above average and periodic strong year-classes over the last decade have helped to recover the age structure of the stock. Overall, the stock is estimated to be in good condition and has maintained a stable depletion level of around 30% (i.e., $SSB/SSB_0 = 0.30$) for over a decade.

It is not possible to calculate maximum sustainable yield (MSY) and its associated reference points (F_{MSY} and B_{MSY}) when the spawner-recruit relationship is unknown or considered unreliable; therefore, a proxy for F_{MSY} is required. In past vermilion snapper assessments, the fishing mortality rates that achieve a given spawning potential ratio (F_{SPR}) or maximize the yield-per-recruit (F_{MAX}) have been used as F proxies. Spawning potential ratios (SPR) values of 30%-40% are commonly used in the assessment of moderately fecund and fast growing species, such as most reef fish. An SPR of 30% has typically been used as an SPR proxy in previous assessments of Gulf vermilion snapper. Another yield per recruit metric that has been used is the fishing mortality rate that maximizes yield-per-recruit conditional on a prescribed selection pattern, hereafter referred to as F_{CMAX}. Overfishing limits (OFLs; retained yield streams that achieve the biomass proxy or maximized yield in equilibrium) were calculated for each of the potential MSY proxies (i.e., $F=F_{SPR30\%}$, $F=F_{MAX}$, and $F=F_{CMAX}$) along with three additional requested projections: F_{OY} (F = 75% of directed fishing mortality at $F_{MSYProxy}$), future landings equal to 2014 annual catch targets (ACTs), and constant catch (yield equivalent to 2017-2021 average OY assuming FSPR 30% as the MSY proxy). Given the caveats and limitations, SPR 30% was chosen by the Scientific and Statistical Committee (SSC) as the appropriate proxy for the standing stock biomass ($SSB_{MSY)}$ and was used for the basis of stock status determinations and overfishing limit (OFL) calculations.

Status

Using SPR 30% as the basis for defining minimum stock size threshold (MSST) and (maximum fishing mortality threshold (MFMT), the stock status appears to be healthy and the stock is considered not overfished or undergoing overfishing. The current SPR, (SPR 32%), is slightly above the target value of 30% and the SSB has been above the MSST for its entire history. The fishing mortality rate has been below the MFMT since 2012. Forecasts suggest that near-term yield could be moderately increased to fish the stock down towards SPR 30%, but current yields are on par with projected acceptable biological catch (ABC); based on the yield when fishing at 75% of $F_{30\%\ SPR}$) given the level of uncertainty in stock-recruit parameters.

Discards

Discard data from both the commercial and recreational hook-and-line sectors were reviewed in SEDAR 45, but were ultimately not included in the final assessment models. The overall magnitude of the commercial discards relative to the landings was small, and SEDAR 45 (2016) indicated the discard mortality rate ranges from 5%-15%. The assessment concluded dead discards represented an insignificant source of mortality. This, as well as the short time-series and relatively low sample sizes available for commercial discards, and high uncertainty associated with the recreational discard estimates, were factors in the decision to not pursue inclusion of discards in the final assessment model.

General Information on Reef Fish Species

In general, reef fish are widely distributed in the Gulf, occupying both pelagic and benthic habitats during their life cycle. Habitat types and life history stages are summarized in Appendix C and can be found in more detail in GMFMC (2004b). In general, both eggs and larval stages are planktonic. Larvae feed on zooplankton and phytoplankton. Exceptions to these generalizations include the gray triggerfish that lay their eggs in depressions in the sandy bottom, 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 Fishery Management Plan (FMP) for Corals and Coral Reefs (GMFMC and SAFMC 1982).

Many of these species co-occur with vermilion snapper and can be incidentally caught during vermilion snapper fishing. In some cases, these fish may be discarded for regulatory reasons and thus are considered bycatch.

Status of Reef Fish Stocks

The Reef Fish FMP currently encompasses 31 species (Table 3.2.1). Eleven other species were removed from the FMP in 2012 through the Generic ACL/AM Amendment (GMFMC 2011a). Stock assessments and stock assessment reviews have been conducted for 13 species, are listed in Table 3.3.1, and can be found on the Council (www.gulfcouncil.org) and SEDAR (http://sedarweb.org) websites.

Table 3.2.1 Species of the Reef Fish FMP grouped by family, their stock status, and most recent stock assessment

Common Name	Scientific Name	Stock Status	Most Recent Stock Assessment+
Family Balistidae – Triggerfishes			
Gray Triggerfish	*Balistes capriscus*	Overfished, no overfishing	SEDAR 43 2015
Family Carangidae – Jacks			
Greater Amberjack	*Seriola dumerili*	Overfished, no overfishing	SEDAR 33 2014a
Lesser Amberjack	*Seriola fasciata*	Unknown	
Almaco Jack	*Seriola rivoliana*	Unknown	
Banded Rudderfish	*Seriola zonata*	Unknown	
Family Labridae - Wrasses			
*Hogfish	*Lachnolaimus maximus*	Not overfished, no overfishing	SEDAR 37 2014
Family Malacanthidae - Tilefishes			
Tilefish (Golden)	*Lopholatilus chamaeleonticeps*	Not overfished, no overfishing	SEDAR 22 2011a
Blueline Tilefish	*Caulolatilus microps*	Unknown	
Goldface Tilefish	*Caulolatilus chrysops*	Unknown	
Family Serranidae - Groupers			
Gag	*Mycteroperca microlepis*	Not overfished, no overfishing	SEDAR 33 2014b
Red Grouper	*Epinephelus morio*	Not overfished, no overfishing	SEDAR 42 2015
Scamp	*Mycteroperca phenax*	Unknown	
Black Grouper	*Mycteroperca bonaci*	Not overfished, no overfishing	SEDAR 19 2010
Yellowedge Grouper	‡*Hyporthodus flavolimbatus*	Not overfished, no overfishing	SEDAR 22 2011b
Snowy Grouper	‡*Hyporthodus niveatus*	Unknown	
Speckled Hind	*Epinephelus drummondhayi*	Unknown	
Yellowmouth Grouper	*Mycteroperca interstitialis*	Unknown	
Yellowfin Grouper	*Mycteroperca venenosa*	Unknown	
Warsaw Grouper	‡*Hyporthodus nigritus*	Unknown	
†Atlantic Goliath Grouper	*Epinephelus itajara*	Unknown	SEDAR 23 2011
Family Lutjanidae - Snappers			
Queen Snapper	*Etelis oculatus*	Unknown	
Mutton Snapper	*Lutjanus analis*	Not overfished, no overfishing	SEDAR 15A Update 2015
Blackfin Snapper	*Lutjanus buccanella*	Unknown	
Red Snapper	*Lutjanus campechanus*	Overfished, no overfishing	SEDAR 31 Update 2015
Cubera Snapper	*Lutjanus cyanopterus*	Unknown, no overfishing	
Gray Snapper	*Lutjanus griseus*	Unknown, no overfishing	
Lane Snapper	*Lutjanus synagris*	Unknown, no overfishing	
Silk Snapper	*Lutjanus vivanus*	Unknown	
Yellowtail Snapper	*Ocyurus chrysurus*	Not overfished, no overfishing	SEDAR 3 2003; O'Hop et al. 2012
Vermilion Snapper	*Rhomboplites aurorubens*	Not overfished, no overfishing	SEDAR 45.2016
Wenchman	*Pristipomoides aquilonaris*	Unknown	

Notes: +Copies of the stock assessment final reports can be found at the SouthEast Data, Assessment, and Review (SEDAR) web site (http://sedarweb.org/).
* The East Florida/Florida Keys hogfish stock is considered overfished and undergoing overfishing.

‡ In 2013 the genus for yellowedge grouper, snowy grouper, and warsaw grouper was changed by the American Fisheries Society from *Epinephelus* to *Hyporthodus* (American Fisheries Society 2013).
† Atlantic goliath grouper is a protected grouper and benchmarks do not reflect appropriate stock dynamics. In 2013 the common name was changed from goliath grouper to Atlantic goliath grouper by the American Fisheries Society to differentiate from the Pacific goliath grouper, a newly named species (American Fisheries Society 2013).

Protected Species

The Marine Mammal Protection Act (MMPA) and Endangered Species Act (ESA) provide special protections to some species that occur in the Gulf, and more information is available on the Nation al Marine Fisheries Service (NMFS) Office of Protected Resources website (http://www.nmfs.noaa.gov/pr/laws/). All 22 marine mammals in the Gulf are protected under the MMPA (Waring et al. 2016). Two marine mammals (sperm whales and manatees) are also protected under the ESA. Other species protected under the ESA include five sea turtle species (Kemp's ridley, loggerhead, green, leatherback, and hawksbill), two fish species (Gulf sturgeon and smalltooth sawfish), and five coral species (elkhorn, lobed star, mountainous star, and boulder star). Critical habitat designated under the ESA for smalltooth sawfish, Gulf sturgeon, and the Northwest Atlantic Ocean distinct population segment of loggerhead sea turtles also occur in the Gulf, though only loggerhead critical habitat occurs in federal waters.

The following sections provide a brief overview of the marine mammals, sea turtles, and fish that may be present in or near areas where Gulf reef fish fishing occurs and their general life history characteristics. Because none of the listed corals or designated critical habitats in the Gulf are likely to be adversely affected by the Gulf reef fish fishery, they are not discussed further.

Marine Mammals

The 22 species of marine mammals in the Gulf include one sirenian species (a manatee), which is under U.S. Fish and Wildlife Service's (USFWS) jurisdiction, and 21 cetacean species (dolphins and whales), all under NMFS' jurisdiction. Manatees primarily inhabit rivers, bays, canals, estuaries, and coastal waters rich in seagrass and other vegetation off Florida, but can occasionally be found in seagrass habitats as far west as Texas. Although most of the cetacean species reside in the oceanic habitat (greater than or equal to 200 m), the Atlantic spotted dolphin is found in waters over the continental shelf (20-200 m), and the common bottlenose dolphin (hereafter referred to as bottlenose dolphins) is found throughout the Gulf, including within bays, sounds, and estuaries; coastal waters over the continental shelf; and in deeper oceanic waters.

Sperm whales are one of the cetacean species found in offshore waters of the Gulf (greater than 200m) and are listed endangered under the ESA. Sperm whales, are the largest toothed whales and are found year-round in the northern Gulf along the continental slope and in oceanic waters (Waring et al. 2016). There are several areas between Mississippi Canyon and De Soto Canyon where sperm whales congregate at high densities, likely because of localized, highly productive habitats (Biggs et al. 2005; Jochens et al. 2008).

Gulf of Mexico Bryde's whales are the only resident baleen whales in the Gulf and are currently being evaluated to determine if listing under the ESA is warranted. Sightings of Bryde's whales in the Gulf have been consistently located in the DeSoto Canyon area in all season, along the continental shelf break between 100 m and 300 m depth. Bryde's whales have been sighted with in the DeSoto Canyon area (Mullin and Hoggard 2000; Maze-Foley and Mullin 2006; Mullin 2007; DWH MMIQT 2015). Consequently, LaBrecque *et al.* (2015) designated this area, home to the small resident population of Bryde's whale in the northeastern Gulf, as a Biologically Important Area. On September 18, 2014, NMFS received a revised petition from the Natural

Resource Defense Council to list the Gulf Bryde's whale as an endangered Distinct Population Segment. On April 6, 2015, NMFS found the petitioned action may be warranted and convened a Status Review Team to prepare a status review report. On December 8, 2016, NMFS published a proposed rule to list the Gulf Bryde's whale as endangered (81 FR 88639).

Bottlenose dolphins in the Gulf are separated into and managed as demographically independent populations called stocks. Bottlenose dolphins are currently managed by NMFS as 36 distinct stocks within the Gulf. These include 31 bay, sound and estuary stocks; three coastal stocks; one continental shelf stock; and one oceanic stock (Waring et al. 2016). It is assumed that the dolphins occupying habitats with dissimilar climatic, coastal and oceanographic characteristics might be restricted in their movements, and thus constitute separate stocks (Waring et al. 2016). The Eastern Coastal Stock ranges from 84°W to Key West, FL, the Northern Coastal Stock ranges from 84°W to the Mississippi River Delta, and the Western Coastal stock ranges from the Mississippi River Delta to the Texas/Mexico border (Waring et al. 2016). The Continental Shelf stock inhabits waters from 20 to 200 m deep in the northern Gulf from the U.S.- Mexican border to the Florida Keys (Waring et al. 2016). Marine Mammal Stock Assessment Reports and additional information on these stocks in the Gulf are available on the NMFS Office of Protected Species website: http://www.nmfs.noaa.gov/pr/sars/species.htm

Bottlenose dolphin adults range from 6 to 9 feet (1.8 to 2.8 m) long and weigh typically between 300 to 600 lbs (136 to 272 kg). Females and males reach sexual maturity between ages 5 to 13 and 9 to 14, respectively. Once mature, females give birth once every 3 to 6 years. Maximum known lifespan is estimated to be 40-45 years for males and greater than 60 years for females.

The MMPA requires that each commercial fishery be classified into one of three categories based on the level of incidental mortality or serious injury of marine mammals. NMFS's List of Fisheries classifies U.S. commercial fisheries categories based on the rate, in numbers of animals per year, of incidental mortalities and serious injuries of marine mammals relative to a stock's Potential Biological Removal level (i.e., sustainable levels of human-caused mortality). More information about the List of Fisheries and the classification process can be found at: http://www.nmfs.noaa.gov/pr/interactions/fisheries/lof.html
NMFS classifies reef fish bottom longline/hook-and-line gear in the MMPA 2016 List of Fisheries as a Category III fishery (81 FR 20550). This classification indicates the fishery has a remote likelihood of or no known incidental mortality or serious injury of marine mammals. There have been three observed takes of bottlenose dolphins from this fishery, all belonging to the continental shelf stock.

Sea turtles

Green, hawksbill, Kemp's ridley, leatherback, and loggerhead sea turtles are all highly migratory and travel widely throughout the Gulf. Several volumes exist that cover the biology and ecology of these species (Lutz and Musick 1997; Lutz et al. 2003; Wynekan et al. 2013).

Green On April 6, 2016, the original listing was replaced with the listing of 11 distinct population segments (DPSs) (81 FR 20057). The North and South Atlantic, which encompass Gulf populations, were listed as threatened.

Turtle hatchlings are thought to occupy pelagic areas of the open ocean and are often associated with *Sargassum* rafts (Carr 1987; Walker 1994). At approximately 20 to 25 cm carapace length, juveniles migrate from pelagic habitats to benthic foraging areas (Bjorndal 1997). As juveniles move into benthic foraging areas a diet shift towards herbivory occurs. They consume primarily seagrasses and algae, but are also known to consume jellyfish, salps, and sponges (Bjorndal 1980, 1997; Paredes 1969; Mortimer 1981, 1982). The diving abilities of all sea turtles species vary by their life stages. The maximum diving depth of green sea turtles is estimated at 110 m (360 ft) (Frick 1976), but they are most frequently making dives of less than 20 m (65 ft.) (Walker 1994). The time of these dives also varies by life stage. The maximum dive length is estimated at 66 minutes with most dives lasting from 9 to 23 minutes (Walker 1994).

The **hawksbill's** pelagic stage lasts from the time they leave the nesting beach as hatchlings until they are approximately 22-25 cm in straight carapace length (Meylan 1988; Meylan and Donnelly 1999). The pelagic stage is followed by residency in developmental habitats (foraging areas where juveniles reside and grow) in coastal waters. Little is known about the diet of pelagic stage hawksbills. Adult foraging typically occurs over coral reefs, although other hard-bottom communities and mangrove-fringed areas are occupied occasionally. Hawksbills show fidelity to their foraging areas over several years (van Dam and Diéz 1998). The hawksbill's diet is highly specialized and consists primarily of sponges (Meylan 1988). Gravid females have been noted ingesting coralline substrate (Meylan 1984) and calcareous algae (Anderes Alvarez and Uchida 1994), which are believed to be possible sources of calcium to aid in eggshell production. The maximum diving depths of these animals are not known, but the maximum length of dives is estimated at 73.5 minutes. More routinely, dives last about 56 minutes (Hughes 1974).

Kemp's ridley hatchlings are also pelagic during the early stages of life and feed in surface waters (Carr 1987; Ogren 1989). After the juveniles reach approximately 20 cm carapace length they move to relatively shallow (less than 50m) benthic foraging habitat over unconsolidated substrates (Márquez-M. 1994). They have also been observed transiting long distances between foraging habitats (Ogren 1989). Kemp's ridley sea turtles feeding in these nearshore areas primarily prey on crabs, though they are also known to ingest mollusks, fish, marine vegetation, and shrimp (Shaver 1991). The fish and shrimp Kemp's ridley sea turtles ingest are not thought to be a primary prey item but instead may be scavenged opportunistically from bycatch discards or discarded bait (Shaver 1991). Given their predilection for shallower water, Kemp's ridley sea turtles most routinely make dives of 50 m or less (Soma 1985; Byles 1988). Their maximum diving range is unknown. Depending on the life stage a Kemp's ridley sea turtles may be able to stay submerged anywhere from 167 minutes to 300 minutes, though dives of 12.7 minutes to 16.7 minutes are much more common (Soma 1985; Mendonca and Pritchard 1986; Byles 1988). Kemp's ridley sea turtles may also spend as much as 96% of their time underwater (Soma 1985; Byles 1988).

Leatherbacks are the most pelagic of all ESA-listed sea turtles and spend most of their time in the open ocean. Although they will enter coastal waters and are seen over the continental shelf on a seasonal basis to feed in areas where jellyfish are concentrated. Leatherbacks feed primarily on cnidarians (medusae, siphonophores) and tunicates. Unlike other sea turtles, leatherbacks' diets do not shift during their life cycles. Because leatherbacks' ability to capture and eat jellyfish is not constrained by size or age, they continue to feed on these species regardless of life stage (Bjorndal 1997). Leatherbacks are the deepest diving of all sea turtles. It is estimated that these species can dive in excess of 1000 m (Eckert et al. 1989) but more frequently dive to depths of 50 m to 84 m (Eckert et al. 1986). Dive times range from a maximum of 37 minutes to more routines dives of 4 to 14.5 minutes (Standora et al. 1984; Eckert et al. 1986; Eckert et al. 1989,; Keinath and Musick 1993). Leatherbacks may spend 74% to 91% of their time submerged (Standora et al. 1984).

Loggerhead In 2011, NMFS and USFWS published a Final Rule which designated 9 DPSs for loggerhead sea turtles (76 FR 58868, September 22, 2011, and effective October 24, 2011). This rule listed the Northwest Atlantic Ocean DPS, the only one that occurs within the action area, as threatened.

Hatchlings forage in the open ocean and are often associated with *Sargassum* rafts (Hughes 1974; Carr 1987; Walker 1994; Bolten and Balazs 1995). The pelagic stage of these sea turtles are known to eat a wide range of things including salps, jellyfish, amphipods, crabs, syngnathid fish, squid, and pelagic snails (Brongersma 1972). Stranding records indicate that when pelagic immature loggerheads reach 40-60 cm straight-line carapace length, they begin to live in coastal inshore and nearshore waters of the continental shelf throughout the U.S. Atlantic (Witzell 2002). Here they forage over hard- and soft-bottom habitats (Carr 1986). Benthic foraging loggerheads eat a variety of invertebrates with crabs and mollusks being an important prey source (Burke et al. 1993). Estimates of the maximum diving depths of loggerheads range from 211 m to 233 m (692-764ft.) (Thayer et al. 1984; Limpus and Nichols 1988). The lengths of loggerhead dives are frequently between 17 and 30 minutes (Thayer et al. 1984, Limpus and Nichols 1988; Limpus and Nichols 1994; Lanyon et al. 1989) and they may spend anywhere from 80 to 94% of their time submerged (Limpus and Nichols 1994; Lanyon et al. 1989).

All of the above sea turtles are adversely affected by the Gulf reef fish fishery. Incidental captures are- infrequent, but occur in all commercial and recreational hook-and-line and longline components of the reef fish fishery. Observer data indicate that the bottom longline component of the fishery interacts solely with loggerhead sea turtles. Captured loggerhead sea turtles can be released alive or can be found dead upon retrieval of bottom longline gear as a result of forced submergence. Sea turtles caught during other reef fish fishing with other gears are believed to all be released alive due to shorter gear soak. All sea turtles released alive may later succumb to injuries sustained at the time of capture or from exacerbated trauma from fishing hooks or lines that were ingested, entangled, or otherwise still attached when they were released. Sea turtle release gear and handling protocols are required in the commercial and for-hire reef fish fisheries to minimize post-release mortality.

NMFS has conducted specific analyses ("Section 7 consultations") evaluating potential effects from the Gulf reef fish fishery on sea turtles (as well as on other ESA-listed species and critical habitat) as required by the ESA. On September 30, 2011, Southeast Regional Office (SERO) completed a biological opinion (Opinion), which concluded that the continued authorization of the Gulf reef fish fishery is not likely to jeopardize the continued existence of any sea turtles (loggerhead, Kemp's ridley, green, hawksbill, and leatherback) (NMFS 2011). An incidental take statement was issued specifying the amount and extent of anticipated take, along with reasonable and prudent measures and associated terms and conditions deemed necessary and appropriate to minimize the impact of these takes. On September 29, 2016, NMFS reinitiated consultation on the continued authorization of the Gulf reef fish fishery because new species (Nassau grouper and green sea turtle North Atlantic and South Atlantic distinct population segments) have been listed under the ESA that may be affected by the fishery.

