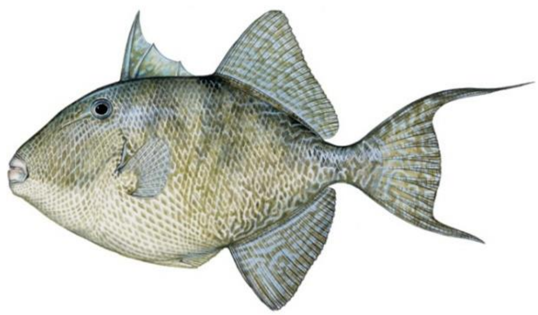
Tab B No. 8
Rev. 01/13/2017

Gray Triggerfish Rebuilding Plan



Public Hearing Draft
Amendment 46 to the Fishery Management Plan for the Reef Fish Resources of the Gulf of Mexico

January 2017

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COVER SHEET

Name of Action

Draft Amendment 46: Modifications to the Gray Triggerfish Rebuilding Plan

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Type of Action

( ) Administrative
(X) Draft
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( ) Final

ABBREVIATIONS USED IN THIS DOCUMENT

ABC	acceptable biological catch
ACL	annual catch limit
ACT	annual catch target
ALS	accumulated landings system
AMs	accountability measures
AP	advisory panel
APAIS	Access Point Angler Intercept Survey
B	biomass
B_{MSY}	stock biomass level capable of producing an equilibrium yield of MSY
CDT	commercial decision tool
CFLP	coastal fisheries logbook program
Council	Gulf of Mexico Fishery Management Council
CPUE	catch-per-unit effort
CS	consumer surplus
DPS	distinct population segment
EA	environmental assessment
EFH	essential fish habitat
EIS	environmental impact statement
EJ	environmental justice
ELMR	Estuarine Living Marine Resources
ESA	Endangered Species Act
F	Instantaneous rate of fishing mortality
FL	fork length
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
FWS	Fish and Wildlife Service
GMFMC	Gulf of Mexico Fishery Management Council
Gulf	Gulf of Mexico
gw	gutted weight
HAPC	habitat of particular concern
HBS	headboat survey
IFQ	individual fish quota
IPCC	Intergovernmental Panel on Climate Change
LA Creel	Louisiana Department of Wildlife and Fisheries creel survey
LETC	Law Enforcement Training Center
M	Instantaneous rate of natural mortality
Magnuson-Stevens Act	Magnuson-Stevens Fishery Conservation and Management Act
MFMT	Maximum fishing mortality threshold
MMPA	Marine Mammal Protection Agency
MRIP	Marine Recreational Information Program
MRFSS	Marine Recreational Fisheries Survey and Statistics
MSST	minimum stock size threshold

MSY	maximum sustainable yield
NMFS	National Marine Fisheries Service
NOAA	National Oceanic and Atmospheric Administration
OFL	overfishing level
OY	optimum yield
PAH	polycyclic aromatic hydrocarbons
RQ	regional quotient
RS	Restricted Species
SAS	SAS Institute
SEDAR	Southeast Data, Assessment and Review
SEFSC	Southeast Fisheries Science Center
SERO	Southeast Regional Office
SPL	Special Products License
SPR	Spawning potential ratio
SRHS	Southeast Region Headboat Survey
SSASPM	State-Space Age-Structured Production Model
SSB	spawning stock biomass
SSBR	spawning stock biomass per recruit
SSC	Scientific and Statistical Committee
T	number of years
TIP	Trip Interview Program
TL	total length
TPWD	Texas Parks and Wildlife Department
VOC	volatile organic compound
vms	vessel monitoring system
ww	whole weight

TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

CHAPTER 1. INTRODUCTION

1.1 Background and Status of the Gray Triggerfish Stock

Gray triggerfish (*Balistes capriscus*) is one of 31 reef fish species in the management unit for the Fishery Management Plan (FMP) for the Reef Fish Resources of the Gulf of Mexico (Gulf). The FMP provides management for reef fish species in the federal waters of the Gulf.

Gray triggerfish is caught throughout the Gulf, but landings are greater east of the Mississippi River than in the western Gulf (SEDAR 43 2015). Figure 1.1.1 displays the commercial, recreational, and total Gulf gray triggerfish landings from 1986 to 2014. The recreational landings are composed of landings estimated generated from Southeast Region Headboat Survey landings (SRHS), Texas Parks and Wildlife Department landings (TPWD), and Marine Recreational Information Program (MRIP) landings. The SRHS documented the landings from headboats in the entire Gulf of Mexico, TPWD surveyed the private and non-headboat charter fishers in Texas, and MRIP surveyed the shore, private, and non-headboat charter fishers from Louisiana to west Florida. However, in 2014 Louisiana started their own recreational survey which took the place of MRIP landings in Louisiana.

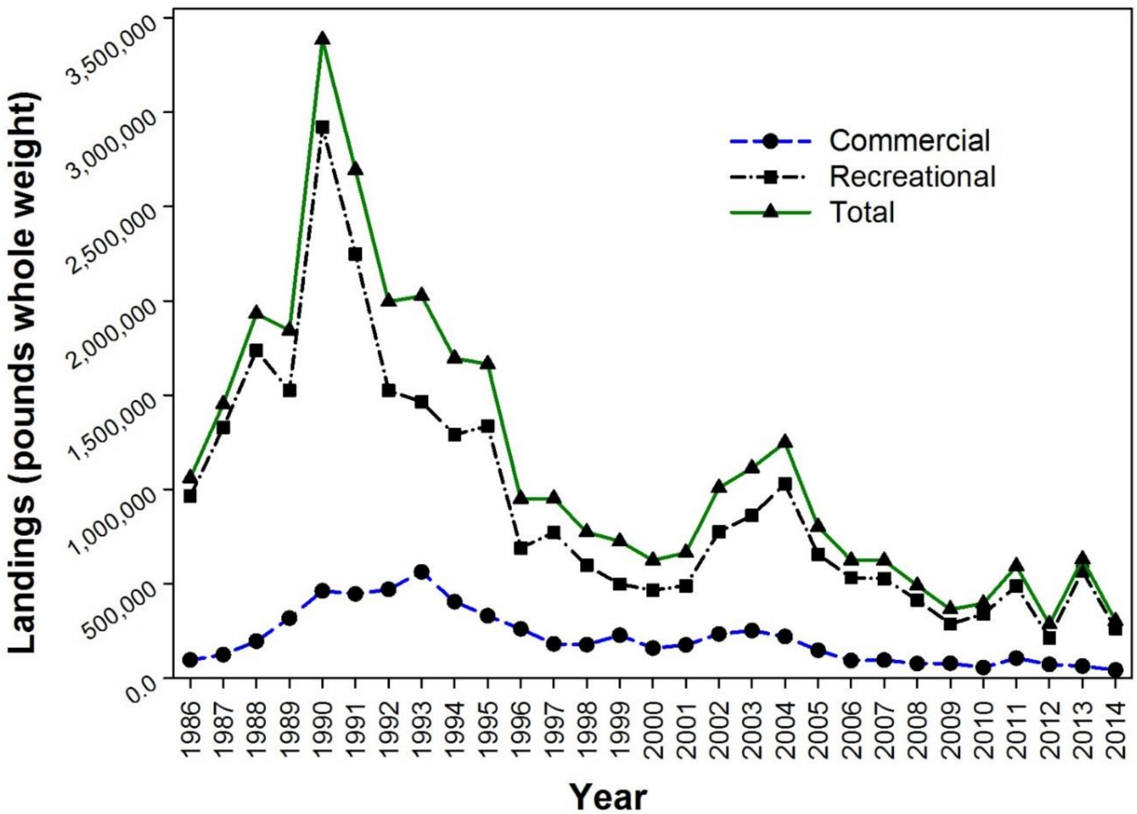

Figure 1.1.1. Gray triggerfish recreational, commercial, and total landings in pounds whole weight from 1986 through 2014. Source: Commercial landings from commercial ACL dataset (data accessed December 24, 2015). Recreational landings from the recreational ACL dataset (data accessed July 11, 2016).

From 1986 through 2012 MRIP did not exist and instead landings were estimated from the Marine Recreational Fisheries Statistics Survey (MRFSS) survey. MRFSS estimates from 1986 to 2003 have been adjusted to take into account the MRIP weighted estimation methodology (SEDAR31-DW25). Revised MRIP estimates, which reflect this weighted estimation methodology, were released in 2012 and are provided from 2004 to 2012. Recreational landings in 2013 and 2014 reflect the new MRIP APAIS (Access Point Angler Intercept Survey), which started in 2013.

In 1990, the highest recreational and commercial landings of gray triggerfish were documented at 3.38 mp whole weight (ww), then steeply declined through the 1990's (Figure 1.1.1). Total landings increased from 2001-2004 and peaked in 2004 over 1,200,000 lbs ww (Figure 1.1.1). Landings declined after 2004 to just under 500,000 lbs ww in 2008 and 2009 and decreased to around 390,000 lbs ww in 2010. In 2013, total landings increased over 600,000 lbs ww and in 2014 total landings were constrained to 302,840 lbs ww (Figure 1.1.1).

In 2012, the Gulf of Mexico Fishery Management Council (Council) modified the gray triggerfish rebuilding plan through Reef Fish Amendment 37 (GMFMC 2012). This amendment implemented management changes to the recreational and commercial sectors. Amendment 37 reduced the recreational annual catch limit (ACL) to 241,200 lbs ww and the recreational annual catch target (ACT) to 217,100 lbs ww. The commercial ACL was reduced to 64,100 lbs ww and the commercial ACT (quota) was reduced to 60,900 lbs ww. This rebuilding plan also established a fixed closed season for both the recreational and commercial sectors during peak spawning from June 1 through July 31. A recreational bag limit of 2 gray triggerfish within the 20-reef fish aggregate bag limit and a commercial trip limit of 12 gray triggerfish were also established. The recreational accountability measures (AMs) were modified to allow an in-season closure authority for gray triggerfish based on projected landings reaching the recreational ACT. As long as gray triggerfish remains overfished, if the recreational ACL is exceeded, a post-season overage adjustment is applied that reduces the ACL and ACT by the amount of the overage the following fishing year.

> ***Annual Catch Limit (ACL)***
> The amount of fish that can be harvested from the stock each year.
>
> ***Annual Catch Target (ACT)***
> A harvest level set lower than the annual catch limit to create a buffer so that overharvest does not occur.
>
> ***Accountability Measures (AMs)***
> Measures taken to prevent harvest from exceeding the annual catch limit and, if exceeded, to mitigate or correct the overage.

The recent SEDAR 43 (2015) standard assessment of Gulf gray triggerfish was completed and reviewed by the Scientific and Statistical Committee (SSC) in October 2015. The assessment indicated that gray triggerfish was no longer undergoing overfishing, but remains overfished (Table 1.1.1). On November 2, 2015, National Marine Fisheries Service (NMFS) notified the Council that the gray triggerfish stock was not making adequate progress toward rebuilding. Within 2 years of this notification, the Council must prepare and implement a plan amendment or proposed regulations for a plan to rebuild the stock as quickly as possible, but not to exceed 10 years. Based on SSC recommendations and Council discussion, the Council requested additional data and analyses from the Southeast Fisheries Science Center (SEFSC) for subsequent review by the SSC. The Council requested the SEFSC complete 6 projection scenarios with specific rebuilding targets of 8, 9, and 10 years and assuming 2 recruitment scenarios due to recruitment concerns raised during the assessment. This request was fulfilled and the SSC reviewed these projections at their January 2016 meeting.

In January 2016, the SSC accepted the low recruitment scenarios for 2014-2018 as the basis for the projections because the results of the analyses demonstrated there was a 5-year auto-correlation in the recruitment indices. However, the SSC felt there was no information in the assessment to support holding recruitment at lower levels more than 5 years into the future. The Council requested that yield stream projections start in 2017. However, the last year of data in the assessment was 2013; therefore, the following methodology was used to estimate 2014, 2015, and 2016 landings. For 2014, the SEFSC used the finalized commercial and recreational landings. However, at the time, 2015 landings were only provisional for the commercial sector and partially available for the recreational sector, with the remainder of the 2015 recreational landings estimated based on prior years' landings. For 2016, the total landings were set at the combined commercial and recreational ACLs of 305,300 lbs ww. Selectivity, discard, and retention functions were held constant for all years of the projections.

Table 1.1.1. Status determination criteria and stock status of gray triggerfish based on SEDAR 43 (2015) accepted by the SSC. The highlighted rows indicate gray triggerfish stock status as overfished ($SSB_{CURRENT}$/MSST) but no longer experiencing overfishing ($F_{CURRENT}$/MFMT).

Criteria	**Definition**	**Value**
Mortality Rate Criteria		
F_{MSY}	$F_{30\% SPR}$	0.166
MFMT	$F_{MSY\ proxy}$	0.166
F_{OY} proxy	75% of $F_{30\% SPR}$	0.125
$F_{CURRENT}$	2013	0.120
$F_{CURRENT}$/MFMT	**30% SPR proxy**	**0.72**
Base M	M	0.28
Biomass Criteria		
$SSB_{MSY\ proxy}$ (egg production)	Equilibrium egg production @$F_{30\%SPR}$	9.16E+09
MSST (egg production)	(1-M)*SSB30% SPR: M= 0.28	6.60E+09
$SSB_{CURRENT}$	2013	1.13E+10
$SSB_{CURRENT}$/MSST	**$SSB_{MSY\ proxy}$**	**0.89**
Equilibrium MSY (lbs ww)	Equilibrium Yield @ $F_{30\% SPR}$	2,236,983
Equilibrium OY proxy (lbs ww)	Equilibrium Yield @ 75%*$F_{30\%SPR}$	2,103,591

The SSC recommended yield streams for all three of the possible rebuilding time scenarios so that the Council could determine which target date (8, 9, or 10 years) to adopt. Given the uncertainties in the assessment and projections, the SSC recommended an acceptable biological catch (ABC) for 3 years (2017-2019) using a 40% probability of exceeding the overfishing limit

(OFL) applied to the yield at $F_{rebuild}$ (the yield that rebuilds the stock within 10 years or less). If there is not a new assessment by 2019, the SSC intends to reevaluate the ABC yield stream based on updated landings and any other new information available.

1.2 Assessment and Management History

A benchmark stock assessment was conducted in October 2006 for the Gulf gray triggerfish stock (SEDAR 9 2006a). The assessment used the two scenarios of a Stock Production Model Incorporating Covariates and the State-Space Age-Structured Production Model (SSASPM). The assessment results indicated the stock was both overfished and experiencing overfishing (SEDAR 9 2006a). In October 2006, NMFS notified the Council that the gray triggerfish stock was overfished and experiencing overfishing. This required that the Council take action to end overfishing and develop a rebuilding plan.

In response, the Council submitted Reef Fish Amendment 30A (GMFMC 2008) that established a stock rebuilding plan beginning in 2008 as required by the Magnuson-Stevens Fishery Conservation and Management Act (Magnuson-Stevens Act). Commercial and recreational ACTs[1], ACLs, and AMs were also established in Amendment 30A. The sector-specific ACTs, ACLs, and landings are shown in Table 1.2.1. For the commercial sector, the in-season AM would close the fishing season the year after the ACT (quota) is estimated to be met. If the commercial ACL is exceeded, the post-season AM is to reduce the ACL for the following year by the amount of the overage in the prior year. For the recreational sector, a post-season AM was established. If the ACL for a single year, or the 3-year running average of recreational landings, resulted in the ACL being exceeded, then the length of the fishing season would be shortened the next year based on the ACT.

An update stock assessment was conducted for Gulf gray triggerfish in 2011 (SEDAR 9 Update 2011b). The same assessment model (SSASPM model) from the 2006 gray triggerfish benchmark assessment (SEDAR 9 2006a) was applied and three scenarios were explored: 1) re-run the same model but with updated landings, catch-per-unit-effort series including 2010, and updated indices of abundance; 2) additional updated age-length information; and 3) updated shrimp trawl bycatch and effort data.

[1] Amendment 30A was developed before the new National Standard 1 guidelines (74 FR 3178) were published. Thus, the term target total allowable catch was used to describe what are now referred to as ACTs.

> ***Spawning Potential Ratio (SPR)***
>
> The spawning potential ratio assumes that a certain amount of fish must survive and spawn in order to replenish the stock.
>
> The spawning potential ratio is calculated as the average number of eggs per fish over its lifetime when the stock is fished compared to the average number of eggs per fish over its lifetime when the stock is not fished.

The Council's SSC reviewed the 2011 Update Assessment and accepted the second and third model scenarios listed above that used the updated age and length data, and the shrimp trawl bycatch and effort data. At that time the status determination criteria and the estimated rebuilding timeframes were based on future recruitment adhering to maximum sustainable yield (MSY) proxy. The MSY proxy is defined as the fishing mortality rate at 30% spawning potential ratio ($F_{30\%\ SPR}$). Future yields are normally based on recruitment projections that depend in part on the spawner-recruit curve developed in the assessment. At the time the update assessment was completed, gray triggerfish recruitment had been at low levels relative to the spawner-recruit curve (SEDAR 9 Update 2011b). The reason for low recruitment was unknown. Further, it was unknown whether recruitment in the near future will remain at these low levels or revert back to the levels projected by the spawner-recruit curve. At that time, the SSC set the ABC based on a low recruitment time period (i.e., 2005 through 2009) for 2012 and 2013 of 305,300 lbs ww (http://gulfcouncil.org/resources/SSC_Reports.php). The corresponding overfishing level (OFL) defined by the SSC was the yield at $F_{SPR30\%}$, equal to 401,600 lbs ww for these years. Results from the update stock assessment showed that the gray triggerfish stock is continuing to experience overfishing and the stock is overfished. In a March 2012 letter, NMFS informed the Council that the gray triggerfish stock was continuing to experience overfishing and was not making adequate progress to recover within the specified rebuilding period (NMFS 2012).

In response to this letter, the Council requested an interim rule for gray triggerfish be prepared for its April 2012 meeting that would reduce the recreational ACL to 241,200 lbs ww and the recreational ACT to 217,100 lbs ww. The commercial ACL was reduced to 64,100 lbs ww and the commercial ACT (quota) was reduced to 60,900 lbs ww. The interim rule also established in-season closure authority for the recreational sector based on the ACT. Therefore, if the recreational gray triggerfish ACT is reached or projected to be reached within a fishing year, the Assistant Administrator for Fisheries can close the recreational sector from harvesting gray triggerfish the rest of the year (http://sero.nmfs.noaa.gov/bulletins/fishery_bulletins.htm). Amendment 30A (GMFMC 2008) had already established in-season closure authority for the commercial sector based on the ACT (quota). Following implementation of the interim rule in May 2012, the recreational sector was closed on June 11 and the commercial sector was closed on July 1. The interim rule reduced fishing levels until long-term management measures were implemented through Amendment 37.

On June 10, 2013, NMFS implemented Amendment 37 (GMFMC 2012), that adjusted the commercial and recreational ACLs and ACTs, established a 12-fish commercial trip limit and a 2-fish recreational daily bag limit, established an annual fishing season closure from June 1 through July 31 for the commercial and recreational sectors, and revised the in-season AM for the recreational sector by eliminating the 3-year running average ACL. In addition, an overage adjustment for the recreational sector was added (Table 1.2.1).

Since implementation of Amendment 30A in 2008 and the reduction in sector ACLs and ACTs in Amendment 37 (GMFMC 2012), the commercial sector has exceeded its ACT (quota) in 2012 and 2013 (Table 1.2.1). However, this has not been the case for the recreational sector. The recreational sector has exceeded its ACT and ACL in 2008 and 2011, and its adjusted ACT and ACL from 2013 through 2016. In 2009, the ACT was exceeded, but not the ACL. The ACLs for 2009 and beyond were based on an average of the F_{OY} yield streams as established in Amendment 30A (GMFMC 2008), but were later removed in Amendment 37 in 2012 (GMFMC 2013).

The 2016 recreational landing are estimated to be 422,436 lbs ww. On November 15, 2016 NMFS published a temporary rule for 2017 gray triggerfish recreational sector that determined the recreational season would not reopen on January 1, 2017 and remain closed the entire 2017 fishing year. This determination was based on the 2016 adjusted recreational ACL and ACT for gray triggerfish being exceeded by 210% and 239%, respectively (Table 1.2.1). The gray triggerfish stock is overfished and this closure is necessary to protect the resource (http://sero.nmfs.noaa.gov/sustainable_fisheries/gulf_fisheries/reef_fish/2017/am46_gray_trigger/documents/pdfs/gulf_reef_trigger_closure_frnotice.pdf).

Table 1.2.1. Gulf landings, ACTs, and ACLs for gray triggerfish during the 9 years of the rebuilding plan. Amendment 37 removed the recreational moving averages and implemented an AM that triggered a post-season overage adjustment of the ACL and ACT implemented on June 10, 2013.

	Recreational					Rec. Landings	Commercial			
Year	**Landings**	**ACT**	**Adjusted ACT**	**ACL**	**Adjusted ACL**	**Moving Average**	**Landings**	**ACT (Quota)**	**Adjusted ACT**	**ACL**
2008	419,276	306,000		394,000		419,000	76,569	80,000		105,000
2009	401,026	356,000		426,000		410,000	78,117	93,000		122,000
2010	296,358	405,000		457,000		372,000	55,661	106,000		138,000
2011	461,548	405,000		457,000		386,000	105,251	106,000		138,000
2012	279,874	217,100		241,200			71,948	60,900	51,290	64,100
2013	453,642	217,100	162,759	241,200	186,859		63,086	60,900	54,802	64,100
2014	217,885	217,100	0	241,200	0		42,532	60,900		64,100
2015	94,184	217,100	30,107	241,200	54,207		47,480	60,900		64,100
2016	422,436	217,100	177,123	241,200	201,223		51,524	60,900		64,100
2017		0	0	241,200	19,987			60,900		64,100

Source: Commercial landings are from the commercial ACL dataset, accessed December 2, 2016, and recreational landings are from the recreational ACL dataset, accessed October 20, 2016.

Since the implementation of the revised rebuilding plan through an interim rule in 2012 and Amendment 37 in 2013, the federal recreational fishing season lengths have been decreasing (Table 1.2.2). Amendment 37 implemented a post-season AM for the recreational sector that reduced the quota the following year by the amount of the landings overage. This overage adjustment combined with the projected season length and incompatible state fishing seasons has led to further overages and additional uncertainty in projecting when the ACT would be harvested and the corresponding recreational season closure would occur. These variables add to uncertainty in the stock assessment and rebuilding plan for gray triggerfish. In addition, fishing behavior, such as effort shifting, remains difficult to quantify.

Table 1.2.2. Dates and number of days the recreational season was open in federal waters and state waters. During the federal season, both federal and state waters were open to the harvest of gray triggerfish.

Recreational Fishing Seasons							
Year	**Open Federal Season Dates**	**Number of Days in Federal Season**	**Additional state water fishing days after closure of federal season**				
			Florida	**Alabama**	**Mississippi**	**Louisiana**	**Texas**
2011	Jan 1 – Dec 31	365	0	0	0	0	0
2012	Jan 1 - June 10	161	205	0	0	24	205
2013	Jan 1 - Oct 15	236	129	0	0	0	129
2014	Jan 1 – Apr 30	120	245	12	0	0	245
2015	Jan 1- Feb 6	37	0	31	0	328	328
2016	Jan 1 – May 31	152	0	31	0	0	214

Note: On June 10, 2013, a June 1 – July 31 fixed closed season and decrease in the recreational bag limit to 2 gray triggerfish within the 20 reef fish aggregate became effective through Amendment 37.

1.3 Purpose and Need

Purpose for Action

The purpose is to establish a rebuilding time period, catch levels, and management measures for the Gulf gray triggerfish stock.

Need for Action

The need is to make adequate progress to rebuild an overfished stock, consistent with the requirement for rebuilding plans, and to achieve, on a continuing basis, the optimum yield from the federally managed stock.

1.4 History of Management

The following summary describes management actions that affect the reef fish fishery in the Gulf of Mexico. The summary focuses on the management of grouper stocks in general, and in particular, the management of gray triggerfish in the FMP for the Reef Fish Resources of the Gulf of Mexico. More information on the FMP can be obtained from the Council at http://www.gulfcouncil.org/fishery_management_plans/index.php.

Status in the fishery management unit:

Management measures from the initial **FMP** [with its associated environmental impact statement (EIS)] were implemented in November 1984. The original list of species included in the management unit consisted of snappers, groupers, and sea basses. Gray triggerfish was in a second list of species included in the fishery, but not in the management unit. This designation was for species not considered to be targeted because they were generally taken incidentally. Their inclusion in the Reef Fish FMP was for purposes of data collection, and their take was not regulated. Species including gray triggerfish were added to the fishery management unit through **Amendment 1** [with its associated environmental assessment (EA), regulatory impact review (RIR), and regulatory flexibility analysis (RFA)] in 1990.

Stock status determination criteria:

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% spawning stock biomass per recruit (SSBR), relative to the SSBR that would occur with no fishing. A framework procedure for the specification of the total allowable catch was created to allow for annual management changes. Measures in the **Generic Sustainable Fisheries Act Amendment** (with its associated EA, RIR, and RFA), were partially approved and implemented in November 1999. This amendment set the maximum fishing mortality threshold (MFMT) for gray triggerfish at $F_{30\% \ SPR}$. Estimates of the MSY, MSST, and optimum yield (OY) were disapproved because they were based on spawning potential ratio proxies rather than biomass based estimates.

Amendment 30A (supplemental EIS/RIR/RFA) was developed in part to stop overfishing of gray triggerfish and rebuild the overfished stock. The amendment established the MSY, MSST, and OY status determination criteria disapproved in the **Generic Sustainable Fisheries Act Amendment**, and set ACLs and AMs (AMs) that were implemented in August 2008. Management measures from the **Final Generic ACL/AM Amendment for the Gulf of Mexico Fishery Management Council's Red Drum, Reef Fish, Shrimp, Coral and Coral Reefs Fishery Management Plans (Generic ACL/AM Amendment)** (EIS/RIR/RFA) were implemented in January 2012. Although ACLs and AMs for gray triggerfish had been set in **Amendment 30A**, the **Generic ACL/AM Amendment** also established an ABC control rule, ACL/ACT control rule, and revised the framework procedures.

National Marine Fisheries Service prepared a **2012 interim rule** to end overfishing immediately that reduced the recreational and commercial ACLs and ACTs, respectively after the results of the 2011 Update Assessment (SEDAR 9 Update 2011). **Amendment 37** (implemented in June 2013 with its associated environmental assessment (EA), Regulatory Impact Review (RIR), and Regulatory Flexibility Act (RFA) Analysis) made the reductions in ACLs and ACTs for both sectors permanent and established the objective of rebuilding the stock within 5-years or less. The rebuilding plan also modified the recreational AMs to replace the current accountability measure with an in-season closure authority for gray triggerfish based on the recreational ACT. The Council also selected to add a post-season overage adjustment to the recreational AMs. Any overages for the recreational ACL (applied only if the ACL is exceeded and the stock is overfished) and ACT will be deducted in the following season.

Allocation:

Amendment 1 provided a framework procedure for specifying the total allowable catch that was implemented in 1990. The framework procedure specified that allocations between the commercial and recreational sectors were based on historical landing percentages from average landings during 1979-1987. This represented the total period for which both commercial and recreational landings data were available. However, this did not preclude the use of a plan amendment to set allocations using different criteria. The Council revised the allocation for gray triggerfish in 2008, on an interim basis, in **Amendment 30A** based on 2001-2004 landings. The allocation was set at 21% commercial and 79% recreational.

Bag limits:

Management measures from **Amendment 12** (with its associated EA and RIR) were implemented in January 1997. The management measures included the creation of an aggregate bag limit of 20-reef fish for all reef fish species not having a bag limit. Gray triggerfish were included in this aggregate bag limit. In **Amendment 37** the bag limit was reduced to 2-gray triggerfish per angler within the 20-reef fish aggregate bag limit and became effective June 2013.

Minimum size limits:

Amendment 16B established a 12-inch total length minimum size, which became effective in 1999. To assist fishermen in measuring gray triggerfish, the size limit was changed from total to fork length in **Amendment 30A** (implemented in August 2008). Amendment 30A also increased the minimum size limit to 14-inches fork length in as part of a rebuilding plan to end overfishing and allow the stock to recover.

Fixed closed seasons:

In **Amendment 37** the Council established a fixed closed season for gray triggerfish during peak spawning (June 1 through July 31) for both the recreational and commercial sectors that became effective June 2013.

Commercial quota:

Management measures from **Amendment 30A** established a commercial quota as part of the gray triggerfish rebuilding plan. This measure went into effect in August 2008.

Commercial trip limit:

Amendment 37 implemented a commercial trip limit of 12 gray triggerfish as part of the modified rebuilding plan that became effective June 2013.

Commercial permits:

Commercial reef fish permits were established through **Amendment 1** in 1990. **Amendment 4** (with its associated EA and RIR) established a moratorium on the issuance of new reef fish permits for a maximum period of three years. This moratorium was extended in **Amendments 9** (with its associated EA and RIR, rule implemented in July 1994), **11** (with its associated EA and RIR, rule implemented in January 1996), and **17** (with its associated EA and RIR) rule implemented in August 2000). It was extended indefinitely in **Amendment 24** [with its EA, RIR, and RFA), rule implemented in August 2005]. Rulemaking from **Amendment 14** (EA/RIR/RFA), implemented in March and April 1997, provided for a 10-year phase-out for the fish trap fishery, allowed transfer of fish trap endorsements for the first 2 years, and prohibited the use of fish traps west of Cape San Blas, Florida.

For-hire permits:

For-hire reef fish permits were put in place through **Amendment 11** in January 1997. Management measures from **Amendment 20** (with its associated EA, RIR, and RFA) were implemented in June 2003 to establish a three-year moratorium on the issuance of new charter and headboat vessel permits for Gulf of Mexico reef fish to limit further expansion of the for-hire fleet while the Council considered the need for more comprehensive effort management systems. This moratorium was replaced by a permanent limited entry system by actions in **Amendment 25** (with its supplemental EIS, RIR, and RFA) which was effective in June 2006. **Amendment 30B** included an action that required vessels with a federal Gulf charter/headboat permit for reef fish to abide by the stricter regulations if state and federal water regulations are different. Thus, if state waters are open to fishing while federal waters are closed, federally permitted vessels are prohibited from fishing in the additional state water fishing opportunities (Table 1.2.2).

CHAPTER 2. MANAGEMENT ALTERNATIVES

2.1 Action 1 – Establish a Rebuilding Time Period

Alternative 1: No Action. Maintain the current 5-year rebuilding time period that began in 2012 and ends in 2017.

Alternative 2: Establish a rebuilding time period equal to the minimum number of years (T_{min}) to rebuild the stock based on a constant fishing mortality rate equal to zero starting in 2017. Using the Scientific and Statistical Committee (SSC) selected recruitment scenario the gray triggerfish stock is projected to recover in 6 years, by the end of 2022.

Alternative 3: Establish a rebuilding time period of 8 years or by the end of 2024.

Preferred Alternative 4: Establish a rebuilding time period of 9 years or by the end of 2025.

Alternative 5: Establish a rebuilding time period of 10 years or by the end of 2026.

Note: The new rebuilding time periods are assumed to begin in 2017 based on the results of the SEDAR 43 (2015) standard assessment. The yield streams for these rebuilding periods correspond to the 40^{th} percentile of the $F_{rebuild}$ probability distribution functions.

Discussion:

This action evaluates various rebuilding time periods for gray triggerfish from status quo to the range of approved years supported by the SSC. The stock needs to be rebuilt to a size that can support harvesting the maximum sustainable yield (MSY). For gray triggerfish, MSY is defined as the yield at the fishing mortality rate (F) that can support a 30% spawning potential ratio (SPR), or the yield at $F_{30\%\ SPR}$, the proxy for MSY. The recovery target for gray triggerfish is based on egg productivity or achieving a SPR of 30% of an unfished stock or virgin biomass (GMFMC 2008; SEDAR 43 2015). To account for uncertainty in stock dynamics, current stock status, and recruitment variability, Restrepo et al. (1998) suggest that rebuilding plans should be designed to possess a 50% or higher chance of achieving the biomass target with the proposed rebuilding time period. For stocks in an overfished condition, the Magnuson-Stevens Fishery Conservation and Management Act (Magnuson Stevens Act) (304)(4)(A) states "when specifying a time period for rebuilding that it shall (i) be as short as possible, taking into account the status and biology of any overfished stocks of fish, the needs of the fishing communities...".

Alternative 1 (No Action) would maintain the current rebuilding schedule established in Amendment 37 (GMFMC 2012). The most recent Standard Assessment (SEDAR 43 2015) on gray triggerfish indicated the stock was not rebuilding on schedule. In Amendment 37 the Council selected to rebuild the stock within 5 years or less, or by the end of 2017 (GMFMC 2012). The rebuilding schedule was associated with harvesting at a fishing mortality rate associated with 30% SPR with an acceptable biological catch (ABC) of 305,300 lbs whole weight (ww). Since implementation of Amendment 37 the rebuilding plan the Council developed has ended overfishing. However, the assessment indicated that inadequate progress has been made to rebuild the stock. The National Marine Fisheries Service (NMFS) informed the Council of this determination in a November 2, 2015 letter. After receiving this notice, the Council has 2 years to prepare and implement a fishery management plan, plan amendment, or proposed regulations to rebuild the affected stock.

Alternative 2 would be the most conservative rebuilding plan by establishing a fishing mortality value of zero starting in 2017. Based on the stock assessment and SSC recruitment scenario, the gray triggerfish stock is projected to rebuild in 6 years or by the end of 2022 with zero fishing mortality. This is the minimum time the stock is expected to rebuild at 30% SPR ratio (i.e., egg production is 30% of an unfished stock if all sources of fishing mortality, including discard mortality, were eliminated. This would require a complete closure to the harvest of gray triggerfish. Unlike other reef fish species, gray triggerfish is considered hardy and less susceptible to discard mortality (SEDAR 9 2006a; SEDAR 43 2015). However, in a closed fishery there will always be some discard mortality. Therefore, it is not realistic to assume zero fishing mortality would occur even if the fishery was completely closed. Based on the harvest projections, it was concluded that if any directed harvest is allowed, the additional discard mortality, while low, would be sufficient to prevent rebuilding in 7 years. Therefore, a 7 year rebuilding plan is not viable and is not included as an alternative.

Alternatives 3-5 would use the SSC's recommended rebuilding time period for the gray triggerfish stock of 8 (**Alternative 3**), 9 (**Preferred Alternative 4**), or 10 (**Alternative 5**) years, respectively. All of these alternatives are projected to begin in 2017 and are based on the results of SEDAR 43 (2015). **Alternatives 3-5** consider a constant fishing mortality rate and the resulting catch levels, if constrained, have a 60% probability of rebuilding the stock within the 8, 9, or 10 year periods.

Table 2.1.1. Rebuilding times starting in 2017 for gray triggerfish with fishing mortality maintained at constant fishing mortality rate (F).

Alternative	Rebuilding time (years)	Rebuilding date
Alternative 2	6	2022
Alternative 3	8	2024
Preferred Alternative 4	9	2025
Alternative 5	10	2026

2.2 Action 2 – Establish Annual Catch Limits and Annual Catch Targets

*Notes: The decisions in Action 1 for rebuilding time period dictates the options that can be used in Alternative 3.

The sector allocations for gray triggerfish are 21% commercial and 79% recreational as established in Amendment 30A. All ABC, sector annual catch limits (ACLs), and annual catch targets (ACTs) are in pounds whole weight.

Preferred Alternative 1: No Action. Retain the gray triggerfish sector ACLs and ACTs developed in Amendment 37 and in effect since 2012.

ABC	Commercial ACL	Recreational ACL
305,300	64,100	241,200
	Commercial ACT (quota)	**Recreational ACT**
	60,900	217,100

Alternative 2: Set sector ACLs and ACTs for gray triggerfish at zero pounds until a new stock assessment has been completed.

Alternative 3: Use the SSC recommendation of mean ABC yield streams for 2017 through 2019 for each of the rebuilding periods (8, 9, and 10 years). Use the ACL/ACT control rule buffer for each sector based on landings from 2012 through 2015. This results in an 8% buffer between the ACL and ACT for the commercial sector and a 20% buffer between the ACL and ACT for the recreational sector.

Option a. Corresponds with the mean ABC projections to rebuild the stock in 8 years or by the end of 2024.

Option b. Corresponds with the mean ABC projections to rebuild the stock in 9 years or by the end of 2025.

Option c. Corresponds with the mean ABC projections to rebuild the stock in 10 years or by the end of 2026.

Options	Year	ABC Mean (2017-2019)	Commercial ACL	Commercial ACT (quota)	Recreational ACL	Recreational ACT
Option a	8-year	225,333	47,320	43,534	178,013	142,410
Option b	9-year	409,333	85,960	79,083	323,373	258,698
Option c	10-year	551,667	115,850	106,582	435,817	348,654

Discussion:

Action 2 includes alternatives to modify the ABC, ACLs, and ACTs for gray triggerfish based on the SEDAR 43 (2015) stock assessment and subsequent SSC review. Gray triggerfish are currently managed toward harvesting the ACT (quota). When the ACT is estimated to be reached the in-season accountability measure (AM) is triggered to close the fishing season for the remainder of the year. This strategy of a management buffer between the ACT and ACL, reduces the likelihood of exceeding the ACL and triggering post-season accountability measures, which reduces the amount of fish allowed to be harvested in the following year.

The Council established the ACL/ACT control rule in the Generic ACL/AM Amendment (GMFMC 2011). The Council developed the ACL/ACT control rule so that it could objectively and efficiently assign catch limits and targets that take into account management uncertainty. The rule uses different levels of information about catch levels, sector overages, stock management practices, and data quality to assign levels of reduction for either sector ACLs or ACTs.

Amendment 30A (GMFMC 2008) established both ACLs and ACTs for gray triggerfish. In Amendment 37 (GMFMC 2012) the Council used the revised ABC to set the sector ACLs based on the Amendment 30A sector allocations. The allocation was based on landings for each sector from 2000 to 2004. The resulting gray triggerfish allocation was 21% commercial and 79% recreational. By applying the allocation to the ABC, sector ACLs are currently 64,100 lbs ww for the commercial sector and 241,200 lbs ww for the recreational sector. The ACL/ACT Control Rule applied in Amendment 37 resulted in a 5% commercial buffer and a 10% recreational buffer to the ACL to establish the ACT. The resulting gray triggerfish ACTs are 60,900 lbs ww for the commercial sector and 217,100 lbs ww for the recreational sector.

Since the implementation of the Amendment 37 in 2013, the commercial sector landings have remained under the ACL of 64,100 lbs ww, while the recreational sector has exceeded its 217,100 lbs ww ACL in 2013, 2015, and 2016 (see Table 1.2.1).

Preferred Alternative 1 (No Action) would retain an ABC, ACLs, and ACTs as established in Amendment 37 (GMFMC 2012). **Alternative 2** would set the sector ACLs and ACTs at zero until a new stock assessment is completed, currently schedule for initiation in summer 2018 (http://gulfcouncil.org/resources/SEDAR/SEDAR%20Gulf%20Assessment%20Schedule%20100116.pdf). **Alternative 3** uses the SSC recommendation of the mean of the ABC yield streams from 2017 through 2019 for each of the rebuilding periods (8, 9, and 10 years). For **Alternative 3** the mean ABC in **Option a** (8 years) is 225,333 lbs, **Option b** (9 years) is 409,333 lbs, and **Option c** (10 years) is 551,667 lbs. **Options a-c** in **Alternative 3** would all use the ACL/ACT control rule to set the commercial ACT buffer at 8% less than the commercial ACL, and the recreational ACT buffer at 20% less than the recreational ACL. The ACL/ACT Control Rule Buffer Worksheet (Appendix A) explains how the 8% commercial buffer was calculated. The ACL/ACT Control Rule Buffer Worksheet (Appendix B) explains how the 20% recreational buffer was calculated.

If the Council selects a 10 year rebuilding time period in Action 1, then any alternative in Action 2 could be selected, including **Preferred Alternative 1** (No Action). If a 9 year rebuilding time period is selected, then any alternative except **Alternative 3 Option c** may be selected. If an 8 year rebuilding time period is selected, the Council is limited to **Alternative 2** and **Alternative 3 Option a** catch levels.

2.3 Action 3 – Recreational Management Measures

Action 3.1: Modify the Recreational Fixed Closed Season

Alternative 1: No Action. Do not modify the recreational fixed closed season (June 1 through July 31) for gray triggerfish.

Modify the recreational fixed closed season for gray triggerfish to be:

Alternative 2: June 1 through August 31
Alternative 3: January 1 through July 31
Preferred Alternative 4: January 1 through the end of February and June 1 through July 31
Alternative 5: January 1 through January 31 and June 1 through July 31

Action 3.2: Modify the Recreational Bag Limit

Alternative 1: No Action. Do not modify the recreational daily bag limit of 2 gray triggerfish per angler per day within the 20-reef fish aggregate bag limit.
Preferred Alternative 2: Reduce the recreational daily bag limit to 1 gray triggerfish per angler per day within the 20-reef fish aggregate bag limit.

Action 3.3: Modify the Recreational Minimum Size Limit

Alternative 1: No Action. Do not modify the gray triggerfish recreational minimum size limit of 14 inches fork length (FL).
Preferred Alternative 2: Increase the recreational minimum size limit for gray triggerfish to 15 inches FL.
Alternative 3: Increase the recreational minimum size limit for gray triggerfish to 16 inches FL.

Discussion for Action 3 – Recreational Management Measures:

The decision tool for gray triggerfish recreational scenarios (Gulf Gray Triggerfish Recreational Tool 2016; Appendix D) was developed to allow the Council to examine a range of options after establishing ACLs and ACTs in Action 2. The recreational decision tool for gray triggerfish provides estimates of total projected landings under the various management scenarios and an estimate of discards, dead discards, and total removals. The estimate of total removals incorporates discard mortality which was estimated to be 5% in the recreational sector in the most recent assessment (SEDAR 43 2015).

The gray triggerfish recreational decision model applies reductions in landings associated with various management measures (i.e., closed seasons, bag limits, and minimum size limits) necessary to achieve the ACTs summarized in Action 2. Reductions in landings for bag limits and minimum size limits were determined using Marine Recreational Information Program (MRIP), headboat survey (HBS), Texas Parks and Wildlife Department (TPWD), and Louisiana Department of Wildlife and Fisheries Creel Survey (LA Creel) data from 2013 through 2015. Details on the calculation of the reduction in landings from the bag and size limits can be found in Appendix D. These reductions were applied to monthly projected 2017 landings to determine how much harvest would be reduced by implementing new management regulations. Details of the estimation of the predicted 2017 landings can be found in Appendix D. The impacts of seasonal closures were modeled by converting the number of days closed into a percentage of days closed for a given month, and then by applying the percentage to 2017 monthly projected recreational landings.

