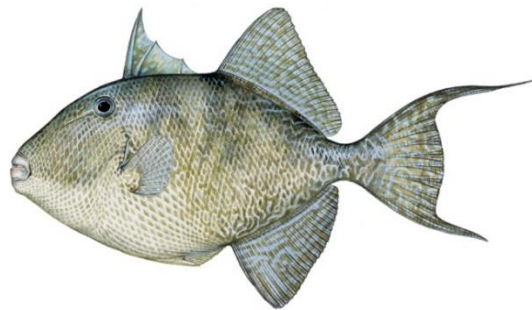
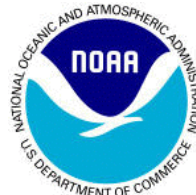


# Gray Triggerfish Rebuilding Plan



## **Draft Options Paper for Amendment 46 to the Fishery Management Plan for the Reef Fish Resources of the Gulf of Mexico**

**August 2016**



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# COVER SHEET

## Name of Action

Options Paper for Amendment 46: Modifications to the Gray Triggerfish Rebuilding Plan

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## ABBREVIATIONS USED IN THIS DOCUMENT

ABC	acceptable biological catch
ACL	annual catch limit
ACT	annual catch target
AMs	accountability measures
AP	advisory panel
B	biomass
B <sub>MSY</sub>	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
F	Instantaneous rate of fishing mortality
FL	fork length
F <sub>MSY</sub>	fishing mortality rate corresponding to an equilibrium yield of MSY
F <sub>OY</sub>	fishing mortality rate corresponding to an equilibrium yield of OY
F <sub>30% SPR</sub>	fishing mortality corresponding to 30% spawning potential ratio
FMP	Fishery Management Plan
GMFMC	Gulf of Mexico Fishery Management Council
Gulf	Gulf of Mexico
Headboat	Southeast Region Headboat Survey
LA Creel	Louisiana Department of Wildlife and Fisheries creel survey
M	Instantaneous rate of natural mortality
Magnuson-Stevens Act	Magnuson-Stevens Fishery Conservation and Management Act
MFMT	Maximum fishing mortality threshold
MRIP	Marine Recreational Information Program
MSST	minimum stock size threshold
MSY	maximum sustainable yield
NMFS	National Marine Fisheries Service
NOAA	National Oceanic and Atmospheric Administration
OFL	overfishing level
OY	optimum yield
SAS	SAS Institute
SEDAR	Southeast Data, Assessment and Review
SEFSC	Southeast Fisheries Science Center
SERO	Southeast Regional Office
SSASPM	State-Space Age-Structured Production Model
SSB	spawning stock biomass
SSC	Scientific and Statistical Committee
SPR	Spawning potential ratio
T	number of years
TL	total length
TPWD	Texas Parks and Wildlife Department
ww	whole weight

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# 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). Total landings increased from 2001-2004 and peaked in 2004 at almost 1,200,000 lbs whole weight (ww) (Figure 1.1.1). Landings declined after 2004 to just under 500,000 lbs ww in 2008 and 2009 and decreased to around 350,000 lbs ww in 2010. In 2013, total landings increased to 564,000 lbs ww.

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 project 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.

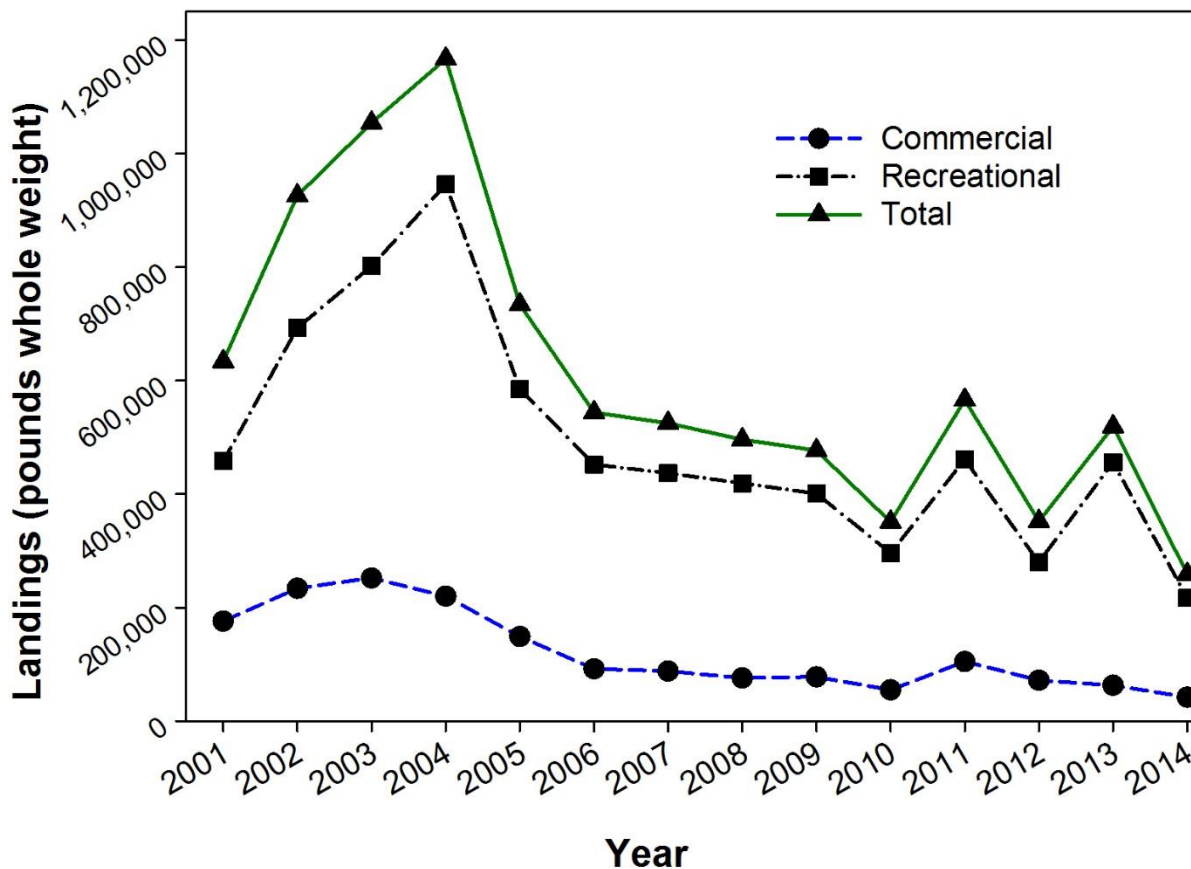
### *Accountability Measures (AMs)*

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 gray triggerfish was completed and reviewed by the Scientific and Statistical Committee (SSC) in October 2015. The assessment indicated that the Gulf 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 brought up during the assessment. This request was fulfilled and the SSC review these projections at their January 2016 meeting.