Fish

Smalltooth sawfish historical ranges in the U.S. was from New York to the Mexico border. Their current range is poorly understood but believed to have contracted from these historical areas. Smalltooth sawfish primarily occur in the Gulf off peninsular Florida and are most common off Southwest Florida and the Florida Keys. Historical accounts and recent encounter data suggest that immature individuals are most common in shallow coastal waters less than 25 meters (Bigelow and Schroeder 1953; Adams and Wilson 1995), while mature animals occur in waters in excess of 100 meters (Simpfendorfer and Wiley 2005). Smalltooth sawfish feed primarily on fish. Mullet, jacks, and ladyfish are believed to be their primary food resources (Simpfendorfer 2001). Smalltooth sawfish also prey on crustaceans (mostly shrimp and crabs) by disturbing bottom sediment with their saw (Norman and Fraser 1938; Bigelow and Schroeder 1953).

Smalltooth sawfish are also adversely affected by the Gulf reef fish fishery, but takes are less than those for sea turtles. Although the long, toothed rostrum of the smalltooth sawfish causes this species to be particularly vulnerable to entanglement in fishing gear, incidental captures in the commercial and recreational hook-and-line components of the reef fish fishery are rare events. Only eight smalltooth sawfish are anticipated to be incidentally caught every three years in the entire reef fish fishery, and none are expected to result in mortality (NMFS 2011). In the September 30, 2011, biological opinion, NMFS concluded that the continued authorization of the Gulf reef fish fishery is not likely to jeopardize the continued existence of smalltooth sawfish (NMFS 2011). An incidental take statement was issued specifying the amount and extent of anticipated take, along with reasonable and prudent measures and associated terms and conditions deemed necessary and appropriate to minimize the impact of these takes. Fishermen in this fishery are required to follow smalltooth sawfish safe handling guidelines.

Nassau grouper is a shallow-water grouper species that has supported fisheries throughout the wider Caribbean, South Florida, Bermuda, and the Bahamas (Carter et al. 1994). Like other grouper species, they are slow-growing and long-lived (at least to age 29 years; Bush et al. 1996). Eggs and larvae are pelagic, but transition as juveniles to macroalgal and seagrass habitats. Adults are primarily found on high relief coral reefs and rocky substrates (Sadovy and Eklund 1999). Adults undergo annual migrations to discrete locations where they aggregate in large numbers to spawn (Smith 1972; Olsen and LaPlace 1979; Colin et al. 1987; Fine 1990; Fine 1992; Colin 1992). After spawning, the return to their home reef (Sadovy and Eklund 1999).

Nassau grouper are caught with spear, traps, and hook-and-line (NMFS 2016b). Because many of the spawning aggregations were well known, fishermen have fished these aggregations out to the point that in U.S. waters, there are no known spawning aggregations. To protect Nassau grouper from this overharvest, the Caribbean, South Atlantic, and Gulf Councils, as well as the state of Florida have prohibited take and possession of Nassau grouper. On June 29, 2016, NMFS published a final rule (81 FR 42268) listing Nassau grouper as threatened under the ESA.

Oceanic Whitetip Shark The oceanic whitetip shark is a large open ocean apex predatory shark found in subtropical waters around the globe. In the Western Atlantic, oceanic whitetips occur from Maine to Argentina, including the Caribbean and Gulf. It is a tropical, epipelagic species usually found offshore in the open ocean, on the outer continental shelf, or around oceanic islands in deep water, occurring from the surface to at least 152 m depth.

This species has a clear preference for open ocean waters between 10˚N and 10˚S, but can be found in decreasing numbers out to latitudes of 30˚N and 35˚S, with abundance decreasing with greater proximity to continental shelves (Backus et al. 1956; Strasburg 1958; Compagno 1984; Bonfil et al. 2008). Oceanic whitetip sharks are top level predators in open ocean ecosystems feeding mainly on teleosts and cephalopods (Bonfil et al. 2008), but studies have also reported that they consume sea birds, marine mammals, other sharks and rays, molluscs, crustaceans, and even garbage (Compagno 1984; Cortés 1999). Backus et al. (1956) recorded various fish species in the stomachs of oceanic whitetip sharks, including blackfin tuna, barracuda, and white marlin. The available evidence suggests that oceanic whitetip sharks are opportunistic feeders. Oceanic whitetip sharks are one of the more common tropical pelagic species taken as bycatch primarily in tuna and swordfish fisheries using pelagic longlines, purse seines, and probably also with pelagic gillnets, handlines, and occasionally pelagic and even bottom trawls. This species was proposed for listing as Threatened (ESA proposed rule issued December 29, 2016 (81 FR 96304).

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 (see http://www.gulfhypoxia.net/). 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. The "dead zone" refers to Gulf waters were 2 parts per million or less of oxygen are measured. For 2015, the extent of the hypoxic area was estimated to be 6,474 square miles and is similar the running average for over the past five years of 5,543 square miles Gulf (Figure 3.2.1) (see http://www.gulfhypoxia.net/).

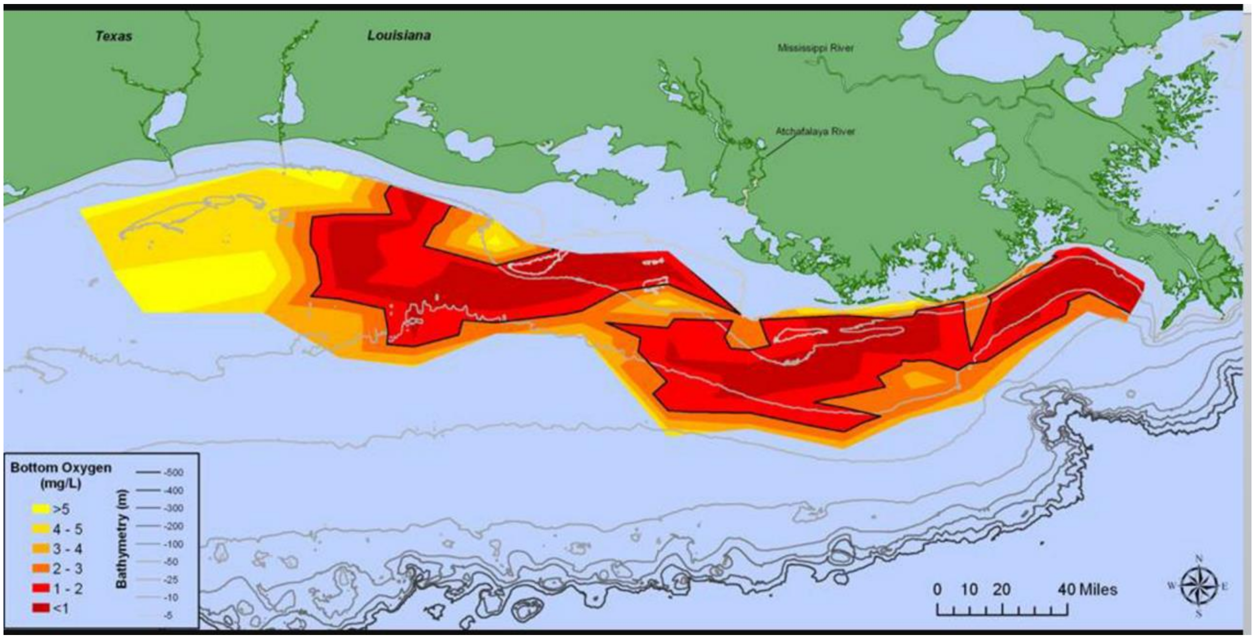

Figure 3.2.1 Map showing distribution of bottom-water dissolved oxygen from July 28 to August 3, west of the Mississippi River delta. Black lined areas – areas in red to deep red – have less than 2 milligrams per liter of dissolved oxygen. (Data: Nancy Rabalais, LUMCON; R Eugene Turner, LSU. Credit: NOAA; http://www.noaanews.noaa.gov/stories2015/080415-gulf-of-mexico-dead-zone-above-average.html)

The hypoxic conditions in the northern Gulf directly impact 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 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 (Craig 2012). They theorize that increased nutrient loading may be working in 'synergy' with abundant red snapper artificial habitats (oil platforms). Nutrient loading likely increases forage species biomass and productivity providing ample prey for red snapper residing on the oil rigs, thus increasing red snapper productivity.

Climate change

Climate change projections show increases in sea surface temperature and sea level; decreases in sea ice cover; and changes in salinity, wave climate, and ocean circulation [Intergovernmental Panel on Climate Change (IPCC) http://www.ipcc.ch/]. These changes are likely to affect plankton biomass and fish larvae abundance that could adversely impact fish, marine mammals, seabirds, and ocean biodiversity. Kennedy et al. (2002) and Osgood (2008) have suggested global climate change could bring about temperature changes in coastal and marine ecosystems that, in turn, can influence organism metabolism; alter ecological processes, such as productivity and species interactions; change precipitation patterns and cause a rise in sea level that could change the water balance of coastal ecosystems; alter 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. National Oceanic and Atmospheric Administration's (NOAA) Climate Change Web Portal (http://www.esrl.noaa.gov/psd/ipcc/ocn/) indicates that the average sea surface temperature in the Gulf will increase by 1.2-1.4ºC for 2006-2055 compared to the average over the years 1956-2005. For reef fishes, Burton (2008) speculated that climate change could cause shifts in spawning seasons, changes in migration patterns, and changes to basic life history parameters such as growth rates. The OceanAdapt model (http://oceanadapt.rutgers.edu/regional_data/) shows distributional trends both in latitude and depth over the time period 1985-1013. For some reef fish species such as the smooth puffer, 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. Finally, for other reef fish species such as the dwarf goatfish, there has been a distributional trend both to the north and to deeper waters. These changes in distributions have been hypothesized as a response to environmental factors such as increases in temperature.

The distribution of native and exotic species may change with increased water temperature, as may the prevalence of disease in keystone animals such as corals and the occurrence and intensity of toxic algae blooms. Hollowed et al. (2013) provided a review of projected effects of climate change on the marine fisheries and dependent communities. Integrating the potential effects of climate change into the fisheries assessment is currently difficult due to the time scale differences (Hollowed et al. 2013). The fisheries stock assessments rarely project through a time span that would include detectable climate change effects.

Greenhouse gases

The IPCC (http://www.ipcc.ch/) has indicated that 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 3.2.2 with respect to total emissions and from fishing. Commercial fishing and recreational vessels make up a small percentage of the total estimated greenhouse gas emissions from the Gulf (1.43% and 0.59%, respectively).

Table 3.2.2 Total Gulf greenhouse gas emissions estimates (tons per year) from oil platform and non-oil platform sources, commercial fishing and recreational vessels, and percent greenhouse gas emissions from commercial fishing and recreational vessels of the total emissions*.

Emission source	Greenhouse Gas CO_2	CH_4	N_2O	Total CO_{2e}**
Oil platform	11,882,029	271,355	167	17,632,106
Non-platform	22,703,695	2,029	2,698	23,582,684
Total	34,585,724	273,384	2,865	41,214,790
Commercial fishing	585,204	2	17	590,516
Recreational vessels	244,483	N/A	N/A	244,483
Percent commercial fishing	1.69	>0.01	0.59	1.43
Percent recreational vessels	0.71	NA	NA	0.59

*Compiled from Tables 7.9 and 7.10 in Wilson et al. (2014).
**The CO_2 equivalent (CO_2e) emission estimates represent the number of tons of CO_2 emissions with the same global warming potential as one ton of another greenhouse gas (e.g., CH_4 and N_2O). Conversion factors to CO_{2e} are 21 for CH_4 and 310 for N_2O.

Deepwater Horizon MC252 Oil Spill Incident

On April 20, 2010, an explosion occurred on the *Deepwater Horizon* semi-submersible oil rig approximately 36 nautical miles (41 statute miles) off the Louisiana coast. Two days later the rig sank. An uncontrolled oil leak from the damaged well continued for 87 days until the well was successfully capped by British Petroleum on July 15, 2010. The *Deepwater Horizon* MC252 oil spill affected at least one-third of the Gulf area from western Louisiana east to the Florida Panhandle and south to the Campeche Bank in Mexico. In response to the spill, NMFS closed waters in the Gulf to fishing, and at its height, closed over 88,000 square miles (Figure 3.2.2.1)

A final Programmatic Damage Assessment and Restoration Plan and Final Programmatic Environmental Impact Statement (PDARP), incorporated by reference, were conducted by NOAA and many cooperating agencies to assess the damage caused by the spill (DWH Trustees 2016). Key findings by NOAA with regards to the injury assessment were:

- Oil came into contact with a variety of northern Gulf habitats ranging from the deep-sea floor to coastal and nearshore areas.
- Species affected included deep-sea corals, fish and shellfish, birds, among others.
- The oil was toxic to a wide variety of organisms including fish, invertebrates, plankton, birds, deep-sea corals, sea turtles, and marine mammals.
- Toxic effects included death, disease, reduced growth, impaired reproduction, and physiological impairments that made it more difficult for organisms to survive and reproduce.

- The extent and degree of toxic levels of oil has declined substantially from 2010 to the present.

The PDARP outlines ways fish, including reef fish, were likely adversely affected. Affects include reduced recruitment, changes in trophic structure, changes in community structure, reduced growth, impaired reproduction, and adverse health effects. A more detailed description of these effects can be found in Chapter 4 of the PDARP (http://www.gulfspillrestoration.noaa.gov/restoration-planning/gulf-plan).

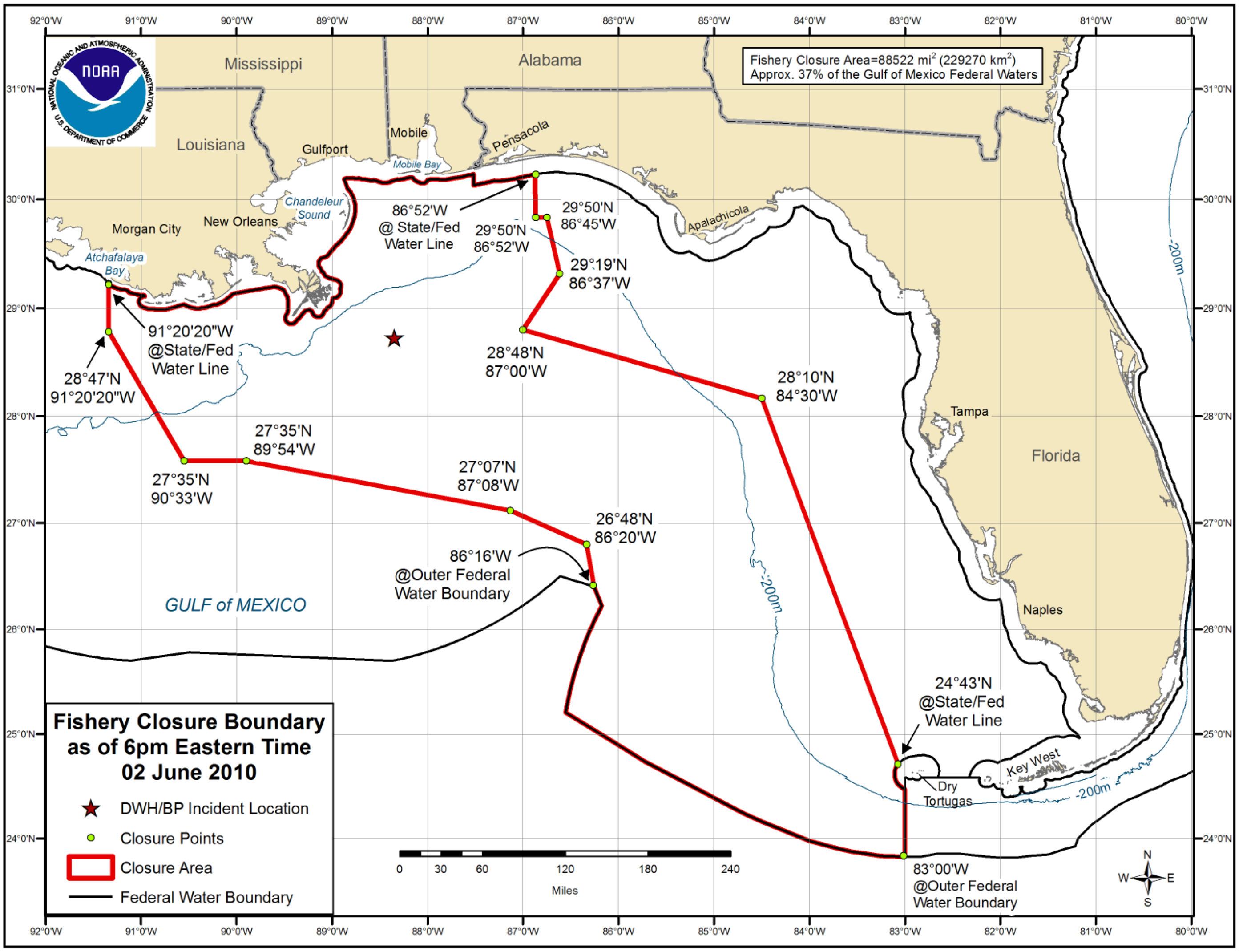

Figure 3.2.2. Fishery closure at the height of the Deepwater Horizon MC252 oil spill.

3.3 Description of the Economic Environment

3.3.1 Recreational Sector

Overview

From 2010 through 2014, an annual average of approximately 10.8 million saltwater anglers across the U.S. took approximately 70.6 million saltwater finfish fishing trips around the country. During that same period, an annual average of 3.0 million saltwater anglers residing in the Gulf region took approximately 23.7 million saltwater finfish fishing trips in the Gulf, and these Gulf anglers and trips accounted for approximately 28% of all U.S. saltwater anglers and 34% of all U.S. finfish fishing trips (Table 3.3.1.1). In 2015, saltwater anglers across the country took approximately 61 million finfish fishing trips, while Gulf region saltwater anglers took almost 21 million finfish fishing trips.

Table 3.3.1.1. Number of saltwater anglers and saltwater finfish fishing trips in the Gulf and U.S., 2011-2015.

Year	In-State Anglers (1000s)			Trips (1000s)		
	Gulf	U.S.	Percent Gulf	Gulf	U.S.	Percent Gulf
2010	2,715	10,966	24.8%	22,039	72,348	30.5%
2011	3,048	10,628	28.7%	23,701	69,661	34.0%
2012	3,070	11,025	27.8%	24,332	70,784	34.4%
2013	3,372	11,006	30.6%	26,383	71,801	36.7%
2014	2,889	10,513	27.5%	22,125	68,704	32.2%
Average	**3,019**	**10,828**	**27.9%**	**23,716**	**70,660**	**33.6%**
2015	2,032	7,394	27.5%	20,769	61,494	33.8%

Source: NMFS 2016a and NMFS, Fisheries Statistics Division, pers. comm., January 9, 2017, for trips (including LA and TX) and anglers 2015.

In the Gulf region in 2014, the 2.9 million saltwater anglers spent approximately $1.5 billion on their 21 million finfish fishing trips and another $11.5 billion on durable fishing-related equipment (NMFS 2015a). These trip and equipment expenditures generate jobs and other economic impacts in the Gulf States.

Within the Gulf region, the largest numbers of saltwater anglers and trips and associated economic impacts are in West Florida. In 2014, for example, 1.6 million saltwater anglers took approximately 15 million saltwater fishing trips in West Florida that generated 70,109 full and part-time jobs, approximately $7.5 billion in sales, $3.2 billion in income, and $4.9 billion in value-added impacts in the state (Table 3.3.1.2). Also that year, the second largest economic impacts from saltwater fishing trips in the Gulf were in Texas, where 16,496 jobs and approximately $1.8 billion in sales, $7.6 million in income impacts and $1.2 billion in value-added impacts were generated. Louisiana was a close third.

Saltwater fishing occurs along the shore (e.g., beaches, bridges, and piers) and in state and federal waters. When in state and federal waters, anglers fish from private (own and rented) vessels and for-hire vessels (charter vessels and headboats). Shore, private vessels, and for-hire vessels comprise the three modes of recreational fishing.

Table 3.3.1.2. Number of anglers, trips, and economic impacts of recreational finfish fishing trips in Gulf region, 2014.

State	In-State Anglers	Trips	Jobs	In Thousands		
				Sales	Income	Value Added
Alabama	342,701	2,169,169	14,124	$1,070,579	$540,257	$827,849
West Florida	1,649,274	15,179,236	70,109	$7,467,774	$3,161,122	$4,868,743
Louisiana	663,000[1]	2,187,892	15,241	$1,619,677	$662,470	$1,029,281
Mississippi	233,736	1,480,525	4,174	$374,063	$157,772	$247,281
Texas	NA[2]	1,069,128	16,496	$1,825,290	$757,027	$1,205,146
Total	**2,889,000**	**22,125,105**				

Source: NMFS 2015a, LDWF 2016, and NMFS Service, Fisheries Statistics Division, pers. comm., January 5, 2017.
1. Estimate generated from subtracting total less anglers from AL, West FL, and MS.
2. Number of Texas anglers is not available (NA).

In Alabama and Mississippi, 2014 saltwater angler (finfish) fishing trips were more likely to be taken on shore, followed in turn by trips on private and charter vessels. Trips in Western Florida and in Louisiana that year, however, were more likely to be taken by anglers on private vessels (Table 3.3.1.3). Collectively, the most popular mode in the Gulf region in 2014 was private vessel (54.8% of trips), followed in turn by trips on shore (40.8%), and those by charter vessels (4.4%).

Table 3.3.1.3. Percentage of angler trips by mode in 2014.

State	Percentage of Saltwater Angler Trips by Mode			
	Shore	Charter Vessel	Private Vessel	Total
AL	63.1%	4.0%	32.9%	100.0%
West FL	42.0%	4.6%	53.5%	100.0%
LA	0.0%	5.9%	94.1%	100.0%
MS	57.0%	1.1%	42.0%	100.0%
TX	NA	NA	NA	100.0%
Total	**40.8%**	**4.4%**	**54.8%**	**100.0%**

Source: NMFS 2015a.

In Alabama, West Florida, Louisiana, and Mississippi, most saltwater angler trips in 2014 were in inland waters (Table 3.3.1.4). NMFS defines inland waters as inshore saltwater and brackish water bodies such as bays, estuaries, sounds, etc. It does not include inland freshwater areas. The second most popular area was the state territorial sea, except in Mississippi where fishing in federal waters ranks second.