A similar recreational decision tool was created for Reef Fish Amendment 37 (2012). The accuracy of the Amendment 37 recreational decision tool was determined by comparing the predicted landings from the decision tool to the actual recreational landings in 2013. The Amendment 37 recreational decision tool predicted landings were 21.2% below the actual 2013 landings. The recreational sector closed on October 15, 2013 even with the fixed in-season closure from June 1 through July 31. The 21.2% increase in landings above the predicted landings could have been a result of effort shifting due to both the fixed closed season closure (June 1- July 31) and the in-season closure on October 15, 2013. Seasonal closures can result in fishing effort shifting to time periods outside the closure (Baum et al. 2003; O'Keefe et al. 2013). To address effort shifting the recreational decision tool (Gulf Gray Triggerfish Recreational Tool 2016) allows the landings to be modified as a result of effort shifting from season closures. The effort shifting component also allows the user to define an effort shift scalar (a percentage) from 0% through 100% for each individual mode (headboat, charter vessel, and private component) that may occur as a result of season closures. Details of the effort shift method can be found in Appendix D.

Effort shifting is difficult to predict because the amount of effort shifting can vary by species and time period (Vermard et al. 2008). The Gulf Gray Triggerfish Recreational Tool 2016 and this amendment allows the Council to consider both seasonal closures and various percentages of recreational fishing effort shifting to other months. These analyses were accomplished by first determining the number of closed fishing days from closure, and then distributing these days to the open days using the daily catch rate for the open periods. Daily catch rates were determined for each month from the 2017 predicted landings; however, the landings are uniform within a month. An example of the fishing effort shifting method is if 20 days are closed in June, such as June 1 through June 20, then these 20 days are redistributed to the daily catch rates for the open period (January 1 through May 31 and June 21 through December 31). Since January is open for the entire month in this example, the January landings will increase from the added days from the effort shift multiplied by the January daily catch rate. Additionally, the effort shifting method allows the user to define the percentage (from 0 to 100%) of the closed days to apply to the other open days. For example, if an effort shift of 10% is used for 20 closed fishing days than 2 extra fishing days will be distributed to the open season.

Another example of an effort shift scalar can be demonstrated using the Amendment 37 recreational decision tool. The amount of effort shift scalar (percentage) was determined by comparing the predicted landings from the tool against the actual landings in 2013, 2014, and 2015. Table 2.3.1 displays the determined effort shift scalar generated from the Amendment 37 decision tool by component (headboat, charter vessel, and private anglers).

Table 2.3.1. Effort shift scalar (percentage) by year, closure date, and recreational mode estimated from the Amendment 37 recreational decision tool.

	Year		
	2013	2014	2015
Closure Date	Oct 15	May 1	Feb 7
Headboat	16.4%	99.8%	>100%
Charter vessel	1%	0%	47%
Private	10.5%	>100%	>100%

Source: Gray triggerfish recreational decision tool presentation for the Council's Scientific and Statistical Committee September 2016 meeting.

As with most projection models, the reliability of the recreational decision tool results are dependent upon the accuracy of their underlying data and input assumptions. We have attempted to create a realistic effort baseline as a foundation for comparisons, under the assumption that projected 2017 landings will accurately reflect actual 2017 landings. Uncertainty exists in this projection, as economic conditions, weather events, changes in catch-per-unit effort, fisher response to management regulations, and a variety of other factors may cause departures from this assumption.

<u>Discussion for Action 3.1:</u> Modify the Recreational Fixed Closed Season

Action 3.1 would modify the recreational fixed closed season for gray triggerfish. In 2011 and 2012, peak recreational gray triggerfish landings occurred during the months of May and June (wave 3). The 2014 recreational landings peaked during the month of August (wave 4) after the current June 1 through July 31 closed season was implemented through Amendment 37 (Figure 2.3.1). **Alternative 1** would maintain the June 1 through July 31 recreational closed season. The Council elected to establish this fixed closed season because it overlapped with the time period of peak spawning in the northern Gulf (Ingram 2001; Simmons and Szedlmayer 2012). Gray triggerfish are fecund as early as May and as late as August, but peak spawning was recorded in June and July in the northern Gulf and South Atlantic Bight (Wilson et al. 1995; Hood and Johnson 1997; Ingram 2001; Moore 2001; Simmons and Szedlmayer 2012).

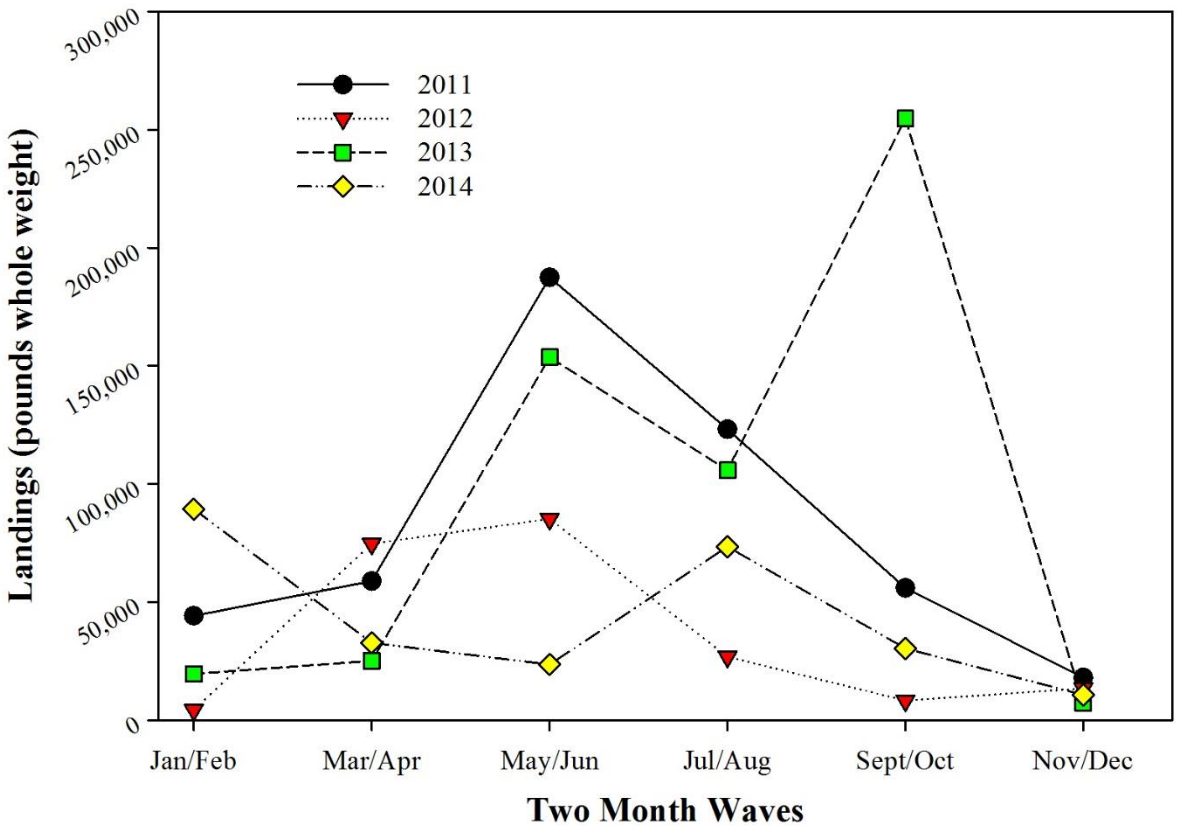

Figure 2.3.1. Recreational landings of gray triggerfish in the Gulf by two month wave from 2011 through 2014. Source: SERO-ACL dataset.

Alternative 1 would maintain the 2-month fixed closed season, which is projected to provide 163 recreational fishing days, closing by mid-August when landings are projected to reach the ACT, based on the Gulf Gray Triggerfish Recreational Tool (Appendix D). However, as the stock rebuilds this projected closure could fluctuate annually, as it has since 2012. In 2016, for example, the recreational sector did not re-open in August, because the adjusted ACT (quota) is estimated to have been reached prior to the June 1 through July 31 fixed closed season. Despite the in-season AM, adjusted ACT, and 2-month fixed closed season, recreational landings have continued to exceed the adjusted ACT. If the Council decides not to modify the recreational fixed closed season (June 1 through July 31) then additional management measures will likely be needed in order to constrain landings to the recreational ACT selected in Action 2 and avoid a later closed season. Gray triggerfish and red snapper co-occur on reefs in the northern Gulf. Currently, the recreational red snapper season is open during June so anglers may not currently land gray triggerfish while fishing for red snapper. Discarded gray triggerfish are estimated to have a minimal mortality (SEDAR 9 2006a; SEDAR 9 Update 2011b; SEDAR 43 2015). Therefore, retaining the current closed season, which overlaps with part of the red snapper season would not be expected to substantially increase dead discards.

Alternative 2 would establish a fixed closed season for gray triggerfish from June through August. **Alternative 3** would establish a fixed recreational closed season for gray triggerfish from January 1 through July 31. **Preferred Alternative 4** and **Alternative 5** would maintain the June 1 through July 31 closed season, and establish an additional fixed recreational closed season. **Preferred Alternative 4** would establish the additional fixed recreational closed season for gray triggerfish during the months of January and February, and **Alternative 5** would establish the additional fixed recreational closed season during the month of January. The estimates of total projected landings are in Table 2.3.2. If the Council uses closed seasons alone to constrain the recreational harvest, **Alternative 3** is the most conservative alternative the Council is currently considering. It is estimated to constrain landings to 148,177 lbs ww.

Table 2.3.2. The total recreational projected landings expected by closing single months or a combination of months and maintaining the minimum size limit of 14 inches fork length (FL), 2 fish bag limit, and assuming no effort shifting.

Action 3	Closed Month(s)	Total Projected Landings (ww)
	January	487,134
	February	489,057
	March	484,537
	April	485,261
	May	399,408
	June	402,879
	July	441,929
	August	441,929
	September	474,346
	October	473,258
	November	498,793
	December	498,520
Alternative 1	June – July (status quo)	337,803
Alternative 2	June – August	272,727
	April – July	208,464
	May – July	230,207
	May – August	165,131
Alternative 3	January – July	148,177
Preferred Alternative 4	Jan-Feb & Jun – July	299,984
Alternative 5	Jan & Jun – July	317,932

Source: Gulf Gray Triggerfish Recreational Decision Tool 2016.

<u>Discussion for Action 3.2:</u> Modify the Recreational Bag Limit

Action 3.2 would modify the recreational bag limit for gray triggerfish. Gray triggerfish is currently part of the 20-reef fish aggregate bag limit that includes: vermilion snapper, lane snapper, almaco jack, tilefish (golden), goldface tilefish, and blueline tilefish. Gray triggerfish currently has a 2 fish per angler per day bag limit (**Alternative 1**). Based on recreational landings from 2013 through 2015 (Figure 2.3.2) approximately, 10% of the trips with reef fish landings harvest 2-gray triggerfish within the 20 fish aggregate bag limit (**Alternative 1**).

Preferred Alternative 2 would reduce the recreational bag limit to 1 gray triggerfish per angler within the 20-reef fish aggregate bag limit. Reducing the bag limit to 1 fish per angler per day and maintaining the other recreational management measures (June 1 – July 31 closed season and 14 inch FL) at status quo is only expected to reduce recreational landings by 15% (Tables 2.3.5 and 2.3.6). Thus, depending on the rebuilding time period and catch limits established in Actions 1 and 2, other management measures would likely be necessary reduction to avoid a closed season later in the year.

A recent publication using headboat data and cluster analysis from 2004 to 2009 (n = 121,334 trips) determined gray triggerfish was caught most frequently with the following other moderate-depth species: vermilion snapper, red snapper, and lane snapper (Farmer et al. 2016). Red snapper currently has its own bag limit whereas, vermilion snapper and lane snapper are within the 20-fish aggregate. A similar analysis using MRFSS data from 2000 to 2009 (n = 64,782 dockside intercepts) was conducted and demonstrated a greater number of species caught with gray triggerfish including red snapper, lane snapper, vermilion snapper, scamp, banded rudderfish, greater amberjack, misty grouper and speckled hind (Farmer et al. 2016). Several of which have individual bag limits. To determine if reducing the gray triggerfish bag limit to 1 fish per angler per day (**Preferred Alternative 2**) could impact the other species in the aggregate a more in-depth analysis of the recent (2013-2015) recreational survey data was completed. This analysis showed only a small percentage of trips (<1%, n = 70 trips) reached the 20-reef fish aggregate bag limit when all 7 species in the aggregate were included (Figure 2.3.2). Therefore, the other species are not anticipated to be impacted if gray triggerfish was removed from the aggregate group or if the bag limit is reduced to 1 fish per angler per day as the 20-reef fish aggregate is not currently constraining recreational harvest.

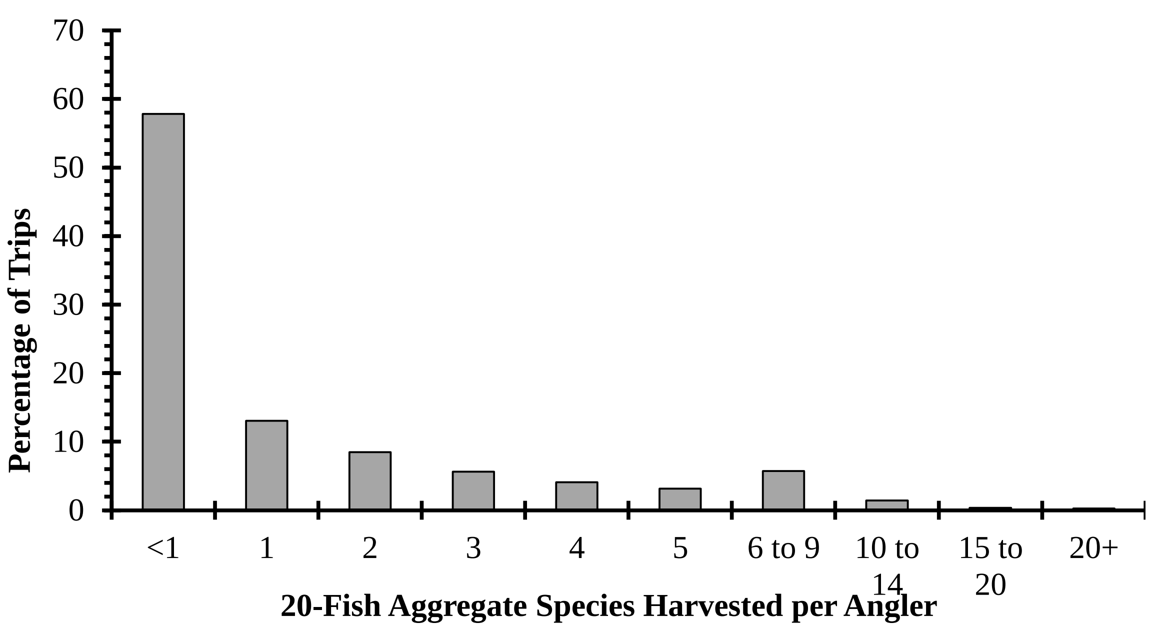

Figure 2.3.2. Number of reef fish per angler per trip (expressed as a percentage) landed within the 20 reef fish aggregate bag limit from the Gulf (n = 25,385 trips) from 2013 through 2015.

<u>Discussion for Action 3.3:</u> Modify the Recreational Minimum Size Limit

Action 3.3 would increase the recreational minimum size limit. Amendment 16B (GMFMC 1998**)** established a 12-inch total length (TL) minimum size limit, which became effective in 1999. To assist fishermen in measuring gray triggerfish, the size limit was changed from TL to fork length (FL) in Amendment 30A (implemented in August 2008). Amendment 30A also increased the minimum size limit to 14-inches FL as part of the rebuilding plan to end overfishing and allow the stock to recover.

The Council typically considers both the size and age at reproductive maturity and discard mortality when anticipating modifications to the minimum size limit of reef fish species. The 14-inch FL minimum size limit is greater than the size at first maturity. Studies estimated first maturity for both male and female gray triggerfish at 10-inches FL (Hood and Johnson 1997; Ingram 2001). An increase in the minimum size limit could also potentially benefit the stock by increasing spawning potential (larger fish are more fecund). Based on the von Bertalanffy growth equation the approximate age of a 14-inch FL fish (**Alternative 1**) is age 5, 15-inches FL (**Preferred Alternative 2**) is age 6, and a 16-inch FL fish (**Alternative 3**) is approximately 7 years old (Figure 2.3.3).

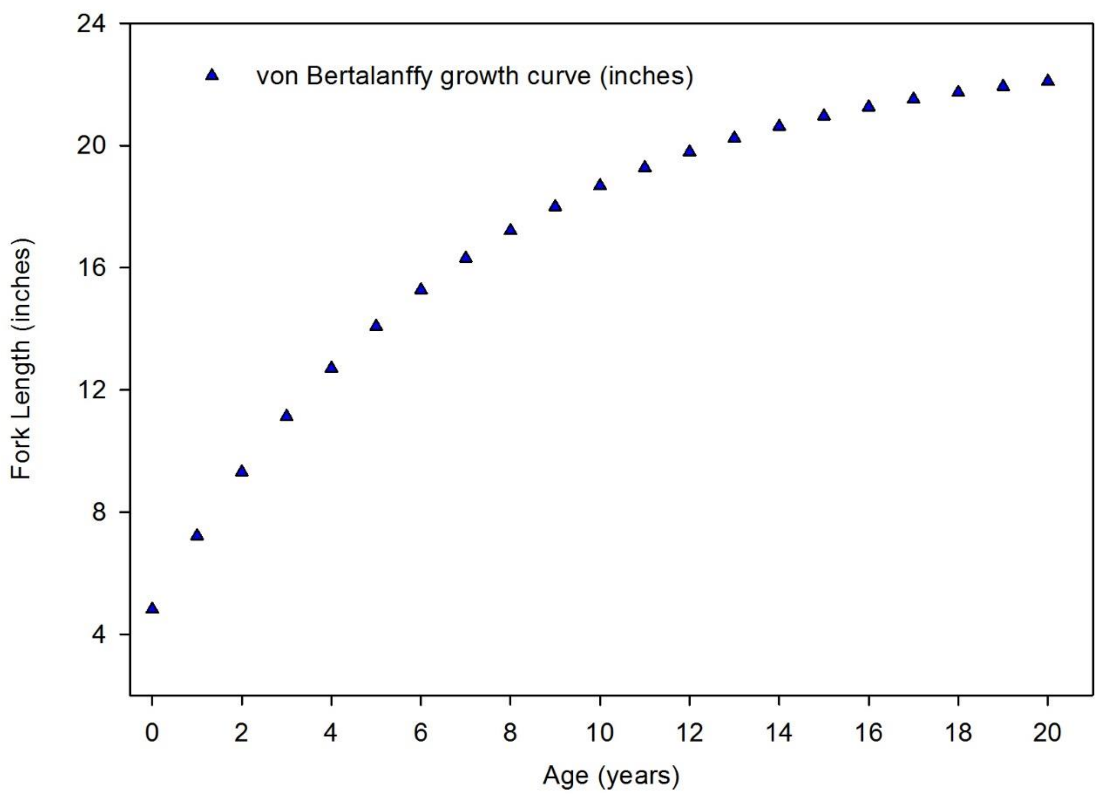

Figure 2.3.3. Gray triggerfish von Bertalanffy growth curve converted to inches fork length. Source: Conversion factors from SEDAR 43 (2015): FL (cm) = 58.97*(1-e-0.14*(t+1.66)).

Further based on the von Bertalaffy growth curve in SEDAR 43 (2015), it is estimated to take approximately 10 months to grow from 14 inches FL to 15 inches FL and about 16 months to grow from 14 inches FL to 16 inches FL (Table 2.3.3).

Table 2.3.3. Approximate time for a gray triggerfish to grow from 14 inches FL to 16 inches FL.

Alternatives	Length	Approximate time
1	14 inches FL (status quo)	-
Preferred 2	15 inches FL	10 months
3	16 inches FL	16 months

The recreational decision tool (SERO-LAPP Gulf Amendment 2016-06) allows for an increase in minimum size limits up to 20 inches FL. Based on the length-weight relationship of gray triggerfish used during SEDAR 43 (2015), a 14-inch FL (**Alternative 1**) gray triggerfish is estimated to weigh 2.23 lbs ww, 15-inches FL (**Preferred Alternative 2**) is estimated to weigh 2.75 lbs ww and a 16-inch FL (**Alternative 3**) fish is estimated to weight 3.34 lbs ww (Figure 2.3.4).

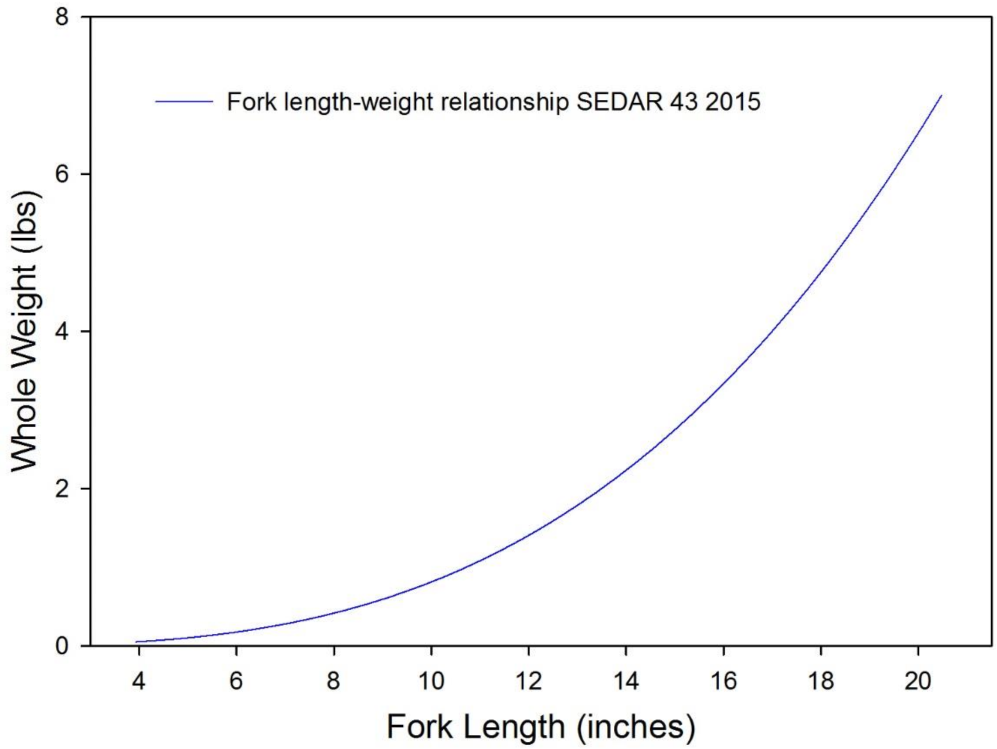

Figure 2.3.4. Gray triggerfish length-weight relationship. Source: Conversion factors from SEDAR 43 (2015): weight (kg) = 0.00000002162*FL(mm)3.007.

The current average size of recreational gray triggerfish landed is 3.2 lbs ww from 2013-2015. The recreational decision tool (SERO-LAPP Gulf Amendment 2016-06) used the average weight landed in 2015 of 2.49 lbs ww. Table 2.3.4 shows the projected landings based on **Alternatives 1-3** if other management variables and fixed closed season and bag limit are held constant. Until the Council selects the ACTs and ACLs in Action 2 it is unknown if these modifications to minimum size limit will achieve the needed reductions in harvest level.

Table 2.3.4. The total recreational projected landings expected by modifying the minimum size limit. The other management measures such as the June - July fixed closed season and the 2-fish bag limit were held constant, and it was assumed there was no effort shifting.

Alternatives	Minimum Size Limits (FL)	Total Projected Landings (lbs ww)
1	14 inches (status quo)	337,803
Preferred 2	15 inches	269,256
3	16 inches	220,810

Source: Gulf Gray Triggerfish Recreational Tool 2016.

Size limits are typically established to reduce fishing mortality by slowing harvest rates, increasing yield-per-recruit, and prevent growth overfishing. Increasing the minimum size limit is estimated to increase the proportion of dead discards to landings. However, unlike nearly all other reef fish species managed by the Council, gray triggerfish has a very low release mortality rate. Only small percentages (5%) of gray triggerfish are estimated to die after release (GMFMC 2008). Increasing the minimum size limit is not anticipated to significantly increase discard mortality due to the very low release mortality rate.

Undersized gray triggerfish had previously been landed from 2009 through 2011 and this was brought to the attention of NMFS, the Council, and the Gulf state directors. The Council determined that there should be increased education regarding the current size limits before implementing new size limits and that the current minimum size limit (14 inches FL) was a large gray triggerfish. Staffs of NMFS and the Council conducted education and outreach efforts on species identification and measuring guidelines for gray triggerfish which were developed cooperatively with public relations staff from all agencies. These efforts in 2013 were successful. Figure 2.3.5 provides the length distribution both before (2011-2012) and after (2014-2015) the education and outreach efforts, and the percent of gray triggerfish harvested under the 14 inches fork length decreased from 31% in 2011-2012 to 23% in 2014-2015.

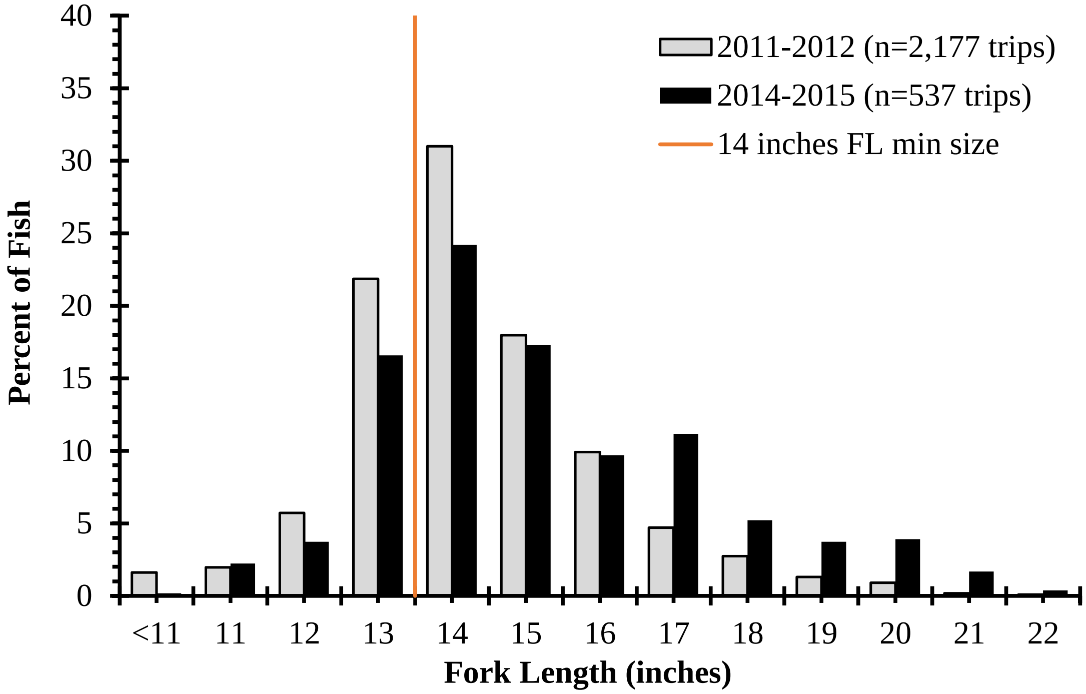

Figure 2.3.5. Length distribution of Gulf recreational gray triggerfish for 2011-2012 and 2014-2015. Length data came from dock-side intercepts from the Gulf's recreational surveys (MRIP, Headboat, LA Creel, and TPWD).

Estimated projected landings based on combined recreational management measures can be found in Tables 2.3.5 and 2.3.6. The target reductions and necessary management measures are based on the recreational ACT selected by the Council in Action 2. If the Council maintains the current ACT equal to 217,100 lbs ww for the recreational sector and the 2-gray triggerfish per angler per day bag limit a longer closed season and increased minimum size limit would need to be considered (Table 2.3.5). Another unknown effect is the percent effort shifting scalar the Council may select (0-100%) for the headboat, charter vessel, and private angling modes. If any percentage greater than 0% is selected, the projected landings in the non-closed period will increase which could result in several of the management measures being below the necessary reductions. If the Council decides to reduce the bag limit to 1-gray triggerfish per angler per day with the ACT equal to 217,100 lbs ww more management options become available for minimum size limits and bag limits (Table 2.3.6). The greater the effort shifting scalar selected such as 50% or 100% results in more conservative estimates of reductions needed, such as longer fixed closed seasons and increases in minimum size limits (Tables 2.3.5 and 2.3.6). Until the Council select its preferred ACT and whether or not to use an effort shifting scalar, it is difficult to determine which of these management measures would meet the necessary reduction in landings.

Table 2.3.5. Gray triggerfish projected recreational landings for alternative closed seasons (Action 3.1), minimum size limits (Action 3.3), and effort shifting scenarios (0%, 50%, and 100%) for all modes (headboat, charter, and private). The bag limit is held at status quo (**2-gray triggerfish per angler per day** within the 20-reef fish aggregate bag limit). Landings are in pounds whole weight.

Action 3.3 Size Limit	0% effort shifting				
	Action 3.1 Closed Season Alternatives				
	Alt.1 Jun - Jul	Alt. 2 Jun - Aug	Alt. 3 Jan - Jul	Alt. 4 Jan - Feb & Jun - Jul	Alt. 5 Jan & Jun – Jul
Alt 1. 14” FL	337,803	272,727	148,177	299,984	317,932
Alt. 2. 15” FL	269,246	217,280	119,519	238,044	252,921
Alt. 3. 16” FL	220,810	178,374	99,589	194,178	207,092
50% effort shifting					
Action 3.3 Size Limit	Action 3.1 Closed Season Alternatives				
	Alt.1 Jun - Jul	Alt. 2 Jun - Aug	Alt. 3 Jan - Jul	Alt. 4 Jan - Feb & Jun - Jul	Alt. 5 Jan & Jun – Jul
Alt 1. 14” FL	371,676	318,556	251,454	373,953	371,356
Alt. 2. 15” FL	296,244	253,791	202,822	296,739	295,422
Alt. 3. 16” FL	242,952	208,347	169,001	242,058	241,891
100% effort shifting					
Action 3.3 Size Limit	Action 3.1 Closed Season Alternatives				
	Alt.1 Jun - Jul	Alt. 2 Jun - Aug	Alt. 3 Jan - Jul	Alt. 4 Jan - Feb & Jun - Jul	Alt. 5 Jan & Jun – Jul
Alt 1. 14” FL	405,549	364,384	354,732	447,922	424,781
Alt. 2. 15” FL	323,243	290,302	286,125	355,435	337,922
Alt. 3. 16” FL	265,093	238,320	238,413	289,937	276,690

Note: The color indicates projected landings at or below the corresponding ACT

Alternative 3a. ACT = 142,410	Alternative 1 ACT = 217,100	Alternative 3b. ACT = 258,698	Alternative 3c. ACT = 348,654	Projected landings exceed all ACTs

Table 2.3.6. Gray triggerfish projected recreational landings for alternative closed seasons (Action 3.1), minimum size limits (Action 3.3), and effort shifting scenarios (0%, 50%, and 100%) for all modes (headboat, charter, and private). The bag limit is reduced to **1-gray triggerfish per angler per day** within the 20-reef fish aggregate bag limit. Landings are in pounds whole weight.

Action 3.3 Size Limit	0% effort shifting				
	Action 3.1 Closed Season Alternatives				
	Alt.1 Jun - Jul	Alt. 2 Jun - Aug	Alt. 3 Jan - Jul	Alt. 4 Jan - Feb & Jun - Jul	Alt. 5 Jan & Jun – Jul
Alt 1. 14” FL	286,008	233,205	123,661	254,059	269,747
Alt. 2. 15” FL	227,525	185,777	99,495	201,165	214,173
Alt. 3. 16” FL	185,425	151,565	82,228	162,901	174,196
	50% effort shifting				
Action 3.3 Size Limit	Action 3.1 Closed Season Alternatives				
	Alt.1 Jun - Jul	Alt. 2 Jun - Aug	Alt. 3 Jan - Jul	Alt. 4 Jan - Feb & Jun - Jul	Alt. 5 Jan & Jun – Jul
Alt 1. 14” FL	314,687	272,392	209,852	316,703	315,074
Alt. 2. 15” FL	250,340	216,994	168,842	250,767	250,161
Alt. 3. 16” FL	204,018	177,034	139,540	203,069	203,467
	100% effort shifting				
Action 3.3 Size Limit	Action 3.1 Closed Season Alternatives				
	Alt.1 Jun - Jul	Alt. 2 Jun - Aug	Alt. 3 Jan - Jul	Alt. 4 Jan - Feb & Jun - Jul	Alt. 5 Jan & Jun – Jul
Alt 1. 14” FL	343,366	311,579	296,042	379,348	360,401
Alt. 2. 15” FL	273,155	248,212	238,188	300,370	286,150
Alt. 3. 16” FL	222,612	202,502	196,582	243,236	232,738

Note: The color indicates projected landings at or below the corresponding ACT

Alternative 3a. ACT = 142,410	Alternative 1 ACT = 217,100	Alternative 3b. ACT = 258,698	Alternative 3c. ACT = 348,654	Projected landings exceed all ACTs

2.4 Action 4 - Modify the Commercial Trip Limit

Alternative 1: No Action. Maintain the commercial trip limit of 12 gray triggerfish per trip.

Alternative 2: Decrease the commercial trip limit for gray triggerfish to 10 fish per trip.

Alternative 3: Increase the commercial trip limit for gray triggerfish to 14 fish per trip.

Alternative 4: Increase the commercial trip limit for gray triggerfish 16 fish per trip.

Alternative 5: Increase the commercial trip limit for gray triggerfish to 18 fish per trip.

Discussion:

Action 4 evaluates different commercial trip limits as a measure to reduce or increase gray triggerfish commercial landings. Increasing the commercial trip limit when the rebuilding plan has not made adequate progress is an alternative that must be carefully considered. Since the implementation of the 12 fish commercial trip limit in 2013, commercial landings have been 42,532 lbs ww in 2014 and 47,480 lbs ww in 2015. This is 31% and 23% below the 60,900 lbs ww commercial ACT. Increasing the commercial trip limit will provide a better opportunity for the commercial sector to achieve optimal yield.

In Amendment 37, the Council based its decision to use trip limits in numbers of fish instead of weight based on the recommendations made by the Law Enforcement Advisory Panel at their October 2012. The Law Enforcement AP felt it would be difficult to enforce such a low poundage of gray triggerfish per trip (i.e., 25, 50, and 75 lbs ww) and recommended the trip limit be set using numbers of fish. During the August 2016 Council meeting, a Council member requested the gray triggerfish commercial trip limit be changed to pounds of fish instead of number of fish due to potential high grading to larger fish by commercial fishermen. The Law Enforcement Technical Committee (LETC) met again in October 2016 and discussed trip limits in pounds versus number fish and made the same recommendation. Given the small weight of the fish in the alternatives, the LETC recommended the trip limit be set in numbers of fish rather than weight.

The gray triggerfish landings for each commercial trip were analyzed to determine the impact of changes to the trip limit. Any pounds reported in gutted weight were converted to whole weight using a conversion of 1.04. Whole weight pounds for each trip were converted to numbers of gray triggerfish by dividing the landings by the average weight. The average weight was determined from the 2014 and 2015 Southeast Fisheries Science Center's (SEFSC's) Trip Interview Program (TIP) data. TIP data is collected by port samplers that interviewed fishermen and measured their catch. With this data, the average weight of a commercially harvested gray triggerfish was determined to be 4.278 lbs ww which was used in the commercial decision tool (SERO-LAPP Gulf Amendment 2016-06). Figure 2.7.1 provides the percent of commercial trips from 2014 through 2015 that landed at least 1 gray triggerfish. Only commercial trips in 2014 and 2015 were examined because Amendment 37 implemented a trip limit in 2013. The majority (87%) of Gulf commercial trips from 2014 through 2015 landed 12 gray triggerfish or less on any particular trip (Figure 2.7.1). The commercial sector typically lands a relatively small number of pounds of the species per trip, because gray triggerfish is one of the many species that is part of a multi-species reef fish fishery.

Commercial trip limits of 5, 10, 12, 13, 14, and 20 gray triggerfish were analyzed using the SEFSC's coastal fisheries logbook program (CFLP) that documents landings in pounds. The impacts of the various trip limits were analyzed with two different methods: one method for trip limits less than the current trip limit and another method for trip limits greater than the current trip limit. For trip limits less than the current trip limit (e.g. 5 and 10 fish), if the total catch per logbook-reported trip was greater than the trip limit being analyzed, the value was re-set to the new trip limit. For example, to analyze the 5 fish trip limit per trip, if 8 gray triggerfish were reported that value was re-set to 5 gray triggerfish. If a trip had reported gray triggerfish equal to or less than the trip limit being considered then no changes to catch were made. Percent reduction in landings were determined by looking at the reduction in numbers of triggerfish from the trips that were re-set compared to the overall landings of gray triggerfish. For trip limits greater than the current trip limit (e.g. 13, 14, and 20 fish), the analysis assumed that any trip that met the current trip limit of 12 fish would also meet the proposed increased trip limits and were modified accordingly. For example, to analyze the 14 fish per trip limit, a trip that reported 12 gray triggerfish was re-set to 14 gray triggerfish. Trips that reported greater than the new increased trip limit were not modified. It was assumed since these trips exceeded the limit in the past, that in the future there will still be a similar proportion of trips that exceed the trip limit. Trips that had less than 12 fish were not modified. Both methods used data from 2014 and 2015 because regulations from Amendment 37 impacted the fishery starting mid-year in 2013.

The majority of gray triggerfish trips in recent years reported less than 10 gray triggerfish per trip (Figure 2.4.1). Over 80% of the trips caught 10 gray triggerfish or less and about 87% of the trips caught 12 gray triggerfish or less. There appears to be some harvest exceeding the trip limit with 13% of the trips harvesting more than 12 gray triggerfish. These landings were reflected in the generated trip limit reductions with the largest reductions occurring at the low trip limit of 5 gray triggerfish (Table 2.4.1).

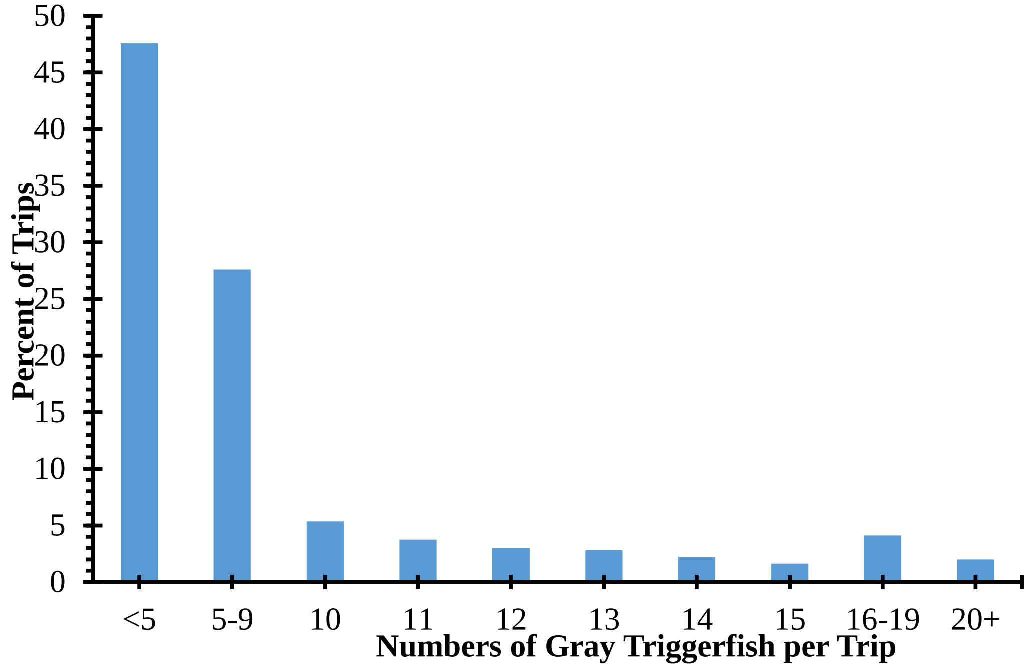

Figure 2.4.1. Percent of commercial trips landing different numbers of gray triggerfish in the Gulf of Mexico from 2014 and 2015 (n = 2,409 trips). SERO-LAPP.

Alternative 1 (No Action) would maintain the 12-gray triggerfish fish trip limit and is expected to yield annual landings of 42,316 lbs ww. The Council determined at their October 2016 meeting to maintain the fixed June 1 – July 31 closed season so no that additional reductions in harvest would occur. However, depending on the rebuilding plan selected by the Council and the corresponding catch levels, a reduction in trip limit may not be necessary. Currently, the commercial sector is not landing their quota and the Reef Fish AP suggested that the commercial trip limit is currently too low. Table 2.4.1 shows the estimated weight of each of the trip limit alternatives.

Table 2.4.1. Commercial trip limit alternatives and weight estimates

Alternatives	Trip Limit	Estimated weight (lbs ww)
1 (No Action)	12 fish	51
2	10 fish	45
3	14 fish	60
4	16 fish	68
5	18 fish	75

Source: Based 2014 and 2015 average landed weight of 4.278 lbs ww from TIP data.

Alternative 2 would decrease the trip limit to 10-fish. With this reduction in the trip limit the commercial sector is estimated to yield landings of 34,338 lbs ww, which is less than the 8-year rebuilding plan ACT in Alternative 3 (43,534 lbs ww) of Action 2. **Alternative 3** (14-fish) along with the current season closure (June-July) is estimated to reduce landings by 18.85% yielding landings of 42,697 lbs ww of fish which is less than the 8-year rebuilding plan ACT in Alternative 3 of Action 2. **Alternative 4** (16-fish) along with the current season closure (June – July) is estimated to yield landings of 43,592 lbs ww. **Alternative 5** (18-fish) along with the current season closure (June-July) is estimated to yield landings of 45,080 lbs ww. This is more than the ACT prescribed in the 8-year rebuilding plan. **Alternatives 1-4** projected landings are all below the 9-year (Option b) and 10-year (Option c) rebuilding plan ACT in Action 2, Alternative 3.

Table 2.4.1. Percent increases (positive numbers) and decreases (negative numbers) in landings by month for various proposed commercial trip limits. Estimates of increase and decrease were generated from commercial logbook data from 2014 and 2015 (SERO LAPP 2016 Commercial Decision Tool).