**Figure 1.1.1.** Gulf of Mexico gray triggerfish recreational, commercial, and total landings in pounds whole weight from 2001 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).

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 the 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. The assessment indicated that the Gulf gray triggerfish stock was no longer undergoing overfishing, but remains overfished (Table 1.1.1).

**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
<i>Mortality Rate Criteria</i>		
$F_{MSY}$	$F_{30\% SPR}$	0.166
MFMT	$F_{MSY proxy}$	0.166
FOY proxy	75% of $F_{30\% SPR}$	0.125
$F_{CURRENT}$	2013	0.120
<b><math>F_{CURRENT}/MFMT</math></b>	<b>30% SPR proxy</b>	<b>0.72</b>
Base M	M	0.28
<i>Biomass Criteria</i>		
$SSB_{MSY proxy}$ (egg production)	Equilibrium egg production @ $F_{30\% SPR}$	9.16E+09
MSST (egg production)	$(1-M)*SSB_{30\% SPR}$ : M= 0.28	6.60E+09
$SSB_{CURRENT}$	2013	1.13E+10
<b><math>SSB_{CURRENT}/MSST</math></b>	<b><math>SSB_{MSY proxy}</math></b>	<b>0.89</b>
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 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<sup>1</sup>, 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.

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](http://gulfcouncil.org/resources/SSC_Reports.php)). The corresponding overfishing limit defined by the SSC was the yield at  $F_{SPR30\%}$ , equal to 401,600 lbs ww for these years. Results

#### *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.

<sup>1</sup> Because this amendment was developed before the new National Standard 1 guidelines (74 FR 3178) were published, the Council used the term target total allowable catch to describe what are now referred to as ACTs.

from the update stock assessment showed that the gray triggerfish stock is continuing to experience overfishing and the stock is overfished. In March 2012, 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 their April 2012 Council 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](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 the 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 eliminated the 3-year running average ACL. In addition, an overage adjustment for the recreational sector was added (Table 1.2.1).

Since the implementation of Amendment 30A in 2008 and the reduction in sector 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 the ACT and ACL in 2008 and from 2011 through 2012 and its adjusted ACL and ACT from 2013 through 2015. The ACLs for 2009 and beyond were based on an average of the F<sub>OY</sub> yield streams as established in Amendment 30A (GMFMC 2008), but were later removed in Amendment 37 (GMFMC 2012).

**Table 1.2.1.** Gulf of Mexico landings, ACTs, and ACLs for gray triggerfish during the 8 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

Year	Recreational					Rec. Landings Moving Average	Commercial			
	Landings	ACT	Adjusted ACT	ACL	Adjusted ACL		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		217,100	177,123	241,200	201,123			60,900		64,100

Source: Commercial landings are from the commercial ACL dataset, accessed December 24, 2015, and recreational landings are from the recreational ACL dataset, accessed March 17, 2016.

Since the implementation of the revised rebuilding plan through an interim rule in 2012 and subsequent 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 variability in projecting when the ACT would be harvested and the recreational season closure date. These variables also compounded the stock assessment and rebuilding plan for gray triggerfish. In addition, unknown fisher behavior, such as effort shifting is difficult to quantify.

**Table 1.2.2.** Number of gray triggerfish fishing days in federal waters and number of additional fishing days in state waters. During the federal season, both federal and state waters are open to the harvest of gray triggerfish.

Recreational Fishing Seasons							
Year	Federal season	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 14	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

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

## 1.2 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.

## CHAPTER 2. MANAGEMENT ALTERNATIVES

### 2.1 Action 1 - Establish a Rebuilding Time Period for Gulf of Mexico Gray Triggerfish

**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.

**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<sup>th</sup> percentile of the  $F_{\text{rebuild}}$  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 Scientific and Statistical Committee (SSC). The stock needs to be rebuilt to a size that can support harvesting the maximum sustainable yield (MSY). For gray triggerfish, the yield at the fishing mortality rate (F) that can support a 30% spawning potential ratio (SPR), or the yield at  $F_{30\% \text{ SPR}}$ , the proxy for MSY. The recovery target for gray triggerfish is based on egg productivity or achieving a spawning potential ratio of 30% of and 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 overfished condition, the 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). Based on the most recent Standard Assessment (SEDAR 43 2015) on gray triggerfish, which indicated the stock was not rebuilding on schedule. In Amendment 37 the Council selected to rebuild the stock within 5 years or less, by the end of 2017 (GMFMC 2012). The rebuilding schedule was associated with harvesting at a fishing mortality rate associated with 30% spawning potential ratio with an acceptable biological catch

(ABC) of 305,300 lbs 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 Gulf of Mexico Fishery Management Council (Council) of this determination in a November 2, 2015, letter. After receiving this notice the Council “shall prepare and implement a fishery management plan, plan amendment, or proposed regulations for the fishery” as defined in section 304(e)(3) in Magnuson-Stevens Act.

**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% spawning potential 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). Therefore, this alternative could be feasible for rebuilding the stock but is not realistic considering the model estimates zero fishing mortality. For other reef fish species, discard mortality is greater and so alternative measures to reduce bycatch within different sectors would need to be considered for a rebuilding plan where fishing mortality is set at zero in order to work.

**Alternatives 3-5** would use the SSC’s recommended rebuilding time period for the gray triggerfish stock of 8, 9, or 10 years respectively. All of these alternatives are projected to begin in 2017 and are based on the results of SEDAR 43 (2015). The rebuilding time periods and the respective yield streams were approved by the SSC. **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.

The harvest projections 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.

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

<b>Alternative</b>	<b>Rebuilding time (years)</b>	<b>Rebuilding date</b>
<b>Alternative 2</b>	6	2022
<b>Alternative 3</b>	8	2024
<b>Alternative 4</b>	9	2025
<b>Alternative 5</b>	10	2026



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

\*Notes: The decisions in Action 1 for rebuilding time period dictates the options that can be used in Alternative 4.

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

**Alternative 1:** No Action. Retain the gray triggerfish sector ACLs and ACTs as developed in Amendment 37 and has been 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’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

**Alternative 4:** Use the SSC recommendation of mean ABC yield streams for 2017 through 2019 for each of 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 acceptable biological catch (ABC), annual catch limits (ACLs), and annual catch targets (ACTs) for gray triggerfish based on the SEDAR 43 (2015) stock assessment and subsequent Scientific and Statistical Committee (SSC) review.