Table 3.3.1.4. Percentage of angler trips by fishing area in 2014, except Louisiana in 2013.

State	Percentage of Saltwater Angler Trips by Fishing Area			
	Inland Waters	State Territorial Sea	Federal Waters	Total
AL	48.4%	44.2%	7.4%	100.0%
West FL	53.7%	38.6%	7.7%	100.0%
LA[1]	91.1%	7.2%	1.7%	100.0%
MS	96.2%	0.8%	2.9%	100.0%
TX	NA	NA	NA	100.0%
Total[2]	63.3%	30.5%	6.2%	100.0%

Source: NMFS, Fisheries Statistics Division, pers. comm.,September 7, 2016.
1. Data not available for 2014, based on 2013 figures.
2. Excluding Texas.

West Florida ranks first in the Gulf region by numbers of finfish caught (both harvested and released) by saltwater anglers (Figure 3.3.1.1). From 2011 through 2015, an average of approximately 42.0 million finfish were harvested in West Florida, followed in turn by approximately 12.8 million in Louisiana, 7.7 million in Alabama, 5.3 million in Mississippi and 2.1 million in Texas. From 2011 through 2015, from 46% to 69% of the harvested fish were by West Florida anglers (Table 3.3.1.5). The number of fish released by Texas anglers is unknown.

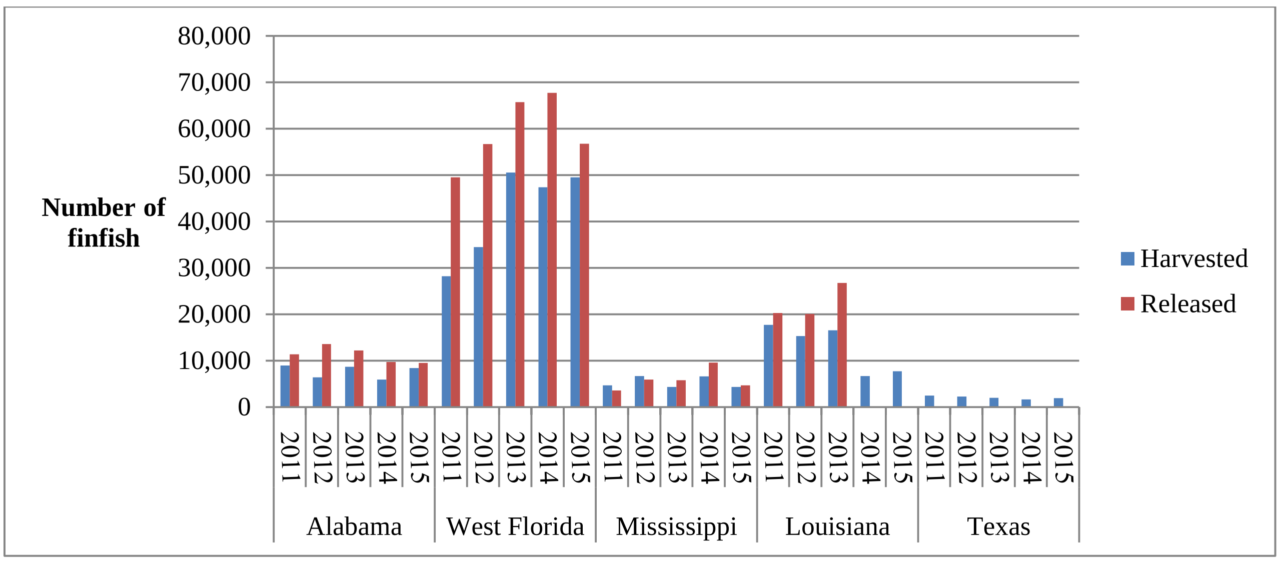

Figure 3.3.1.1. Number of finfish harvested and released, 2011-2015.
Source: Fisheries of the United States, 2012-2015.

Table 3.3.1.5. Percentage of number of finfish harvested by anglers in Gulf region by state, 2011-2015.

Year	Percentage of Harvested Number of Finfish					
	AL	W FL	LA	MS	TX	Total
2011	14.4%	45.5%	28.6%	7.6%	4.0%	100.0%
2012	9.9%	52.9%	23.5%	10.2%	3.5%	100.0%
2013	10.6%	61.6%	20.1%	5.2%	2.4%	100.0%
2014	8.6%	69.5%	9.8%	9.7%	2.4%	100.0%
2015	11.6%	69.0%	10.7%	6.0%	2.7%	100.0%
Average	**11.0%**	**59.7%**	**18.5%**	**7.7%**	**3.0%**	**100.0%**

Source: Fisheries of the United States, 2012 – 2015.

Reef Fish Fishery

Private recreational fishing vessels are not required to have a federal permit to harvest individual species or species complexes in the reef fish fishery from the Gulf exclusive economic zone (EEZ). Anglers aboard these vessels, however, must either be federally registered or licensed in states that have a system to provide complete information on the states' saltwater anglers to the national registry.

Any for-hire fishing vessel that takes anglers into the Gulf EEZ where anglers harvest species or complexes in the reef fish fishery must have a limited-access charter vessel/headboat (for-hire) permit for reef fish that is specifically assigned to that vessel. As of January 2, 2017, there were 1,243 for-hire fishing vessels with a valid or renewable/transferrable for-hire permit for reef fish: 1,212 vessels with a for-hire permit and another 31 with a historical captain for-hire permit.

Table 3.3.1.6. Number and percentage of for-hire reef fish permits by state of mailing recipient (of permit).

State	For-Hire Reef Fish Permits by State of Recipient	
	Number	Percentage
Alabama	123	9.9%
Florida	715	57.5%
Louisiana	106	8.5%
Mississippi	33	2.7%
Texas	224	18.0%
Other	42	3.4%
Total	1,243	100.0%

Source: Permit Information Management System (PIMS) as of January 2, 2017.

Approximately 58% (715) of the 1,243 for-hire vessel reef fish permits have mailing recipients in Florida. Texas recipients hold the second highest number of permits, with 18%. Collectively, approximately 97% of the permits have mailing recipients in one of the Gulf States.

Saltwater anglers in the Gulf region caught approximately 140.7 million finfish in 2014. Approximately 10% of those fish were caught in the EEZ (Table 3.3.1.7). The top four species groups by number of fish caught in all areas were herrings (34.9 million), drums (24.1 million), porgies (15.5 million), and jacks (11.9 million). Snappers ranked sixth (9.4 million). In the EEZ, the top five species groups by number of fish caught were snappers, sea basses, grunts, jacks, and herrings. Forty percent of snappers that were caught by anglers in the Gulf in 2014 were caught in federal waters.

Table 3.3.1.7. Number of fish in species groups caught by anglers in the Gulf by area, 2014.

Species Group	Inland	State Ocean	EEZ	Total	% Federal
Barracudas	3,915	65,569	40,558	110,042	36.86%
Bluefish	288,219	782,708	28,086	1,099,013	2.56%
Cartilaginous Fishes	973,433	552,683	84,345	1,610,461	5.24%
Catfishes	4,904,305	1,019,930	34,072	5,958,307	0.57%
Dolphins	388	26,215	606,885	633,488	95.80%
Drums	19,288,315	4,747,076	99,285	24,134,676	0.41%
Eels	2,968	8,452	3,408	14,828	22.98%
Flounders	744,226	550,365	11,702	1,306,293	0.90%
Grunts	1,516,369	3,053,078	2,345,537	6,914,984	33.92%
Herrings	28,435,473	5,699,692	770,252	34,905,417	2.21%
Jacks	2,771,517	8,276,069	829,693	11,877,279	6.99%
Mullets	4,198,644	105,857	21,787	4,326,288	0.50%
Other Fishes	6,293,478	3,642,946	694,229	10,630,653	6.53%
Porgies	10,083,454	4,097,424	1,355,638	15,536,516	8.73%
Puffers	260,805	178,615	24,182	463,602	5.22%
Sea Basses	992,080	2,224,128	2,434,618	5,650,826	43.08%
Searobins	29,550	2,837	1,800	34,187	5.27%
Snappers	6,131,275	5,598,826	3,798,285	9,397,111	40.42%
Temperate Basses	18,704	0	0	18,704	0.00%
Toadfishes	37,278	10,262	3,020	50,560	5.97%
Triggerfishes/Filefishes	2,757	208,704	267,758	479,219	55.87%
Tunas & Mackerels	1,908,546	2,948,964	561,679	5,419,189	10.36%
Wrasses	7,904	106,334	56,233	170,471	32.99%
Total	88,893,603	43,906,734	14,073,052	140,742,114	10.00%

Source: NMFS, Fisheries Statistics Division, pers. comm. January 9, 2017.

Vermilion snapper is one of the 31 species in the reef fish fishery, and the actions of this amendment concern fishing for vermilion snapper, only. Consequently, the remainder of this section focuses exclusively on recreational fishing for vermilion snapper.

Additional information on commercial landings for the reef fish fishery as a whole or the other species or complexes within the fishery can be found in previous amendments, such as Amendment 29 (GMFMC 2008a), Amendment 31 (GMFMC 2009), Amendment 32 (GMFMC 2011b), Amendment 34 (GMFMC 2012a), Amendment 38 (GMFMC 2012d), and a recent Framework Action (GMFMC 2015a), and is incorporated herein by reference.

Vermilion Snapper

The recreational fishing year (season) for vermilion snapper in the Gulf EEZ runs from January 1 to December 31 every year. If the sum of the commercial and recreational landings reaches or is projected to reach the stock ACL, the seasons for both the commercial and recreational sectors in the EEZ are closed for the remainder of the fishing year. The stock ACL for vermilion snapper has been at 3.42 mp whole weight (mp ww) since 2012. To date, there has not been an in-season closure because combined sector landings have been less than the ACL since it was implemented in 2012 (Table 3.3.1.8).

Table 3.3.1.8. Recreational and commercial landings of vermilion snapper, 2012 – 2016.

Year	Vermilion snapper landings (lbs ww)			ACL (lbs ww)	Percent of stock ACL
	Recreational	Commercial	Total		
2012	756,052	2,410,891	3,166,943	3,420,000	92.6%
2013	1,118,790	1,418,401	2,537,191		74.2%
2014	1,160,951	1,759,141	2,920,092		85.4%
2015	886,587	1,396,545	2,283,132		66.8%
2016	773,839	1,567,302	2,341,141		68.5%
Average	**939,244**	**1,710,456**	**2,649,700**		**77.5%**

Source: SERO Stock ACL webpage as of January 3, 2017.

In the Gulf EEZ, the daily recreational bag limit is 10 vermilion snapper per person within the 20 reef fish combined total. In Alabama and Florida waters, the daily bag limit is also 10 per person. In Mississippi, the daily bag limit is part of a 20 fish per person aggregate limit. However, there is no limit in Texas waters. The minimum size limit is 10 inches TL in both the EEZ and all state waters.

On average, approximately 91% to 92% of the vermilion snapper are landed annually by anglers occur in the Eastern Gulf (Table 3.3.1.9). The majority of these fish are caught by anglers onboard for-hire vessels (Table 3.3.1.10). While headboats account for approximately 99% to 100% of the for-hire vessel landings in the Western Gulf, charter boats account for a slight majority of the for-hire vessel landings in the East (Table 3.3.1.11).

Table 3.3.1.9. Number of vermilion snapper landed by anglers by area of Gulf, 2010 – 2014.

Year	Number of Vermilion Snapper Landed			Percent East
	East	West	Total	
2010	374,136	58,437	432,573	86.5%
2011	1,060,686	69,730	1,130,416	93.8%
2012	567,790	64,281	632,071	89.8%
2013	1,020,107	77,910	1,098,017	92.9%
2014	1,038,005	70,327	1,108,332	93.7%
Average 2010-14	**812,145**	**68,137**	**880,282**	**91.3%**
Average 2012-14	**875,301**	**70,839**	**946,140**	**92.1%**

Source: SEDAR 45 (2016). East refers to waters within statistical grids 1-12, which occur off Florida, Alabama, Mississippi, and the eastern coastline of Louisiana. West refers to waters within statistical grids 13-21 that are off Louisiana and Texas.

Table 3.3.1.10. Number of vermilion snapper landed by anglers by vessel, 2010 – 2014.

Year	Number of Vermilion Snapper Landed			Percent For-Hire Vessels
	For-Hire Vessel	Private Vessel	All Vessels	
2010	340,118	92,455	432,573	78.6%
2011	901,730	228,686	1,130,416	79.8%
2012	475,752	156,320	632,072	75.3%
2013	685,388	412,629	1,098,017	62.4%
2014	840,946	267,387	1,108,333	75.9%
Average 2010-14	**648,787**	**231,495**	**880,282**	**74.4%**
Average 2012-14	**667,362**	**278,779**	**946,141**	**71.2%**

Source: SEDAR 45 (2016).

Table 3.3.1.11. Number of vermilion snapper landed by anglers on for-hire vessels by vessel and area of Gulf, 2010 – 2014.

Year	Number of Vermilion Snapper Landed by For-Hire Vessels					
	East			West		
	Charter boat	Headboat	Percent Charter	Charter boat	Headboat	Percent Charter
2010	117,574	164,181	41.7%	0	58,363	0.0%
2011	455,592	376,813	54.7%	74	69,251	0.1%
2012	171,347	240,140	41.6%	28	64,237	0.0%
2013	342,386	266,618	56.2%	731	75,653	1.0%
2014	475,143	297,933	61.5%	405	67,465	0.6%
Average 2010-14	**312,408**	**269,137**	**51.2%**	**248**	**66,994**	**0.3%**
Average 2012-14	**329,625**	**268,230**	**53.1%**	**388**	**69,118**	**0.5%**

Source: SEDAR 45 (2016).

Relatively few recreational charter and private vessel fishing trips target vermilion snapper. The average annual number of trips where the species is the primary or secondary target is approximately from 10% to 12% of the average annual number of trips that land the species and approximately 0.1% of all average annual angler trips in the Gulf (Table 3.3.1.12). Preliminary data for 2016 indicates a total of 24,762 angler trips, not including headboats, targeted vermilion snapper and approximately 0.2% of all angler trips by charter and private/rental vessels targeted the species).

Table 3.3.1.12. Number of charter and private vessel trips that targeted and landed vermilion snapper and percentage of trips that targeted vermilion snapper, 2010 – 2015.

Year	Number of Trips by Charter and Private/Rental Vessels			Percentage Trips Vermilion Snapper Targeted	
	Vermilion Snapper Primary or Secondary Target	Vermilion Snapper Landed	All	Vermilion Snapper Landed	All
2010	7,225	111,612	21,047,433	6.47%	0.03%
2011	23,479	178,902	22,575,779	13.12%	0.10%
2012	11,272	134,499	23,172,483	8.38%	0.05%
2013	22,064	255,709	25,233,371	8.63%	0.09%
2014	27,137	210,872	18,828,931	12.87%	0.14%
2015	33,355	211,807	17,300,160	15.75%	0.19%
Average 2010-14	**18,235**	**178,319**	**22,171,599**	**9.90%**	**0.08%**
Average 2011-15	**23,461**	**198,358**	**21,422,145**	**11.75%**	**0.12%**

Source: Personal communication from the NMFS, Fisheries Statistics Division pers. comm. February 13, 2017. Does not include headboats and estimates for Louisiana after 2013 or Texas.

The above annual average of 23,461 directed trips (4,627 charter vessel trips and 18,835 private vessel trips) generates the following economic impacts in the Gulf region: 44 jobs and approximately $2.2 million in income impacts, $3.5 million in value-added impacts and $6.0 million in sales impacts (Table 3.3.1.13).

Table 3.3.1.13. Estimates of average annual economic impacts of directed fishing trips, not including headboats.

Mode	Number of		Impacts (Thousands of 2015 $)		
	Directed Trips	Jobs	Income	Value-Added	Sales
Charter	4,627	32	$1,635	$2,417	$4,160
Private	18,835	12	$604	$1,044	$1,882
Shore	0	0	$0	$0	$0
Total All Waters	**23,462**	**44**	**$2,239**	**$3,461**	**$6,042**

Source: Estimates of economic impacts calculated by NMFS SERO using model developed for NMFS (2016).

The majority of charter and private vessel (angler) trips that target vermilion snapper tend to occur in the EEZ; however, that did not occur in 2010 and 2015 (Table 3.3.1.14). Preliminary data for 2016 indicates approximately 77% of charter and private vessel trips that targeted the species occurred in the EEZ.

Table 3.3.1.14. Number of charter and private vessel trips that targeted and landed vermilion snapper and percentage of trips that targeted vermilion snapper, 2010 – 2015.

Year	Number of Trips that Targeted Vermilion Snapper in EEZ			In All Areas	Percent in EEZ
	Charter	Private	Total		
2010	399	1,087	1,486	7,225	20.6%
2011	5,881	11,733	17,614	23,479	75.0%
2012	1,529	8,703	10,232	11,272	90.8%
2013	2,970	16,697	19,667	22,063	89.1%
2014	6,482	17,115	23,597	27,137	87.0%
2015	3,622	11,798	15,420	33,355	46.2%
Average 2010-14	**3,452**	**11,067**	**14,519**	**18,235**	**72.5%**
Average 2011-15	**4,097**	**13,209**	**17,306**	**23,461**	**77.6%**

Source: NMFS, Fisheries Statistics Division pers. comm. February 15, 2017. Does not include estimates for Louisiana after 2013 or Texas.

The above annual average of 17,306 directed trips in the EEZ generates the following economic impacts in the Gulf region: 37 jobs and approximately $1.9 million in income impacts, $2.9 million in value-added impacts and $5.0 million in sales impacts (Table 3.3.1.15). Trips that targeted vermilion snapper in the EEZ account for approximately 83% to 84% of the economic impacts generated from charter and private vessel trips that target the species in all waters. These estimates do not include impacts from headboat trips.

Table 3.3.1.15. Estimates of average annual economic impacts of directed fishing trips in EEZ.

Mode	Number		Impacts (Thousands of 2015 $)		
	Directed Trips	Jobs	Income	Value-Added	Sales
Charter	4,097	28	$1,448	$2,140	$3,684
Private	13,209	9	$424	$732	$1,320
Shore	0	0	$0	$0	$0
Total EEZ	**17,306**	**37**	**$1,872**	**$2,872**	**$5,004**
Percent of All Waters		**84.1%**	**83.6%**	**83.0%**	**82.8%**

Source: Estimates of economic impacts calculated by NMFS SERO using model developed for NMFS (2016).

The majority of vermilion snapper landed by anglers onboard charter and private vessels in the Gulf are caught in the EEZ. An annual average of approximately 82% to 84% of landed vermilion snapper are from the EEZ (Table 3.3.1.16). Preliminary data for 2016 indicates approximately 69% of landings of the species were caught in the EEZ and approximately 31% from state territorial waters.

Table 3.3.1.16. Number and percentage of vermilion snapper landed by area, 2010 – 2015.

Year	Percentage of Total Number of Vermilion Snapper Landed		
	Inland Waters	State Territorial Seas	EEZ
2010	0.0%	16.5%	83.5%
2011	0.0%	18.4%	81.6%
2012	0.0%	9.5%	90.5%
2013	0.7%	18.4%	81.0%
2014	0.0%	18.1%	81.9%
2015	0.0%	25.1%	74.9%
Average 2010-14	**0.1%**	**16.1%**	**83.7%**
Average 2011-15	**0.1%**	**17.9%**	**82.0%**

Source: NMFS, Fisheries Statistics Division pers. comm. February 13, 2017. Does not include landings by headboats, from Texas, and from Louisiana after 2013.

The number of vermilion snapper caught in the EEZ and landed by anglers onboard private/leased vessels tends to peak during the May and June wave, while that number by anglers onboard charter fishing vessels tends to peak during July and August (Figure 3.3.1.2). The lowest landings by anglers tend to occur during the winter months from December through February.

From 2010 through 2015, the annual number of for-hire and private vessel fishing trips that landed vermilion snapper from the EEZ increased continuously after 2012, while the number by private vessels decreased in 2014 and 2015 after peaking in 2013 (Figure 3.3.1.3). Preliminary data for 2016 indicates a continuing increase in the number of for-hire trips (107,641) that land vermilion snapper from the EEZ and an increase in private trips to 49,649; however, that figure is substantially below the 2010-2014 and 2011-2015 annual averages for private vessels.

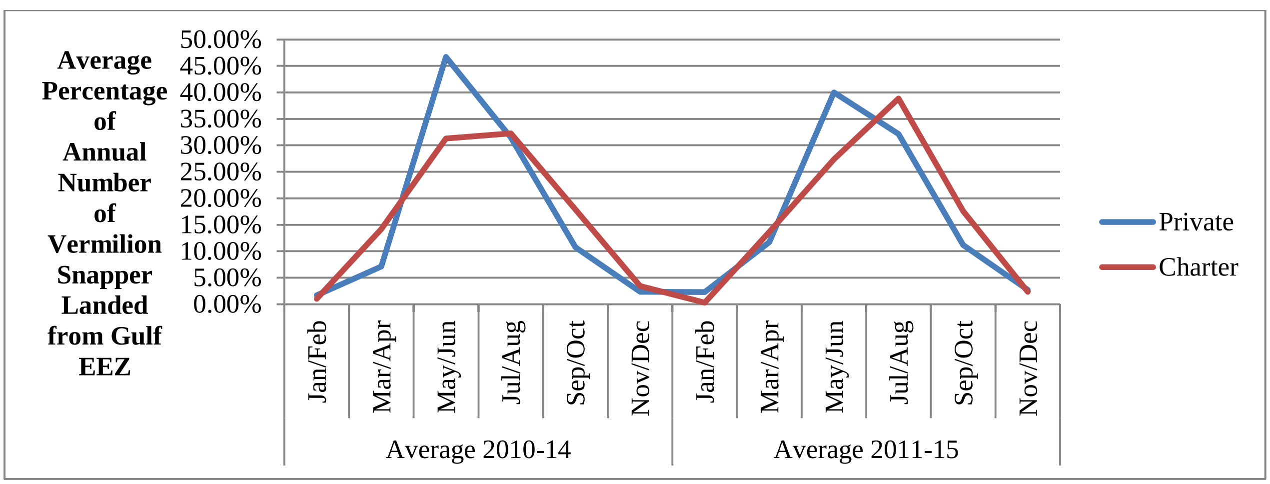

Figure 3.3.1.2. Average percentage of annual number of vermilion snapper caught in EEZ and landed by anglers onboard private and charter vessels by wave, 2010-2015.
Source: NMFS, Fisheries Statistics Division pers. comm. February 15, 2017. Does not include landings by headboats and estimates for Louisiana after 2013 or Texas.