Alt.	Trip Limit	Month												Annual Average
		Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
2	**10**	-33.60%	-26.90%	-22.50%	-12.90%	-17.90%	-60.40%	-55.50%	-15.20%	-13.10%	-15.70%	-16.60%	-19.20%	-23.50%
1	**12**	0	0	0	0	0	0	0	0	0	0	0	0	0
3	**14**	0.98%	0.66%	1.08%	0.95%	0.91%	0.48%	0.21%	1.12%	1.03%	0.52%	0.97%	0.83%	0.84%
4	**16**	3.23%	1.96%	2.91%	3.60%	3.36%	1.32%	0.84%	4.17%	3.17%	2.18%	2.96%	2.73%	2.79%
5	**18**	6.39%	4.28%	6.44%	7.77%	7.13%	2.89%	1.51%	8.53%	6.81%	5.53%	6.08%	6.13%	6.02%

CHAPTER 3. AFFECTED ENVIRONMENT

The actions considered in this environmental assessment (EA) would affect fishing in federal waters of the Gulf of Mexico (Gulf). Federally-permitted vessels harvest rates in state waters will also be affected through the implementation of these regulations as these vessel must adhere to federal regulations in federal and state waters they fish. Descriptions of the physical, biological, economic, social, and administrative environments were completed in the environmental impact statement (EIS) for Reef Fish Amendment 30A: Gray Triggerfish – Establish Rebuilding Plan, End Overfishing, Accountability Measures, Regional Management, Management Thresholds and Benchmarks that was implemented in 2008. The information from that EIS is being incorporated herein by reference and the reader is directed to the 2008 EIS to obtain the information http://www.gulfcouncil.org/docs/amendments/Amend-30A-Final%20208.pdf. New information is summarized below.

3.1 Description of the Fishery

Gray triggerfish is primarily landed by recreational anglers (Figure 1.1.1). Amendment 30A established an allocation for gray triggerfish of 79% recreational and 21% commercial (GMFMC 2008). A majority of the recreational and commercial landings of gray triggerfish landings occur off of the State of Florida (Tables 3.1.1 and 3.1.2). The State of Alabama follows Florida for the next highest percent of gray triggerfish recreational landings in the last five years (Table 3.1.1).

Table 3.1.1. Percent of gray triggerfish landed recreationally by regional from 2010-2014.

Year	Florida	west FL/ Ala	Alabama	Louisiana/Mississippi	Texas
2010	76.4%	7.3%	15.8%	0%	0.6%
2011	70.9%	9.7%	18.0%	0.6%	0.7%
2012	73.0%	8.1%	6.7%	10.7%	1.5%
2013	77.5%	0.0%	19.4%	2.5%	0.5%
2014	92.2%	0.0%	5.2%	1.8%	0.8%

Source: Data from recreational ACL dataset which was provided from the SEFSC on July 11, 2016.

Table 3.1.2. Percent of gray triggerfish landed commercially by state from 2010-2014.

Year	Florida	Alabama	Mississippi	Louisiana	Texas
2010	77.1%	6.0%	0.2%	6.9%	9.7%
2011	84.5%	3.2%	0.2%	7.4%	4.7%
2012	88.6%	1.8%	0.3%	5.9%	3.4%
2013	89.1%	3.2%	0.5%	4.1%	3.2%
2014	88.6%	4.4%	0.8%	3.9%	2.3%

Source: Data from commercial ACL dataset which was provided from the SEFSC on December 24, 2015.

Anglers on private vessels landed the greatest amount of gray triggerfish from 2010 through 2014 at 67% following by 25% charter vessels, and 7% headboats (Table 3.1.3). Landings of gray triggerfish by the recreational sector consisted of the following two gear types: hook-and-line and spear. Based on recreational landings from 2010 through 2014, 99% of the landings were from hook-and-line fishing and 1% were from spear fishing (Table 3.1.4). The landings data from the headboat survey did not separate the landings by gear type and it was assumed all headboat landings came from hook-and-line gear.

Table 3.1.3. Recreational landings (lbs ww) of gray triggerfish by mode from 2010-2014. The "Percent" row is the percent of total recreational landings of gray triggerfish for each mode for 2010-2014.

Year	Charter	Headboat	Private	Shore
2010	87,136	25,756	225,635	897
2011	198,595	50,449	238,924	0
2012	49,329	18,706	145,092	0
2013	95,603	27,119	440,925	2,743
2014	42,359	8,693	209,256	0
Total	473,022	130,722	1,259,832	3,639
Percent	25%	7%	67%	<1%

Source: Data from recreational ACL dataset which was provided from the SEFSC on July 11, 2016.

Table 3.1.4. Recreational landings (lbs ww) of gray triggerfish by gear from 2010-2014. The "Percent" row is the percent of total recreational landings of gray triggerfish for each gear for 2010-2014.

Year	Hook and Line	Spear
2010	337,731	1,693
2011	484,716	3,252
2012	212,595	532
2013	546,657	19,733
2014	260,308	0
Total	1,842,006	25,209
Percent	99%	1%

Source: Data from recreational ACL dataset which was provided from the SEFSC on July 11, 2016.

Landings of gray triggerfish by the commercial sector consisted of the following gear types: hook-and-line, bottom longline, and other. The other category includes the following gear types: dredges, unclassified gear, nets, spear, and traps. Based on 2010 through 2014 commercial landings, 92.0% of the landing gray triggerfish were caught by hook-and-line, 1.3% were from bottom longline, and 6.6% were from other (Figure 3.1.3).

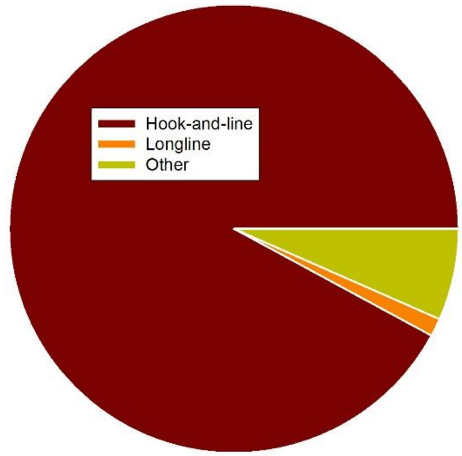

Figure 3.1.3. Commercial landings of gray triggerfish by gear type from 2010 through 2014. The other category includes the following gear types: dredges, unclassified gear, nets, spear, and traps. Source: Data from commercial annual catch limit (ACL) dataset which was provided from the SEFSC on December 24, 2015.

3.2 Description of the Physical Environment

The Gulf has a total area of approximately 600,000 square miles (1.5 million km^2), including state waters (Gore 1992). It is a semi-enclosed, oceanic basin connected to the Atlantic Ocean by the Straits of Florida and to the Caribbean Sea by the Yucatan Channel (Figure 3.2.1). Oceanographic conditions are affected by the Loop Current, discharge of freshwater into the northern Gulf, and a semi-permanent, anti-cyclonic gyre in the western Gulf. The Gulf includes both temperate and tropical waters (McEachran and Fechhelm 2005). Gulf water temperatures range from 54º F to 84º F (12º C to 29º C) depending on time of year and depth of water. Mean annual sea surface temperatures ranged from 73 º F through 83º F (23-28º C) including bays and bayous (Figure 3.2.1) between 1982 and 2009, according to satellite-derived measurements (NODC 2011: http://accession.nodc.noaa.gov/0072888). In general, mean sea surface temperature increases from north to south with large seasonal variations in shallow waters.

The physical environment for Gulf reef fish is also detailed in the EIS for the EFH Amendment, the Generic ACL/AM Amendment, and Reef Fish Amendment 40 (GMFMC 2004a; GMFMC 2011b; GMFMC 2014) and are incorporated by reference and further summarized below. In general, reef fish are widely distributed in the Gulf, occupying both pelagic and benthic habitats during their life cycle. A planktonic larval stage lives in the water column and feeds on zooplankton and phytoplankton (GMFMC 2004a). Juvenile and adult reef fish are typically demersal and usually associated with bottom topographies on the continental shelf (<100m) which have high relief, i.e., coral reefs, artificial reefs, rocky hard-bottom substrates, ledges and caves, sloping soft-bottom areas, and limestone outcroppings. However, several species are found over sand and soft-bottom substrates. For example, juvenile red snapper are common on mud bottoms in the northern Gulf, particularly off Texas through Alabama. Also, some juvenile snapper (e.g. mutton, gray, red, dog, lane, and yellowtail snappers) and grouper (e.g. goliath grouper, red, gag, and yellowfin groupers) have been documented in inshore seagrass beds, mangrove estuaries, lagoons, and larger bay systems.

In the Gulf, the U.S.S. Hatteras, located in federal waters off Texas, is listed in the National Register of Historic Places. Fishing activity already occurs in the vicinity of this site, but the proposed action would have no additional adverse impacts on listed historic resources, nor would they alter any regulations intended to protect them. Historical research indicates that over 2,000 ships sank on the federal outer continental shelf between 1625 and 1951; thousands more sank 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

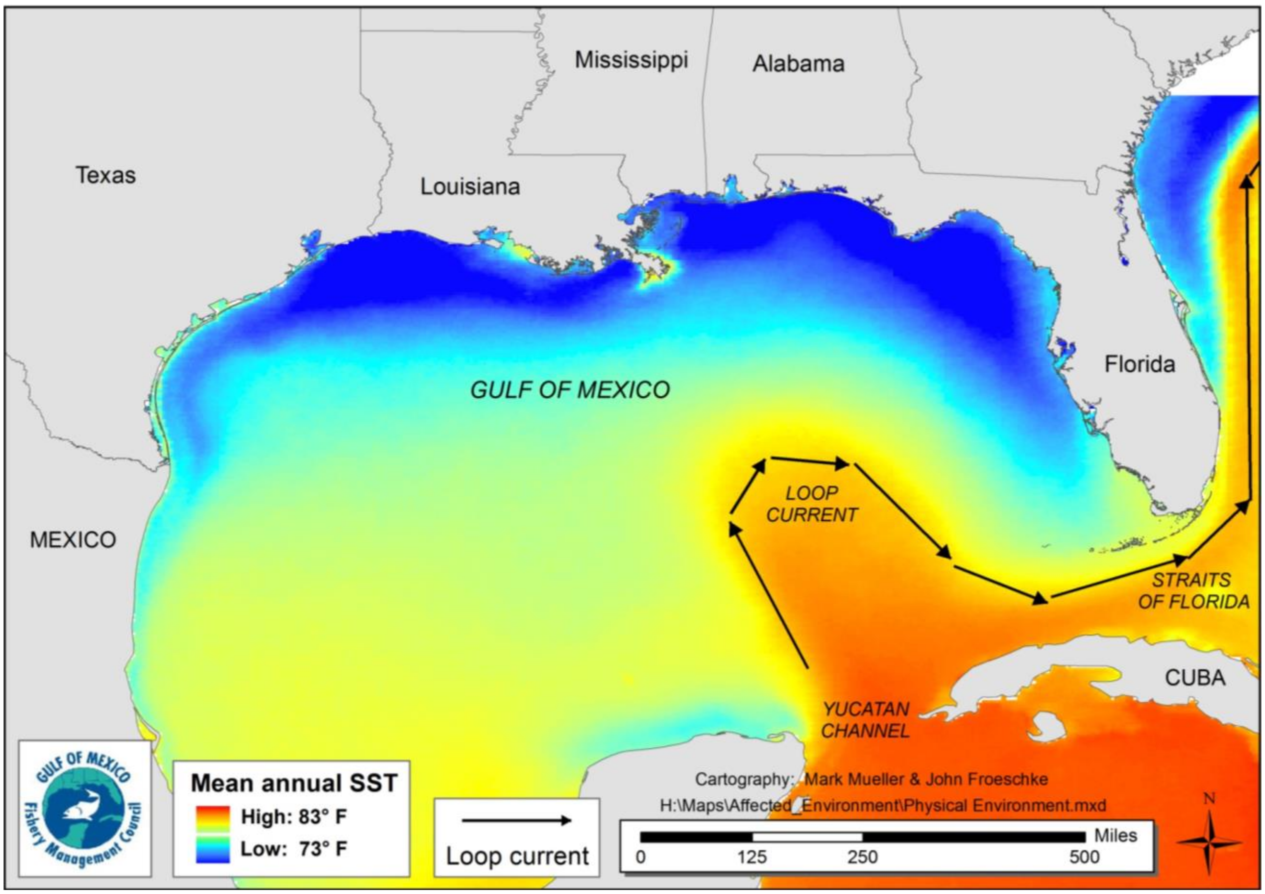

Figure 3.2.1. Physical environment of the Gulf, including major feature names and mean annual sea surface temperature as derived from the Advanced Very High Resolution Radiometer Pathfinder Version 5 sea surface temperature data set (http://accession.nodc.noaa.gov/0072888)

Habitat Areas of Particular Concern (HAPC)

Generic Amendment 3 (GMFMC 2005) for addressing essential fish habitat (EFH), HAPC, and adverse effects of fishing in the fishery management plans for Gulf Reef Fish, Red Drum, and CMP is hereby incorporated by reference.

Environmental Sites of Special Interest Relevant to Reef Fish species (Figure 3.2.2)

The following area closures include gear restrictions that may affect targeted and incidental harvest of reef fish species.

Longline/Buoy Gear Area Closure – Permanent closure to use of these gears for reef fish harvest inshore of 20 fathoms (36.6 meters) off the Florida shelf and inshore of 50 fathoms (91.4 meters) for the remainder of the Gulf, and encompasses 72,300 square nautical miles (nm^2) or 133,344 km^2 (GMFMC 1989). Bottom longline gear is prohibited inshore of 35 fathoms (54.3 meters) during the months of June through August in the eastern Gulf (GMFMC 2009), but is not depicted in Figure 3.2.1.2.

Madison-Swanson and Steamboat Lumps Marine Reserves - No-take marine reserves (total area is 219 nm^2 or 405 km^2) sited based on gag spawning aggregation areas where all fishing is prohibited except surface trolling from May through October (GMFMC 1999; 2003).

The Edges Marine Reserve – All fishing is prohibited in this area (390 nm^2 or 1,338 km^2) from January through April and possession of any fish species is prohibited, except for such possession aboard a vessel in transit with fishing gear stowed as specified. The provisions of this do not apply to highly migratory species (GMFMC 2008).

Tortugas North and South Marine Reserves - No-take marine reserves (185 nm^2) cooperatively implemented by the state of Florida, National Ocean Service, the Gulf of Mexico Fishery Management Council (Council), and the National Park Service in Generic Amendment 2 Establishing the Tortugas Marine Reserves (GMFMC 2001). Only a small portion (13 nm^2) of the Tortugas North Marine Reserve is in federal waters while the entire Tortugas South Marine Reserve (54.5 nm^2) is in federal waters.

Reef and bank areas designated as Habitat Areas of Particular Concern (HAPCs) in the northwestern Gulf include - East and West Flower Garden Banks, Stetson Bank, and McGrail Bank, - Pristine coral areas protected by preventing the use of some fishing gear that interacts with the bottom and prohibited use of anchors (totaling 80.4 nm^2). Subsequently, three of these areas were established as marine sanctuaries (i.e., East and West Flower Garden Banks and Stetson Bank). Bottom anchoring and the use of trawling gear, bottom longlines, buoy gear, and all traps/pots on coral reefs are prohibited in the East and West Flower Garden Banks, McGrail Bank, and on significant coral resources on Stetson Bank (GMFMC 2005a). Sonnier Bank, MacNeil Bank, 29 Fathom, Rankin Bright Bank, Geyer Bank, Bouma Bank, Rezak Sidner Bank, Alderice Bank, and Jakkula Bank (totaling 183 nm^2) are other areas that have been designated as HAPCs but currently have no regulations associated with them. A weak link in the tickler chain of bottom trawls on all habitats throughout the Gulf exclusive economic zone (EEZ) is required.

A weak link is defined as a length or section of the tickler chain that has a breaking strength less than the chain itself and is easily seen as such when visually inspected. An education program for the protection of coral reefs when using various fishing gears in coral reef areas for recreational and commercial fishermen was also developed.

<u>Florida Middle Grounds HAPC</u> - Pristine soft coral area (348 nm^2 or 644.5 km^2) that is protected by prohibiting the following gear types: bottom longlines, trawls, dredges, pots and traps (GMFMC and SAFMC 1982).

<u>Pulley Ridge HAPC</u> - A portion (101 nm^2) of the HAPC (2,300 nm^2 or 4,259 km^2) where deep-water hermatypic coral reefs are found is closed to anchoring and the use of trawling gear, bottom longlines, buoy gear, and all traps/pots (GMFMC 2005a).

<u>Alabama Special Management Zone</u> - For vessels operating as a charter vessel or headboat, a vessel that does not have a commercial permit for Gulf reef fish, or a vessel with such a permit fishing for Gulf reef fish, fishing is limited to hook-and-line gear with no more than three hooks. Nonconforming gear is restricted to recreational bag limits, or for reef fish without a bag limit, to 5% by weight of all fish aboard (GMFMC 1993).

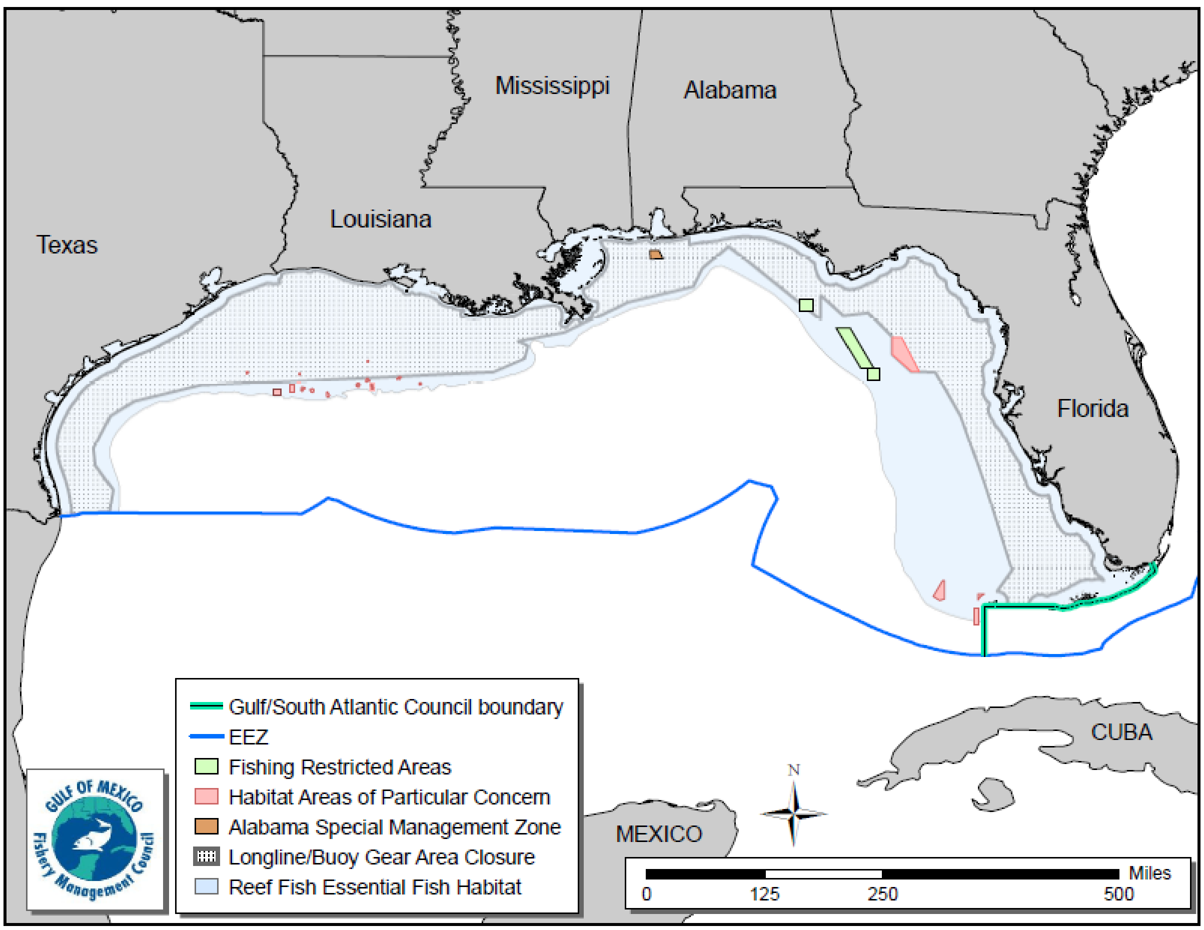

Figure 3.2.2. Map of most fishery management closed areas in the Gulf.

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.

As reported by the National Oceanic and Atmospheric Administration (NOAA) Office of Response and Restoration (NOAA 2010), the oil from the *Deepwater Horizon* MC252 oil spill is relatively high in alkanes which can readily be used by microorganisms as a food source. As a result, the oil from this spill is likely to biodegrade more readily than crude oil in general. The *Deepwater Horizon* MC252 oil is also relatively much lower in polycyclic aromatic hydrocarbons. Polycyclic aromatic hydrocarbons are highly toxic chemicals that tend to persist in the environment for long periods of time, especially if the spilled oil penetrates into the substrate on beaches or shorelines. Like all crude oils, *Deepwater Horizon* MC252 oil contains volatile organic compounds (VOCs) such as benzene, toluene, and xylene. Some VOCs are acutely toxic, but because they evaporate readily, they are generally a concern only when oil is fresh (http://sero.nmfs.noaa.gov/sf/deepwater_horizon/OilCharacteristics.pdf).

In addition to the crude oil, over one million gallons of the dispersant, Corexit 9500A®, was applied to the ocean surface and an additional hundreds of thousands of gallons of dispersant was pumped to the mile-deep well head (National Commission 2010). No large-scale applications of dispersants in deep water had been conducted prior to the *Deepwater Horizon* MC252 oil spill.

Oil could exacerbate the development of the hypoxic “dead” zone in the Gulf, similar in effect as higher than normal input of water laden with fertilizer runoff from the Mississippi River basin. For example, oil on the surface of the water could restrict the normal process of atmospheric oxygen mixing into and replenishing oxygen concentrations in the water column. In addition, microbes in the water that break down oil and dispersant consume oxygen; this metabolic process further depletes oxygen in the adjacent waters.

3.3 Description of the Biological Environment

There have been relatively few age and growth studies on gray triggerfish; however, this species is estimated to live up to 11 years, with 16 being the maximum age recorded (Hood and Johnson 1997; Wilson et al. 1995; Ingram 2001; Panama City National Marine Fisheries Service (NMFS) Database, accessed 2012). Gray triggerfish is estimated to grow rapidly within the first year of life (K = 0.39), then growth slows and is estimated at K = 0.152-0.183 $year^{-1}$ for both sexes combined (Hood and Johnson 1997; Ingram 2001; Wilson et al. 1995; SEDAR 9 2006a). The maximum length of gray triggerfish recorded was 27-28 inches fork length (697-725 mm FL) by Hood and Johnson (1997) and samples processed from 2003 through 2010 at the Panama City Laboratory from both fishery-dependent and fishery-independent samples in the Gulf. The maximum weight document from the Panama City NMFS Database, accessed in 2012 was 13.8

lbs gutted weight (6.26 kg gw). Male gray triggerfish reach significantly larger sizes than females (Hood and Johnson 1997; Ingram 2001; Simmons and Szedlmayer 2012).

Gray triggerfish spawn as early as May and as late as August, with peak spawning in June and July in the Gulf of Mexico and South Atlantic Bight (Wilson et al. 1995; Hood and Johnson 1997; Ingram 2001; Moore 2001; Simmons and Szedlmayer 2012). Both sexes are reproductively mature by age-2, 10-inches FL (250 mm FL). At this size (~10-inches FL), some males are age-1 and all females are age-2 (Wilson et al. 1995; Ingram 2001). Male and female gray triggerfish have a combination of atypical spawning behaviors compared to most marine fishes (i.e., pelagic broadcast spawners) managed by the Council. Male gray triggerfish establish territories, build demersal nests, and form harems (one male and several females) during the spawning season (Simmons and Szedlmayer 2012). Gray triggerfish form harems (one male and several females) 50% of the time at sites with active nests, a mean sex ratio of 1:4.2 male to females on the reef. While at other reefs without spawning (lack of active nests) the mean sex ratio is 1:1.3 male to females. After fertilization of the eggs, female gray triggerfish provide parental care of the eggs (Figure 3.1.1), while the male defends his territory and courts other female gray triggerfish on the reef (Simmons and Szedlmayer 2012).

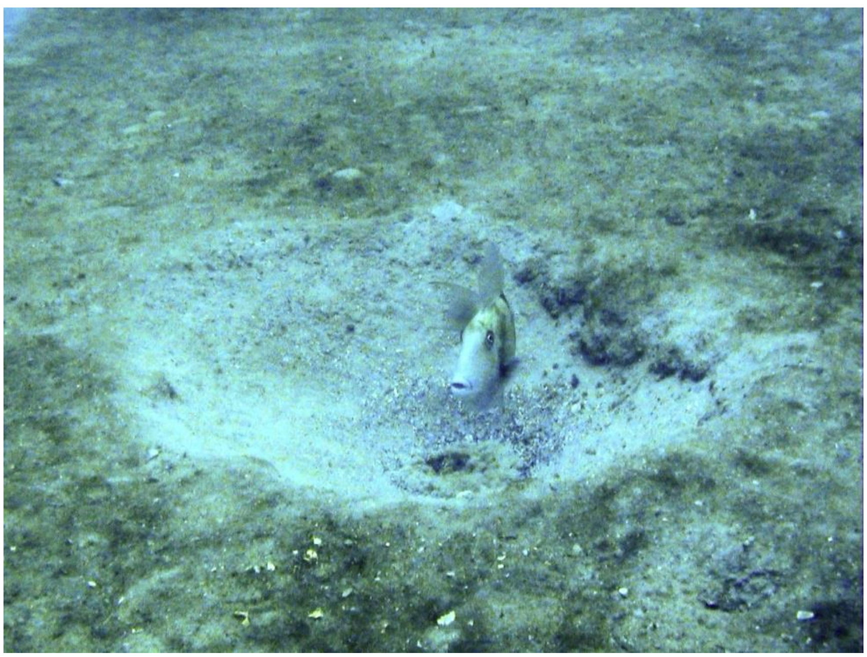

Figure 3.3.1. Underwater photograph of a female gray triggerfish guarding eggs in a nest in the northern Gulf of Mexico. Source: Simmons and Szedlmayer 2012.

The eggs are small 0.62 mm and laid in a gelatinous matrix in the bottom of the nest. Eggs hatch 24 to 48 hours after fertilization and gray triggerfish larvae move up into water column (Simmons and Szedlmayer 2013). Large numbers of larval and juvenile gray triggerfish are found associated with *Sargassum* spp. mats in late summer and fall (Dooley 1972; Fahay 1975; Bortone et al. 1977; Wells and Rooker 2004). After 4 to 7 months in the pelagic zone, juvenile gray triggerfish recruit to benthic substrate (Simmons and Szedlmayer 2011). Adult gray triggerfish are closely associated with both natural and artificial reefs (Johnson and Saloman 1984; Frazer and Lindberg 1994; Vose and Nelson 1994; Kurz 1995; Ingram 2001; Lingo and

Szedlmayer 2006; Simmons and Szedlmayer 2011). Diet studies on juvenile and adult gray triggerfish, after recruitment to benthic structure, determined they consume a wide variety of invertebrates such as: barnacles, bivalves, polychaetes, crustaceans, echinoderms, and isopods (Vose and Nelson 1994; Kurz 1995). Adult gray triggerfish (mean size tagged = 13.6 inches FL (347 mm FL)) are estimated to have high site fidelity (Ingram and Patterson 2001). In a mark-recapture study completed in the northern Gulf of Mexico, 28 out of the 42 recaptures were made at the site of release (n = 206 tagged gray triggerfish; Ingram and Patterson 2001). Herbig and Szedlmayer (2016) recently completed an internal transmitter tagging paper on gray triggerfish found that adult gray triggerfish have 64% site fidelity, staying close to the reef ((35.9 m (108 ft); n=13)) and have high reef residency (>57 weeks). Core area movements were reduced in the winter (January through May) and increase in June at the start of the spawning season; however, the greatest movement was document during the months after spawning September through November (Herbig and Szedlmayer 2016). They also found diel movement patterns were greater during the day than at night that may likely be due to foraging that has been documented for other species of Balistidae that rest inside the reef at night potentially for protection from predators (Herbig and Szedlmayer 2016).

Status of the Stock Gray Triggerfish
See Section 1.1 under the Introduction.

General Information on Reef Fish Species

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

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

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 can be found in more detail in GMFMC (2004). 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).

Status of Reef Fish Stocks

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

- Red Snapper (SEDAR 7 2005; SEDAR 7 Update 2009; SEDAR 31 2013; SEDAR 31 Update 2015)
- Vermilion Snapper (Porch and Cass-Calay 2001; SEDAR 9 2006c; SEDAR 9 Update 2011a)
- Yellowtail Snapper (Muller et al. 2003; SEDAR 3 2003; O'Hop et al. 2012)
- Mutton Snapper (SEDAR 15A 2008)
- Gray Triggerfish (Valle et al. 2001; SEDAR 9 2006a; SEDAR 9 Update 2011b, SEDAR 43 2015)
- Greater Amberjack (Turner et al. 2000; SEDAR 9 2006b; SEDAR 9 Update 2010; SEDAR 33 2014a)
- Hogfish (Ault et al. 2003; SEDAR 6 2004b; Cooper et al. 2013; SEDAR 37 2014)
- Red Grouper (NMFS 2002; SEDAR 12 2007; SEDAR 12 Update 2009, SEDAR 42 2015)
- Gag (Turner et al. 2001; SEDAR 10 2006; SEDAR 10 Update 2009; SEDAR 33 2014b)
- Black Grouper (SEDAR 19 2010)
- Yellowedge Grouper (Cass-Calay and Bahnick 2002; SEDAR 22 2011b)
- Tilefish (Golden) (SEDAR 22 2011a)
- Atlantic Goliath Grouper (Porch et al. 2003; SEDAR 6 2004a; SEDAR 23 2011)

The NMFS Office of Sustainable Fisheries updates its Status of U.S. Fisheries Report to Congress on a quarterly basis utilizing the most current stock assessment information. The most recent update can be found at: http://www.nmfs.noaa.gov/sfa/fisheries_eco/status_of_fisheries/. The status of both assessed and unassessed stocks as of the writing of this report is provided in Table 3.3.1. Of the six individual fishing quota (IFQ) species that have been assessed, only red snapper is considered overfished at this time and none are undergoing overfishing. The stock status is unknown for scamp, snowy grouper, speckled hind, yellowfin grouper, yellowmouth grouper, warsaw grouper, blueline tilefish, and goldface tilefish. However, the annual catch limits for the other shallow-water grouper, deepwater grouper, and tilefish species groups has not been exceeded.

Table 3.3.1. Species of the Reef Fish FMP grouped by family.

Common Name	Scientific Name	Stock Status
Family Balistidae – Triggerfishes		
Gray Triggerfish	*Balistes capriscus*	Overfished, no overfishing
Family Carangidae – Jacks		
Greater Amberjack	*Seriola dumerili*	Overfished, overfishing
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
Family Malacanthidae - Tilefishes		
Tilefish (Golden)	*Lopholatilus chamaeleonticeps*	Not overfished, no overfishing
Blueline Tilefish	*Caulolatilus microps*	Unknown
Goldface Tilefish	*Caulolatilus chrysops*	Unknown
Family Serranidae - Groupers		
Gag	*Mycteroperca microlepis*	Not overfished, no overfishing
Red Grouper	*Epinephelus morio*	Not overfished, no overfishing
Scamp	*Mycteroperca phenax*	Unknown
Black Grouper	*Mycteroperca bonaci*	Not overfished, no overfishing
Yellowedge Grouper	***Hyporthodus flavolimbatus*	Not overfished, no overfishing
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
Family Lutjanidae - Snappers		
Queen Snapper	*Etelis oculatus*	Unknown
Mutton Snapper	*Lutjanus analis*	Not overfished, no overfishing
Blackfin Snapper	*Lutjanus buccanella*	Unknown
Red Snapper	*Lutjanus campechanus*	Overfished, no overfishing
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
Vermilion Snapper	*Rhomboplites aurorubens*	Not overfished, no overfishing
Wenchman	*Pristipomoides aquilonaris*	Unknown

Notes: *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. Appendix E includes a very brief summary of these two laws and more information is available on 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. Two marine mammals (sperm whales and manatees) are also protected under the ESA. Other species protected under the ESA include sea turtle species (Kemp's ridley, loggerhead (Northwest Atlantic Ocean distinct population segment distinct population segment (DPS)), green (South Atlantic and North Atlantic DPSs), leatherback, and hawksbill), three fish species (Gulf sturgeon, smalltooth sawfish, and Nassau grouper), and five coral species (elkhorn, staghorn, lobed star, mountainous star, pillar, and boulder star). Critical habitat designated under the ESA for smalltooth sawfish, Gulf sturgeon, and the Northwest Atlantic Ocean DPS of loggerhead sea turtles also occur in the Gulf, though only loggerhead critical habitat occurs in federal waters.

The most recent biological opinion (opinion) on the Reef Fish FMP was completed on September 30, 2011. The opinion determined the continued authorization of the Gulf reef fish fishery managed under the Reef Fish FMP was not likely to affect ESA-listed marine mammals or corals, and was not likely to jeopardize the continued existence of sea turtles (loggerhead, Kemp's ridley, green, hawksbill, and leatherback), or smalltooth sawfish. An incidental take statement was provided. Since issuing the opinion, in memoranda dated September 16, 2014, and October 7, 2014, the National Marine Fisheries Service (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 DPS or four species of corals (*Mycetophyllia ferox*, *Orbicella annularis*, *O. faveolata*, and *O. franksi*).

On April 6, 2016, NMFS and the U.S. Fish and Wildlife Service published a final rule (81 FR 20057) removing the range-wide and breeding population ESA listings of the green sea turtle and listing eight DPSs as threatened and three DPSs as endangered, effective May 6, 2016. Two of the green sea turtle DPSs, the North Atlantic DPS and the South Atlantic DPS, occur in the Gulf and are listed as threatened. In addition, on June 29, 2016, NMFS published a final rule (81 FR 42268) listing Nassau grouper as threatened under the ESA. NMFS has reinitiated consultation on the Reef Fish FMP to address the listing of this new species and determined that allowing the fishing under Reef Fish FMP to continue during the reinitiation period is not likely to jeopardize the continued existence of the Nassau grouper.

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. Since 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 (FWS) 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. 2013). 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). There is a resident population of female sperm whales, and whales with calves frequently sighted there.

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. Bryde's whales (pronounced "BREW-days") in the Gulf are currently restricted to a small area in the northeastern Gulf near De Soto Canyon in waters between 100 – 400 m depth along the continental shelf break, though information in the southern Gulf is sparse (Waring et al. 2013). 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. NMFS will rely on the information status review report to make a 12-month determination as to whether or not listing as endangered or threatened the species is warranted, and if so, a proposed rule will be published in the Federal Register.

Although they are all the same species, **bottlenose dolphins** in the Gulf can be separated into 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. 2013). Additional climatic and oceanographic boundaries delineate the three coastal stocks such that the Gulf 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 Gulf Western Coastal stock ranges from the Mississippi River Delta to the Texas/Mexico border. Marine Mammal Stock Assessment Reports and additional information on these species in the Gulf are available on the NMFS Office of Protected Species website: http://www.nmfs.noaa.gov/pr/sspecies/.

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 can be 50 years for males and greater than 60 years for females (Reynolds 2000).

The MMPA requires that each commercial fishery be classified by the number of marine mammals they seriously injure or kill. NMFS's List of Fisheries classifies U.S. commercial fisheries into three categories based on the number of incidental mortality or serious injury they cause to marine mammals. 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 annual mortality and serious injury of a marine mammal stock resulting from any fishery is less than or equal to 1% of the maximum number of animals, not including natural mortalities, that may be removed from a marine mammal stock while allowing that stock to reach or maintain its optimum sustainable population. Dolphins are the only species documented as interacting with these fisheries. Bottlenose dolphins are a common predator around reef fish vessels. They prey upon on the bait, catch, and/or released discards of fish from the reef fish fishery.

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 (i.e., Lutz and Musick (eds.) 1997; Lutz et al. (eds.) 2003, Wynekan et al. (eds.) 2013).

Green sea turtle hatchlings are thought to occupy pelagic areas of the open ocean and are often associated with *Sargassum* rafts (Carr 1987; Walker 1994). Pelagic stage green sea turtles are thought to be carnivorous. Stomach samples of these animals found ctenophores and pelagic snails (Frick 1976; Hughes 1974). 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 range 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). As noted above, NMFS and FWS removed the range-wide and breeding population ESA listings of the green sea turtle and listed eight DPSs as threatened and three DPSs as endangered, effective May 6, 2016. Two of the green sea turtle DPSs, the North Atlantic DPS and the South Atlantic DPS, occur in the Gulf and are listed as threatened.

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 ridleys 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 ridleys 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 ridleys 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 ridleys 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 ridleys 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 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 these species of 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.

Protected Fish

<u>Nassau Grouper</u>

The Nassau grouper's confirmed distribution currently includes “Bermuda and Florida (USA), throughout the Bahamas and Caribbean Sea” (Heemstra and Randall 1993). The Nassau grouper has been documented in the Gulf at Arrecife Alacranes (north of Progreso) to the west off the Yucatan Peninsula, Mexico (Hildebrand et al. 1964). Nassau grouper is generally replaced ecologically in the eastern Gulf by red grouper (*E. morio*) in areas north of Key West or the Tortugas (Smith 1971). They are considered a rare or transient species off Texas in the northwestern Gulf (Gunter and Knapp 1951 in Hoese and Moore 1998).

The Nassau grouper is primarily a shallow-water, insular fish species that has long been valued as a major fishery resource throughout the wider Caribbean, South Florida, Bermuda, and the Bahamas (Carter et al. 1994). As larvae, Nassau grouper are planktonic. After an average of 35-40 days and at an average size of 32 millimeters total length (TL), larvae recruit from an oceanic environment into demersal habitats (Colin 1992, Eggleston 1995). Juvenile Nassau grouper (12-15 centimeters TL) are relatively solitary and remain in specific areas (associated with macroalgae, and both natural and artificial reef structure) for months (Bardach 1958). As juveniles grow, they move progressively to deeper areas and offshore reefs (Tucker et al. 1993, Colin et al. 1997). Smaller juveniles occur in shallower inshore waters (3.7-16.5 meters [m]) and larger juveniles are more common near deeper (18.3-54.9 m) offshore banks (Bardach et al. 1958; Cervigón 1966; Silva Lee 1974; Radakov et al. 1975; Thompson and Munro 1978). Adult Nassau grouper also tend to be relatively sedentary and are commonly associated with high-relief coral reefs or rocky substrate in clear waters to depths of 130 m. Generally, adults are most common at depths less than 100 m (Hill and Sadovy de Mitcheson 2013) except when at spawning aggregations where they are known to descend to depths of 255 m (Starr et al. 2007). Nassau grouper form spawning aggregations at predictable locations around the winter full moons, or between full and new moons (Smith 1971; Colin 1992; Tucker et al. 1993; Aguilar-Perera 1994; Carter et al. 1994; Tucker and Woodward 1994).

The most serious threats to the status of Nassau grouper today are fishing at spawning aggregations and inadequate law enforcement protecting spawning aggregations in many foreign nations. These threats are currently affecting the status of Nassau grouper, putting it at a heightened risk of extinction.

Smalltooth Sawfish

Historically the smalltooth sawfish in the U.S. ranged 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 pers. comm. 2006). 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 are interacted with to a much lesser extent than 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 year in the entire ref fish fishery, and none are expected to result in mortality (NMFS 2011). In the September 30, 2011, 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.

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. For 2014, the extent of the hypoxic area was estimated to be 5,052 square miles and is similar the running average for over the past five years of 5,543 square miles Gulf (see http://www.gulfhypoxia.net/).

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 (e.g., red snapper) are able to detect lower dissolved oxygen levels and move away from hypoxic conditions. Therefore, although not directly affected, these organisms are indirectly affected by limited prey availability and constrained available habitat (Baustian and Rabalais 2009; Craig 2012). For red snapper, Courtney et al. (2013) have conjectured that the hypoxic zone could have an indirect positive effect on red snapper populations in the western Gulf. 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. Grouper and tilefish are less common in the northern Gulf, so the northern Gulf hypoxic zone influences these stock less.

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 affect temperature changes in coastal and marine ecosystems that can influence organism metabolism and alter ecological processes such as productivity and species interactions; change precipitation patterns and cause a rise in sea level which could change the water balance of coastal ecosystems; altering patterns of wind and water circulation in the ocean environment; and influence the productivity of critical coastal ecosystems such as wetlands, estuaries, and coral reefs. The NOAA Climate Change Web Portal[2] indicates 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 climate change could cause shifts in spawning seasons, changes in migration patterns, and changes to basic life history parameters such as growth rates. It is unclear if reef fish distribution in the Gulf has been affected. 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. 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

[2] http://www.esrl.noaa.gov/psd/ipcc/ocn/

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 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 3.3.2 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 3.3.2. Total Gulf greenhouse gas emissions estimates (tons per year) from oil platform and non-oil platform sources, commercial fishing, and percent greenhouse gas emissions from commercial fishing vessels of the total emissions*.

Emission source	**CO_2**	**Greenhouse CH_4**	**Gas 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
Percent commercial fishing	1.69	>0.01	0.59	1.43

*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

General Impacts on Fishery Resources

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

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

The effect of oil, dispersants, and the combination of oil and dispersants on fishes of the Gulf remains an area of concern. Marine fish species typically concentrate PAHs in the digestive tract, making stomach bile an appropriate testing medium. A study by Synder et al. (2015) assessed bile samples from golden tilefish (*Lopholatilus chamaeleonticeps*), king snake eel (*Ophichthus rex*), and red snapper for PAH accumulation over time, and reported concentrations were highest in golden tilefish during the same time period when compared to king snake eel and red snapper. These results suggest that the more highly associated an organism is with the sediment in an oil spill area, the higher the likelihood of toxic PAH accumulation. Twenty-first century dispersant applications are thought to be less harmful than their predecessors. However, the combination of oil and dispersants has proven to be more toxic to marine fishes than either dispersants or crude oil alone. Marine fish which are more active (e.g., a pelagic species versus a demersal species) appear to be more susceptible to negative effects from interactions with weathered oil/dispersant emulsions. These effects can include mobility impairment and inhibited respiration (Swedmark et al. 1973). Another study found that while Corexit 9500A® and oil are similar in their toxicity, when Corexit 9500A® and oil were mixed in lab tests, toxicity to microscopic rotifers increased up to 52-fold (Rico-Martínez et al. 2013). These studies suggest that the toxicity of the oil and dispersant combined may be greater than anticipated.