**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 2019. The current ABC recommendation from the SSC to rebuild the stock within 8 years for 2017 through 2019 are as follows: **Alternative 3** would set the ABCs at 216,000 lbs for 2017 which is a 29% reduction from the status quo, 2018 at 227,000 lbs (26% reduction), and 2019 at 233,000 lbs (24% reduction). **Alternative 4** 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 4** 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. **Alternatives 3, 4 and 5** 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. Appendix A of this document is the ACL/ACT Control Rule Buffer Worksheet that explains how the 8% commercial buffer was calculated. Appendix B of this document is the ACL/ACT Control Rule Buffer Worksheet that explains how the 20% recreational buffer was calculated.

Gray triggerfish are currently managed toward harvesting the ACT (i.e., quota). When the ACT is projected to be reached the accountability measure (AM) is implemented to close the fishing season for the remainder of the year. This strategy provides a management buffer between the ACT and ACL, ultimately reducing the likelihood of exceeding the ACL and triggering accountability measures. 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 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.

## 2.3 Action 3 - Modify the Recreational Fixed Closed Season for Gray Triggerfish

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

**Alternative 2:** Modify the gray triggerfish closed season for the recreational sector to be from June 1 through August 31.

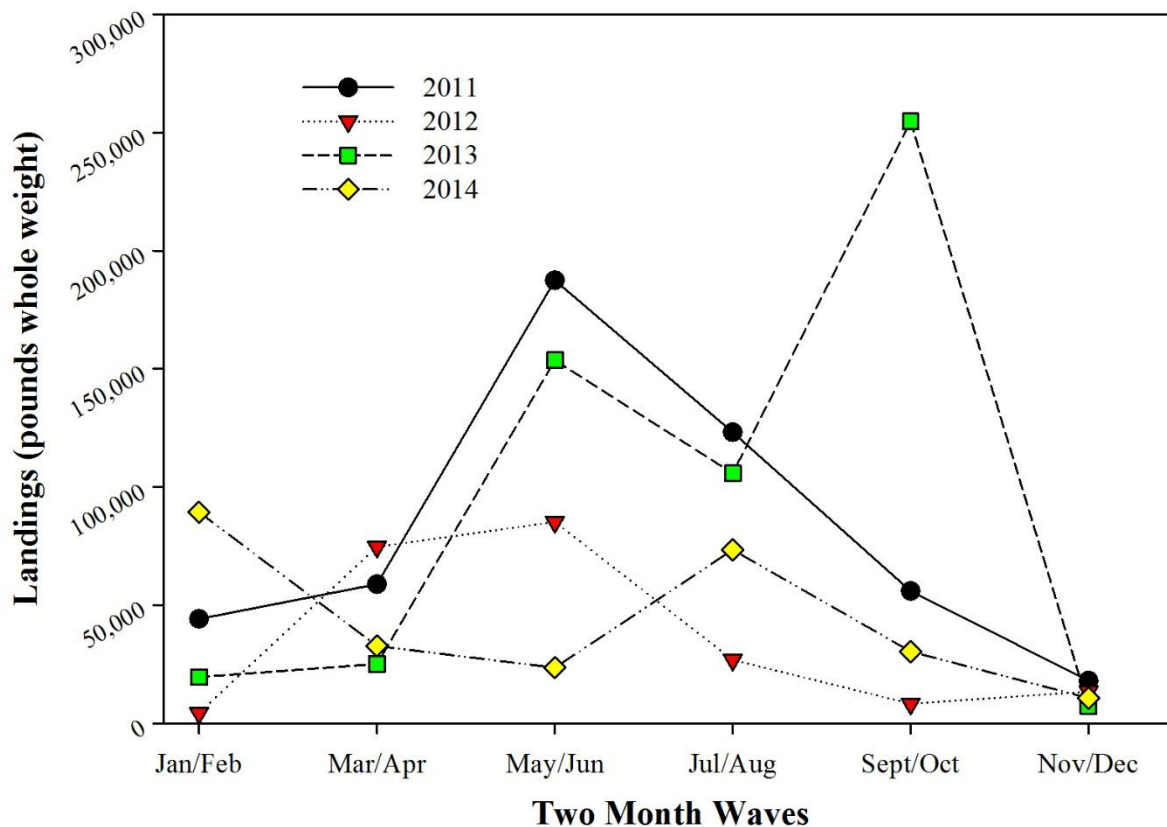
**Alternative 3:** Modify the gray triggerfish closed season for the recreational sector to be from January 1 through July 31.

**Alternative 4:** Modify the gray triggerfish closed season for the recreational sector to be from January 1 through February 28 and from June 1 through July 31.

**Alternative 5:** Modify the gray triggerfish closed season for the recreational sector to be from January 1 through January 31 and from June 1 through July 31.

### **Discussion:**

Action 3 would modify the recreational fixed closed season for gray triggerfish for 2017 and beyond. In 2011 and 2012, peak recreational gray triggerfish landings occurred during the months of May and June (wave 3). The 2014 recreational landings peak during the month of August (wave 4) after the June 1 through July 31 closed season was implemented on June 10, 2013 through Amendment 37 (Figure 2.3.1). Recreational landings may need to be reduced based on the ACT selected by the Council in Action 2. **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 of Mexico 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 recreational decision tool, SERO-LAPP Gulf 2016. However, as the stock rebuilds this projected closure could fluctuate annually, as it has since 2012. In 2016, for example, the recreational sector is 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. Gray triggerfish and red snapper co-occur on reefs in the northern Gulf of Mexico. 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). Therefore, closing gray triggerfish fishing during 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. **Alternatives 4** and **5** would maintain the June 1 through July 31 closed season, and establish an additional fixed recreational closed season. **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 2.3.1. If the Council uses closed seasons alone to constrain recreational harvest, **Alternative 3** is currently the most conservative Alternative the Council is considering. It is estimated to constrain landings to 148,177 pounds ww.

**Table 2.3.1.** 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) and the 2 fish bag limit.

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
<b>Alternative 1</b>	June – July (status quo)	337,803
<b>Alternative 2</b>	June – August	272,727
	April – July	208,464
	May – July	230,207
	May – August	165,131
<b>Alternative 3</b>	January – July	148,177
<b>Alternative 4</b>	Jan-Feb & Jun – July	299,984
<b>Alternative 5</b>	Jan & Jun – July	317,932

Source: SERO-LAPP Gulf 2016.