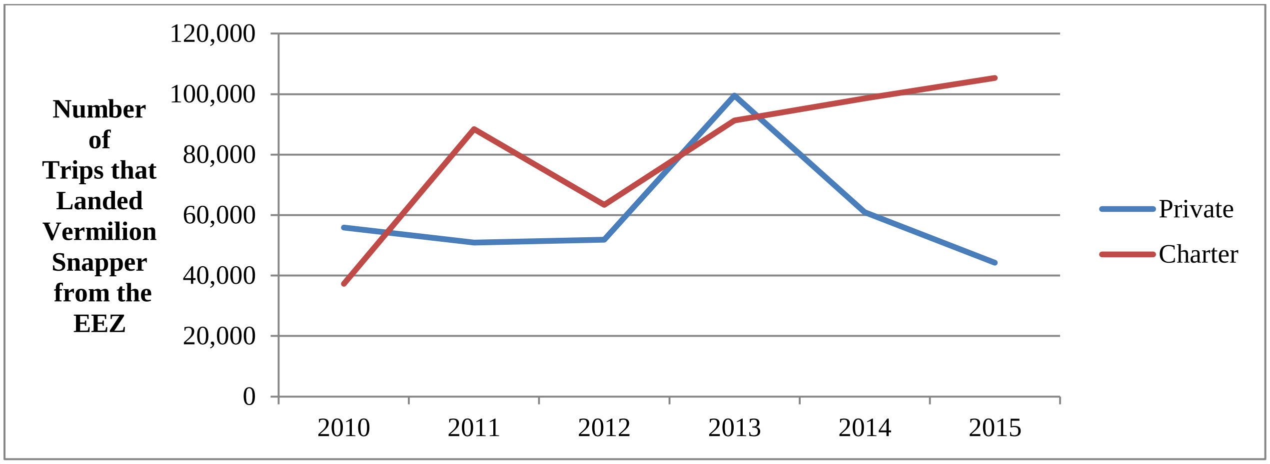

Figure 3.3.1.3. Annual number of vermilion snapper landed by anglers by wave, 2010-2015.
Source: National Marine Fisheries Service, pers. comm. Fisheries Statistics Division February 15, 2017. Does not include trips by headboats and estimates for Louisiana after 2013 or Texas.

3.3.2 Commercial Sector

Overview

From 2010 through 2014, commercial fishermen in the United States landed an annual average of approximately 9.6 billion pounds of finfish and shellfish with a dockside value of $5.4 billion (2015$). During that same 5-year period, commercial landings in the Gulf region accounted for approximately 16% of those average national landings by weight and dockside value (Table 3.3.2.1). Landings support jobs and generate other economic impacts. For example, all landings in West Florida in 2014 supported 92,858 jobs and created approximately $18.5 billion in sales impacts, $3.5 billion in income impacts, and $6.2 billion in value-added impacts (Table 3.3.2.2).

Table 3.3.2.1. Commercial landings in the Gulf region and U.S., 2010 – 2014.

Year	Thousands pounds landed		Percent Gulf	Dockside Value (Thousands 2015 $)		Percent Gulf
	Gulf	U.S.		Gulf	U.S.	
2010	1,072,068	8,044,996	13.3%	$678,791	$4,916,516	13.8%
2011	1,792,550	9,903,529	18.1%	$864,457	$5,717,862	15.1%
2012	1,438,492	9,435,960	15.2%	$779,734	$5,351,694	14.6%
2013	1,395,521	9,812,198	14.2%	$970,869	$5,707,389	17.0%
2014	1,143,715	9,409,780	12.2%	$1,038,936	$5,531,718	18.8%
Average	**1,368,469**	**9,640,367**	**14.6%**	**866,557**	**$5,445,036**	**16.4%**

Source: FEUS 2014 and Bureau of Economic Analysis (BEA) for GDP deflator.

Table 3.3.2.2. Economic impacts of all Gulf region landings by state, 2014.

State	Economic Impacts Without Imports			
	Jobs	2015 $		
		Sales	Income	Value-Added
AL	15,069	$667,729,341	$254,224,069	$336,767,042
FL	92,858	$18,513,976,972	$3,471,159,183	$6,201,017,476
LA	44,066	$2,244,755,470	$824,977,925	$1,127,854,489
MS	4,714	$200,743,217	$80,355,708	$103,835,452
TX	33,880	$2,888,307,649	$835,095,541	$1,251,791,754

Source: FEUS 2014 for jobs and nominal impacts (2014$) and BEA for GDP deflator.

Reef Fish Fishery

Annual dockside revenue from all landings of the species and species groups in reef fish fishery increased from approximately $34.3 million in 2010 to approximately $60.3 million in 2015 (Table 3.3.2.3). The reef fish fishery accounts for approximately 6% of the dockside revenue from all landings in the Gulf region. Most reef fish landings occur in West Florida, where they accounted for approximately 2% of the jobs supported by all landings in West Florida (Table 3.3.2.4).

Table 3.3.2.3. Dockside revenue from all reef fish fishery landings, 2010-2014.

Year	Dockside Value (2015$)		Percent Reef Fish
	Reef Fish	All Gulf Landings	
2010	$34,262,980	$678,791,000	5.0%
2011	$44,733,134	$864,457,000	5.2%
2012	$49,114,620	$779,734,000	6.3%
2013	$52,266,235	$970,869,000	5.4%
2014	$60,254,917	$1,038,936,000	5.8%
Average	**$48,126,377**	**$866,557,400**	**5.5%**

Source: SEFSC Online Economic Query System, February 28, 2017, and BEA for GDP deflator.

Table 3.3.2.4. Economic impacts of all reef fish landings by state, 2014.

State	2014 Reef Fish Landings		Economic Impacts Without Imports			
			Jobs	Thousands of 2015 $		
	Weight (lbs gw)	Dockside Revenue (2015 $)		Sales	Income	Value-Added
AL	0	$0	0	$0	$0	$0
FL	11,165,708	$42,392,318	1,888	$170,829	$46,851	$70,841
LA	1,627,262	$6,852,194	547	$26,826	$10,868	$14,438
MS	159,450	$316,490	43	$2,089	$833	$1,073
TX	2,140,382	$9,519,037	688	$40,732	$16,857	$22,725

Source: Estimates of economic impacts calculated by NMFS SERO using model developed for NMFS (2016a).

Commercial fishing vessels that harvest reef fish from the Gulf EEZ must have a Gulf reef fish permit, which is a limited access permit. As of January 16, 2017, a total of 847 vessels have the permit (775 valid and 72 renewable/transferable). Approximately 98% of the permits have the mailing recipient in a Gulf State (Table 3.3.2.5). These vessels combine to make up the federal Gulf reef fish fleet, and any vessel in the fleet must have a vessel monitoring system (VMS) onboard.

Table 3.3.2.5. Number and percentage of vessels with a Gulf reef fish permit by state as of January 16, 2017.

State	Gulf Reef Fish Permits	
	Number	Percent
AL	36	4.3%
FL	673	79.5%
LA	38	4.5%
MS	8	0.9%
TX	76	9.0%
Subtotal	**831**	**98.1%**
Other	16	1.9%
Total	**847**	**100.0%**

Source: NMFS SERO PIMS.

A total of 631 entities (mailing recipients) hold the 847 Gulf reef fish permits. The sizes of their individual reef fish fleets vary from one to 17 vessels (Table 3.3.2.6). Approximately 1% (6) of the entities collectively hold approximately 9% (73) of the 847 permits for the vessels that make up the Gulf reef fish fleet.

Table 3.3.2.6. Number of entities (mailing recipients) and vessels by size of their individual reef fish fleet.

Permitted Vessels in Fleet	Number of Entities	Number of Vessels	Percent of Vessels
1	533	533	62.9%
2	58	116	13.7%
3	23	69	8.1%
4	4	16	1.9%
5	4	20	2.4%
6	1	6	0.7%
7	2	14	1.7%
8	1	8	0.9%
9	5	65	7.7%
Total	**631**	**847**	**100.0%**

Source: NMFS SERO PIMS, January 16, 2017.

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 85º30ˈW. long 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.

Not all of the vessels in the fleet have reef fish landings in any given year. From 2011 through 2015, for example, an annual average of 550 vessels reported reef fish landings (Table 3.3.2.7). That average represents approximately 65% of the current size of the fleet. The average vessel landed 25,786 lbs gutted weight (gw) of reef fish annually with a dockside value of $96,723 (2015 $) and the average trip with reef fish landed 2,146 lbs gw of species within the fishery with a dockside value of $8,037 (Table 3.3.2.8).

Table 3.3.2.7. Number of vessels, trips, and total and average annual reef fish landings (lbs gw), 2010-2015.

Year	Number		Reef Fish Landings (lbs gw)		
	Vessels	Trips	Total	Average per Vessel	Average per Trip
2010	577	5,981	10,337,462	17,916	1,728
2011	561	6,539	13,343,057	23,784	2,041
2012	554	6,593	13,983,672	25,241	2,121
2013	531	6,287	13,626,126	25,661	2,167
2014	574	6,968	15,438,913	26,897	2,216
2015	532	6,659	14,548,652	27,347	2,185
Average 2010-14	**559**	**6,474**	**13,345,846**	**23,900**	**2,055**
Average 2011-15	**550**	**6,609**	**14,188,084**	**25,786**	**2,146**

Source: SEFSC Online Economic Query System, January 18, 2017.

Table 3.3.2.8. Number of vessels, trips, and total and average annual dockside revenue (2015 $) from reef fish landings, 2010-2015.

Year	Number		Dockside revenue from reef fish (2015 $)		
	Vessels	Trips	Total	Average per vessel	Average per trip
2010	571	5,981	$34,262,980	$60,005	$5,729
2011	561	6,539	$44,733,134	$79,738	$6,841
2012	554	6,593	$49,114,620	$88,655	$7,450
2013	531	6,287	$52,266,235	$98,430	$8,313
2014	574	6,968	$60,254,917	$104,974	$8,647
2015	532	6,659	$59,486,917	$111,818	$8,933
Average 2010-14	**558**	**6,474**	**$48,126,377**	**$86,360**	**$7,396**
Average 2011-15	**550**	**6,609**	**$53,171,165**	**$96,723**	**$8,037**

Source: SEFSC Online Economic Query System, January 18, 2017, for nominal revenue and BEA for GDP deflator.

Dockside revenue from landings of reef fish accounts for approximately 5.6% of the dockside revenue from all landings in the Gulf region (Table 3.3.2.9). In 2014, for example, total dockside revenue from all landings of all species was approximately $1.0 billion reef fish was approximately $59.1 million (2015 dollars).

Table 3.3.2.9. Total dockside revenue from Gulf reef fish landings and all Gulf landings.

Year	Dockside Value (2015$)		Percent Reef Fish
	Reef Fish	All	
2010	$34,262,980	$678,791,000	5.0%
2011	$44,733,134	$864,457,000	5.2%
2012	$49,114,620	$779,734,000	6.3%
2013	$52,266,235	$970,869,000	5.4%
2014	$60,254,917	$1,038,936,000	5.8%
Average	**48,126,377**	**866,557,400**	**5.5%**

Source: SEFSC Online Economic Query System, January 18, 2017, for nominal revenue from reef fish landings, 2014 FEUS for nominal dockside revenue from all Gulf landings, and BEA for GDP deflator.

Vermilion snapper is one of the species in the reef fish fishery, and the actions of this amendment concern fishing for vermilion snapper only. Consequently, the remainder of this section focuses exclusively on commercial fishing for vermilion snapper.

Vermilion Snapper

The stock ACL for vermilion snapper is and has been 3.42 mp ww since 2012. Combined annual commercial and recreational landings have been less than the stock ACL (Table 3.3.2.10). A preliminary estimate of 2016 landings includes recreational landings of approximately 1.01 million as of October 31 that year. At that 10-month rate, it is estimated that approximately 1.22 mp ww of vermilion snapper would have been landed by anglers and a combined 2.79 mp ww of vermilion snapper would have been landed in 2016.

Table 3.3.2.10. Stock ACL and landings for vermilion snapper, 2012-2016.

Year	Pounds ww				Percent ACL
	ACL	Annual Landings			
		Recreational	Commercial	Stock	
2012	3,420,000	756,052	2,410,891	3,166,943	92.6%
2013	3,420,000	1,118,790	1,418,401	2,537,191	74.2%
2014	3,420,000	1,160,951	1,759,141	2,920,092	85.4%
2015	3,420,000	886,587	1,396,545	2,283,132	66.8%
2016 (preliminary)	3,420,000	1,013,800	1,577,160	2,590,960	75.8%

Source: NMFS SERO Stock ACL online for ACL and sector landings as of March 7, 2017.

The fishing season/year for vermilion snapper begins January 1 and ends on December 31 each year. However, if combined landings reach or are projected to reach the stock ACL, the fishing seasons for both the recreational and commercial sectors are closed early. Since 2012, when this in-season closure provision was put in place, there have been no early closures.

From 2011 through 2015, an annual average of 339 vessels had vermilion snapper landings (Table 3.3.2.11). That average represents approximately 62% of the average 550 vessels with annual reef fish landings and 40% of the 847 vessels currently in the Gulf reef fish fleet. During the same 5-year period, the average of those 339 vessels landed 4,923 lbs gw of vermilion snapper annually with a dockside value of $15,543 (2015 $). The average trip with vermilion snapper landed 628 lbs gw of species with a dockside value of $1,984 (Table 3.3.2.12).

Table 3.3.2.11. Number of vessels, trips, and total and average vermilion snapper landings (lbs gw), 2010-2015.

Year	Number		Commercial vermilion snapper landings (lbs gw)		
	Vessels	Trips	Total	Average per vessel	Average per trip
2010	320	2,093	1,734,852	5,421	829
2011	342	2,737	2,596,301	7,592	949
2012	342	2,817	2,029,275	5,934	720
2013	315	2,392	1,164,105	3,696	487
2014	347	2,677	1,407,221	4,055	526
2015	351	2,568	1,172,468	3,340	457
Average 2010-14	**333**	**2,543**	**1,786,351**	**5,339**	**702**
Average 2011-15	**339**	**2,638**	**1,673,874**	**4,923**	**628**

Source: SEFSC Online Economic Query System, January 18, 2017.

Table 3.3.2.12. Number of vessels, trips, and total and average annual dockside revenue (2015 $) from vermilion snapper landings, 2010-2015.

Year	Number		Dockside Revenue from vermilion snapper (2015 $)		
	Vessels	Trips	Total	Average per vessel	Average per trip
2010	320	2,093	$5,011,127	$15,660	$2,394
2011	342	2,737	$7,899,809	$23,099	$2,886
2012	342	2,817	$6,353,541	$18,578	$2,255
2013	315	2,392	$3,745,145	$11,889	$1,566
2014	347	2,677	$4,346,003	$12,525	$1,623
2015	351	2,568	$4,080,313	$11,625	$1,589
Average 2010-14	**333**	**2,543**	**$5,471,125**	**$16,350**	**$2,145**
Average 2011-15	**339**	**2,638**	**$5,284,962**	**$15,543**	**$1,984**

Source: SEFSC Online Economic Query System, January 18, 2017, and BEA for GDP deflator.

Dockside revenue from landings of vermilion snapper generates economic impacts to the nation in the form of jobs, income, sales and value-added impacts. The $5.28 million annual average of dockside revenue from 2011 through 2015 supports 716 jobs and generates approximately $19.2 million in income impacts, $27.2 million in value-added impacts, and $52.4 million in sales impacts (Table 3.3.2.13).

Table 3.3.2.13. Economic impacts of commercial vermilion snapper landings.

Average Annual Dockside Revenue from Vermilion Snapper Landings	Jobs	Impacts (Thousands 2015 $)		
		Income	Value added	Sales
$5,471,125	742	$19,925	$28,151	$54,256
$5,284,962	716	$19,247	$27,193	$52,410

Source: Estimates calculated by NMFS SERO using model developed for NMFS (2016).

Approximately two-thirds of the Gulf's annual commercial landings of vermilion snapper are landed in Florida (Table 3.3.2.14). Texas ranks second.

Table 3.3.2.14. Commercial landings (lbs gw) of vermilion snapper by state, 2010-2015.

Year	Commercial landings (lbs gw) of Gulf vermilion snapper						
	AL	FL	LA	MS	TX	Total	Percent FL
2010	102,401	1,056,157	163,536	124	412,634	1,734,852	60.9%
2011	177,684	1,825,098	179,134	818	415,590	2,598,324	70.2%
2012	110,781	1,262,292	223,526	258	432,418	2,029,275	62.2%
2013	15,621	839,614	149,379	756	158,734	1,164,104	72.1%
2014	89,522	999,447	197,431	434	121,307	1,408,141	71.0%
2015	64,866	667,621	215,220	1,128	248,863	1,197,698	55.7%
Average 2010-14	99,202	1,196,522	182,601	478	308,137	1,786,939	67.3%
Average 2011-15	91,695	1,118,814	192,938	679	275,382	1,679,508	66.3%

Source: SEFSC Online Economic Query System, January 18, 2017.

Florida accounts for approximately two-thirds of the dockside revenues from all Gulf landings of the vermilion snapper (Table 3.3.2.15). Texas ranks second.

Table 3.3.2.15. Dockside revenue (2015 $) from Gulf vermilion snapper landings by state, 2010-2015.

Year	Dockside revenue from Gulf vermilion snapper landings (2015 $)						
	AL	FL	LA	MS	TX	Total	Percent FL
2010	$321,950	$3,030,018	$423,826	$380	$1,234,976	$5,011,151	60.5%
2011	$584,562	$5,508,211	$467,982	$2,153	$1,343,662	$7,906,569	69.7%
2012	$381,336	$3,956,939	$602,796	$507	$1,411,996	$6,353,574	62.3%
2013	$55,443	$2,711,616	$468,426	$1,556	$508,118	$3,745,159	72.4%
2014	$313,515	$2,992,895	$638,820	$879	$402,727	$4,348,836	68.8%
2015	$241,509	$1,997,982	$700,578	$2,266	$829,487	$3,771,822	53.0%
Ave. 2010-14	$331,361	$3,639,936	$520,370	$1,095	$980,296	$5,473,058	66.7%
Ave. 2011-15	$315,273	$3,433,529	$575,720	$1,472	$899,198	$5,225,192	65.2%

Source: SEFSC Online Economic Query System, January 18, 2017, and BEA for GDP deflator.

A large majority of Gulf vermilion snapper are harvested with hook and line gear. From 2011 through 2015, approximately 92% of commercial landings (lbs gw) of the species were by hook-and-line gear (Table 3.3.2.16).

Table 3.3.2.16. Percentage of annual commercial landings of Gulf vermilion snapper by gear, 2010-2015.

Year	Percentage of commercial landings (lbs gw)					
	Hook & Line	**Rod & Reel**	**Longline**	**By Hand, Other**	**Others**	**Total**
2010	89.2%	10.6%	0.1%	0.0%	0.0%	100.0%
2011	89.1%	10.7%	0.2%	0.0%	0.0%	100.0%
2012	89.4%	10.3%	0.1%	0.1%	0.1%	100.0%
2013	96.8%	3.0%	0.1%	0.0%	0.0%	100.0%
2014	94.4%	5.1%	0.2%	0.2%	0.0%	100.0%
2015	88.1%	11.6%	0.3%	0.1%	0.0%	100.0%
Average 2010-14	**91.8%**	**7.9%**	**0.2%**	**0.1%**	**0.0%**	**100.0%**
Average 2011-15	**91.6%**	**8.1%**	**0.2%**	**0.1%**	**0.0%**	**100.0%**

Source: SEFSC Online Economic Query System, January 25, 2017.

Rod and reel is the second most popular gear used, and when its percentage is combined with hook-and-line, the two gears account for almost all commercial landings of vermilion snapper. Use of bottom longline gear is limited to those vessels with a valid Eastern Gulf longline endorsement. Moreover, use of bottom longline is prohibited in McGrail Bank year-round and from June through August each year in the portion of the Gulf EEZ east of 85º30´W. longitude. Within that area from January through May and September through December, a bottom longline vessel cannot possess more than 1,000 hooks on board and hooks being fished and cannot possess more than 750 hooks rigged for fishing at any given time. Moreover, the use of longline or buoy gear for reef fish is prohibited inside 50 fathoms west of Cape San Blas, Florida. East of Cape San Blas, the use of longlines and buoy gear for reef fish is prohibited inside of 20 fathoms year-round and 35 fathoms during the months of June through August. Vessels fishing within this zone and possessing longlines or buoy gear may not exceed the recreational bag limit for vermilion snapper, which is 10 per person within the 20-reef fish aggregate bag limit.

3.4 Description of the Social Environment

This section includes a description of the recreational and commercial portions of the vermilion snapper components of the reef fish fishery. The description is based on the geographical distribution of landings and the relative importance of vermilion snapper for commercial and recreational communities. A spatial approach enables the consideration of fishing communities and consideration of the importance of fishery resources to those communities, as required by National Standard 8.