As reported by NOAA's Office of Response and Restoration (NOAA 2010), the oil from the Deepwater Horizon MC252 spill is relatively high in alkanes, which can readily be used by microorganisms as a food source (Figure 3.3.2). As a result, the oil from this spill is likely to biodegrade more readily than crude oil in general. The Deepwater Horizon MC252 oil is also relatively much lower in polyaromatic hydrocarbons (PAHs), which are highly toxic chemicals that tend to persist in the environment for long periods of time, especially if the spilled oil penetrates into the substrate on beaches or shorelines. Like all crude oils, MC252 oil contains volatile organic compounds (VOCs) such as benzene, toluene, and xylene. Some VOCs are acutely toxic but because they evaporate readily, they are generally a concern only when oil is fresh.[3]

[3] Source: http://sero.nmfs.noaa.gov/deepwater_horizon/documents/pdfs/fact_sheets/oil_characteristics.pdf

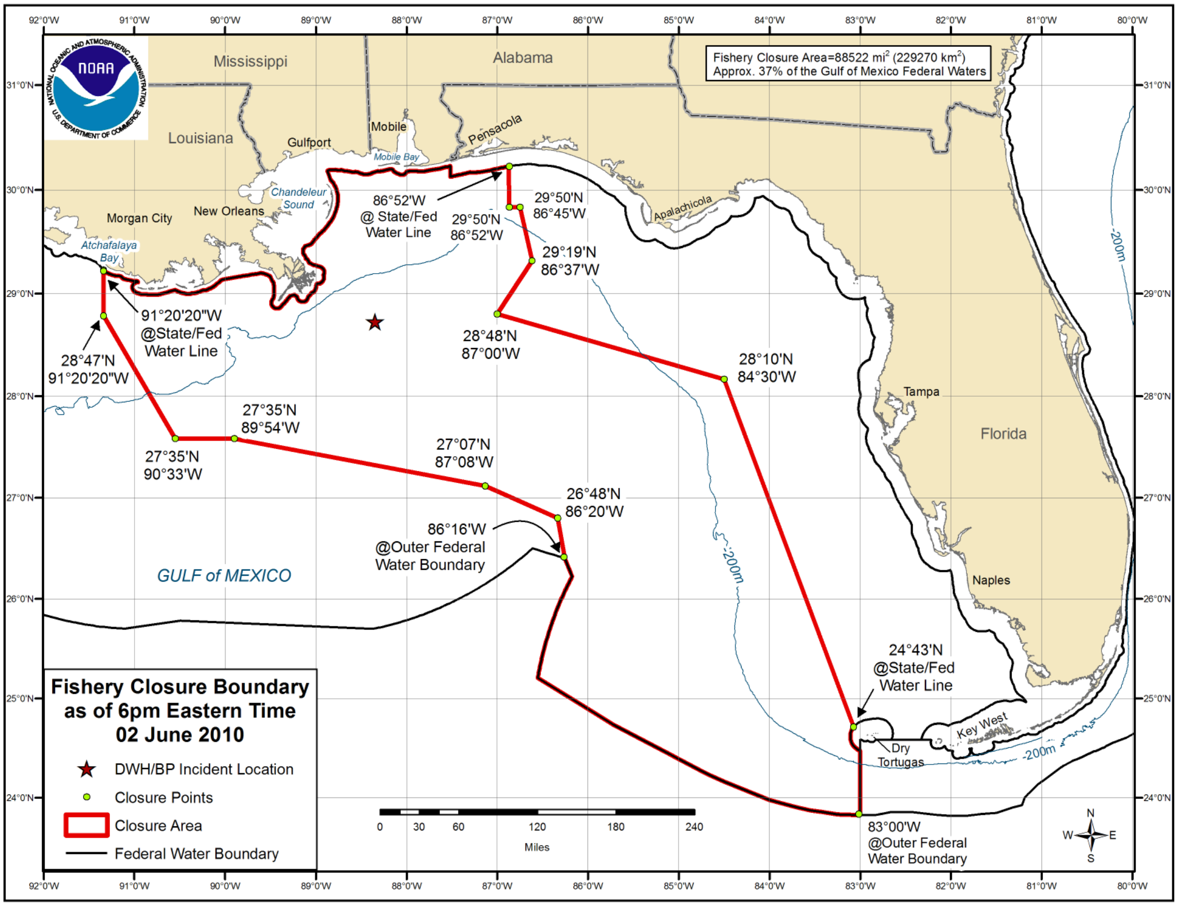

Figure 3.3.2. Fishery closure at the height of the Deepwater Horizon MC252 oil spill.

In addition to the crude oil, over a million gallons of the dispersant, Corexit 9500A®, was applied to the ocean surface and an additional hundreds of thousands of gallons of dispersant was pumped to the mile-deep well head (National Commission 2010). No large-scale applications of dispersants in deep water had been conducted until the Deepwater Horizon MC252 oil spill. Thus, no data exist on the environmental fate of dispersants in deep water. However, a study found that, while Corexit 9500A® and oil are similar in their toxicity, when Corexit 9500A® and oil were mixed in lab tests, toxicity to microscopic rotifers increased up to 52-fold (Rico-Martínez et al. 2013). This suggests that the toxicity of the oil and dispersant combined may be greater than anticipated.

Deepwater Coral Communities

Deepwater corals are particularly vulnerable to episodic mortality events such as oil spills, since corals are immobile. Severe health declines have been observed in three deepwater corals in response to dispersant alone (2.3–3.4 fold) and the oil–dispersant mixtures (1.1–4.4 fold) compared to oil-only treatments (DeLeo et al. 2015). Increased dispersant concentrations appeared to exacerbate these results. As hundreds of thousands of gallons of dispersant were applied near the wellhead during the Deepwater Horizon MC252 oil spill, the possibility exists that deepwater corals may have been negatively impacted by the oil spill and subsequent spill remediation activities.

Several studies have documented declines in coral health or coral death in the presence of oil from the Deepwater Horizon MC252 oil spill (White et al. 2012; Hsing et al. 2013; Fisher et al. 2014). Sites as far as 11 km southwest of the spill were documented to have greater than 45% of the coral colonies affected by oil (White et al. 2012; Hsing et al. 2013), and, though less affected, a site 22 km in 1900 m of water had coral damage caused by oil (Fisher et al. 2014). Coral colonies from several areas around the wellhead had damage to colonies that seemed to be representative of microdroplets as all colonies were not affected, and colonies that were affected had patchy distributions of damaged areas (Fisher et al. 2014). Because locations of deep-sea corals are still being discovered, it is likely that the extent of damage to deep-sea communities will remain undefined.

Outstanding Effects

As a result of the Deepwater Horizon MC252 oil spill, a consultation pursuant to ESA Section 7(a)(2) was reinitiated. As discussed above, on September 30, 2011, the Protected Resources Division released an Opinion, which after analyzing best available data, the current status of the species, environmental baseline (including the impacts of the recent Deepwater Horizon MC252 oil spill in the northern Gulf), effects of the proposed action, and cumulative effects, concluded that the continued operation of the Gulf reef fish fishery is not likely to jeopardize the continued existence of green, hawksbill, Kemp's ridley, leatherback, or loggerhead sea turtles, nor the continued existence of smalltooth sawfish (NMFS 2011). For additional information on the Deepwater Horizon MC252 oil spill and associated closures, see: http://sero.nmfs.noaa.gov/deepwater_horizon_oil_spill.htm.

3.4 Description of the Economic Environment

3.4.1 Recreational Sector

In 2014, there were approximately 11 million recreational saltwater anglers across the U.S. who took approximately 68 million saltwater finfish fishing trips around the country. These anglers spent $4.9 billion on fishing trips and $28 billion on durable fishing-related equipment, and their fishing activity supported 439,000 jobs nation-wide (NMFS FEUS 2014). Atlantic croaker/spot drum and seatrouts were the top two U.S. key recreational species groups by number of finfish caught.

Also in 2014, approximately 2.9 million saltwater anglers combined to take approximately 21 million trips in the Gulf Region (FEUS 2014). The largest numbers of saltwater anglers and trips were in West Florida. The approximately 15 million angler trips in West Florida 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 3.4.1.1. Number of anglers, trips and economic impacts of recreational finfish fishing in Gulf Region, 2014.

State	Trips	Jobs	In Thousands		
			Sales	Income	Value Added
Alabama	2,169,169	14,124	$1,070,579	$540,257	$827,849
West Florida	15,179,236	70,109	$7,467,774	$3,161,122	$4,868,743
Louisiana	2,188,000	15,241	$1,619,677	$662,470	$1,029,281
Mississippi	1,480,525	4,174	$374,063	$157,772	$247,281
Texas	NA	16,496	$1,825,290	$757,027	$1,205,146
Total	21,016,000				

Source: FEUS 2014

Approximately 35% of the fish in the Region's key species/species groups that were caught by saltwater anglers in 2014 were spotted seatrout, making it the Region's top key recreational species (FEUS 2014). The other key recreational species that year were red drum, Spanish mackerel, Atlantic croaker, sand and silver seatrout, red snapper, striped mullet, sheepshead porgy, Gulf and southern kingfish, and southern flounder (Table 3.4.1.2). When caught, striped mullet was the most likely to be harvested (89.0%), while red snapper was the most likely to be released alive (78.1%). Red snapper is the only species in the Reef Fish Fishery that is included among the key recreational species of the Region.

Table 3.4.1.2. Number of finfish harvested and released by anglers in Gulf Region, 2014, excluding those released in Texas.

Gulf Region's Key Recreational Species	Thousands of Fish			Percent of Catch		
	Harvested	Released	Catch	Catch	Harvested	Released
Atlantic croaker	2,682	2,240	4,922	11.68%	13.32%	10.18%
Gulf & southern kingfish	705	356	1,061	2.52%	3.50%	1.62%
Sand & silver seatrouts	2,500	481	2,981	7.07%	12.41%	2.19%
Spotted seatrout	5,703	8,931	14,634	34.73%	28.32%	40.60%
Porgies (sheepshead)	1,381	1,579	2,960	7.02%	6.86%	7.18%
Red drum	2,096	3,479	5,575	13.23%	10.41%	15.82%
Red snapper	500	1,785	2,285	5.42%	2.48%	8.12%
Southern flounder	491	72	563	1.34%	2.44%	0.33%
Spanish mackerel	1,718	2,779	4,497	10.67%	8.53%	12.63%
Striped mullet	2,365	293	2,658	6.31%	11.74%	1.33%
Total Key Species	**20,141**	**21,995**	**42,136**	**100.00%**	**100.00%**	**100.00%**

Source: FEUS 2014.

In Alabama and Mississippi, 2014 angler trips were more likely to be taken on shore, followed in turn by trips by private/rental and for-hire vessels. Trips in Western Florida and Mississippi that year and in Louisiana in 2013, however, were more likely to be taken by anglers on private/rental vessels (Table 3.4.1.3). Collectively, the most popular mode in the Region in 2014 was private/rental vessel (53.8% of trips), followed in turn by trips on shore (42.3%), and those by for-hire vessels (3.9%).

Table 3.4.1.3. Number and percentage of angler trips by mode in Four States of Gulf Region in 2014, except Louisiana in 2013.

State	Number of Angler Trips by Mode				Percentage of Angler Trips		
	Shore	For-hire Vessel	Private/ Rental Vessel	Total	Shore	For-hire Vessel	Private/ Rental Vessel
AL	1,368,219	89,736	714,214	2,169,169	63.1%	4.0%	32.9%
FL	6,370,193	693,741	8,115,303	15,179,237	42.0%	4.6%	53.5%
LA[1]	1,349,019	122,366	3,189,769	4,661,154	28.9%	2.6%	68.4%
MS	843,449	16,242	620,833	1,480,524	57.0%	1.1%	41.9%
Total	**9,930,880**	**922,085**	**12,640,119**	**23,490,084**	**42.3%**	**3.9%**	**53.8%**

1. Data not available for 2014.
Source: Personal communication from the National Marine Fisheries Service, Fisheries Statistics Division, September 7, 2016.

In Alabama, most saltwater angler trips were in state ocean waters, whereas most of those trips in West Florida, Louisiana and Mississippi were in inland waters (Table 3.4.1.4). Collectively in the Region, the fewest trips were taken in federal waters (7.6% of approximately 25 million trips).

Table 3.4.1.4. Number and percentage of angler trips by fishing area in Gulf Region, 2014, except Louisiana in 2013.

State	Number of Angler Trips by Fishing Area				Percentage of Angler Trips		
	Inland Waters	State Ocean Waters	Federal Waters	Total	Inland Waters	State Ocean Waters	Federal Waters
Alabama	1,049,752	1,390,226	334,966	2,862,429	39.7%	48.6%	11.7%
Florida	8,149,333	5,857,718	1,172,185	15,179,236	53.7%	38.6%	7.7%
Louisiana[1]	4,244,979	335,072	81,103	4,661,154	91.1%	7.2%	1.7%
Mississippi	1,425,410	12,473	42,642	1,480,525	96.3%	0.8%	2.9%
Total	14,869,474	7,595,489	1,630,896	24,183,344	61.5%	31.4%	6.7%

1. Data not available for 2014.
Source: Personal communication from the National Marine Fisheries Service, Fisheries Statistics Division, September 7, 2016.

Reef Fish Fishery

Private/rental 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/headboat permit for reef fish that is specifically assigned to that vessel. As of April 20, 2016, there were 1,310 for-hire fishing vessels with a valid or renewable/transferrable charter/headboat permit for reef fish: 1,277 vessels with a charter/headboat permit for reef fish and another 33 with a historical captain charter/headboat permit. More recently, as of January 26, 2017, there were 1,212 for-hire vessels with a charter/headboat permit and 31 for-hire vessels with a historical captain permit. A charter/headboat permit for reef fish that is not a historical captain permit is fully transferable, with or without the sale of the permitted vessel. However, a historical captain permit may only be transferred to a vessel operated by the historical captain and is not otherwise transferable.

Approximately 57% (745) of the 1,310 permits have mailing recipients in Florida (Table 3.4.1.5). Texas recipients hold the second highest number of permits, with 19%. Collectively, 97.3% of the permits have mailing recipients in one of the Gulf States.

Gray triggerfish is one of the species in the reef fish fishery, and the actions of this amendment concern fishing for gray triggerfish only. Consequently, the remainder of this section focuses exclusively on recreational fishing for gray triggerfish in the region.

Table 3.4.1.5. Number and percentage of for-hire reef fish permit by state of mailing recipient (of permit).

State	Permits by State of Recipient	
	Number	Percentage
Alabama	131	10.0%
Florida	745	56.9%
Louisiana	115	8.8%
Mississippi	37	2.8%
Texas	246	18.8%
Other	36	2.7%
Total	1,310	100.0%

Source: PIMS as of April 20, 2016.

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

Gray Triggerfish

The recreational fishing year (season) for gray triggerfish in the Gulf EEZ runs from January 1 to December 31 every year. Prior to a final interim rule implemented in 2012 and then made permanent by Amendment 37, which was implemented on June 10, 2013, if recreational landings exceeded, reached or were projected to reach the ACL, there was no in-season AM to close the current season. Since 2012, if recreational landings are projected to reach the recreational ACT for the fishing year, the recreational season is closed on the date the landings are projected to meet the ACT. Moreover, if the recreational ACT has been reached, the closure begins immediately. In 2012, the federal season closed on June 11, and since June 10, 2013, there has been a two-month federal closure from June 1 through July 31 every year. In 2013 and 2014, the season closed October 15 and May 1, respectively. In 2015, it closed on February 7, and in 2016 it closed on June 1 and never re-opened.

The above interim rule and Amendment 37 reduced the recreational ACL from 457,000 to 241,200 lbs ww and reduced the ACT from 405,000 pounds ww to 217,100 pounds ww. Amendment 37 also established a post-season AM such that the ACL and ACT are adjusted by the amount of the previous year's overage if the stock is overfished and the previous year's recreational landings exceed the recreational ACL.

The initial estimate of the overage in 2013 (283,406 lbs ww) exceeded both the ACL and ACT. Consequently, the 2014 adjusted ACL and ACT were initially set at zero, and the recreational season was closed on May 1, 2014, for the remainder of the fishing year (79 FR 22883; April 25, 2014). Updates of 2013 landings, however, indicated an overage of 215,442 lbs ww, which yielded an adjusted ACL of 25,758 lbs ww and adjusted ACT of 1,658 lbs ww for 2014 (80 FR 4517; January 23, 2015). In 2014, there was an overage of 186,993 lbs ww, which was subtracted from the ACL and ACT to generate the adjusted ACL (54,207 lbs ww) and adjusted ACT (30,107 lbs ww) for 2015 (80 FR 4517) (Table 3.4.1.6).

Table 3.4.1.6. Recreational landings, ACT, ACL, overage, adjusted ACL, adjusted ACT, and seasonal closure date for gray triggerfish, 2011 – 2016.

Year	Landings	ACL/ Quota	ACT	ACL Overage	Adjusted ACL	Adjusted ACT	Date Closed
2011	461,549	457,000		4,549	NA	NA	Dec. 31
2012	279,874	241,200	217,100	62,774	NA	NA	Jun. 11
2013	456,642	241,200	217,100	215,442	NA	NA	Oct. 15
2014	212,751	241,200	217,100	186,993	25,758	1,658	May 1
2015	114,059*	241,200	217,100	TBD	54,207	30,107	Feb. 7
2016		241,200	217,100		TBD	TBD	

*: Preliminary data.
.Sources: 79 FR§22883 for 2013 landings and 2014 adjusted ACL and ACT, 80 FR 4517 for 2014 landings and 2015 adjusted ACL and ACT, NMFS SERO ACL for other landings.

The effectiveness of early federal closures to cap annual landings varies based on multiple factors, such as if the states have compatible regulations and the extent that gray triggerfish are harvested from federal waters. In 2012, for example, the federal season closed on June 11. The season in Texas waters for the for-hire fishing vessels with a federal reef fish permit also ended June 11, 2012. Although Mississippi and Alabama closed their seasons on the same date (June 11), Louisiana closed the season in its waters a few weeks later on July 4, 2012, and the recreational fishing seasons for gray triggerfish remained open in Florida and Texas waters. Florida later closed its recreational season on July 11, 2012. However, after the federal season closed on June 11, 2012, another 41,547 lbs ww of gray triggerfish were landed (SERO-LAPP-2013-03).

Currently, when the federal season is closed, Alabama, Florida, Louisiana and Mississippi close the season in their waters on the same date. Moreover, the closure from June 1 through July 31 of each year in the EEZ also occurs in Alabama, Florida, Louisiana, and Mississippi waters. The relationship between the length of the open season in the EEZ and annual recreational landings from all waters is illustrated by Figure 3.4.1.1.

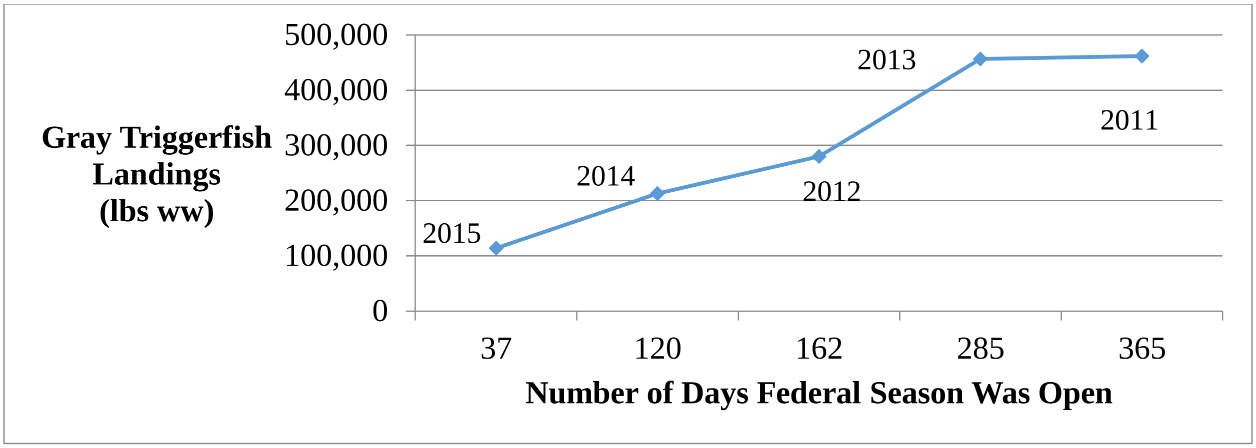

Figure 3.4.1.1. Comparison of number of days the federal season was open and recreational landings of gray triggerfish, 2011 - 2015. Source: NMFS SERO ACL.

Marine Recreational Information Program (MRIP) estimates of recreational catch of gray triggerfish are available for Alabama, West Florida, and Mississippi from 2011 through 2015, but not for Louisiana after 2013. LA Creel data is used for 2014 harvest and the following estimates use the average of 2011 through 2014 harvest as a preliminary estimate of 2015 harvest in Louisiana. Estimates of Texas harvest are derived from Texas Parks and Wildlife Department (TPWD) data for 2011 through 2014, and the average of 2011 through 2014 harvest is used as the preliminary estimate of 2015 harvest in Texas.

Most gray triggerfish in the region are harvested in Florida (Table 3.4.1.7). From 2011 through 2015, Florida accounted for an average of 85% of gray triggerfish harvested. Alabama and Louisiana ranked second and third, respectively, with approximately 10% and 5% of the annual harvest. In 4 of the 5 years, there was no recreational harvest of gray triggerfish in Mississippi. In 2013 when there was harvest, only 13 gray triggerfish were harvested.

Table 3.4.1.7. Estimates and percentages of annual recreational harvest of gray triggerfish by state, 2011 - 2015.

Year	Number of Gray Triggerfish Harvested					Percent of Total Harvested			
	AL	FL	LA	MS + TX	Total	AL	FL	LA	MS + TX
2011	2,765	132,644	807	1,001	136,216	2.0%	97.4%	0.6%	0.7%
2012	5,078	51,546	8,059	1,474	64,683	7.9%	79.7%	12.5%	2.3%
2013	24,954	121,713	4,704	1,011	151,371	16.5%	80.4%	3.1%	0.7%
2014	4,292	74,783	1,433	682	80,508	5.3%	92.9%	1.8%	0.8%
2015[1]	7,503	35,063	3,751	1,039	46,317	16.2%	75.7%	8.1%	2.2%
Ave.	**8,918**	**83,150**	**3,751**	**1,041**	**95,819**	**9.6%**	**85.2%**	**5.2%**	**1.4%**

1. Preliminary.
Source: Personal communication from the National Marine Fisheries Service, Fisheries Statistics Division April 27, 2016, for all numbers of fish harvested except for Texas and 2014 and 2015 figures for Louisiana. LA Creel estimate for 2014 Louisiana harvest and TPWD for estimates of Texas 2011- 2014 harvest. Average of 2011-2014 harvest used to produce preliminary estimate 2015 harvest in Louisiana and Texas.

The federal bag limit is currently two gray triggerfish per person per day. Prior to June 10, 2013, an angler could land up to 20 gray triggerfish from the EEZ as long as the angler stayed within the 20-reef fish aggregate bag limit. Currently, Alabama, Florida and Louisiana have a compatible 2-gray triggerfish bag limit. In Louisiana, however, a 2-day limit is allowed in possession on charter vessels and headboats on multi-day trips that satisfy certain conditions. Mississippi has a 20 gray triggerfish limit in aggregate and also has a 2-day possession limit for-hire vessels that go on multi-day trips. Texas has a 20 gray triggerfish limit per angler.

The number of annual directed angler trips that target gray triggerfish in the EEZ generally declined from 2011 through 2015 (Table 3.4.1.8 and Figure 3.4.1.2). The 5-year decline may be attributable to multiple factors, such as implementation of the 2-fish bag limit, June-July closure, and early closures.

Table 3.4.1.8. Numbers and percentages of directed trips that targeted gray triggerfish, 2011 - 2015.

Year	Number and Percentage of Directed Trips					
	Gray Triggerfish Primary Target			Gray Triggerfish Secondary Target		
	All Waters	EEZ	Percent EEZ	All Waters	EEZ	Percent EEZ
2011	10,367	9,788	94.41%	14,281	9,082	63.6%
2012	5,801	5,317	91.66%	8,603	5,212	60.6%
2013	3,853	2,620	68.00%	23,335	7,706	33.0%
2014	14,507	669	4.61%	7,029	0	0.00%
2015	4,775	0	0.00%	2,464	2,464	100.00%
Ave.	**7,861**	**3,679**	**51.74%**	**11,142**	**4,893**	**51.4%**

Source: Personal communication from the National Marine Fisheries Service, Fisheries Statistics Division April 28, 2016.

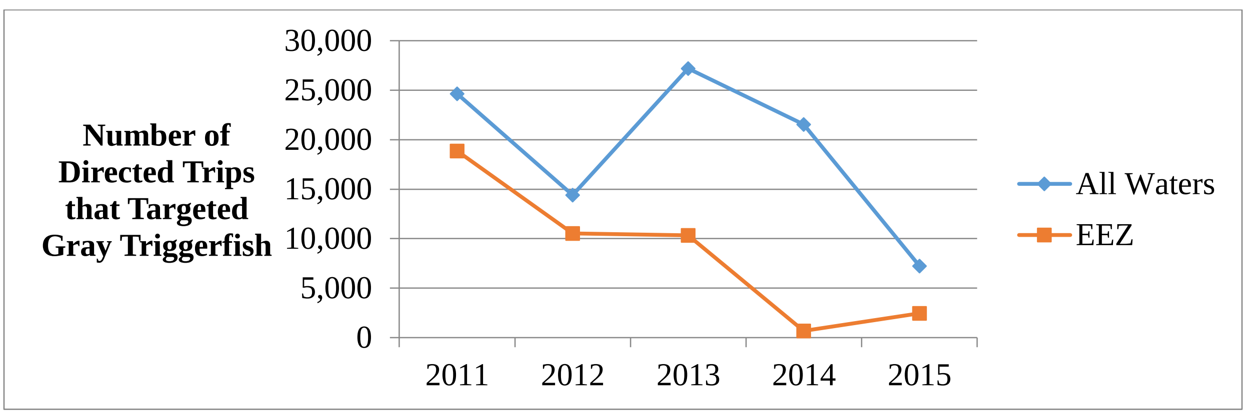

Figure 3.4.1.2. Number of directed trips that targeted gray triggerfish, 2011 - 2015. Source: Personal communication from the National Marine Fisheries Service, Fisheries Statistics Division April 28, 2016.

The percentage of gray triggerfish that were harvested from those caught in the Gulf EEZ also generally decreased from 2011 through 2015 (Table 3.4.1.9). A lower rate of harvest can be associated with multiple factors, such as a lower bag limit and early closures. The minimum size limit did not change during that time. Since 2008 (Amendment 30B), the minimum size limit in federal waters has been 14 inches fork length (FL). An equivalent size limit also applies in state waters of Alabama, Florida, Louisiana and Mississippi. Texas has a 16 inches TL size limit, which is approximately equivalent to the federal limit. During the above 5-year period, an average of one gray triggerfish was harvested per trip among those annual trips that harvested the species.

Table 3.4.1.9. Number of directed trips that harvested and released gray triggerfish and percentage of total catch trips that harvested, 2011 - 2015.

Year	Number of Directed Trips in EEZ			
	Harvest	Released	Total	Percentage Harvested
2011	149,494	50,959	200,453	74.6%
2012	52,291	37,909	90,200	58.0%
2013	130,360	56,485	186,845	69.8%
2014	56,353	69,875	126,228	44.6%
2015	13,077	76,948	90,025	14.5%

Source: Personal communication from the National Marine Fisheries Service, Fisheries Statistics Division April 28, 2016.

All of the directed trips that targeted (primary or secondary) gray triggerfish from 2011 through 2015 were by anglers who were onboard vessels. On average, approximately 95% of the trips were taken by private/rental vessels and the remaining 5% by for-hire vessels (Table 3.4.1.10). None of the trips were taken out of Mississippi or Louisiana.

Table 3.4.1.10. Number of directed trips that targeted gray triggerfish in all areas by mode, 2011 - 2015.

Year	Trips that Targeted Gray Triggerfish by Mode					
	Shore	For-Hire Vessel	Private/Rental Vessel	Total	For-Hire	Private/ Rental
2011	0	3,184	21,464	24,648	12.9%	87.1%
2012	0	790	13,613	14,403	5.5%	94.5%
2013	0	953	26,325	27,278	3.5%	96.5%
2014	0	557	20,979	21,536	2.6%	97.4%
2015	0	0	7,239	7,239	0.0%	100.0%
Ave.	0	1,097	17,924	19,021	4.9%	95.1%

Source: Personal communication from the National Marine Fisheries Service, Fisheries Statistics Division April 28, 2016.

In Alabama, the average annual number of target trips by for-hire vessels is 263 and in Florida, the average is 834 target trips by for-hire vessels (Table 3.4.1.11). Alabama's 263 for-hire trips are estimated to generate 2 jobs, $61,000 in income impacts, $156,000 in sales impacts, and $84,000 in valued-added impacts (2015 $) (Table 3.4.1.12). Florida's 834 for-hire trips are similarly estimated to generate 5 jobs, $239,000 in income impacts, $565,000 in sales impacts, and $344,000 in value-added impacts (Table 3.4.1.13).

Table 3.4.1.11. Number of directed trips that targeted gray triggerfish in all areas, 2011 - 2015.

Year	Alabama Trips that Targeted Gray Triggerfish				
	For-Hire	Private/Rental	Total	For-Hire	Private/Rental
2011	1,138	8,852	9,990	11.39%	88.6%
2012	47	1,959	2,006	2.34%	97.7%
2013	131	7,341	7,472	1.75%	98.2%
2014	0	930	930	0.00%	100.0%
2015	0	2,464	2,464	0.00%	100.0%
Average	**263**	**4,309**	**4,572**	**3.10%**	**96.9%**
Year	**Florida Trips that Targeted Gray Triggerfish**				
	For-Hire	**Private/Rental**	**Total**	**For-Hire**	**Private/Rental**
2011	2,046	12,612	14,658	14.0%	86.0%
2012	743	11,654	12,397	6.0%	94.0%
2013	822	18,984	19,806	4.2%	95.8%
2014	557	20,049	20,606	2.7%	97.3%
2015	0	4,775	4,775	0.0%	100.0%
Average	**834**	**13,615**	**14,448**	**5.4%**	**94.6%**

Source: Personal communication from the National Marine Fisheries Service, Fisheries Statistics Division April 28, 2016.

Table 3.4.1.12. Estimates of economic impacts of Alabama's average annual target trips.

Mode	Alabama				
	Target Trips	Jobs	In Thousands (2015 $)		
			Income	Sales	Value-Added
Shore	0	0	$0	$0	$0
For-Hire Vessel	263	2	$61	$156	$84
Private/Rental Vessel	4,309	2	$78	$225	$130
Total	4,572	4	$139	$381	$214

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

Table 3.4.1.13. Estimates of economic impacts of Florida's average annual target trips.

Mode	Florida				
	Target Trips	Jobs	In Thousands (2015 $)		
			Income	Sales	Value-Added
Shore	0	0	$0	$0	$0
For-Hire Vessel	834	5	$239	$565	$344
Private/Rental Vessel	13,615	6	$263	$686	$435
Total	14,449	11	$502	$1,251	$779

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

The above trips and generated economic impacts are for target trips in both state and federal waters. Although all of the 263 target trips by for-hire vessels in Alabama were in the EEZ, approximately 90% of the 4,305 target trips by private/rental vessels were in the EEZ (Table 3.4.1.14). Approximately 38% of Florida's 834 average annual target trips by for-hire vessels and approximately 30% of the average annual 13,615 trips by private/rental vessels were in the EEZ (Table 3.4.1.14).

Table 3.4.1.14. Number of target trips in EEZ by state, 2011-2015.

Year	Number of Trips that Targeted Gray Triggerfish in EEZ			
	Alabama		Florida	
	For-Hire	Private/Rental	For-Hire	Private/Rental
2011	1,138	7,019	757	9,957
2012	47	1,959	743	7,779
2013	131	7,341	92	2,761
2014	0	669	0	0
2015	0	2,464	0	0
Average	**263**	**3,890**	**318**	**4,099**

Source: Personal communication from the National Marine Fisheries Service, Fisheries Statistics Division April 29, 2016.

The target trips in the EEZ are estimated to generate economic impacts in Alabama of 4 jobs, $131,000 in income impacts, $359,000 in sales impacts, and $201,000 in value-added impacts (Table 3.4.1.15). Similarly, the target trips in the EEZ are estimated to generate economic impacts in Florida of 4 jobs, $170,000 in income impacts, $422,000 in sales impacts, and $262,000 in value-added impacts (Table 3.4.1.15).

Table 3.4.1.15. Estimates of economic impacts of Alabama and Florida's average annual target trips in the EEZ.

Mode	Alabama				
	Target Trips	Jobs	In Thousands (2015 $)		
			Income	Sales	Value-Added
Shore	0	0	$0	$0	$0
For-Hire Vessel	263	2	$61	$156	$84
Private/Rental Vessel	3,890	2	$70	$203	$117
Total	4,153	4	$131	$359	$201
Mode	**Florida**				
	Target Trips	**Jobs**	**In Thousands (2015 $)**		
			Income	**Sales**	**Value-Added**
Shore	0	0	$0	$0	$0
For-Hire Vessel	318	2	$91	$215	$131
Private/Rental Vessel	4,099	2	$79	$207	$131
Total	4,417	4	$170	$422	$262

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

3.4.2 Commercial Sector

In 2014, commercial fishermen in the U.S. harvested 9.4 billion pounds of finfish and shellfish and sold their catch earning $5.5 billion. Approximately 62% of that dockside revenue is from landings of ten U.S. key species/species groups. The U.S. seafood industry, which here includes the commercial marine harvest sector, seafood processors and dealers, seafood wholesalers and distributors, importers, and seafood retailers, supported approximately 1.4 million full- and part-time jobs and generated $153.3 billion in sales impacts, $42 billion in income impacts, and $64.1 billion in value added impacts nationwide (NMFS FEUS 2014).

The Gulf of Mexico Fishery Management Council manages seven fisheries (Aquaculture, Coral and Coral Reefs, Coastal Migratory Pelagics, Red Drum, Reef Fish, Shrimp, and Spiny Lobster) and shrimp is one of the top ten U.S. key species/species groups. Dockside revenue from landings of shrimp nationwide accounts for approximately 13% ($702 million) of U.S. dockside revenue in 2014, and approximately 84% of the national revenue from shrimp is from the Gulf landings. None of the other nine U.S. key species/species groups is or is part of a Gulf Council-managed fishery.

Commercial fishermen in the Gulf Region landed 1.1 billion pounds of finfish and shellfish with dockside revenue of $1 billion in 2014 (NMFS FEUS 2014). Shrimp landings account for approximately 57% ($588 million) of that dockside revenue (Table 3.4.2.1). Included among the key species/species groups in the Gulf Region are groupers and red snapper, which are part of the reef fish fishery.

Table 3.4.2.1. Dockside revenue in Gulf Region, 2014.

Key species/species group	**Dockside revenue ($1,000s)**	**Percent all dockside revenue**
Blue crab	73,426	7.14%
Crawfish	13,430	1.31%
Groupers	28,830	2.80%
Menhaden	70,917	6.90%
Mullets	10,292	1.00%
Oysters	86,751	8.44%
Red snapper	23,088	2.25%
Shrimp	587,986	57.20%
Stone crab	27,135	2.64%
Tunas	6,330	0.62%
Total top ten	*928,185*	90.30%
All other (all non-top ten)	99,700	9.70%
All landings	*1,027,885*	100.00%

Source: NMFS FEUS 2014.

Reef Fish Fishery

There are 31 species in the management unit of the reef fish fishery as shown in Table 3.4.2.2. Shallow-water grouper, red grouper, gag grouper, deep-water grouper, and tilefishes are managed under the Gulf Reef Fish IFQ Program and red snapper under the Red Snapper IFQ Program. Commercial landings of the other species groups are limited by ACLs.

Table 3.4.2.2. Managed species of Gulf reef fish fishery.

Group	Stocks/Complexes	Species
Snappers	Cubera snapper	Cubera snapper
	Gray (mangrove) snapper	Gray snapper
	Lane snapper	Lane snapper
	Mutton snapper	Mutton snapper
	Red snapper	Red snapper
	Mid-water snapper	Silk snapper, wenchman, queen snapper, and blackfin snapper
	Vermilion snapper	Vermilion snapper
	Yellowtail snapper	Yellowtail snapper
Groupers	Atlantic goliath grouper	Atlantic goliath grouper
	Shallow-water grouper	Black grouper, scamp, yellowfin grouper, and yellowmouth grouper
	Gag	Gag
	Red grouper	Red grouper
	Deep-water grouper	Snowy grouper, specked hind, warsaw grouper, and yellowedge grouper
Tilefishes	Tilefishes	Blueline, goldface and golden tilefish
Jacks	Jacks complex	Almaco jack, banded rudderfish, and lesser amberjack
	Greater amberjack	Greater amberjack
Triggerfishes	Gray triggerfish	Gray triggerfish
Wrasses	Hogfish	Hogfish

Over the 5-year period from 2011 through 2015, snappers and groupers accounted for approximately 95% of reef fish landings by pounds and 96% by dockside revenue (Table 3.4.2.3). Among the above six species groups (snappers, groupers, jacks, tilefishes, triggerfishes, and wrasses), triggerfishes ranked next to last by weight and tied for last by dockside revenue during that time. The six species/complexes managed under an IFQ Program accounted for an annual average of approximately 78% of landings by weight and 83% by dockside revenue during that time (Table 3.4.2.4).

Table 3.4.2.3. Percent of commercial landings by weight and dockside revenue of managed species of reef fish fishery, 2011 through 2015.

Species group	Annual average	
	By pounds	By dockside revenue
Snappers	48.2%	49.6%
Groupers	44.7%	46.3%
Tilefishes	3.3%	2.4%
Jacks	3.3%	1.2%
Triggerfishes	0.4%	0.2%
Wrasses	0.2%	0.2%
Total reef fish	100.0%	100.0%

Source: SEFSC Economic Query System.

Table 3.4.2.4. Commercial landings by weight and dockside revenue of IFQ- and non IFQ-managed species of reef fish fishery and percent IFQ-managed, 2011 through 2015.

Year	Gulf reef fish commercial landings (lbs gw and nominal value)					
	IFQ-managed		Non-IFQ managed		Percent IFQ-managed	
	Pounds	Dollars	Pounds	Dollars	Pounds	Dollars
2011	9,290,918	31,311,416	4,052,140	10,702,300	69.63%	74.53%
2012	10,539,626	37,443,066	3,444,046	9,535,475	75.37%	79.70%
2013	11,047,764	43,753,895	2,577,394	7,043,186	81.08%	86.13%
2014	12,365,672	50,914,739	3,045,500	8,588,123	80.24%	85.57%
2015	11,085,574	48,238,699	2,229,290	6,365,420	83.26%	88.34%
Average	10,865,911	$42,332,363	3,069,674	$8,446,901	77.92%	82.85%

Source: SEFSC Economic Query System.

Any commercial fishing vessel that harvests species and species complexes from the Gulf EEZ must have a limited-access federal Gulf reef fish permit and vessel monitoring system (VMS). As of April 5, 2016 (and June 20, 2106), 852 vessels had that permit (either valid or renewable/transferrable). Eighty percent of the permits were held by residents of Florida (Table 3.4.2.5). Collectively, residents (individuals and businesses) of the five Gulf States held 98.4% of the permits. For those vessels with a reef fish permit that use bottom longline to harvest reef fish in bottom longline in the Gulf EEZ east of 85°30' W. longitude, a longline endorsement is also required. As of June 20, 2016, there were 62 vessels with a longline endorsement (57 valid and 5 renewable/transferable). More recently, as of January 2, 2017, 815 vessels had a Gulf reef fish permit and 59 had a longline endorsement.

Vessels that harvest IFQ-managed shallow water groupers, red grouper, gag grouper, deep water grouper and/or tilefishes must have an IFQ Gulf Reef Fish Account. As of April 5, 2016, there were 1,415 Gulf IFQ shareholders; 389 of them had red snapper shares, and 279 of the red snapper shareholders held other reef fish shares. Approximately 97% of the primary contacts representing these shareholders resided in in one of the five Gulf States (Table 3.4.2.5).

Table 3.4.2.5. Number and percentage of valid and renewable reef fish permits as of April 5, 2016 (and June 20, 2016), and primary contacts of IFQ shareholders by state as of April 5, 2016.

State	Reef fish permits		Primary contact of IFQ shareholder	
	Number	Percentage	Number	Percent
Alabama	38	4.5%	69	4.90%
Florida	682	80.0%	1,106	78.20%
Louisiana	38	4.5%	60	4.20%
Mississippi	8	0.9%	19	1.30%
Texas	72	8.5%	118	8.30%
Outside region	14	1.6%	43	3.00%
Total	852	100.0%	1,415	100.00%

Source: SERO PIMS.

Any dealer that wants to purchase, receive, trade or barter Gulf reef fish caught from a federally permitted commercial fishing vessel must have a Gulf and South Atlantic dealer permit. As of June 20, 2016, there were 416 dealers with that permit. Approximately 69% of the permits were held by dealers residing in one of the five Gulf States (Table 3.4.2.6). If this annual permit is the only permit requested by an entity, its annual cost is $50 and the time required to complete the application is expected to be 20 minutes. If it is a second permit, the annual cost is $12.50 for the dealer permit. As of January 2, 2017, there were 368 dealers with the permit.

Table 3.4.2.6. Number and percentage of Gulf and South Atlantic dealer permits as of June 20, 2016.

State	Dealer permit	
	Number	Percent
Alabama	12	2.88%
Florida	239	57.45%
Louisiana	18	4.33%
Mississippi	3	0.72%
Texas	17	40.9%
Other	127	30.53%
Total	416	100.0%

Source: SERO PIMS.

The actions of this amendment concern fishing for gray triggerfish only. Consequently, the remainder of this section focuses exclusively on fishing for gray triggerfish in the Region. Additional information on commercial landings for the reef fish fishery as a whole and the other species or complexes within it can be found in previous amendments, such as Amendment 29 (GMFMC 2008), Amendment 31 (GMFMC 2009), Amendment 32 (GMFMC 2011), Amendment 34 (GMFMC 2012), Amendment 38 (GMFMC 2012), Amendment 40 (GMFMC 2014) and Framework Action (GMFMC 2015), and are incorporated herein by reference.

Gray Triggerfish

As shown previously in Table 3.4.1.3, triggerfishes accounted for less than half a percent of commercial landings of reef fish annually by both weight and dockside revenue from 2011 through 2015. The triggerfishes complex is composed of one species: gray triggerfish.

The commercial fishing year for gray triggerfish in the Gulf EEZ runs from January 1 through May 31 and from August 1 through December 31 every year. Prior to June 10, 2013 (Amendment 37), the season remained open from June 1 through July 31, which is the time of peak spawning. An annual June and July closure also occurs in state waters of Alabama, Florida, and Louisiana.

If commercial landings reach or are projected to reach or exceed the commercial ACL, the season is closed and the ACL for the following year is reduced by the amount of the overage. In 2012, the season closed early when landings were projected to exceed the ACL by 9,298 lbs ww. Consequently, the ACL for 2013 was reduced to 54,802 lbs (by the amount of the projected overage in 2012). Since 2013, the season has not closed early, although 115% of the ACL was landed in 2013 (Table 3.4.2.7). As of June 13, 2016, a preliminary estimate of 44.4% of the gray triggerfish ACL was landed during the first half of the open season, and at that rate, 2016 commercial landings would be less than the ACL and the season would remain open until December 31.

Table 3.4.2.7. ACL, ACT and landings (lbs ww) of gray triggerfish, 2011 through 2015.