## 2.4 Action 4 - Modify the Recreational Bag Limit for Gray Triggerfish

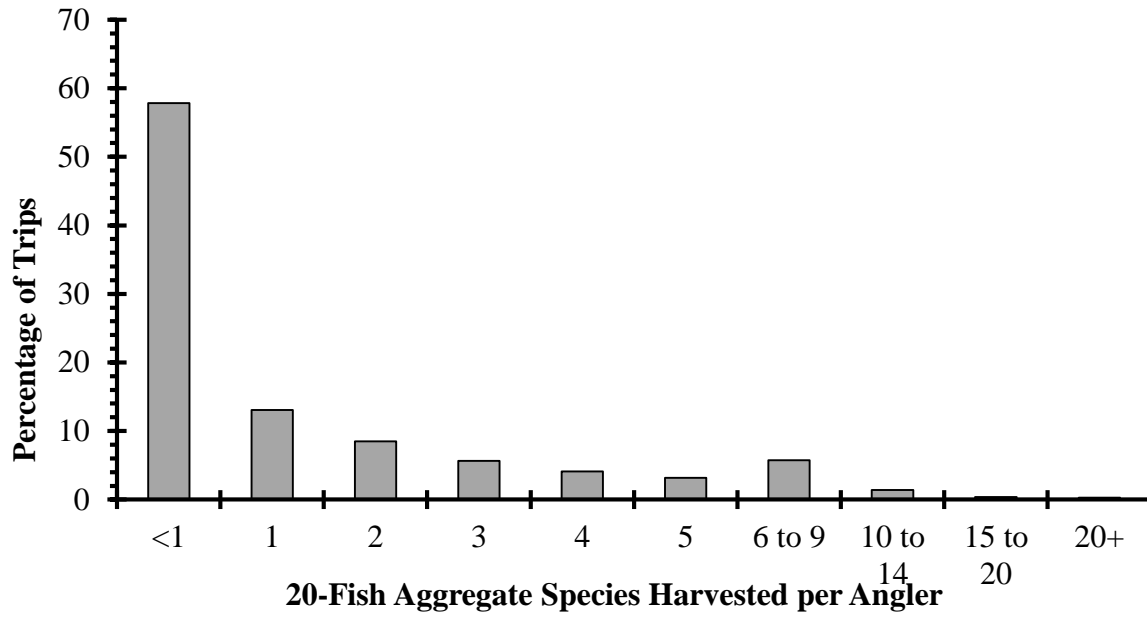
**Alternative 1:** No Action. Do not modify the recreational daily bag limit of 2 gray triggerfish per angler per day within the 20-reef fish aggregate bag limit.

**Alternative 2:** Reduce the recreational daily bag limit to be 1 gray triggerfish per angler per day within the 20-reef fish aggregate bag limit.

### Discussion:

Action 4 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**). **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.

A more in-depth analysis of the recreational survey data showed only a small percentage of trips (<1%, n = 70 trips) reached the 20-reef fish aggregate bag limit when all seven species in the aggregate were included (Figure 2.4.1). Therefore, the other species should not be impacted by removing gray triggerfish from the aggregate group as the 20-reef fish aggregate is not currently constraining harvest. Approximately, 10% of the trips harvest 2-gray triggerfish within the 20 fish aggregate bag limit (**Alternative 1**) status quo. The Council may want to consider removing gray triggerfish from the 20-reef fish aggregate since there is an individual bag limit for this species, particularly if it is reduced to 1 gray triggerfish per angler per day.



**Figure 2.4.1.** Number of reef fish per angler per trip (expressed as a percentage) landed within the 20 reef fish aggregate bag limit from the Gulf of Mexico (n=25,385 trips) from 2013 through 2015.

## 2.5 Action 5 - Modify the Recreational Minimum Size Limit for Gray Triggerfish

**Alternative 1:** No Action. Do not modify the gray triggerfish recreational minimum size limit of 14 inches fork length (FL).

**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:

Action 5 would increase the recreational minimum size limit. **Alternative 1** (No Action) would maintain the current 14 inch FL recreational minimum size. **Alternative 2** and **3** would increase the minimum size limit to 15 and 16 inches FL, respectively. Amendment 37 (GMFMC 2013) originally included management alternatives to modify the current minimum size limit of 14 inches FL, to 16 or 18 inches FL. The SERO-LAPP 2016 recreational decision tool allows for an increase in minimum size limits up to 20 inches FL. Table 2.5.1 show 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. Reducing the minimum size limit is expected to further increase harvest rates and is therefore is not a reasonable alternative for consideration.

**Table 2.5.1.** 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.

Alternatives	Minimum Size Limits (FL)	Total Projected Landings (lbs ww)
<b>1</b>	14 inches (status quo)	337,803
<b>2</b>	15 inches	269,256
<b>3</b>	16 inches	220,810
<b>NA</b>	20 inches	112,044

Source: SERO-LAPP Gulf 2016.

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 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 SERO-LAPP 2016 recreational decision tool does not account for effort shifting that may take place during season closures, nor does it consider any changes in the average size of gray triggerfish during rebuilding. Future angler behavior is unknown and the model is based on past behavior and economic environments. However, effort shifting and changes in average size may

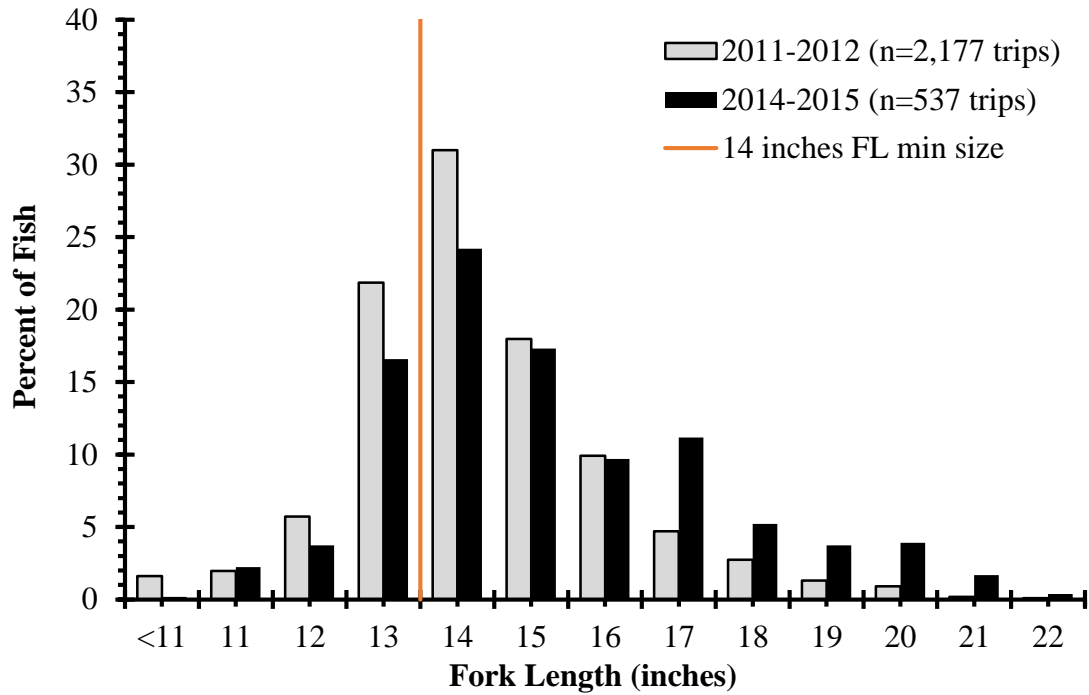


affect the total number of pounds harvested. Further, the model does not account for increases in the number of trips taken to compensate for implemented effort controls such as aggregate bag limits and closed seasons because it is largely unknown how management measures considered in the model will affect angler behavior. Finally, changes in recreational effort levels or catch-per-effort are not considered in the model. As such, management reductions projected by the model may be overestimated, and caution should be taken in their interpretation and use.