Socio-cultural values are qualitative in nature making it difficult to measure social valuation of marine resources and fishing activity. The following description includes multiple approaches to examining fishing importance. These spatial approaches focus on the community level (based on the address of dealers or permit holders) and identify importance by “community”, defined according to geo-political boundaries (census designated places). A single county may thus have several communities identified as reliant on fishing, and the boundaries of these communities are not discrete in terms of residence, vessel homeport, and dealer address. For example, a commercial fisherman may reside in one community, homeport his vessel in another, and land his catch in yet another. Furthermore, while commercial fishing landings are available at the community level, these data are not available for recreational fishing which must be addressed more generally. Despite these caveats, the analysis identifies where most fishing activity takes place.

Recreational Fishing

To identify the communities of greatest engagement in recreational fishing, a factor analysis was run on a set of predictor variables including the number of federal charter permits, number of vessels designated recreational by owner address, number of vessels designated recreational by homeport (SERO permit office 2016), and recreational fishing infrastructure (Marine Recreational Information Program (MRIP) site survey 2010). The 10 communities in the Gulf region with the highest factor scores are identified in Figure 3.4.1 as the communities of highest recreational fishing engagement. The ranking addresses recreational fishing generally and is not specific to vermilion snapper, because recreational landings are not recorded at the community level. Communities in the Florida Keys were not included in this ranking as they do not have substantial vermilion snapper landings.

Destin, Florida and Orange Beach, Alabama are far above other communities in terms of recreational fishing engagement and have been since 2003 through 2014 (Figure 3.4.1). Orange Beach was ranked equal with Destin in 2003, but has since declined in its engagement score but has remained higher than most other Gulf communities. The rest of the communities have engagement scores that have been relatively stable over time.

To identify those communities that are more reliant upon recreational fishing the same variables used for engagement are used for reliance but are divided by the community population. Recreational fishing reliance is a relative measure (Figure 3.4.2). These communities are usually smaller in population size than the communities included in the Figure 3.4.1. Venice, Louisiana is substantially more reliant than most other communities in Figure 3.4.2, and saw a significant drop after 2003, but a steady rise in reliance since 2009. Most other communities show a rather stable but slight increase over time. The jump in reliance in 2007 that most communities demonstrate for both graphics is likely due to anomalies with the permit system and not indicative of any significant change.

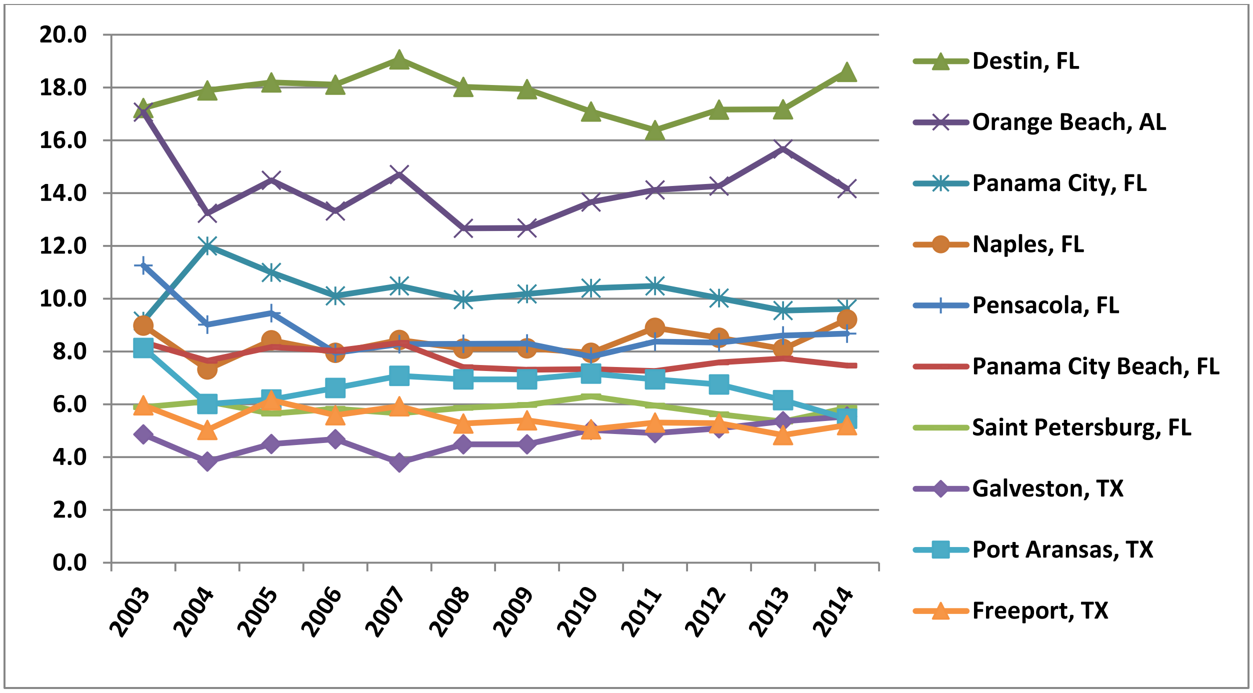

Figure 3.4.1. Recreational engagement for top 10 Gulf communities 2003-2014.
Source: SERO Social Indicators Database 2016.

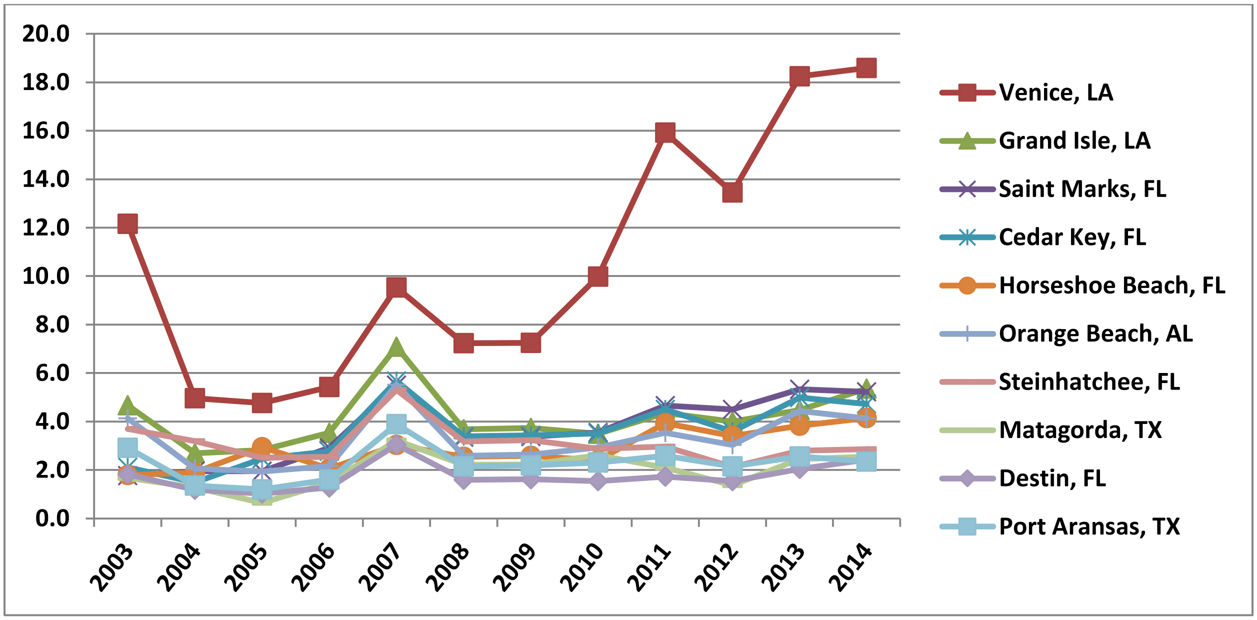

Figure 3.4.2. Recreational reliance for top 10 Gulf communities 2003-2014.
Source: SERO Social Indicators Database 2016.

Ideally, additional variables quantifying the importance of vermilion snapper fishing to a community would be included (such as the amount of recreational landings in a community, number of recreational fishing related businesses, etc.); however, these data are not available at this time.

Commercial Fishing

To capture commercial dependence on vermilion snapper the regional quotient (RQ) is one measure at the community level that is species specific. The RQ is a way to measure the relative importance of a particular species within a community among all landings in the region. The RQ is calculated by dividing the total pounds (or value) of landings of a given species in a community by the total pounds (or value) of the given species for that region. Thus, the RQ represents the proportion of landings of a given species among all communities in the region. The data used for the RQ measure were assembled from the accumulated landings system (ALS) which includes landings of all species from both state and federal waters and is based on dealers' reports. These measures are an attempt to quantify the importance of vermilion snapper to communities around the Gulf and suggest where impacts from management actions are more likely to be experienced. The proportional values for the y-axis are not provided to ensure confidentiality.

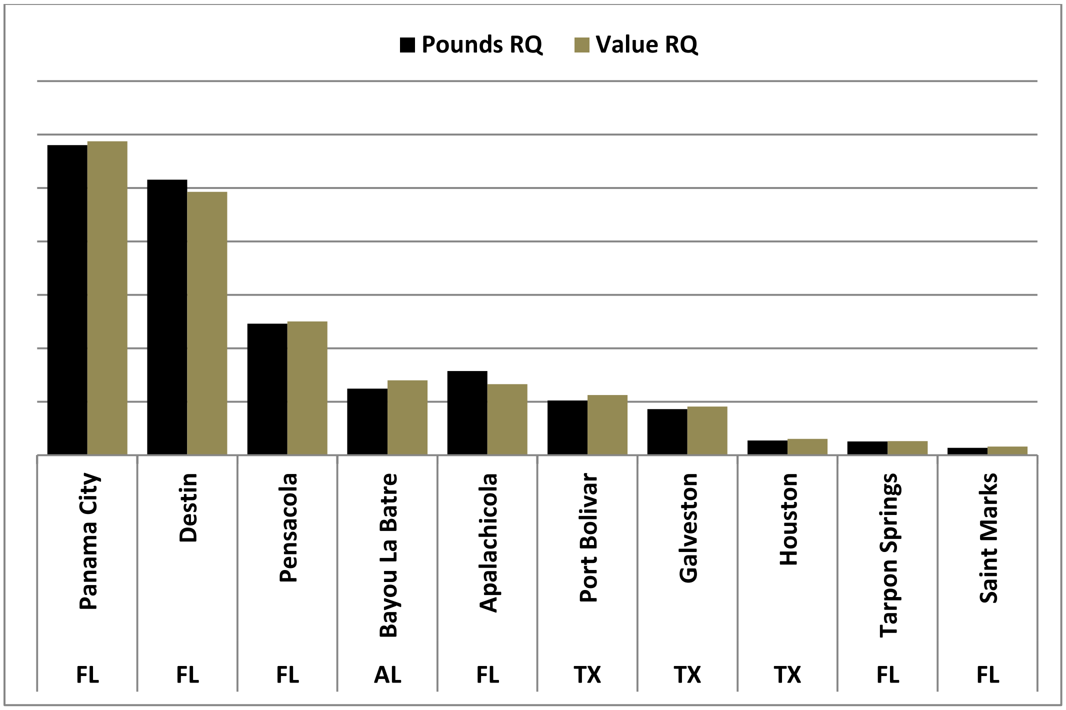

Figure 3.4.3. Vermilion snapper 2014 pounds and value regional quotient (RQ) for top 10 commercial communities.
Source: SERO ALS 2014.

Many of the same communities that were engaged or reliant recreational fishing communities are also important commercial fishing communities (Figure 3.4.3). Panama City and Destin, Florida have the highest RQs for both pounds and value by a large margin with the other communities represented in the top 10 being in Florida, Alabama, and Texas. Bayou La Batre and Port Bolivar are the leading communities outside of Florida, respectively.

If RQ is tracked over time (Figure 3.4.4) the same top two communities show a substantial rise in RQ, while Pensacola demonstrates a decline in RQ over time. Galveston, Texas has an increase in its RQ up to 2007 then sees a decline to 2014. Other communities like Apalachicola have seen a rise in its RQ since 2009, as did Port Bolivar which has seen a more recent decline.

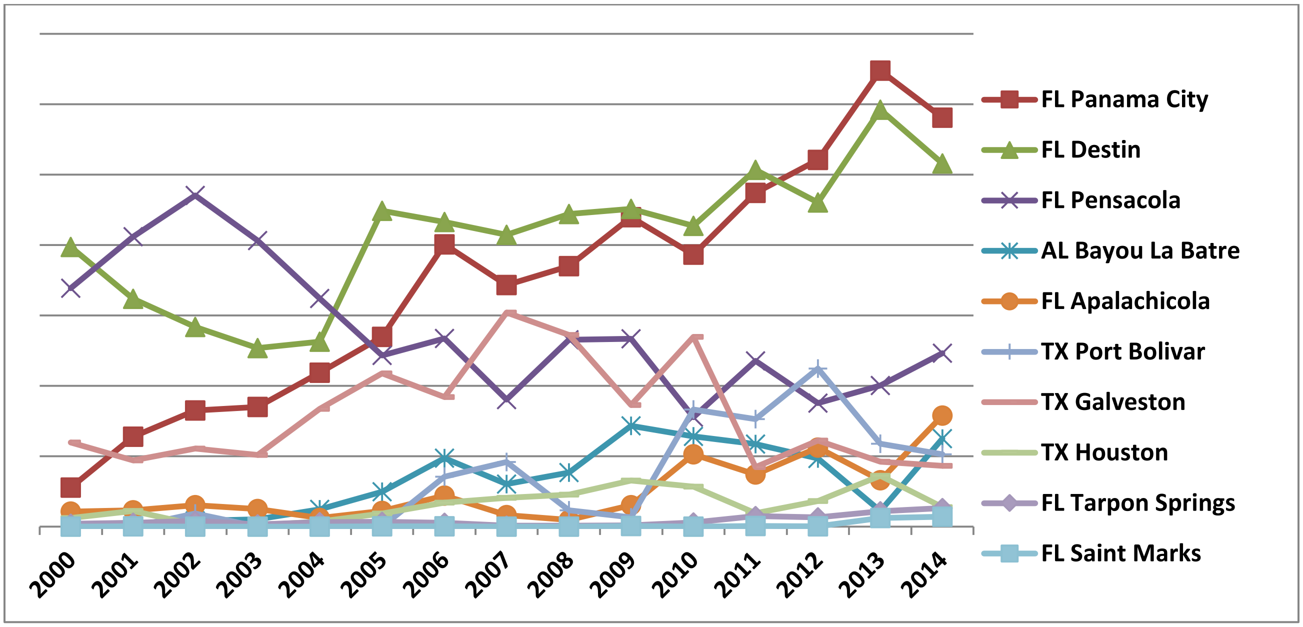

Figure 3.4.4. Vermilion snapper regional quotient pounds for top 10 commercial communities for 2000-2014.
Source: SERO ALS 2000-2014.

Vermilion snapper is landed throughout the Gulf although commercial landings are greatest in the Florida Panhandle, Alabama, and Texas. Commercial landings have been higher since the red snapper individual fishing quota (IFQ) program was implemented in 2007. Some commercial fishermen who did not receive red snapper IFQ shares have likely shifted effort toward vermilion snapper since the implementation of the IFQ program and that may be responsible for some of the substantial shifts in landings within a community.

3.4.1 Environmental Justice (EJ)

To evaluate environmental justice concerns for the proposed action, a suite of indices was created to examine the social vulnerability of coastal communities and is depicted in Figure 3.4.5. The three indices are poverty, population composition, and social disruptions. The variables included in each of these indices have been identified through the literature as being important components that contribute to a community's vulnerability. Indicators such as increased poverty rates for different groups, more single female-headed households, and households with children under the age of 5 are included, along with personal disruptions such as higher marital separation rates, higher crime rates, and unemployment, all of which may indicate populations experiencing vulnerabilities. These vulnerabilities signify that it may be difficult for someone living in these communities to recover from significant social disruption that might stem from a change in their ability to work or maintain a certain income level. These vulnerabilities are community-wide and are not specific to fishermen or the fishing infrastructure within a community.

The communities selected for Figure 3.4.5 represent those that were often highest in their engagement or reliance with regard to either commercial or recreational fishing and may have fishermen who target vermilion snapper. The majority of communities show few vulnerabilities with only Bayou La Batre, Alabama exceeding both thresholds for all three indices. Three communities exceed the highest threshold for poverty only, while three other communities exceed the lower threshold for poverty and personal disruption. While these communities exhibit some vulnerability it is unlikely that they are sufficient to point to any environmental justice issues within. However, it is those communities that exhibit the highest vulnerabilities that may have a more difficult recovery from negative effects of a regulatory action. That may occur if the community were highly engaged in commercial and recreational fishing, dependent upon vermilion snapper, and are highly vulnerable.

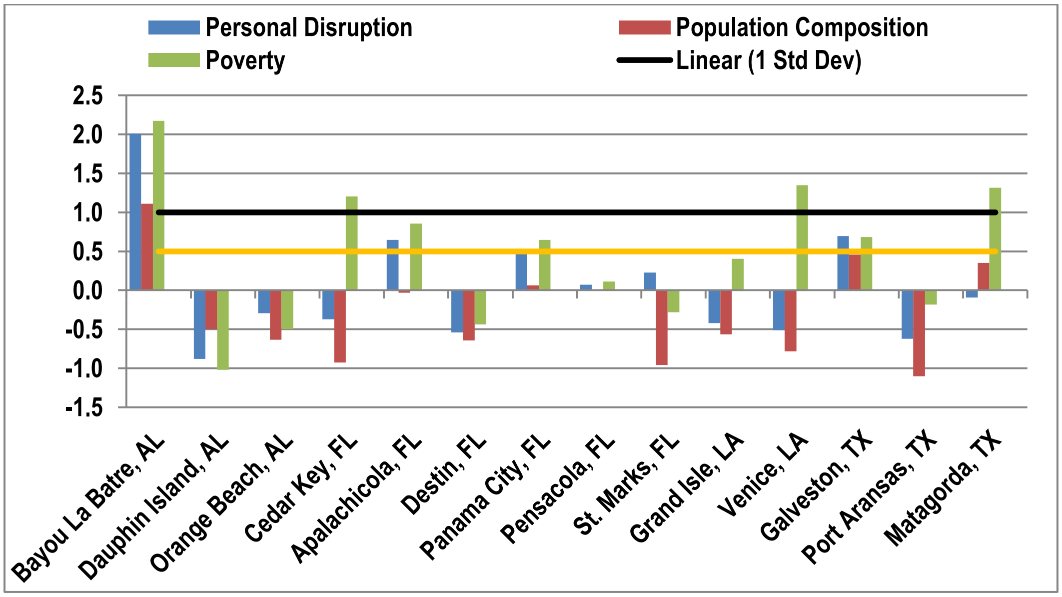

Figure 3.4.5. Social vulnerability indices for selected commercial and recreational fishing communities.
Source: SERO Social Indicators Database 2016.

Information on the race and income status for groups at the different participation levels (for-hire captains and crew, and employees of associated support industries, etc.) is not available. As discussed in Sections 4.1.4 and 4.2.4, any effects from the actions in this amendment are expected to be indirect and minimal. Further, the actions in this amendment would not affect commercial or recreational fishing participants differently based on race, ethnicity, or income status. Thus, disproportionate impacts to EJ populations are not expected to result from any of the actions in this amendment. Nevertheless, the lack of impacts on EJ populations cannot be assumed. Finally, there is no known subsistence consumption of vermilion snapper, nor are there any claims to customary subsistence consumption of vermilion snapper by any indigenous or tribal group in the Gulf.

3.5 Description of the Administrative Environment

3.5.1 Federal Fishery Management

Federal fishery management is conducted under the authority of the Magnuson-Stevens Fishery Conservation and Management Act (Magnuson-Stevens Act) (16 U.S.C. 1801 *et seq*.), 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 exclusive economic zone, 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 exclusive economic zone.

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 Gulf of Mexico Fishery Management Council (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 the National Oceanic and Atmospheric Administration's (NOAA) 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 Advisory Panel (LEAP) and the Gulf States Marine Fisheries Commission's Law Enforcement Committee, which have developed joint enforcement agreements and cooperative enforcement programs (www.gsmfc.org).

Reef fish stocks are assessed through the Southeast Data Assessment and Review (SEDAR) process. As species are assessed, stock condition and ABCs 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.

3.5.2 State Fishery Management

The purpose of state representation at the Council level is to ensure state participation in federal fishery management decision-making and to promote the development of compatible regulations in state and federal waters. The state governments of Texas, Louisiana, Mississippi, Alabama, and Florida have the authority to manage their respective state fisheries. Each of the five Gulf states exercises legislative and regulatory authority over their states' natural resources through discrete administrative units. Although each agency is the primary administrative body with respect to the states natural resources, all states cooperate with numerous state and federal regulatory agencies when managing marine resources. A more detailed description of each state's primary regulatory agency for marine resources is provided on their respective Web pages (Table 3.5.2.1).

Table 3.5.2.1. Gulf of Mexico 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) Proxy

4.1.1 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. The action does not affect the gear used and therefore has no direct impacts on the physical environment. However, the selection of a proxy for maximum sustainable yield (MSY) partly determines the acceptable biologic catch (ABC) which can affect the level of fishing activity. A more conservative (lower) MSY proxy would likely result in a lower ABC and less 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 effort would have a greater negative impact on the physical environment.

Alternative 1, no action, would leave in place the guidance from Amendment 23 to use the model generated estimate of MSY rather than a proxy. Table 4.1.1.1 shows that the most recent estimate of the fishing mortality rate estimated for F_{MSY} = 0.76. (SEDAR 9 2006). This fishing mortality rate is 7 times greater than **Alternative 2**, resulting in greater negative impacts to the physical environments. **Alternative 1** also results in a fishing mortality rate greater than other proxies that are discussed but considered unsuitable for management (see Section 2.1 for a discussion of proxies including those considered not suitable for management).