Year	ACL (lbs ww)	ACT (lbs ww)	Landings (lbs ww)	Projected overage (lbs ww)	ACL less overage (lbs ww)	% ACL	% ACT	Closure date
2011	NA	106,000	105,251		NA	NA	99.3%	Dec. 31
2012	64,100	51,290	71,948	9,248	54,852	112.2%	140.3%	Jul. 1
2013	54,802	54,802	63,086	0	0	115.1%	115.1%	Dec. 31
2014	64,100	60,900	41,613	0	0	64.9%	68.3%	Dec. 31
2015	64,100	60,900	47,480	0	0	74.1%	78.0%	Dec. 31

Source: NMFS SERO ACL Webpage.

Most of the commercial landings occur in Florida as shown in Figure 3.4.2.1. From 2010 through 2014, for example, Florida landings accounted for an average of 95% of the gray triggerfish landings (lbs ww). Florida regulations require the commercial vessel or its operator to have a Special Products license (SPL) with a Restricted Species (RS) endorsement in addition to a having a federal snapper grouper permit to harvest gray triggerfish.

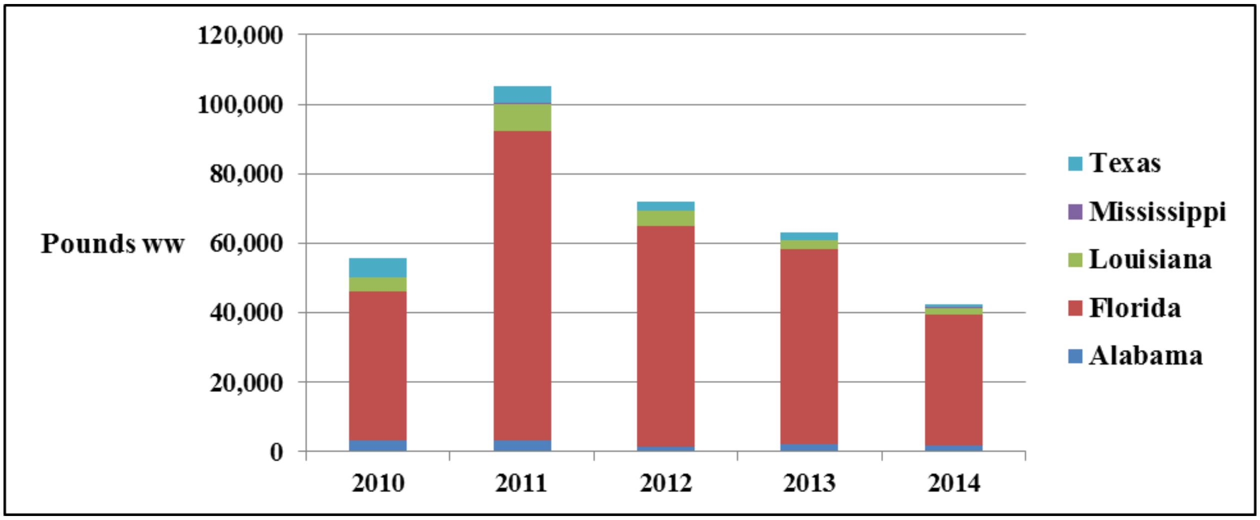

Figure 3.4.2.1. Commercial landings (lbs ww) of gray triggerfish by state, 2010 through 2014. Source: NMFS SERO ACL December 2015.

Commercial landings tend to highest in May; however, 2011 landings do not show the same trend (Figure 3.4.2.2). March, April and May have tended to be the three highest months by average percent of annual landings (Figure 3.4.2.3**)**. Note that in 2012, the commercial season closed July 1.

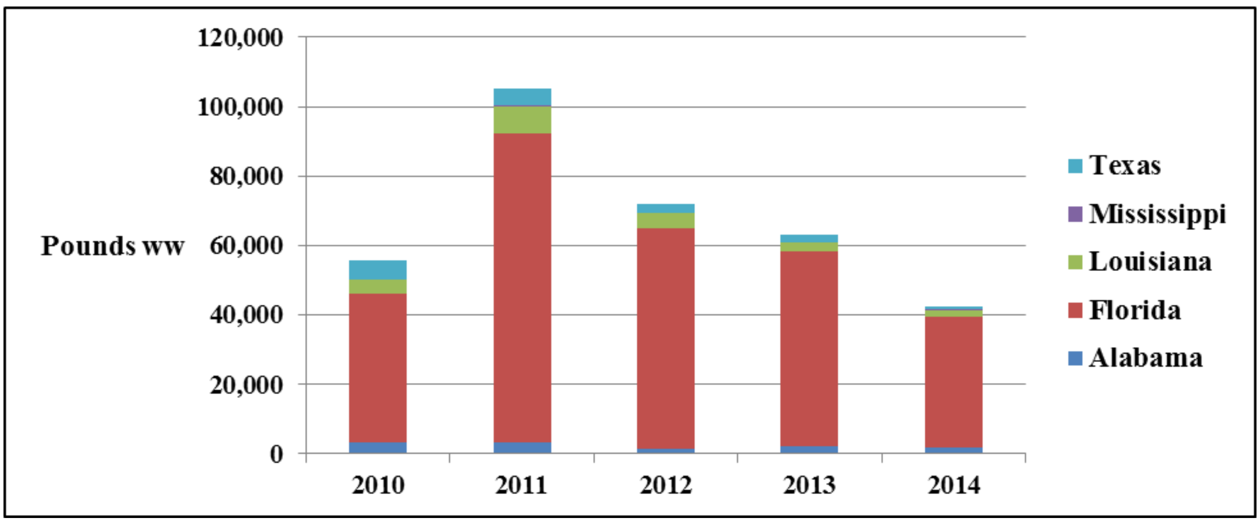

Figure 3.4.2.2. Commercial landings (lbs ww) of gray triggerfish by month, 2010 through 2014. Source: NMFS SERO ACL December 2015.

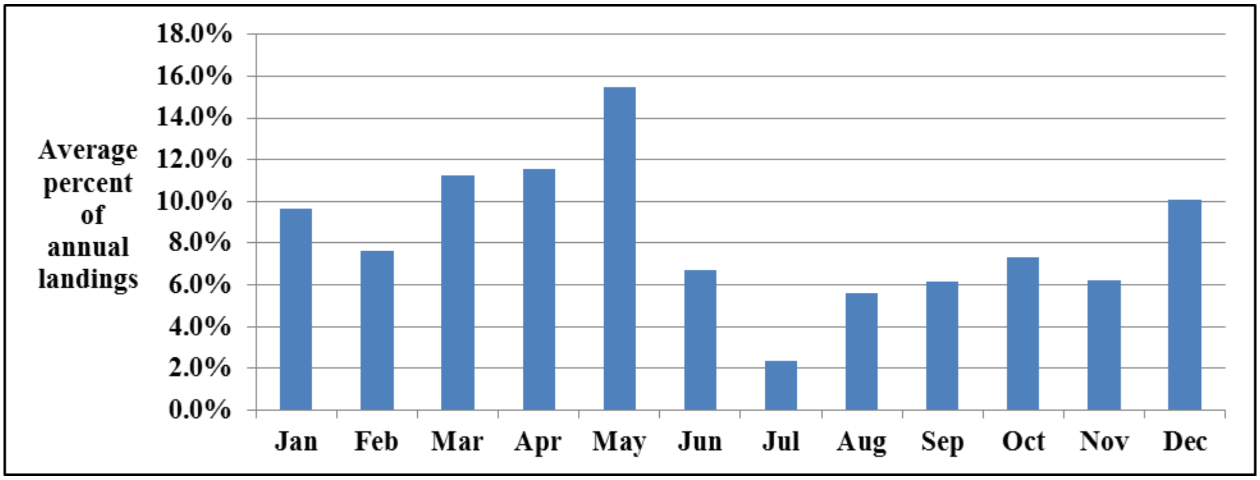

Figure 3.4.2.3. Average percent of annual commercial landings (lbs ww) of gray triggerfish by month, 2010 through 2014. Source: NMFS SERO ACL December 2015.

The majority of Gulf gray triggerfish that are commercially landed are typically harvested from federal waters (Table 3.4.2.8). From 2010 through 2014, gray triggerfish taken from federal waters accounted for an average of 65% of annual landings. Although a vessel may be in both federal and state waters during a single trip, the logbook guidance instructs vessel owners/operators to identify the area where the majority of the catch of each species is from.

Table 3.4.2.8. Commercial landings of gray triggerfish by jurisdiction, 2010 through 2014.

Year	Landings (lbs ww) by reported jurisdiction						
	Federal	State	Unreported	Total	Federal	State	Unreported
2010	48,663	1,247	5,751	55,661	87.4%	2.2%	10.3%
2011	99,450	633	5,168	105,251	94.5%	0.6%	4.9%
2012	69,054	364	2,530	71,948	96.0%	0.5%	3.5%
2013	60,577	391	2,118	63,086	96.0%	0.6%	3.4%
2014	38,108	3,138	1,286	42,532	89.6%	7.4%	3.0%
Average	63,170	1,155	3,371	67,696	92.7%	2.3%	5.0%

Source: NMFS SERO ACL. December 2015.

Hook and line are the most commonly used gear when harvesting gray triggerfish from the Gulf Region. Approximately 93% of annual commercial landings of the species from 2010 through 2014 were taken with hook and line gear (Figure 3.4.2.4).

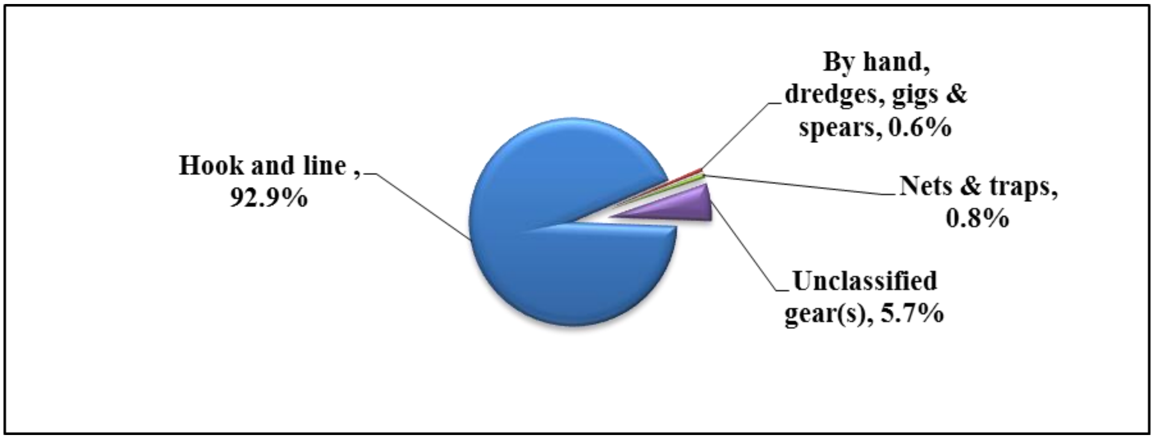

Figure 3.4.2.4. Average annual percent of annual commercial landings (lbs ww) of gray triggerfish by gear, 2010 through 2014. Source: NMFS SERO ACL December 2015.

As shown in Figure 3.4.2.5 below, annual commercial landings of gray triggerfish in the Gulf of Mexico Region have ranged between 33,828 and 94,800 lbs gw since 2006. The annual average decreased from 81,366 lbs gw during the 5-year period from 2006 through 2010 to 54,579 lbs gw during the second 5-year period from 2011 through 2015 (NMFS SEFSC Online Economic Query System).

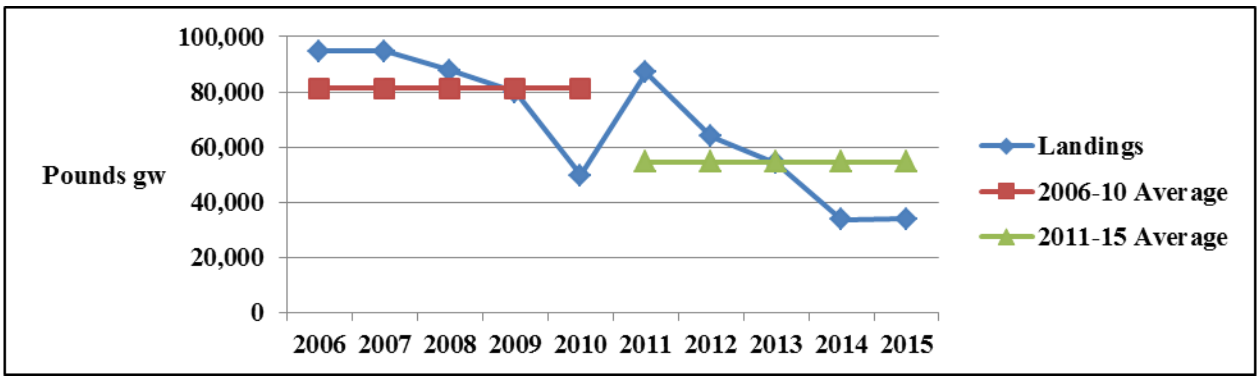

Figure 3.4.2.5. Annual commercial landings (lbs ww) of gray triggerfish, 2006 – 2015. Source: NMFS SEFSC Online Economic Query System, June 20, 2016.

Amendment 37 established a commercial trip limit in the Gulf EEZ of 12 gray triggerfish, which began June 10, 2013. Alabama and Louisiana have commercial trip limits in their waters equivalent to that limit. However, there are no compatible trip limits in Florida, Mississippi or Texas waters. Texas caps commercial landings at 20 gray triggerfish per person or 40 per trip, and Florida and Mississippi have no trip limit.

From 2011 through 2013, an annual average of 247 vessels made 1,349 trips that landed gray triggerfish from the Region, and those trips represent approximately 35% of all of their annual trips during that 3-year period (Table 3.4.2.9). From 2014 through 2015, an annual average of 223 vessels made 1,207 trips that landed gray triggerfish from the Region, and those trips represent approximately 33% of all of their annual trips during that 2-year period. On average, after Amendment 37, there was no change in the average number of trips per vessel that landed gray triggerfish.

Table 3.4.2.9. Number and averages of vessels with trips with gray triggerfish landings, 2011 through 2015.

Year	Vessels	Trips with gray trigger-fish	Trips without gray trigger-fish	Total trips	Percent of trips with gray triggerfish	Average trips with gray triggerfish per vessel	Average all trips per vessel
2011	284	1,748	2,698	4,446	39.3%	6.2	15.7
2012	244	1,066	2,891	3,957	26.9%	4.4	16.2
2013	212	1,234	2,004	3,238	38.1%	5.8	15.3
2014	228	1,176	2,614	3,790	31.0%	5.2	16.6
2015	218	1,238	2,401	3,639	34.0%	5.7	16.7
Average 2011-13	247	1,349	2,531	3,880	34.8%	5.4	15.7
Average 2014-15	223	1,207	2,508	3,715	32.5%	5.4	16.7

Source: NMFS SEFSC Online Economic Query System, June 20, 2016.

From 2011 through 2013, the average vessel landed approximately 275 lbs gw of gray triggerfish annually and 50 lbs gw of the species per trip when it was landed, while from 2014 through 2015, the average vessel landed 164 lbs gw of gray triggerfish annually and 30 lbs gw per trip when the species was landed (Table 3.4.2.10).

Table 3.4.2.10. Average landings (lbs gw) of gray triggerfish per vessel and per trip, 2011 through 2015.

Year	Average landings (lbs gw) of gray triggerfish	
	Per vessel	Per trip
2011	306	50
2012	262	60
2013	255	44
2014	149	29
2015	179	32
Average 2011-13	**275**	**51**
Average 2014-15	**164**	**30**

Source: NMFS SEFSC Online Economic Query System, June 20, 2016.

From 2011 through 2013, the average 247 vessels collectively landed an average of 68,392 lbs gw of gray triggerfish annually, and from 2014 through 2015, the average 223 vessels collectively landed an average of 36,486 lbs gw (Table 3.3.1.11). From 2011 through 2013, average annual gray triggerfish landings represent 0.7% of all landings by weight and from 2014 through 2015, approximately 0.4% by weight (Table 3.4.2.11).

Table 3.4.2.11. Number and averages of vessels and landings (lbs gw) of gray triggerfish and other species of trips with gray triggerfish landings, 2011 through 2015.

Year	Vessels	Pounds gw of gray trigger-fish	Pounds gw other species from gray trigger-fish trips	Total pounds gw from gray triggerfish trips	Pounds gw from trips without gray triggerfish	Total pounds gw from all trips	Percent gray trigger-fish of all pounds
2011	284	87,042	4,905,758	4,992,800	5,797,235	10,790,035	0.8%
2012	244	64,004	3,050,682	3,114,686	7,139,713	10,254,399	0.6%
2013	212	54,130	3,731,574	3,784,705	4,765,751	8,551,455	0.6%
2014	228	33,931	3,298,968	3,332,899	5,785,481	9,118,380	0.4%
2015	218	39,041	3,457,059	3,496,100	5,804,785	9,300,885	0.4%
Average 2011-13	247	68,392	3,895,611	3,964,397	5,900,900	9,865,296	0.7%
Average 2014-15	223	36,486	3,155,018	3,414,500	5,795,133	9,209,633	0.4%

Source: NMFS SEFSC Online Economic Query System, June 20, 2016.

Dockside revenue (2015 dollars) from gray triggerfish landings ranged from $64,167 to $133,618 during the 5-year period from 2011 through 2015 (Table 3.4.2.12). When gray triggerfish was landed, it represented, on average, 0.9% of dockside revenue from trips during the period from 2011 through 2013 and 0.6% during the period from 2014 through 2015. However, average annual dockside revenue from gray triggerfish represented approximately 0.4% of all annual dockside revenue for the vessels that annually landed the species from 2011 through 2013 and 0.2% from 2014 through 2015. The following estimates of the economic impacts of commercial landings of gray triggerfish are derived from using the model developed for and applied in NMFS (2016). The 2014 through 2015 annual average landings of 36,486 lbs gw (with dockside value of $73,457 (2015 dollars)), generate annual national economic impacts of 10 jobs, approximately $268,000 in income impacts, $378,000 in value added impacts, and $728,000 in sales impacts (2015 dollars).

The average annual dockside revenue (2015 dollars) from gray triggerfish landings was $475 per vessel from 2011 through 2013 and $331 per vessel from 2013 through 2015 (Table 3.4.2.13). The average trip earned $88 from gray triggerfish landings from 2011 through 2013 and $61 from 2014 through 2015. The average annual dockside revenue from all landings for a vessel that landed gray triggerfish during a year was higher from 2014 through 2015 than from 2011 through 2013. Moreover, the average dockside revenue per trip was also higher during the latter 2-year period.

Table 3.4.2.12. Number and averages of vessels, pounds and dockside revenue (2015 dollars) from gray triggerfish and other species landed, 2011 through 2015.

Year	Vessels	Pounds gw gray trigger-fish	Real dockside revenue from gray trigger-fish (2015 $)	Total dockside revenue from all trips with gray trigger- fish (2015 $)	Total dockside revenue from all trips (2015 $)	Percent dockside revenue from gray trigger-fish for trips with species	Percent dockside revenue from gray trigger-fish from all trips
2011	284	87,042	$133,618	$15,720,012	$34,087,489	0.85%	0.39%
2012	244	64,004	$107,020	$10,211,000	$33,953,481	1.05%	0.32%
2013	212	54,130	$109,155	$14,182,642	$32,022,446	0.77%	0.34%
2014	228	33,931	$64,167	$12,177,262	$33,354,167	0.53%	0.19%
2015	218	39,041	$82,748	$13,737,440	$36,844,687	0.60%	0.22%
Average 2011-13	247	68,392	$116,597	$13,371,218	$33,353,217	0.89%	0.35%
Average 2014-15	223	36,486	$73,457	$12,957,351	$33,172,796	0.56%	0.21%

Source: NMFS SEFSC Online Economic Query System, June 20, 2016.

Table 3.4.2.13. Average dockside revenue from gray triggerfish landings per vessel and per trip and all species landed by vessels with gray triggerfish landings, 2011 through 2015.

Year	Average dockside revenue (2015 $)			
	From gray triggerfish landings		From all landings	
	Per Vessel	Per Trip	Per Vessel	Per Trip
2011	$470	$76	$120,026	$7,667
2012	$439	$100	$139,154	$8,581
2013	$515	$88	$151,049	$9,890
2014	$281	$55	$146,290	$8,801
2015	$380	$67	$169,012	$10,125
Average 2011-13	$475	$88	$136,743	$8,712
Average 2014-15	$331	$61	$157,651	$9,463

Source: NMFS SEFSC Online Economic Query System, June 20, 2016.

As shown in Figure 3.4.2.1, the majority of commercial landings of gray triggerfish occur in Florida. From 2011 through 2015, vessels that landed gray triggerfish in Florida represented from 79% to 83% of the vessels that landed gray triggerfish annually and represented from 79% to 84% of the annual trips with gray triggerfish landings. Landings in Florida account for an average of approximately 90% of average annual dockside revenue from gray triggerfish landings (Table 3.4.2.14).

Table 3.4.2.14. Florida vessels, trips, landings and dockside revenues from/with gray triggerfish and their percentages of totals, 2011 through 2015.

Year	Vessels		Trips		Landings (lbs gw)		Dockside Revenue (2015 $)	
	FL	Percent FL	FL	Percent FL	FL	Percent FL	FL	Percent FL
2011	224	78.87%	1,392	79.63%	72,571	83.37%	$115,393	86.36%
2012	191	78.28%	844	79.17%	55,118	86.12%	$95,785	89.50%
2013	170	80.19%	1,023	82.90%	48,583	89.75%	$101,015	92.54%
2014	190	83.33%	992	84.35%	30,537	90.00%	$59,279	92.38%
2015	173	79.36%	983	79.40%	33,443	85.66%	$72,799	87.98%
Average 2011-13	195	79.11%	1,086	80.57%	58,757	86.41%	$104,064	89.47%
Average 2014-15	182	81.35%	988	81.88%	31,990	87.83%	$66,039	90.18%

Source: NMFS SEFSC Online Economic Query System, June 20, 2016.

From 2011 through 2013, an average of over 99% of Florida's annual landings of gray triggerfish was of fish taken from federal waters; however, in 2014, after the federal trip limit was established, that percentage fell to approximately 48% (Table 3.4.2.15).

Table 3.4.2.15. Florida commercial landings (lbs ww) of gray triggerfish, 2011 through 2014.

Year	Florida commercial landings (lbs ww) by jurisdiction			
	Federal	State	Total	Percent Federal
2011	88,599	293	88,892	99.70%
2012	63,517	228	63,745	99.60%
2013	55,871	312	56,183	99.40%
2014	34,630	37,685	72,315	47.90%
Ave. 2011-13	69,329	278	69,607	99.57%

Source: NMFS SERO ACL December 2015.

During the 5-year period from 2011 through 2015, the minimum size limit of gray triggerfish was 14- inches FL in the Gulf EEZ. The federal minimum size limit is the same in four of the five state waters of the Gulf. Texas, however, has had a 16-inches TL minimum size limit, although that is approximately equivalent to the federal size limit.

In the effects analysis for Gulf Reef Fish Amendment 37, the average weight of a commercially harvested gray triggerfish was estimated to be 4.1 lbs ww (3.94 lbs gw), which was based on 1,808 observer samples from 2008 through 2011. More recently, the average weight of a commercially harvested gray triggerfish is estimated to be 4.278 lbs ww (4.11 lbs gw), which is based on 2014 and 2015 TIP data (dockside intercepts of commercial fishermen). At those average weights, 12 gray triggerfish would collectively weight from 49 to 51 lbs ww.

From 2011 through 2013, approximately 69% (925) of the 1,349 average annual total trips that landed gray triggerfish landed no more than 50 lbs gw of the species per trip. Approximately 85% (1,029) of 1,207 average annual total trips from 2014 through 2015 landed up to 50 lbs gw per trip (Table 3.4.2.16). During the three years prior to 2014, an annual average 87 trips landed more than 150 lbs per trip, while from 2014 through 2015, an average of only nine trips landed more than that.

Table 3.4.2.16. Number of trips with gray triggerfish landings by pounds landed, 2011 - 2015.

Year	Number of trips by lbs gw of gray triggerfish					
	1 to 50	51 to 100	101 to 150	151 to 500	501 and more	Total
2011	1,178	329	123	115	3	1,748
2012	671	211	87	91	6	1,066
2013	925	216	48	42	3	1,234
2014	1,020	144	4	5	3	1,176
2015	1,037	184	9	4	4	1,238
Average 2011-13	925	252	86	83	4	1,349
Average 2014-15	1,029	164	7	5	4	1,207

Source: NMFS SEFSC Online Economic Query System, June 20, 2016.

Approximately 57% (141) of the average 247 vessels from 2011 through 2013 and approximately 70% (156) of the 223 average vessels from 2014 through 2015 landed no more than 50 lbs gw of gray triggerfish per trip during those time periods (Table 3.4.2.17). There was an increase in the average annual number of vessels that landed from 51 to 100 lbs of gray triggerfish per trip from the first time period (42) to the second (57).

Table 3.4.2.17. Numbers of vessels with gray triggerfish landings by maximum pounds landed (per trip) by that vessel, 2011 - 2015.

Year	Number of vessels by lbs gw of gray triggerfish					
	1 to 50	51 to 100	101 to 150	151 to 500	501 or more	Total
2011	163	43	31	44	3	284
2012	139	32	28	40	5	244
2013	120	50	17	22	3	212
2014	159	59	4	D	D	228
2015	152	55	5	D	D	218
Average 2011-13	141	42	25	35	4	247
Average 2014-15	156	57	5	D	D	223

D: Not disclosed. Source: NMFS SEFSC Online Economic Query System, June 20, 2016.

A closer inspection of the average numbers of trips and vessels with landings of gray triggerfish less than 50 lbs ww shows 78% of the average annual trips and 62% of the vessels landed no more than 45 lbs ww of gray triggerfish (Table 3.4.2.18). Approximately 82% of the trips and 67% of the vessels landed no more than 49 lbs ww per trip.

Table 3.4.2.18. Number of trips with gray triggerfish landings by pounds landed, 2011 - 2015.

Year	Trips (by lbs ww)						Percent of Trips				
	Total	**Up to 45**	**46 - 49**	**50 - 60**	**61 - 75**	**76 +**	**Up to 45**	**46 - 49**	**50 - 60**	**61 - 75**	**76 +**
2014	1,176	937	55	85	62	37	79.7%	4.7%	7.2%	5.3%	3.1%
2015	1,238	946	49	102	80	61	76.4%	4.0%	8.2%	6.5%	4.9%
Average	1,207	942	52	94	71	49	78.0%	4.3%	7.7%	5.9%	4.1%
Year	**Vessels (by lbs ww)**						**Percent of Vessels**				
	Total	**Up to 45**	**46 - 49**	**50 - 60**	**61 - 75**	**76 +**	**Up to 45**	**46 - 49**	**50 - 60**	**61 - 75**	**76 +**
2014	228	141	13	21	28	25	61.8%	5.7%	9.2%	12.3%	11.0%
2015	218	136	8	27	20	26	62.4%	3.7%	12.4%	9.2%	11.9%
Average	223	139	11	24	24	26	62.1%	4.7%	10.8%	10.8%	11.4%

Source: NMFS SEFSC Online Economic Query System, June 20, 2016.

3.5 Description of the Social Environment

A description of the social environment is included in the Generic ACL/AM Amendment (GMFMC 2011a) and Reef Fish Amendment 30A (GMFMC 2008). These documents are incorporated herein by reference. The description focuses on available geographic and demographic data to identify communities with a strong relationship to fishing for species in the reef fish complex in the Generic ACL/AM Amendment (GMFMC 2011a) and gray triggerfish more specifically in Amendment 30A (GMFMC 2008). A strong relationship is defined as having significant landings and revenue for managed species. Thus, impacts from regulatory change are more likely to occur in places with greater landings of these species. For gray triggerfish, Panama City and Destin, Florida have the highest commercial landings of all Gulf communities, followed by Pensacola, Florida with substantially fewer landings (see Fig. 3.5.1). For the recreational sector, there are many communities spread throughout the Gulf of Mexico, from Florida to Texas that serve as a launching point for trips that target reef fish species including gray triggerfish, but the majority of the landings are in Alabama and the Florida Panhandle.

Gray triggerfish are part of a multi-species fishing strategy rather than a directed fishery. Most commercially caught gray triggerfish are landed by vertical line alongside other species (GMFMC 2008). Furthermore, some commercial fishermen fish throughout the Gulf and unload in various locations, making it difficult to identify communities that would be most affected by these regulations. Dealers who buy gray triggerfish take in multiple reef fish species so they are not totally dependent on gray triggerfish landings. Depending on what percentage gray triggerfish constitutes their total landings, the dealers may or may not be heavily impacted by any reduction in landings of gray triggerfish. It is thus difficult to isolate potential impacts on communities arising from the actions in this amendment. However, communities may be affected by changes in fishing regulations generally, and by changes to fishing for gray triggerfish, specifically, so social impacts would still be expected.

Commercial Fishing

Gulf commercial dealer landings of gray triggerfish have averaged ~71,700 lbs per year from 2010 through 2014 (NMFS ALS 2014 (with dealer address)). Gray triggerfish is harvested with bandit reel or by hook-and-line.

A regional quotient (RQ) measure was used to identify commercial engagement and reliance on gray triggerfish. The RQ measures the relative importance of a given species across all communities in the region and represents the proportional distribution of commercial landings of a particular species. This proportional measure does not provide the number of pounds or the value of the catch; data that might be confidential at the community level for many places. The RQ is calculated by dividing the total pounds (or value) of a species landed in a given community, by the total pounds (or value) for that species for all communities in the region. The measure is a way to quantify the importance of gray triggerfish to communities around the Gulf coast and suggest where impacts from management actions are more likely to be experienced. The data used for the RQ measure were assembled from the accumulated landings system (ALS), which includes commercial landings of all species from both state and federal waters and is based on dealers' reports. These data were converted to provide landings by (dealer's) address.

As noted, commercial fishing for triggerfish is prosecuted primarily in Florida. Based on the RQ measure, the top 15 communities with the highest landings of gray triggerfish in 2014 are identified in Figure 3.5.1. Of the top five communities, four are located in the Florida Panhandle (Panama City, Destin, Pensacola and Apalachicola).

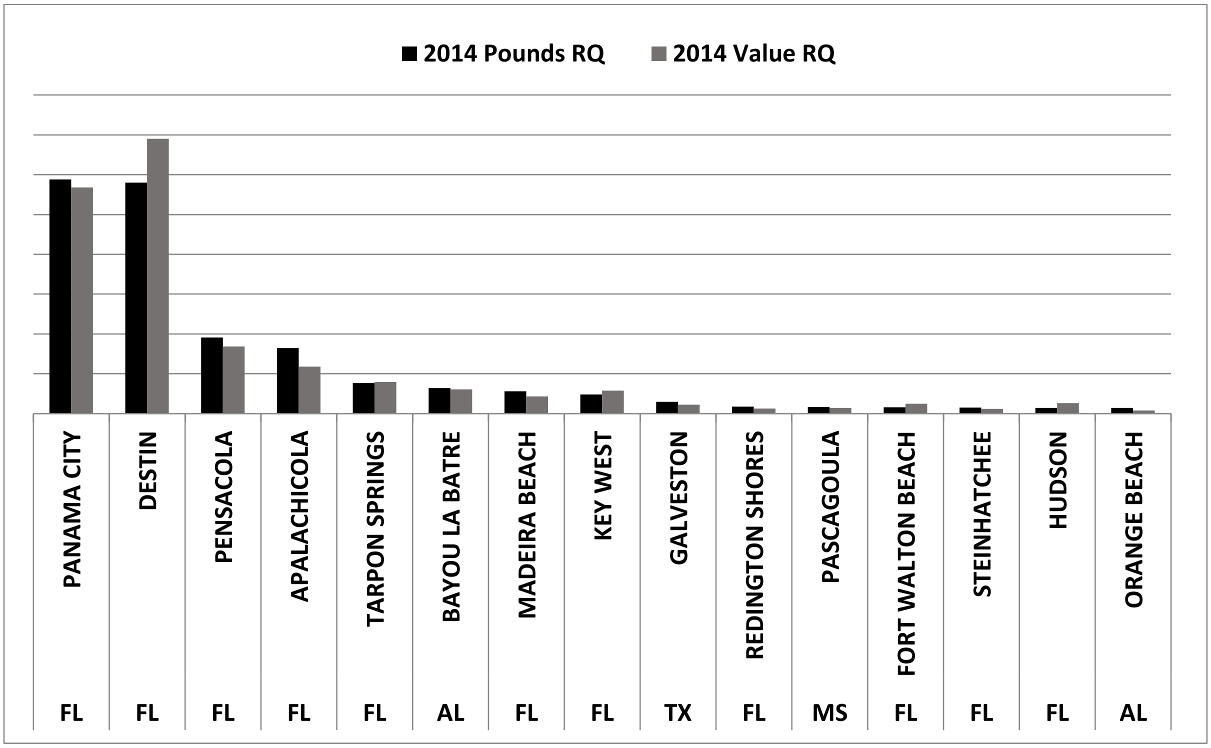

Figure 3.5.1. Top 15 commercial communities with the greatest landings of gray triggerfish in 2014. Source: NMFS ALS 2014 (with dealer address).

A community's proportion of total landings is not static and changes over time. Nevertheless, in recent years Florida's Panhandle communities have ranked highest for commercial gray triggerfish landings with their 5 year average depicted in Figure 3.5.2. In 2010, four of the top five communities with the greatest landings were Panama City, Destin, Apalachicola, and Pensacola, Florida and while in 2012, the top four were Panama City, Destin, Apalachicola, Florida; and Leeville, Louisiana.

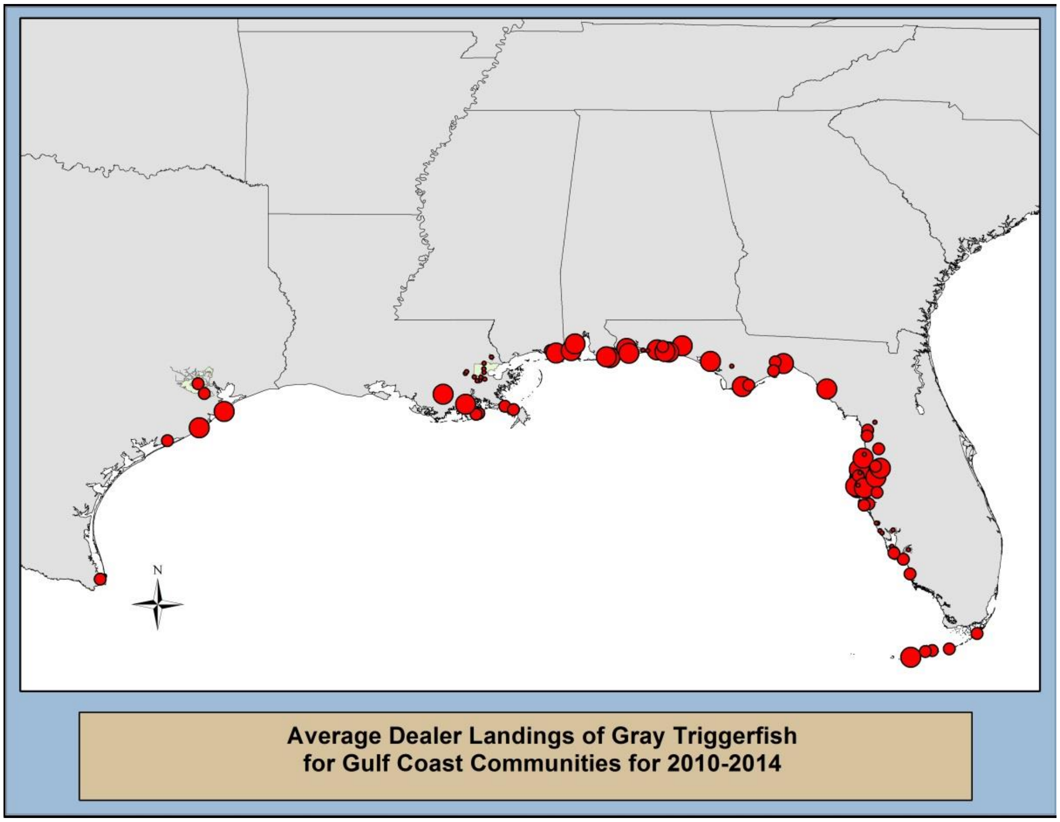

Figure 3.5.2. 5-year average dealer landings of gray triggerfish for the years 2010-2014 by community. Source: NMFS ALS 2014 (with dealer address).

Recreational Fishing

Gray triggerfish landings for the recreational sector are not available by community. This makes it difficult to identify communities as dependent or reliant on recreational fishing for gray triggerfish. Furthermore, gray triggerfish is generally part of a multi-species fishery making it difficult to isolate recreational dependence or reliance on gray triggerfish separately from other reef fish species.

While there are no landings data at the community level for the recreational sector, Table 3.5.1 provides a listing of the top 25 communities based upon their average rank of charter/headboat permits for reef fish and relevance to this fishery based upon where the majority of commercial landings are observed. Their “average rank” is based upon their rank in terms of number of reef fish charter permits, plus their rank based upon the number of permits divided by the community population, then averaged. This is a crude measure of the reliance upon recreational reef fish fishing, is general in nature, and not specific to gray triggerfish. Ideally, additional variables quantifying the importance of recreational fishing to a community would be included (such as the amount of recreational landings in a community by species, availability of recreational fishing related businesses and infrastructure, etc.); however, these data are not available at this time.

Table 3.5.1. Average rank of community based upon sum of rank of number of reef fish charter permits and rank of reef fish charter permits divided by population.

Community	Average rank
Orange Beach, AL	3
Destin, FL	8
Islamorada, FL	9.5
Freeport, TX	10
Grand Isle, LA	10.5
Steinhatchee, FL	14.5
Dauphin Island, AL	16
Biloxi, MS	17
Panama City Beach, FL	18.5
Panama City, FL	23
Apalachicola, FL	23
Mexico Beach, FL	23.5
Port St. Joe, FL	24
Madeira Beach, FL	24.5
South Padre Island, TX	25.5
Marco Island, FL	27
Fort Myers Beach, FL	27
St. Marks, FL	28.5
Carrabelle, FL	30
Chauvin, LA	30.5
Galveston, TX	31
Crystal River, FL	31
Panacea, FL	35.5
Pensacola, FL	37

Source: SERO Permits 2014.

At this time it is not possible to examine the intensity of recreational fishing activity at the community level for a specific species, i.e., gray triggerfish. However, it is likely that those communities that have a higher rank in terms of charter for-hire activity and have a dynamic commercial fishery for gray triggerfish will likely have an engagement in recreational fishing for gray triggerfish. Nevertheless, it cannot be assumed that the proportion of commercial gray triggerfish landings among other species in a community (i.e., Figure 3.5.2.) would be similar to its proportion among recreational landings within the same community because of sector differences in fishing practices and preferences. Nevertheless, an examination of where commercial and recreational landings are the greatest, and where these locations overlap could suggest areas of greater dependence and reliance on the gray triggerfish resource, and thus, where effects would most likely to be experienced.

3.5.1 Environmental Justice Considerations

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

In order to assess whether a community may be experiencing EJ issues, a suite of indices created to examine the social vulnerability of coastal communities (Jepson and Colburn 2013; Jacob et al. 2013) is presented in Figures 3.5.1.1 and 3.5.1.2. The three indices are poverty, population composition, and personal disruptions. The variables included in each of these indices have been identified through the literature as being important components that contribute to a community's vulnerability. Indicators such as increased poverty rates for different groups, more single female-headed households and children under the age of 5, disruptions such as higher separation rates, higher crime rates, and unemployment all are signs of vulnerable populations. These indicators are closely aligned to previously used measures of EJ which used thresholds for the number of minorities and those in poverty, but are more comprehensive in their assessment. Again, for those communities that exceed the thresholds it would be expected that they would exhibit vulnerabilities to sudden changes or social disruption that might accrue from regulatory change. It should be noted that some communities may not appear in these figures as there are no census data available to create the indices.

Of the Florida communities in Figure 3.5.1.1, only Carrabelle, Panacea, Apalachicola and Panama City exceed at least one threshold for at least two indices. Carrabelle and Panacea exceed both thresholds for personal disruption and poverty. The communities of Bayou La Batre, Alabama and Freeport, Texas seem to exhibit the greatest vulnerabilities with all three indices above or near above both thresholds in Figure 3.5.1.2. The communities of Biloxi and Pascagoula, Mississippi; Chauvin, Louisiana; and Galveston, Texas are above the ½ standard deviation threshold for both personal disruption and poverty. Those communities with the highest vulnerabilities would be expected to have a more difficult time adapting to any negative social impacts as a result of actions within this amendment. This is not to say that fishermen in these communities will be impacted negatively and as a result will have difficulties. These results posit the possibility that challenges may exist given the overall vulnerabilities that are present within the community.

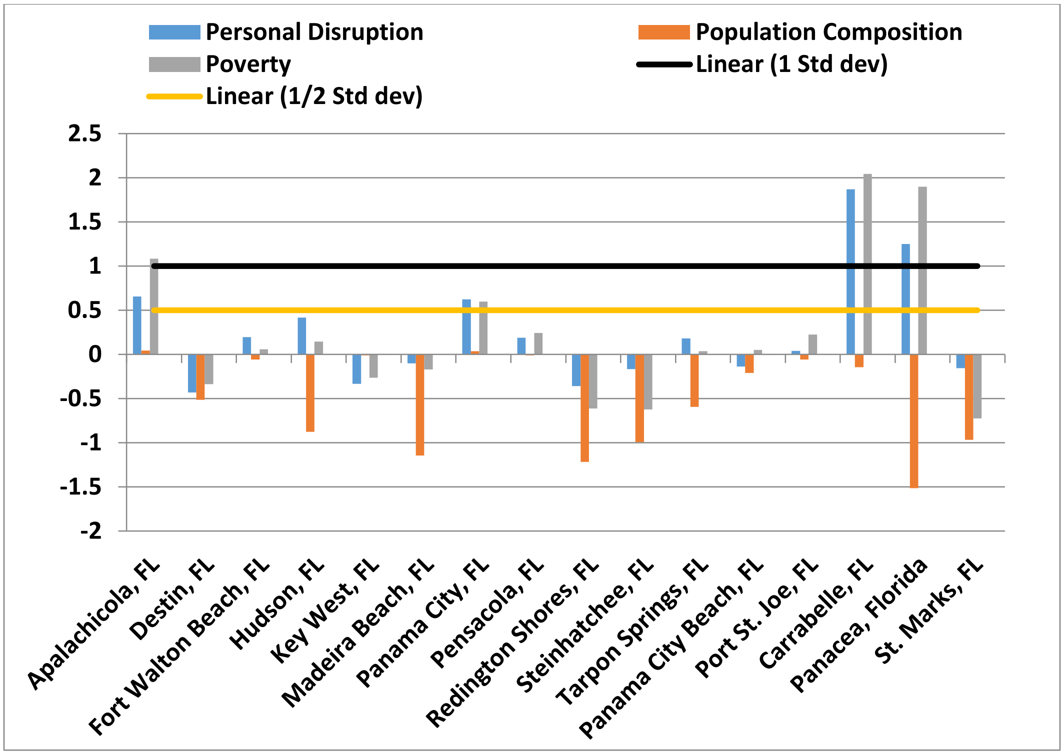

Figure 3.5.1.1. Social Vulnerability indices for Gulf gray triggerfish fishing communities in the Florida. Source: SERO Social Indicator Database 2016.