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). 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., 1.5%) 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. 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.

The issue of undersized gray triggerfish being landed from 2009 through 2011 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 2.5.1 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 2.5.1.** Length distribution of Gulf of Mexico recreational gray triggerfish for 2011-2012 and 2014-2015. Length data came from dock-side intercepts from the Gulf of Mexico’s recreational surveys (MRIP, Headboat, LA Creel, and TPWD).

## 2.6 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.

### **Discussion:**

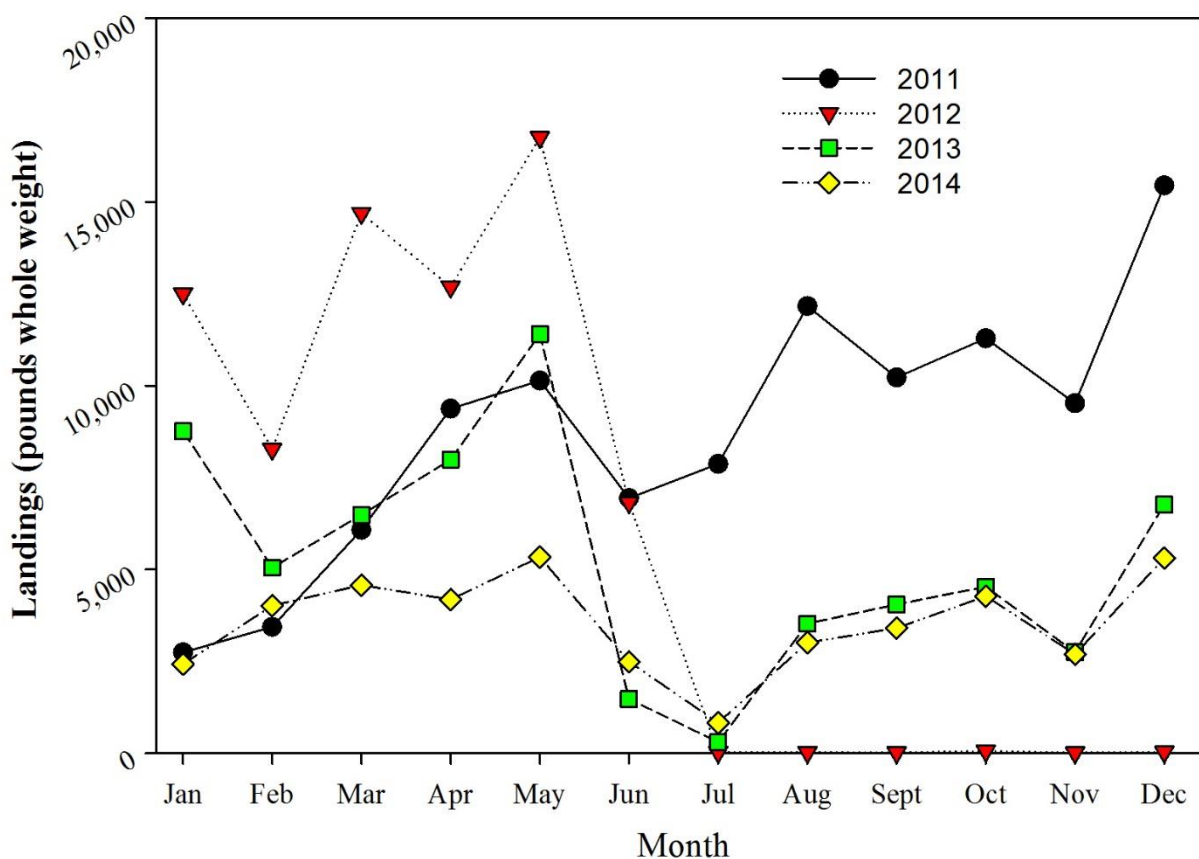
The commercial decision tool for gray triggerfish (SERO-LAPP 2016) was recently developed to allow the Council to examine a range of options after selecting a rebuilding time period (Action 1) and establishing ACLs and ACTs (Action 2). The model has been updated to include landings data from 2013-2015 and will be available for the August Council meeting. The model also provides estimates of total projected landings for gray triggerfish under the various management scenarios and total removals. An estimate of total removals incorporates discard mortality. The stock assessments for gray triggerfish determined discard mortality was minimal and therefore discard mortality was modeled at 0% (SEDAR 9 2006a; SEDAR 9 Update 2011b) and modeled at 5% with a sensitivity analysis at 10% in SEDAR 43 (2015). Results indicated that spawning stock biomass (SSB) was not sensitive to discard mortality. Following this assumption, discard mortality was modeled at 5% in the updated commercial decision tool (SERO-LAPP 2016).

The gray triggerfish commercial decision model estimates reductions in landings associated with various management measures (i.e., trip limits and closed seasons) necessary to achieve the ACTs summarized in Action 2. Reductions in landings for trip limits and minimum size limits were determined using logbook and trip interview program data from 2013 through 2015. These reductions were applied to 2017 monthly projected commercial landings to determine how much harvest would be reduced by implementing new management regulations. 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 applied the percentage to 2017 monthly projected commercial landings. Projected 2017 landings were generated from a seasonal auto-regressive integrated moving average model (Box and Jenkins 1976), which uses a combination of historical landings data and past, present, and future exploitable abundances to predict future landings.

The commercial decision tool does not account for effort shifting that may take place during season closures, nor does it consider any changes in the average size of gray triggerfish during rebuilding. Future fishing behavior is unknown and the model is based on past behavior and economic environments. Thus, changes in effort and average size of fish landed could affect the total pounds of gray triggerfish harvested. Further, the model does not account for increases in the number of trips taken to compensate for implemented effort controls such as trip limits and

closed seasons for the same reasons. Therefore, it is unknown how the management measures considered in the model will impact commercial effort levels or catch-per-effort thereafter. As such, management reductions projected by the model may be overestimated, and caution should be taken in their interpretation and use.