Alternative 2 would set an MSY proxy based on 30% SPR. Table 4.1.1.1 shows that the most recent estimate of the fishing mortality rate estimated for $F_{30\%\ SPR}$ = 0.106. (SEDAR 45 2016). This proxy is more conservative that the status quo, and will likely result in less fishing effort and less negative impact to the physical environment. This proxy is within the range of alternative proxies that are discussed in Section 2.1 but considered not suitable for management (Table 4.1.1.1).

Table 4.1.1.1. MFMT and MSST under various MSY proxy alternatives.

	Alt. 1	Alt. 2	F_{MAX} Age 3 selectivity	F_{MAX} Age 4 selectivity	F_{CMAX}
MSY proxy	none	Yield at 30% SPR	Maximum yield-per-recruit with knife-edge selectivity at age 3	Maximum yield-per-recruit with knife-edge selectivity at age 4	Maximum yield-per-recruit under prevailing conditions
MFMT	F_{MSY} = 0.76 (SEDAR 9)	$F_{30\%\ SPR}$ = 0.103 (SEDAR 45)	F_{MAX-3} = 0.081 = $F_{13\%\ SPR}$ (SEDAR 45)	F_{MAX-4} = 0.069 = $F_{20\%\ SPR}$ (SEDAR 45)	F_{CMAX} = 0.246 = $F_{12\%\ SPR}$ (SEDAR 45)
SSB_{Proxy}	SSB_{MSY} = 52.7 trillion eggs (SEDAR Update 2011)	$SSB_{30\%\ SPR}$ = 197 trillion eggs (SEDAR 45)	SSB_{MAX-3} = 86.6? trillion eggs (SEDAR 45)	SSB_{MAX-4} = 130.3 trillion eggs (SEDAR 45)	SSB_{CMAX} = 81.4 trillion eggs (SEDAR 45)

4.1.2 Direct and Indirect Effects on the Biological Environment

Direct and indirect effects from fishery management actions for vermilion snapper have been discussed in detail in Reef Fish Amendments 12, 14, and 23 (GMFMC 1995, 1997, 2004a), as well as in 2007 and 2013 framework actions (GMFMC 2007, 2013) and are incorporated here by reference. 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 types 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. These impacts may include recruitment failure and reduced fish health.

Fishing can affect life history characteristics of reef fish such as growth and maturation rates. For example, Hood and Johnson (1999) found that the average size-at-age of vermilion snapper from the eastern Gulf of Mexico (Gulf) captured in 1995-1996 was smaller than that captured in studies occurring in the 1980s. Although this might reflect regional differences in growth (eastern versus western Gulf – see Lombard et al. 2015), Hood and Johnson (1999) suggested this change could also be caused by increasing fishing pressure. If larger fish are more vulnerable to capture, then faster-growing fish within an age-class would be selectively removed from the population, thus depressing the mean size-at-age for older fish. This same trend was noted by Zhao et al. (1997) for vermilion snapper in the South Atlantic Bight and was also attributed to increased fishing pressure. In addition, both Zhao et al. (1997) and Hood and Johnson (1999) noted earlier sizes of maturation for South Atlantic and Gulf of Mexico (Gulf) vermilion snapper populations over time and speculated this change also could be due to increases in fishing effort.

Establishing a proxy for MSY should not directly affect the biological/ecological environment because it simply provides fishery managers with a defined harvest threshold to consider in developing fishery management measures. Managers use this measure in part to evaluate whether the stock removal (fishing) and fishing mortality rates are within desirable ranges. Therefore, **Alternatives 1** and **2** should have no direct effect on the biological/ecological environment. However, specifying this value would indirectly affect the biological/ecological environment by defining the future level of harvest that would be used to 1) reduce the likelihood of overfishing occurring and 2) sustain the stock over the long term in accordance with the national standard guidelines. **Alternative 1** (MSY) would have a higher maximum fishing mortality threshold (MFMT) and lower minimum stock size thresholds (MSST) when compared to **Alternative 2** (MSY proxy; see Table 2.1.1). Thus, **Alternative 1** would provide fewer benefits to the vermilion snapper stock as it could lead to a greater fishing rate and maintain a smaller stock size when compared to **Alternative 2**.

The relationships among species in marine ecosystems are complex and poorly understood, making the nature and magnitude of ecological effects difficult to predict with any accuracy. The most recent vermilion stock assessment (SEDAR 45 2016) indicated the Gulf stock is not overfished and not experiencing overfishing. It is possible that forage species and competitor species could increase or decrease in abundance in response to a decrease or increase in vermilion snapper abundance. This action, regardless of the alternative, should not directly affect vermilion snapper abundance in the near term, thus any effects on forage species and competitor species would not likely be different from no action. Although birds, dolphins, and other predators may feed on vermilion snapper discards, there is no evidence that any of these species rely on vermilion snapper discards for food. Changes in the prosecution of the reef fish fishery are not expected from this action, so no additional effects to protected resources (see Section 3.3.1) are anticipated.

4.1.3 Direct and Indirect Effects on the Economic Environment

This action considers using a proxy for vermilion snapper MSY. **Alternative 1** (No Action) would continue to use the MSY estimated by the assessment model, while **Alternative 2** would use the yield when fishing at $F_{30\%\ SPR}$ as the MSY proxy. While the decision to use a proxy for MSY is not expected to result in direct economic effects, indirect economic effects would be anticipated. If the use of a MSY proxy provides a more accurate estimate for overfishing limit (OFL) and ABC than the MSY estimate, then biological benefits would be observed in the fish stock, and these biological benefits would translate to indirect economic benefits. While these indirect economic effects cannot be quantified, **Alternative 2** is expected to yield greater economic benefits than **Alternative 1**, as better protection of the stock would provide long-term benefits from higher or more stable catch limits.

4.1.4 Direct and Indirect Effects on the Social Environment

Additional effects would not be expected from retaining **Alternative 1**, and MSY for vermilion snapper would not be changed. Some effects would be expected from **Alternative 2**, which defines a more conservative estimate for MSY. The method for setting MSY, and whether or not a proxy is used, does not result in direct effects on the social environment, as fishing activity and behavior are not directly affected. However, changes in how MSY is defined can result in indirect effects should other catch levels projected from MSY, such as OFL, ABC, and ACL, be required to change. Selecting a more conservative MSY (**Alternative 2**) will necessitate lowering the values of these other catch limits resulting in indirect effects from these lower catch limits; these indirect effects are discussed in Section 4.2.4.

4.1.5 Direct and Indirect Effects on the Administrative Environment

The setting of status determination criteria is an administrative action and will have effects on the administrative environment through additional rulemaking (direct effect), addressing overfished and overfishing conditions (direct effect), and monitoring the harvest (indirect effect). Because **Alternatives 1** and **2** would not require rulemaking, there would not be any immediate effect on the administrative environment from rulemaking. However, the Magnuson-Stevens Fishery Conservation and Management Act (Magnuson-Stevens Act) requires the National Marine Fisheries Service (NMFS) to end overfishing as soon as possible and develop rebuilding plans for stocks considered overfished. Alternatives that have a higher degree of likelihood of determining if the vermilion snapper stock is overfished or undergoing overfishing would be expected to result in further action to correct these conditions. Because the MSY proxy in **Alternative 2** is more conservative than MSY (**Alternative 1**), the probability of fishing mortality rate (F) exceeding the MFMT and the spawning stock biomass falling below the MSST are greater (Table 2.1.1). Therefore, this alternative would adversely affect the administrative environment more than **Alternative 1** as the likelihood of needing to take corrective action is greater.

Indirect effects of status determination criteria require monitoring of the harvests and evaluating the stock condition through stock assessments. Regardless of which alternative is selected as preferred, these management activities need to continue. Therefore, the indirect effects from each alternative should be similar.

4.2 Action 2: Annual Catch Limit (ACL)

4.2.1 Direct and Indirect Effects on the Physical Environment

The annual catch limit (ACL) does not affect the gear used and therefore has no direct impacts on the physical environment. However, changes to the ACL can affect the amount of fishing effort, which could result in indirect effects. A smaller ACL would result in less fishing effort and less gear interaction with the physical habitat, which would be beneficial to the environment. The reverse would occur for a larger ACL. Therefore, alternatives that allow higher ACLs and greater fishing effort would have a greater negative impact on the physical environment.

Alternative 1, no action, would leave the ACL at the existing level of 3.42 million pounds whole weight. This ABC was originally recommended by the Science and Statistical Committee (SSC) in July 2010 using Tier 3a of the ABC control rule, and was subsequently adopted as the ACL for 2012 in the Generic ACL/AM Amendment (GMFMC 2011a). The ABC was set at one standard deviation above the mean landings of vermilion snapper during the years 1999-2008. The Environmental Assessment for the Generic ACL/AM Amendment concluded that, because this ACL was based on existing catch levels, this specification of ACL should not cause direct or indirect effects. However, subsequent management actions developed to adhere to the ACL could vary the fishing effort, which might have slight effects on the physical environment.

Alternative 2 would set an annual ACL initially at 3.21 mp ww in 2017, and then gradually reduce it each subsequent year until it reached 3.03 mp ww in 2021. All of these ACLs are less than the status quo, so **Alternative 2** would have slightly greater positive benefits to the physical environment that **Alternative 1**. There are two options for setting ACL after 2021 if there is no new ABC projection. **Option 2a** would keep the 2021 ACL of 3.03 mp ww indefinitely until a new ACL is established. **Option 2b** would reduce the ABC of 2.98 mp ww and keep it at that level indefinitely until a new ACL is established. Both options would result in less fishing effort and greater positive benefits to the physical environment than **Alternative 1**. **Option 2b** would result in slightly greater long-term positive benefits to the physical environment than **Option 2a**, but given that these ACLs are very close, any difference in effects is not likely to be meaningful.

Alternative 3 would set a constant catch ACL at 3.11 mp ww for the years 2017 through 2021. During 2017 and 2018, this would be a slightly lower ACL than **Alternative 2** and would result in slightly greater positive benefits to the physical environment. For the years 2019 through 2021, the **Alternative 3** ACL would be slightly higher than **Alternative 2**, and would result in slightly less positive benefits than **Alternative 2**, although it would continue to have greater benefits than **Alternative 1**. Over the five-year period of 2017 through 2021, the aggregate catch would be the same, suggesting that the physical impacts of **Alternative 2** vs. **Alternative 3** would be the same overall for that period. **Alternative 3** has two options for setting ACL after 2021 if there is no new ABC projection. **Option 3a** would keep the constant catch ACL of 3.11 mp ww indefinitely until a new ACL is established. **Option 3b** would reduce the ABC of 2.98 mp ww and keep it at that level indefinitely until a new ACL is established. Both options would result in less fishing effort and greater positive benefits to the physical environment than **Alternative 1**, although **Option 2a** would result in slightly greater benefits than **Option 3a**. **Option 3b** would result in slightly greater long-term positive benefits to the physical environment than **Option 3a**, but given that these ACLs are very close, any difference in effects is not likely to be meaningful. **Option 2 b** and **3b** are identical and would have the same impact on the physical environment.

Alternative 4 would set a constant catch ACL at 2.98 mp ww for all years from 2017 onward. During the years 2017 through 2021 this is the lowest ACL and would result in the lowest fishing effort and greatest benefits to the physical environment. The benefits from **Alternative 4** would continue to be greater than all of the other alternatives except for **Options 2b** and **3b** for which the effects would be identical.

Overall, **Alternative 1** provides the greatest negative impacts to the physical environment, followed in order of decreasing negative impacts by **Option 3a**, **Option 2a**, **Options 2b** and **3b**, and **Alternative 4**. It should be noted that all of these are indirect effects, and there is only a small difference in largest ACL (3.42 mp ww) and the smallest ACL (2.98 mp ww). Therefore, all of these indirect effects are expected to be minor.

4.2.2 Direct and Indirect Effects on the Biological Environment

Establishing ACLs for vermilion snapper should not directly affect the biological/ecological environment, as described in Section 4.1.2, because ACLs simply provide fishery managers with defined harvest levels to consider in developing fishery management measures. Managers use ACLs in part to evaluate whether the harvest within a year is below or above recommended limits. Therefore, **Alternatives 1-4** should have no direct effect on the biological/ecological environment. However, specifying these values would indirectly affect the biological/ecological environment by defining the future level of harvest that is not to be exceeded.

Over the 2017-2021 time period, **Alternative 4** would provide the lowest harvest limit (Table 4.2.2.1; summed ACL = 14.9 mp ww). This lower limit should reduce the removals of vermilion snapper from the stock more than the other alternatives. **Alternatives 2** and **3** would result in similar but intermediate summed ACLs over the 2017-2021 time period (summed ACL of 15.54 and 15.55 mp ww, respectively). These values are less than the summed 2017-2021 ACLs under **Alternative 1** of 17.10 mp ww. Thus, **Alternative 1** would have a greater adverse effect on the vermilion snapper stock than the other alternatives through greater removals of fish over this time period. If harvests were maintained at this level, the chance of overfishing would be greatest as harvesting at these ACLs are closest to the OFLs. **Alternatives 2-3** are consistent with the ABC recommended by the SSC. Any adverse effects on the stock should these ACLs be exceeded in a given year would likely be minimal as accountability measures would be applied to reduce the likelihood of an overage in the following year. The likelihood of overfishing if the ACL were exceeded would be lowest under **Alternative 4**, and intermediate under **Alternatives 2** and **3** (Table 4.2.2.1).

As explained in Section 4.2.1, **Options 2a, 2b, 3a** and **3b** determine where the ACL should be set after 2021. **Options 2a** and **3a** are greater than **Options 2b** and **3b**, the long-term equilibrium value for both alternatives and so would provide less protection to the stock over time if no further vermilion snapper assessments were to occur. **Option 3a** is greater than **Option 2a**, and so would provide the least protection to the stock of the four options.

Table 4.2.2.1. Proposed vermilion snapper annual catch limits (millions of pounds whole weight) for 2017-2021 as well as the sum of the 2017-2021 annual catch limits for each Action 2 alternative.

Year	**Alternative 1**	**Alternative 2**	**Preferred Alternative 3**	**Alternative 4**
2017	3.42	3.21	3.11	2.98
2018	3.42	3.15	3.11	2.98
2019	3.42	3.10	3.11	2.98
2020	3.42	3.05	3.11	2.98
2021	3.42	3.03	3.11	2.98
Sum 2017-2021	17.1	15.54	15.55	14.9

4.2.3 Direct and Indirect Effects on the Economic Environment

This action considers decreasing the ACL for vermilion snapper from the current ACL. **Alternative 1** (No Action) would retain the current ACL at 3.42 mp ww, while **Alternatives 2-4** would result in reductions. The potential economic impacts of these alternatives are calculated for both the commercial and recreational sectors and are examined individually by sector. Table 4.2.3.1 and Table 4.2.3.2 display, respectively, the expected annual commercial sector and expected annual recreational sector landings under **Alternatives 1-4**; this was calculated using the 65% commercial, 35% recreational split based on the landings by sector during the most recent five years (2011-2015).

Table 4.2.3.1. Expected annual commercial sector landings from the vermilion snapper ACL for 2017-2021 plus 2022 and beyond, under each alternative.

<table>
<tr><th>Year</th><th>Alt 1
No Action</th><th>Alt 2
Constant F</th><th>Alt 3
Constant catch at ave. of 2017-2021</th><th>Alt 4
Constant catch at equilibrium ABC</th></tr>
<tr><td>2017</td><td rowspan="6">2.223 mp</td><td>2.0865 mp</td><td rowspan="5">2.022 mp</td><td rowspan="6">1.937 mp</td></tr>
<tr><td>2018</td><td>2.0475 mp</td></tr>
<tr><td>2019</td><td>2.015 mp</td></tr>
<tr><td>2020</td><td>1.9825 mp</td></tr>
<tr><td>2021</td><td>1.9695 mp</td></tr>
<tr><td>2022+</td><td>1.9695 mp (opt. a)
1.937 mp (opt. b)</td><td>2.022 mp (opt. a)
1.937 mp (opt. b)</td></tr>
</table>

Table 4.2.3.2. Expected annual recreational sector landings from the vermilion snapper ACL for 2017-2021 plus 2022 and beyond, under each alternative.

Year	Alt 1 No Action	Alt 2 Constant F	Alt 3 Constant catch at ave. of 2017-2021	Alt 4 Constant catch at equilibrium ABC
2017	1.197 mp	1.1235 mp	1.0885 mp	1.043 mp
2018		1.1025 mp		
2019		1.085 mp		
2020		1.0675 mp		
2021		1.0605 mp		
2022+		1.0605 mp (opt. a) 1.043 mp (opt. b)	1.0885 mp (opt. a) 1.043 mp (opt. b)	

Table 4.2.3.3 shows the expected annual difference in ex-vessel commercial revenue for the industry between each alternative and **Alternative 1**, in nominal value. The ex-vessel commercial revenue was calculated by multiplying the expected commercial landings from Table 4.2.3.1 by $2.71[3], the average commercial dockside price per pound of vermilion snapper from 2011-2015. Table 4.2.3.4 provides the cumulative expected difference in ex-vessel commercial revenue between each alternative and **Alternative 1**, in nominal value, over the years 2017-2022.

Table 4.2.3.3. Expected annual difference in ex-vessel commercial revenue from the vermilion snapper ACL for 2017-2021 plus 2022 and beyond, between each alternative and Alternative 1, in nominal value.

Year	Alt 1 No Action	Alt 2 Constant F	Alt 3 Constant catch at ave. of 2017-2021	Alt 4 Constant catch at equilibrium ABC
2017	$0	-$369,915	-$546,065	-$775,060
2018		-$475,605		
2019		-$563,680		
2020		-$651,755		
2021		-$686,985		
2022+		-$686,985 (opt. a) -$775,060 (opt. b)	-$546,065 (opt. a) -$775,060 (opt. b)	

[3] NOAA Office of Science and Technology. Commercial Fisheries Statistics. https://www.st.nmfs.noaa.gov/commercial-fisheries/commercial-landings/annual-landings/index Accessed 2/24/2017.

Table 4.2.3.4. Cumulative expected difference in ex-vessel commercial revenue from the vermilion snapper ACL from 2017-2022, between each alternative and Alternative 1, in nominal value.

Range of Years	Alt 1 No Action	Alt 2 Constant F	Alt 3 Constant catch at ave. of 2017-2021	Alt 4 Constant catch at equilibrium ABC
2017-2022	$0	-$3,434,925 (opt. a) -$3,523,000 (opt. b)	-$3,276,390 (opt. a) -$3,505,385 (opt. b)	-$4,650,360

Alternative 1 would maintain the current ACL of 3.42 mp, and so **Alternative 1** would not be expected to result in any direct economic effects to the commercial sector. **Alternative 2** would result in a gradually declining ACL, resulting in either **Option 2a** with a final ACL of 3.03 mp after 2021 or **Option 2b** with a final ACL of 2.98 mp after 2021. With the reductions in expected landings, **Option 2a** would be expected to result in a cumulative decrease in commercial ex-vessel revenue of $3,434,925 from 2017-2022, in comparison to **Alternative 1**; **Option 2b** would be expected to result in a cumulative decrease in commercial ex-vessel revenue of $3,523,000 from 2017-2022, in comparison to **Alternative 1**. **Alternative 3** would maintain a constant ACL of 3.11 mp from 2017-2021, and either maintain the ACL of 3.11 mp after 2021 under **Option 3a** or decrease the ACL to 2.98 mp after 2021 under **Option 3b**. From 2017-2022, commercial ex-vessel revenue would be expected to decrease, when compared to **Alternative 1**, by $3,276,390 under **Option 3a** and by $3,505,385 under **Option 3b**. **Alternative 4** would result in a constant ACL of 2.98 mp for 2017-2021; in comparison to **Alternative 1**, **Alternative 4** would be expected to result in a decrease of $4,650,360 in commercial ex-vessel revenue from 2017-2022.

For the recreational sector, Table 4.2.3.5 shows the expected annual difference in consumer surplus (CS) between each alternative and **Alternative 1**, in nominal value. The CS was calculated by converting the expected landings in Table 4.2.3.2 to number of fish by dividing through by the average weight of 0.88 lbs for recreational vermilion snapper landed in 2010-2014 (M. Smith, NMFS – Southeast Fisheries Science Center, pers. comm.) and then multiplying the number of fish by a proxy value for the CS value for an additional ‘snapper’ (not specific to the species) kept on a trip, i.e. $12.54 (Haab et al. 2012; values updated to 2016 dollars), since the CS per vermilion snapper is not known. The recreational producer surplus is not examined here due to the assumption that the number of for-hire trips would not be affected since vermilion snapper is a component of the 20-reef fish aggregate bag limit.

Table 4.2.3.5. Expected annual difference in CS from the vermilion snapper ACL for 2017-2021 plus 2022 and beyond, between each alternative and Alternative 1, in nominal value.

Year	Alt 1 No Action	Alt 2 Constant F	Alt 3 Constant catch at ave. of 2017-2021	Alt 4 Constant catch at equilibrium ABC
2017	$0	-$1,047,375	-$1,546,125	-$2,194,500
2018		-$1,346,625		
2019		-$1,596,000		
2020		-$1,845,375		
2021		-$1,945,125		
2022+		-$1,945,125 (opt. a) -$2,194,500 (opt. b)	-$1,546,125 (opt. a) -$2,194,500 (opt. b)	

Table 4.2.3.6. Cumulative expected difference in CS from the vermilion snapper ACL from 2017-2022, between each alternative and Alternative 1, in nominal value.