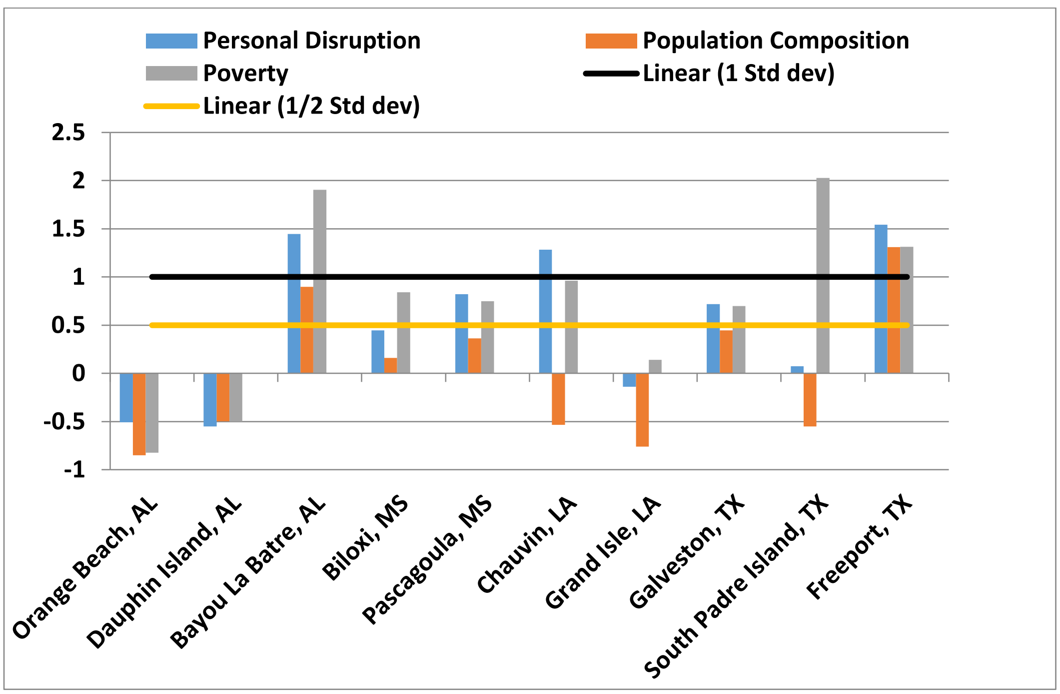

Figure 3.5.1.2. Social Vulnerability indices for Gulf gray triggerfish fishing communities in Alabama, Mississippi, Louisiana and Texas. Source: SERO Social Indicator Database 2016.

Information on race, ethnicity, and income status for groups at the different participation levels (private anglers, for-hire captains, crew, and customers, and employees of recreational fishing businesses, etc.) is not available, because these types of data are not collected by NMFS or other agencies. Recreational and commercial fishermen and associated businesses and communities along the coast may be affected by the actions in this amendment. However, as addressed in the social effects analysis for each action (Chapter 4), the effects are generally expected to be indirect and neutral. Further, the actions in this amendment would not affect individuals 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 are no known claims for customary usage or subsistence consumption of gray triggerfish by any population including tribes or indigenous groups.

3.6 Description of the Administrative Environment

3.6.1 Federal Fishery Management

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

Responsibility for federal fishery management decision-making is divided between 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 E. In most cases, the Secretary has delegated this authority to NMFS.

The Gulf of Mexico Fishery Management Council is responsible for fishery resources in federal waters of the Gulf of Mexico These waters extend to 200 nautical miles (370 kilometers (km)) offshore from the seaward boundaries of the states of Alabama, Florida, Louisiana, Mississippi, and Texas, as those boundaries have been defined by law. The length of the Gulf of Mexico coastline is approximately 1,631 miles (2,625 km). Florida has the longest coastline of 770 miles (1,239 km) along its Gulf coast, followed by Louisiana (397 miles or 639 km), Texas (361 miles or 581 km), Alabama (53 miles or 85 km), and Mississippi (44 miles or 71 km).

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 publically open Council meetings, with some exceptions for discussing internal administrative matters. 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 NMFS’s Office of Law Enforcement, the U.S. Coast Guard, and various state authorities. To better coordinate enforcement activities, federal and state enforcement agencies have developed cooperative agreements to enforce the Magnuson-Stevens Act. These activities are being coordinated by the Council’s Law Enforcement Advisory Panel and the Gulf States Marine Fisheries Commission’s Law Enforcement Committee have developed a two year “Gulf Cooperative Law Enforcement Strategic Plan – 2011 - 2012.”

3.6.2 State Fishery Management

The purpose of state representation at the Council level is to ensure state participation in federal fishery management decision-making and to promote the development of compatible regulations in state and federal waters. The state governments of Texas, Louisiana, Mississippi, Alabama, and Florida have the authority to manage their respective state fisheries. Each of the five Gulf of Mexico 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 in Amendment 22 (GMFMC 2004b).

CHAPTER 4. ENVIRONMENTAL CONSEQUENCES

4.1 Action 1 – Establish a Rebuilding Time Period

4.1.1 Direct and Indirect Effects on the Physical Environment

Impacts of these alternatives on the physical environment would depend on the resulting reduction in the level of fishing effort by the commercial and recreational sectors. The commercial sector is currently allocated 21% of the stock annual catch limit (ACL) and the recreational sector is currently allocated 79% of the stock ACL. Using gray triggerfish landings history from 2010 through 2014, commercial longlines landed 1.3% of the gray triggerfish and vertical lines (i.e., electric reel, bandit rig, hook-and-line, and trolling) landed 92% of the gray triggerfish (Figure 3.1.3). The remaining fish were landed with fish traps that are no longer allowed in the reef fish fishery. The recreational sector (headboat, charter, and private modes) primarily uses vertical gear (hook-and-line) to fish for gray triggerfish (99%; Figure 3.1.4). Gray triggerfish is also harvested by recreational fishermen using spearguns (1%).

Longline gear is deployed over hard bottom habitats using weights to keep the gear in direct contact with the bottom. A low percentage of commercial gray triggerfish (1.3%) from 2010 through 2014 are landed with bottom longline gear. The potential for this gear to adversely impact the bottom depends on the type of habitat it is set on, the presence or absence of currents and the behavior of fish after being hooked. In addition, this gear, upon retrieval, can abrade, snag, and dislodge smaller rocks, corals, and sessile invertebrates (Hamilton 2000; Barnette 2001). Direct underwater observations of longline gear in the Pacific halibut fishery by High (1998) noted that the gear could sweep across the bottom. A study that directly observed deployed longline gear (Atlantic tilefish fishery) found no evidence that the gear shifted significantly, even when set in currents. Lack of gear shifting even in strong currents was attributed to setting anchors at either end of the longline to prevent movement (Grimes et al. 1982), which is the standard in the longline component of the commercial sector of the reef fish fishery. Based on the direct observations, it is logical to assume that bottom longline gear would have a minor impact on sandy or muddy habitat areas. However, due to the vertical relief that hard bottom and coral reef habitats provide, it would be expected that bottom longline gear may become entangled, resulting in potential negative effects to habitat (Barnette 2001).

Concentrations of many managed reef fish species are higher on hard bottom areas than on sand or mud bottoms, thus vertical line gear fishing generally occurs over hard bottom areas (GMFMC 2004a). Vertical lines include multi-hook lines known as bandit gear, handlines, and rod-and-reels. Vertical line gear is less likely to contact the bottom than longlines, but still has the potential to snag and entangle bottom structures and cause attached organisms such as soft corals and sponges to tear off or be abraded (Barnette 2001). Vertical lines (i.e., electric reel, bandit rig, hook-and-line, and trolling) landed 90% of the commercial gray triggerfish from 2010 through 2014. In using bandit gear, a weighted line is lowered to the bottom, and then the weighted line is raised slightly off the bottom (Siebenaler and Brady 1952). The gear is in direct contact with the bottom for only a short period of time. Barnette (2001) suggests that physical impacts may include entanglement and minor degradation of benthic species from line abrasion and the use of weights (sinkers).

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

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

The effects on the physical environment from the different rebuilding plan alternatives are based on annual catch limits and annual catch targets and the associated fishing effort. This effort is related to the level of landings allowed in a rebuilding plan - the greater the landings, the greater the fishing effort. **Alternative 1**, no action would allow the rebuilding plan to expire at the end of 2017 and would be expected to cause gray triggerfish fishing to affect the physical environment at the current levels. **Alternative 2**, which would set the fishing mortality rate (F) to zero, would allow no harvest, thus the effects from gray triggerfish fishing would be the least. **Alternative 3,** the 8-year rebuilding plan is expected to rebuild the stock in less time than **Preferred Alternative 4** (9-year) and **Alternative 5** (10-year) rebuilding plan and consequently would be more beneficial to the physical environment by reducing effort and catch than **Alternatives 1** and **5,** and **Preferred Alternative 4** through the reduction in fishing effort and landings. The rebuilding time frame of **Preferred Alternative 4** (9 years) is expected to require three years longer to rebuild the stock than closing the harvest of gray triggerfish entirely (**Alternative 2**, 6 years), meaning that **Preferred Alternative 4** should result in fewer short-term impacts than a complete closure (**Alternative 2**). Short-term adverse impacts from **Preferred Alternative 4** would be greater than **Alternative 5**, but enable long-term benefits of a rebuilt stock to be realized sooner.

4.1.2 Direct and Indirect Effects on the Biological Environment

Gray triggerfish management actions that affect the biological/ecological environment mostly relate to the impacts of fishing on a species' population size, life history, and the role of the species within its habitat. Removal of fish from the population through fishing reduces the overall population size. Fishing gears have different selectivity patterns, which refer to a fishing methods' ability to target and capture organisms by size and species. For other reef fish 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. However, due to the hardiness of gray triggerfish, as discussed in Sections 2.3 and 2.4, this is not a major concern.

The spawning potential ratio (SPR) has been widely used by U.S. fishery management councils to define overfishing of a fish stock (Goodyear 1993; Rosenberg et al. 1994). To estimate SPR, life history characteristics (e.g. growth and reproduction) are required and are generally assumed constant among years (Gabriel et al., 1989). However, these parameters, particularly maturity schedules, are not static. They can change in response to fishing pressure, predator and prey abundance, stock composition, and other biotic and abiotic environmental factors (Wootton, 1990). Fishing can affect life history characteristics of reef fish such as growth and maturation rates. Although these changes have not been observed for gray triggerfish in the Gulf, it has been noted in other reef fish species such as vermilion snapper (Zhao et al. 1997; Hood and Johnson 1999).

Changes in the target species stock abundance from fishing (e.g., changing fishing selectivity's) are likely to have ecological effects. However, the relationships among species in marine ecosystems are complex and poorly understood. As a result, the nature and magnitude of ecological effects are difficult to predict with any accuracy. However, it is important to note that some species such as red snapper, greater amberjack, red grouper, and gag are being managed to improve their stock condition. Other species (e.g., vermilion snapper and deepwater grouper) are being managed to maintain a certain stock condition. Therefore, the effects of rebuilding the gray triggerfish could have an adverse effect on these stocks. These effects could come about through competition for food or space. For example, adult gray triggerfish feed primarily on benthic invertebrates (Frazer et al. 1991; Kurz 1995; Pattengill et al. 1997). Less of these prey items may be available to other reef fish species if the gray triggerfish stock is allowed to increase.

The reef fish fishery can affect species outside the reef fish complex. Specifically, sea turtles have been observed to be directly affected by the use of bottom longlines in the Gulf. These effects occur when sea turtles interact with fishing gear and result in an incidental capture injury or mortality and are summarized in Reef Fish Amendment 31 (GMFMC 2009). A variety of factors may affect the likelihood and frequency of sea turtles being caught in reef fish bottom longline gear. The spatial overlap between fishing effort and sea turtles is one such factor. The more abundant sea turtles are in a given area where the fishing gear is set, the greater probability a sea turtle would be incidentally caught on the gear. However, for sea turtles and other projected species, the most recent biological opinion for the Fishery Management Plan (FMP) for Reef Fish Resources of the Gulf concluded authorization of the Gulf reef fish fishery managed in the reef fish plan is not likely to jeopardize the continued existence of sea turtles, smalltooth sawfish, or Acropora species (NMFS 2009). The NMFS'2016 List of Fisheries (81 FR 20550) considers vertical line gear and longline gear, the dominant gear used in the Gulf of Mexico reef fish fishery, as Category III gears. This classification indicates the annual mortality and serious injury of a marine mammal stock resulting from any fishery is less than or equal to 1% of the maximum number of animals, not including natural mortalities, that may be removed from a marine mammal stock while allowing that stock to reach or maintain its optimum sustainable population.

The setting of a biomass target and date has no direct impact on the biological/ecological environment. However, establishing a target biomass level may result in management actions expected to rebuild the gray triggerfish stock from its present level. This would indirectly affect the gray triggerfish stock by rebuilding it to a level where it can support higher removals without being overfished. In addition, it can better resist periodic environmental impacts.

Given that the more quickly a stock is rebuilt provides the least adverse biological/ecological effects to the gray triggerfish stock (based on the reasons discussed above), **Alternative 2**, which would be expected to rebuild the stock in 6 years is expected to provide the least adverse effect to the gray triggerfish biological/ecological environment. However, the more quickly a stock size increases, the more adverse the effects on other fish species through competition for food or space, or to prey species through predation. In terms of effects, **Alternative 2** would be followed by **Alternative 3**, which would be expected to rebuild the stock in 8 years, and then by **Preferred Alternative 4**, which would be expected to rebuild the stock in 9 years, and then by **Alternative 5**, which would be expected to rebuild the stock in 10 years. **Alternative 1**, the no-action alternative, would continue a rebuilding plan that is not projected to allow the stock to recover in 10 years. Based on Southeast Data, Assessment, and Review (SEDAR 43 2015) the stock is still overfished but no longer undergoing overfishing. Therefore, **Alternative 1** would be expected to have the most adverse effect on the gray triggerfish stock, but the least adverse effect on other fish and prey species. The rebuilding time frame of **Preferred Alternative 4** (9 years) is expected to require three years longer to rebuild the stock than closing the harvest of gray triggerfish entirely (**Alternative 2**, 6 years), meaning that **Preferred Alternative 4** should result in fewer short-term impacts than a complete closure (**Alternative 2**). Short-term adverse impacts from **Preferred Alternative 4** would be greater than **Alternative 5**, but enable long-term benefits of a rebuilt stock to be realized sooner.

4.1.3 Direct and Indirect Effects on the Economic Environment

Alternative 1 would maintain the current 5-year rebuilding time period that began in 2012 and ends in 2017. As a result, **Alternative 1** would not be expected to affect harvests of gray triggerfish. Therefore, **Alternative 1** would not be expected to result in any direct economic effects. Since the most recent Standard Assessment (SEDAR 43 2015) on gray triggerfish indicated the stock was not rebuilding on schedule, **Alternative 1** could be expected to result in some negative direct economic effects in the long-run, as additional time for rebuilding after 2017 would likely be necessary.

Alternatives 2, **3**, **4**, and **5** would establish rebuilding time periods of 6, 8, 9, and 10 years, respectively. **Alternative 2**'s time period is based on a constant fishing mortality rate equal to zero, and since harvest of gray triggerfish would need to be zero, **Alternative 2** would have the greatest negative direct economic effects in the short-run, compared to the other Alternatives. Since some harvest could occur with **Alternatives 3-5**, they should have a positive direct economic effect in comparison to **Alternative 2**. In comparison with **Alternative 1**, **Alternatives 3**, **4**, and **5** could have positive or negative direct economic effects, depending on the relative harvest levels allowed in their respective rebuilding time periods. If harvest levels are less than those in **Alternative 1**, **Alternatives 3-5** would have a negative direct economic effect; likewise, if harvest levels are greater than those in **Alternative 1**, **Alternatives 3-5** would have a positive direct economic effect. Due to the necessary constraints on harvest to ensure the rebuilding time periods, **Alternative 5** would have the least negative direct economic effect, followed by **Preferred Alternative 4**, and then **Alternative 3**. Of note, shorter rebuilding time periods result in positive long-term economic effects from a rebuilt gray triggerfish stock occurring sooner. The rebuilding time periods proposed in **Alternatives 1-5** are compared in greater detail in Section 4.2.3 with the proposed ACLs and ACTs.

4.1.4 Direct and Indirect Effects on the Social Environment

As with previous rebuilding plans for gray triggerfish (GMFMC 2013), direct impacts are not expected from modifying the rebuilding plan. Rather, it is the indirect effects related to the selected alternatives in subsequent actions taken to meet the timeline of the adopted rebuilding plan that will determine the effects. However, as also noted in previous amendments (GMFMC 2013), given that most fishermen do not target gray triggerfish but rather, catch them alongside other reef fish species, the indirect adverse effects to the social environment are expected to be relatively minor. For those fishermen who do target gray triggerfish, negative impacts will be related to any reduced harvest from the new ACLs or ACTs that are selected under the status quo rebuilding plan to meet the objectives (**Alternative 1**, No Action). A shorter rebuilding period may involve greater adverse short-term impacts due to greater restrictions on fishing behavior to achieve required reductions in removals under the shorter timeframes. But, these restrictions may be eased and positive long-term impacts could be realized sooner.

A longer rebuilding period may involve fewer disruptions to fishing activity in the short term, but it will take longer for the long-term benefits of a rebuilt stock to be realized. Any impacts from **Alternative 1,** with no change to the existing rebuilding plan, would likely occur from continued overfishing. It is likely that there would continue to be overharvesting and subsequent accountability measures (AMs) to account for exceeding existing harvest thresholds. Overfishing is likely to continue and a new rebuilding plan would still be necessary. Therefore, impacts from **Alternative 1** would be the continued short-term impacts from exceeding harvest thresholds with continued early closures and overage adjustments as AMs for the recreational sector and the long-term impact of a declining stock. While **Alternative 2** should rebuild the stock in the shortest period of time (6 years), it would effectively reduce the allowable harvest to zero. This is the most restrictive option and could incur the greatest adverse impacts to fishing activity in the short term for both sectors. **Alternative 5** provides for the longest rebuilding timeframe (10 years), and could likely result in the fewest short-term impacts. However, the long-term benefits of a rebuilt stock would take the longest under this alternative. The rebuilding time frame of **Preferred Alternative 4** (9 years) is expected to require three years longer to rebuild the stock than closing the harvest of gray triggerfish entirely (**Alternative 2**, 6 years), meaning that **Preferred Alternative 4** should result in fewer short-term impacts than a complete closure (**Alternative 2**). Short-term adverse impacts from **Preferred Alternative 4** would be greater than **Alternative 5**, but enable long-term benefits of a rebuilt stock to be realized sooner.

4.1.5 Direct and Indirect Effects on the Administrative Environment

The setting of a rebuilding target for biomass within a specific time frame is expected to have administrative effects. The act of setting a target, whether it be 6, 8, 9 or 10 years, is a one-time event, and thus **Alternatives 2**, **3, 5** and **Preferred Alternative 4** have equivalent though minor direct administrative impacts. **Alternative 1** (No Action) is not compliant with the Magnuson

Stevens Fishery Conservation and Management Act requirement to rebuild the stock. Therefore, it will trigger additional administrative actions by the Council and NMFS to bring gray triggerfish management into compliance. Thus, **Alternative 1** has a greater negative effect on the administrative environment than **Alternatives 2**, **3, 5,** and **Preferred Alternative 4**, albeit minor.

Indirect effects include more restrictive management measures, which may require increased enforcement. From this aspect, **Alternative 2** is the most restrictive rebuilding time period and will require the most active enforcement. **Alternative 1**, and **Alternatives 3**, **5,** and **Preferred Alternative 5** would likely require less restrictive rebuilding actions and enforcement. Therefore, indirect effects on the enforcement, from greatest to least, result progressively from **Alternative 2**, **Alternative 1**, **Alternative 3, Preferred Alternative 4,** and **Alternative 5**. However, given that enforcement activities address the reef fish fishery in general, most enforcement activities would be covered in day-to-day operations, thus any adverse effects on enforcement from this action would be expected to be minor.

4.2 Action 2 - Establish Annual Catch Limits and Annual Catch Targets

4.2.1 Direct and Indirect Effects on the Physical Environment

Setting ACLs and ACTs should not directly affect the physical environment because it is an administrative action. However, setting the ACLs and ACTs can indirectly affect the physical environment by limiting the amount of fishing effort. As described in Section 4.1.1, the higher the effort, the more adverse the effects on the physical environment. Generally, as fishing effort goes up, so do the landings. Therefore, landings were used as a proxy for fishing effort and are presented in Table 4.2.1.1. It should be noted that the same caveats described in Section 4.1.1 regarding stock rebuilding and the non-targeted nature of gray triggerfish fishing also applies here and suggest any indirect effects from this action would be expected to be minor.

Alternative 3, **Option c**, regardless of whether the ACLs or ACTs are used to limit the harvest, would allow the highest level of landings (551,667 and 542,399 lbs ww). Therefore, **Alternative 3, Option c,** would be expected to have the greatest adverse effect on the physical environment. On the other hand, **Alternative 2** would not allow any harvest of gray triggerfish and so should have the least adverse effects on the physical environment. Harvest levels allowed by **Alternative 3**, **Option a**, would be expected to be less that of **Alternative 1**. **Alternative 4, Option b,** would allow more harvest and be expected to result in more impacts than **Alternative 1**, but less impacts from hat of **Alternative 3, Option c**.

Table 4.2.1.1. Commercial, recreational, and combined annual catch limits (ACLs) and annual catch targets (ACTs) in pounds whole weight for Action 2, Alternatives 1-5.

Alternative	Commercial ACL	Recreational ACL	Sum of ACLs	Commercial ACT	Recreational ACT	Sum of ACTs
1	64,100	241.200	305,300	60,900	217,100	278,000
2	0	0	0	0	0	0
3	47,320	178,013	225,333	43,534	142,410	185,944
4	85,960	323,373	409,333	79,083	258,698	337,781
5	115,850	435,817	551,667	106,582	435,817	542,399

4.2.2 Direct and Indirect Effects on the Biological Environment

Setting ACLs and ACTs should not directly affect the biological environment because it is an administrative action. However, setting the ACLs and ACTs can indirectly affect the biological environment by limiting the amount of fishing effort. As described in Section 4.1.1, the higher the effort, the more adverse the effects on the biological environment. Generally, as fishing effort goes up, so do the landings. Therefore, landings were used as a proxy for fishing effort and are presented in Table 4.2.1.1. It should be noted that the same caveats described in Section 4.1.1 regarding stock rebuilding and the non-targeted nature of gray triggerfish fishing also applies here and suggest any indirect effects from this action would be expected to be minor.

Alternative 3, **Option c**, regardless of whether the ACLs or ACTs are used to limit the harvest, would allow the highest level of landings (551,667 and 542,399 lbs ww, respectively). Therefore, **Alternative 3, Option c,** would be expected to have the greatest adverse effect on the biological environment. On the other hand, **Alternative 2** would not allow any harvest of gray triggerfish and so should have the least adverse effects on the biological environment. Harvest levels allowed by **Alternative 3**, **Option a**, are less that of **Preferred Alternative 1**. **Alternative 4, Option b,** would allow more harvest than **Preferred Alternative 1**, but less that **Alternative 3, Option c**.

4.2.3 Direct and Indirect Effects on the Economic Environment

Preferred Alternative 1 would maintain the gray triggerfish sector ACLs and ACTs developed in Amendment 37 and that have been in effect since 2012. **Preferred Alternative 1** could be selected for three of the rebuilding time periods from Action 1: the status quo which ends in 2017; a 9 year period; a 10 year period. The 9 and 10 year periods from Action 1 are feasible rebuilding time periods since they require an ABC greater than that under Action 2, Alternative 1. If **Preferred Alternative 1** is selected with the status quo alternative in Action 1, no change to the status quo harvest would occur, and thus, **Preferred Alternative 1** would not be expected to result in any direct economic effects. Likewise, **Preferred Alternative 1** would not be expected to result in any direct economic effects if selected with the 9 or 10 year periods in Action 1.

Alternative 2 would reduce the gray triggerfish sector ACLs and ACTs to zero pounds, until a new stock assessment has been completed. **Alternative 2** could be selected for four of the rebuilding time periods from Action 1: a 6 year period; a 8 year period; a 9 year period; a 10 year period. In contrast to the status quo in Action 2, selection of a 6 year period would result in a reduction of the commercial ACT by 60,900 pounds and of the recreational ACT by 217,100 pounds (Table 4.2.3.2).

Table 4.2.3.3 builds upon the data in Table 4.2.3.2 (ACTs in pounds in contrast to the status quo) by displaying the commercial ex-vessel revenue and the recreational consumer surplus (CS) associated with that poundage change. For calculating the commercial ex-vessel revenue, $2.12 is used as the commercial dockside price per pound of gray triggerfish in 2015 (Table 3.4.2.12). Calculating the recreational consumer surplus requires transforming the poundage in Table 4.2.3.2 into an equivalent number of fish and multiplying that by the CS per gray triggerfish. An average weight of 2.49 pounds for recreational gray triggerfish landed in 2015 is used (Michael Larkin, personal communication, 11/8/16). Since the CS per gray triggerfish is not known, the proxy value used in this analysis is the CS value for an additional "snapper" (not specific to the species) kept on a trip, i.e. $12.38 (Haab et al. 2012; values updated to 2015 dollars). Thus, the direct economic effects from **Alternative 2** would be a loss in annual commercial revenue (in 2015 dollars) of $129,108 and a loss in annual recreational consumer surplus of $1,079,397 (Table 4.2.3.3). The recreational producer surplus is not examined here due to the assumption that the number of for-hire trips would not be affected since gray triggerfish is a component of the 20-reef fish aggregate bag limit.

Alternative 3 contains three options (**Options a-c**), which use the mean ABC projections to rebuild the stocks in 8, 9, and 10 years, respectively; these rebuilding periods also correspond with **Alternatives 3-5** in **Action 1**. **Option a** would set the ACLs and ACTs to correspond with the mean ABC projections for a rebuilding period of 8 years. As such, **Option a** would be paired with Action 1, Alternative 3, which has a rebuilding period of 8 years. **Option a** would result in a reduction in the commercial ACT by 17,366 pounds and a reduction in the recreational ACT by 74,690 pounds (Table 4.2.3.2). The direct economic effects from **Option a** would be a loss in annual commercial revenue (in 2015 dollars) of $36,816 and a loss in annual recreational consumer surplus of $371,350 (Table 4.2.3.3).

Option b would set the ACLs and ACTs to correspond with the mean ABC projections for a rebuilding period of 9 years; this option would be paired with Action 1, Preferred Alternative 4, which has a rebuilding period of 9 years. **Option b** would result in an increase in the commercial ACT by 18,183 pounds and an increase in the recreational ACT by 41,598 pounds (Table 4.2.3.2). The direct economic effects from **Option b** would be an increase in annual commercial revenue (in 2015 dollars) of $38,548 and an increase in annual recreational consumer surplus of $206,821 (Table 4.2.3.3).

Option c would set the ACLs and ACTs to correspond with the mean ABC projections for a rebuilding period of 10 years; this option would be paired with Action 1, Alternative 5, which has a rebuilding period of 10 years. **Option c** would result in an increase in the commercial ACT by 45,682 pounds and an increase in the recreational ACT by 131,553 pounds (Table 4.2.3.2). The direct economic effects from **Option c** would be an increase in annual commercial revenue (in 2015 dollars) of $96,846 and an increase in annual recreational consumer surplus of $654,067 (Table 4.2.3.3).

Table 4.2.3.1. Commercial and recreational ACTs (in pounds) under Action 2 and the rebuilding time periods under which they could occur in Action 1.

			Action 2				
			Alt 1	**Alt 2**	**Alt 3a**	**Alt 3b**	**Alt 3c**
Action 1	**Alt 1** (status quo)	Com	60,900				
		Rec	217,100				
	Alt 2 (6 yrs.)	Com		0			
		Rec		0			
	Alt 3 (8 yrs.)	Com		0	43,534		
		Rec		0	142,410		
	Alt 4 (9 yrs.)	Com	60,900	0		79,083	
		Rec	217,100	0		258,698	
	Alt 5 (10 yrs.)	Com	60,900	0			106,582
		Rec	217,100	0			348,653

Table 4.2.3.2. Differences between ACTs (in pounds) under **Alternatives 2-3** and the status quo ACT in Action 2.

			Action 2			
			Alt 2	**Alt 3a**	**Alt 3b**	**Alt 3c**
Action 1	**Alt 2** (6 yrs.)	Com	-60,900			
		Rec	-217,100			
	Alt 3 (8 yrs.)	Com	-60,900	-17,366		
		Rec	-217,100	-74,690		
	Alt 4 (9 yrs.)	Com	-60,900		18,183	
		Rec	-217,100		41,598	
	Alt 5 (10 yrs.)	Com	-60,900			45,682
		Rec	-217,100			131,553

Table 4.2.3.3. Changes in annual commercial ex-vessel revenue and recreational consumer surplus (CS) for **Alternatives 2-3** (in 2015 dollars).

			Action 2			
			Alt 2	**Alt 3a**	**Alt 3b**	**Alt 3c**
Action 1	**Alt 2** (6 yrs.)	Com	-$129,108			
		Rec	-$1,079,397			
	Alt 3 (8 yrs.)	Com	-$129,108	-$36,816		
		Rec	-217,100	-$371,350		
	Alt 4 (9 yrs.)	Com	-$129,108		$38,548	
		Rec	-217,100		$206,821	
	Alt 5 (10 yrs.)	Com	-$129,108			$96,846
		Rec	-217,100			$654,067

4.2.4 Direct and Indirect Effects on the Social Environment

Similar to Action 1, this action will impact the human environment relative to how much difference in the amount of gray triggerfish allowed to be harvested from the current amount of fish allowed (**Preferred Alternative 1**, No Action), as fishing behavior is affected. However, because gray triggerfish are generally not targeted by either sector, the adverse effects from this action would be expected to be relatively minor. The impacts from **Preferred Alternative 1** may have the fewest negative impacts as the ACLs and ACTs remain the same. As long as these current catch thresholds allow for rebuilding, there should be minimal negative effects, especially given the harvesting behavior discussed before. Although there have been in-season AMs closing the fishery in the past, the greatest impacts to fishing behavior would be expected from selection of **Alternative 2**, which would prohibit the harvest of gray triggerfish until a new assessment is completed. Although there may be minimal effects due to the nature of each sector's fishing behavior, the prohibition of landings can be inconvenient causing regulatory discards and/or species switching, which may increase fishing pressure on other reef fish species. The various sub-options under **Alternative 3** offer both increases and decreases in harvest thresholds. Under **Alternative 3**, **Option a**, there is a reduction in the ACL and ACT for both sectors. This option could have more negative effects than **Alternative 1**, but fewer than **Alternative 2** as fishing could continue but seasons would be shorter. Both **Alternative 3**, **Options b** and **c** offer increases in the ACL and ACT for both sectors and would likely have positive social effects in the short term; however, if current landings levels have continued to lead to overfishing then the long-term impacts of choosing higher ACLs and ACTs could likely lead to negative social effects in the future if rebuilding does not occur.

4.2.5 Direct and Indirect Effects on the Administrative Environment

The setting of a ACLs and ACTs is expected to have administrative effects. The act of setting the ACLs and ACTs, whether it be 6, 8, 9 or 10 years, is a one-time event, and thus **Alternatives 2**, **3, 4**, and **5** have equivalent though minor direct administrative impacts. **Preferred Alternative 1**, the no-action alternative, is not compliant with the Magnuson Stevens Fishery Conservation and Management Act (Magnuson-Stevens Act) requirement to end rebuild the stock. Therefore, it will trigger additional administrative actions by the Gulf Council and NMFS to bring gray triggerfish management into compliance. Thus, **Preferred Alternative 1** has a greater negative effect on the administrative environment than **Alternatives 2**, **3, 4**, and **5,** albeit minor.

Indirect effects include more restrictive management measures, which may require increased enforcement. From this aspect, **Alternative 2** has the most restrictive catch limits and targets and will require the most active enforcement. **Alternative 1**, **3**, **4**, and **5** would likely require less restrictive rebuilding actions and enforcement. Therefore, indirect effects on the enforcement, from greatest to least, result progressively from **Alternative 2**, **Preferred Alternative 1**, **Alternative 3, Alternative 4,** and **Alternative 5**. However, given that enforcement activities address the reef fish fishery in general, most enforcement activities would be covered in day-to-day operations, thus any adverse effects on enforcement from this action would be expected to be minor.

4.3 Action 3 - Recreational Management Measures

4.3.1 Action 3.1 - Modify the Recreational Fixed Closed Season

4.3.1.1 Direct and Indirect Effects on the Physical Environment

Information about gray triggerfish effects are based on landed catch including any information about other reef fish that are caught with gray triggerfish. The comparison of alternatives is based on the number of available fishing days. This comparison does not take into account fishing during the closed season or effort shifting outside of the closed season. The impacts to the physical environment may be underestimated in this analysis if effort shifting occurs outside the closed season; however, any effort shifting is expected to be minor because fishermen do not typically target gray triggerfish. Physical impacts to the environment could occur when gear such as weights, hooks, and anchors hit and damage the substrate and surrounding habitat. Thus, greater impacts can be expected from a longer fishing season, as there are more opportunities for gear interactions with the physical environment. On the other hand, it is not likely that many recreational fishermen target gray triggerfish exclusively on a fishing trip. Therefore, any beneficial effects to the physical environment from reducing the number of fishing days may be minimal as fishermen still take trips, but target other reef fish. Recreational fishers typically use rod-and-reel or spearguns to harvest gray triggerfish and often anchor their vessel over desired fishing locations; see Section 3.1 for a comparison of gear types and impacts to the physical environment.

Alternative 3 would result in a 153 day recreational fishing season and would be expected to result in less fishing days and thus less impacts to the physical environment than **Alternative 1** (163 days), **Alternative 2** (273 days), **Preferred Alternative 4** (273 days), and **Alternative 5** (245 days).

4.3.1.2 Direct and Indirect Effects on the Biological Environment

Results of the SEDAR 43 (2015) assessment determined gray triggerfish was not rebuilding on schedule. Therefore, more conservative management is needed to rebuild the stock. It is unknown how angler behavior might change if the fixed closed season is modified, particularly if there are other prized or targeted species open for harvest that occur in the same habitat as gray triggerfish. Therefore, this analysis is focused on landed catch and information about gray triggerfish reproductive biology and behavior. Because gray triggerfish display unique reproductive behavior (Simmons and Szedlmayer 2012) compared to other marine fishes (i.e., pelagic broadcast spawners), closing recreational gray triggerfish during spawning or a portion of the spawning season is expected to have beneficial effects for the stock.

Gray triggerfish is fecund as early as May and as late as August, but peak spawning occurs in June and July in the northern Gulf and South Atlantic Bight (Wilson et al. 1995; Hood and Johnson 1997; Ingram 2001; Moore 2001; Simmons and Szedlmayer 2012). All the **Alternatives** are expected to provide positive direct effects on the biological and ecological environment because they close the recreational sector to harvest of gray triggerfish for at least two months during the spawning season. During the spawning season, gray triggerfish may be more susceptible to harvest than during other periods of time. For example, Simmons and Szedlmayer (2012) found that if females were on an active nest with eggs, they were easily harvested by SCUBA divers with spearguns. For males, they found dominant fish display aggressive behaviors including chasing other male gray triggerfish and divers, especially if there were females present on active nests. This could make dominant male gray triggerfish more susceptible to spear fishing or hook-and-line harvest because of this behavior.

Alternative 1 would maintain the 2-month fixed closed season, which is projected to provide a 163 recreational fishing season, closing by mid-August when landings are projected to reach the ACT, based on the recreational decision tool, or SERO-LAPP Gulf 2016 (Appendix D). However, as the stock rebuilds this projected closure could fluctuate annually, as it has since 2012. In 2016, for example, the recreational sector did not re-opening in August, because the adjusted ACT (quota) is estimated to have been reached prior to the June 1 through July 31 fixed closed season. Despite the in-season AM, adjusted ACT, and 2-month fixed closed season, recreational landings have continued to exceed the adjusted ACT. If the Council decides not to modify the recreational fixed closed season (June 1 through July 31) then additional management measures will likely be needed in order to constrain landings to the recreational ACT selected in Action 2 without further shortening the season with the in-season AM closure.

Alternative 3 would establish the longest recreational closed season for 153 days, as compared to the status quo **Alternative 1** (61 days), **Alternative 2** and **5** (92 days), and **Preferred Alternative 4** (120 day) and would be expected to provide greater positive benefits to the gray triggerfish stock. Alternative 3 would provide a closed season adjacent to the spawning season closure and would be expected to protect fish that are ready to spawn or spawn earlier than June 1. A longer closed season is expected to result more gray triggerfish discards. However gray triggerfish have a low discard mortality rate which helps reduce any adverse impacts due to the longer season closure on dead discards. As noted above effort shifting during the gray triggerfish closed season is difficult to predict. However, few trips actually target gray triggerfish and thus it is anticipated that fishing behavior would not be altered, or increase the impacts to the biological environment.

4.3.1.3 Direct and Indirect Effects on the Economic Environment

Action 3.1 addresses the modification of the recreational fixed closed season, with **Alternative 1** representing the status quo of June 1 through July 31 as the closed season and **Alternatives 2-5** adding additional dates to the status quo. The potential economic impacts of these alternatives are examined through the changes in consumer surplus in comparison to the status quo. This change in consumer surplus is calculated by first taking the difference in landings from **Alternatives 2-5** to the status quo and converting those landings to number of fish by dividing through by the average weight of 2.49 pounds for recreational gray triggerfish landed in 2015 (M. Larkin, Southeast Regional Office, pers. comm.). Then, the number of fish is multiplied by a proxy value for the CS value for an additional “snapper” (not specific to the species) kept on a trip, i.e. $12.38 (Haab et al. 2012; values updated to 2015 dollars), since the CS per gray triggerfish is not known.

Alternative 1, the status quo, would not be expected to result in any direct economic effects. As displayed in Table 4.3.3.1, **Alternative 2**, which adds the month of August to the status quo, would reduce landings by 65,076 pounds and be expected to reduce CS by $323,551. **Alternative 3** expands the closed season from January 1 to July 31, leading to a reduction in landings by 189,626 pounds**.** **Alternative 3** would then be expected to reduce CS by $942,799. The closed season in **Preferred Alternative 4** spans from January 1 through the end of February and also from June 1 through July 31. This would result in a reduction in landings by 37,816 pounds and would be expected to reduce CS by $188,015. **Alternative 5** would have a closed season for the month of January as well as from June 1 through July 31. **Alternative 5** would reduce landings by 19,871 pounds and reduce CS by $98,792. Relative to the status quo, **Alternative 5** would be expected to result in the smallest reduction in CS, followed by **Preferred Alternative 4**.

Table 4.3.3.1. Changes in Pounds Landed, Number of Fish Landed, and CS under Three Effort Shifting Assumptions with a 14" FL Size Limit

Action 3.1 Closed Season Alternatives under 14" FL Size Limit				
0% Effort Shifting				
	Alt. 2 Jun – Aug	Alt. 3 Jan – Jul	Alt. 4 Jan – Feb & Jun – Jul	Alt. 5 Jan & Jun - Jul
Difference in Landings (lbs) from Status Quo (Alt. 1)	-65,076	-189,626	-37,816	-19,871
Difference in Number of Fish Landed from Status Quo (Alt. 1)	-26,135	-76,155	-15,187	-7,980
Difference in CS from Status Quo (Alt. 1)	-$323,551	-$942,799	-$188,015	-$98,792
50% Effort Shifting				
Difference in Landings (lbs) from Status Quo (Alt. 1)	-53,120	-120,222	2,277	-320
Difference in Number of Fish Landed from Status Quo (Alt. 1)	-21,333	-48,282	914	-129
Difference in CS from Status Quo (Alt. 1)	-$264,107	-$597,730	$11,321	-$1,591
100% Effort Shifting				
Difference in Landings (lbs) from Status Quo (Alt. 1)	-41,165	-50,817	42,373	19,232

Difference in Number of Fish Landed from Status Quo (Alt. 1)	-16,532	-20,408	17,017	7,724
Difference in CS from Status Quo (Alt. 1)	-$204,668	-$252,656	$210,674	$95,619

Assuming some level of effort shifting will occur with recreational fishermen, they will mitigate the impact of seasonal closures by diverting trips they would have taken during that timeframe to open months. Two such scenarios are examined in Table 4.3.3.1, one with 50% effort shifting and one with 100% effort shifting. Each of these scenarios displays a smaller negative impact of **Alternatives 2-5** on CS, in comparison to 0% effort shifting, and in some cases displays a positive impact due to the effort shifting assumptions.

4.3.1.4 Direct and Indirect Effects on the Social Environment

The current fixed closed season for the recreational harvest of gray triggerfish and an in-season AM were implemented through Amendment 37 (GMFMC 2013). Under this authority, the gray triggerfish recreational fishing season is closed on June 1 through July 31. Even with this fixed closed season, when recreational landings are estimated to have met the ACT, an in-season closure is implemented prohibiting further harvest of gray triggerfish for the remainder of the year. **Alternative 1** (No Action) would maintain the 2-month fixed closed season, which is projected to provide 163 recreational fishing days. Landings projections under **Alternative 1** are 337,803 lbs ww, which are well above both the recreational ACT and ACL currently selected in Action 2 (217,100 lbs ww and 241,200 lbs ww, respectively). Thus, even though a 163-day fishing season is estimated, it is highly likely that an in-season closure would still be triggered when the recreational ACT is estimated to have been met. Therefore, maintaining the current closed season with current harvest levels may do little to stop continuing in-season closures.

Impacts from implementing a fixed closed season generally relate to how much fishing activity is restricted by the closure. A shorter duration of the fixed closed season would generally result in fewer negative short-term impacts, and a longer closed season would generally result in more negative short-term impacts. However, only the projected landings under **Alternative 3** are currently below the selected recreational ACT and ACL in Action 2, meaning that an in-season closure is least likely to be triggered under **Alternative 3**. With the proposed extensions to the fixed closed season under **Alternatives 1**, **2**, **5**, and **Preferred Alternative 4**, it is highly likely that an in-season closure would still occur. Thus, a smaller bag limit (Action 3.2) and/or larger minimum size limit (Action 3.3) would need to be selected to reduce projected landings to avoid or delay an in-season closure.

Compared with **Alternative 1**, which retains the existing closed season, increasing the fixed closed season would reduce the projected landings under each of the remaining alternatives. With a June-August closure (**Alternative 2**) and retention of the 2-fish bag limit and 14-inch minimum size limit, landings are projected to be 272,727 lbs ww, which is higher than the more conservative 148,177 lbs ww projected landings under **Alternative 3** (January-July fixed closure). Adding a 2-month or 1-month fixed closure earlier in the year, is expected to result in projected landings of 299,984 lbs ww under **Preferred Alternative 4** and 317,932 lbs ww under **Alternative 5**, respectively, both of which would be higher than under **Alternatives 2** and **3**.