Action 6 evaluates different fixed closed seasons for the commercial sector to address the goal of rebuilding the gray triggerfish stock. Figure 2.6.1 illustrates that gray triggerfish is landed throughout the year by the commercial sector and there is no discernible trend in monthly landings from 2011-2015. In 2012, there were no landings from July to December, because the fishery was closed on July 1, 2012. Currently, the commercial sector closes when the harvest reaches or is projected to reach the ACT (quota). There is also a fixed closed season during the months of June and July. The June and July closure was implemented through Amendment 37 (GMFMC 2012) to reduce harvest during the peak spawning months (Simmons and Szedlmayer 2012) for gray triggerfish in the Gulf. If an in-season closure is necessary because the ACT is determined to have been met, the harvest of gray triggerfish would be prohibited until January 1 of the next year.



**Figure 2.6.1.** Commercial landings of gray triggerfish in the Gulf of Mexico by month from 2011 through 2014. Source: SERO-ACL dataset.

**Table 2.6.1** Projected commercial landings (lbs ww) of Gulf of Mexico gray triggerfish under a variety of proposed management measures (closed seasons and trip limits) that estimate landings below the current ACT of 60,900 lbs ww.

Alternative	Closed Season	Days Open	Trip limit (# of Fish)	Total Projected Landings (lbs ww)
<b>Alternative 1</b>	Jun – Jul (status quo)	304	12 (status quo)	42,316
<b>Alternative 2</b>	Mar – Jul	212	12 (status quo)	28,541
<b>Alternative 3</b>	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	273	14	38,996

**Alternative 1** (No Action) would continue to close the commercial harvest of gray triggerfish from June 1 through July 31, and prohibit further harvest when the ACT is projected to be reached. **Alternatives 2 and 3** would close different months of the year to achieve reductions in harvest. **Alternative 2** would close the commercial fishing season from March 1 through July 31, and is estimated to achieve a 33% reduction in landings from the status quo. **Alternative 3** would close the commercial fishing season from June 1 through August 31, and is estimated to achieve a reduction of 8% from the status quo. The alternatives each reduce gray triggerfish landings below the 60,900 lbs ww, which is the current ACT established in Amendment 37. Thus, although the number of days the season could be open varies by alternative, none of the Alternatives would be expected to allow landings to exceed the ACT and consequently, require an early closure.

## 2.7 Action 7 - Modify the Commercial Trip Limit for Gray Triggerfish

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

**Alternative 2:** Increase the commercial trip limit for gray triggerfish to 14 fish per vessel per day.

**Alternative 3:** Decrease the commercial trip limit for gray triggerfish to 10 fish per vessel per day.

**IPT Proposed Alternative X:** Increase the commercial trip limit for gray triggerfish to 20 fish per vessel per day.

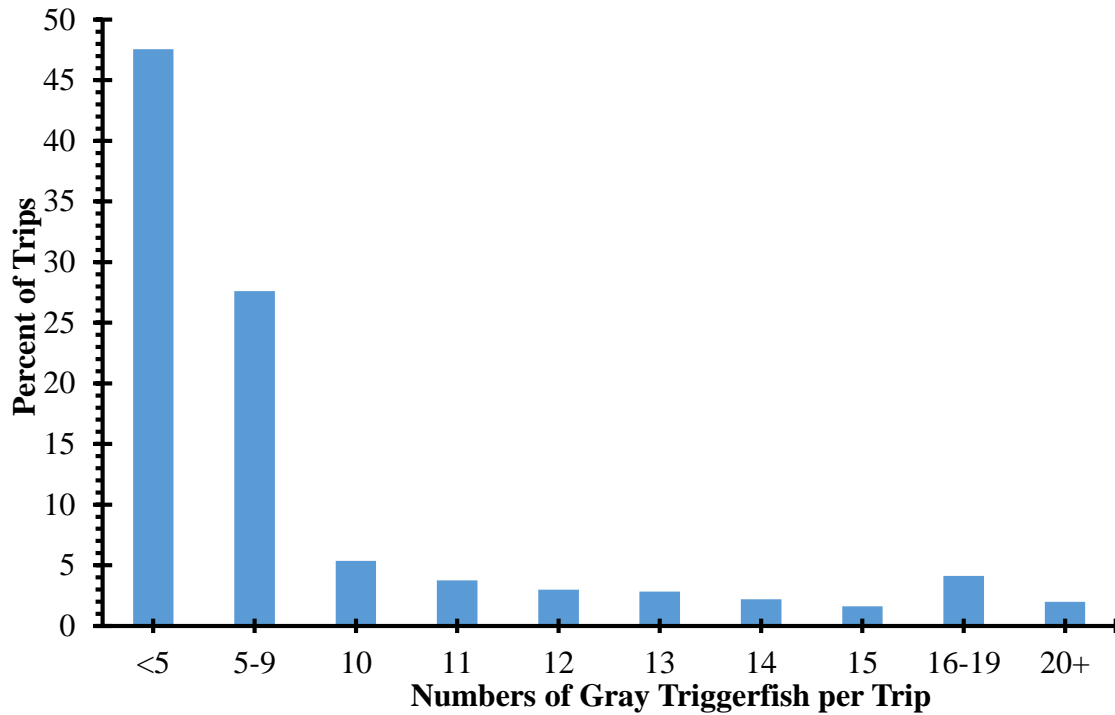
### **Discussion:**

Currently, the commercial trip limit for gray triggerfish is 12 fish. Action 7 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 been achieved is an alternative that must be carefully considered. Since the implementation of the 12 fish commercial trip limit in 2013 the 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 ACT. Increasing the commercial trip limit will provide a better opportunity for the commercial sector to achieve optimal yield. However, the gray triggerfish population as a whole is not meeting its rebuilding plan based on the most recent stock assessment (SEDAR 43 2015).

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 (AP). 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. 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 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. 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 Southeast Fisheries Science Center's (SEFSC) 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 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 mid-year in 2013.

The majority of gray triggerfish trips in recent years reported less than 10 gray triggerfish per trip (Figure 2.7.1). Over 80% of the trips caught 10 gray triggerfish or less and about 87% 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 gray triggerfish (Table 2.7.1).