Range of Years	Alt 1 No Action	Alt 2 Constant F	Alt 3 Constant catch at ave. of 2017-2021	Alt 4 Constant catch at equilibrium ABC
2017-2022	$0	-$9,725,625 (opt. a) -$9,975,000 (opt. b)	-$9,276,750 (opt. a) -$9,925,125 (opt. b)	-$13,167,000

The current ACL of 3.42 mp would be maintained with **Alternative 1**, and so **Alternative 1** would not be expected to result in any direct economic effects to the recreational sector. **Alternative 2** would result in a gradually declining ACL, resulting in either **Option 2a** with a final ACL of 3.03 mp after 2021 or **Option 2b** with a final ACL of 2.98 mp after 2021. With the reductions in expected landings, **Option 2a** would be expected to result in a cumulative decrease in CS of $9,725,625 from 2017-2022, in comparison to **Alternative 1**; **Option 2b** would be expected to result in a cumulative decrease in CS of $9,975,000 from 2017-2022, in comparison to **Alternative 1**. **Alternative 3** would maintain a constant ACL of 3.11 mp from 2017-2021, and either maintain the ACL of 3.11 mp after 2021 under **Option 3a** or decrease the ACL to 2.98 mp after 2021 under **Option 3b**. In comparison to **Alternative 1**, CS would be expected to decrease by $9,276,750 under **Option 3a** and by $9,925,125 under **Option 3b** from 2017-2022. **Alternative 4** would result in a constant ACL of 2.98 mp for 2017-2021; **Alternative 4** would be expected to result in a decrease of $13,167,000 in CS from 2017-2022, in comparison to **Alternative 1**.

4.2.4 Direct and Indirect Effects on the Social Environment

Currently, recreational harvest of vermilion snapper is managed with a 10-inch total length (TL) minimum size limit and a 10-vermilion snapper bag limit within the 20-reef fish aggregate bag limit. There is no commercial trip limit or closed season for either sector. In the event the ACL is estimated to be reached, an in-season closure would be triggered prohibiting further harvest of vermilion snapper by both sectors for the duration of the year. To date, landings have not reached the current ACL of 3.42 mp ww, and no in-season closure has occurred. Additional harvest restrictions are not proposed in this amendment.

Although additional effects are not usually expected from **Alternative 1**, the current 3.42 mp ww ACL exceeds the ABC established by the SSC (Table 2.2.3). Thus, the 3.42 mp ww ACL under **Alternative 1** may not be retained. Lowering the ACL (**Alternatives 2-4**) would result in indirect negative effects if the combined landings of both sectors are estimated to reach the selected ACL. In that case, an in-season closure would be triggered prohibiting the harvest of vermilion snapper for the duration of the year. In-season closures are disruptive to fishing activity and increase negative perceptions of management. Requiring fishermen to throw back all vermilion snapper, regardless of whether the fish would be able to survive, is perceived as wasteful by fishermen.

Since 2011, total landings of vermilion snapper have shown a declining trend, from 4.27 mp in 2011 to 2.34 mp in 2015. However, landings prior to 2011 have reached a high of 4.49 mp in 2009; thus, it cannot be assumed that landings will continue to decline overall. As it is not possible to predict future landings, landings from recent years are used to discuss the likelihood of exceeding the ACL under **Alternatives 2-4**, thereby triggering an in-season closure.

For the years 2017 through 2021, the greatest negative effects would correspond to the lowest ACL (**Alternative 4**), as this catch level would be reached soonest, triggering the in-season closure. By extension, the in-season closure from the lowest ACL would occur earliest in the year among the alternatives and be the most disruptive to fishing activity. Given the landings from 2011 through 2015, the ACL under **Alternative 4** would have resulted in an in-season closure in two years: 2011 and 2012.

Alternatives 2 and **3** would provide the same total amount of vermilion snapper that may be landed over the 5-year period of 2017 through 2021. While **Alternative 3** provides a fixed ACL for each year (3.11 mp), **Alternative 2** provides ACLs that decrease each year. Under **Alternative 2**, it would be more likely for an in-season closure to be triggered in 2021 compared to 2017. Given the landings from 2011 through 2015, the ACL under **Alternative 3** and for the years 2019 through 2021 under **Alternative 2** would have resulted in an in-season closure in the same two years as **Alternative 4** (2011 and 2012), although the closures would have occurred later than under **Alternative 4**. The ACL for 2018 under **Alternative 2** is very close, but slightly greater, than the total landings in 2012. The ACL for 2017 under **Alternative 2** is the least likely to be exceeded, triggering an in-season closure, and would occur later in the year than any in-season closures due to reaching the ACLs under **Alternatives 3** and **4**, or the years 2018 through 2021 under **Alternative 2**.

The options under **Alternatives 2** and **3** provide ACLs for years following 2021; under **Alternative 4**, the ACL would not change following 2021. It is likely that before 2022, the SSC will review additional information pertaining to the stock status of vermilion snapper and make a new recommendation for ABC. It is also more difficult to predict fishing behavior and potential landings further in the future, although it is not likely for landings to continue to decline overall given the increasingly stringent management measures being adopted for many other popular reef fish species. Fishermen of both sectors may direct greater effort toward targeting vermilion snapper as a result. **Options 2b** and **3b**, and **Alternative 4** would establish the same ACL beginning in 2022 and for subsequent years; this is the lowest ACL under all the alternatives for all years, and would be most likely to be met, triggering the earliest in-season closure. **Option 2a** would be the next most likely to trigger an in-season closure, followed by **Option 3a**.

4.2.5 Direct and Indirect Effects on the Administrative Environment

Setting ACLs is an administrative action and would have effects on the administrative environment through additional rulemaking (direct effect), addressing overfished and overfishing conditions (direct effect), and monitoring harvests (indirect effect). Because **Alternative 1**, the no-action alternative, would not require rulemaking, there would not be any immediate effect on the administrative environment from rulemaking. For **Alternatives 2-4**, rulemaking would be required to codify a new vermilion snapper ACL.

ACLs can have direct effects on the administrative environment should they be exceeded. Currently, if the sum of the commercial and recreational landings exceeds or is projected to exceed the stock ACL in a given year, then a notification will be filed by NMFS with the Office of the Federal Register to close the commercial and recreational sectors for the remainder of that fishing year. Therefore, the higher the ACL, the probability of it being exceeded and the need to close the commercial and recreational sectors to vermilion snapper fishing is lower. Thus, alternatives with lower ACLs would likely adversely affect the administrative environment more than alternatives with higher ACLs by increasing the chance of a closure.

Alternative 4 has the lowest constant catch ACL (2.98 mp ww) and, unless management measures are stringent enough, has the greatest probably being exceeded (Table 4.2.2.1). Thus, this alternative could adversely affect the administrative environment more than any of the other alternatives. **Alternative 3**, with the next highest constant catch ACL (3.11 mp ww), would be followed by **Alternative 1** (3.42 mp ww). It is difficult to assess how **Alternative 2** compares to **Alternative 3** as **Alternative 2**, with its declining yield stream, has a higher ACL in 2017 and 2018 and a lower ACL from 2019-2021. It is likely to be similar to the effects of **Alternative 3** and in between the effects of **Alternatives 1** and **4**. Unless further action is taken prior to 2022, the effects from **Options 2b** and **3b** would be similar to **Alternative 4** under, and **Options 2a** and **3a** would be intermediate to **Alternatives 1** and **4** .

Indirect effects of ACLs is that the harvest needs to be monitored and evaluated with respect to the ACLs. Regardless of which alternative is selected as preferred, these management activities need to continue. Therefore, the indirect effects from each alternative should be similar.

4.3 Cumulative Effects Analysis

The cumulative effects from managing the reef fish fishery have been analyzed in Amendments 30A (GMFMC 2008b), 30B (GMFMC 2008c), 31 (GMFMC 2009), 32 (GMFMC 2011b), 40 (GMFMC 2014), and 28 (GMFMC 2015b) and are incorporated here by reference. Additional pertinent actions are summarized in the history of management (Section 1.3). Currently, there are two reef fish reasonably foreseeable future actions (RFFAs) that are being considered, which could affect the Gulf vermilion snapper stock. One is Amendment 44, which would set the MSST for reef fish stocks taking into consideration natural mortality rates and to establish MSST for all stocks in the reef fish fishery management unit. The other is an amendment to require electronic reporting for charter vessels to improve the quality and timeliness of landings data for this component of the recreational sector. These actions in combination with the proposed action are not expected to significantly change how the fishery is prosecuted, and so any cumulative effects should be minimal. A full list of management actions proposed by the Council can be found on the Council's web page at http://gulfcouncil.org/fishery_management_plans/scoping-thru-implementation.php.

The affected area of this proposed action encompasses the state and federal waters of the Gulf as well as Gulf communities that are dependent on reef fish fishing. However, most vermilion snapper are landed in the Florida Panhandle, Louisiana, and Texas. Thus communities in these areas would be expected to be affected the most from this action. The proposed action would establish an MSY proxy and set the stock ACL. These actions are not expected to have significant beneficial or adverse cumulative effects on the physical and biological/ecological environments because they will only minimally affect current fishing practices and the ACL measure is designed to reduce the likelihood of overfishing (see Sections 4.1.1, 4.1.2, 4.2.1, 4.2.2). If the recreational and commercial harvests are constrained to the stock ACL, then the effects to these environments would likely be beneficial compared to the no action alternatives. However, for the social and economic environments, short-term adverse effects are likely (see Sections 4.1.3, 4.1.4, 4.2.3, and 4.2.4) 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. This action, combined with past and RFFAs is not expected to have substantial adverse effects on public health or safety. Because the reef fish fishery is a multispecies fishery, there are always fish to target throughout the year for the commercial and recreational sectors such that the proposed actions, along with past and RFFAs, are not expected to substantially alter the manner in which the fishery is prosecuted.

Non-fishery management plan (FMP) actions affecting the reef fish fishery have been described in previous cumulative effect analyses (e.g., Amendment 40). Two important events include impacts of the Deepwater Horizon MC252 oil spill and climate change. Impacts from the Deepwater Horizon MC252 oil spill are still being examined; however, damage was done to fish stocks as summarized in Section 3.2. Vermilion snapper are found in the areas most heavily impacted by the oil spill, but little research was directed at this species and so the effects cannot be quantified. Vermilion snapper do share many life history traits with red snapper, a stock that was shown to have been affected by the spill. Therefore, it is probable that the vermilion snapper stock, particularly in the northern Gulf where the spill occurred, was adversely affected by the spill.

There is a large and growing body of literature on past, present, and future impacts of global climate change induced by human activities. Some of the likely effects commonly mentioned are sea level rise, increased frequency of severe weather events, and change in air and water temperatures. The Environmental Protection Agency's (EPA) climate change web page provides basic background information on these and other measured or anticipated effects. In addition, 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 actions are not expected to significantly contribute to climate change through the increase or decrease in the carbon footprint from fishing as these actions should not change how the fishery is prosecuted. As described in Section 3.2, the contribution to greenhouse gas emissions from fishing is minor compared to other emission sources (e.g., oil platforms).

The effects of the proposed action are, and will continue to be, monitored through collection of landings data by NMFS, stock assessments and stock assessment updates, life history studies, economic and social analyses, and other scientific observations. Landings data for the recreational sector in the Gulf are collected through Marine Recreational Information Program, the Southeast Region Headboat Survey, the Louisiana Recreational Creel Survey, the Alabama Red Snapper Reporting Program, and the Texas Marine Recreational Fishing Survey. Commercial data are collected through trip ticket programs, port samplers, and logbook programs, as well as dealer reporting through the individual fishing quota program.

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GMFMC = Gulf of Mexico Fishery Management Council; NOAA GC = National Oceanic and Atmospheric Administration General Counsel; SEFSC = Southeast Fisheries Science Center; SERO = Southeast Regional Office of the National Marine Fisheries Service

CHAPTER 6. LIST OF AGENCIES CONSULTED

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- Southeast Fisheries Science Center
- Southeast Regional Office
- Office for Law Enforcement

National Oceanic Atmospheric Administration General Counsel

Environmental Protection Agency
United States Coast Guard
United States Fish and Wildlife Services
Texas Parks and Wildlife Department
Alabama Department of Conservation and Natural Resources/Marine Resources Division
Louisiana Department of Wildlife and Fisheries
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Florida Fish and Wildlife Conservation Commission

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APPENDIX A – OTHER APPLICABLE LAW

The Magnuson-Stevens Fishery Conservation and Management Act (Magnuson-Stevens Act) (16 U.S.C. 1801 et seq.) provides the authority for fishery management in federal waters of the exclusive economic zone. However, fishery 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 are summarized below.

Administrative Procedures Act

All federal rulemaking is governed under the provisions of the Administrative Procedure Act (APA) (5 U.S.C. Subchapter II), which establishes a "notice and comment" procedure to enable public participation in the rulemaking process. Under the APA, 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 APA also establishes a 30-day waiting period from the time a final rule is published until it takes effect.

Coastal Zone Management Act

Section 307(c)(1) of the federal Coastal Zone Management Act of 1972 (CZMA), as amended, requires federal activities that affect any land or water use or natural resource of a state's coastal zone be conducted in a manner consistent, to the maximum extent practicable, with approved state coastal management programs. The requirements for such a consistency determination are set forth in NMFS regulations at 15 C.F.R. 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, NMFS will determine if this plan amendment is consistent with the Coastal Zone Management programs of the states of Alabama, Florida, Louisiana, Mississippi, and Texas to the maximum extent possible. Their determination will then be submitted to the responsible state agencies under Section 307 of the CZMA administering approved Coastal Zone Management programs for these states.

Data Quality Act

The Data Quality Act (DQA) (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 DQA directs the Office of Management and Budget (OMB) 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.

Endangered Species Act

The Endangered Species Act (ESA) of 1973, as amended, (16 U.S.C. Section 1531 et seq.) requires federal agencies use their authorities to conserve endangered and threatened species. The ESA requires NMFS, when proposing a fishery action that "may affect" critical habitat or endangered or threatened species, to consult with the appropriate administrative agency (itself for most marine species, the U.S. Fish and Wildlife Service for all remaining species) to determine the potential impacts of the proposed action. Consultations are concluded informally when proposed actions may affect but are "not likely to adversely affect" endangered or threatened species or designated critical habitat. Formal consultations, including a biological opinion, are required when proposed actions may affect and are "likely to adversely affect" endangered or threatened species or adversely modify designated critical habitat. If jeopardy or adverse modification is found, the consulting agency is required to suggest reasonable and prudent alternatives.

On September 30, 2011, the Protected Resources Division released a biological opinion which, after analyzing best available data, the current status of the species, environmental baseline (including the impacts of the recent Deepwater Horizon MC 252 oil release event in the northern Gulf of Mexico), effects of the proposed action, and cumulative effects, concluded that the continued operation of the Gulf of Mexico reef fish fishery is also not likely to jeopardize the continued existence of green, hawksbill, Kemp's ridley, leatherback, or loggerhead sea turtles, nor the continued existence of smalltooth sawfish (NMFS 2011). Since issuing the biological opinion, in memoranda dated September 16, 2014, and October 7, 2014, NMFS concluded that the activities associated with the Reef Fish FMP will not adversely affect critical habitat for the Northwest Atlantic Ocean loggerhead sea turtle distinct population segment (DPS) and four species of corals (*Mycetophyllia ferox*, *Orbicella annularis*, *O. faveolata*, and *O. franksi*). In a memorandum dated September 29, 2016, NMFS indicated that several species (green sea turtle

North Atlantic and South Atlantic DPSs, and Nassau grouper) have been recently listed under the ESA that may be affected by fishing managed under the Reef Fish FMP, thus triggering the need for reinitiation of consultation. In the September 29, 2016, memorandum, NMFS concluded that allowing continued authorization of the reef fish fishery in federal waters during the reinitiation period will not violate Section 7(a)(2) or 7(d). Implementing the proposed action during the re-initiation period in no way alters the existing Section 7(a)(2) and 7(d) findings.

Marine Mammal Protection Act

The Marine Mammal Protection Act (MMPA) established a moratorium, with certain exceptions, on the taking of marine mammals in U.S. waters and by U.S. citizens on the high seas, and on the importing of marine mammals and marine mammal products into the United States. Under the MMPA, the Secretary of Commerce (authority delegated to NMFS) is responsible for the conservation and management of cetaceans and pinnipeds (other than walruses). The Secretary of the Interior is responsible for walruses, sea and marine otters, polar bears, manatees, and dugongs.

Part of the responsibility that NMFS has under the MMPA involves monitoring populations of marine mammals to make sure that they stay at optimum levels. If a population falls below its optimum level, it is designated as "depleted," and a conservation plan is developed to guide research and management actions to restore the population to healthy levels.

In 1994, Congress amended the MMPA, to govern the taking of marine mammals incidental to commercial fishing operations. This amendment required the preparation of stock assessments for all marine mammal stocks in waters under U.S. jurisdiction, development and implementation of take-reduction plans for stocks that may be reduced or are being maintained below their optimum sustainable population levels due to interactions with commercial fisheries, and studies of pinniped-fishery interactions.

Under Section 118 of the MMPA, NMFS must publish, at least annually, a List of Fisheries (LOF) that places all U.S. commercial fisheries into one of three categories based on the level of incidental serious injury and mortality of marine mammals that occurs in each fishery. The categorization of a fishery in the LOF determines whether participants in that fishery may be required to comply with certain provisions of the MMPA, such as registration, observer coverage, and take reduction plan requirements. The primary gears used in the Gulf of Mexico reef fish fishery are still classified in the proposed 2017 MMPA LOF as Category III fishery (82 FR 3655, January 12, 2017). The conclusions of the most recent LOF for gear used by the reef fish fishery can be found in Section 3.3.

Paperwork Reduction Act

The Paperwork Reduction Act of 1995 (PRA) (44 U.S.C. 3501 et seq.) regulates the collection of public information by federal agencies to ensure the public is not overburdened with information requests, the federal government's information collection procedures are efficient, and federal agencies adhere to appropriate rules governing the confidentiality of such information. The PRA requires NMFS to obtain approval from the Office of Management and Budget before requesting most types of fishery information from the public. Defining the vermilion snapper maximum sustainable yield proxy and setting the annual catch limit would not likely have PRA consequences.

Executive Orders

E.O. 12630: Takings

The Executive Order 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 National Oceanic and Atmospheric Administration Office of General Counsel will determine whether a Taking Implication Assessment is necessary for this amendment.

E.O. 12866: Regulatory Planning and Review

Executive Order 12866: Regulatory Planning and Review, signed in 1993, requires federal agencies to assess the costs and benefits of their proposed regulations, including distributional impacts, and to select alternatives that maximize net benefits to society. To comply with E.O. 12866, NMFS prepares a Regulatory Impact Review (RIR) for all fishery regulatory actions that either implement a new fishery management plan or significantly amend an existing plan (See Chapter 5). RIRs provide a comprehensive analysis of the costs and benefits to society of proposed regulatory actions, the problems and policy objectives prompting the regulatory proposals, and the major alternatives that could be used to solve the problems. The reviews also serve as the basis for the agency's determinations as to whether proposed regulations are a "significant regulatory action" under the criteria provided in E.O. 12866 and whether proposed regulations will have a significant economic impact on a substantial number of small entities in compliance with the Regulatory Flexibility Analysis. A regulation is significant if it a) has an annual effect on the economy of $100 million or more or adversely affects in a material way the economy, a sector of the economy, productivity, competition, jobs, the environment, public health or safety, or State, local, or tribal governments and communities; b) creates a serious inconsistency or otherwise interferes with an action taken or planned by another agency; c) materially alters the budgetary impact of entitlements, grants, user fees, or loan programs or the rights and obligations of recipients thereof; or d) raises novel legal or policy issues arising out of legal mandates, the President's priorities, or the principles set forth in this Executive Order.

E.O. 12898: Federal Actions to Address Environmental Justice in Minority Populations and Low Income Populations

This Executive Order mandates that each Federal agency shall make achieving environmental justice part of its mission by identifying and addressing, as appropriate, disproportionately high and adverse human health or environmental effects of its programs, policies, and activities on minority populations and low-income populations in the United States and its territories and possessions. The Executive Order is described in more detail relative to fisheries actions in Section 3.5.1.

E.O. 12962: Recreational Fisheries

This Executive Order 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 (Council) 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 Council 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 Order requires NMFS and the U.S. Fish and Wildlife Service to develop a joint agency policy for administering the ESA.

E.O. 13132: Federalism

The Executive Order on Federalism requires agencies in formulating and implementing policies, to be guided by the fundamental Federalism principles. The Order 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 Order 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).

E.O. 13158: Marine Protected Areas

This Executive Order 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, habitat areas of particular concern, and gear-restricted areas in the eastern and northwestern Gulf of Mexico.

Essential Fish Habitat

The amended Magnuson-Stevens Act included a new habitat conservation provision known as essential fish habitat (EFH) that requires each existing and any new FMPs to describe and identify EFH for each federally managed species, minimize to the extent practicable impacts from fishing activities on EFH that are more than minimal and not temporary in nature, and identify other actions to encourage the conservation and enhancement of that EFH. To address these requirements the Council has, under separate action, approved an Environmental Impact Statement (GMFMC 2004b) to address the new EFH requirements contained within the Magnuson-Stevens Act. Section 305(b)(2) requires federal agencies to obtain a consultation for any action that may adversely affect EFH. An EFH consultation will be conducted for this action.

APPENDIX B – BYCATCH PRACTICABILITY ANALYSIS

Introduction

Bycatch is defined as fish harvested in a fishery, but not sold or retained for personal use. This definition includes both economic and regulatory discards, and excludes fish released alive under a recreational catch-and-release fishery management program. Economic discards are generally undesirable from a market perspective because of their species, size, sex, and/or other characteristics. Regulatory discards are fish required by regulation to be discarded, but also include fish that may be retained but not sold.

Agency guidance provided at 50 CFR 600.350(d)(3) identifies ten factors to consider in determining whether a management measure minimizes bycatch or bycatch mortality to the extent practicable. These are:

1. Population effects for the bycatch species;
2. Ecological effects due to changes in the bycatch of that species (effects on other species in the ecosystem);
3. Changes in the bycatch of other species of fish and the resulting population and ecosystem effects;
4. Effects on marine mammals and birds;
5. Changes in fishing, processing, disposal, and marketing costs;
6. Changes in fishing practices and behavior of fishermen;
7. Changes in research, administration, and enforcement costs and management effectiveness;
8. Changes in the economic, social, or cultural value of fishing activities and non-consumptive uses of fishery resources;
9. Changes in the distribution of benefits and costs; and
10. Social effects.