Should a longer fishing season be preferred among recreational fishermen than a reduction to the bag limit or increase in the minimum size limit, greater negative impacts would be expected from adopting a 7-month closure (**Alternative 3**) compared to a 4-month staggered closed season (**Preferred Alternative 4**). Greater negative impacts may also be expected from a closure occurring during times of peak effort, as more anglers and trips would be restricted through the prohibition of landing gray triggerfish alongside other species. On the other hand, a fixed closure during times of peak effort would allow for more fishing days. Recreational landings have been greatest during May and June, yet with recent management those peak periods have shifted some (Figure 2.3.1) with a peak in September and October for 2013. Some anglers who are able to fish year-round prefer closed seasons be staggered such that there is always an open season for landing popular species but must navigate closures for other species like red snapper which currently overlaps with the current closure. **Preferred Alternative 4** continues to overlap with the red snapper closure with the June-July closure and a 2-month earlier closure during January-February. The same is true for **Alternative 5** with a 1-month earlier closure during January. The social effects of these earlier closures are likely to have minimal negative effects as landings are usually lower in those months, although for 2014 it was a period of higher landings. Ultimately, if rebuilding is successful in the long term, then there should be more positive social effects that would mitigate any negative short-term effects as the stock rebuilds.

4.3.1.5 Direct and Indirect Effects on the Administrative Environment

Alternatives in Action 3.1 should not result in any substantial direct or indirect effects to the administrative environment. The type of regulations needed to manage the reef fish fishery would remain unchanged regardless of the choice of fishing season closures. The NMFS's Office for Law Enforcement, in cooperation with state agencies, would continue to monitor regulatory compliance with existing regulations and NMFS would continue to monitor recreational landings to determine if landings are meeting or exceeding specified ACTs and ACLs.

4.3.2 Action 3.2 - Modify the Recreational Bag Limit

4.3.2.1 Direct and Indirect Effects on the Physical Environment

The number of gray triggerfish landed per angler per trip is low. For example, based on landings data from 2013 through 2015 from the Marine Recreational Fisheries Survey and Statistics (MRFSS), headboat survey (HBS), and Texas Parks and Wildlife Department (TPWD), 10% of all reef fish trips landed 2 gray triggerfish per angler per trip (Table 2.3.2.). **Preferred Alternative 2** would reduce the recreational bag limit to 1 gray triggerfish per angler within the 20-reef fish aggregate bag limit. If the Council reduced the bag limit to 1 gray triggerfish per angler and maintained the June 1 through July 31 closed season and 14-inch FL minimum size, estimated annual recreational landings are estimated to be 286,008 lbs whole weight (ww). Therefore, depending on the rebuilding time period and catch limits established in Actions 1 and

2, other management measures would likely be necessary in addition to a bag limit reduction to avoid an in-season closure.

Alternative 1 (no action) is expected to result in fewer impacts to the physical environment than **Preferred Alternative 2** due to the longer recreational fishing season that would be expected to result with **Preferred Alternative 2**. It is assumed that fishers will fish longer at one spot or move to several more locations to reach the bag limits. However, based on the low percentage of gray triggerfish landed per angler on a trip, it is likely any adverse impacts to the physical environment between alternatives would be minimal. It is possible that there are regions in the Gulf of Mexico where gray triggerfish is more highly prized and may be more easily accessible to anglers.

4.3.2.2 Direct and Indirect Effects on the Biological Environment

Preferred Alternative 2, the 1-fish bag limit, is expected to provide the greatest positive effects on the biological environment based a projected reduction in landings of 15%. **Alternative 1** (no action) would maintain a 2-fish bag limit for gray triggerfish as part of the 20-reef fish aggregate bag limit providing no reduction in harvest. Limiting the number of gray triggerfish within the 20-reef fish aggregate could potentially cause effort to shift towards the other 6 species within the reef fish aggregate. However, the effects on the other 6 species are anticipated to be minimal because only three trips (0.2%) reached the 20-reef fish aggregate bag limit (n = 826 trips) based on MRFSS landings from 2009 through 2011. Analysis of MRFSS recreational landings determined of the 7 species within the 20-reef fish aggregate, the following four have been landed from most to least frequently in the last 3 years: vermilion snapper (80%), gray triggerfish (17.4%), lane snapper (1.6%), and almaco jack (1%) (SERO 2012). The tilefish (i.e., golden, goldface and blueline) were not recorded on any of the recreational trips from 2009 through 2011 (SERO 2012). The benchmark assessment for tilefish (golden) only documented recreational landings for two years (2005 and 2008), from 2002 through 2011 (SEDAR 22 2011a). It is possible by reducing the bag limit for gray triggerfish within the 20 reef fish aggregate that effort could shift towards these other three species. However, taking a closer look at the biology and life history of these three other species makes the ease of effort shift unlikely. For example, adult almaco jacks are typically found on large offshore reefs and rigs (Randall 1996) and are typically targeted by recreational anglers using live bait while gray triggerfish are caught with cut bait from vessels drifting or anchored over an artificial or natural reef. Vermilion snapper may be caught on the same reefs as gray triggerfish, but their range extends from 82-1,000 feet (25-400 m) in deeper waters than gray triggerfish found at a maximum depth of 328 feet (100 m) (www.fishbase.org; McEachran and Fechhelm 2005). Lane snapper are more typically found on coral reefs or live bottom habitats (Randall 1996) and were caught less frequently in the last 3 years than gray triggerfish and vermilion snapper (SERO 2012). Tilefish have a limited habitat range and distinct sediment type, depth, and temperature preferences (Nelson and Carpenter 1968; Able et al. 1982; Katz et al. 1983). Although, deep-drop fishing has become more popular with recreational anglers, the distance from shore alone may prohibit recreational anglers from reaching tilefish fishing grounds.

4.3.2.3 Direct and Indirect Effects on the Economic Environment

Action 3.2 addresses modifications to the recreational bag limit of gray triggerfish. **Alternative 1** maintains the status quo of a recreational daily bag limit of 2 gray triggerfish per angler within the 20-reef fish aggregate bag limit. **Alternative 1** is expected to result in landings of 337,803 lbs ww (Gulf Gray Triggerfish Recreational Decision Tool 2016). Landings are converted to number of fish by dividing through by the average weight of 2.49 pounds for recreational gray triggerfish landed in 2015 (M. Larkin, Southeast Regional Office, pers. comm.); **Alternative 1** would be expected to result in 135,664 gray triggerfish landed. Since the CS per gray triggerfish is not known, 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. $12.38 (Haab et al. 2012; values updated to 2015 dollars) finds that **Alternative 1** would be expected to result in a CS of $1,679,519 (Table 4.3.3.2).

Preferred Alternative 2 reduces the recreational daily bag limit of gray triggerfish to 1 per angler. **Preferred Alternative 2** is expected to result in a reduction in landings of 51,795 lbs ww and in a reduction in CS by $257,519, in comparison to **Alternative 1**.

Table 4.3.3.2. Landings, Number of Fish, and CS Resulting from Two Recreational Bag Limits

	Landings (lbs ww)	Number of Fish	CS
Alt. 1	337,803	135,664	$1,679,519
Alt. 2	286,008	114,863	$1,422,000
Difference between Alt. 1 and Alt. 2	51,795	20,801	$257,519

4.3.2.4 Direct and Indirect Effects on the Social Environment

Although **Alternative 1** (No Action) would maintain the current bag limit, the social effects may come from whether the combined effects of all alternatives are able to keep effort within the harvest thresholds that result from other actions. **Preferred Alternative 2** reduces the bag limit by 1 fish but may not have the desired effect of reducing effort enough to keep within some rebuilding alternatives without requiring an in-season closure. While reducing the bag limit by 1 fish would likely have few negative social effects, especially since gray triggerfish is not often a targeted species and discard mortality is low, it is sometimes the perception of regulatory discards that cause negative feelings toward management. However, if rebuilding is successful in the long term, then there should be more positive social effects, even with the perception of negative short-term effects. The key to positive social effects will rely upon a combined suite of management alternatives that sustain a successful rebuilding of the stock, thereby justifying the reduction in bag limit and other measures deemed necessary to achieve a rebuilt stock.

4.3.2.5 Direct and Indirect Effects on the Administrative Environment

Alternatives in Action 3.2 should not result in any substantial direct or indirect effects to the administrative environment. The type of regulations needed to manage the reef fish fishery would remain unchanged regardless of the choice of bag limits. The NMFS's Office for Law Enforcement, in cooperation with state agencies, would continue to monitor regulatory compliance with existing regulations and NMFS would continue to monitor recreational landings to determine if landings are meeting or exceeding specified ACTs and ACLs.

4.3.3 Action 3.3 - Modify the Recreational Minimum Size Limit

4.3.3.1 Direct and Indirect Effects on the Physical Environment

Alternative 1 (No Action) with the status quo June-July closure and 2-fish bag limit is estimated to result in 337,803 lbs ww landed. **Preferred Alternative 2** and **Alternative 3** with the status quo June-July closure and 2-fish bag limit would result in an estimated to harvest 269,256 lbs ww and 220,810 lbs ww, respectively. **Alternative 1** would be expected to result in fewer impacts to the physical environment than **Preferred Alternative 2** and **Alternative 3** due to the fishing season being closed earlier and thus reducing the number of fishing days. However, as explained above, it is not likely that many recreational fishermen target gray triggerfish exclusively on a fishing trip. Therefore, any effects to the physical environment that result from the number of fishing days may be minimal as fishermen still take trips, but target other reef fish.

4.3.3.2 Direct and Indirect Effects on the Biological Environment

Alternative 1 (No Action) is the 14-inch FL minimum size limit is greater than the size at first maturity. Studies estimated first maturity for both male and female gray triggerfish at 10-inches fork length (FL) (Hood and Johnson 1997; Ingram 2001). Unlike nearly all other reef fish species managed by the Council, gray triggerfish has a very low release mortality rate. Only small percentages (i.e., 5.0%) of gray triggerfish are estimated to die after release (SEDAR 43 2015). Increasing the minimum size limit is not anticipated to significantly increase discard mortality due to the very low release mortality rate. An increase in the minimum size limit could also potentially benefit the stock by increasing spawning potential (larger fish are more fecund).

Size limits are typically established to reduce fishing mortality, increase yield-per-recruit, and prevent growth overfishing. Increasing the minimum size limit is estimated to increase the proportion of dead discards to landings. Nevertheless, the overall magnitude of dead discards is estimated to be less for higher size limits relative to the status quo because of the concurrent reductions in harvest. By itself, increasing the recreational minimum size limit to 15 inches (**Preferred Alternative 2)** or 16 inches (**Alternative 3**) would reduce the number of gray triggerfish harvested compared to **Alternative 1**. Increasing the size the 16 inches would be expected to provide the greatest biological benefits to the gray triggerfish population by resulting in the greatest reduction in the number of fish landed, however, a 16 inch size limit would also have the greatest number if discards.

4.3.3.3 Direct and Indirect Effects on the Economic Environment

Action 3.3 addresses modifications to the recreational minimum size limit of gray triggerfish. The direct economic effect of **Alternatives 1-3** contained within Action 3.3 are measured by the resulting CS and displayed in Table 4.3.3.3. **Alternative 1**, the status quo, would retain the current gray triggerfish recreational minimum size limit of 14 inches FL. **Alternative 1** is expected to result in landings of 286,008 lbs ww, resulting in CS of $1,422,000. **Preferred**

Alternative 2 would increase the recreational minimum size limit to 15 inches FL, with an expected decrease in landings of 58,483 lbs ww in comparison to **Alternative 1**. **Preferred Alternative 2** would be expected to result in a reduction in CS by $426,679 from **Alternative 1**. **Alternative 3** would increase the recreational minimum size limit to 16 inches FL. In comparison to **Alternative 1**, **Alternative 3** would be expected to result in a decrease in landings of 100,583 lbs ww and in CS by $690,929; in comparison to **Preferred Alternative 2**, **Alternative 3** would be expected to result in a decrease in CS by $264,250.

Table 4.3.3.3. Landings, Number of Fish, and CS Resulting from three recreational minimum size limits

	Landings (lbs ww)	Number of Fish	CS
Alt. 1	286,008	114,863	$1,422,000
Alt. 2	227,525	80,398	$995,321
Alt. 3	185,425	59,053	$731,071

It should be noted that the analysis provided above does not include consideration of the combined expected effects on the recreational sector of the proposed changes considered in this amendment and assumes the status quo management under Actions 1 and 2 as well with recreational fixed closed seasons and size limits. The discussion of the interaction of the expected effects of Actions 1 (rebuilding time period), 2 (ACL and ACT), and 3 (recreational fixed closed season, recreational bag limit, and recreational size limit) is provided in Chapter 5.

4.3.3.4 Direct and Indirect Effects on the Social Environment

Selecting a minimum size limit for gray triggerfish is being considered as part of a suite of alternatives to help ensure that the recreational harvest can be constrained to a selected ACT in Action 2 and potentially avoid a disruptive in-season closure. The **Alternative 1** (No Action) keeps the current size limit of 14 inches FL which may not keep landings within a particular preferred ACT according to the scenarios presented in Table 2.3.5, especially with no change in the bag limit. With an increase in size limit to 15 inches FL (**Preferred Alternative 2**), the ability to constrain landings to the ACT without an in-season closure is enhanced when combined with other preferred alternatives in this amendment depending upon effort shifting calculations. The minimum size limit of 16 inches FL (**Alternative 3**) has the highest likelihood of helping constrain landings to the ACT without an in-season closure, yet the change in minimum size will likely also lead to more regulatory discards and some negative perceptions regarding gray triggerfish management.

As mentioned earlier, it is the combined effects of all recreational management alternatives that will determine the social effects from the rebuilding plan for gray triggerfish. While this species is not often a targeted choice, it is likely that certain fishermen do prefer to catch this species when they are able. While any rebuilding plan must incorporate restrictions on harvests that will have short-term negative social effects, the balance comes when trying to weigh the long-term beneficial social effects from rebuilding. The important aspect of choosing preferred alternatives are balancing the burden on recreational fishermen while ensuring a successful rebuilding of the stock.

4.3.3.5 Direct and Indirect Effects on the Administrative Environment

Alternatives in Action 3.3 should not result in any substantial direct or indirect effects to the administrative environment. The type of regulations needed to manage the reef fish fishery would remain unchanged regardless of the choice of a size limit. The NMFS's Office for Law Enforcement, in cooperation with state agencies, would continue to monitor regulatory compliance with existing regulations and NMFS would continue to monitor recreational landings to determine if landings are meeting or exceeding specified ACTs and ACLs.

4.4 Action 4 – Modify the Commercial Trip Limit

4.4.1 Direct and Indirect Effects on the Physical Environment

Commercial fishing activities including bottom anchoring, using trawling gear, deploying bottom longlines and buoy gear have the potential to interact with substrate a would be expected to adverse impacts to the physical environment. Maintaining the current closed commercial season (June – July) and the no action **Alternative 1** (12-fish) would be expected to result in estimated landings of 42,316 lbs, **Alternative 2** (10-fish) 34,388 lbs, **Alternative 3** (14-fish) 42,697 lbs, **Alternative 4** (16-fish) 43,592lbs, **Alternative 5** (18-fish) 45,080 lbs ww. Based upon the estimated landings results from applying the Commercial Decision Tool (Appendix D) **Alternative 2** would be expected to result in the least negative direct or indirect effects while **Alternative 5** would be expected to result in the most negative effects based upon the number of fish harvested. However, any effects on the physical environment would be minor because gray triggerfish are more of an incidentally caught species in the commercial reef fish sector. Therefore, it is unlikely that fishermen would modify their trips or fishing practices given they are targeting other species.

4.4.2 Direct and Indirect Effects on the Biological Environment

Alternative 1 (No Action) would maintain the status quo at a 12-fish commercial trip limit, which would close the commercial fishing season when the ACT is projected to be met. Gray triggerfish commercial fishing season closures will not likely stop fishermen from ending their trip after the trip limit is met because most commercial trips are targeting more economically valuable species, such as snappers and groupers.

Alternative 2 would establish a trip limit of 10 gray triggerfish. This trip limit is estimated to reduce commercial landings by 18% from the status quo estimated for 2017 (Appendix E). **Alternative 3** would establish a trip limit of 14 gray triggerfish. This trip limit is estimated to increase commercial landings by 1% from the status quo estimated for 2017 (Appendix E). **Alternative 4**, would establish a trip limit of 16 gray triggerfish, and is estimated to increase landings by 3% (Appendix E) from the status quo estimated for 2017. **Alternative 5**, would establish a trip limit of 18 gray triggerfish, and is estimated to increase landings by 6% (Appendix E) from the status quo estimated for 2017. Because gray triggerfish is typically caught as a secondary species on most commercial fishing trips, modifying the trip limit will limit the number of gray triggerfish commercial fishermen land while targeting other species. The commercial sector typically lands a relatively small number of pounds per trip, because gray triggerfish is one of the many species that is part of the reef fish component. The current trip limit of 12 gray triggerfish is not likely to cause fishermen to end their trip after the trip limit is met because most commercial trips are targeting more economically valuable species, such as snappers and groupers. Therefore, the trip limit is expected to reduce fishing mortality by requiring commercial fishermen to release gray triggerfish after the trip limit is reached. Because survival after release is high, most fish released in excess of the trip limit would survive (SEDAR 9 2006a; SEDAR 9 Update 2011b; SEDAR 43 2015). Commercial high grading to larger size fish is known to occur in the commercial sector. High grading would be expected to increase the amount of dead discards from the commercial sector. Fortunately, any adverse effects to the gray triggerfish stock from discard mortality associated with trip limits should be minimal. The survival of gray triggerfish after release is high, so most fish released would likely survive.

4.4.3 Direct and Indirect Effects on the Economic Environment

Action 4 considers five alternatives for commercial trip limits of gray triggerfish, ranging from 10 to 18 gray triggerfish per trip. **Alternative 1** would maintain the commercial trip limit of 12 gray triggerfish, and so **Alternative 1** would not be expected to result in any direct economic effects. **Alternative 2** would decrease the commercial trip limit to 10 gray triggerfish and is expected to reduce annual landings by 23.5%. Table 4.4.3.1 utilizes the annual average of the percent increase (decrease) for the proposed alternatives, in contrast to the status quo trip limit, from Table 2.4.1 by multiplying it by the commercial landings in 2015 to show the change in landings by pounds; the change in revenue is calculated by multiplying the change in pounds by $2.12, the commercial dockside price per pound of gray triggerfish in 2015. Commercial landings were 47,480 pounds ww in 2015, so **Alternative 2** would be expected to result in a reduction of 11,158 pounds landed and in $23,655 less in commercial ex-vessel revenue. **Alternative 3** would increase the commercial trip limit to 14 gray triggerfish and is expected to increase annual landings by 0.84%. **Alternative 3** would be expected to result in an increase of $846 in commercial ex-vessel revenue. **Alternative 4** increases the commercial trip limit to 16 gray triggerfish and is expected to increase annual landings by 2.79% with an expected increase of $2,809 in commercial ex-vessel revenue. **Alternative 5** would increase the commercial trip limit to 18 gray triggerfish and is expected to increase annual landings by 6.02%. **Alternative 5** would be expected to result in an increase of $6,059 in commercial ex-vessel revenue.

Table 4.4.3.1. Changes in poundage and ex-vessel revenue for **Alternatives 2-4** (in 2015 dollars).

		Changes	
	Trip Limit	**Pounds**	**Ex-Vessel Revenue**
Alt. 1	12		
Alt. 2	10	-11,158	-$23,655
Alt. 3	14	399	$846
Alt. 4	16	1,325	$2,809
Alt. 5	18	2,858	$6,059

It should be noted that the analysis provided above does not include consideration of the combined expected effects on the recreational sector of the proposed changes considered in this amendment and assumes the status quo management under Actions 1 and 2. The discussion of the interaction of the expected effects of Actions 1 (rebuilding time period), 2 (ACL and ACT), and 4 (recreational fixed closed season, recreational bag limit, and recreational size limit) is provided in Chapter 5.

4.4.4 Direct and Indirect Effects on the Social Environment

Modifying the commercial trip limit can have various social effects depending upon whether the trip limit is decreased or increased. **Alternative 1** (No Action) would maintain the commercial trip limit at 12 fish per trip. While this would likely have few social effects, because the commercial fishery has not landed its quota and the Reef Fish AP has suggested an increase, there may be the perception that negative social effects might occur with the status quo. A decrease in the trip limit under **Alternative 2** would likely increase the perception of negative social effects given the current quota is not being met and because an increase was recommended. Although, if the ACT chosen in Action 2 requires a reduction in the trip limit to avoid an in-season closure, the short-term negative social effects would likely increase. An increase in the trip limit, as in **Alternative 3**, would have more beneficial social effects given the perception that an increase is needed, however, the projected landings with the current closed season suggest that landings may be less than what is required to implement the 8-year rebuilding plan. The projected landings with **Alternatives 1-5** fall below the projected harvest levels associated with either the 9-year or 10-year rebuilding plans' ACT in Action 2, Alternative 3. As with the alternatives to constrain the recreational harvest, short-term negative effects come with any reduction in harvest (**Alternative 2**), and positive effects would come with a proportional increase in harvest (**Alternatives 3-5**). For the preferred rebuilding plan (Action 1) and catch levels (Action 2), the projected landings for each of the trip limit increases under **Alternatives 3**, **4**, and **5** would remain below the commercial ACL and ACT, allowing the stock to rebuild and the commercial sector to harvest more of its quota.

4.4.5 Direct and Indirect Effects on the Administrative Environment

In Action 4, **Alternative 1** (No Action) would maintain the commercial trip limit at 12-fish per trip. The continuation of a commercial trip limit would not be expected to increase the enforcement and monitoring burden. All the trip limit alternatives result is estimated landings that would be below the current ACT. The Commercial Decision Tool in Appendix D estimates that **Alternative 1** (12-fish) would result in 42,316 lbs ww of gray triggerfish being landed in 2017, **Alternative 2** (10-fish) estimates the commercial landings would be 34,338, a 19% reduction from the status quo. **Alternatives 3** (14-fish) is expected to result in less than a one percent increase in landings, while **Alternatives 4** (16-fish) and **Alternative 5** (18-fish) estimates landings would be 3% and 6% increase to the status quo, respectively. These alternatives do not exceed the ACT and therefore would not be expected to increase the administrative burden by not having to implement a commercial season closure. Thus, any adverse effects would be minor.

CHAPTER 5. LIST OF AGENCIES AND PERSONS CONSULTED

PREPARERS (Interdisciplinary Planning Team)

Name	Expertise	Responsibility	Agency
Carrie Simmons, Ph.D.	Fishery Biologist	Co-Team Lead – Amendment development, introduction,	GMFMC
Rich Malinowski	Biologist	Co-Team Lead – Amendment development, effects analysis, and cumulative effects	SERO
Michael Jepson. Ph.D.	Anthropologist	Social analyses and Reviewer	SERO
Matt Freeman, Ph.D.	Economist	Economic Analysis and Reviewer	GMFMC
Assane Diagne, Ph.D.	Economist	Economic Analysis, Regulatory Impact Review and Reviewer	GMFMC
Denise Johnson, Ph.D.	Economist	Economic Environment and Reviewer	SERO
Ava Lasseter. Ph.D.	Anthropologist	Social analyses and Reviewer	GMFMC
Mara Levy	Attorney	Legal compliance and Reviewer	NOAA GC
Scott Sandorf	Technical Writer Editor	Regulatory writer	SERO
Steven Atran	Fishery Biologist	Reviewer	GMFMC
Noah Silverman	Natural Resource Management Specialist	NEPA compliance	SERO
Mike Larkin, Ph.D.	Biologist	Data analysis	SERO
Jeff Isely, Ph.D.	Biologist/Statistician	Stock assessment analyst and Reviewer	SEFSC

LIST OF AGENCIES CONSULTED

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

NOAA General Counsel
U.S. Coast Guard

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APPENDIX A. ACL/ACT CONTROL RULE FOR THE

ACL/ACT Buffer Spreadsheet version 4.1 - April 2011

Commercial Gray Triggerfish
Revised 3/24/2016

sum of points	2		
max points	6.0		
Min. Buffer	0	**min. buffer**	User adjustable
Max Unw.Buff	19	max unwt. Buff	
Max Wtd Buff	25	**max wtd. buffer**	User adjustable

Buffer between ACLand ACT (or ABC and ACL) Unweighted 6
Weighted 8

Component	Element score	Element	Selection	Element result
Stock assemblage	0	This ACL/ACT is for a single stock.	x	0
	1	This ACL/ACT is for a stock assemblage, or an indicator species for a stock assemblage		
Ability to Constrain Catch	0	Catch limit has been exceeded 0 or 1 times in last 4 years	x	1
	1	Catch limit has been exceeded 2 or more times in last 4 years		
		For the year with max. overage, add 0.5 pts. For every 10 percentage points (rounded up) above ACL	1.0	
		Not applicable (there is no catch limit)		
		Apply this component to recreational fisheries, not commercial or IFQ fisheries		
Precision of Landings Data Recreational	0	Method of absolute counting		not applicable
	1	MRIP proportional standard error (PSE) <= 20		
	2	MRIP proportional standard error (PSE) > 20		
		Not applicable (will not be included in buffer calculation)	x	
		Apply this component to commercial fisheries or any fishery under an IFQ program		
Precision of Landings Data Commercial	0	Landings from IFQ program		1
	1	Landings based on dealer reporting	x	
	2	Landings based on other		
		Not applicable (will not be included in buffer calculation)		
Timeliness	0	In-season accountability measures used or fishery is under an IFQ	X	0
	1	In-season accountability measures not used		
			Sum	2

Weighting factor

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

Year	Catch	ACL	Over/Under %
2012	71,948	64,100	12%
2013	63,086	64,100	-2%
2014	42,532	64,100	-34%
2015	47,480	64,100	-26%

Greatest percent overage = 12% = 1 point
ACL exceeded 1 time in last 4 years
Data Source ACL Data set provided to IPT by Rich Malinowski to IPT on 2/26/2016

COMMERCIAL SECTOR

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

ACL/ACT Buffer Spreadsheet version 4.1 - April 2011

Recreational Gray Triggerfis
revised 3/24/2016

sum of points	8.5		
max points	10.5		
Min. Buffer	0	**min. buffer**	User adjustable
Max Unw.Buff	19	max unwt. Buff	
Max Wtd Buff	25	**max wtd. buffer**	User adjustable

Buffer between ACLand ACT (or ABC and ACL): Unweighted 16; Weighted **20**

Component	Element score	Element	Selection	Element result
Stock assemblage	0	This ACL/ACT is for a single stock.	x	0
	1	This ACL/ACT is for a stock assemblage, or an indicator species for a stock assemblage		
Ability to Constrain Catch	0	Catch limit has been exceeded 0 or 1 times in last 4 years		6.5
	1	Catch limit has been exceeded 2 or more times in last 4 years	x	
		For the year with max. overage, add 0.5 pts. For every 10 percentage points (rounded up) above ACL	5.5	
		Not applicable (there is no catch limit)		
		Apply this component to recreational fisheries, not commercial or IFQ fisheries		
Precision of Landings Data Recreational	0	Method of absolute counting		2
	1	MRIP proportional standard error (PSE) <= 20		
	2	MRIP proportional standard error (PSE) > 20	x	
		Not applicable (will not be included in buffer calculation)		
		Apply this component to commercial fisheries or any fishery under an IFQ program		
Precision of Landings Data Commercial	0	Landings from IFQ program		not applicable
	1	Landings based on dealer reporting		
	2	Landings based on other		
		Not applicable (will not be included in buffer calculation)	x	
Timeliness	0	In-season accountability measures used or fishery is under an IFQ	x	0
	1	In-season accountability measures not used		

Sum 8.5

Weighting factor

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

Year	Catch	ACL	Over/Under %	
2012	279,874	214,200	31%	
2013	456,642	241,200	89%	
2014	217,885	186,993	17%	
2015	114,059	54,207	110%	preliminary

2014 and 2015 ACLs adjusted for prior year overages
Greatest percentage overage = -117% = 6 points
ACL exceeded 4 times in last 4 years
Data Source ACL Data set provided to IPT by Rich Malinowski to IPT on 2/26/2016

Year	PSE	
2012	16.2	
2013	21.8	
2014	26.3	
2015	36.8	preliminary
Average	25.3	Avg PSE > 20

APPENDIX C. CONSIDERED BUT REJECTED

The Council moved Action 2 Alternative 3 to consider but rejected section at their August 2016 meeting, after determining that the increasing 8-year rebuilding yield stream for 2017 through 2019 was duplicative of another alternative currently in the document that uses the mean ABC for the 8-year rebuilding period.

Action 2 - Establish Annual Catch Limits and Annual Catch Targets for Gray Triggerfish

Alternative 3: Use the SSC's recommended rebuilding period of 8 years from SEDAR 43 (2015) that corresponds with the annual ABC's recommended for 2017 through 2019 that are estimated to rebuild the gray triggerfish stock in 8 years or by the end of 2024. Use the ACL/ACT control rule buffer for each sector based on landings from 2012 through 2015. This results in an 8% buffer between the ACL and ACT for the commercial sector and a 20% buffer between the ACL and ACT for the recreational sector.

Year	ABC	Commercial ACL	Commercial ACT (quota)	Recreational ACL	Recreational ACT
2017	216,000	45,360	41,731	170,640	136,512
2018	227,000	47,670	43,856	179,330	143,464
2019	233,000	48.930	45,016	184,070	147,256

The Council moved Action 6 to the considered but rejected section of the document at their August 2016 meeting. The Council determined since the implementation of the 12-fish trip limit and fixed closed season (June 1 – July 31) in 2013 commercial landings have been 22-31% below the commercial ACT of 60,900 lbs ww. Therefore, modifying the commercial closed season may not be necessary at this time. After discussion the Committee passed the following motion.

Action 6 - Modify the Commercial Fixed Closed Season for Gray Triggerfish

Alternative 1: No Action. Do not modify the gray triggerfish current closed season for the commercial sector of June 1 through July 31**.**

Alternative 2: Modify the gray triggerfish closed season for the commercial sector to be from March 1 through July 31.

Alternative 3: Modify the gray triggerfish closed season for the commercial sector to be from June 1 through August 31.

APPENDIX D. RECREATIONAL DECISION TOOL REPORT

Modeling the Combined Impact of Proposed Management Measures for the Gulf of Mexico Gray Triggerfish Recreational Sector

LAPP/DM Branch
NOAA Fisheries Service
Southeast Regional Office

Introduction
Gray triggerfish (*Balistes capriscus*) are one of 31 reef fish species in the Fishery Management Plan (FMP) for the Reef Fish Resources of the Gulf of Mexico. The FMP provides management for reef fish species in the federal waters of the Gulf of Mexico.
In 2015, a stock assessment was conducted for the Gulf of Mexico gray triggerfish (SEDAR 43). Results from the assessment showed the gray triggerfish stock overfished but not experiencing overfishing. Amendment 46 is currently being drafted and its purpose is to establish management measures that will rebuild the stock. The current management measures for the recreational sector are a minimum size 14 inches fork length (FL), closed season from June 1 to July 31, and a two gray triggerfish per angler bag limit. Amendment 46 proposes an increase in minimum size (16 and 18 inches FL), revised closed season, and a reduction in the bag limit down to 1 triggerfish per angler for the recreational sector. A recreational decision tool was created to allow evaluation of the efficacy of the different management measures.

Data Sources
Recreational landings data for Gulf of Mexico gray triggerfish were obtained from the Southeast Fisheries Science Center (SEFSC) Marine Recreational Information Program (MRIP), the Texas Parks and Wildlife Department (TPWD) Creel Survey, Louisiana Creel survey (LA Creel) and the Headboat Survey (Headboat). MRIP, TPWD, and LA Creel conducted dockside intercepts to collect information on the size and number of gray triggerfish caught by mode (charter, private, shore). Headboat collected size and number of gray triggerfish through logbooks completed by headboat operators.

Methods
Reductions in landings are necessary to achieve the proposed Annual Catch Limits (ACL) and Annual Catch Targets (ACT). The management measures of minimum size limits, closed seasons, and bag limits were explored as tools to reduce harvest. Percent reductions of landings for each management measure were determined from 2013 to 2015 data. All the calculations were done using SAS (SAS Institute, Cary, NC).

Recreational Minimum Size Limit
Length measurements were collected during biological sampling associated with MRIP, TPWD, LA Creel, and Headboat. The length measurement unit recorded was millimeters. MRIP, LA Creel, and Headboat recorded length in fork length and TPWD recorded total length. All lengths

were converted to inches fork length using standard conversion factors and equations summarized in Table 1. The size limit analysis estimated the percent reduction in weight. Thus the weight of each fish was required. When weight data was available it was used. When weight data was unavailable it was estimated from length using the equations summarized in Table 1.

Table 1. Meristic conversions for Gulf of Mexico gray triggerfish. Source: SEDAR 43.

Conversion	Model
Total Length (mm) to Fork Length (mm)	Total Length = 0.807*(Fork Length) + 24.360
Fork Length (mm) to Whole Weight (lbs)	Whole Weight = (0.00000002162*(Fork Length^3.007))*2.2046

Figure 1 provides the length distribution for the recreational sector in 1 inch increments from 2013-2015. There was a level of non-compliance to size limits with 27% of the fish harvested below the current minimum size limit (14 inches fork length).

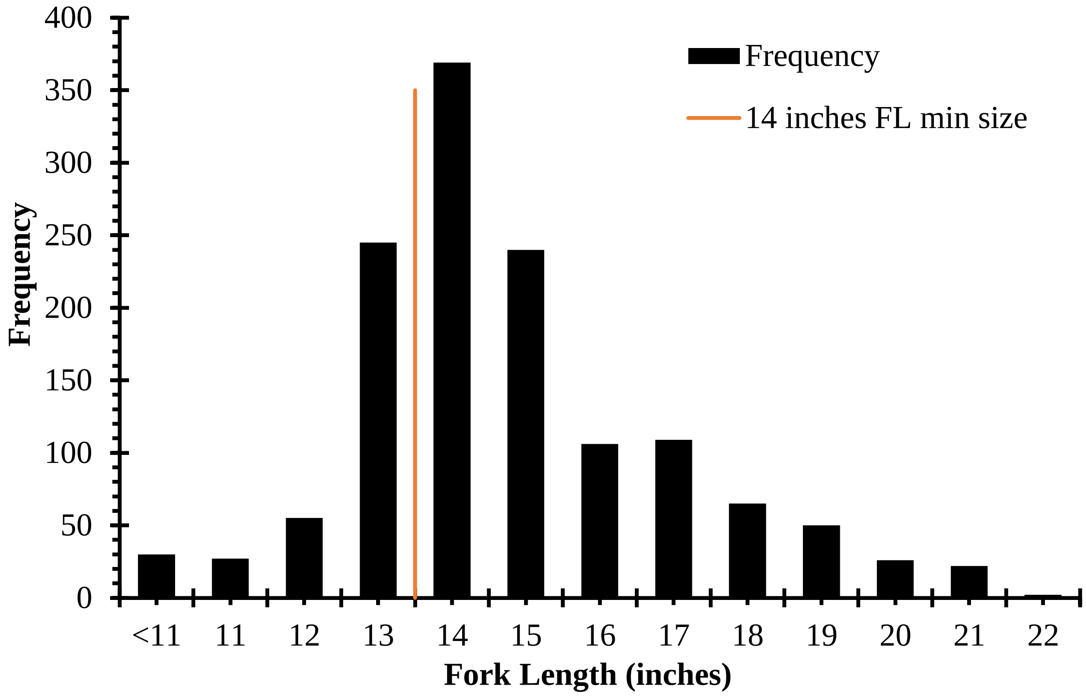

Figure 1. Gulf of Mexico fork length distribution for biologically sampled intercepts of recreationally landed gray triggerfish from MRIP, TPWD, LA Creel, and Headboat for 2013 to 2015 (n=1,346 gray triggerfish). The red line denotes current recreational minimum size limit of 14 inches FL.

Reductions in landings in weight were calculated for each mode of fishing (charter, headboat, and private) for minimum size limits (MSL) at 1 inch intervals between 15-20 inches as follows:

Percent reduction = *((C – G) - B)/C*, where:
C = catch in pounds ww
G = weight of fish that are greater than or equal to the MSL

B = weight of fish smaller than the 14-inch FL MSL (non-compliance or measurement error)

Percent reductions associated with MSL were estimated by mode of fishing normalized to a 0% reduction at the recreational status quo size limit of 14 inches fork length. Due to concerns about low sample sizes, output was pooled for 2013-2015 data. MRIP, TPWD, and LA Creel output were pooled by mode. If a sample size of 30 gray triggerfish was not achieved in a month then the samples were pooled with the nearest months until a sample size of 30 was achieved. Projected MSL impacts varied by month and mode (Table 2). No calculations were made for the Shore mode because there were no gray triggerfish sampled in this mode.

Table 2. Projected reductions of gray triggerfish landings by month for various minimum size limits for A) MRIP, TPWD, and LA Creel charter, B) MRIP, TPWD, and LA Creel private, and C) Headboat. Warmer colors denote higher reductions.

A) MRIP, TPWD, & LA Creel Charter

Size Limit	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
15	8%	28%	38%	18%	18%	15%	23%	25%	20%	14%	11%	11%
16	47%	50%	50%	35%	36%	42%	40%	40%	27%	30%	37%	37%
17	68%	58%	56%	41%	43%	61%	54%	53%	32%	37%	50%	50%
18	86%	61%	66%	52%	54%	76%	59%	59%	53%	50%	66%	66%
19	86%	73%	66%	61%	65%	91%	62%	60%	62%	59%	70%	70%
20	86%	73%	70%	70%	73%	91%	72%	70%	72%	70%	77%	77%

B) MRIP, TPWD, & LA Creel Private

Size Limit	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
15	19%	16%	19%	18%	19%	9%	6%	12%	13%	25%	22%	22%
16	30%	26%	33%	30%	30%	18%	26%	23%	17%	29%	29%	29%
17	30%	33%	41%	38%	38%	20%	44%	29%	17%	29%	29%	29%
18	41%	37%	53%	41%	40%	28%	71%	47%	17%	29%	35%	35%
19	46%	48%	66%	51%	51%	44%	81%	65%	26%	43%	44%	44%
20	53%	48%	66%	59%	60%	62%	81%	71%	47%	51%	52%	52%

C) Headboat

Size Limit	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
15	18%	22%	22%	16%	40%	12%	24%	28%	22%	29%	27%	30%
16	34%	35%	44%	30%	63%	48%	45%	46%	51%	54%	53%	48%
17	43%	45%	57%	42%	74%	56%	56%	59%	53%	63%	63%	59%
18	60%	55%	69%	55%	79%	56%	65%	71%	62%	72%	73%	67%
19	65%	61%	76%	63%	82%	81%	75%	77%	78%	75%	77%	70%
20	74%	72%	83%	67%	82%	81%	77%	80%	82%	83%	84%	74%

Recreational Bag Limits
The numbers of gray triggerfish per angler on a given trip were collected with MRIP, TPWD, LA Creel, and Headboat. The MRIP system classifies recreational catch into three categories:

- Type A - Fish that were caught, landed whole, and available for identification and enumeration by the interviewers.
- Type B - Fish that were caught but were either not kept or kept but not available for identification.
    - Type B1 - Fish that were caught and filleted, released dead, given away, or disposed of in some way other than Types A or B2.
    - Type B2 - Fish that were caught and released alive.

Type A and B1 catches were used for bag limit analyses. Type A catch represents the total landings of all anglers on a fishing trip. However, some or all of the anglers contributing to the A catch are also interviewed to report type B1 catch, and those may be recorded on an individual basis. If the number of people contributing to the A portion was greater than the number of people interviewed to report B1 portion, the following formula was used to account for possible under reporting of the B1 portion:

$$B1 = B1_{interviewed} \times (\text{\# people in fishing party/\# people interviewed to report B1 portion}).$$

The total landings per vessel was then determined by summing the total Type A and Type B1 (AB1) for each trip. Percent reductions in landings were estimated for bag limits for reducing the bag limit down to 2 gray triggerfish per person. If AB1 landings per vessel was greater than the bag limit being analyzed, the value was re-set to the new bag limit ($AB1_{bag\ limit}$), otherwise no changes to the landings were made.

The following formulas were used to estimate reductions in harvest resulting from bag limits:

$$\text{If } AB1 \text{ landings} <= \text{bag limit, then harvest} = A + B1$$

$$\text{If } AB1 \text{ landings} > \text{bag limit, then harvest} = AB1_{vessel\ limit}$$

Reductions for TPWD, LA Creel and Headboat bag limits were calculated in a similar manner as described above, except no B1 data were available. If the landings per trip was greater than the bag limit being analyzed, the value was re-set to the bag limit, as described above. If the landings per person was less than the bag limit being analyzed, then no change was made to the landings. Percent reductions associated with bag limits were estimated relative to the status quo of the 2 fish bag limit, by mode of fishing. Table 3 provides the percent reductions for the one gray triggerfish bag limit. MRIP, TPWD, and LA Creel output were pooled by mode. If a sample size of 30 gray triggerfish was not achieved in a month then the samples were pooled with the nearest months until a sample size of 30 was achieved. For example, if only 20 gray triggerfish were intercepted in January, January samples would be pooled with December and February samples; if this failed to attain the 30 sample target, November and March samples would also be included, and so on. The impact of bag limits varied by mode: the private mode was most heavily impacted and Headboat was the least impacted.

Table 3. Projected reduction of gray triggerfish landings by month for various bag limits for A) MRIP, TPWD and LA Creel charter, B) MRIP, TPWD and LA Creel private, and C) Headboat. Warmer colors denote higher reductions.

A) MRIP, TPWD, La Creel Charter

Bag Limit	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1	25%	16%	26%	11%	8%	0%	16%	16%	0%	4%	17%	17%

B) MRFSS & TWPD Private

Bag Limit	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1	19%	13%	27%	16%	22%	15%	29%	30%	22%	40%	28%	22%

C) Headboat

Bag Limit	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1	4%	11%	4%	1%	2%	0%	0%	1%	3%	2%	6%	25%

2017 Predicted Landings

Amendment 46 is being drafted in 2016 and the resultant management measures will be imposed on the 2017 fishing year. An estimate of the 2017 landings are required to apply the percent reductions from the various management measures, and determine the predicted landings relative to the ACLs and ACTs.