**Figure 2.7.1.** 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. Thus, no additional reductions in harvest would occur unless a longer commercial season closure is selected in Action 6. **Alternative 2** (14-gray triggerfish trip limit) along with the current closure (June 1 through July 31) is estimated to land 42,697 lbs, which is less than the 8-year rebuilding plan ACLs in **Alternative 3** (47,320 lbs) of Action 2. 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. **Alternative 3** (10 gray triggerfish trip limit) along with the current closure (June-July) is estimated to reduce landings by 18.85%, yield 34,338 lbs which is less than the 8-year rebuilding plan ACLs in Alternative 3 of Action 1. Using the commercial decision tool, **Alternative x** (20 fish trip limit) along with the current closure (June 1 through July 31) is estimated to land 46,669 lbs. The estimated 46,669 lbs is less than the ACLs prescribed in the 8-year rebuilding plan in Action 1, Alternative 3 for 2018 and 2019, but not 2017, which the ACT is 45,360 lbs.



**Table 2.7.1.** 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	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
	<b>5</b>	-57.90%	-50.20%	-48.20%	-41.10%	-48.00%	-74.60%	-66.90%	-44.40%	-43.70%	-45.10%	-46.30%	-50.10%
<b>Alt. 3</b>	<b>10</b>	-33.60%	-26.90%	-22.50%	-12.90%	-17.90%	-60.40%	-55.50%	-15.20%	-13.10%	-15.70%	-16.60%	-19.20%
<b>Alt. 1</b>	<b>12</b>	0	0	0	0	0	0	0	0	0	0	0	0
	<b>13</b>	0.24%	0.23%	0.34%	0.20%	0.15%	0.18%	0.00%	0.27%	0.26%	0.17%	0.28%	0.23%
<b>Alt. 2</b>	<b>14</b>	0.98%	0.66%	1.08%	0.95%	0.91%	0.48%	0.21%	1.12%	1.03%	0.52%	0.97%	0.83%
	<b>20</b>	9.60%	6.54%	10.27%	12.12%	11.40%	4.40%	2.47%	12.87%	10.96%	9.22%	9.52%	10.10%

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# APPENDIX A. ACL/ACT CONTROL RULE FOR THE COMMERCIAL SECTOR

## ACL/ACT Buffer Spreadsheet

version 4.1 - April 2011

Commercial Gray Triggerfish

sum of points 2

Revised 3/24/2016

max points 6.0

Buffer between ACL and ACT (or ABC and ACL) Unweighted 6

Min. Buffer	0	min. buffer	User adjustable
Max Unw. Buff	19	max unwt. Buff	
Max Wtd Buff	25	max wtd. buffer	User adjustable

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

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

**ACL/ACT Buffer Spreadsheet**

version 4.1 - April 2011

Recreational Gray Triggerfish  
revised 3/24/2016

sum of points 8.5  
max points 10.5

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

<b>Min. Buffer</b>	<b>0</b>	<b>min. buffer</b>	User adjustable
Max Unw. Buff	19	max unwt. Buff	
<b>Max Wtd Buff</b>	<b>25</b>	<b>max wtd. buffer</b>	User adjustable

Component	Element score	Element	Selection	Element result
Stock assemblage	0	This ACL/ACT is for a single stock.	x	0
	1	This ACL/ACT is for a stock assemblage, or an indicator species for a stock assemblage		
Ability to Constrain Catch	0	Catch limit has been exceeded 0 or 1 times in last 4 years		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 Not applicable (there is no catch limit)	5.5	
Precision of Landings Data Recreational	0	Apply this component to recreational fisheries, not commercial or IFQ fisheries		2
		Method of absolute counting		
	1	MRIP proportional standard error (PSE) <= 20		
	2	MRIP proportional standard error (PSE) > 20	x	
Precision of Landings Data Commercial	0	Apply this component to commercial fisheries or any fishery under an IFQ program		not applicable
		Landings from IFQ program		
	1	Landings based on dealer reporting		
	2	Landings based on other		
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. 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).

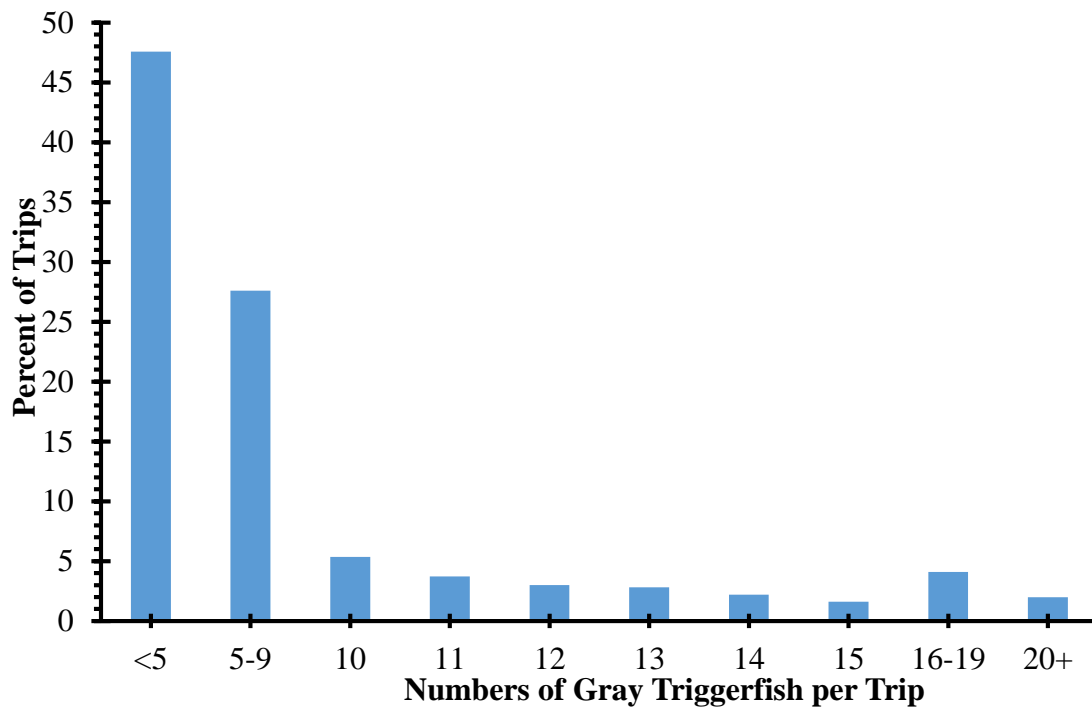
### *Commercial Trip Limits*

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.