The Regional Fishery Management Councils are encouraged to adhere to the precautionary approach outlined in Article 6.5 of the Food and Agriculture Organization of the United Nations Code of Conduct for Responsible Fisheries when uncertain about these factors.

Bycatch practicability analyses of the reef fish fishery have been provided in several reef fish amendments to the Fishery Management Plan (FMP) for the Reef Fish Resources of the Gulf of Mexico and focused to some degree on the component of the fishery affected by the actions covered in the amendment. Bycatch practicability analyses have been completed for red snapper (GMFMC 2004c, GMFMC 2007, GMFMC 2014, GMFMC 2015), grouper (GMFMC 2008a, GMFMC 2009, GMFMC 2011a, GMFMC 2012c), vermilion snapper (GMFMC 2004b), greater amberjack (GMFMC 2008b, GMFMC 2012a), gray triggerfish (GMFMC 2008b, GMFMC 2012b) and hogfish (GMFMC 2016). In addition, a bycatch practicability analysis was conducted for the Generic Annual Catch Limits/Accountability Measures Amendment (GMFMC 2011b) that covered the Reef Fish, Coastal Migratory Pelagics, Red Drum, and Coral FMPs. In general, these analyses found that reducing bycatch provides biological benefits to managed species as well as benefits to the fishery through less waste, higher yields, and less forgone yield. However, in some cases, actions are approved that can increase bycatch through regulatory discards such as increased minimum sizes and closed seasons. In these cases, there is some biological benefit to the managed species that outweighs any increases in discards.

Vermilion Snapper Bycatch

Vermilion snapper bycatch from the directed commercial and recreational reef fish fisheries is thought to be minimal. Total commercial discards compared to landings for 2007-2017 ranged from 3% to 28% for vertical line fishing depending on year and region (eastern vs western Gulf; SEDAR 45 2016). With discard mortality rates ranging between 5% and 15%, the SEDAR 45 Review group indicated dead discards represented an "insignificant source of mortality" (SEDAR 45 2016). Discards from the longline fishery were less than 1% of the vertical line discards and so were not used in the assessment. Pulver (2016), using observer data, found that immediate discard mortality for vermilion snapper increased with depth, increased when water was warmer, and decreased as fish grew larger. Vermilion snapper are not overfished or undergoing overfishing (SEDAR 45 2016) and bycatch is not expected to jeopardize the status of this stock.

In the western Gulf, vermilion snapper and some deep-water groupers are incidentally caught as bycatch when harvesting red snapper. In the eastern Gulf, various species of shallow-water grouper and vermilion snapper are the primary species caught as bycatch when targeting red snapper.

For the recreational sector, discards were generally low, although there were some peaks as high as 50% in the mid-1990s. Discards for most years were generally 5% to 20% of landed fish. Like the commercial sector, applying a 15% discard mortality rate to released fish caused the SEDAR 45 Review group to also consider discards an insignificant source of mortality (SEDAR 45 2016).

SEDAR 45 (2016) shrimp bycatch was estimated using both research vessel data and NMFS observer program data. Bycatch estimates showed strong interannual variation, but have trended downward from highs reached in the 1990's and bycatch estimates have been at time series lows for the last 6 years used in the assessment (2009-2014). For SEDAR 45 (2016), the final median value was estimated at 3.37 million fish. These fish are primarily age 1+. Compared to other important snapper species found in shrimp trawl bycatch such as red and lane snapper, bycatch of vermilion snapper, by weight, is less than 20% of these other species (Scott-Denton et al. 2012).

Other Bycatch

Species incidentally encountered by the reef fish fishery include sea turtles, sea birds, and reef fishes. The primary gears of the Gulf reef fish fishery (longline and handline) are classified in the List of Fisheries (LOF) for 2015 (79 FR 77919, December 29, 2014) as Category III gear. This classification indicates the annual mortality and serious injury of a marine mammal stock resulting from any fishery is less than or equal to one percent of the maximum number of animals, not including natural mortalities, that may be removed from a marine mammal stock, while allowing that stock to reach or maintain its optimum sustainable population.

The most recent biological opinion for the Reef Fish FMP was completed on September 30, 2011 (NMFS 2011). The opinion determined the continued authorization of the Gulf reef fish fishery managed under this FMP is not likely to adversely affect Endangered Species Act-listed marine mammals or coral, and would not likely jeopardize the continued existence of sea turtles (loggerhead, Kemp's ridley, green, hawksbill, and leatherback), or smalltooth sawfish. However, in the past, actions have been taken by the Council and NMFS to increase the survival of incidentally caught sea turtle and smalltooth sawfish by the commercial and recreational sectors of the fishery. These include the requirements for permitted vessels to carry specific gear and protocols for the safe release in incidentally caught endangered sea turtle species and smalltooth sawfish (GMFMC 2005) as well as restrictions on the longline portion of the commercial sector. Restrictions for longlines in the reef fish fishery include a season-area closure, an endorsement to use longline gear, and a restriction on the total number of hooks that can be carried on a vessel (GMFMC 2009).

Three primary orders of seabirds are represented in the Gulf, Procellariiformes (petrels, albatrosses, and shearwaters), Pelecaniformes (pelicans, gannets and boobies, cormorants, tropic birds, and frigate birds), and Charadriiformes (phalaropes, gulls, terns, noddies, and skimmers) (Clapp et al., 1982; me, 1983) and several species, including: piping plover, least tern, roseate tern, bald eagle, and brown pelican (the brown pelican is endangered in Mississippi and Louisiana and delisted in Florida and Alabama) are listed by the U.S. Fish and Wildlife Service as either endangered or threatened. Human disturbance of nesting colonies and mortalities from birds being caught on fishhooks and subsequently entangled in monofilament line are primary factors affecting sea birds. Oil or chemical spills, erosion, plant succession, hurricanes, storms, heavy tick infestations, and unpredictable food availability are other threats. There is no evidence that the reef fish fishery is adversely affecting seabirds. However, interactions, especially with brown pelicans consuming reef fish discards and fish before they are landed, are known to occur (SEDAR 7 2005).

Other species of reef fish are also incidentally caught when targeting vermilion snapper by the reef fish fishery. Bycatch practicability analyses have been conducted for red snapper, grouper species, greater amberjack, gray triggerfish, and hogfish as cited above. Depending on the trip, these species can be targeted or are incidentally caught. Common factors effecting the disposition of discards include size at capture, water depth and temperature as discussed above for vermilion snapper (Pulver 2016).

Gulf red snapper are no longer undergoing overfishing, but are overfished and in a rebuilding plan. The reef fish fishery directed at red snapper has been regulated to limit harvest in order for the stock to recover from an overfished condition. Regulations for the recreational sector include catch quotas, minimum size limits, bag limits, and seasonal closures. These are used to limit the harvest to levels allowed under the rebuilding plan. For the commercial sector, regulations previously included quotas, minimum size limits, seasonal closures, and trip limits. Now the sector is managed under an individual fishing quota (IFQ) program that was established in 2007. The program eliminates the need for seasonal closures and trip limits. Red snapper regulations have been generally effective in limiting fishing mortality, the size of fish targeted, the number of targeted fishing trips, and/or the time fishermen spend pursuing a species. However, these management tools have the unavoidable adverse effect of creating regulatory discards, which makes reducing bycatch challenging, particularly in the recreational sector.

Deep-water groupers are caught both in the eastern and western Gulf primarily with longline gear (> 80 percent). The deep-water grouper fishery was managed with a 1.02 million pound quota. From 2004 until the implementation of the grouper/tilefish IFQ program in 2010 (SERO 2012a), the fishery met their quota and closed no later than July 15 each year. Deep-water grouper closures during this time period may have resulted in some additional discards of grouper by longliners targeting red snapper. Since the IFQ program was implemented, deep-water grouper species are landed year-round by holders of IFQ allocation and the quota has not been exceeded. Longliners account for approximately 5% of the annual commercial red snapper landings since 2000 (SEDAR 31 2013). It is unknown how increases in closed season discards might have affected the status of deep-water grouper stocks or the change to an IFQ managed sector. An updated assessment for yellowedge grouper found the stock was not overfished or undergoing overfishing (SEDAR 22 2011).

Red grouper and gag are the two most abundant shallow-water grouper species in the Gulf and primarily occur on the west Florida shelf. Both species have been found to be not overfished or undergoing overfishing (SEDAR 33 2014 for gag and SEDAR 42 2015 for red grouper). Gag had been in a rebuilding plan that took into account gag dead discards and this plan was implemented through Amendment 32 (GMFMC 2011a). Within the reef fish fishery, discards represent a large and significant portion of mortality for gag and red grouper. In the past, these species were managed under a shallow-water grouper quota which was met prior to the end of the 2004 and 2005 fishing years. For the recreational sector, shallow-water grouper including gag and red grouper are managed with size limits, bag limits, and season and area closures. The recreational gag season begins July 1 and extends until the catch target is projected to be caught. Since 2010, the commercial harvest of gag, red grouper, and other shallow-water grouper are managed under an IFQ program and the commercial sector has not exceeded its quota under the program. Prior to the IFQ program, quota closures at the end of the year have likely resulted in some additional commercial discards when the red snapper fishery is open.

Practicability of current management measures in the reef fish fishery fishing for vermilion snapper fishery relative to their impact on bycatch and bycatch mortality.

A bycatch practicability analysis was conducted for vermilion snapper in Amendment 23. Vermilion snapper were also included in the more general analysis for reef fish in the Generic Annual Catch Limits/Accountability Measures Amendment (GMFMC 2011b). Hogfish are regulated by a 10-inch fork length (FL) minimum size limit for both the commercial and recreational sectors, and a 10-fish limit in the 20 reef fish combined recreational bag limit. There is no allocation between the commercial and recreational sectors. Vermilion snapper are also managed under a stock annual catch limit (ACL), which has not been exceeded since 2012. The accountability measure for vermilion snapper is that the Regional Administrator closes vermilion snapper fishing if and when the ACL is projected to be reached within the year. Other reef fish fishery management measures that affect vermilion snapper fishing include reef fish permit requirements for the commercial and for-hire sectors.

Closed Seasons

Amendment 23 established an April 22 through May 31 closed season for the commercial fishery that first took effect in 2006. However, this action was rescinded in February 2007 and so was in effect for only one year.

Bag Limits

Vermilion snapper are in the 20-reef fish aggregate bag limit. Vermilion snapper were restricted to 10 fish within the aggregate bag limit in from August 2005 to February 2007 when the 10 fish restriction was rescinded. This bag limit restriction went back into effect through a framework action in September 2013. However, vermilion snapper discards because of the bag limit are likely to be minor. This is because only approximately 7% of angler trips catching vermilion snapper would be affected by the 10-fish bag limit (GMFMC 2013).

Size limits

The 10-inch FL minimum size limit is an important factor when considering bycatch in the directed fishery. Size limits are intended to protect immature fish and reduce fishing mortality. The size at which 50% of the vermilion snapper are mature is 138 mm FL (5.4 inches FL) (SEDAR 45 2016). Thus, the 10-inch minimum size limit is sufficient to allow most vermilion snapper to spawn at least once before being susceptible to the fishery.

Area closures

Although the Council has not developed area closures specifically for vermilion snapper, the Council has created areas to protect other species. For example, two restricted fishing areas were developed to specifically protect spawning aggregations of gag in 2000 (GMFMC 1999b). The Madison-Swanson and Steamboat Lumps marine restricted fishing areas are located in the northeastern Gulf at a depth of 40 to 60 fathoms. Both areas prohibit bottom fishing. Bottom fishing is also prohibited in the Tortugas North and South marine reserves in the southern Gulf near the Dry Tortugas. Marine reserves and time/area closures benefit fish residing within reserve boundaries by prohibiting their capture during part or all of the year. Within marine reserves, fish that are undersized potentially have an opportunity to grow to legal size and are no longer caught as bycatch. If these fish emigrate from the marine reserve (i.e., spillover effect), then they may be caught as legal fish outside the reserve, thereby reducing bycatch. However, anglers and commercial fishermen may redistribute their effort to areas surrounding the area closure. If fishing pressure in these areas is increased, then any benefits of reduced bycatch of fish in the marine reserve will likely be offset by increases in bycatch of fish residing outside the marine reserve. Within restricted fishing areas or time/area closures, fishing is allowed under restrictions that are intended to protect certain components of the populations within the area (e.g., prohibitions on bottom fishing gear), or to protect populations during a critical phase of their life history, such as during spawning.

The Council did develop a season area closure to reduce bycatch of sea turtles for the longline component of the commercial sector. The use of longlines had been prohibited from waters less than 20 fathoms east of Cape San Blas, Florida, and 50 fathoms west of Cape San Blas; however, due to higher estimates of sea turtles caught in longline gear, measures were put in place through Amendment 31 (GMFMC 2009) to reduce this bycatch. One of these measures was the prohibition of the use of bottom longline gear in the Gulf reef fish fishery, shoreward of a line approximating the 35-fathom contour east of Cape San Blas, Florida from June through August. Most sea turtle takes by longline occur during the summer months.

Allowable gear

Vertical hook-and-line gear (bandit rigs, manual handlines, rod-and-reel) is the primary gear used in the recreational (exclusively) and commercial fishery fishing for vermilion snapper. Longlines account for only a small fraction of red snapper dead discards as most of the landings come from vertical hook-and-line-caught fish. In addition, longlines are fished in deeper water, particularly in the west, and select for larger, vermilion snapper. Longline vessels east of Cape San Blas, Florida, are also restricted to carrying 1,000 hooks onboard (only 750 rigged for fishing at any given time) as part of a suite of measures put in place through Amendment 31 (GMFMC 2009) to reduce sea turtle bycatch.

Fishermen in both the commercial and recreational sectors are required to use non-stainless steel circle hooks, if using natural baits, to reduce discard mortality. The size of circle hooks used in the fishery varies by manufacturer, gear type, and species targeted (i.e., if targeting vermilion snapper, smaller circle hooks may be used). Although circle hooks may not work as well to reduce red snapper discard mortality, they are effective in reducing mortality in other species such as red grouper (Burns and Froeschke 2012).

In addition to the circle hook requirement, Amendment 27 (GMFMC 2007) also put in place requirements for both commercial and recreational fishermen in the reef fish fishery to carry onboard dehooking devices. These gears are all intended to reduce bycatch and discard mortality. A dehooking device is a tool intended to remove a hook embedded in a fish. It reduces the handling time releasing a fish from a hook and allows a fish to be released with minimum damage. The Council also encourages fishermen to use devices such as venting tools and fish descenders to reduce discard mortality from barotrauma. These gears have been shown in some instances to reduce discard mortality in fish showing signs of barotrauma.

Alternatives being considered and bycatch minimization

The measures in Amendment 47 would establish an MSY proxy and set the stock ACL. These actions are primarily administrative. Both would affect how many vermilion snapper can be caught, but it is ACL that triggers the AMs. Depending on which Action 2 alternative is selected, it could either reduce or increase bycatch in the reef fish fishery based on the level of harvest. The lower the harvest, the greater the chance of regulatory discards should a season closure be needed if the ACL is met or projected to be met. These measures are not expected to change how the reef fish fishery is prosecuted and so should not change bycatch of other species including reef fish, sea turtles, marine mammals, or seabirds.

Practicability Analysis

Criterion 1: Population effects for the bycatch species

The actions in this amendment are not expected to directly affect bycatch minimization. As described earlier in this bycatch practicability analysis, the Council and NMFS have developed a variety of management measures to reduce reef fish (including vermilion snapper) bycatch and these measures are thought to benefit the status of the stock. These include the gear requirements as discussed above, such as dehooking devices and the use of circle hooks by the reef fish fishery, as well as the encouragement for fishermen to use devices that reduce discard mortality from barotrauma. In addition, any increases in bycatch resulting from proposed management actions are accounted for when reducing directed fishing mortality. Any reductions in bycatch not achieved must be accounted for when setting the ACLs; the less bycatch is reduced, the more the ACLs must be reduced.

Criterion 2: Ecological effects due to changes in the bycatch of hogfish (effects on other species in the ecosystem)

The relationships among species in marine ecosystems are complex and poorly understood, making the nature and magnitude of ecological effects difficult to predict with any accuracy. The most recent vermilion snapper stock assessment (SEDAR 45 2016) indicated the stock is not overfished or undergoing overfishing in the Gulf. Changes in the bycatch of vermilion snapper through a revision of the ACLs are not expected to directly affect other species in the ecosystem. Although birds, dolphins, and other predators may feed on vermilion snapper discards, there is no evidence that any of these species rely on vermilion snapper discards for food.

Criterion 3: Changes in the bycatch of other species of fish and invertebrates and the resulting population and ecosystem effects

Population and ecosystem effects resulting from changes in the bycatch of other species of fish and invertebrates are difficult to predict. As discussed above, deep-water grouper, red grouper, red snapper, and gag are commonly caught in association with vermilion snapper. Red snapper is in a rebuilding plan with the stock improving. Regulatory discards significantly contribute to fishing mortality for all of these reef fish species.

No measures are proposed in this amendment to directly reduce the bycatch of other reef fish species. As mentioned, this action would define the MSY proxy and set the ACL. Bycatch minimization measures implemented through Amendment 18A (GMFMC 2005), Amendment 27 (GMFMC 2007), and Amendment 31 (GMFMC 2009) are expected to benefit reef fish stocks, sea turtles, and smalltooth sawfish.

Criterion 4: Effects on marine mammals and birds

The effects of current management measures on marine mammals and birds are described above. Bycatch minimization measures evaluated in this amendment are not expected to significantly affect marine mammals and birds. There is no information to indicate marine mammals and birds rely on vermilion snapper for food, and the measure in this amendment is not anticipated to alter the existing prosecution of the fishery, and thus interactions with marine mammals or birds.

Criterion 5: Changes in fishing, processing, disposal, and marketing costs

Reducing the ACL in Action 2, Alternatives 2-3 after 2021 and Alternative 4 would result in fewer fish being landed and certainly affect fishing, processing, disposal, and marketing costs relative to no action. However, because vermilion snapper is a part of a multispecies fishery, other species could be targeted to fill any loses from reduced vermilion snapper ACLs. This action would not be expected to result in any changes in fishing, processing, disposal, or marketing costs of recreationally harvested vermilion snapper because these fish may not be sold.

Criterion 6: Changes in fishing practices and behavior of fishermen

Actions proposed in Amendment 47 would not likely result in a modification of fishing practices by commercial and recreational fishermen and the number of discards is not expected to be affected by the proposed actions because of the gears used to harvest this species. It is difficult to quantify any of the measures in terms of reducing discards until bycatch has been monitored over several years. Commercial and recreational bycatch information is collected by NMFS, and that information will continue to be analyzed to determine what changes, if any, have taken place in terms of fishing practices and fishing behavior as a result of the actions implemented through this amendment.

Social effects of actions proposed in this amendment are addressed in Chapter 4 and information on environmental justice can be found in Section 3.4.1.

Criterion 7: Changes in research, administration, and enforcement costs and management effectiveness

The proposed management measures are not expected to significantly impact administrative costs. MSY and ACLs are based on stock assessments used to regulate the commercial and recreational sectors harvesting vermilion snapper. None of the resultant measures from this action are expected to diminish regulatory effectiveness. All of these measures will require additional research to determine the magnitude and extent of impacts to bycatch and bycatch mortality. Administrative activities such as ACL monitoring and enforcement should not be affected by the proposed management measures.

Criterion 8: Changes in the economic, social, or cultural value of fishing activities and non-consumptive uses of fishery resources

Vermilion snapper is a desirable target species with economic and culinary benefits. The proposed decrease in the ACL in Action 2, Alternatives 2 4 is intended to maintain a sustainable harvest of vermilion snapper in the Gulf. This would be expected to improve fishing opportunities for the reef fish fishery, thereby increasing the economic and social benefits for fishermen and associated coastal businesses and communities. No effects would be expected on the non-consumptive uses of the fishery resources.

Criterion 9: Changes in the distribution of benefits and costs

The net effects of the proposed management measures in this amendment on bycatch are unknown because the resultant management measures could increase dead discards as a result of decreasing the ACL should the ACL be met or projected to be met. The proposed management measures would not be expected to affect the total amount of vermilion snapper normally harvested by anglers and commercial fishermen.

Criterion 10: Social effects

Bycatch is considered wasteful by fishermen and it reduces overall yield obtained from the fishery. Minimizing bycatch to the extent practicable will increase efficiency, reduce waste, and benefit stock sustainability, thereby resulting in net social benefits. It is expected that these actions would result in benefits for the recreational and commercial sectors.

Conclusion

Analysis of the ten bycatch practicability factors indicates there would be positive biological impacts associated with further reducing bycatch in the reef fish fishery. The main benefits of reducing vermilion snapper bycatch are less waste and increased yield in the directed fishery. Reducing discards and discard mortality rates would result in increased long-term yield.

When determining reductions associated with various management measures, discard mortality is factored into the analyses to adjust the estimated reductions for losses due to dead discards. Changes in discards associated with each of these management measures are contingent on assumptions about how fishermen's behavior and fishing practices will adjust. In these actions to establish an MSY proxy and set the stock ACL as discussed in this amendment can indirectly affect bycatch in the Gulf reef fish fishery. However, as discussed above, this effect is likely minimal given the actions are not expected to change how the fishery is prosecuted.

The Council needed to consider the practicability of implementing the bycatch minimization measures discussed above with respect to the overall objectives of the Reef Fish FMP and Magnuson-Stevens Fishery Conservation and Management Act. Therefore, given actions in this amendment combined with previous actions, management measures, to the extent practicable, minimize bycatch and to the extent bycatch cannot be avoided, minimize the mortality of that bycatch.

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