In the past six years (2010-2015) the Gulf of Mexico gray triggerfish recreational sector has experienced many closures at different times of the year. There have been closures of the recreational sector in federal waters in the years of 2010, 2012, 2013, 2014, and 2015. Some states followed the federal closures (e.g., Mississippi) and some states ignored the federal closures (e.g., Texas). Also, some states sometimes went compatible with federal closures and then other times ignored the federal closure (e.g., Florida). The different closure dates and variation in compatibility of state and federal closures made it difficult to predict 2017 landings. The recreational sector was open in Waves 1 (January/February) and 2 (March/April) in all of the Gulf of Mexico (federal and state waters) in the years of 2012 through 2014. Predicted landings for waves 1 and 2 were determined from the average landings for all three years (2012-2014) for each wave. From 2012 through 2015 there have been many Gulf of Mexico gray triggerfish closures in federal waters. Some as early as February 7th (2015) and some as late as October 15 (2013). Also, in the years 2012 through 2015 there were years when the states closed their waters at the same time as the federal closures, and there were years when the state waters remained open when the federal waters were closed. Due to all of the variation in closure dates and federal versus state closure compatibility the landings for waves 3 (May/June) through 6 (November/December) were predicted using earlier landings where there were no closures. The most recent years without any Gulf of Mexico triggerfish closures are 2008, 2009, and 2011. A large portion of the Gulf of Mexico was closed in 2010 due to the Deepwater Horizon oil spill.

The landings from these three years (2008, 2009, and 2011) were used to predict landings in waves 3 through 6 by using the proportion of landings in these waves relative to wave 2. The proportion of landings of wave 2 to waves 3 through 6 was averaged from the years of 2008, 2009, and 2011. The average proportion for each of the wave relationships are shown in Table 4. Table 5 displays the years used to determine the predicted landings. The average proportion estimates were multiplied against the predicted wave 2 landings to create predicted landings for waves 3 through 6. Figure 2 displays the landings from 2008, 2009, 2011, and predicted 2017 landings.

Table 4. The proportional relationship of landings between wave 2 to waves 3 through 6 for the Gulf of Mexico gray triggerfish recreational sector. The proportions were determined from taking the average of the proportional relationship between the waves using the annual landings of 2008, 2009, and 2011.

Relationship	Proportion
Wave 2 to Wave 3	4.789
Wave 2 to Wave 4	2.944
Wave 2 to Wave 5	1.502
Wave 2 to Wave 6	0.378

Table 5. Matrix displaying the years that were used to predict the 2017 landings for waves 2 through 6.

	Wave				
Year	2	3	4	5	6
2008		X	X	X	X
2009		X	X	X	X
2010	Not used, Deepwater Horizon Oil Spill				
2011		X	X	X	X
2012	X				
2013	X				
2014	X				

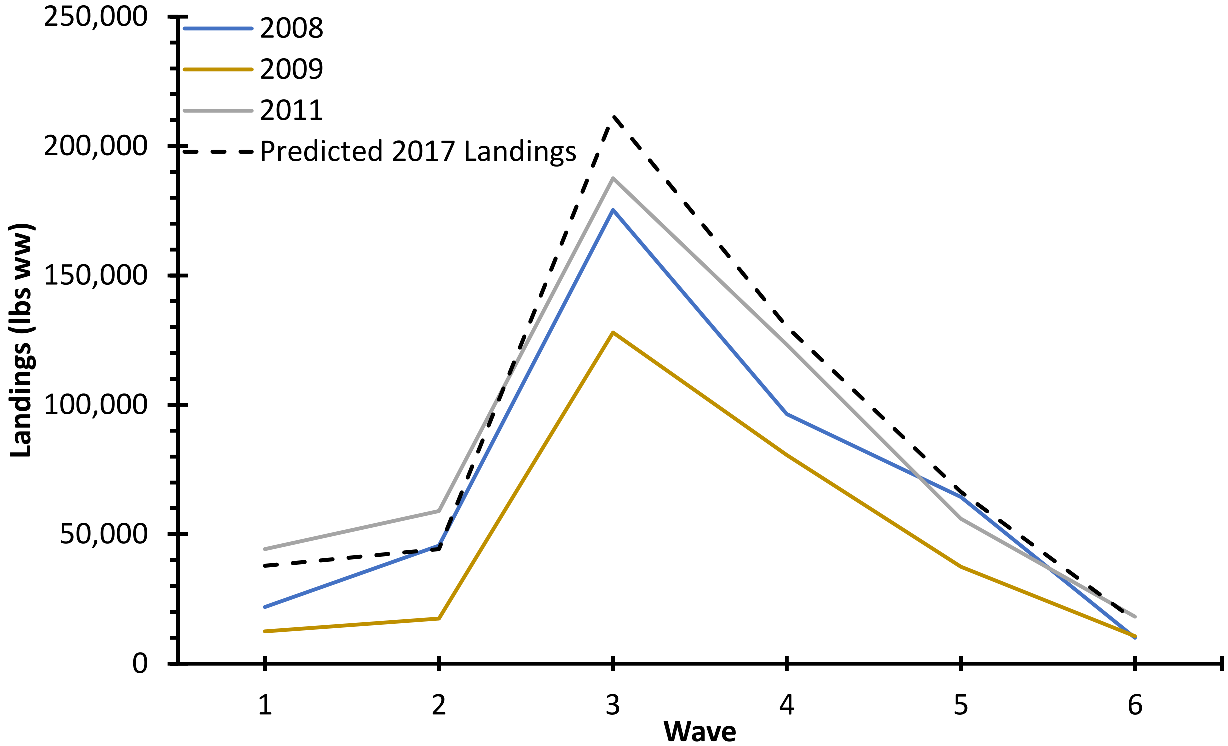

Figure 2. Gulf of Mexico gray triggerfish recreational landings by wave for 2008, 2009, 2011, and predicted 2017 landings.

Averages or recent landings were used to determine predicted 2017 landings. The uncertainty in the predicted landings was explored by evaluating the variability of the annual landings estimates. This was conducted from using the mean and proportion standard error (PSE) for the landings estimates. The annual landings were separated into wave and mode (private and charter) then the mean and PSE of the landings estimates were used to establish distributions of the landings. Then a bootstrap method was employed to sample the distributions 1,000 times for each mode (private and charter) and wave. This resulted in a range of potential charter and private landings. The bootstrap samples for waves 1 and 2 were done using the distribution of the landings for 2012, 2013, and 2014. The proportion of landings relationship from wave 2 to waves 3 through 6 (Table 1) were applied to the bootstrap samples for wave 2 to generate a range of landings for waves 3 through 6. Then 95% confidence intervals were generated from the sample results to provide both upper and lower bounds of potential recreational landings. The variability of the Headboat landings was not available and these landings were treated as point estimates. Figure 3 shows the predicted landings along with the upper and lower 95% confidence intervals.

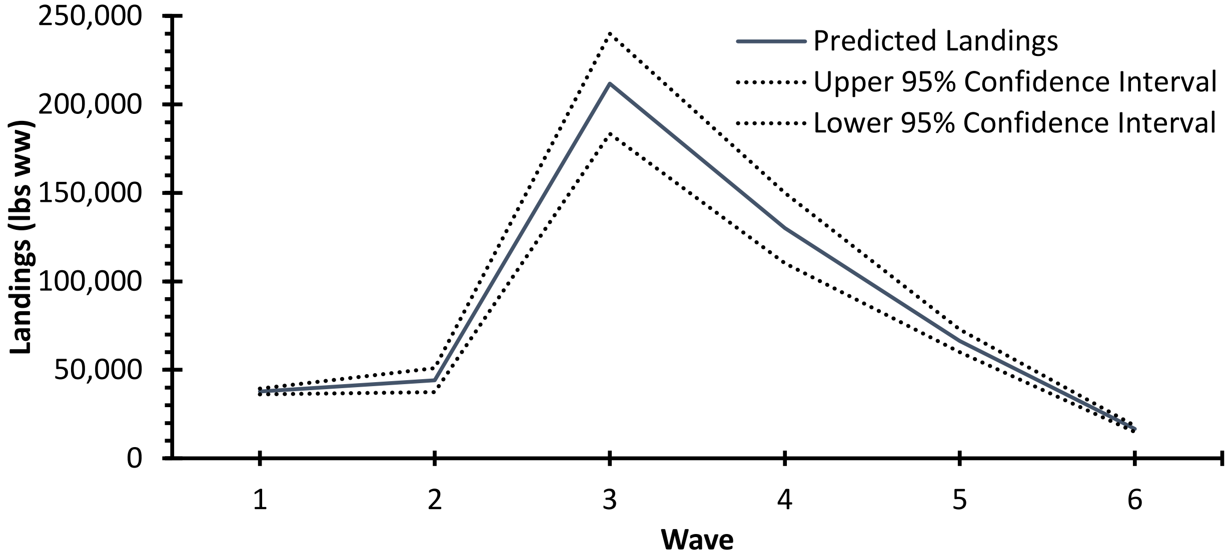

Figure 3. Gulf of Mexico recreational gray triggerfish predicted landings by wave. The blue line is the predicted landings and the black dashed lines are upper and lower 95% confidence intervals.

Discards and Total Removals

The relative change in dead discards from exploring different regulations was calculated. A baseline of landings was established by assuming no regulation changes and the season was open all year. Then when a regulation change is implemented the reduced landings were converted to numbers of gray triggerfish by dividing by the average weight. The current average weight of gray triggerfish was determined from the most recent ACL dataset generated from SEFSC (March 17, 2016 Recreational ACL dataset), and was determined to be 2.49 pounds whole weight. The numbers of gray triggerfish released due to a regulation change were converted to dead discards by multiplying the discard mortality rate of 5%. This discard morality rate came from SEDAR 43. Additionally, the landings in weight were converted to numbers of gray triggerfish by dividing by the average weight. Then total removals were determined from summing both the dead discards and the dead triggerfish from landings.

Seasonal Closure Analyses

Landings of gray triggerfish are highly seasonal in the Gulf of Mexico; thus, reductions associated with seasonal closures differ greatly depending upon the time period selected for closure (Figure 2). The Headboat landings are available by month. The MRIP, TPWD, and LA Creel landings are available by two-month wave and were separated into months by multiplying the proportion of days in each month relative to the total days in a wave. For example wave 3 consists of May/June where May has 31 days and June has 30 days (total wave landings = 61 days). Therefore, May landings are estimated by multiplying the wave 3 landings by 0.508 (31/61 = 0.508). The predicted 2017 landings by month are shown in Figure 4.

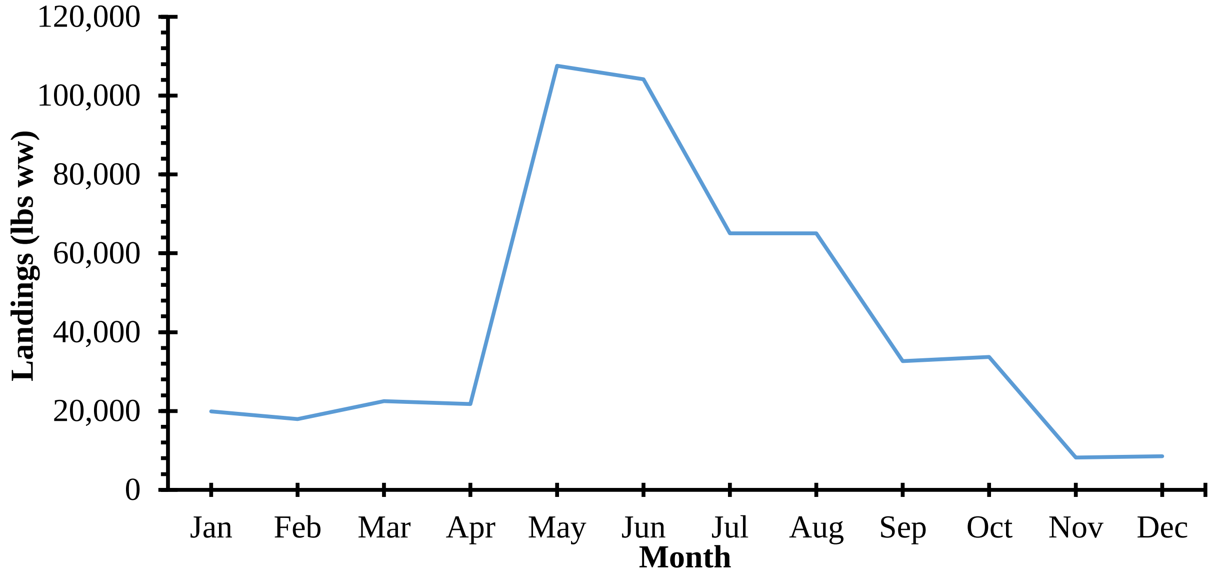

Figure 4. Distribution by month of projected 2017 landings for the Gulf of Mexico gray triggerfish recreational landings. The recreational landings include projected MRIP, Headboat, TPWD, and LA Creel landings.

The impact of a seasonal closure was modeled by converting the number of days closed into a percentage of days closed for a given month. The projected landings during that month were then reduced by the percentage of the month that was closed.

Fishing Effort Shifting

Temporal closures can result in fishing effort shifting to time periods outside the closure (Baum et al. 2003, O'Keefe et al. 2013). The amount of effort shifting can vary by species and time period (Vermard et al. 2008). Amendment 46 is considering temporal closures and fishing effort shifting was addressed. This was done by first determining the closed days from a closure then distributing these days to the open days using the daily catch rate for the open periods. Daily catch rates were determined for each month from the 2017 predicted landings, however, the landings are uniform within a month. An example of the fishing effort shifting method is if 20 days are closed in June, such as June 1 through June 20, then these twenty days are distributed to the daily catch rates for the open period (January 1 through May 31 and June 21 through December 31). Since January is open for the entire month in this example the January landings will increase from the added days from the effort shift multiplied by the January daily catch rate. Additionally, the effort shifting method allows the user to define the percentage (from 0 to 100%) of the closed days to apply to the other open days. For example, if an effort shift of 10% is used for twenty closed days then two extra days will be distributed to the open days. The effort shifting method also allows the effort shifting percentage to be chosen for each mode (headboat, charter, and private).

An equation describing the effort shift calculations is shown below.

$$L_{mode,m} = \left(BL_{mode,m} * O_m\right) * \left(1 + \sigma_m * \begin{cases} if < 100\%\ closed: & \left[\left(\frac{\sum_{d=Jan\ 1}^{Dec\ 31}[d = closed]}{\sum_{d=Jan\ 1}^{Dec\ 31}[d]}\right) * \left(1 + \frac{\sum_{m=Jan}^{Dec}[O_m = 0\%]}{\sum_{m=Jan}^{Dec}[O_m > 0\%]}\right)\right] \\ & if\ 100\%\ closed: 0 \end{cases}\right)$$

where $L_{mode,m}$: projected landings after accounting for change in open season, $BL_{mode,m}$: projected 2017 landings by mode and month (m), d: day of the month, O_m: percent of month open to fishing, and σ_m: effort shift scalar for open month m.

Decision Tools

Percent reductions calculated from changes in management measures were applied to 2017 monthly projected landings to determine how much harvest would be reduced. These results were incorporated into a recreational decision tool. If month (m) was 100% closed, landings were set to zero pounds for all sectors. If a month was partially or fully open, the projected monthly recreational landings (RL) were computed as follows:

$$RL_{sector,m} = PRL_{sector,m} * O_m * \varsigma_{sector,m} * \beta_{sector,m}$$

where PRL: projected 2017 recreational landings, O: percent of month open to fishing, and ς: projected reduction following a size limit implementation, and β: projected reductions following a bag limit implementation.

The projected monthly recreational landings (RL), projected 2017 landings (PRL), projected reduction following a size limit implementation (ς), and projected reductions following a following bag limit implementation (β) were calculated for each sector (headboat, private, and charter). The sector landings (RL_{sector}) were combined to predict the total recreational landings.

The recreational decision tool (RDT) was implemented in Microsoft Excel using drop-down menus for inputting desired management measures (Figures 5 and 6). Excel was chosen because it is widely available for constituent use.

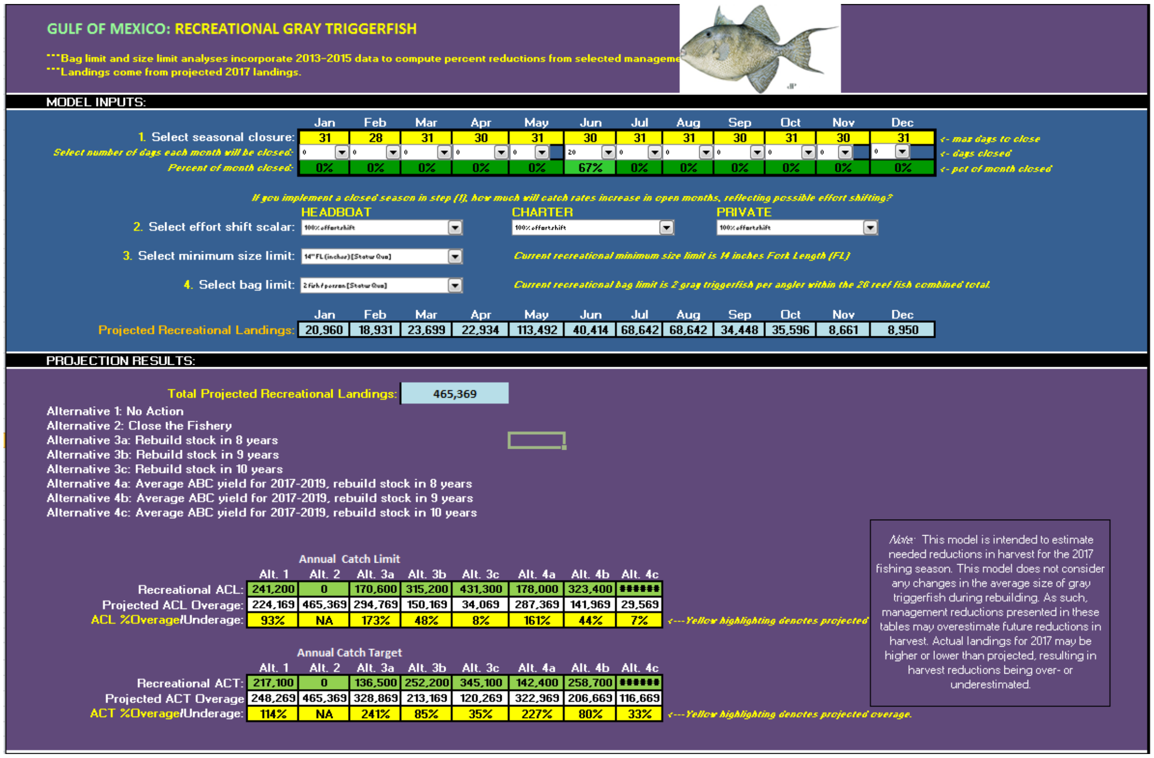

Figure 5. Top screenshot for the recreational decision tool.

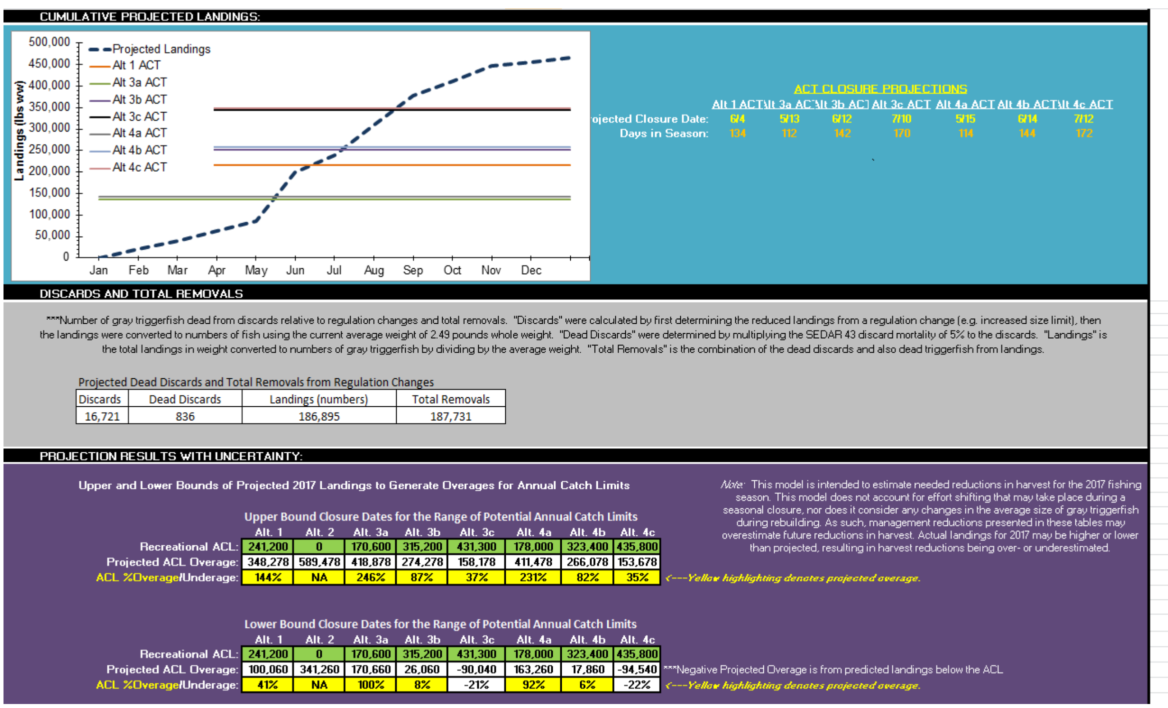

Figure 6. Bottom screenshot for the recreational decision tool.

Results
The RDT allows a range of management measures and then the modified landings are compared to the proposed ACTs and ACLs of Amendment 46. Table 6 presents projected recreational landings and days open in the season for a variety of management alternatives for the current ACT (217,100 pounds ww). A mix of management measures can reduce the landing to prevent the ACT from being exceeded.

Table 6. Projected recreational landings (lbs ww) of Gulf of Mexico gray triggerfish under a variety of proposed management measures that predict landings below the current ACT of 217,100 lbs ww. These results assume no effort shifting.

Closed Season	Days Open	Minimum Size Limit (inches FL)	Bag limit (fish/person)	Total Projected Landings (lbs ww)
Jun - Jul	163	14 (status quo)	2 (status quo)	337,803
Jun – Jul	281	16	2 (status quo)	220,810
Jun – Jul	304	16	1	185,425
None	365	18	1	200,700

Discussion
As with most projection models, the reliability of the RDT results are dependent upon the accuracy of their underlying data and input assumptions. We have attempted to create a realistic baseline as a foundation for comparisons, under the assumption that projected 2017 landings will accurately reflect actual 2017 landings. Uncertainty exists in this projection, as economic conditions, weather events, changes in catch-per-unit effort, fisher response to management regulations, and a variety of other factors may cause departures from this assumption.

The effort shifting method allows a projection of landings due to fishing effort shifting by increasing the days fished in the open time period. This results in higher landings during the open period. However, this method may not be realistic if an open time period is already saturated with landings and then the landings are increased even more from the fishing effort shift. Another caveat is closing days in a low daily catch rate time period may end up adding more days to a time period when the daily catch rates are high. For example, closing 10 days in the low daily catch rate month of December and then with the effort shift method adding more days to the high daily catch rate month of May could generate unrealistic results.
The RDT does not incorporate any changes in the average size of gray triggerfish during rebuilding. As the stock rebuilds it is likely that the average size will increase. An increased average size would lead to fishermen capturing their quota more rapidly relative to previous years under similar effort levels. All of these factors would result in more pessimistic projections. As such, management reductions may be overestimates, and caution should be taken in their interpretation and use. By contrast, continued adverse economic conditions and rising fuel prices may reduce effort, which would counter these other trends.

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APPENDIX E. COMMERCIAL DECISION TOOL REPORT

Modeling the Combined Effects of Proposed Management Measures for the Gulf of Mexico Gray Triggerfish Commercial Sector

LAPP/DM Branch
NOAA Fisheries Service
Southeast Regional Office

Introduction

Gray triggerfish (*Balistes capriscus*) are one of 31 reef fish species in the Fishery Management Plan (FMP) for the Reef Fish Resources of the Gulf of Mexico. The FMP provides management for reef fish species in the federal waters of the Gulf of Mexico.

In 2015, a stock assessment was conducted for the Gulf of Mexico gray triggerfish (SEDAR 43). Results from the assessment showed the gray triggerfish stock overfished but not experiencing overfishing. Amendment 46 is currently being drafted and its purpose is to establish management measures that will rebuild the stock. The current management measures for the commercial sector are a minimum size 14 inches fork length, closed season from June 1 to July 31, and a twelve gray triggerfish trip limit. Amendment 46 proposes changing the closed season and the trip limit for the commercial sector. A commercial decision tool was created to allow evaluation of the efficacy of the different management measures.

Data Sources

Commercial landings data for Gulf of Mexico gray triggerfish were obtained from the Southeast Fisheries Science Center (SEFSC) on June 28, 2016. SEFSC's Trip Interview Program (TIP) data was used to determine the average weight of gray triggerfish, and the data was provided on June 1, 2016. SEFSC's coastal fisheries logbook program (CFLP) was used for the trip limit analysis, and this data was provided by SEFSC on April 25, 2016.

Methods

Reductions in landings are necessary to achieve the proposed Annual Catch Limits (ACL) and Annual Catch Targets (ACT). The management measures of closed seasons and trip limits were explored as tools to reduce harvest. However, Amendment 46 is also proposing an increase in the trip limit which would likely increase harvest. All the calculations were done using SAS (SAS Institute, Cary, NC).

Commercial Trip Limits

Trip limits of 5, 10, 12, 13, 14, and 20 gray triggerfish were examined using CFLP. CFLP has the landings in pounds. Any pounds reported in gutted weight were converted to whole weight using a conversion of 1.04. Whole weight pounds for each trip were converted to numbers of gray triggerfish by dividing the landings by the average weight. The average weight was determined from the 2014 and 2015 TIP data. TIP data is collected by port samplers that interviewed fishermen and measured their catch. The average weight of gray triggerfish was determined to be 4.278 lbs ww.

The impacts of the various trip limits were analyzed with two different methods: one method for trip limits lesser than the current trip limit and another method for trip limits greater than the current trip limit. For trip limits lesser than the current trip limit (e.g. 5 and 10 fish), if the total catch per logbook-reported trip was greater than the trip limit being analyzed, the value was re-set to the new trip limit. For example, to analyze the 5 fish trip limit a trip, if 8 gray triggerfish were reported that value was re-set to 5 gray triggerfish. If a trip had reported gray triggerfish equal to or less than the trip limit being considered then no changes to catch were made. Percent reduction in landings were determined by looking at the reduction in numbers of triggerfish from the trips that were re-set compared to the overall landings of gray triggerfish. For trip limits greater than the current trip limit (e.g. 13, 14, and 20 fish), the analysis assumed that any trip that met the current trip limit of 12 fish would also meet the proposed increased trip limits and were modified accordingly. For example, to analyze the 14 fish trip limit a trip, a trip that reported 12 gray triggerfish was re-set to 14 gray triggerfish. Trips that reported greater than the new increased trip limit were not modified. It was assumed that since these trips exceeded the limit in the past that in the future there will still be a similar proportion of trips that exceed the trip limit. Trips that had less than 12 fish were not modified. Both methods used data from 2014 and 2015 because regulations from Amendment 37 impacted the fishery starting midyear 2013.

The majority of gray triggerfish trips in recent years reported less than 10 gray triggerfish per trip (Figure 1). Over 75% of the trips caught 10 gray triggerfish or less and over 85% of the trips caught 12 gray triggerfish or less. These landings were reflected in the generated trip limit reductions with the largest reductions occurring at the low trip limit of 5 fish (Table 1).

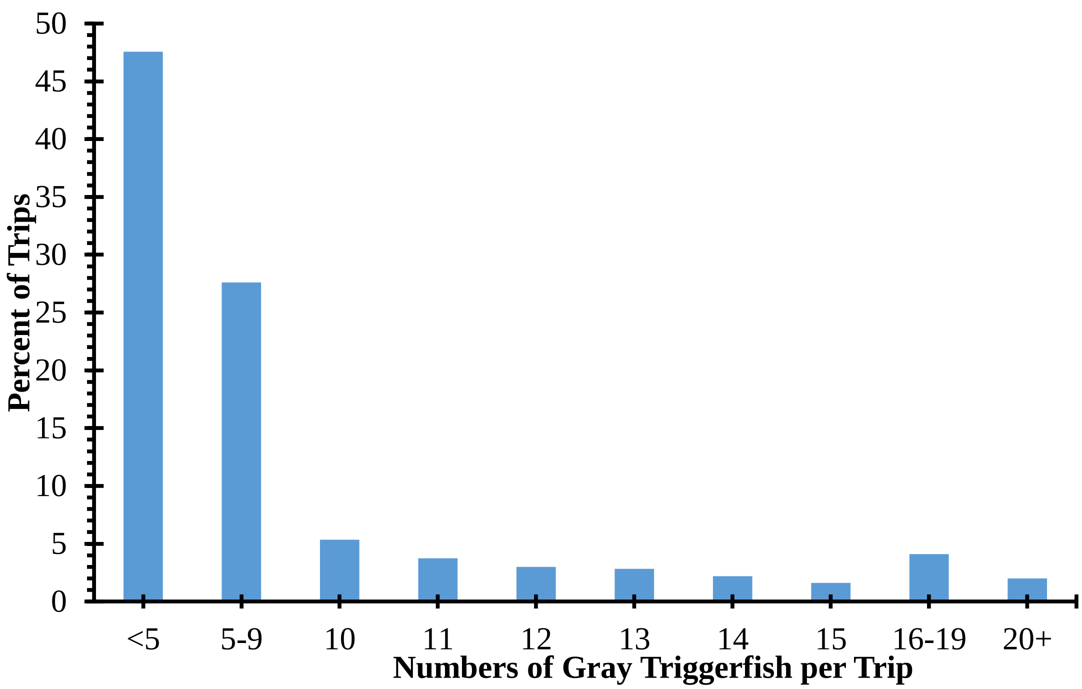

Figure 1. Percent of commercial trips landing different numbers of gray triggerfish in the Gulf of Mexico from 2014 and 2015 (n = 2,409 trips).

Table 1. Percent increases and decreases in landings for various commercial trip limits proposed in Amendment 46. Percent increases are positive numbers and percent decreases are negative numbers. Both the percent increase and decreases were generated from commercial logbook data from 2014 and 2015.

Trip Limit	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
5	-57.90%	-50.20%	-48.20%	-41.10%	-48.00%	-74.60%	-66.90%	-44.40%	-43.70%	-45.10%	-46.30%	-50.10%
10	-33.60%	-26.90%	-22.50%	-12.90%	-17.90%	-60.40%	-55.50%	-15.20%	-13.10%	-15.70%	-16.60%	-19.20%
12	0	0	0	0	0	0	0	0	0	0	0	0
13	0.24%	0.23%	0.34%	0.20%	0.15%	0.18%	0.00%	0.27%	0.26%	0.17%	0.28%	0.23%
14	0.98%	0.66%	1.08%	0.95%	0.91%	0.48%	0.21%	1.12%	1.03%	0.52%	0.97%	0.83%
20	9.60%	6.54%	10.27%	12.12%	11.40%	4.40%	2.47%	12.87%	10.96%	9.22%	9.52%	10.10%

2017 Predicted Landings

Amendment 46 is being drafted in 2016 and the resultant management measures will be imposed on the 2017 fishing year. An estimate of the 2017 landings are required to apply the percent increase or percent decrease from the various management measures, and determine the predicted landings relative to the ACLs and ACTs.

In May of 2013, Amendment 37 implemented regulations on the commercial sector to reduce harvest. A trip limit and closed season were implemented. The impact of the new closed season and trip limits being considered in Amendment 46 are analyzed relative to the status quo trip limit and closed season put forth through Amendment 37. For example, if the council keeps the status quo trip limit of twelve fish then landings will not be modified. Therefore, predicted 2017 landings came from average annual landings in recent years after the regulations of Amendment 37 were implemented. Predicted landings from January to May came from the average annual landings of 2014 and 2015. The commercial sector has been closed in June and July since 2013 therefore the predicted 2017 commercial landings were generated from an average of the 2008, 2009, and 2011 monthly landings. The landings in 2010 were not used because of the Deepwater Horizon oil spill and subsequent federal closures. Landings in 2012 were not used because the commercial sector was closed from July through December. There was no trip limits in place in 2008, 2009, and 2011. The landings from these years need to be comparable to landings from 2014 and 2015 which were used in the other months. This was done by calculating percent reductions in landings for a 12 fish trip limit with the logbook data for these three years (2008, 2009, and 2011) and then reducing the landings by these percentages.

The logbook data was converted from pounds to numbers of fish using the average Gulf of Mexico commercial average weight of 3.08 pounds generated from the TIP data from 2008, 2009, and 2010. The method for calculating the percent reduction in landings is described earlier in the document, and the calculated percent reduction for the 12 fish trip limit in 2008, 2009, and 2011 is 55.1%. The landings from August to December were the average monthly landings of 2013, 2014, and 2015. The landings from 2013 were included in determining the August to December predicted landings because the new regulations from Amendment 37 were implemented before August (May of 2013). Figure 2 provides the monthly landings for each year used to generate the 2017 predicted landings, and also the predicted landings.

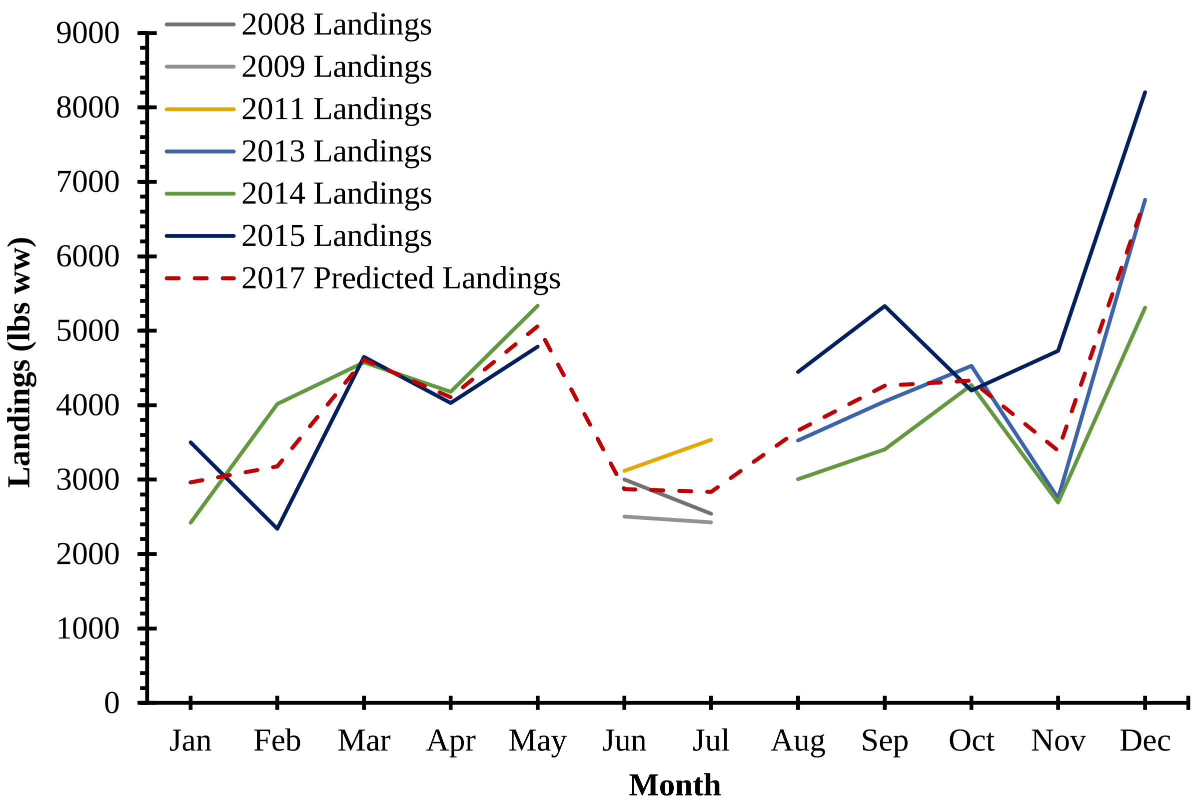

Figure 2. Gulf of Mexico gray triggerfish commercial landings by month for 2008-2015, and predicted 2017 landings, however 2010 landings were not used because of the oil spill. Only monthly landings that were used to generate predicted 2017 landings are included in the figure. The monthly landings of June and July in 2008, 2009, and 2011 were reduced to account for the current trip limit of 12 gray triggerfish.

Seasonal Closure Analyses

Landings of gray triggerfish are highly seasonal in the Gulf of Mexico; thus, reductions associated with seasonal closures differ greatly depending upon the time period selected for closure (Figure 2). The impact of a seasonal closure was modeled by converting the number of days closed into a percentage of days closed for a given month. The projected landings during that month were then reduced by the percentage of the month that was closed.

Decision Tool

Percent reductions calculated from changes in management measures were applied to 2017 monthly projected landings to determine how much harvest would be reduced. These results were incorporated into a commercial decision tool. If a month (*m*) was 100% closed, landings were set to zero pounds for that month. If a month was partially or fully open, the projected monthly commercial landings (CL) were computed as follows:

$$CL_m = PCL_m * O_m * T_m$$

where PCL: projected 2017 commercial landings, O: percent of month open to fishing, and T: projected reductions following a trip limit implementation.

The projected monthly commercial landings (CL), projected 2017 landings (PCL), and projected reductions following a following trip limit implementation (T) were calculated and combined for all months to predict total commercial landings.

The commercial decision tool (CDT) was implemented in Microsoft Excel using drop-down menus for inputting desired management measures (Figure 3). Excel was chosen because it is widely available for constituent use.

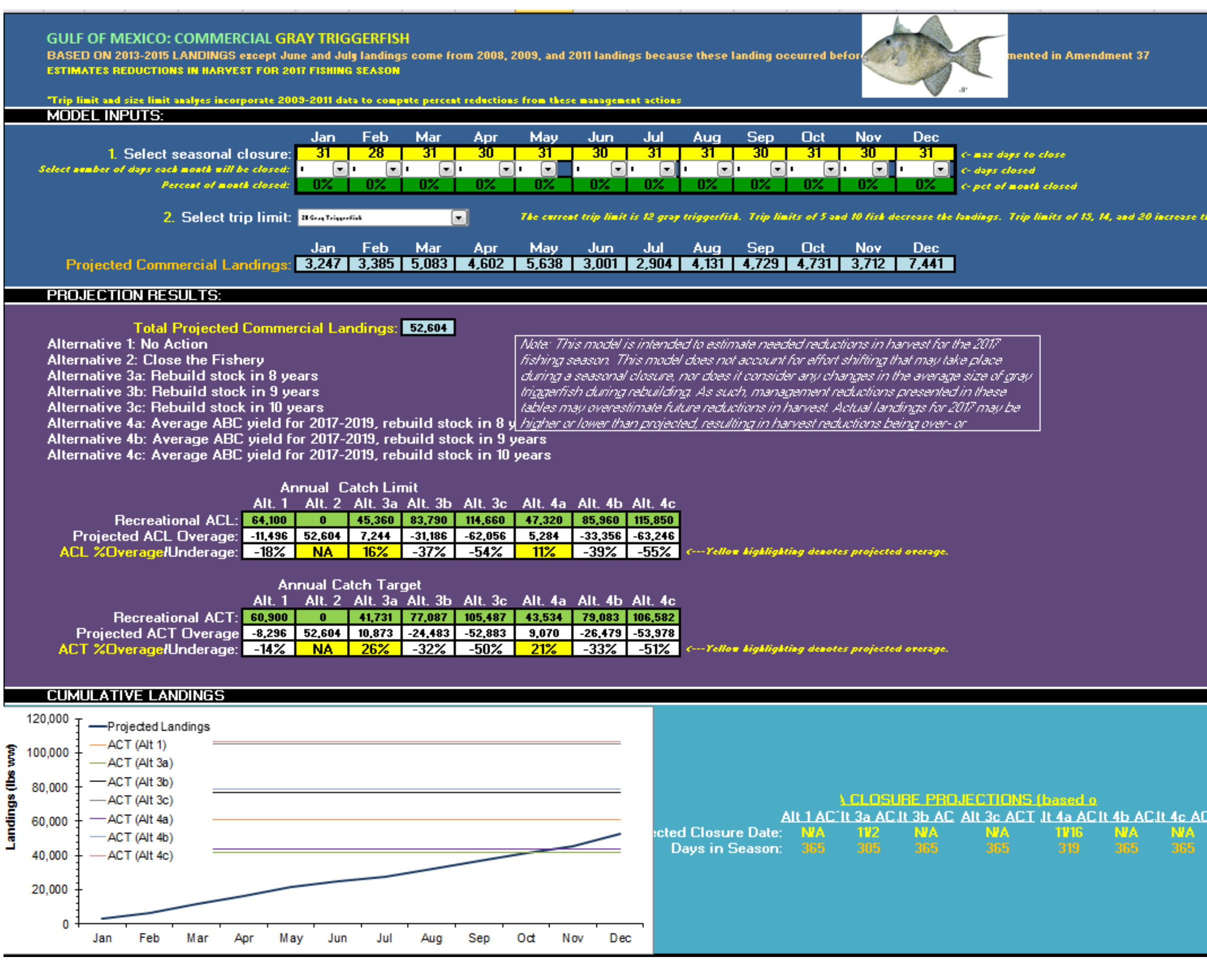

Figure 3. Screenshots for the commercial decision tool.

Results
The CDT allows a range of management measures and then the modified landings are compared to the proposed ACTs and ACLs of Amendment 46. Table 2 presents projected commercial landings and days open in the season for a variety of management alternatives for the current ACT (60,900 pounds ww). A mix of management measures can reduce the landings to prevent the ACT from being exceeded.

Table 2. Projected commercial landings (lbs ww) of Gulf of Mexico gray triggerfish under a variety of proposed management measures that predict landings below the current ACT of 60,900 lbs ww.

Closed Season	Days Open	Trip limit (# of Fish)	Total Projected Landings (lbs ww)
Jun – Jul (status quo)	304	12 (status quo)	42,316
Mar – Jul	212	12 (status quo)	28,541
Jun – Aug	273	12 (status quo)	38,656
None	365	10	36,738
None	365	12 (status quo)	48,024
None	365	14	48,425
Jun – Aug	365	14	38,996

Discussion
As with most projection models, the reliability of the CDT results are dependent upon the accuracy of their underlying data and input assumptions. We have attempted to create a realistic baseline as a foundation for comparisons, under the assumption that projected 2017 landings will accurately reflect actual 2017 landings. Uncertainty exists in this projection, as economic conditions, weather events, changes in catch-per-unit effort (CPUE), fisher response to management regulations, and a variety of other factors may cause departures from this assumption.

The CDT does not account for effort shifting that may take place during a seasonal closure. Effort shifting may lead to increased removal rates before and after a closure that partially offset the reductions expected from the closure.

The CDT does not incorporate any changes in the average size of gray triggerfish during rebuilding. An increased average size would lead to fishermen capturing their quota more rapidly relative to previous years under similar effort levels. All of these factors would result in more pessimistic projections. As such, management reductions may be overestimates, and caution should be taken in their interpretation and use. By contrast, continued adverse economic conditions and rising fuel prices may reduce effort, which would counter these other trends.

References

SEDAR 43. 2015. Stock assessment of gray triggerfish in the Gulf of Mexico. Southeast Data, Assessment and Review. North Charleston, South Carolina. http://www.sefsc.noaa.gov/sedar/.