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

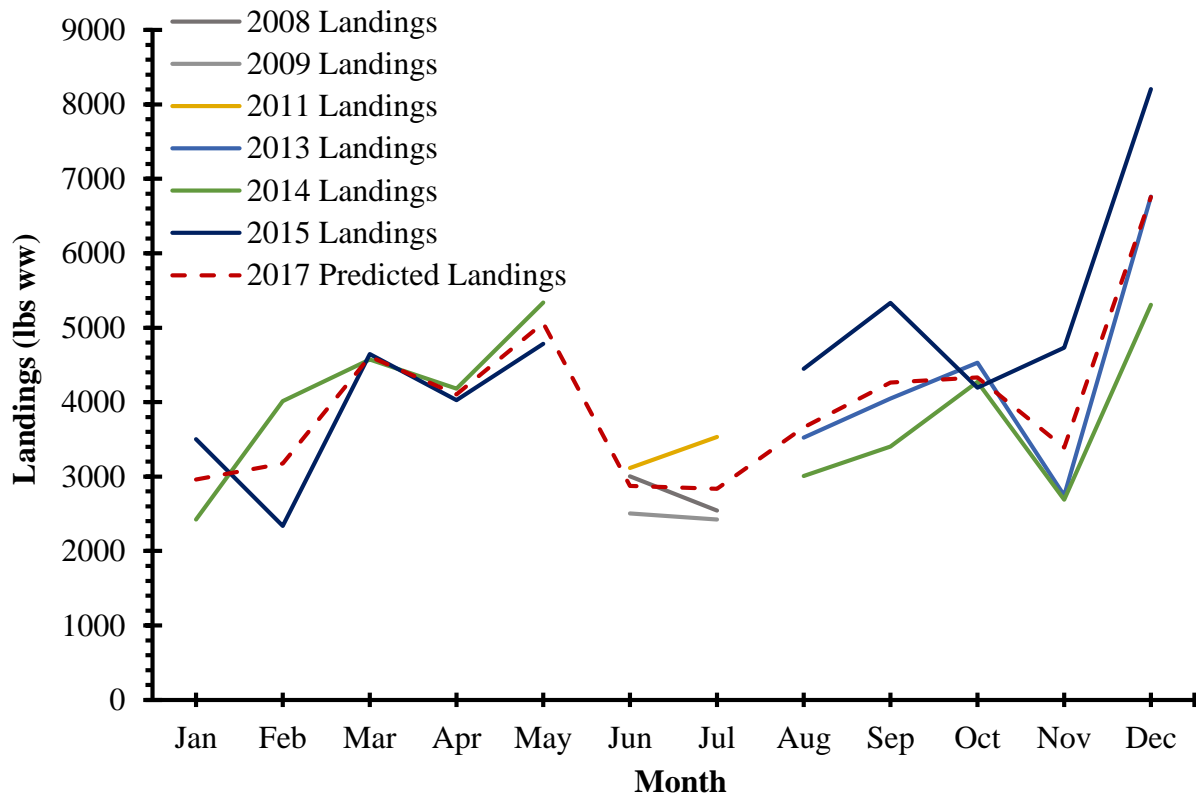
*2017 Predicted Landings*

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.

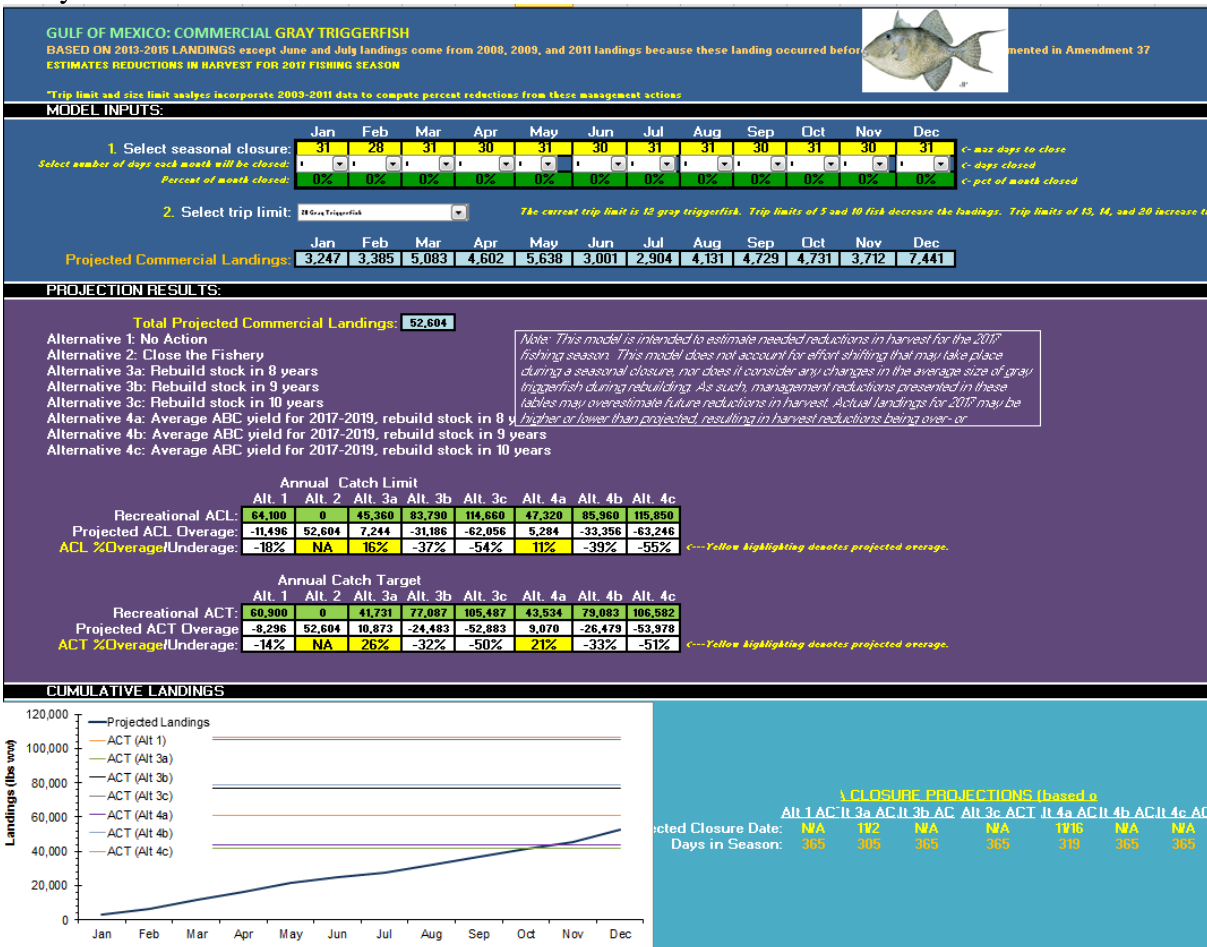


Figure 3. Screenshots for the commercial decision tool.

## 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.

<b>Closed Season</b>	<b>Days Open</b>	<b>Trip limit (# of Fish)</b>	<b>Total Projected Landings (lbs ww)</b>
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/>.